

# TETHYS ENGINEERING BLAST



**8 April 2022**

*Tethys Engineering* is an online knowledge hub that facilitates the exchange and dissemination of information on the technical and engineering aspects of marine energy. 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. Email [tethys@pnnl.gov](mailto:tethys@pnnl.gov) to contribute!

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## Announcements

### Marine Energy Collegiate Competition

The US Department of Energy (DOE) has opened the application period for the [2023 Marine Energy Collegiate Competition](#), which challenges interdisciplinary teams of undergraduate and graduate students to offer unique solutions to the marine energy industry that can play a role in powering the blue economy. For more information, join the [informational webinar](#) at 12:00pm MDT (6:00pm UTC) on 20 April 2022. Applications are due 8 May 2022.

### ETIPP Applications

The US DOE is accepting applications from remote, island, and islanded communities for technical assistance to transform their energy systems and increase energy resilience through the [Energy Transitions Initiative Partnership Project \(ETIPP\)](#). Applications are due 15 April 2022.

### MHKiT Survey

The [Marine and Hydrokinetic Toolkit \(MHKiT\)](#) team is conducting a short, online [survey](#) that will be used to shape future development, both in terms of architecture and content. MHKiT is an open-source marine energy software, developed in Python and MATLAB, that includes modules for ingesting, quality controlling, and managing data. Please submit responses by 15 April 2022.

## OPIN Support

The Ocean Power Innovation Network (OPIN), an international network based in Europe, is offering a free, high-level [Technology Assessment Process](#) for small and medium-sized enterprises. OPIN is also offering support for [Collaborative Innovation Groups](#) working to solve specific problems which are barriers to deployment of ocean energy and offer opportunities for new products, services, or markets. Applications for both are due 10 April 2022.

## BECS Proposals

The International Network on Offshore Renewable Energy's (INORE) [2022 Call for Blue Energy Collaborative Scholarships \(BECS\) Proposals](#) is now open through 15 April 2022. Sponsored by Ocean Energy Systems (OES), the BECS grant aims to advance research and promote collaboration amongst early-career professionals from diverse disciplines and nations.

## BLUE DEAL

Interreg Mediterranean's BLUE DEAL project is launching "[BLUE DEAL for the Future](#)", an International Blue Energy contest, created to raise awareness and involve future generations in building a blue future. Participation is open to High School Institutions from European Members States and Instrument for Pre-accession Assistance countries. Proposals are due 30 April 2022.

## Calls for Abstracts

The [Call for Abstracts](#) for the International Conference on Ocean Energy (ICOE) and Ocean Energy Europe (OEE)'s annual event has been extended to 22 April 2022. The Basque Energy Cluster and OEE will host [ICOE-OEE 2022](#) on 18-20 October 2022 in San Sebastián, Spain.

The [Call for Abstracts](#) for the [Pan-American Marine Energy Conference](#) (PAMEC 2022) has been extended to 25 April 2022. PAMEC is scheduled for 19-22 June 2022 in Ensenada, Mexico, with workshops on 17-18 June 2022. This international meeting is a great opportunity for graduate students to present their research to international colleagues.

The Call for Abstracts for the [University Marine Energy Research Community \(UMERC\) and Marine Energy Technology Symposium \(METS\) joint conference](#) is now open through 1 May 2022. UMERC and METS will host the event on 13-14 September 2022 in Portland, US, in conjunction with the [Ocean Renewable Energy Conference \(OREC\)](#) on 14-15 September 2022.

The [Call for Speakers](#) for [Clean Currents 2022](#) is now open until 1 May 2022. The Clean Currents Tradeshow and Conference will take place 18-20 October 2022 in Sacramento, US.

## Funding & Testing Opportunities

The Horizon Europe Framework Programme has launched a funding opportunity titled, "[Demonstration of innovative rotor, blades and control systems for tidal energy devices](#)". Proposals are due 26 April 2022.

The UK Department for Business, Energy & Industrial Strategy has launched Phase 9 of the [Energy Entrepreneurs Fund](#), which aims to support the development and demonstration of green energy technologies. Applications are due 11 May 2022.

The Centre for Advanced Sustainable Energy (CASE), an industry led, collaborative, sustainable energy research centre hosted at Queen's University Belfast, is seeking applications from suitably qualified consortia for research and development funding to support the decarbonisation of the energy system. The [Call for CASE Project Applications](#) closes 13 May 2022.

