

TETHYS ENGINEERING BLAST



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[Tethys Engineering](#) is an online knowledge base 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. If you have specific content you would like circulated to the greater marine energy community, please send it to tethys@pnnl.gov for consideration.

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Announcements

ETIPP Seeks Regional Partner

The US Department of Energy's (DOE's) [Energy Transitions Initiative Partnership Project](#) (ETIPP) is seeking a regional partner in the Pacific Northwest to engage and support remote and island communities as they plan for energy resilient solutions. With support from the Water Power Technologies Office and others, ETIPP expands on the work of the US DOE's Energy Transitions Initiative. [Regional partner proposals](#) are due August 31.

Marine Energy Survey

Mindseed and OceanEnergy are conducting a [survey](#) in association with the European Space Agency and the Dutch Marine Energy Centre to investigate the potential use of remote sensing space data for marine energy project development. Complete the survey by 1 September 2021 for the chance to win a €100 Amazon voucher.

Calls for Abstracts

The Call for Abstracts for [Oceanology International](#), which includes a conference track on offshore energy development, is now open. The conference and exhibition will take place in London, UK on 15-17 March 2022. Abstracts are due by 31 August 2021.

The abstract deadline for the [Ocean Sciences Meeting \(OSM 2022\)](#) has been extended to 29 September 2021. Please consider submitting an abstract to Scientific Session OT15: Measuring, Modeling, and Mitigating Environmental Effects of Ocean Renewable Energy. OSM 2022 will take place online and in Honolulu, US from 27 February to 4 March 2022.

Funding & Testing Opportunities

The US DOE recently announced a plan to provide \$37 million for small businesses pursuing climate and energy R&D projects through its Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs. Letters of intent for the [SBIR/STTR Phase 1 Release 1 Funding Opportunity Announcement](#) (FOA) are due by 5:00pm EDT (9:00pm UTC) on 30 August 2021. This is the first of four SBIR/STTR FOAs for 2022, so stay tuned for additional opportunities.

The European Commission's Horizon Europe Framework Programme launched a [Call for Partnership on Innovative SMEs](#) (small and medium-sized enterprises) to improve knowledge transfer through increased collaboration, improve access to financing and value chains, and spur more innovative solutions. Applications are due 1 September 2021.

Interreg North-West Europe launched the [4th Ocean DEMO](#) (Demonstration Programme for Ocean Energy Pilot Farms and Supporting Technologies) [Call for Applications](#). Successful applicants will receive free access to test their ocean energy products in real sea environments at the project's network of test centers. Applications are due 10 September 2021.

The Blue Climate Initiative is welcoming applications from innovators and entrepreneurs for the [Ocean Innovation Prize](#), which is designed to inspire, fund and support innovations that mitigate climate change through ocean-related strategies. Applications are due 15 September 2021.

The US Testing Expertise and Access for Marine Energy Research (TEAMER) program is now accepting applications for its 4th Request for Technical Support (RFTS) through 16 September 2021. Applications will now be reviewed on a quarterly basis and those submitted after the due date will be considered for the next RFTS. Check out the [TEAMER website](#) for more details.

The Oceanic Platform of the Canary Islands (PLOCAN) has opened its [Summer Access Call for 2021](#). Applicants interested in accessing PLOCAN facilities and services are encouraged to contact PLOCAN before submitting their proposal. Applications are due 20 September 2021.

The Horizon Europe Framework Programme has launched the [European Innovation Council \(EIC\) Accelerator Challenges](#) to support small and medium enterprises developing game-changing innovations, including renewable energy. Applications are due by 6 October 2021.

Student & Employment Opportunities

The Delft University of Technology is seeking candidates for a [PhD in Variable Wave Energy Converter Farms](#). This position will investigate wave structure interactions in large scale wave

energy converter farms with different geometries, leading to the design of tools and methodologies. Applications are due 1 September 2021.

MaREI, the Science Foundation Ireland Research Centre for Energy, Climate and Marine, is seeking a [Post-Doctoral Researcher](#) to join a team of researchers on the [PORTOS Project](#), which aims to promote the use of renewables in Atlantic ports. Applications are due 3 September 2021.

