

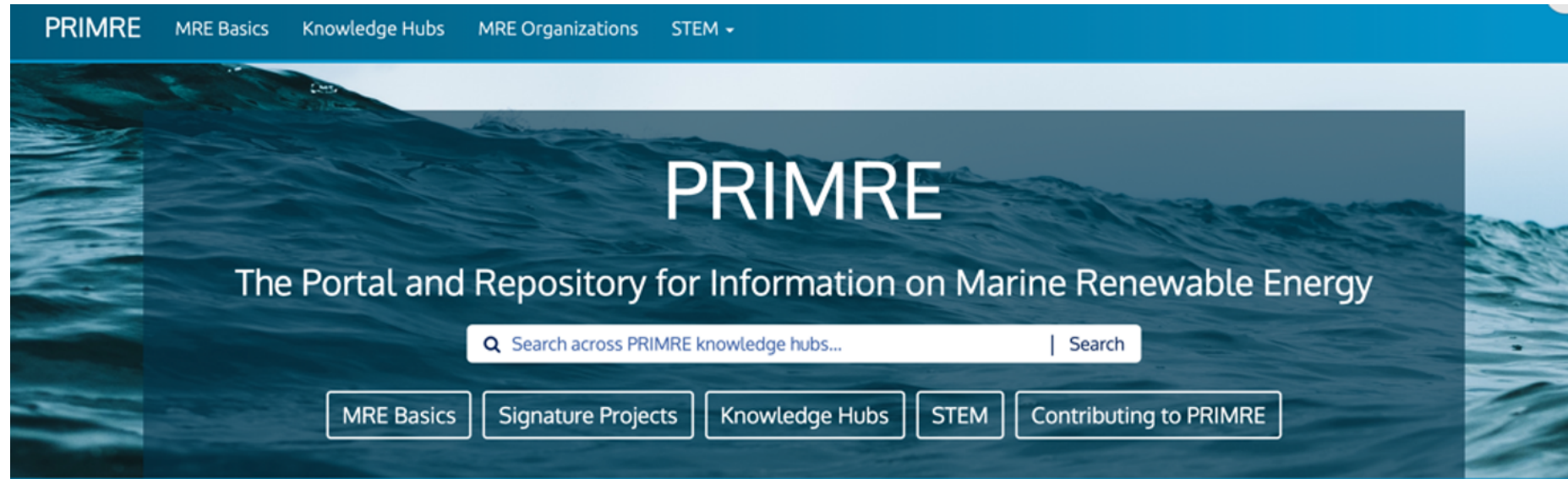
PRIMRE Workshop Breakout Group

Introducing MRE Software

**Hosted by Kelley Ruehl, Mat Topper, and Cesar Castillo
(Sandia National Laboratories and Data Only Greater)**

**Ocean Renewable Energy Conference
September 24, 2021**

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



PRIMRE seeks to provide broad access to engineering, resource characterization, and environmental effects information on marine renewable energy projects to facilitate the commercial development of the MRE industry.

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

PRIMRE Knowledge Hubs

1. Tethys
2. Tethys Engineering
3. Marine Energy Projects Database
- 4. MRE Software**
5. Telesto
6. Marine Energy Atlas
7. MHK Data Repository

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



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 (2019)



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](#)

PRIMRE Knowledge Hubs

- [**MRE Technology Database**](#) contains information on MRE devices, points to companies active in the MRE field, and traces the development of projects around the world (2020)
- [**Telesto**](#) is a collection of information and guidance for testing, measurement, and data analysis for MRE research, development, and demonstration (2020)
- [**MRE Software**](#) is a collection of software relevant to MRE development, including the [**MRE Code Hub**](#) and [**PRIMRE Code Catalog**](#) (2020)



MRE Technology Database

Provides up-to-date information on marine and hydrokinetic renewable energy. The database includes wave, tidal, current, and ocean thermal energy, and contains information on the various energy conversion technologies, companies active in the field, and development of projects in the water.

