

WPTO R&D Deep Dive Webinar Series

Contributing Data and Information to PRIMRE

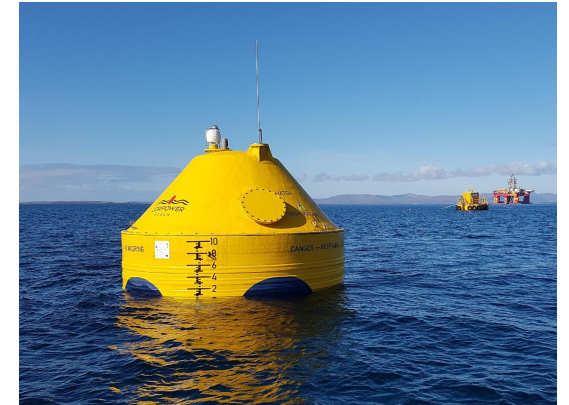
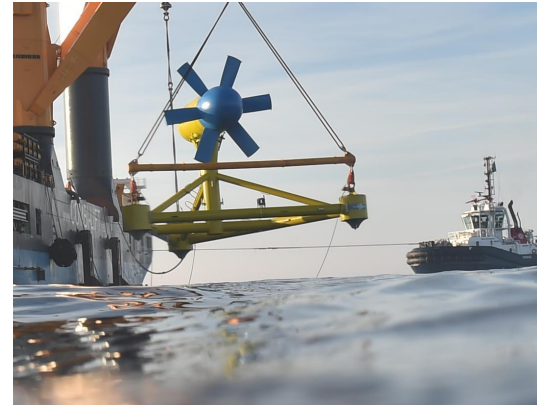
Speakers

Andrea Copping, Jon Weers, Jonathan Whiting, Cesar Castillo

Wednesday, July 28, 2021

Agenda

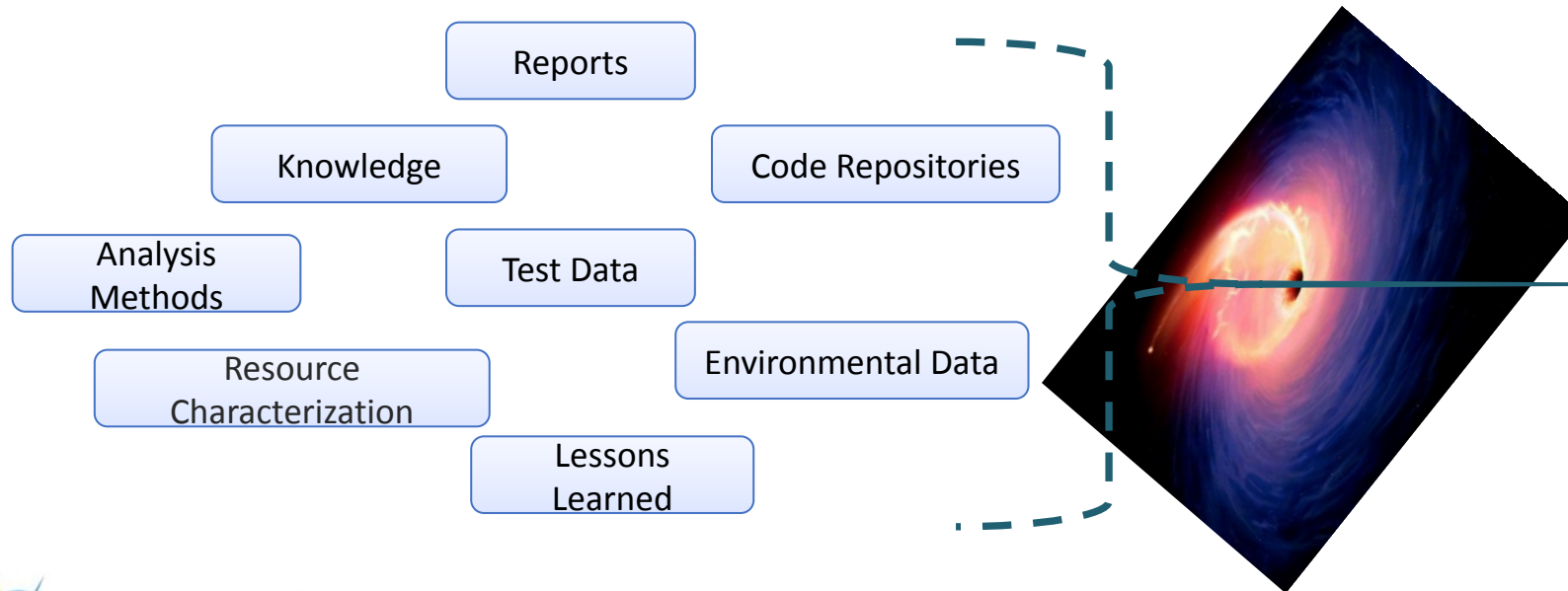
- The need for PRIMRE
- Introduction to PRIMRE
- PRIMRE Knowledge Hubs
- PRIMRE Aggregate Search
- Contributing to the Knowledge Hubs
- Contributing to PRIMRE
- Signature Projects
- Next Steps for PRIMRE
- Q&A



Availability of MRE Knowledge

Data and information are:

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



PRIMRE was developed to overcome data and information barriers to technology, research, design, and testing in support of the MRE community.

Introduction to PRIMRE

Broad access to data and information on MRE

- Engineering and technologies
- Resource characterization
- Device performance
- Environmental effects

Features

- MRE Basics
- STEM Resources
- Knowledge Hubs
- Aggregate Search

The screenshot shows the PRIMRE website homepage. At the top, there is a navigation bar with the 'openEI' logo and links for 'Information', 'Data', and 'Apps'. Below this is a blue header with 'PRIMRE' and sub-navigation for 'MRE Basics', 'Knowledge Hubs', 'MRE Organizations', and 'STEM'. The main content area features a large image of ocean waves with the text 'PRIMRE Portal and Repository for Information on Marine Renewable Energy'. A search bar is present with the placeholder text 'Search across PRIMRE knowledge hubs...'. Below the search bar are five buttons: 'MRE Basics', 'Signature Projects', 'Knowledge Hubs', 'STEM', and 'Contributing to PRIMRE'. The footer contains logos for the International Electrotechnical Commission (IEC), the U.S. Department of Energy Office of Energy Efficiency & Renewable Energy Water Power Technologies Office, and the Ocean Energy Systems (OES) initiative. A section titled 'Upcoming Events' shows a calendar icon for July 8, 2021, with the event '2021 Hydropower RAPID Toolkit Annual Update' listed as an online event from July 8, 2021, to July 8, 2021. A brief description of the event is provided: 'NREL will provide an overview on the Hydropower Regulatory and...'. The bottom of the page features logos for NREL (National Renewable Energy Laboratory), Pacific Northwest National Laboratory, and Sandia National Laboratories.

PRIMRE Knowledge Hubs

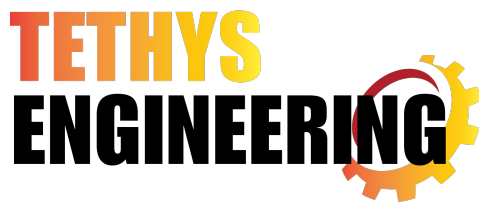


[Marine and Hydrokinetic Data Repository \(MHKDR\)](#)

hosts data collected by WPTO funded R&D, including device testing data, resource characterization data, etc.