The Interreg Europe programme, financed by the European Regional Development Fund, has launched its first [Call for Proposals](#) in the 2021-2027 period, and is looking for interregional cooperation projects that will support a greener Europe. Applications are due 31 May 2022.

The Interreg North-West Europe Programme has launched its first [Call for Projects](#) in the 2021-2027 period, and is looking for transnational cooperation initiatives that can deliver concrete results for the North-West Europe area. The Call for Projects will close on 15 June 2022.

### Student & Employment Opportunities

The Pacific Marine Energy Center (PMEC) at Oregon State University is recruiting a [Post-Doctoral Scholar](#) to support hydrodynamic modelling and wave energy technology research and development. Applications are due 15 April 2022.

The Dutch Marine Energy Centre (DMEC) is looking for a [Business Data Analyst](#) who will work closely with various teams to collect, organize, and synthesize information and data about players and trends in different energy sectors. Applications are due 15 April 2022.

Pacific Ocean Energy Trust is seeking a [Program Coordinator](#) to provide administrative support to the Testing Expertise and Access for Marine Energy Research (TEAMER) Program. Applications are due 30 April 2022.

The University of Plymouth is accepting applications from UK students for a [funded PhD project](#) aimed at assessing and addressing the cyber-physical risks of offshore renewable energy. Applications are due 4 May 2022.

The National University of Ireland Galway is accepting applications for [5 PhD research positions](#) available through the TIDAL-GES (Tidal Energy – A transition to affordable and clean energy that can achieve ‘Good Environmental Status’ in coastal and marine waters) project. Applications are due 9 May 2022.

Sandia National Laboratories is seeking a [Water Power Technologies Testing Coordinator & Analyst](#). The selected candidate will work with a team of scientists and engineers on a variety of tasks as well as publications and presentations. Position open until filled.

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## Upcoming Events

### Upcoming Summit

The Australian Ocean Energy Group is hosting the [Australian Ocean Energy Market Summit](#) on 10-11 May 2022 in Hobart, Australia and online. The event aims to create information-based connections between Australian market representatives and industry leaders. Register [here](#).

### Upcoming Webinars

Net Zero Atlantic is hosting a webinar, “[Tidal velocity measurements at turbine rotor height and with turbine blade resolution](#)”, from 1:00-2:00pm ADT (4:00-5:00pm UTC) on 21 April 2022. The webinar will discuss the *Vectron*, a wide-baseline, converging-beam acoustic Doppler profiler developed to enable velocity measurements at tidal energy sites. Register [here](#).

Ocean Energy Systems (OES) is hosting a public webinar, “[Study of Offshore Aquaculture as a Market for Ocean Renewable Energy](#)”, on 26 April 2022 from 12:00-1:00pm PDT (7:00-8:00pm UTC) that will provide an overview of the findings in the “Study of Offshore Aquaculture as a Market for Ocean Renewable Energy” report, which will be published in April. Register [here](#).

### Upcoming Workshops

The Marine Offshore Renewable Energy Lab (MOREnergy Lab), in collaboration with the Centre for Ocean Energy Research (COER) Maynooth, is hosting the [7<sup>th</sup> Wave Energy Workshop](#) on 29 April 2022 in Turin, Italy. The workshop will cover a range of topics across wave energy conversion, with a broad focus on hydrodynamic modelling, control, and wave energy technology enhancement. Register [here](#).

UMERC is hosting a workshop, [Power for Ocean Sensing: Creating Dialogue around Power Capabilities and Needs](#), from 10:00am-12:00pm PDT (5:00-7:00pm UTC) on 19 May 2022. During this workshop, marine energy developers will update oceanographers on new power technology development and discuss how to support big data in the ocean. Register for free [here](#).

### Upcoming Conference

The [Wave Energy Scotland Annual Conference](#) will take place on 3 May 2022 in Edinburgh, Scotland. The full conference agenda is now available. Register for free [here](#).

### Event Update

The [Asian Wave and Tidal Energy Conference \(AWTEC\)](#) Executive Board and AWTEC 2022 Organizing Committee have decided to postpone AWTEC 2022 to 19-22 May 2023. The event will take place in Hangzhou, China. Abstract submissions will open in November 2022.

