

# TETHYS ENGINEERING BLAST



**23 October 2020**

[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

### PRIMRE Webinar Series

Pacific Northwest National Laboratory, National Renewable Energy Laboratory, and Sandia National Laboratories will be hosting the second of a [two-part webinar series](#) to present new developments on the [Portal and Repository for Information on Marine Renewable Energy \(PRIMRE\)](#), a centralized access point that enhances the accessibility and discoverability of information relevant to MRE development and operations in the U.S. The second webinar, at 8:00am PDT (3:00pm UTC) on 28 October 2020, will highlight new features of existing [PRIMRE Knowledge Hubs: Signature Projects](#), the [Tethys Engineering Photo Library](#), and the PRIMRE aggregate search. Register [here](#). A recording of the first webinar, which highlighted new sites and tools developed within PRIMRE ([MRE Technology Database](#), [MRE Software](#), and [Telesto](#)) is now available [here](#).

### Ocean Observing Prize

The U.S. Department of Energy (DOE) and National Oceanic and Atmospheric Administration (NOAA) recently announced the opening of 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.

## Call for Abstracts

The University of Plymouth is accepting abstract submissions for the [14<sup>th</sup> European Wave and Tidal Energy Conference \(EWTEC 2021\)](#) until 1 November 2020. EWTEC 2021 will be held in Plymouth, UK from 5-9 September 2021.

## Call for Papers

The *Journal of Ocean Technology* is inviting the submission of technical papers, essays, and short articles for its Spring 2021 [Special Issue on Renewable Ocean Energy](#). Submissions are due 13 November 2020.

## Funding/Testing Opportunities

The European Space Agency (ESA) Space Solutions, in partnership with the Dutch Marine Energy Centre (DMEC), has released an open competition [Invitation to Tender](#) for teams looking to investigate the technical feasibility and economic viability of space-based applications in support of MRE solutions, and define a roadmap for services implementation and demonstration.

The [TEAMER](#) (Testing Expertise and Access for Marine Energy Research) Program, which provides MRE developers with access to a network of U.S. testing facilities, will begin accepting applications for its second round of Requests for Technical Support (RFTS) on 9 November 2020. Applications will be due by 18 December 2020.

The TEAMER Network Director is also accepting applications for additional facilities to join the [TEAMER Test Facility Network](#) for RFTS round 3 and beyond. Potential facilities (both physical infrastructure as well as expertise capabilities, such as modeling and analysis services) should submit an application by 4 December 2020.

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.

## Employment Opportunities

Offshore Renewable Energy Catapult (ORE Catapult) is recruiting for a [Research Engineer](#) to be based within the Marine Energy Engineering Centre of Excellence (MEECE). Applications are due 29 October 2020.

The Fundy Ocean Research Centre for Energy (FORCE) is currently seeking a [Board Director](#) to support its mission as Canada's lead research facility for tidal stream technology.

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## **Upcoming Events**

### Upcoming Workshops

Marine Scotland Science will now be hosting the [Scottish Shelf Waters Reanalysis Service \(SSWRS\) Launch Event](#) online on 3 November 2020. The SSWRS is a 25 year hindcast of the Scottish Shelf Model (SSM) and will include variables such as hourly horizontal current velocities and water elevation fields, as well as daily mean files (de-tided) of three-dimensional currents, temperature, and salinity, all on the original unstructured model mesh. The launch event will include information about the SSM reanalysis service, how to get started with the SSWRS, and the potential applications of the service, as well as provide an opportunity to network with other users.

As part of MaRINET2, the University of Edinburgh and WavEC Offshore Renewables are organizing a short-course on reducing uncertainty in techno-economic analysis of ocean energy from 17-19 November 2020. Register [here](#).

### Upcoming Webinars

In collaboration with the Oceansgate Marine Technology Webinar Series, the European Marine Energy Centre (EMEC) is hosting the [fifth](#) supply chain seminar event as part of the TIGER (Tidal Stream Industry Energiser) project on 28 October 2020 at 11:00am UTC. This webinar, facilitated by Offshore Renewable Energy (ORE) Catapult, will raise awareness of reliability and condition monitoring techniques and future applications of machine learning. Register [here](#).

