

PRIMRE: Readily Available Data and Information on Marine Energy

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For NHA Marine Energy Council

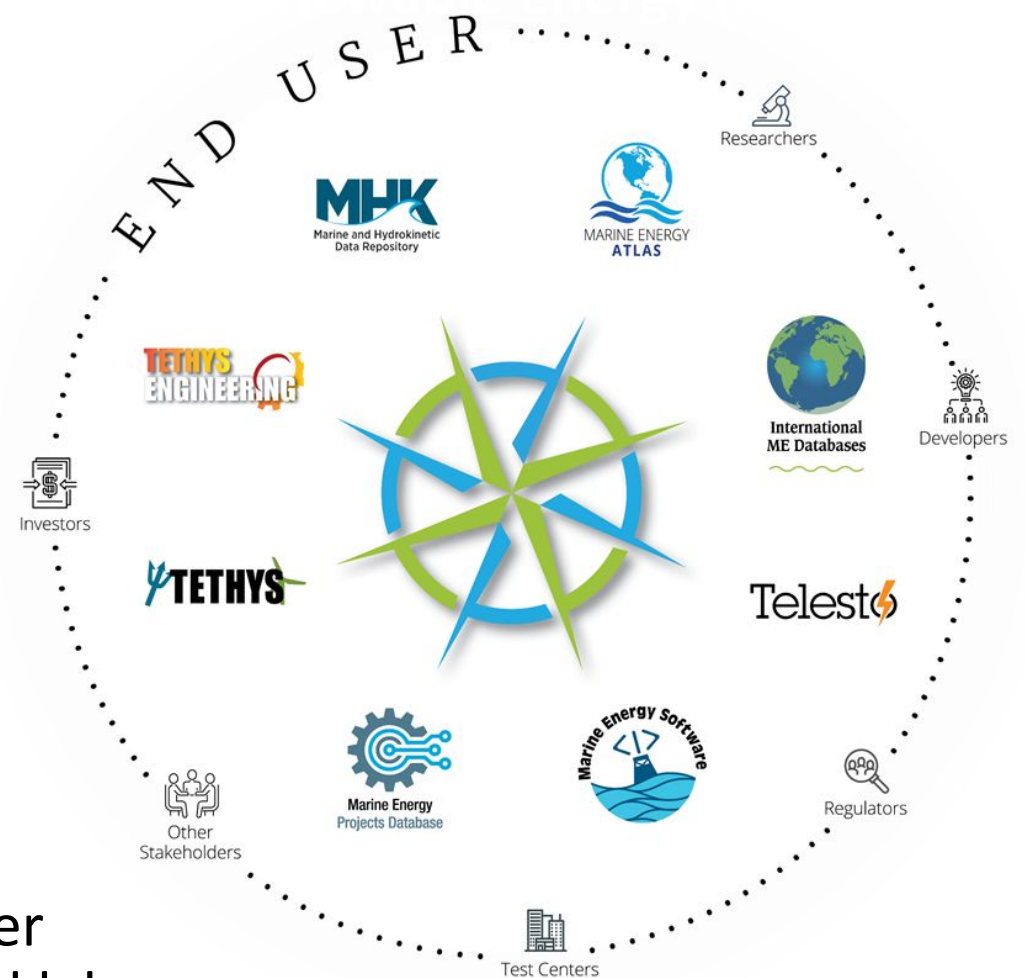


The **Portal and Repository of Information on Marine Renewable Energy (PRIMRE)** provides access to marine energy data, information, and resources to help advance the industry.

- Knowledge Hubs
- Marine Energy Basics
- Events Calendar & Webinars
- Educational Resources
- Data, Tools, & Software

Funded by the US Department of Energy's Water Power Technologies Office and led by 3 national labs.

