



3rd International Marine Energy Data Sharing Workshop Report

Tuesday, May 2, 2023

8:00 – 10:00 AM PDT (3:00 – 5:00 PM UTC)

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On behalf of Ocean Energy Systems (OES) and the U.S. Department of Energy, the PRIMRE ([Portal and Repository for Information on Marine Renewable Energy](#)) team held the third international workshop to explore the potential for sharing marine energy data, following successful workshops in [2021](#) and [2022](#). The workshop was held online, hosted by the three U.S. national laboratories that make up the PRIMRE team (Pacific Northwest National Laboratory [PNNL], National Renewable Energy Laboratory [NREL], and Sandia National Laboratories). The workshop participants were invited to attend based on their knowledge and experience with, or responsibilities for, marine energy databases and portals in their nations.

The workshop agenda included presentations and discussions focused on marine energy and geospatial databases from around the world, and the need for geospatial data sharing (Appendix A). A total of 31 professionals participated in the workshop from 9 countries (Appendix B). The presentations were followed by breakout sessions. The three breakout groups which were not recorded, but a record of the written and oral discussion was made using Google Jamboards to contribute to this report (Appendix C).

The objectives of the workshop were to:

- Provide a short update on PRIMRE and the team's activities (e.g., interoperability);
- Highlight updates on marine energy and geospatial databases from around the world;
- Discuss geospatial data sharing and expansions of the Marine Energy Atlas; and
- Determine next steps and value of continued coordination.

Workshop Structure

After the introduction to the workshop, Andrea Copping of the U.S. presented an update on [PRIMRE](#), which consists of seven [Knowledge Hubs](#) and several other tools and resources intended to support the growing marine energy community. Andrea also highlighted a recently

launched page on PRIMRE, [Lessons Learned](#), which presents lessons collected from the U.S. marine energy sector using expert interviews and links to relevant resources.

Jonathan Whiting of the U.S. then presented on the [Marine Energy Projects Database](#), which is a PRIMRE Knowledge Hub that provides information on marine energy projects, test sites, devices, and organizations in the U.S. and around the world.

José Chambel Leitão of Portugal presented on [MARENDATA](#), a European data portal that supports several European projects. Jonathan Whiting of PNNL then provided additional details on the integration of MARENDATA's content into the PRIMRE search.

Youen Kervella of France presented on [RESCORE](#), which is an online resource tool providing access to relevant information and other assets deemed valuable for the development of the offshore renewable energy sector in France.

Nicolas Raillard of France presented on [ResourceCode](#), which is an online toolbox with modeling and software tools that enable resource characterization, and allow technology developers and supply chain companies to improve designs and optimize operations.

Pedro Vinagre of Portugal presented on the [European Biofouling Database](#), which is a mapping tool that provides developers, marine energy project operators and regulators an overview of geographical biofouling distribution information to help facilitate decision making.

Finally, Katie Peterson of NREL presented on the [Marine Energy Atlas](#), which is another PRIMRE Knowledge Hub that allows users to visualize, analyze, and download datasets on marine energy resources. Katie also highlighted the recent ingestion of the OES Geographic Information System (GIS) data layers, including locations for marine energy projects, bathymetry, ports, population density, exclusive economic zones, and marine protected areas.

Three breakout rooms brought workshop participants together, with PRIMRE staff acting as facilitators and notetakers, to discuss additional opportunities to expand and improve the Marine Energy Atlas with additional geospatial data and linkages. Each breakout group was asked to work through three group discussion questions:

1. What additional data layers would you like to see on Marine Energy Atlas?
2. What other geospatial databases should be linked to the Marine Energy Atlas?
3. What sources of geospatial information are you aware of (that would be useful)?

After the breakout sessions, the group facilitators reported their findings to the larger group and next steps were discussed.

Key Workshop Discussions

The results of the breakout group discussions are summarized below:

What additional data layers would you like to see on OES-GIS?