Mystic Aquarium is hosting a [Virtual Tour and Panel Event on Renewable Ocean Energy](#) at 7:00pm EDT (11:00pm UTC) on 27 October 2020. The event will include a virtual tour of Mystic's new exhibit space, as well as a presentation and live Q&A with experts from the U.S. Department of Energy, Ocean Power Technologies, and Vineyard Wind. Register [here](#).

EMEC is also hosting the [sixth](#) supply chain seminar event as part of the TIGER project on 30 October 2020 at 12:00pm UTC. This webinar, facilitated by Minesto, will focus on onshore and offshore mobilization and logistics, aiming to integrate cross-sector supply chain capability and innovation into the development of world leading tidal energy projects. Register [here](#).

The Ocean Power Innovation Network (OPIN) is hosting a webinar, "[Converting to offshore – From the test tank to the sea](#)", at 12:30pm UTC on 18 November 2020. The webinar will feature speakers from EMEC, Wave Energy Scotland, and Verdant Power. Register [here](#).

### Upcoming Conferences

The [Offshore Technology Conference Asia \(OTC Asia\) 2020](#) will be held online from 2-6 November 2020. Register [here](#).

The International Network on Offshore Renewable Energy (INORE) Virtual Symposium 2020 will be held on 19 November 2020. Entries for the three-minute thesis competition close 6 November 2020. Register [here](#) by 18 November 2020.

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## **New Documents on *Tethys Engineering***

### **[Techno-Economic Modelling of Tidal Energy Converter Arrays in the Tacoma Narrows](#) – Topper et al. 2020**

The advanced ocean energy array techno-economic modelling tool 'DTOcean' enables designers to calculate and improve the levelised cost of energy (LCOE) of an array through parametric simulation of the energy extraction, design of the electrical network, moorings and foundations, and simulation of the installation and lifetime operations and maintenance of the array. This work presents a verification of DTOcean's ability to simulate the techno-economic performance of tidal energy converter arrays by reproducing the hypothetical RM1 reference model, a semi-analytical model of a TEC array based in the Tacoma Narrows of Washington state, U.S.A.

### **[Design of optimal velocity tracking controllers for one and two-body point absorber wave energy converters](#) – Stock and Gonzales 2020**

Point absorber Wave Energy Converters (WECs) are typically operated using linear damping control in which the resistive force of the power take-off (PTO) is linearly proportional to the velocity of the floater. Such algorithms are used predominantly due to their simplicity and ease of application, however, it is known that such control is far from optimal in terms of energy capture. The main objective of the work presented here is to develop and implement a novel two-body WEC optimal velocity tracking controller design methodology.

### **[Modeling and optimization of an ocean thermal energy conversion system for remote islands electrification](#) – Vera et al. 2020**

This study performs a theoretical model and optimization of an ocean thermal energy conversion (OTEC) system coupled to an organic Rankine cycle (ORC) generator for small scale applications in the San Blas archipelago (Panama). The gross electric power has been previously set at 125 kW for the eleven working fluids selected: ammonia, R152a, R1234yf, R1234ze, R125, R134a, R161, propane, isobutene, RE143a and decafluorobutane. Results show R1234yf gets the maximum thermodynamic and net electric efficiency (3.60% and 2.57%, respectively).

### **[New inorganic coating-based triboelectric nanogenerators with anti-wear and self-healing properties for efficient wave energy harvesting](#) – Xu et al. 2020**

As a new approach of collecting friction energy, triboelectric nanogenerators (TENGs) have shown promising applications in many fields. However, most TENGs based on organic polymer materials often suffer from durability problems of aging, wear, and low output performance. Here, a novel inorganic coating TENG based on normal microarc oxidation coating (FM-TENG) is constructed and designed for wave energy collection and in situ self-powered cathodic protection against corrosion.