<https://openei.org/wiki/PRIMRE>



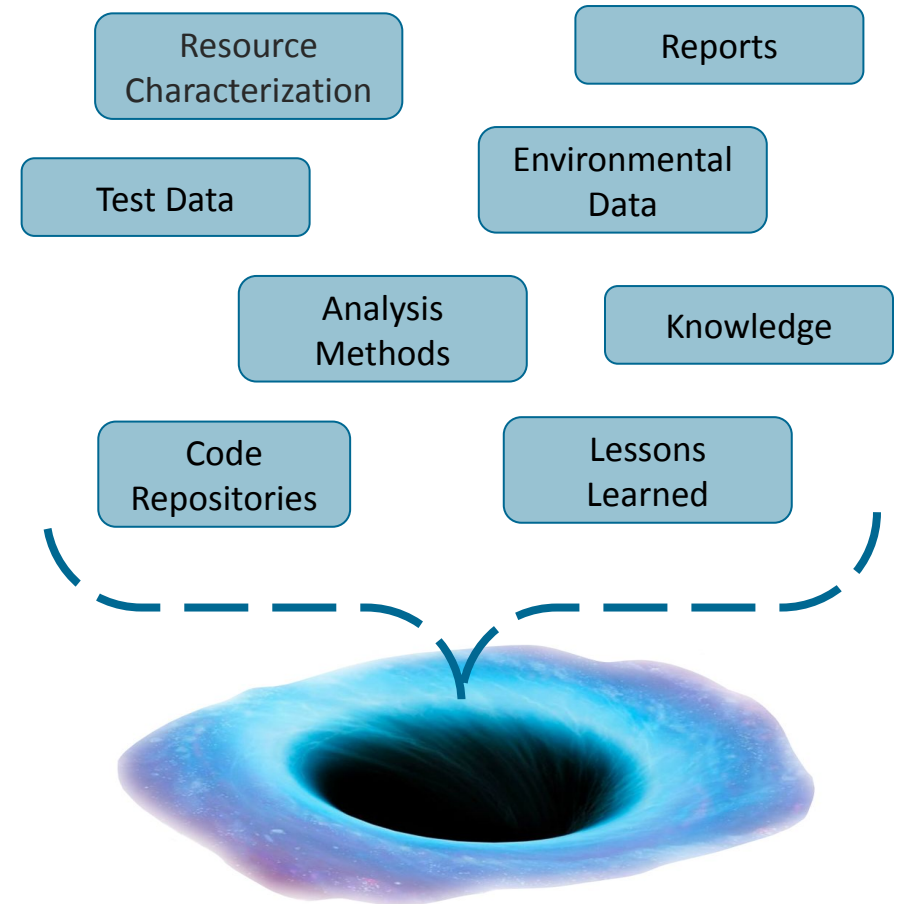
Availability of Knowledge

Data and information are:

- often not made public
- stored in many locations and diverse formats
- often not catalogued, described, accessible, or discoverable.

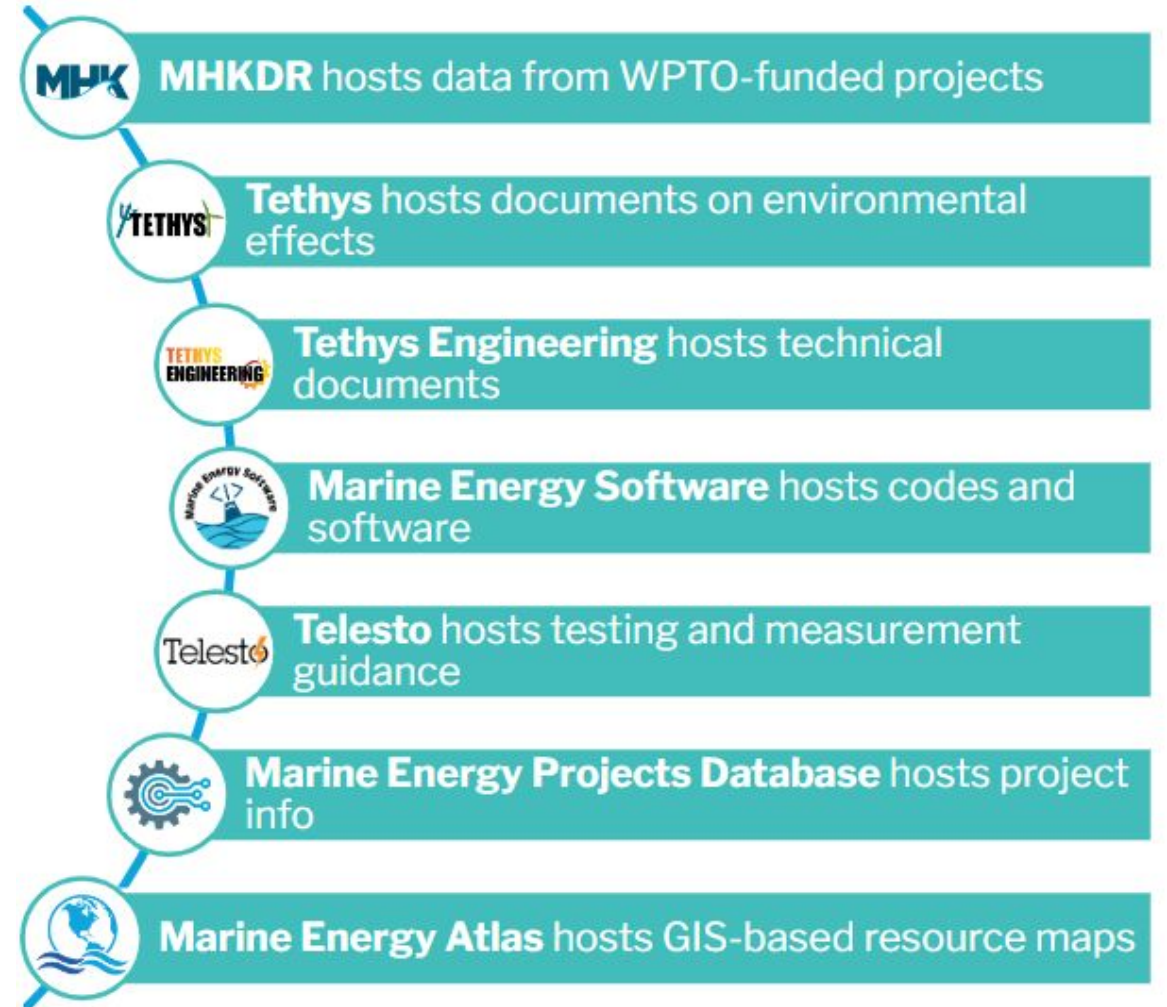
US Department of Energy developed:

Portal and Repository for Information on Marine Renewable Energy ([PRIMRE](#)) to overcome data and information barriers to research, development, and testing in support of the US and international marine energy communities.



PRIMRE Knowledge Hubs

- Each **Knowledge Hub** houses a different type and format of information related to marine energy.
- Several Knowledge Hubs were developed under other projects, but all have been integrated and improved.
- PRIMRE has a **one-stop search** that allows users to find data and information throughout the system.



Additions to PRIMRE Over The Years...



2019 Launched Tethys Engineering

2019 Published Guidelines and Best Practices

2020 Launched Marine Energy Software

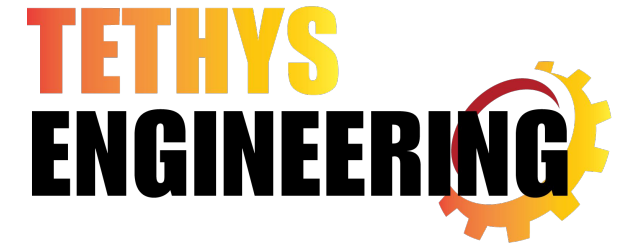
2021 Launched PRIMRE Signature Projects

2021 Conducted Lessons Learned Interviews

2022 Launched Marine Energy Atlas

2022 Relaunched Marine Energy Projects Database

Launched Tethys Engineering



The screenshot shows the Tethys Engineering website interface. At the top, there is a navigation menu with links for ABOUT, CONTENT, CONNECTIONS, BROADCASTS, and HELP. Below the navigation is a banner for the Tethys Engineering Photo Library, which contains hundreds of photos of marine energy devices. A 'NEW USER' button is visible, along with a 'KNOWLEDGE BASE' button.

The 'Knowledge Base' section is highlighted, showing a search interface and a table of results. The search criteria are 'CURRENT' (Power from tidal, ocean current, and river flows). The table lists several entries with columns for Title, Author, Date, Content type, Technology, Collection Method, and Application.