[View Tech Database](#)



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](#)

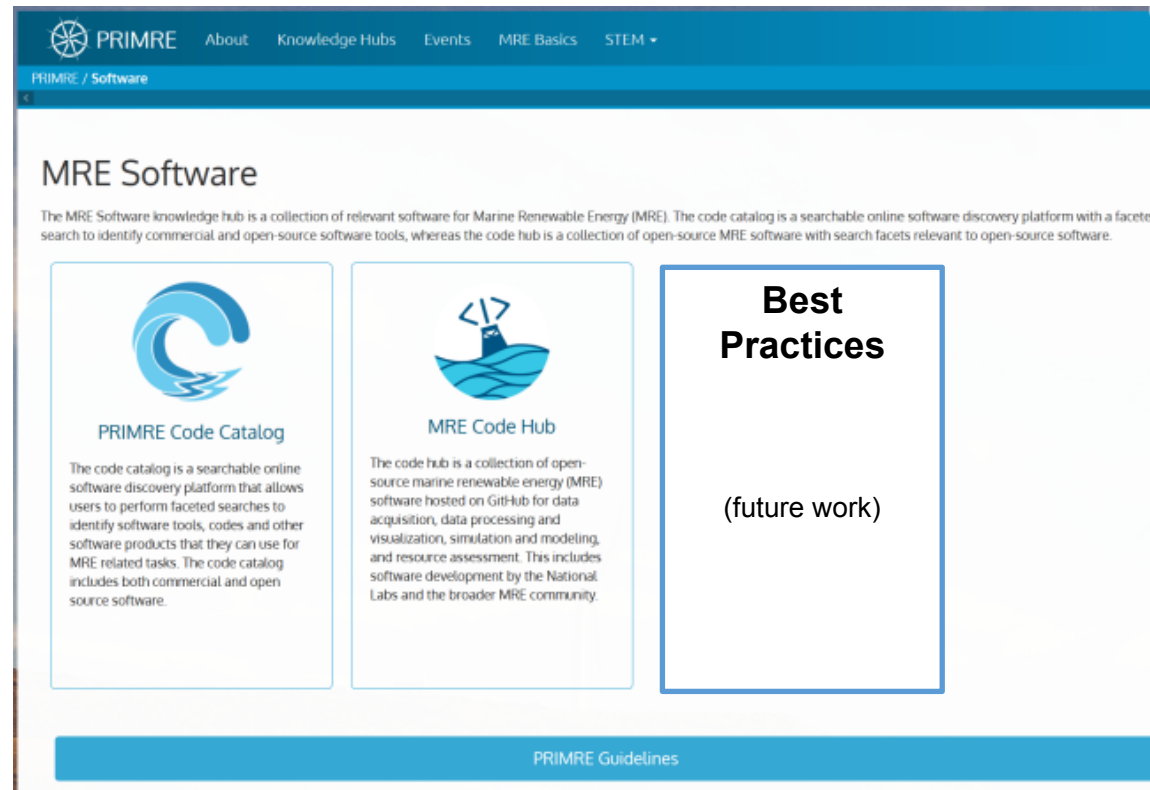
MRE Software

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](#)

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

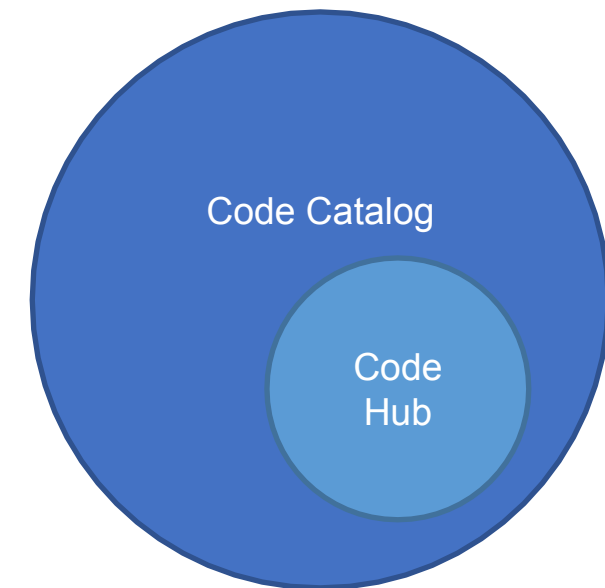
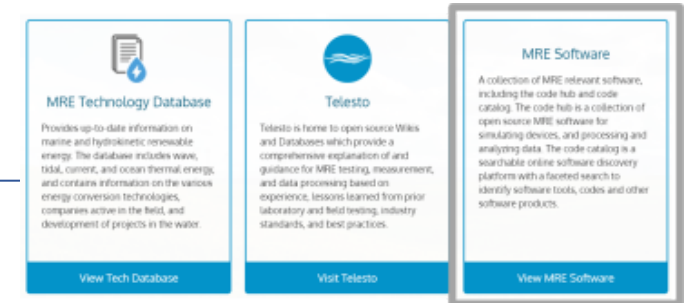
MRE Software Knowledge Hub