The Environmental Research Institute at the University of the Highlands and Islands is recruiting for a [Research Fellow - Offshore Renewable Energy and the Environment](#) to work with Ørsted to design novel environmental and ecological monitoring techniques and next-generation measurement platforms. Applications are due 20 September 2021.

The European Marine Energy Centre (EMEC) is looking for a [Commercial Officer](#) to develop opportunities for EMEC to grow its marine energy portfolio, as well as a [Technical Manager](#) to manage its team of specialists. Applications are due 3 and 15 September 2021, respectively.

Upcoming Events

Upcoming Course

The RENOVABLES project, which aims to support the marine sector in the Euroregion, is hosting an online course on artificial intelligence for marine renewables and use cases in marine energy generation using deep learning on 22 September 2021. Learn more [here](#).

Upcoming Workshop

The European Technology and Innovation Platform for Ocean Energy (ETIP Ocean) and the Next Evolution in Materials and Models for Ocean Energy (NEMMO) project are hosting a workshop titled, “[Innovative materials for ocean energy: Latest advances from ETIP Ocean & NEMMO](#)”, from 5:00-6:30pm BST (4:00-5:30pm UTC) on 8 September 2021.

Upcoming Webinars

OES-Environmental is hosting a public webinar, “[Guidance Documents for Risk Retirement](#)”, from 8:00-9:00am PDT (3:00-4:00pm UTC) on 31 August 2021. This webinar will provide an overview of the [risk retirement](#) process, including [data transferability](#), and an update on the new [guidance documents](#), which aim to bridge between scientific evidence and application for consenting/permitting processes. Register [here](#).

The Selkie project, which aims to support the marine energy sector in Wales and Ireland, is hosting a webinar, “Manufacturing for the Marine Environment”, at 9:00am UTC on 2 September 2021, as part of its [Meet the Expert event series](#). During the webinar, Safinah Group will discuss their experience in creating functional specifications to optimize performance, reduce maintenance and costs, and prolong the lifetime of assets. Register [here](#).

The US DOE Water Power Technologies Office (WPTO) is hosting a webinar titled, “WPTO in Alaska”, from 5:00-6:00pm ET (9:00-10:00pm UTC) on 15 September 2021, as part of its [R&D Deep Dive Webinar Series](#). During the webinar, WPTO representatives will share the work they are doing and offer insights into what could be next for water power in Alaska. Register [here](#).

Upcoming Conferences

The Supergen Hubs are convening online at the [Supergen Net Zero Conference](#) on 1-3 September 2021 to explore the role of energy research in the pathway to net zero. Register [here](#).

The University of Plymouth is hosting the [14th European Wave and Tidal Energy Conference](#) on 5-9 September 2021 online and in Plymouth, UK. Register [here](#).

New Documents on *Tethys Engineering*

[Satellite data for the offshore renewable energy sector: Synergies and innovation opportunities](#) – Medina-Lopez et al. 2021

Can satellite data be used to address challenges currently faced by the Offshore Renewable Energy (ORE) sector? What benefit can satellite observations bring to resource assessment and maintenance of ORE farms? Can satellite observations be used to assess the environmental impact of offshore renewables leading towards a more sustainable ORE sector? This review paper faces these questions presenting a holistic view of the current interactions between satellite and ORE sectors, and future needs to make this partnership grow. We present offshore needs and satellite technology limitations, as well as potential opportunities and areas of growth. To better understand this, the reader is guided through the history, current developments, challenges and future of offshore wind, tidal and wave energy technologies.

[Study of a novel rotational speed amplified dual turbine wheel wave energy converter](#) – Xiao et al. 2021

In this study, a novel wave energy converter is proposed, which features a dual turbine wheel to provide an amplified rotational speed to the generator. The design novelty of the system is that the counter-rotational turbine wheels are connected to the generator stator and rotor respectively through a belt-drive transmission system for amplification of the rotational speed of the generator. This arrangement enables the power take-off system to be placed inside the buoy which is above the waterline. Furthermore, the belt-drive transmission system can effectively absorb the load fluctuations or vibrations caused by sea waves. A lumped parameter analytical model of the system has been developed where the Lagrange principle is applied to analyze the motion of the system and the computational fluid dynamics simulation is employed to determine the drag coefficients of the system.