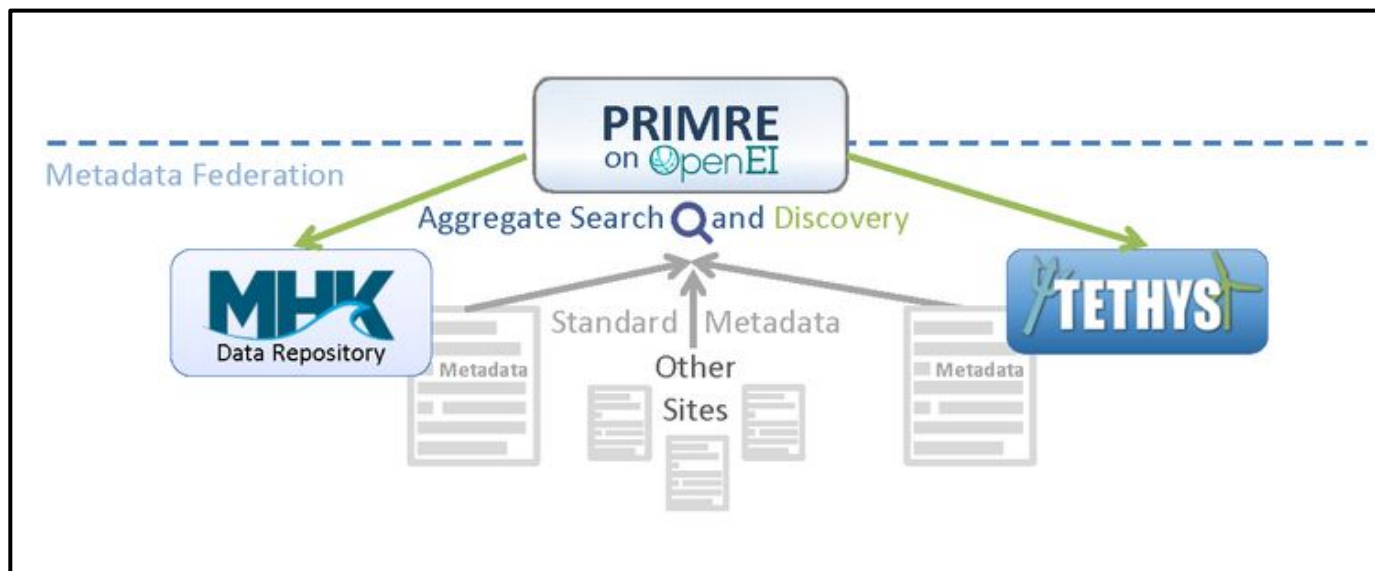
Title	Author	Date	Content type	Technology	Collection Method	Application
Heat transfer mechanism of cold-water pipe in ocean thermal energy conversion system	Mao, L.; Wei, C.; Zeng, S.; et al.	April 2023	Journal Article	OTEC	Modeling	Performance
Performance variations of wave energy converters due to global long-term wave period change (1900–2010)	Ulazia, A.; Saenz-Aguirre, A.; Ibarra-Berastegui, G.; et al.	April 2023	Journal Article	Wave, Point Absorber, Oscillating Water Column	Modeling	Hydrodynamics
Co-enhancements of several design parameters of an Archimedes spiral turbine for hydrokinetic energy conversion	Badawy, Y.; Nawar, M.; Attai, Y.; et al.	April 2023	Journal Article	Current, Axial Flow Turbine, Archimedes Screw, Riverine	Modeling	Performance, Structural
Hydrodynamic independence and passive control application of twist and flapwise deformations of tidal turbine blades	Zilic de Arcos, F.; Vogel, C.; Wilden, R.	April 2023	Journal Article	Current, Axial Flow Turbine	Modeling	Hydrodynamics
Performance investigations of hybrid hydrokinetic turbine rotor with different system and operating parameters	Kamal, M.; Saini, R.	March 2023	Journal Article	Current, Cross Flow Turbine	Modeling	Hydrodynamics, Performance, Structural

Search filters on the right include 'Current Search' with 7068 results found. The 'Content Type' filter shows options like Journal Article (4499), Conference Paper (1621), Report (469), Thesis (170), Book Chapter (145), Presentation (100), Book (29), Guidance (20), Workshop Article (6), Summary (4), Magazine Article (2), and Website (1). The 'Technology Type' filter shows options like Wave (3997), Point Absorber (715), Oscillating Water Column (646), Oscillating Wave Surge Converter (184), Overlapping (94), Attenuator (89), Pressure Differential (44), Current (2680), Tidal (1641), Axial Flow Turbine (403), and Cross Flow Turbine (229).

- New Knowledge Hub that brings together documents on technical and engineering aspects of marine energy
- Analogous to the Tethys Knowledge Hub for environmental documents
- Features a Photo Library with over 600 device images that are free for use

<https://tethys-engineering.pnnl.gov/>

Published Data Guidelines and Best Practices



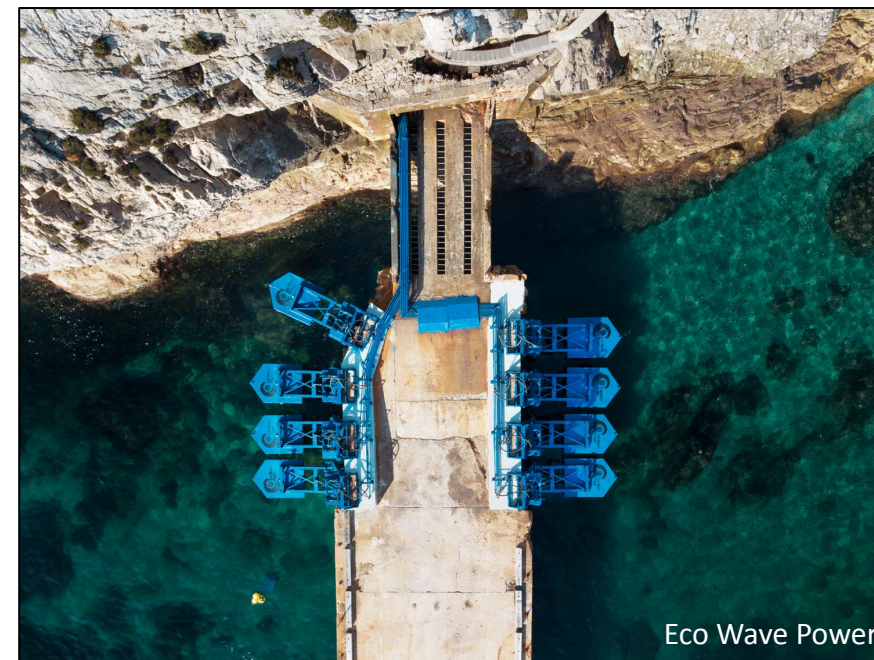
- Enable platform integration, future expansion, system integrity, and data sharing across U.S. and international databases
 - Standard metadata units/formatting = data can be shared seamlessly between platform
- Encouraging use with other systems, including internationally