**All MRE software,
commercial and
open-source**

**Open-Source MRE
software (on GitHub)**

**Software
development
best practices**



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

PRIMRE Code Catalog

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

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

PRIMRE / Code Catalog

Explore the PRIMRE Code Catalog to find software relevant to MRE research, analyses, performance assessment, LCOE, and more.

Search the PRIMRE the Code Catalog

Showing 41 results

ANSYS AQWA

ANSYS AQWA software addresses the vast majority of analysis requirements associated with hydrodynamic assessment of all types of offshore and marine structures. These include SPARs, FPSOs, Semi-submersibles, Tension leg platforms, Ships, Renewable energy devices, and Breakwaters. Ansys has been used extensively in the oil & gas, renewable and general engineering sectors to model installation and/or equipment in-water as well as in-harbour or sheltered locations. Ansys AQWA provides an integrated facility for developing primary hydrodynamic parameters required to undertake complete stability and response analysis. Model iteration can be performed through Ansys.

ANSYS BladeModeler

ANSYS BladeModeler software is a specialized software tool for the rapid 3D design of rotating machinery components. Ansys BladeModeler is used to design axial, mixed-flow and radial blade components in applications such as pumps, compressors, fans, blowers, turbines, expanders, turbochargers, motors and more.

ANSYS CFX

ANSYS CFX is the industry-leading computational fluid dynamics software for turbomachinery applications. CFX is renowned for its outstanding accuracy, reliability and speed. It is easy to set-up, extremely powerful and accurate for turbomachinery applications including pumps, fans, compressors and gas and hydraulic turbines. CFX also offers highly scalable, high-performance computing (HPC) to help solve simulations quickly and cost-effectively.

ANSYS AQWA [init]

Version: 2020 R2

Other

Submission Information

ANSYS AQWA software addresses the vast majority of analysis requirements associated with hydrodynamic assessment of all types of offshore and marine structures. These include SPARs, FPSOs, Semi-submersibles, Tension leg platforms, Ships, Renewable energy devices, and Breakwaters. Ansys AQWA Suite extends Ansys AQWA Diffraction to include analysis capabilities for global performance of moored and/or connected systems subject to random sea states. Simulations may be static or dynamic in frequency and/or time domain. More advanced requirements, such as dynamic position systems and energy dissipation, can be accomplished through a user-defined function.

| | |
|-----------------|---|
| Submission Type | Commercial Software |
| URL | https://www.ansys.com/products/structures/ansys-aqwa |
| Landing Page | https://www.ansys.com/products/structures/ansys-aqwa |
| Tag(s) | hydrodynamics, structural mechanics, modeling, finite element modeling |
| Author(s) | ANSYS, Inc. |
| Organization | ANSYS, Inc. |
| Primary Contact | ANSYS, Inc. |
| Email Address | anagund@ansys.com |

License and Development Status

Version: 2020 R2

License Type: Commercial Software

Dependencies: ANSYS AQWA License

Cost: \$55

MRE Applicability and Technology Types

BEMRosetta [init]

Version: v1.0

Code

Submission Information

BEMRosetta is a hydrodynamic coefficients viewer and converter for Boundary Element Method (BEM) solver formats.

| | |
|-----------------|--|
| Submission Type | Public Repo (e.g. public git repo) |
| URL | https://github.com/cabala23/BEMRosetta |
| Landing Page | https://github.com/cabala23/BEMRosetta |
| Tag(s) | hydrodynamics, meshviewer, mesh-processing, potential flow, offshore-wind platforms, hydrodynamic coefficients-viewer, boundary-element, wave-energy |
| Author(s) | Miki Zabala |
| Primary Contact | Miki Zabala |
| Online Forum | https://github.com/cabala23/BEMRosetta/issues |

License and Development Status

Version: v1.0

License Type: GNU General Public License v3.0

Source Code Availability: Compiled code (with source code available)