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

### **[Size matters: Scale effects of an OWC wave energy converter](#) – Orphin et al. 2022**

Models help us understand, assess, predict; but they are limited, uncertain. To better understand limitations and uncertainties due to scale effects in model test experiments of wave energy converters (WECs), we conducted a series of experiments at three model scales of a case study oscillating-water-column (OWC) WEC. This paper reports incident waves, power, and loads results across scales, and evaluates the causes and effects of identified scale-dependent parameters. Incident wave profiles varied significantly across scales as they became more nonlinear. These nonlinear wave variations caused and interacted with scale effects associated with capture width ratio and loads, which showed moderate-significant differences across scales (10–30%+). Larger models tended to show relatively higher power performance and loads.

### **[Marine Renewables Canada 2021 Annual Report](#) – Marine Renewables Canada**

Marine Renewable Canada is the national association for tidal, offshore wind, wave, and river current energy, representing technology and project developers, utilities, researchers, communities, and suppliers. Marine renewable energy projects and R&D are progressing in Canada, with several tidal energy developers approaching deployments as a next step in 2022, new partnerships to accelerate integration in remote communities, and a growing focus on how to support offshore wind development. This 2021 Annual Report covers project and technology development; research, innovation, and demonstration; and policy, legislation, and enabling activities in Canada. It also provides an overview of Marine Renewables Canada's work to advance the sector.

### **[Upscaling scenarios for ocean thermal energy conversion with technological learning in Indonesia and their global relevance](#) – Langer et al. 2022**

Ocean Thermal Energy Conversion (OTEC) is a promising renewable energy technology that is the most economical at large scale. But contemporary literature does not address how OTEC could reach such scale with current technology, and what the techno-economic impact of location-dependent factors and technological learning are. This paper tackles these issues by simulating OTEC's upscaling with a model that implements OTEC to meet local electricity demand and extrapolates to the global relevance of OTEC. The model uses a learning rate for investment costs and cost of finance. This study shows that up to 45 GW of OTEC capacity can be installed in Indonesia with national demand coverage of 22% in 2050. This paper provides reasons to fight for the attention of global decision makers and future research could focus on refining the concepts of this study.

### **[Wave energy extraction from a floating flexible circular plate](#) – Michele et al. 2022**

We present a theoretical model to investigate the hydrodynamics of a floating flexible circular wave energy converter (WEC). Decomposition in rigid and bending elastic modes of the plate allows us to investigate power extraction efficiency in monochromatic

incident waves. We show that plate elasticity increases the number of eigenfrequencies, which has a positive beneficial effect on power output. We also show how plate radius and power take-off (PTO) distribution affect the response of the system and the consequent absorbed energy. This work highlights the need to extend theoretical studies and experimental investigations on flexible devices, currently seen as the future of WEC technology.

### **Tidal stream energy potential in the Shannon Estuary – Fouz et al. 2022**

The tidal and river in-stream energy resource in the Shannon Estuary (W Ireland) is investigated using of high-resolution numerical modelling and spatial analysis. Although freshwater discharges are large, their influence on the available resource is found to be all but negligible, the tide being the main driver of estuarine circulation. The Tidal Stream Exploitability (TSE) index is adapted to the analysis of estuaries with non-depth-limited areas (TSE<sub>ndt</sub>), such as the Shannon Estuary, and then used to select the hotspots with potential for a tidal stream farm. For this purpose, a new depth penalty-limiting function is defined to avoid overestimating the available energy potential in areas with depths greater than those required for tidal energy converter operation. Seven hotspots are identified based on the revised index.

### **Membrane-based indirect power generation technologies for harvesting salinity gradient energy - A review – Jiao et al. 2022**

The giant and sustainable salinity gradient energy broadly occurs when mixing solution sources with different concentrations can be potentially harvested through the intensively studied membrane-based indirect power generation technologies. This kind of technology commonly has two functional submodules, namely the osmosis submodule to induce driven forces and the electric submodule to produce electricity. However, almost all relevant reviews only concentrate on the traditional pressure retarded osmosis technology without involving newly emerged ones such as the forward osmosis-electrokinetic technology, leading to outdated and incomplete knowledge in this field. This study is going to provide a comprehensive and up-to-date review of the membrane-based indirect power generation technologies through adequately outlining most related research.