## **[Quantifying and reducing uncertainty in tidal energy yield assessments](#) – Clayton 2020**

Tidal stream energy has the potential to contribute to a diverse future energy mix. As the industry moves towards commercialisation and array scale deployment, there is an opportunity to better understand the uncertainties around energy yield assessments. This thesis investigates ways to achieve this through utilising lessons learnt from the established wind industry. An evaluation of both the wind and tidal energy yield assessment process is conducted, highlighting where synergies can be used to increase understanding of uncertainty for the nascent tidal industry.

## **[On Wave-Induced Elastic Deformations of a Submerged Wave Energy Device](#) – Li et al. 2020**

Structural integrity has remained a challenge for design and analysis of wave energy devices. A difficulty in assessment of the structural integrity is often laid in the accurate determination of the wave-induced loads on the wave energy devices and the responses of the structure. Decoupled hydroelastic response of a submerged, oscillating wave energy device to extreme nonlinear wave loads is studied here. The submerged wave energy device consists of an oscillating horizontal disc attached to a direct-drive power take-off system.

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## **News & Press Releases**

### **[Nova Innovation Celebrates Birthday with Shetland Tidal Array Expansion](#) – Nova Innovation**

Nova Innovation is celebrating its 10th birthday with the successful expansion of the world's first tidal array. The company confirms a step-change cost reduction in tidal energy as their new turbine begins powering homes in Scotland's most northerly isles. Eunice is the first of three turbines set to double the size of the Shetland Tidal Array as part of the EnFAIT (Enabling Future Arrays in Tidal) project, making tidal energy a commercial reality. The EnFAIT project, now in its third year, has been driving the commercialisation of the tidal energy sector by improving reliability, reducing costs, and boosting the sector's 'bankability'.

### **[Eco Wave Power Announces Strategic Collaboration with Painhas Engineering and Construction Company for its 20MW Portugal Project](#) – Eco Wave Power**

Eco Wave Power recently announced the strategic collaboration with Painhas for the technical support for the licensing of its' Portugal project. Painhas, which was founded in 1980, has more than 40 years of experience in providing engineering and construction, operation and maintenance services for the energy sector in Portugal and other countries (including Production, Distribution and Power Transmission sectors). Painhas will take an integral part in the technical support needed for the official licensing procedures for

the Eco Wave Power planned 20MW wave energy project in Portugal, as part of the company's newly signed Concession Agreement with the Port Authority of Leixões.

### **Orbital's O2 taking shape – Offshore Energy**

Scotland-based Orbital Marine Power is moving forward with the manufacturing process of its first O2 floating tidal turbine device rated at 2MW. The retractable legs officially landed on the O2's floating hull delivered by Gray Fabrication in Dundee with six other parts that will support its turbine blades. Texo Group, who secured the contract in August last year, will carry out the final O2 assembly also at their quayside facilities in Dundee. The O2 will launch at The European Marine Energy Centre (EMEC)'s grid-connected tidal test site at the Fall of Warness next year.

### **MaREI @ NUI Galway put the largest load ever on a tidal energy turbine blade – the weight of 10 double decker buses – MaREI**

Our MaREI @ NUI Galway colleagues believe that they have put the largest load ever on a tidal energy turbine blade in their Large Structures Test Laboratory. This is equivalent loading to the curb weight of approximately 10 double-decker buses. The blade was co-designed using their in-house BladeComp software with Orbital Marine Power and it was manufactured by local Galway company ÉireComposites. They are currently testing the same blade under equivalent life fatigue loading to confirm that it has at least a 20-year design life. When completed, this will also be a first – largest tidal blade in the world to have undergone full fatigue life testing.

### **Puerto Rico makes progress on ocean energy research – Power Engineering International**

The Puerto Rico Ocean Technology Complex (PROTech) initiative is an ambitious government-led plan to establish a major technology park on the island territory while also spearheading its economic regrowth. The main drivers of the proposal are the development of the use of deep seawater in ocean thermal energy conversion (OTEC) and air conditioning systems. Typically, such seawater comes from depths greater than 200m and has a temperature of 10-12° C.