<https://openei.org/wiki/PRIMRE/Guidelines>



Launched Marine Energy Software

- Systematically catalogues codes and software relevant to marine energy
- Includes commercial and open access software
- Driven by user needs and input



<https://openei.org/wiki/PRIMRE/Software>

Signature Projects

- Highlight a selection of Water Power Technologies Office projects, including:
 - Reference Model
 - Wave Energy Prize
 - Resource Characterization
 - TEAMER
 - U MERC
- Ensure all project reports, datasets, and associated papers are easily discoverable

https://openei.org/wiki/PRIMRE/Signature_Projects



Project Information

Project Purpose

The Testing Expertise and Access for Marine Energy Research (TEAMER) program aims to accelerate the viability of marine renewables by providing access to the United States' best facilities and expertise in order to solve challenges, build knowledge, foster innovation, and drive commercialization.

Project Description

The TEAMER program, sponsored by the U.S. Department of Energy (DOE) and directed by the Pacific Ocean Energy Trust (POET), provides marine energy developers and researchers access to the nation's best facilities and expertise. Between 2020 and 2023, TEAMER plans to distribute approximately \$13 million through its periodic competitive funding opportunities (known as Request for Technical Support, RFTS) to support marine energy testing and development projects.

TEAMER is supported by the TEAMER Facility Network, which is comprised of the national labs, private research institutions, and universities approved to provide testing or expertise to TEAMER applicants.

POET is supported by the TEAMER Technical Board, which includes representatives from the National Renewable Energy Laboratory, Pacific Northwest National Laboratory, Sandia National Laboratories, University of Washington, Oregon State University, University of Alaska Fairbanks, Florida Atlantic University, and University of Hawaii.

Methods

TEAMER RFTS calls occur 2-3 times per year (roughly every 4-6 months) with an emphasis on rapid implementation and shared results. Applicants may apply for TEAMER support under the following categories:

- Numerical Modelling and Analysis
- Laboratory/Bench Testing
- Tank/Flume Testing
- Field Testing

Applicants are required to consult with their preferred facilities prior to applying for TEAMER support. All applications are independently reviewed to assess technical feasibility, impact, and relevance. Following approval, selected applicants work with their facilities to create and execute a detailed test plan. Within 60 days of the completion of their activity, Technical Support Recipients are then required to complete a series of post access requirements, including completing a Post Access Report and uploading relevant data and information to the PRIMRE Knowledge Hubs.

Status:	Ongoing
Start Date:	2020/01/01
End Date:	2023/12/01
Source:	TEAMER
Organization:	Pacific Ocean Energy Trust (POET) , US Department of Energy (DOE)
Contact:	Matthew Sanders

Lessons Learned Interviews

- Conducted expert interviews to capture lessons learned from research, development, and deployment projects
- Launching interactive webpage with lessons and links to resources soon
- Planning to continue with U.S. interviews later this year
- Email hayley.farr@pnnl.gov if you're interested in participating

PRIMRE About Knowledge Hubs MRE Basics Events Prizes Signature Projects STEM

PRIMRE / Lessons Learned

Collecting Lessons Learned

Main Themes

- Business Management
- Collaboration
- Contracting
- Data Collection, Analysis, & Reporting
- Design, Build, & Test
- Environmental Monitoring
- Foundations, Moorings, & Anchors
- Funding
- Intellectual Property
- Onshore & Offshore Marine Operations
- Manufacturing & Assembly
- Market Focus
- Resource Assessment & Site Characterization
- Siting & Permitting
- Skills, Experiences, & Competencies
- Stakeholder Engagement & Public Relations
- Supply Chain

