

TETHYS ENGINEERING BLAST



11 February 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 to contribute!

[Announcements](#)
[Upcoming Events](#)

[New Documents](#)
[News & Press Releases](#)

Announcements

Request for Information

The U.S. Department of Energy (DOE), in partnership with IDOM and Florida Atlantic University's Southeast National Marine Renewable Energy Center, is [soliciting feedback](#) from current energy converter technology developers and other stakeholders on design requirements and scope for a Mobile Test Vessel. Please email responses to [IDOM](#) by 18 February 2022.

NetBuoy Survey

Tension Technology International recently launched a survey to gauge potential interest from wave energy developers in the [NetBuoy](#), and to receive feedback on the [NetBuoy Design Tool](#). The NetBuoy was developed under Wave Energy Scotland's procurement "Structural Materials and Manufacturing Processes" programme. Please complete the survey by 18 February 2022.

Call for EMEC Earthshot Nominations

The European Marine Energy Centre (EMEC) is [seeking nominations](#) for [The Earthshot Prize](#), which aims to find new solutions to the world's biggest environmental problems. If you have a solution that is inspiring, inclusive, and impactful in one of the five Earthshot categories, please submit a nomination form to EMEC by 12:00pm UTC on 21 February 2022.

Biofouling Survey

As part of the GloFouling Partnerships Project, the World Ocean Council is conducting a [survey](#) to identify challenges, priorities, trends, and management practices related to biofouling and invasive species in various ocean industries, including offshore renewable energy. The deadline to submit responses is 28 February 2022.

OES-BECS Call for Proposals

The [International Network on Offshore Renewable Energy](#) recently announced the [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 for the Future

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 [9th Partnership for Research in Marine Renewable Energy \(PRIMaRE\) Conference](#) is open through 14 February 2022. The conference will take place in Cornwall, UK on 6-7 July 2022.

The [Call for Abstracts](#) for the International Conference on Ocean Energy (ICOE) and Ocean Energy Europe (OEE)'s annual event is now open until 31 March 2022. The Basque Energy Cluster and OEE will host [ICOE-OEE 2022](#) on 18-20 October 2022 in San Sebastián, Spain.

Funding & Testing Opportunities

The US DOE recently launched the [Inclusive Energy Innovation Prize](#), which will provide cash prizes of up to \$250,000 to groups and organizations that support entrepreneurship and innovation in communities historically underserved in climate and energy technology funding. Phase One submissions are due by 5:00pm EST (10:00pm UTC) on 25 February 2022.

The [US Testing Expertise and Access for Marine Energy Research](#) (TEAMER) program, sponsored by DOE and directed by Pacific Ocean Energy Trust, is offering [open water support for marine energy testing](#). Open Water Support applications may be submitted at any time, while applications for its [6th Request for Technical Support](#) will be due 17 March 2022.

The Oceanic Platform of the Canary Islands (PLOCAN) recently announced the launch of its [Winter Access Call](#) for the use of its facilities and services by public research groups and by the private sector, both national and international communities. Applications are due 20 March 2022.

Student & Employment Opportunities

WavEC Offshore Renewables is recruiting an [Environmental Engineer](#) with experience in Life Cycle Assessment to conduct tasks related with data collection and analysis on the reduction of environmental impacts in the marine environment. Applications are due 13 February 2022.

The University of Plymouth is seeking an [Offshore Renewable Energy Supergen Hub Research Fellow](#) to identify design load cases and demonstrate the impact of a probabilistic design approach in floating offshore renewable energy systems. Applications are due 17 February 2022.

Bombora Wave Power is seeking a [Marine Operations Manager](#), a [Structural Engineer](#), a [Senior Electrical Engineer](#), and a [Membrane Engineer](#). Applications are due 18 February 2022.

The University of Queensland is advertising a [PhD scholarship](#) to study the mechanics of the M4 wave energy converter using experimental and numerical modelling, with a focus on identifying optimization options for offshore aquaculture applications. Applications are due 1 March 2022.

The Environmental Research Institute, part of North Highland College, is recruiting an [Energy Research Associate](#) to join its multidisciplinary group working at the forefront of the energy transition across Scotland and internationally. Applications are due 2 March 2022.