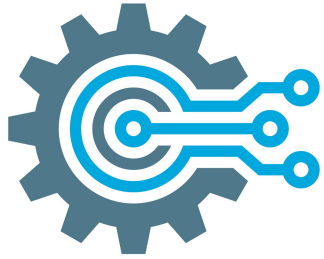


[Tethys](#) hosts over 6,700 documents on the environmental effects of wind and MRE development and supports Ocean Energy Systems' Environmental initiative.



[Tethys Engineering](#) hosts over 4,800 documents on the engineering and technical aspects of MRE development, as well as a library of MRE photos for third-party use.

PRIMRE Knowledge Hubs



Marine Energy Projects Database contains information on MRE devices and companies active in the MRE field, and traces the development of projects around the world.

Telesto 

Telesto is a collection of information and guidance for testing, measurement, and data analysis for MRE research, development, and demonstration.



MRE Software is a collection of software relevant to MRE development, and is made up of the **MRE Code Hub** and **PRIMRE Code Catalog**.

PRIMRE Aggregate Search

- Enables users to find data and information from different Knowledge Hubs simultaneously using PRIMRE as a single entry-point
- Currently operational for:
 - *Tethys*
 - *Tethys Engineering*
 - *MHKDR*
 - *Marine Energy Projects Database*
 - *Telesto*

The screenshot displays the PRIMRE Search interface. At the top, there is a navigation bar with links for PRIMRE, MRE Basics, Knowledge Hubs, MRE Organizations, and STEM. Below this is a search bar with the text 'testing' and a 'Search' button. The main content area features a large image of ocean waves with the text 'PRIMRE Search' and a subtitle: 'Search across PRIMRE knowledge hubs, including the Technology Database, MHKDR, Tethys, and Tethys Engineering'. Below the search bar, there is a filter section on the left titled 'Filter Results By:' with a 'Reset all filters' link. Under 'Technologies', there are several categories with checkboxes and counts: Current (14), Cross Flow Turbine (16), Oscillating Hydrofoil (4), Tidal Kite (1), Archimedes Screw (3), Wave (13), Attenuator (34), Point Absorber (20), Pressure Differential (41), Oscillating Water Column (3), and Overtopping (3). On the right, there is a section for search results, showing 'Showing 1 - 25 results of 757' and 'Show 25 results per page'. The first result is titled 'Testing Marine Renewable Energy Devices in an Advanced Multi-Directional Combined Wave-Current Environment' with a date of June 2017 and a last modified date of July 2019. The second result is titled 'Experimental Testing of a Floating Oscillating Surge Wave Energy Converter at Hinsdale Wave Research Laboratory' with a date of June 2016 and a last modified date of June 2020.

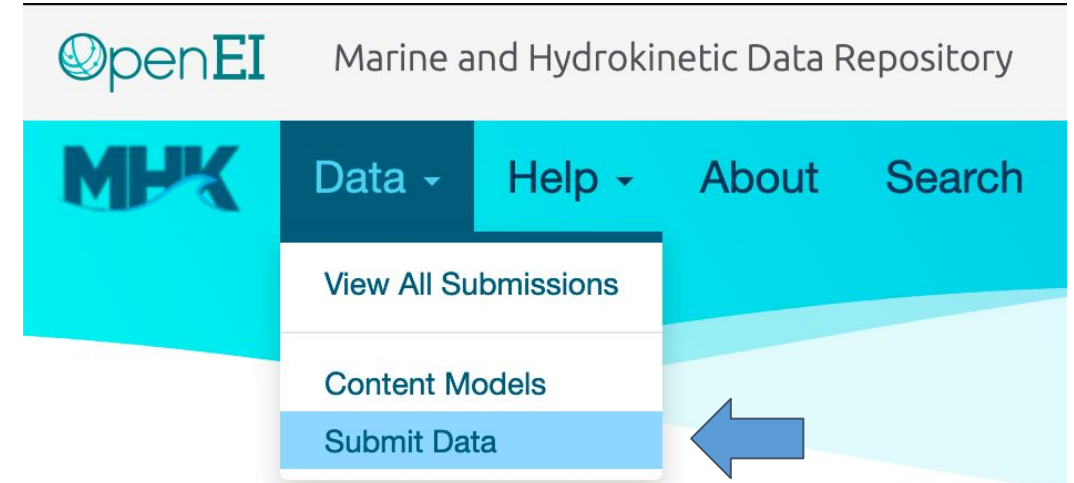
Contributing to MHK Data Repository

What should I contribute?

- Data (e.g., raw data, maps, photos, reports, models, schematics, testing, performance, resource data)
 - All data generated from projects funded by the **DOE Water Power Technologies Office** related to marine energy

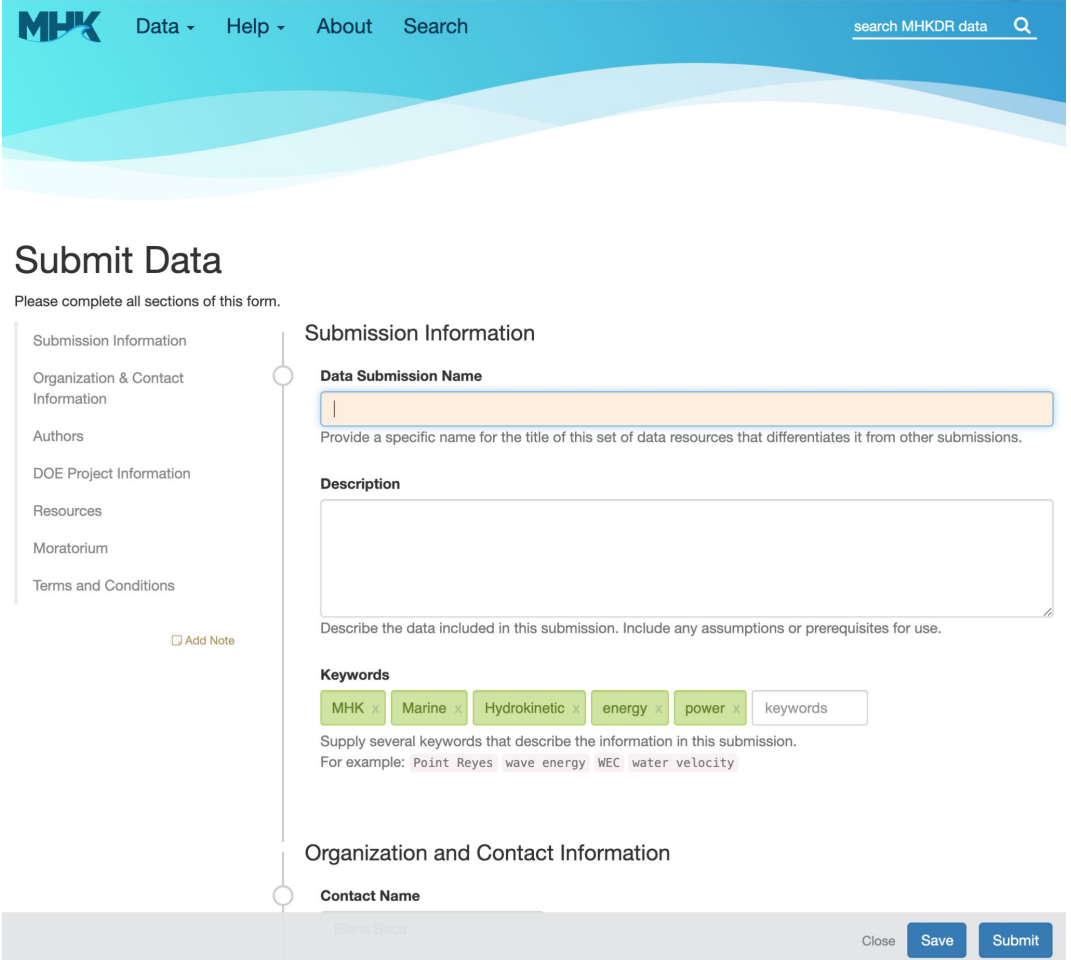
How should I contribute?