- Marine Energy Resource Layers
 - Wave resource data (e.g., directionality, extreme conditions)
 - Tidal flow, river flow, and ocean current data
 - Time series data for waves, currents, wind, bathymetry evolution
 - Data from areas with less marine energy potential (e.g., lakes, bays, gulfs)
 - Layers from MARENDATA and ResourceCode
- Environmental Layers
 - Species and habitat distribution maps, especially for data-poor species
 - Locations of Marine Protected Areas and other areas of international importance (e.g., Natura 2000 network for European Protected Areas)
 - Seabed composition and bathymetry
 - Migration routes
 - Biofouling
- Other Sector Layers
 - Fishing/fisheries areas/activity
 - First Nations and areas of cultural importance
 - Grid infrastructure, including cable routes, and wet storage capacity
 - Locations of existing and future offshore energy projects
 - Shipping routes (e.g., cargo, ferry)
 - Military training areas and unexploded ordinances
 - Geohazards

What other geospatial databases should be linked to the GIS?

- U.S. Databases
 - [Middle Atlantic Regional Coastal Ocean Observing System](#)
 - [Northeast Ocean Data Portal](#)
 - [Ocean Observatories Initiative \(OOI\)](#)
 - [Water Resource Integrated Modeling System \(WRiMS\)](#)
- European Databases
 - [Copernicus Marine](#)
 - [European Online Data Network \(EMODnet\)](#)
 - [European Ocean Biodiversity Information System \(EurOBIS\)](#)
 - [Marine Data Exchange](#)
 - [Marine Environmental Data and Information Network \(MEDIN\)](#)
 - [SeaDataNet](#)
- Global Databases
 - [Global Biodiversity Information Facility \(GBIF\)](#)
 - [Ocean Biogeographic Information System Spatial Ecological Analysis of Megavertebrate Populations \(OBIS-SEAMAP\)](#)

- Additional Suggestions
 - Linking to other renewable energy layers for co-production potential
 - International tracking of migratory organisms (help with population connectivity)
 - Oceanographic data portals
 - Real-time data and live maps

What sources of geospatial information are you aware of (that would be useful)?

- Existing Sources
 - National Oceanic and Atmospheric Administration's National Centers for Environmental Information (NCEI)
 - General bathymetric Chart of the Oceans' gridded bathymetry download
 - Global Fishing Watch
- Additional Layers
 - Indigenous tribal areas and reserved fishing rights
 - Sea level rise and erosion spatial data
 - Existing marine energy deployments
 - Potential reuse of existing built structures for marine energy development
 - Energy Transitions Initiative Partnership Project (ETIPP) communities
 - Energy use estimates and demand maps
- Active marine energy deployments
 - General Data Protection Regulation (GDPR) sets rules for people using personal data in the EU and the UK

Conclusion & Next Steps

There continues to be strong consensus that an annual workshop that updates the international marine energy community on the status of marine energy databases and portals and the potential for sharing data across platforms is useful.

The three breakout groups provided useful input on layers that might be added to the OES-GIS, although the means to capture and add many of these layers will still have to be examined further before their incorporation is implemented. In addition, the participants suggested many databases and portals that could be linked. The U.S.-based PRIMRE team will work to link to as many of these as practical.

There was a fruitful discussion about the challenges of linking geospatial data across databases as this is more complicated than creating APIs, similar to what has been done for tabular and other data sources. This is an area of technical detail that the PRIMRE team will examine.

A shared [Google Drive folder](#) is available with all workshop materials, including a "living" list of marine energy databases around the world, their scope and format, and their points of contact for all to use and keep up to date.

Appendix A – Workshop Agenda

Time	Activity
3:00 - 3:15 PM UTC	Purpose of the Workshop
3:15 - 4:00 PM UTC	Marine Energy & Geospatial Database Presentations <ul style="list-style-type: none">● PRIMRE● MARENDATA● RESCORE● ResourceCode● Biofouling Database● Marine Energy Atlas & GIS
4:00 - 4:35 PM UTC	Breakout Group Discussions <ul style="list-style-type: none">● Breakout Group 1<ul style="list-style-type: none">○ Facilitator: Andrea Copping (PNNL)○ Notetaker: Lysel Garavelli (PNNL)● Breakout Group 2<ul style="list-style-type: none">○ Facilitator: Cesar Castillo (Sandia)○ Notetaker: Jonathan Whiting (PNNL)● Breakout Group 3<ul style="list-style-type: none">○ Facilitator: Katie Peterson (NREL)○ Notetaker: Jon Weers (NREL)
4:35 - 4:50 PM UTC	Report Out
4:50 - 5:00 PM UTC	Closing & Next Steps