Aarhus University is inviting applicants for a [PhD scholarship](#) in connection with the research project *Physical Principles and Commercial Aspects of the Crestwing Wave Energy system* at the PhD Programme Business Development and Technology. Applications are due 4 March 2022.

Oscilla Power, Inc. is currently recruiting a [Senior Engineering Manager and an Electrical Engineer](#) to join its team working on the commercialization of marine renewable energy.

Upcoming Events

Upcoming Workshops

The [12th Hawai'i Okinawa Clean Energy Workshop](#) will take place online on 15-24 February 2022. This year features four primary themes including, "Renewable Ocean Energy Utilization." Presentations will be available on-demand, and a real-time panel discussion will take place on 24 February 2022 at 3:00pm HST (1:00am UTC). Register for free [here](#).

OES-Environmental is hosting a two-part Innovation Session on the future of wave energy in Hawaii as part of the [2022 Ocean Sciences Meeting](#) (OSM) from 11:30am-1:30pm PST (7:30-9:30pm UTC) on 1-2 March 2022. The interactive event will use online breakout sessions, engaging marine scientists to brainstorm what it would take to extract power sustainably and efficiently from waves in Hawaii. Register [here](#).

The Ocean Power Innovation Network is hosting an online [masterclass](#) on dynamic cables on 15-16 March 2022. The training will provide developers, operators, and technology providers with a background knowledge in dynamic cables for offshore renewables. Register for free [here](#).

Upcoming Webinars

The Dutch Marine Energy Centre and Hatch are hosting a webinar, “[Powering Sustainable Aquaculture with Marine Energy](#)”, from 2:00-3:30pm UTC on 15 February 2022. During the event, marine energy developers will pitch their solutions and companies from the aquaculture sector will join the discussion and draw a plan forward. Register [here](#).

Pacific Northwest National Laboratory’s [Triton Initiative](#) is hosting the first in its series of Triton Talks, a webinar series that features a behind-the-scenes look at its US environmental monitoring field trials campaigns, at 11:00am PST (7:00pm UTC) on 17 February 2022. Register [here](#).

The International Integrated Wave Energy Research group is hosting its fifth webinar, “Climate Change Impacts on Wave Power Potential”, from 2:00-3:00pm UTC on 25 February 2022. Register [here](#) by 23 February 2022.

The US DOE’s Water Power Technologies Office (WPTO) is hosting its WPTO Semiannual Stakeholder Webinar from 1:00-2:00pm EST (6:00-7:00pm UTC) on 10 March 2022. During the webinar, WPTO leadership will review accomplishments, preview what’s yet to come, and discuss investments that will come from the Bipartisan Infrastructure Law. Register [here](#).

Upcoming Networking Event

The Selkie Project is hosting a free [Supply Chain Networking Event](#) from 9:00am-1:15pm UTC on 24 February 2022 in Pembrokeshire, Wales to showcase the open-source tools being developed, encourage use of the tools, gather data, and engage the supply chain. Register [here](#).

Upcoming Conferences

The [International Network on Offshore Renewable Energy](#) is hosting its 2021-2022 Annual General Meeting from 3:00-4:00pm UTC on 24 February 2022 online. Register [here](#).

EuropeWave is hosting its [1st Annual Conference & Brokerage Networking Event](#) from 22 February to 2 March 2022. The online event will present the Phase I projects and discuss how to accelerate the commercialization of wave energy technologies. Register for free [here](#).

The Global Underwater Hub is hosting the [2022 Subsea Expo](#) on 22-24 February 2022 in Aberdeen, Scotland. The exhibition and conference are free to attend. Register [here](#).

The National Hydropower Association is hosting [Waterpower Week 2022](#) on 5-7 April 2022 in Washington, DC, US. Early bird registration has been extended through 18 February 2022.