- <https://mhkdr.openei.org/submit>



Contributing to MHK Data Repository

- Complete the data submission metadata form
- No limit to file size or number of files
- **Save** as often as you like and return later to complete the submission
- **Submit** when it's all done.
- Currently home to over 2,000 resources and 15 TB of data.



The screenshot shows the 'Submit Data' form on the MHK Data Repository website. The form is titled 'Submit Data' and includes a navigation bar with 'Data', 'Help', 'About', and 'Search' options. A search bar is located in the top right corner. The form is divided into several sections: 'Submission Information', 'Organization & Contact Information', 'Authors', 'DOE Project Information', 'Resources', 'Moratorium', and 'Terms and Conditions'. The 'Submission Information' section is currently active and contains the following fields: 'Data Submission Name' (a text input field), 'Description' (a large text area), and 'Keywords' (a list of tags including 'MHK', 'Marine', 'Hydrokinetic', 'energy', 'power', and 'keywords'). The 'Organization and Contact Information' section is partially visible, showing a 'Contact Name' field. At the bottom of the form, there are 'Close', 'Save', and 'Submit' buttons.

Contributing to Tethys

What should I contribute?

- Documents (e.g., journal articles, conference papers, reports, theses)
 - Relevant to **environmental effects** of wind and/or marine energy
 - Any language (must have an English title and abstract)

How should I contribute?



Email
tethys@pnnl.gov



GET STARTED
If you are new to Tethys, start here to learn more.

KNOWLEDGE BASE
Access thousands of publications and more, all in a searchable database.



Recent Tethys Story
The Risk Assessment Program (RAP) for Tidal Stream Energy: Combining hydrodynamics and acoustic tracking data to assess the risk of fish encountering a tidal stream device. Canada is witnessing a surge of interest in tidal stream technology development in the Bay of Fundy, but uncertainty around potential impacts on marine life has left the federal regulator, Fisheries and Oceans Canada (DFO), challenged to adequately assess the risk, particularly to

Contributing to Tethys Engineering

What should I contribute?

- Documents (e.g., journal articles, conference papers, reports, theses)
 - Relevant to **engineering and technical aspects** of marine energy
- Any language (must have an English title and abstract)

How should I contribute?



Email
tethys@pnnl.gov



Tethys Engineering
Tethys Engineering is a knowledge base that collects, curates, and makes publicly available documents on engineering and technologies associated with marine renewable energy. Sponsored by the U.S. Department of Energy, Tethys Engineering is part of the PRIMRE system, and is designed after the



Contributing to Tethys & Tethys Eng.

Other Ways to Contribute



Register for an account and link your author profile.



Update your organization's description.



Submit photos to the Photo Library.



Submit an event for the Events Calendar.



Submit content for the Tethys Blast & Tethys Engineering Blast.



Email

tethys@pnnl.gov

Contributing to MRE Software

MRE Software is a collection of software relevant to MRE development, including the **MRE Code Hub** and the **PRIMRE Code Catalog**.

Open-source
MRE software
(on GitHub)

Highlights newly
released software



The screenshot shows the PRIMRE website's 'Software' page. The header includes navigation links for PRIMRE, MRE Basics, Knowledge Hubs, MRE Organizations, and STEM. The main content area is titled 'MRE Software' and contains a description of the software collection. Below the description are two main sections: 'MRE Code Hub' and 'PRIMRE Code Catalog', each with a brief description and a 'View' button. A 'Featured Software' section is also visible, featuring 'MHKIT' with a description and an 'Access MHKIT' button.

All MRE software,
commercial and
open-source

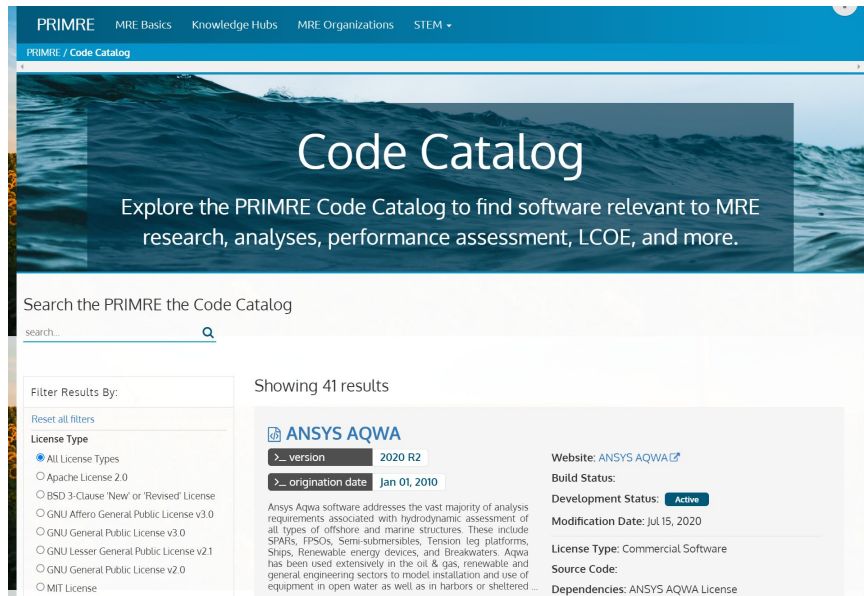
Best Practices for
open-source
software
development
(ongoing/future
work)



Contributing to MRE Software

PRIMRE Code Catalog

- Searchable online software discovery platform with search facets for all MRE relevant software



The screenshot shows the PRIMRE Code Catalog interface. At the top, there's a navigation bar with links for PRIMRE, MRE Basics, Knowledge Hubs, MRE Organizations, and STEM. Below this is a header section with the text "Code Catalog" and "Explore the PRIMRE Code Catalog to find software relevant to MRE research, analyses, performance assessment, LCOE, and more." A search bar is present with the text "Search the PRIMRE the Code Catalog" and a search icon. Below the search bar, there are filter options for "Filter Results By:" and "Showing 41 results". The main content area displays a search result for "ANSYS AQWA" with details such as version (2020 R2), origination date (Jan 01, 2010), website (ANSYS AQWA), build status, development status (Active), modification date (Jul 15, 2020), license type (Commercial Software), source code, and dependencies (ANSYS AQWA License).