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## **News & Press Releases**

### **ORPC Partnering with Matanuska-Susitna Borough to Trial RivGen® Power System in Upper Cook Inlet – Ocean Renewable Power Company (ORPC)**

ORPC, Inc., and the Matanuska-Susitna Borough recently announced a partnership to test ORPC's RivGen Power System at the Upper Cook Inlet industrial and commercial port facility of Port MacKenzie. The RivGen System, which harnesses clean, sustainable energy from free-flowing tidal and river currents, will be trialed to power cathodic protection systems which safeguard the Port's underwater assets. If the testing goes well, Port MacKenzie will be the first port in the United States to harness tidal energy for local

operations and economic development opportunities. ORPC will carry out environmental reviews and analyses of Cook Inlet beluga whales as the company initiates the Port MacKenzie project as well as its tidal energy project at East Foreland, Cook Inlet, under a Federal Energy Regulatory Commission preliminary permit.

### **[AWS Waveswing Gets Shakedown at EMEC](#) – European Marine Energy Centre (EMEC)**

Inverness-based AWS Ocean Energy has commenced sea trials at the EMEC as part of its scientific testing programme for its Waveswing wave energy converter. The initial shakedown testing at EMEC's Scapa Flow test site in Orkney involved ten significant lifting, marine or diving operations demonstrating the practical deployment, operation and recovery of the Waveswing device. The device has now been recovered to shore for detailed inspection prior to being re-deployed at EMEC's test site. This important milestone in the development of the 16 kW Archimedes Waveswing follows successful quayside testing and preparation at Copland's Dock in Stromness since its arrival in Orkney in late January.

### **[Canadian-German collaboration delivers stronger tidal turbine blades](#) – Offshore Energy**

Sustainable Marine has recorded a first major milestone in the Canadian-German EvoFoil project after completing extreme load testing on a new tidal turbine blade, designed to withstand some of the most challenging tidal environments in the world. Sustainable Marine's new 4.3-meter blade underwent a comprehensive 'static-bending test campaign' to demonstrate its future durability as it has been specifically designed to withstand conditions in the Bay of Fundy's Minas Passage. Located in Canadian province of Nova Scotia, the site will play host to the company's Pempa'q Project to showcase the world's first floating tidal energy array. The test results on the new blade showed continued evolution with a 7% energy yield increase, compared to previous 4-meter rotors designs.

### **[CorPower Ocean partners with subsea composite specialist Diab](#) – CorPower Ocean**

CorPower Ocean has partnered with subsea composite specialist Diab for the construction of its first commercial scale Wave Energy Converter (WEC). The ocean energy developer is currently fabricating its next generation C4 WEC, with dual build-out operations in Sweden and Portugal. Part of the flagship HiWave-5 Project, the WEC will ultimately join a four-system wave energy array, located off the coast of Aguçadoura in Portugal, forming one of the world's first grid-connected wave farms. Following several months of process characterization on ¼ scale models, CorPower Ocean is now nearing completion of the first commercial scale hull at its Portuguese base in Viana do Castelo. The site is also demonstrating the firm's 'mobile factory' concept designed to enable rapid roll-out of WEC hulls in port facilities near wave energy sites across the globe.

### **[Researchers revamp MHKiT software for marine energy industry](#) – Offshore Energy**

The Marine and Hydrokinetic Toolkit (MHKiT) has been updated to include data on tidal and river energy resources and various other factors to enable developers make greater

use of this open-source knowledge hub. The MHKiT is a massive, searchable, open-source knowledge hub that provides developers with the code needed to analyze how well their technology might perform in various ocean and river sites. The updated toolkit now includes data on tidal and river energy resources, factors like turbulence and sediment that affect how technology functions underwater, analysis of extreme waves, and more. Created in 2019 with funding from the US Department of Energy's Water Power Technologies Office, the software is available in both Python and MATLAB, with more robust versions now released for each platform.

### **[SIMEC Atlantis Energy secures funding from Scottish Enterprise](#) – Ocean Energy Europe**

SIMEC Atlantis Energy (SAE) is delighted to announce that MeyGen has secured a non-convertible loan of €3m from Scottish Enterprise, which will enable the redeployment of the remaining two turbines at the MeyGen site within the next 12 months. This follows the successful deployment in March 2022 of the AR1500, 1.5MW tidal turbine. The first of these turbines is scheduled for redeployment in May 2022 and the final turbine will be deployed in March 2023, complete with a retrofitted wet mate connection system, which more than halves the costs of future turbine recoveries and deployments. Demonstrating the viability of the tidal turbines is vital to the success of MeyGen, the largest planned tidal stream project in the world.