New Documents on *Tethys Engineering*

[Modelling dynamic loadings of a tidal stream turbine in combined wave-current-turbulence environment](#) – Li et al. 2022

The understanding of hydrodynamic loadings on a Tidal Stream Turbine (TST) is important to its design, deployment and operation. An assessment involving combined wave-current-turbulence effects is essential for the prediction of the loadings and turbine performance. TSTs are often located in regions of localized high current, so the incident waves will be modified as they travel onto that higher current. This paper proposes a methodology which is capable of generating the combined wave-current effects with the integration of a model of the incident turbulence. The algorithm and methodology presented in this paper are implemented in the OpenFAST software. The modified numerical model has been validated by comparing its outputs to the scale model tests conducted in Edinburgh University's FloWave wave-current facility.

[Wave-to-grid \(W2G\) control of a wave energy converter](#) – Said et al. 2022

Grid integration of wave energy involves various power train stages from device to grid, such as a power take-off stage, a power conversion stage, and a power conditioning stage. The coupled performance of the complete wave-to-grid system depends heavily on the dynamics of each stage and their respective controllers. However, the control objectives of various stages may not align with each other and pose a potential problem, in terms of economic performance and grid integration. This study presents a complete wave-to-grid control approach for a wave energy converter, ensuring that the system performs optimally under variable wave resource conditions. The proposed system comprises a point absorber wave energy converter oscillating in heave, a linear permanent magnet generator, and back-to-back power converters for connection to the grid.

[Is bigger always better? Designing economically feasible ocean thermal energy conversion systems using spatiotemporal resource data](#) – Langer et al. 2022

Ocean Thermal Energy Conversion (OTEC) produces electricity using the temperature difference between warm surface and cold deep-sea water. OTEC systems in literature only limitedly consider seasonal seawater temperature variations and thus might not be adequately sized for off-design conditions. This potentially leads to techno-economically sub-optimal design choices. This paper sheds light on which design approach yields the most economically feasible OTEC system considering off-design conditions with 19 years of seawater temperature data in 3-h time steps. We find that systems sized for worst-case thermal resources yield the highest and steadiest electricity production. If seawater temperature variations are moderate, these systems also perform best economically in terms of Levelized Cost of Electricity (LCOE).

[Analysis of Stand-Alone Photovoltaic—Marine Current Hybrid System and the Influence on Daily and Seasonal Energy Storage](#) – Olmedo-González et al. 2022

In this work, we present a case study of a stand-alone, conventional household powered by photovoltaic and marine current energy systems in Cozumel, Mexico. The analysis of different hybridization degrees serves as a guidance tool to decide whether hybrid systems are required for a specific situation; in contrast to previous approaches, where ideal consumption and generation profiles have been utilized, yearlong profiles were utilized here. The renewable potential data were obtained on site at an hourly resolution; requirements such as size of and cycles in the daily and seasonal energy storage were analyzed according to the degree of participation or hybridization of the proposed renewable systems through an algorithm that evaluates power generation and daily consumption throughout the year.

Experimental investigation into laboratory effects of an OWC wave energy converter – Orphin et al. 2022

Reproducibility advances science and de-risks engineering. In ocean wave energy, developing wave energy converters (WECs) requires model test experiments, but there is limited knowledge on the consistency of results if an experiment is reproduced in multiple wave basin laboratories. To better understand reproducibility in WEC experiments, in particular laboratory effects, we reproduced a 1:30 scale model experiment of a case study WEC in two laboratories. This paper compares results between laboratories and evaluates whether, or the degree to which, each experimental parameter contributed to laboratory effects. Performance assessment tests were conducted in intermediate-shallow water regular waves of a bottom-fixed oscillating-water-column (OWC) WEC with a nonlinear, unidirectional flow power take-off (PTO).

Porous $Ti_3C_2T_x$ MXene Membranes for Highly Efficient Salinity Gradient Energy Harvesting – Hong et al. 2022

Extracting osmotic energy through nanoporous membranes is an efficient way to harvest renewable and sustainable energy using the salinity gradient between seawater and river water. Despite recent advances of nanopore-based membranes, which have revitalized the prospect of blue energy, their energy conversion is hampered by nanomembrane issues such as high internal resistance or low selectivity. Herein, we report a lamellar-structured membrane made of nanoporous $Ti_3C_2T_x$ MXene sheets, exhibiting simultaneous enhancement in permeability and ion selectivity beyond their inherent trade-off. The perforated nanopores formed by facile H_2SO_4 oxidation of the sheets act as a network of cation channels that interconnects interplanar nanocapillaries throughout the lamellar membrane.