MRE Code Hub

- Repository for open-source MRE software, includes a landing page with search functionality

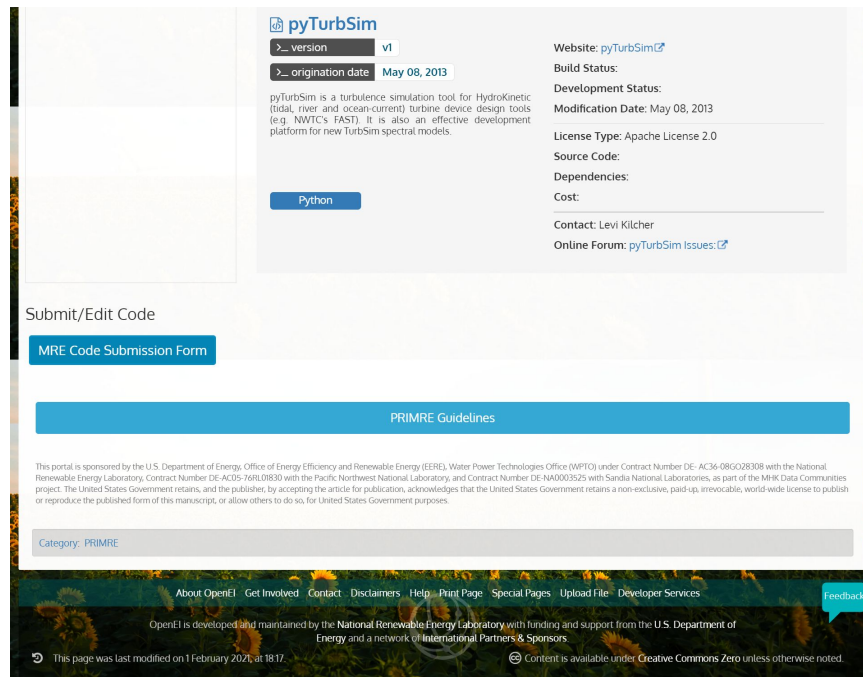


The screenshot shows the MRE Code Hub landing page. At the top, there's a navigation bar with the MRE Code Hub logo and the U.S. Department of Energy logo. Below this is a header section with the text "A collection of open-source software for the marine renewable energy (MRE) community". The main content area features three columns of information: "Browse MRE Code Hub Repositories" (Browse the full list of registered MRE Code Hub repositories that have been contributed by the National Labs and the broader MRE community.), "Search MRE Code Hub Source Code" (Looking for specific code examples? Perform a full-text code search across all repositories in the MRE Code Hub.), and "Register Your Software" (Click here to register your software so it can be discovered and shared with the MRE community.). There are also links for "Need help finding the right software tools for your MRE-related tasks?" (Visit the PRIMRE Code Catalog) and "Looking for other MRE resources?" (Visit the Portal and Repository for Information on Marine Renewable Energy (PRIMRE)).

PRIMRE Code Catalog Submission

Launch MRE Code Submission Form

- Click MRE Code Submission Form button at the bottom of Code Catalog list



pyTurbSim
version: v1
origin date: May 08, 2013

pyTurbSim is a turbulence simulation tool for Hydrokinetic (tidal, river and ocean-current) turbine device design tools (e.g. NWTIC's FAST). It is also an effective development platform for new TurbSim spectral models.

Website: [pyTurbSim](#)
Build Status:
Development Status:
Modification Date: May 08, 2013
License Type: Apache License 2.0
Source Code:
Dependencies:
Cost:
Contact: Levi Kilcher
Online Forum: [pyTurbSim Issues](#)

Python

Submit/Edit Code
MRE Code Submission Form

PRIMRE Guidelines

This portal is sponsored by the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy (EERE), Water Power Technologies Office (WPTO) under Contract Number DE-AC36-08G028308 with the National Renewable Energy Laboratory, Contract Number DE-AC05-76OR0830 with the Pacific Northwest National Laboratory, and Contract Number DE-NA0003525 with Sandia National Laboratories, as part of the MHC Data Communities project. The United States Government retains, and the publisher, by accepting the article for publication, acknowledges that the United States Government retains a non-exclusive, paid-up, irrevocable, world-wide license to publish or reproduce the published form of this manuscript, or allow others to do so, for United States Government purposes.

Category: PRIMRE

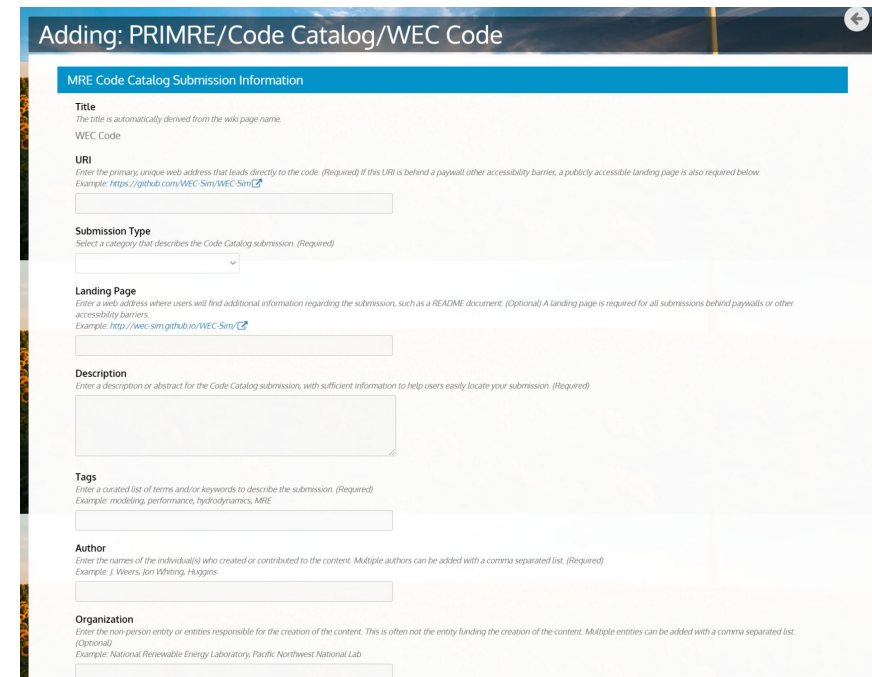
Feedback

OpenEI is developed and maintained by the National Renewable Energy Laboratory with funding and support from the U.S. Department of Energy and a network of International Partners & Sponsors.

This page was last modified on 1 February 2021 at 18:17. Content is available under [Creative Commons Zero](#) unless otherwise noted.

Submission Form

- Mix of required and optional metadata/properties for software



Adding: PRIMRE/Code Catalog/WEC Code

MRE Code Catalog Submission Information

Title
The title is automatically derived from the wiki page name.

WEC Code

URI
Enter the primary, unique web address that leads directly to the code. (Required) If this URI is behind a paywall, other accessibility barriers, a publicly accessible landing page is also required below.
Example: <https://github.com/WEC-Sim/WEC-Sim>

Submission Type
Select a category that describes the Code Catalog submission. (Required)

Landing Page
Enter a web address where users will find additional information regarding the submission, such as a README document. (Optional) A landing page is required for all submissions behind paywalls or other accessibility barriers.
Example: <http://wec-sim.github.io/WEC-Sim/>

Description
Enter a description or abstract for the Code Catalog submission, with sufficient information to help users easily locate your submission. (Required)

Tags
Enter a curated list of terms and/or keywords to describe the submission. (Required)
Example: modeling, performance, hydrodynamics, MRE

Author
Enter the names of the individual(s) who created or contributed to the content. Multiple authors can be added with a comma separated list. (Required)
Example: J. Weiers, Jon Whiting, Hoggins

Organization
Enter the non-person entity or entities responsible for the creation of the content. This is often not the entity funding the creation of the content. Multiple entities can be added with a comma separated list. (Optional)
Example: National Renewable Energy Laboratory, Pacific Northwest National Lab

MRE Code Hub Submission

Launch MRE Code Submission Form

- Click [Register Your Software](#) link

MRE CodeHub

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Contact Us

A collection of open-source software for the marine renewable energy (MRE) community



Browse MRE Code Hub Repositories

Browse the full list of registered MRE Code Hub repositories that have been contributed by the National Labs and the broader MRE community.



