

# TETHYS ENGINEERING BLAST



**15 January 2021**

[Tethys Engineering](#) is an online knowledge base that facilitates the exchange and dissemination of information on the technical and engineering aspects of marine renewable energy (MRE). The bi-weekly *Tethys Engineering Blast* highlights new publications in the [Tethys Engineering Knowledge Base](#); relevant announcements, opportunities, and upcoming events; and news articles of international interest. If you have specific content you would like circulated to the greater MRE community, please send it to [tethys@pnnl.gov](mailto:tethys@pnnl.gov) for consideration.

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## **Announcements**

### ETIPP Community Technical Assistance

The National Renewable Energy Laboratory (NREL) is now accepting community technical assistance applications for the [Energy Transitions Initiative Partnership Project \(ETIPP\)](#), a partnership among U.S. Department of Energy (DOE) offices, national labs, and community organizations that will provide resources and access to on-the-ground support for remote and island communities in the U.S. seeking to transform their energy systems and lower their vulnerability to energy disruptions. Applications are due by 15 February 2021.

### Ocean Observing Prize

The U.S. DOE and National Oceanic and Atmospheric Administration (NOAA) are accepting applications for the [DEVELOP Competition](#) within the [Ocean Observing Prize](#)—a multi-stage prize that challenges innovators to integrate MRE with ocean observation platforms. The DEVELOP Competition comprises three contests—Design, Build, and Splash. Submissions for the Design Contest close at 5:00pm EST on 16 February 2021.

### Calls for Papers

*Energies* is accepting manuscript submissions for several upcoming Special Issues, including "[Computational Modelling of Wave Energy Converters](#)" (due 31 January 2021), "[Advances in the Fault Tolerance and Resilience of Wind and Tidal Energy Conversion Systems](#)" (due 10 March 2021), and "[Policy and Technology for Ocean Renewable Energy](#)" (due 16 March 2021).

The *Journal of Marine Science and Engineering* is accepting manuscript submissions for several upcoming Special Issues, including "[Offshore and Subsea Structures](#)" (due 10 March 2021), "[Response of Offshore and Coastal Structures Subject to Currents and Waves](#)" (due 16 March 2021), and "[Optimization and Energy Maximizing Control Systems for Wave Energy Converters](#)" (due 31 March 2021).

### Funding/Testing Opportunities

Innovate UK has announced an upcoming [Smart Grants funding competition](#) for UK registered organizations to apply for a share of up to £25 million to deliver disruptive research and development innovations. The competition closes at 11:00am UTC on 20 January 2021.

The European Commission has released a [Call for Proposals](#) focused on innovative land-based and offshore renewable energy technologies and their integration into the energy system. Submissions are due by 5:00pm CEST (3:00pm UTC) on 26 January 2021.

The European Commission has also recently announced a [Blue Economy Call for Proposals](#) to help advance market-readiness of new products, services, or processes, including MRE projects. Proposals are due by 5:00pm CEST (3:00pm UTC) on 16 February 2021.

### Student/Employment Opportunities

HydroWing is currently seeking an [Electrical Design Engineer](#) to lead research and development of its tidal energy device's Turbine Control Hub. Applications are due 15 January 2021.

France Énergies Marines is currently seeking a [Research Scientist](#) in offshore renewable energy mooring systems and foundations to join the DTOceanPlus team. The candidate will contribute to the development of advanced design tools for the selection, development, and deployment of ocean energy systems. Applications are due by 21 January 2021.

The University of Oxford is currently seeking an [Associate Professorship of Civil Engineering \(Fluid Mechanics\)](#) to conduct original research and complement existing activities which include flows through porous media, ocean engineering and offshore renewable energy. Applications are due by 25 January 2021.

Maynooth University is currently seeking two [Senior Post-Doctoral Researchers](#) to join its Centre for Ocean Energy Research. The roles will focus on the development of numerical optimization-based control strategies for the linear and nonlinear models of wave energy converter arrays. Applications are due by 14 February 2021.

Maynooth University's Centre for Ocean Energy Research also has an opportunity for applicants interested in undertaking a [funded PhD](#). The primary focus of the project will be the development of a small-scale wave powered data buoy.