News & Press Releases

HydroWing to demonstrate next generation Tocardo Turbines at Morlais – Tocardo

HydroWing Ltd have been awarded a berth with 30 MW potential at Morlais a tidal site located in Angelsey, Wales, and operated by Menter Môn. The company plans a phased

approach starting with a commercial demonstrator project in 2023 which will be operated by HydroWing's newly established Welsh entity: HydroWing Tidal Projects Ltd. The initial project looks to cement the technology at the site, grow the Welsh team, and develop the essential strong local supply chains and stakeholder relations to subsequently enable roll out toward the full 30 MW. This project will demonstrate the next generation Tocardo T-2si Turbines configured into the HydroWing Structure. The new turbines will feature enhanced blade performance and control innovation to provide low cost, clean, predictable and reliable electricity to the local grid.

Ingine eyes global expansion through international projects in 2022 – Offshore Energy

South Korean wave energy developer Ingine is preparing for its tenth anniversary with intentions for further global expansion and new projects to accelerate commercialization as part of the growth plans for 2022. As the company is approaching a landmark fifth year of wave energy operation in North-East Asia, Ingine revealed that further projects will see expansion across four continents. The projects include a Vietnamese and Korean initiative in Quang Ngai province and the development of a 10MW wave energy project for diesel replacement in Indonesia. In addition, Ingine will launch in North America in 2022, after inking a deal with the Mowachaht Muchalaht First Nation to begin design work for an onshore wave energy system in Yuquot, British Columbia, Canada. Meanwhile, collaborative plans are underway in France, Morocco, Taiwan, and Japan.

ORPC team to test hydro-kinetic device in Maine – Ocean Renewable Power Company (ORPC)

US company ORPC is partnering with non-profit organisation Our Katahdin to create a testing centre at One North, the former Great Northern Paper Mill site, to support the next-generation design and development of the former's river hydro-kinetic power system. ORPC will assemble, test, and showcase at Millinocket in the US state of Maine a smaller version of its commercialised RivGen device called Modular RivGen. Modular RivGen is designed for use in grid-connected markets, with applications for large rivers, electrical vehicle charging networks, hydroelectric facilities, irrigation canals and bridges, piers, breakwaters, and flood controls systems. It will begin product testing later this year in Millinocket Stream adjacent to the former mill property.

Sabella designs new hybrid gravity-based foundation for tidal turbines – Offshore Energy

French tidal energy company Sabella has finalized the design of the new gravity-based foundation for tidal turbines which combines concrete and steel for greater cost-competitiveness. The new concrete and steel foundation has been designed as part of OCEAN-ERA Net Co-Fund project CF2T (Competitive Foundation for Tidal Turbine), which in addition to Sabella brings together Saitec, Allia, Reseach Institute of Sweden and Alkit. The objective of the project was to design and develop a competitive foundation for a tidal turbine by combining concrete and steel in order to reduce manufacturing costs and increase the life of the supporting structure. The work carried out also made it possible to make the foundation modular, allowing it to be installed in

several packages in order to limit the lifting capacity required for the installation vessel and reduce costs.

C-Power Announces Series B-2 Round to Accelerate Market Entry of Ocean Energy Technologies – C-Power

C-Power recently announced the first closing of a Series B-2 round of investor funding that will enable the company to advance its strategy to commercialize kilowatt-scale ocean energy and data solutions and develop larger megawatt-scale products. “Our strategy has always involved two phases. First, use our groundbreaking SeaRAY ocean energy technology to provide solutions for offshore applications requiring power generation and data communications. Second, grow our StingRAY technology to megawatt-scale to deliver a near-baseload source of zero-carbon, renewable energy for a range of applications from remote minigrids to utility-scale electricity generation,” said C-Power CEO Reenst Lesemann. The Series B-2 capital will fund the company’s plans to develop and demonstrate its larger-scale systems on an advanced timeline, with plans to bring the StingRAY to market by 2024.