Conclusion
How to Contribute

Collecting Lessons Learned

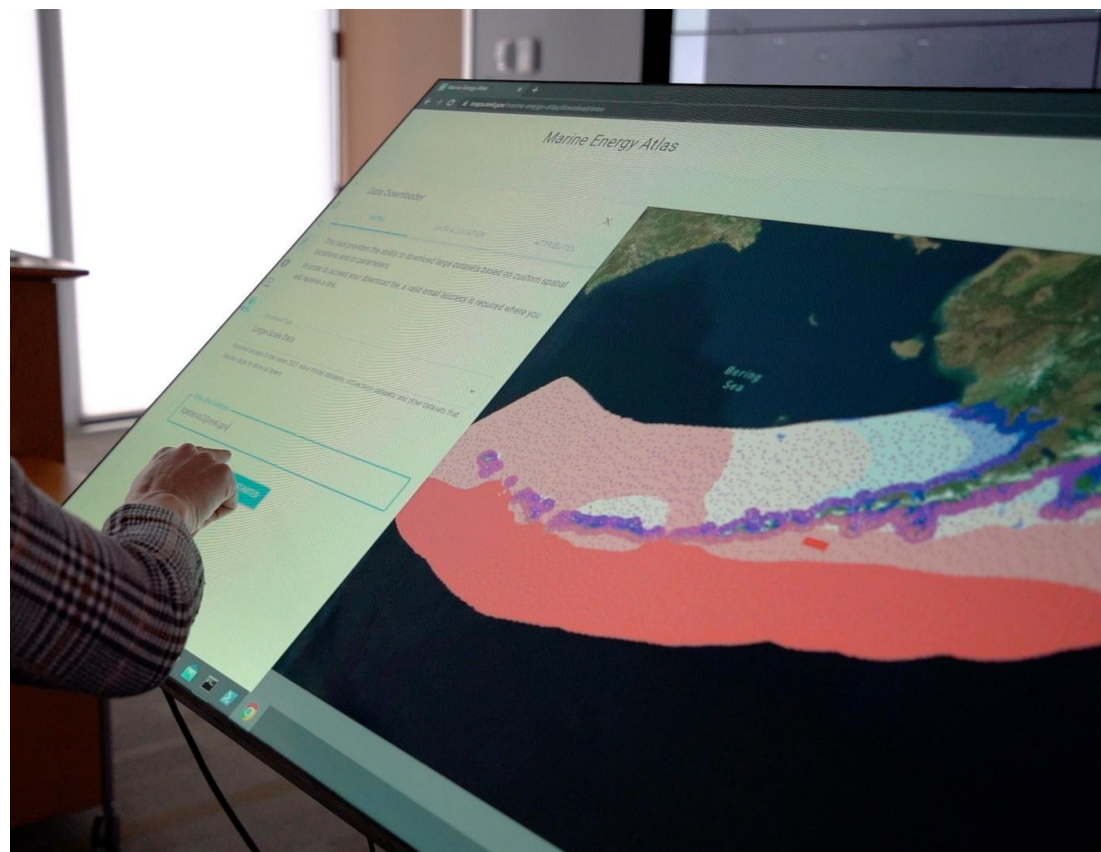
The PRIMRE team is conducting semi-structured interviews with marine energy subject matter experts to collect lessons learned from marine energy research, development, and deployment projects. This page outlines the methods for data collection and analysis, presents the main lessons learned, and highlights links to relevant resources.

Overall, the lessons learned, challenges, and successes identified during the interviews fit into 17 themes that span the entire marine energy development lifecycle. The interactive figure above illustrates how many of the lessons learned relate to multiple themes. Click on the figure or the menu to the left to explore lessons learned and relevant resources for each theme.



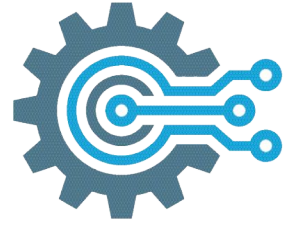
Launched Marine Energy Atlas

- Open-access, interactive mapping tool for marine energy
- Allows users to map U.S. wave, tidal, riverine current, ocean current, and ocean thermal resources to explore potential for marine energy projects



<https://maps.nrel.gov/marine-energy-atlas/>

Relaunched Marine Energy Projects Database



King Island Wave Swell Project

The unit was installed at Grassy, King Island, on January 10, 2021. It has since been commissioned, exporting its first power into the King Island grid on June 18, 2021. These are significant events for WSE's shareholders and stakeholders. WSE has worked with Hydro Tasmania, the island's energy and network provider, to connect the unit to the local grid, and is now delivering energy from the project into the existing network. Hydro Tasmania will separately monitor the energy produced by the unit to ensure it meets the requirements of the King Island grid. The wave energy produced will complement Hydro Tasmania's existing hybrid grid, further diversifying the renewable sources and reducing diesel consumption on King Island.