Search MRE Code Hub Source Code

Looking for specific code examples? Perform a full-text code search across all repositories in the MRE Code Hub.



Register Your Software

Click here to register your software so it can be discovered and shared with the MRE community.

Need help finding the right software tools for your MRE-related tasks?

PRIMRE Code Catalog

Visit the PRIMRE Code Catalog to find software by technology type and other key properties.



Looking for other MRE resources?

PRIMRE

Visit the Portal and Repository for Information on Marine Renewable Energy (PRIMRE).

Featured Software



Submission Form

- Same form used for MRE Code Catalog
- Open-source GitHub repositories will be added to [MRE Code Hub GitHub repository](#) by PRIMRE team

Adding: PRIMRE/Code Catalog/WEC Code

MRE Code Catalog Submission Information

Title
The title is automatically derived from the wiki page name.
WEC Code

URI
Enter the primary, unique web address that leads directly to the code. (Required) If this URI is behind a paywall, other accessibility barriers, a publicly accessible landing page is also required below.
Example: <https://github.com/WEC-Sim/WEC-Sim>

Submission Type
Select a category that describes the Code Catalog submission. (Required)

Landing Page
Enter a web address where users will find additional information regarding the submission, such as a README document. (Optional) A landing page is required for all submissions behind paywalls or other accessibility barriers.
Example: <http://wec-sim.github.io/WEC-Sim/>

Description
Enter a description or abstract for the Code Catalog submission, with sufficient information to help users easily locate your submission. (Required)

Tags
Enter a curated list of terms and/or keywords to describe the submission. (Required)
Example: modeling, performance, hydrodynamics, MRE

Author
Enter the names of the individual(s) who created or contributed to the content. Multiple authors can be added with a comma separated list. (Required)
Example: J. Weers, Jon Whiting, Huggins

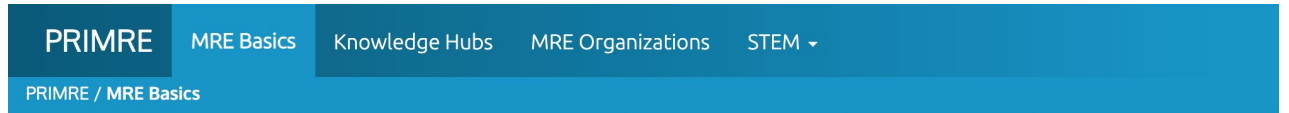
Organization
Enter the non-person entity or entities responsible for the creation of the content. This is often not the entity funding the creation of the content. Multiple entities can be added with a comma separated list. (Optional)
Example: National Renewable Energy Laboratory, Pacific Northwest National Lab



Contributing to the PRIMRE Wiki


Several of PRIMRE's Knowledge Hubs and other content pages exist in the PRIMRE wiki:

- **Marine Energy Projects Database**
- **Events**
- **MRE Basics**
- **Other pages**



Marine Renewable Energy (MRE)


The movement of water in the world's oceans creates a vast store of kinetic energy. **Marine Renewable Energy (MRE)**, also known as Marine Hydrokinetics (MHK), can be harnessed to generate electricity to power homes, transport and industries. MRE encompasses wave power — power from the movement of surface waves, tidal power — power from the kinetic energy of large bodies of moving water, ocean current power — power from the kinetic energy of ocean current, and ocean thermal energy conversion (OTEC) — power from the heat differential of different thermal layers within a body of water.



Wave Energy

Ocean surface waves are generated by wind passing over the ocean surface. The friction between the wind and ocean surface causes energy to be transferred from the faster moving air to the surface layer of the ocean. Wave development depends on the length of ocean, or "fetch," over which the wind blows in a constant direction. Longer fetches with higher wind velocities will produce larger waves. Waves can travel thousands of miles with little energy loss and can combine with waves from storms and other wind-driven events to create very energetic seas. The energy of ocean waves is concentrated at the surface and decays rapidly with depth.

[Learn More >](#)




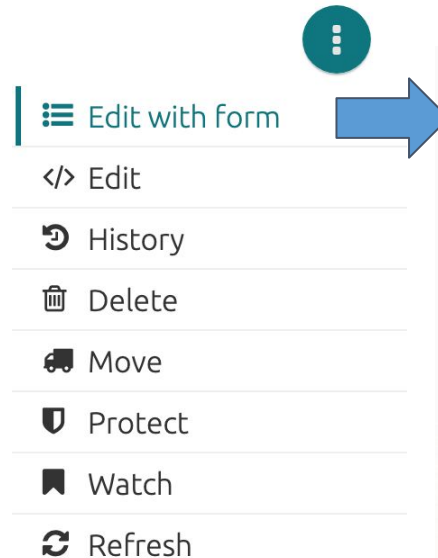
Current Energy









Current energy can be captured from tidal channels, ocean currents, or rivers. Ocean current energy technologies capture the energy from the relatively constant flow of ocean currents, which are driven by several factors, including wind, bathymetry, and the rotation of the Earth, as well as water temperature, density, and salinity. Tidal energy technologies capture the energy from flow induced by the rise and fall of tides, which is driven by gravitational influence of the moon and sun on the earth's oceans. Land or subsea constrictions, such as straits and inlets, can create high velocity currents at specific sites, making them suitable for electricity generation. Riverine energy technologies extract the kinetic energy from flowing water in rivers to generate electricity. Although not technically a marine resource, as part of the natural hydrological cycle, precipitation from drainage basins, groundwater springs, and snow melt feed rivers that flow towards lakes, seas, and

Contributing to the PRIMRE Wiki

To contribute:

- find a specific “add” link
 - e.g. [add an upcoming event](#) on Events
- click the  in the upper right corner of the page.
 - **Edit with Form**
 - Complete a convenient web form
 - **Edit**
 - Use wiki syntax to add or edit content
 - More information on wiki editing via [“Help”](#) at the bottom of each page.
- add an edit history note and click **Save page**.



-  Edit with Form
-  Edit
-  History
-  Delete
-  Move
-  Protect
-  Watch
-  Refresh

Edit Event: Contributing Data and Information to PRIMRE

Event Title

Contributing Data and Information to PRIMRE

Values are derived automatically from the wiki page name.

Description

PRIMRE (Portal and Repository for Information on Marine Renewable Energy) is WPTO's centralized system for storing, curating, and disseminating data and information for all aspects of marine energy. All data and information generated from WPTO national lab, university, and industry projects will find a home somewhere in

Provide a summary of the event

Start Date

28 July 2021

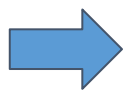
End Date

28 July 2021

Time(Optional)

7:00-8:00 PM UTC

Please specify a timezone when listing a time, e.g. 2:00 PM MDT



Edit history:

This is a minor edit Watch this page

Save page


Show preview


Show changes










Cancel | [Editing help](#) (opens in a new window)

Contributing to the PRIMRE Wiki

More helpful actions:

- Full edit **history** available for each page
- You can **watch** a page to receive emails showing any updates, including who edited what and when.
- Available under the  menu.