Pacific Northwest National Laboratory is currently seeking a [Coastal and Marine Sciences Technical Intern](#) to join projects within one of three focus areas: (1) understanding the national laboratories' role and the unique place they have to accelerate work in coastal and marine ecosystems; (2) research and development of technologies focused on monitoring coastal ecosystems; and (3) MRE technologies and powering the blue economy. Applications are due by 25 February 2021.

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## Upcoming Events

### Upcoming Course

WavEC Offshore Renewables will be hosting an online course entitled, "[Computational Fluid Dynamics \(CFD\) for Sustainable Ocean Solutions: Course I](#)", from 8-11 February 2021. The course is the first in a series sponsored by the University of Tokyo and the University of São Paulo, and will introduce several CFD crucial subjects. Register [here](#) by 4 February 2021.

### Upcoming Webinars

The European Technology and Innovation Platform for Ocean Energy (ETIP Ocean) and OceanDEMO will be hosting a webinar, "[From single device to a farm - tidal edition](#)", on 28 January 2021 at 3:00pm CET (2:00pm UTC). Register [here](#).

The [MHK Environmental Toolkit for Permitting and Licensing](#) project team, led by Kearns & West, will be hosting a series of webinars and other engagement opportunities in February and March 2021 to demonstrate the toolkit, gather feedback, and share experts' understanding of potential impacts. Learn more about the Toolkit, register for the upcoming engagement opportunities, and view recordings of previous workshops [here](#).

### Upcoming Conference

The [Marine Energy Wales Conference 2021](#) will be held online from 27-29 January 2021. The event will bring together MRE technology developers, project developers, the supply chain, academia, and the public sector to discuss how Wales can become a global leader. Register [here](#).

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## New Documents on *Tethys Engineering*

[Non-stationary historical trends in wave energy climate for coastal waters of the United States](#) – Ahn & Neary 2020

The thirty-year non-stationary historical trends in the wave energy climate for United States coastal waters between 1980 and 2009 are investigated using spectral partitioned wave data generated from a WaveWatch III® (version 5.05) hindcast. In addition to historical trends in the omni-directional wave power, frequency and directionally resolved wave power, frequency and directional spreading, and seasonal variability, are examined for the first time, including their geographical distribution. These historical wave energy climate trends are linked to changes to the dominant wave systems and commensurate trends in the historical wind climate.

### **Experiments on line arrays of horizontal-axis hydroturbines – Okulov et al. 2021**

Utility-scale projects for hydrokinetic energy extraction from rivers, tidal or ocean currents could include tens to hundreds of turbines in densely-packed hydro farms. The aim of the present paper is to obtain a better understanding of the power production and wakes generated by several devices modeling a straight array of horizontal-axis water turbines in a hydro farm. To accomplish this, stereo particle image velocimetry experiments were carried out to measure the flow properties upstream and downstream of the devices in the array including up to four elements. The study also provides measured values of power and thrust coefficients of the model turbines using strain gauges installed directly on the rotor shaft.

### **Estimation of Ocean Thermal Energy Conversion Resources in the East of Malaysia – Thirugnana et al. 2020**

The Malaysian Government has set a target of achieving 20% penetration of renewable energy in the energy mix spectrum by 2025. In order to get closer to the target, Ocean Thermal Energy Conversion (OTEC) aligned with solar PV, biogas and biomass energy sources must be evaluated and comprehended. Therefore, for the construction of a commercial OTEC plant, 1 MW or 2.5 MW, the choice of a strategic location or potential site is vital. In this paper, oceanographic data such as seawater temperature, depth, salinity and dissolved oxygen obtained from the Japan Oceanographic Data Center for Semporna, Tawau, Kudat, Pulau Layang-Layang and Pulau Kalumpang in Sabah, Malaysia, are reported.

### **Initial conceptual demonstration of control co-design for WEC optimization – Coe et al. 2020**

While some engineering fields have benefited from systematic design optimization studies, wave energy converters have yet to successfully incorporate such analyses into practical engineering workflows. The current iterative approach to wave energy converter design leads to sub-optimal solutions. This short paper presents an open-source MATLAB toolbox for performing design optimization studies on wave energy converters where power take-off behavior and realistic constraints can be easily included. This tool incorporates an adaptable control co-design approach, in that a constrained optimal controller is used to simulate device dynamics and populate an arbitrary objective function of the user's choosing.