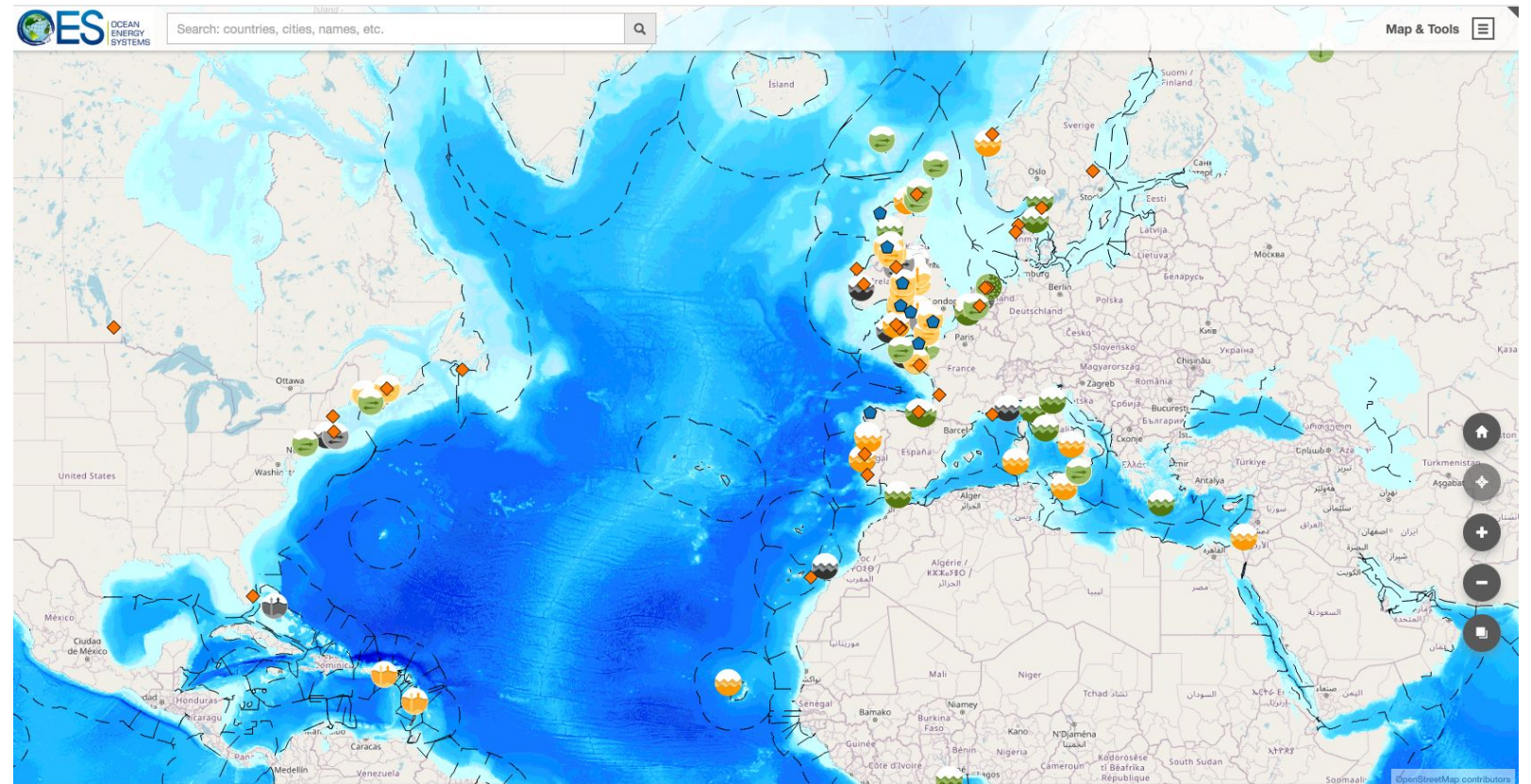
Project Manager	Wave Swell Energy Ltd
Additional Information	Project Website
Project Status	Active
Project Life Cycle	Operational
Start Year	2021
Energy Resource	Wave
Project Scale	Single Device
Max Rated Power Capacity	0.2 MW
Grid Connectivity	Grid Connected
Number of Devices	1
Waterbody	King Island harbour, Tasmania
Country	Australia

- International marine energy projects, devices, test sites, and organizations related to wave, current (including tidal), ocean thermal, and salinity gradient energy
- Historic record of past deployments
- Database pages are linked, allowing for exploration of the relationships between organizations, their projects and test sites, and the devices that they are developing.