Research on Optimization and Verification of the Number of Stator Blades of kW Ammonia Working Medium Radial Flow Turbine in Ocean Thermal Energy Conversion – Chen et al. 2021

Ocean Thermal Energy Conversion (OTEC) is one of the emerging industries of ocean energy and an important link in carbon neutrality. Turbine is a key component of ocean thermal energy conversion, which has an important impact on the performance and energy conversion efficiency of the system. This paper fully considers the application characteristics of ocean thermal energy conversion and the state conversion characteristics of ammonia working fluid. Taking the 100 kW radial inflow turbine in the OTEC application system as an example, based on the design, the turbine is optimized for the key parameters of the turbine stator and the influence of different geometric parameters is analyzed. Subsequently, the optimization results are verified by CFD numerical simulation analysis under different conditions.

Techno-economic analysis of a micro-hydropower plant consists of hydrokinetic turbines arranged in different array formations for rural power supply – Nag & Sarkar 2021

This paper deals with the performance and techno-economic analysis of micro-hydropower plant consists of array of Helical Savonius hydrokinetic turbines (HSHKT). In this study, an optimal inter-turbine distance (L) and two specific HSHKT array formations, i.e., triangular and staggered are considered on a 69 m river stretch corresponding to a study area of 2.36 km². River free stream velocity ranges between 0.88 and 1.88 m/s. Sensitivity analyses were carried out in HOMER software based on the free stream velocity and electric load to investigate the feasibility of the standalone hydrokinetic turbine renewable energy systems (RES) suitable for the rural community. Further, optimization analyses were performed considering minimum total net present cost (TNPC) and cost of energy (COE).

A self-floating oscillating surge wave energy converter – Li et al. 2021

This paper proposes a new conceptual configuration for oscillating surge wave energy converters. The concept is a self-floating device consisting of two vertical flaps with a common hinge and an averaged density equal to that of water. The two flaps will oscillate in opposite directions when driven by incident waves. Kinetic energy will be extracted from the relative speed between the two flaps by a power take-off embedded at the hinge. Numerical studies reveal that the self-floating device has a smaller resonant period and optimal power take-off damping compared with a bottom-hinged floating device of the same overall dimensions. As long as the power take-off damping is appropriately tuned, the opposite-rotation mechanism is valid in both regular and irregular waves, and no matter whether the hinge is fixed or connected with mooring lines.

Enhanced energy recovery using a cascaded reverse electrodialysis stack for salinity gradient power generation – Nam et al. 2021

Despite significant advances in the field applications of reserve electro dialysis (RED) to produce salinity gradient power, net energy production remains an issue owing to limitations such as high energy requirement for high flow rates of feed solutions, and severe fouling and pressure build up when thin spacers are used. Therefore, to maximize the performance and efficiency of energy harvesting in the RED, a cascaded RED stack, with multiple stages between the anode and cathode electrodes, was investigated. In cascaded stacks, 100-cell paired stacks were divided into several stages, so the feed water flowed into the first stage, and the effluent from the first stage was then reused in the next stages. This cascaded stack could overcome the typical drawbacks of RED (large amount of feed water required, intensive pumping energy, and low net energy production).

News & Press Releases

[What does it take to build the world's largest wave energy test-rig?](#) – CorPower Ocean

While bringing its groundbreaking Wave Energy Converter (WEC) technology into commercial scale systems over the last three years, CorPower has also developed an on-land test-rig capable of accurately simulating wave loading from any ocean site around the world. To accurately simulate the conditions of the ocean, a test rig system must be capable of producing powerful motion, while controlling total inertia equating to 250 tonnes. This is the equivalent of swinging 8 trucks back and forth, with speeds up to 4 m/s and high acceleration while requiring sub-millimeter precision. Not only does the system need to handle extreme loads and power flow, it must also deliver the highest levels of safety ensuring fault-proof stopping of the rig, should something go wrong – simply a tremendous engineering challenge.