## **[On the impact of motion-thrust coupling in floating tidal energy applications](#) – Brown et al. 2021**

This paper presents physical modelling and analysis of a 1:12 scale model of the Modular Tide Generators floating tidal platform concept, a pseudo-generic design consisting of a catamaran-style platform, catenary mooring system and a submerged horizontal axis tidal turbine. The behaviour of the full system is explored in a range of wave, current, and following wave–current conditions; with and without the turbine; and in rigidly fixed and moored configurations. The results imply that a linear superposition of waves and currents is an adequate modelling approach for determining the mean and cyclic values for the mooring loads and motion of the system.

## **[Round robin testing of synthetic fibre ropes for application in marine renewable energy](#) – Khalid et al. 2020**

The unique design requirements of mooring systems in Marine Renewable Energy (MRE) installations require detailed numerical and empirical investigations as well as offshore experience to adopt and certify fibre ropes in the marine renewable energy industry. Laboratories provide a controlled environment for quick, inexpensive and repeatable testing compared to field deployment and enable a range of parameters to be studied. This paper presents the outcomes of a round robin testing campaign conducted at two test facilities to conduct a comparative analysis by monitoring the implementation of the test program and analysing the results to highlight differences between facilities and suggest best practice for fibre rope testing in the MRE industry.

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## **News & Press Releases**

### **[Wave Swell Energy's UniWave200 is Installed at King Island](#) – Wave Swell Energy**

Wave Swell Energy's 200 kW demonstration of its unique wave energy technology, the UniWave200 device, was successfully deployed early on the morning of January 10, 2021, at Grassy Harbour on King Island. The unit is now sitting on the seabed in its planned location, approximately 100 metres from shore in 5.75 metres of water depth. The commissioning phase will take place over the coming weeks, with the device expected to be connected to Hydro Tasmania's hybrid grid during Q1, 2021. Once operating and providing electricity, King Island will be the first remote island grid in the world to be powered by three separate renewables – waves, wind, and solar. Check out a video of the full deployment [here](#)!

### **[AUSTEn delivers tidal energy mapping data for Australia](#) – Offshore Energy**

The Australian Tidal Energy (AUSTEn) team has made publicly available tidal energy datasets from two sites in Tasmania and the Northern Territory to help assess Australia's tidal energy resource and its potential contribution to the future energy mix. A new

currents, waves and CTD data, obtained during the campaigns in Banks Strait, Tasmania, and Clarence Strait, Northern Territory, have been made publicly available through the AODN Portal. It is available for researchers and industries alike to further investigate the energy resource potential of these sites and/or validate their ocean and hydrodynamic models.

### **Shoring Up Wave Energy's Bottom Line Through Variable-Geometry WEC Designs – NREL**

Researchers at the National Renewable Energy Laboratory (NREL) are rethinking wave energy converter (WEC) designs to provide a new pathway for the development of next-generation cost-competitive systems. The incorporation of variable-geometry components may hold the key to the elusive combination of increased energy capture and reduced structural costs. Using variable geometry, the shape of the WEC can be changed so that in more energetic sea states the structural loads are controlled, allowing extended power production. What sets variable-geometry WECs apart from other types of wave energy devices? In a word, control.

### **Wavepiston installs a wave energy converter at PLOCAN's test site – Blue-GIFT**

The Danish company Wavepiston has installed the first full-scale modules, of its wave energy converter at the test site of the Oceanic Platform of the Canary Islands (PLOCAN). Their device allows the conversion of wave motion into electricity and desalinated water. The system comprises a chain of wave energy collectors stretched between two anchored buoys. The plates of the collectors move when waves roll along the system, pumping pressurised sea water into a pipe leading to a turbine or a reverse osmosis system, in order to obtain energy or desalinated water. The current set-up is a pre-installation where they are testing two energy collectors. The first full string with 24 energy collectors is planned to be installed in the autumn.

### **Education for the Future: OTEC 360°, The Virtual Reality – Universiti Teknologi Malaysia (UTM)**

UTM Ocean Thermal Energy Centre (UTM OTEC) has recently developed a virtual reality tool to explain the basic concept of power generation & desalination process in Ocean Thermal Energy Conversion (OTEC) system. The objectives of this project are to promote OTEC technology, especially during the time of online teaching and learning, and to captivate and encourage students to learn more about OTEC technology and the fields of Science, Technology, Engineering, and Mathematics. The OTEC 360° is also in line with the United Nations Sustainable Development Goals, whereby, it can be accessed and used by anyone 24/7, thus increasing the quality of education for stakeholders.