-  Edit with form
-  Edit
-  **History** 
-  Delete
-  Move
-  Protect
-  **Watch** 

Revision history of "PRIMRE"

Browse history

From year (and earlier): From month (and earlier):

Diff selection: Mark the radio boxes of the revisions to compare and hit enter or the button at Legend: (cur) = difference with latest revision, (prev) = difference with preceding revision, m =

(newest | oldest) View (newer 50 | older 50) (20 | 50 | 100 | 250 | 500)

Compare selected revisions

- (cur | prev) 16:59, 6 July 2021 Cesar.castillo (talk | contribs | block) .. (4,198 bytes) (0)
- (cur | prev) 22:21, 17 June 2021 Cesar.castillo (talk | contribs | block) .. (4,198 bytes) (
- (cur | prev) 22:21, 17 June 2021 Cesar.castillo (talk | contribs | block) .. (4,199 bytes) (
- (cur | prev) 17:33, 9 June 2021 Whitij (talk | contribs | block) .. (4,199 bytes) (-4) .. (ur
- (cur | prev) 17:54, 9 February 2021 Kmruehl (talk | contribs | block) m .. (4,203 bytes
- (cur | prev) 20:24, 19 January 2021 Cesar.castillo (talk | contribs | block) .. (4,216 byt
- (cur | prev) 15:51, 7 January 2021 Jweers (talk | contribs | block) .. (4,096 bytes) (-26(overlapping the search field on many displays))(undo)
- (cur | prev) 19:30, 22 December 2020 Kmruehl (talk | contribs | block) .. (4,356 byte (undo)
- (cur | prev) 20:44, 17 November 2020 Rbaranowski (talk | contribs | block) m .. (4,3
- (cur | prev) 23:16, 6 November 2020 Avimont (talk | contribs | block) .. (4,272 bytes
- (cur | prev) 22:13, 6 November 2020 Avimont (talk | contribs | block) .. (4,242 bytes
- (cur | prev) 16:38, 29 October 2020 Kmruehl (talk | contribs | block) .. (4,302 bytes) 2nd webinar)(undo)

Revision as of 22:21, 17 June 2021 (edit)

Cesar.castillo (talk | contribs | block)

[← Older edit](#)

Line 39:

```
</div>
<div class="col-xs-12 col-sm-6">
<div class="hide-p">{{Calendar_Event_List|tags=MRE|datemin=-1
week|datemax=1 month|viewall=PRIMRE/Events|title=Upcoming Events}}</div>
</div>
</div>
```

Revision as of 22:21, 17 June 2021 (edit) (undo)

Cesar.castillo (talk | contribs | block)

[Newer edit →](#) [\[\[Mark as patrolled\]\]](#)

Line 39:

```
</div>
<div class="col-xs-12 col-sm-6">
<div class="hide-p">{{Calendar_Event_List|tags=MRE|datemin=-1
week|datemax=1 week|viewall=PRIMRE/Events|title=Upcoming Events}}</div>
</div>
</div>
```

Contributing to PRIMRE





There are a lot of different ways to contribute to PRIMRE.
Not sure? Go to <https://primre.org/Contribute> and select “Help Me Choose”



How to Contribute to PRIMRE? [edit]

Submissions to PRIMRE from researchers, academics, and developers involved in the Marine Energy (ME) industry are highly encouraged. The table below helps identify the appropriate knowledge hub for each type of content. Any questions or requests for guidance on how to contribute content to PRIMRE can be directed to the [PRIMRE Help email address](#).

[Help me choose.](#)

 MHK Data Repository The Marine Hydrokinetic Data Repository (MHKDR) is the repository for data collected using funds from the Water Power Technologies Office of the U.S. Department of Energy (DOE). It contains data on MHK devices, testing, resource and environmental impact assessments, cost analyses, and more. View MHKDR	 Tethys Tethys facilitates the exchange of information and data on the environmental effects of wind and marine renewable energy technologies and serves as a commons for wind and marine renewable energy practitioners and therefore enhance the connectedness of the renewable energy community. View Tethys	 Tethys Engineering Tethys Engineering stores documents from around the world about the technical and engineering aspects of marine renewable energy. View Tethys Engineering	 Telesto Telesto is home to open source Wikis and Databases which provide a comprehensive explanation of and guidance for MRE testing, measurement, and data processing based on experience, lessons learned from prior laboratory and field testing, industry standards, and best practices. Visit Telesto	MRE Software A collection of MRE relevant software, including the code hub and code catalog. The code hub is a collection of open source MRE software for simulating devices, and processing and analyzing data. The code catalog is a searchable online software discovery platform with a faceted search to identify software tools, codes and other software products. View MRE Software
--	--	--	--	--

Contributing to PRIMRE

There are a lot of different ways to contribute to PRIMRE.
Not sure? Go to <https://primre.org/Contribute> and select “Help Me Choose”

Help me choose.

Answer the questions below to narrow the options

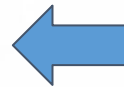
Are you adding a **Document** (e.g. publication, report, conference paper) or **Image/Diagram** (e.g., device, technology)?

- Yes, adding document / image / diagram to Tethys
- No, some data, code/software, or event

What sort of data?

- Data from research and development activities funded by WPTO
- Open source code or to register your commercial software product
- Content for one of PRIMRE's wiki pages, including the Project's Database and Telesto

“Help Me Choose”



Answer a few simple questions to narrow down the options



MHK Data Repository

The Marine Hydrokinetic Data Repository (MHKDR) is the repository for data collected using funds from the Water Power Technologies Office of the U.S. Department of Energy (DOE). It contains data on MHK devices, testing, resource and environmental impact



Tethys

Tethys facilitates the exchange of information and data on the environmental effects of wind and marine renewable energy technologies and serves as a commons for wind and marine renewable energy practitioners



Tethys Engineering

Tethys Engineering stores documents from around the world about the technical and engineering aspects of marine renewable energy.



Telesto

Telesto is home to open source Wikis and Databases which provide a comprehensive explanation of and guidance for MRE testing, measurement, and data processing based on experience. Lessons learned from prior

MRE Software

A collection of MRE relevant software, including the code hub and code catalog. The code hub is a collection of open source MRE software for simulating devices, and processing and analyzing data. The code catalog is a searchable online software discovery platform with a faceted search to identify software tools, codes and other

Contributing to PRIMRE

What should I **not** contribute?

- **Personally Identifiable Information (PII)**
 - Social security numbers
 - Bank account numbers
 - Home phone numbers and personal addresses of individuals not involved directly in the authoring of the data
 - *“Any piece of information or combination of pieces that could be used to compromise the identity of an individual”*
- **Data not suitable for (eventual) public release**



Consider a PRIMRE Signature Project

- Selected projects and initiatives funded by U.S. DOE WPTO
- All project reports, datasets, and associated papers are made more easily discoverable

PRIMRE MRE Basics Knowledge Hubs MRE Organizations STEM

PRIMRE / Signature Projects

Signature Projects

Signature Projects are intended to bring focus to a selection of U.S. Department of Energy's [Water Power Technologies Office \(WPTO\)](#) projects. By designating a Signature Project, the project reports, datasets, and associated papers can be easily discoverable. By bringing together all aspects of a project, whether a completed legacy project or an ongoing investigation, the MRE community can be informed of what investigations have been undertaken, which have succeeded, what tools are available, and where gaps in information persist.