Cost: Free

MRE Applicability and Technology Types

MRE Technology Type: Wave

MRE Code Hub <https://mrecodehub.org/>

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



The landing page features the MRE Code Hub logo and a header with the U.S. Department of Energy logo and 'Energy Efficiency & Renewable Energy' text. A banner image shows a wave. Below the banner, there are three main sections: 'Browse MRE Code Hub Repositories', 'Search MRE Code Hub Source Code', and 'Register Your Software'. Each section has a brief description and a link. To the right, there is a 'Need help finding the right software tools for your MRE-related tasks?' section with a link to the 'PRIMRE Code Catalog'. Below this, there is a 'Looking for other MRE resources?' section with a link to the 'PRIMRE' portal. At the bottom, there is a 'New Releases' section with three cards: 'tsdat v0.2.6', 'WEC-Sim v4.3', and 'MHKT-Python 0.4.0'. Each card has a brief description and links to 'Code' and 'Documentation'.

MRE Code Hub

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.

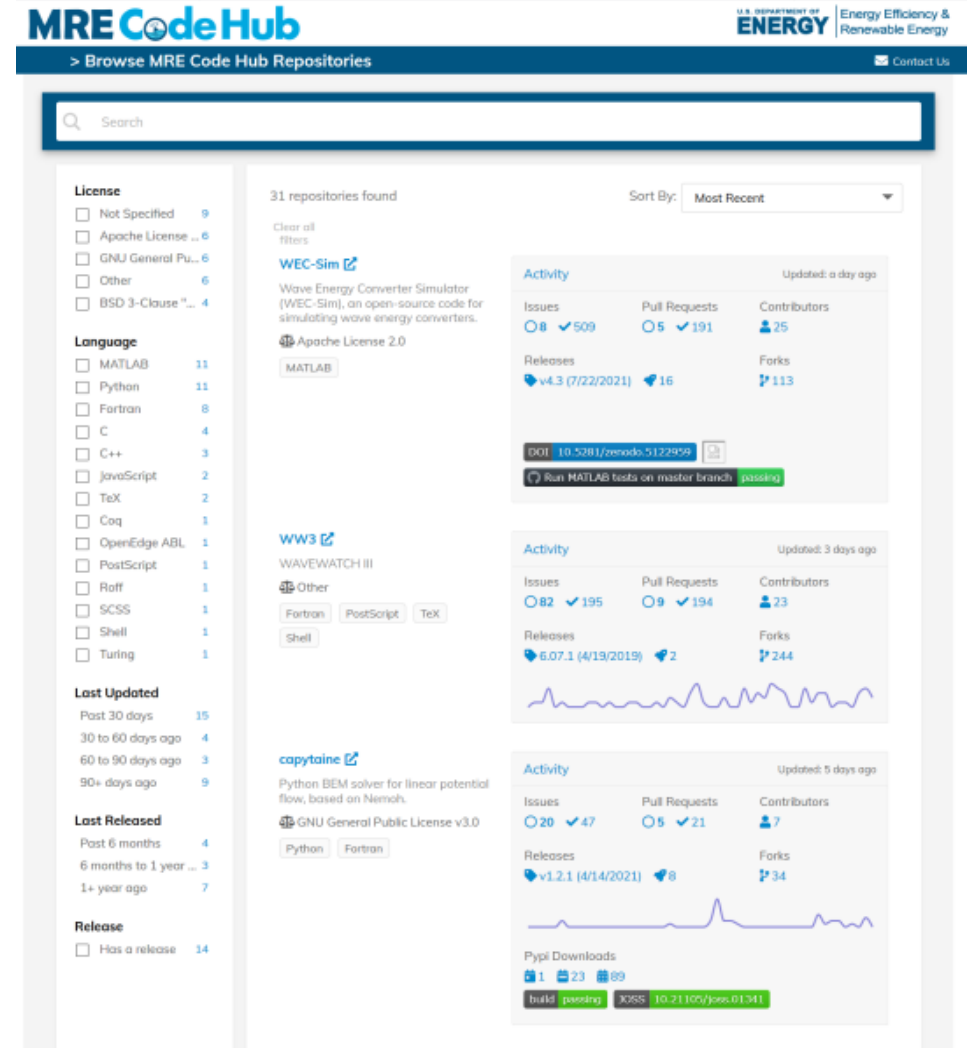
Register Your Software
Click here to register your software so it can be discovered and shared with the MRE community.