https://openei.org/wiki/PRIMRE/Databases/Projects_Database

Updated Ocean Energy Systems GIS Platform

- Currently hosts spatial data on marine energy facilities, resources, geospatial data, and environmental layers
- ~50 GB of data are being transferred to Marine Energy Atlas
- March 2023 - Demonstration of OES-GIS data following data clean up and enhanced functionality



Input and Review: PRIMRE Content and Functionality

PRIMRE Steering Committee

- Industry, university, test center, and government agency representatives
 - Jonathan Colby, Streamwise Development
 - Tim Mundon, Oscilla Power
- Quarterly meetings ensure ongoing communication with the MRE community
 - Prioritize database development and information needs according to the MRE community

User reviews of Knowledge Hubs

- Review two KHs content per year
- FY23: Marine Energy Atlas and Projects Database
- Metrics to demonstrate use data accessibility, and function

PRIMRE Help

PRIMREHelp@groups.nrel.gov

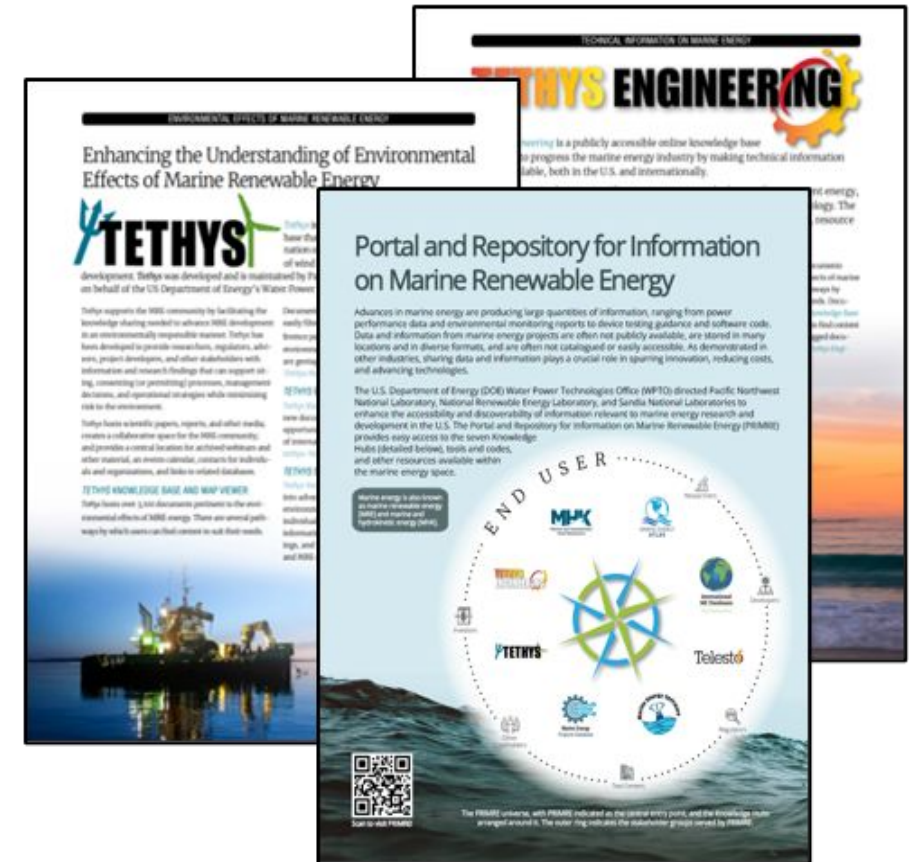
Next Steps

Maintenance & Development

- Publishing Lessons Learned page on PRIMRE
- Redesigning the Telesto Knowledge Hub
- Redesigning the MRE Software Knowledge Hub
- Finishing OES GIS

Upcoming Events

- MEE Toolkit Workshop: April 2023
- 3rd International Data Workshop: May 2023
- Continued outreach and engagement at U.S. and international conferences (e.g., IODC, EWTEC, PAMEC)



Thank You! Questions?

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PRIMRE Team:

- PNNL: Jonathan Whiting, Lysel Garavelli, Hayley Farr, and Dorian Overhus
- NREL: Katie Peterson, Hanna Fields, and Sean Morris
- Sandia: Kelley Ruehl, Will Peplinski, and Rachel Homan

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The National Renewable Energy Laboratory is a national laboratory of the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, operated by the Alliance for Sustainable Energy, LLC, under contract No. DE-AC36-08GO28308. Pacific Northwest National Laboratory is operated by Battelle for the U.S. Department of Energy under contract DE-AC05-76RL01830. Sandia National Laboratories is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.