WPTO projects that are featured as Signature Projects are those for which project outputs are scattered across platforms or are difficult to find; or where the formal project has ended but papers are continuing to accrue. Many of these Signature Projects will be of interest internationally, feature key lessons that have been learned, and may have been the result of collaborations by multiple organizations.

Project	Description
WEC-Sim	WEC-Sim (Wave Energy Converter Simulator) is an open-source code, developed in MATLAB/SIMULINK, for simulating wave energy converters.
Reference Model Project	The Reference Model Project (RMP) was a partnered effort to develop open-source marine hydrokinetic (MHK) point designs as reference models to benchmark MHK technology performance and costs, and an open-source methodology for design and analysis of MHK technologies, including models for estimating their capital costs, operational costs, and leveled costs of energy.
IEC TC 114	The International Electrotechnical Commission (IEC) Technical Committee 114 (TC 114) was established in 2007 to develop international, consensus-based standards for the marine energy industry. The U.S. Department of Energy provides funding to enable qualified U.S. industry technical experts to populate TC 114 project teams and promote the development of standards.
Advanced WEC Dynamics & Controls	Sandia National Laboratories' Advanced WEC (Wave Energy Converter) Dynamics and Controls project focuses on transitioning control design approaches from simplified paper studies to application in full-scale devices.
MRE Cybersecurity	In order to increase cybersecurity awareness within the MRE industry, the U.S. Department of Energy's Water Power Technologies Office funded Pacific Northwest National Laboratory to develop guidance documents that describes a cybersecurity risk framework for MRE developers and end users to integrate security best practices into the MRE system lifecycle.
Resource Characterization	Resource Characterization is a multi-lab project that builds on earlier WPTO-funded resource characterization efforts and is organized around five primary activity areas: wave modelling and analysis, tidal current modelling and analysis, resource characterization and classification, resource measurement, and data dissemination.
MHKIT	MHKIT (Marine and Hydrokinetic Toolkit) is an open-source marine renewable energy (MRE) software, developed in Python and MATLAB, that includes modules for ingesting, quality controlling, processing, visualizing, and managing data.

Consider a PRIMRE Signature Project

TETHYS ENGINEERING  Log In Register 

ABOUT CONTENT CONNECTIONS BROADCASTS HELP

Home » Glossary » Help » Resource » Resource Characterization

Signature Projects are intended to bring focus to a selection of U.S. Department of Energy's **Water Power Technologies Office (WPTO)** @ projects. By designating a Signature Project, the project reports, datasets, and associated papers can be easily discoverable. By bringing together all aspects of a project, whether a completed legacy project or an ongoing investigation, the MRE community can be informed of what investigations have been undertaken, which have succeeded, what tools are available, and where gaps in information persist.

Resource Characterization

Project Purpose

Since 2016, the Resource Characterization project has been motivated by a recognition that detailed resource data is critical to the success of the marine energy industry. This Resource Characterization project also builds on earlier **WPTO-funded resource characterization efforts** @ published between 2011 and 2015. For more information on the work being done by individuals labs, check out **NREL's Characterization page** @, **PNL's Characterization page**, and **Sandia's Characterization page** @.

Project Description

Phase 1 of this project (2016-2018) collected and generated a large amount of resource data, developed high-resolution wave and tidal models, and developed a wave energy resource classification scheme. In Phase 2 of this project (2019-2022), the goal is to lower the cost of marine energy and accelerate marine energy technology development by refining, extending, and disseminating the data necessary for engineering robust and efficient marine energy devices and projects.

Project Methods

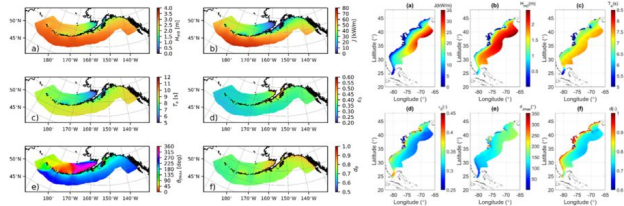
The project is organized around five primary activity areas: wave modelling and analysis, tidal current modelling and analysis, resource characterization and classification, resource measurement, and data dissemination. PNNL leads the modelling efforts, Sandia leads characterization and classification work, and NREL serves as the lead for resource measurements, data dissemination, and the overall project. All of these activities are conducted with careful attention to best practices and methods recommended by the **International Electrotechnical Commission's (IEC) Technical Committee (TC) 114** @. The project also has several public and private partners and holds quarterly calls with a steering committee of international experts and U.S. industry representatives to solicit guidance on key project decisions.

Key Findings/Applications

The data and tools generated by this project can be used for device design and optimal siting processes for technology developers, economic assessments for project developers, energy assessments (power supply and energy portfolio diversification) for regional planners and policy makers, operational reliability and economic assessments for utilities and investors, environmental impacts studies for regulatory agencies.

Wave Modelling and Analysis

- High-resolution wave models for all of the US coastal regions extending to the exclusive economic zone (EEZ) (**Allahdadi et al. 2019**, **Wu et al. 2020**, **Yang et al. 2020**, **Garcia-Medina et al. 2021**, **Li et al. 2021**). All hindcast data are in the process of being made publicly available on the **Open Energy Data Initiative's Cloud server** @. Data include six IEC parameters (significant wave height, mean wave energy period, omni-directional wave power, spectral width, maximum energy direction, directionality coefficient) and several other variables (mean peak wave period, mean zero-crossing period, mean absolute period) and extend 32 years (1979-2010) in 3-hour temporal resolution, with horizontal spatial resolution as fine as 200 m in shallow water.



TETHYS ENGINEERING  Log In Register 

ABOUT CONTENT CONNECTIONS BROADCASTS HELP

Home » Signature Projects » Connections » MHKIT

Signature Projects are intended to bring focus to a selection of U.S. Department of Energy's **Water Power Technologies Office (WPTO)** @ projects. By designating a Signature Project, the project reports, datasets, and associated papers can be easily discoverable. By bringing together all aspects of a project, whether a completed legacy project or an ongoing investigation, the MRE community can be informed of what investigations have been undertaken, which have succeeded, what tools are available, and where gaps in information persist.

MHKIT

Project Purpose

The ability to collect, ingest, condition, reduce, quality control, process, visualize, and store data is critical at all stages of marine energy research and technology/project development. MHKIT empowers the marine energy industry by providing a toolbox of marine energy specific functionality that enables rapid data processing using open-source, verified, and industry standard data handling, allowing for the community to collaboratively develop and expand MHKIT based on industry needs.

Project Description

MHKIT is an open-source marine energy software, developed in Python and MATLAB, that includes modules for ingesting, quality controlling, processing, visualizing, and managing data. **MHKIT-Python** @ and **MHKIT-MATLAB** @ provide robust and verified functions in both Python and MATLAB that are needed by the marine energy community to standardize data processing. Calculations and visualizations are adhere to International Electrotechnical Commission (IEC) technical specifications and other guidelines.

MHKIT is developed as a collaboration between the National Renewable Energy Laboratory (NREL), Pacific Northwest National Laboratory (PNNL), and Sandia National Laboratories (SNL). Development of MHKIT is funded by the U.S. Department of Energy's Water Power Technologies Office.

Project Methods

The MHKIT team leverages previous efforts by the National Labs and guidance from the IEC standards to develop robust and standardized code to be used by the marine energy community. By being an open source project, hosted on GitHub, the marine energy community can take an active role in defining future development in MHKIT but submitting ideas for functionality and code for review to be included in MHKIT. More functionality will continue to be added to MHKIT as the industry evolves, and new standardized code needs emerge.