Appendix B – Workshop Attendees

Country	Name	Organization
Canada	Cyrille Decès-Petit	National Research Council of Canada
Canada	Qi Liang	National Research Council Canada
Canada	Dan Hasselman	Fundy Ocean Research Center for Energy
England	Caroline Whalley	Offshore Renewable Energy Catapult
France	Youen Kervella	France Énergies Marines (POC for RESCORE)
France	Nicolas Raillard	IFREMER (POC for ResourceCode)
Netherlands	Evdokia Tapoglou	European Commission
Portugal	José Chambel Leitão	Hidromod (POC for MARENDATA)
Portugal	Pedro Vinagre	WavEC Offshore Renewables (POC for Biofouling Database)
Portugal	Maria Inês Machado	WavEC Offshore Renewables
Scotland	Alexander Gilliland	Scottish Government
Spain	Maytham M. Abid	University of Rovira i Virgili
U.S.	Lindsay Dubbs	North Carolina Renewable Ocean Energy Program and Atlantic Marine Energy Center
U.S.	Pedro Lomonaco	O.H. Hinsdale Wave Research Laboratory, Oregon State University
U.S.	Stuart Hamilton	East Carolina University
U.S.	Walter Schurtenberger	Hydrokinetic Energy Corp.
U.S.	Swara Salih	U.S. Department of Energy Water Power Technologies Office

U.S.	Denis Nault	U.S. Department of Energy Contractor
U.S.	Chitra Sivaraman	Pacific Northwest National Laboratory
U.S.	Andrea Copping	Pacific Northwest National Laboratory
U.S.	Hayley Farr	Pacific Northwest National Laboratory
U.S.	Jonathan Whiting	Pacific Northwest National Laboratory
U.S.	Lysel Garavelli	Pacific Northwest National Laboratory
U.S.	Curtis Anderson	Pacific Northwest National Laboratory
U.S.	Cesar Castillo	Sandia National Laboratories
U.S.	William Peplinski	Sandia National Laboratories
U.S.	Hanna Fields	National Renewable Energy Laboratory
U.S.	Katie Peterson	National Renewable Energy Laboratory
U.S.	Jon Weers	National Renewable Energy Laboratory
U.S.	Sean Morris	National Renewable Energy Laboratory
Wales	Ceri Seaton	Welsh Government

Appendix C – Jamboards

Breakout Group 1

What additional data layers would you like to see on OES-GIS?

Wave resource data that is in RESOURCECODE

Fishing/Fisheries Activity - importance not just looking at fish presence (snapshot) but also looking at the fisheries and where they are taking place. Also gear specifics.

MAREDATA - focused on test centers, local scales. Importance of scale from local to regional and larger.

Wave (or other marine energy) resource conditions in certain parts of the world. Often worldwide databases are showing aggregated data.

May want more specific data, for example wave directionality, 50 year wave condition, with details.

Why do the IEC standards (or others) specify certain wave conditions - but why? Changes with country.

Importance of linking GIS data (often aggregated) to the underlying raw data to get the necessary detail.

year time series for extreme conditions

Data from areas where marine energy apparently is not so significant (i.e. lakes, bays, gulfs, sheltered areas)

Bathymetric and soil properties of the sea bottom, including sediment potential

Information about the vertical structure of the ocean currents

Time series (short- and long-term) of parameters (waves, currents, wind, bathymetry evolution)

Co-located data of wave-wind and currents

PRIMRE

NREL NATIONAL RENEWABLE ENERGY LABORATORY

Pacific Northwest NATIONAL LABORATORY

Sandia National Laboratories

What other geospatial databases should be linked to the GIS?

Data portals in US (NEODP, MarCOOS)...for fisheries data

<http://www.northeas.toceandata.org/>

OOI (Ocean Observing Initiative)

Oceanographic data portals

Global Ocean Observation System

Capricorn (Europe) - was Spanish ports etc. and now expanded

Are real time data important/necessary for data portals? Perhaps not necessary now, but will be as deployments increase

Hydromod provides real time data for ports, but likely not necessary for free data bases (such as those for marine energy).

How do we sustain databases and portals - need government support.