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).

New Releases

- tsdat v0.2.6**
Time series data utilities for declaratively applying standardization, Q/C, and transformations to datastreams.
Code Documentation
- WEC-Sim v4.3**
Wave Energy Converter Simulator (WEC-Sim), an open-source code for simulating wave energy converters.
Code Documentation
- MHKT-Python 0.4.0**
MHKT-Python provides the marine renewable energy (MRE) community tools for data processing, visualization, quality control, resource assessment, and device performance.
Code Documentation



The repository page shows a search bar at the top. Below the search bar, there are filters for License, Language, Last Updated, Last Released, and Release. The main content area displays a list of repositories. The first repository is 'WEC-Sim', which is a Wave Energy Converter Simulator. It has 8 issues, 5 pull requests, and 25 contributors. The second repository is 'WW3', which is a WAVEWATCH III. It has 82 issues, 9 pull requests, and 23 contributors. The third repository is 'capytaine', which is a Python BEM solver for linear potential flow. It has 20 issues, 5 pull requests, and 7 contributors. Each repository card also shows the number of releases and forks, and a link to the repository.

MRE Code Hub

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

Contact Us

> Browse MRE Code Hub Repositories

Search

31 repositories found Sort By: Most Recent

License

- ☐ Not Specified 9
- ☐ Apache License ... 6
- ☐ GNU General Pu... 6
- ☐ Other 6
- ☐ BSD 3-Clause "... 4

Language

- ☐ MATLAB 11
- ☐ Python 11
- ☐ Fortran 8
- ☐ C 4
- ☐ C++ 3
- ☐ JavaScript 2
- ☐ TeX 2
- ☐ Coq 1
- ☐ OpenEdge ABL 1
- ☐ PostScript 1
- ☐ Roff 1
- ☐ SCSS 1
- ☐ Shell 1
- ☐ Turing 1

Last Updated

- Past 30 days 15
- 30 to 60 days ago 4
- 60 to 90 days ago 3
- 90+ days ago 9

Last Released

- Past 6 months 4
- 6 months to 1 year ... 3
- 1+ year ago 7

Release

- ☐ Has a release 14

WEC-Sim
Wave Energy Converter Simulator (WEC-Sim), an open-source code for simulating wave energy converters.
Apache License 2.0
MATLAB

Activity Updated: a day ago

| Issues | Pull Requests | Contributors |
|--------|---------------|--------------|
| 8 | 5 | 25 |

Releases

- v4.3 (7/22/2021) 16

DOI 10.5081/zenodo.5122956

Run MATLAB tests on master branch **passing**

WW3
WAVEWATCH III
Other
Fortran PostScript TeX
Shell

Activity Updated: 3 days ago

| Issues | Pull Requests | Contributors |
|--------|---------------|--------------|
| 82 | 9 | 23 |

Releases

- 6.07.1 (4/19/2019) 2

capytaine
Python BEM solver for linear potential flow, based on Nemoh.
GNU General Public License v3.0
Python Fortran

Activity Updated: 5 days ago

| Issues | Pull Requests | Contributors |
|--------|---------------|--------------|
| 20 | 5 | 7 |

Releases

- v1.2.1 (4/14/2021) 8

Pypi Downloads

- 1 23 89

build **passing** **XSS** 10.21105/joss.01341

MRE Software

What MRE software do you/your organization use or develop?

Is there any specific MRE software or supporting tools that are not available as either commercial or open-source products? If so, which would be the most important to produce?

Code Catalog

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

What information would you like to find when searching for MRE software packages to use?

When searching for software for your use-case, which categories would you like to filter by?

Which search terms might you use to find a software package?

Which features of the code catalog are superior to searching using a general engine (like Google) and which are worse?

Code Hub <https://mrecodehub.org/>

As a software developer, what information would help you choose open-source software packages?

When searching for software to develop, which categories would you like to filter by?

Which search terms might you use to find a software package?

How would you like to sort the results of your searches?

Would it be useful to extend the functionality to software stored on other open-source repositories (e.g. GitLab, sourceforge)?

Thank you!

- Kelley Ruehl (Sandia)
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- Mathew Topper (Data Only Greater)
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- Cesar Castillo (Sandia)
Cesar.Castillo@sandia.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 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.

U.S. DEPARTMENT OF
ENERGY