Key Findings/Applications

MHKIT provides the following benefits to the marine energy community:

- Eliminates the common code creation across the marine energy field
- Offers standardized, referenceable, and readable code base
- Enables rapid data processing
- Creates a data flow of quality control (QC), analysis, and visualization
- Offers a common development platform across the marine energy community where issues are discussed, and features are expanded
- Assists developers in device certification for insurance, regulator bodies, and investors

Signature Project

Title: MHKIT

Status: Ongoing

Start Date: September 2019

Source: [External Link](#) @

Organization: National Renewable Energy Laboratory (NREL), Pacific Northwest National Laboratory (PNNL), Sandia National Laboratories (SNL)

Point of Contact: Rebecca Fao and Sterling Olson 



Associated Marine Energy Engineering Documents

Total results: 4

Content Type: Search:

Title	Author	Date	Type of Content	Technology	Collection Method	Application
MHKIT-MATLAB: Introduction and Demonstration	Fao, R., Olson, S.	February 2021	Presentation	Marine Energy, Current, Wave	Field Data, Lab Data, Modeling	
MHKIT-Python: Introduction and Demonstration	Fao, R., Olson, S.	February 2021	Presentation	Marine Energy, Current, Wave	Field Data, Lab Data, Modeling	

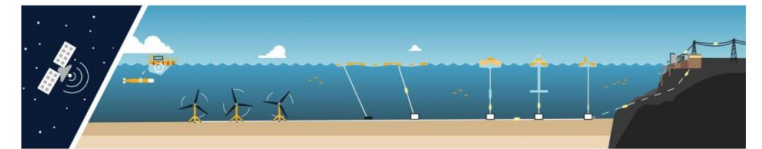
TETHYS ENGINEERING  Log In Register 

ABOUT CONTENT CONNECTIONS BROADCASTS HELP

Home » Signature Projects » Connections » MRE Cybersecurity

Signature Projects are intended to bring focus to a selection of U.S. Department of Energy's **Water Power Technologies Office (WPTO)** @ projects. By designating a Signature Project, the project reports, datasets, and associated papers can be easily discoverable. By bringing together all aspects of a project, whether a completed legacy project or an ongoing investigation, the MRE community can be informed of what investigations have been undertaken, which have succeeded, what tools are available, and where gaps in information persist.

MRE Cybersecurity



Project Purpose

The purpose of the project is to provide guidance to secure marine renewable energy (MRE) systems from cyberattacks and improve the resiliency of MRE systems as a predictable, affordable, and reliable source of energy from oceans and rivers.

Project Description

The advanced operational and information technology used in MRE system designs creates the potential for a cyberattack. Cyber threat actors with malicious intent could target vulnerable MRE systems to gain unauthorized access to data or disrupt operation. In order to increase cybersecurity awareness within the MRE industry, the U.S. Department of Energy's Water Power Technologies Office (WPTO) funded Pacific Northwest National Laboratory (PNNL) to develop guidance documents that describe a cybersecurity risk framework for MRE developers and end users to integrate security best practices into the MRE system lifecycle (e.g., design, construction, operation, and decommissioning). The guidance documents provided an approach to determine the MRE system's cybersecurity risk (Low, Moderate, or High) and identified risk-based best practices to secure the Information Technology and Operational Technology components.

Project Methods

The research involved identifying different network architectures and configurations for an MRE system in order to determine the types of cyber threats to evaluate. Information on MRE system designs is obtained from open source and formal request for information from MRE stakeholders (e.g., system developers and end-users).

The project activities included two focus areas: (1) Identify Cybersecurity Vulnerabilities and (2) Develop Cybersecurity Guidance. The Cybersecurity Framework developed by the National Institute of Standards and Technology (NIST) was followed to generate best practice security controls that were included in the MRE Cybersecurity Guidance. The guidance documents developed from this project were based on initial engagements with MRE stakeholders and knowledge of components used in MRE systems. As MRE system technology evolves and cyber threats increase, the best practice security measures developed from this project could be used, in conjunction with other industry developed guidance.

Key Findings/Applications

de Peralta et al. 2020a provides the results of Focus 1 and describes a framework for determining the cybersecurity risk of an MRE system and its end use. The framework was based on MRE system assets, network architecture, and operational configurations; the vulnerabilities that the assets will have to a cyberattack based on known threats to industrial control systems in the energy sector; and the consequences of a cyberattack on the end user. The resultant framework can be used by MRE developers and end users to determine their cybersecurity risk posture.

de Peralta et al. 2020b provides the results of Focus 2 and describes cybersecurity best practices commensurate with the risk of affecting the business and mission objectives of the end user. The cybersecurity best practices implement the controls of NIST CSF (e.g., identify, detect, protect, respond, and recover). The methods to protect MRE systems were based on recommended strategies to mitigate known threats to the energy sector and security measures to protect IT/OT systems. The cybersecurity best practices were tailored to protect MRE systems and their end use from a cyberattack.

Signature Project

Title: MRE Cybersecurity

Status: Ongoing

Start Date: January 2020

End Date: April 2021

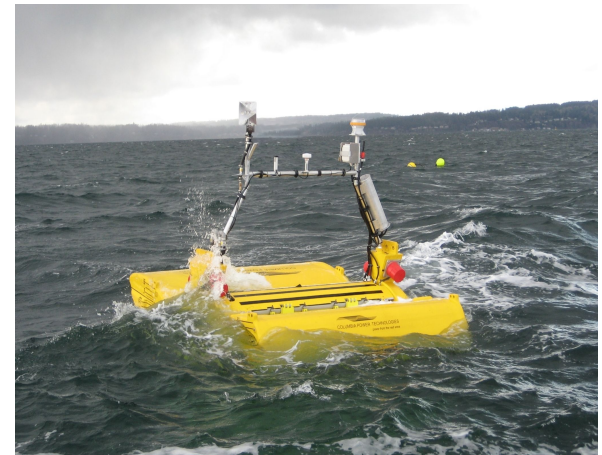
Organization: Pacific Northwest National Laboratory (PNNL)

Point of Contact: [Fleurdaliza De Peralta](#) 



PRIMRE is here for you!

- **PRIMRE:** brings together information and data pertinent to marine energy
- Divided into **knowledge hubs**, based on the type of information
- Managed and updated by the national labs for WPTO
- **Central location** for finding data, analyses, papers, reports, and guidance
- Success depends on **contribution to and use of information**



Next Steps in PRIMRE



- New Knowledge Hub: Marine Energy Atlas
- Lessons learned
- International databases, GIS for Ocean Energy Systems
- Redesign Marine Energy Project Database



PRIMRE Team

NREL

Jon Weers*

Tom King

RJ Scavo

WPTO

Alison Johnson

PNNL

Andrea Copping*

Jonathan Whiting

Lysel Garavelli

Hayley Farr

Chitra Sivaraman

Sandia

Kelley Ruehl*

Cesar Castillo

Mina Faltas

William Peplinski

* Principal Investigator

Thank You!

Andrea Copping

andrea.copping@pnnl.gov

Jon Weers

jon.weers@nrel.gov

Jonathan Whiting

jonathan.whiting@pnnl.gov

Cesar Castillo

crcasti@sandia.gov

PRIMRE

<https://primre.org>

PRIMREHelp@groups.nrel.gov



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 multi-mission 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.