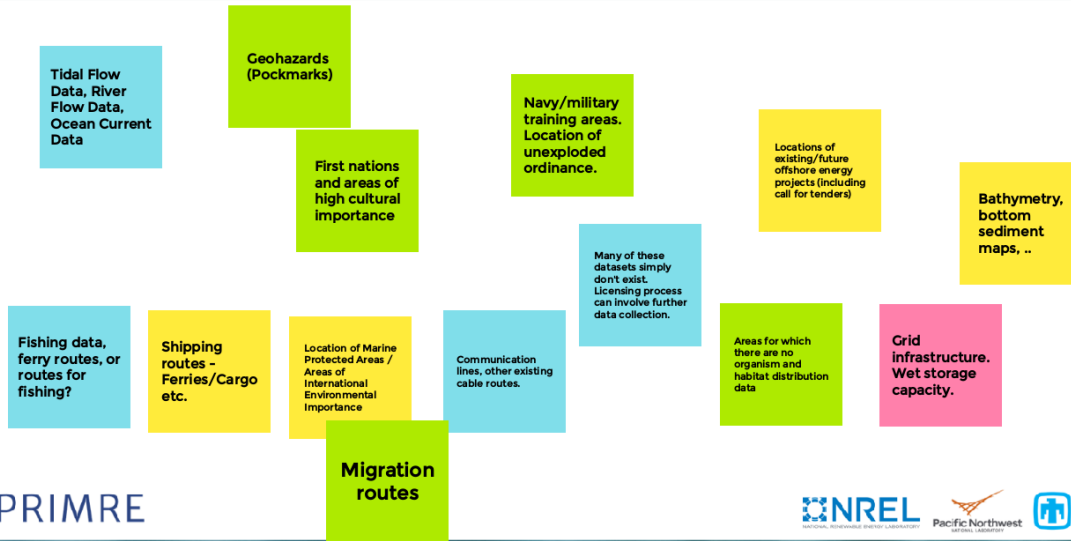
PRIMRE

NREL NATIONAL RENEWABLE ENERGY LABORATORY

Pacific Northwest NATIONAL LABORATORY

Sandia National Laboratories

What additional data layers would you like to see on OES-GIS?



What other geospatial databases should be linked to the GIS?



What sources of geospatial information are you aware of (that would be useful)?

<https://download.gebc.org.net/>

EU and UK law specify which datasets are required for consenting.

Breakout Group 3

What additional data layers would you like to see on OES-GIS?

Natura 2000 network for European Protected Areas

Species distribution maps of sensitive species that may interact with marine energy projects

Migration patterns

protected areas by species

Shipping routes

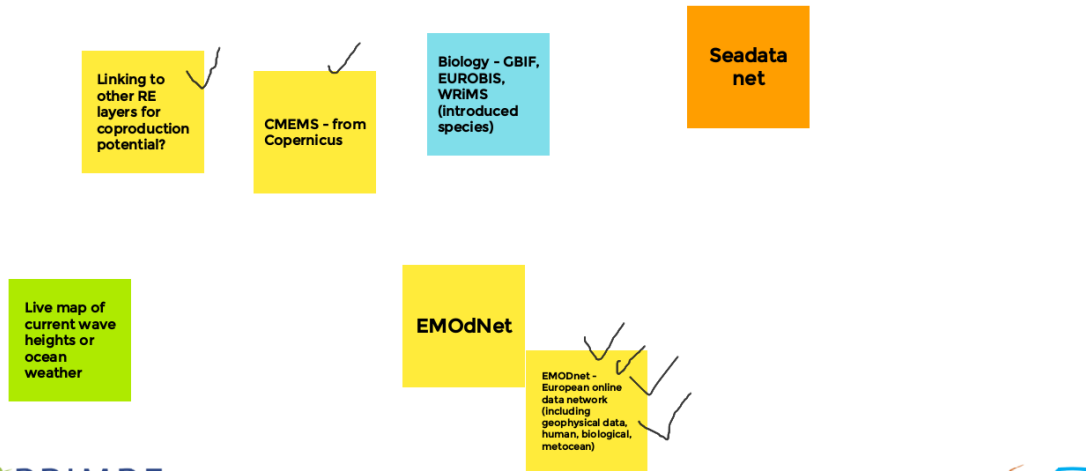
Seabed composition

non-endemic species that need mgmt

interactive filter bathy map by water depth

biofouling

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What sources of geospatial information are you aware of (that would be useful)?