[Launch of New Wave Energy Converter in King George Sound, Albany Project](#) – Blue Economy Cooperative Research Centre (Blue Economy CRC)

The Blue Economy CRC is pleased to announce the launch of its latest project Seeding Marine Innovation with the M4 Wave Energy Demonstrator in Albany. The University of Western Australia's (UWA's) Wave Energy Research Centre, with headquarters in Albany, is leading the \$4.8 million marine innovation project on the Great Southern coast. The project – nicknamed M4 and aimed at demonstrating the region's wave energy potential to power the local aquaculture industry – is jointly supported by the Western Australian Government and the Blue Economy CRC. The UWA project will include a feasibility study with the industry-led Australian Ocean Energy Group to develop the world's first Ocean Wave Energy Market Demonstration Site – or 'Marketplace' – in Albany that links customers with a suitable renewable energy microgrid solution.

[Welsh marine energy test centre secures Crown Estate lease for open water sites](#) – Offshore Energy

Marine Energy Test Area (META), Wales' national test centre, has officially signed a lease with The Crown Estate, launching the opening of its open water test sites. After

initially securing seabed rights with The Crown Estate back in 2020, the signing of a full lease now enables wave and tidal energy testing to take place in more energetic sites on Pembrokeshire's south coast. META has now secured all licenses and consents to be a fully operational test centre, and forms one key stepping stone in the Welsh test centre network, the centre informed. The test sites, offering moderate to high energy areas for operational 'real-sea' testing, include Warrior Way tidal site; Dale Roads wave test site; and East Pickard Bay wave and floating offshore wind component test site.

Sustainable Marine's Tidal Turbine Drivetrain Completes Rigorous Tests at World-Renowned RWTH Aachen University – Sustainable Marine

SCHOTTEL Hydro, Sustainable Marine's German engineering partner, has collaborated with the world-renowned Center of Wind Power Drives at RWTH Aachen University to test its latest generation SIT250 drivetrain. The key component, manufactured by propulsion expert SCHOTTEL, forms the 'powerhouse' of Sustainable Marine's pioneering floating tidal turbine, converting torque - or rotation of the blades - into electricity. The 'accelerated lifetime testing' was successfully completed in a 6-month period, replicating five years of operation in the Minas Passage, Bay of Fundy, Nova Scotia, Canada – home to the highest tides on earth. The site will play host to Sustainable Marine's Pempa'q Project involving the world's first floating tidal energy array, delivering up to 9MW of energy to Nova Scotia's grid, powering ~ 3,000 homes per year.

Wave-Powered SeaRAY Preps for Hawaii Trial: SeaRAY's Clean Energy and Real-Time Data Could Soon Power Offshore Industries – National Renewable Energy Laboratory (NREL)

Offshore industries, like marine research, fish farming, and mineral mining, often rely on big ships with large crews. Without clean energy to power these vessels, each trip out to sea and back to shore is not only expensive but also carbon intensive. You cannot charge that ship by plugging it into the ocean. Or maybe you can. An autonomous, wave-powered, renewable energy device—called the SeaRAY autonomous offshore power system (AOPS)—could power offshore work and help protect our oceans and climate, too. To prove the SeaRAY AOPS can help power this so-called blue economy, C-Power partnered with NREL and the U.S. Department of Energy Water Power Technologies Office to prep the device for its first open ocean trial.

Kyocera and Nagasaki University Develop "Energy Harvesting Smart Buoy" to Collect Ocean Data – Kyocera Corporation

Nagasaki University and Kyocera Corporation announced their joint development of an Energy Harvesting Smart Buoy, which combines Nagasaki University's tidal current power generation technology with Kyocera's IoT technology to collect reliable ocean data. Prototype buoys can collect a wide range of data on the marine environment using self-generated energy. Each prototype is equipped with two different tidal-current power generation systems. A pilot program gathered information from 21 sensors, monitoring everything from water temperature and humidity to current direction. Future development

may include sensors for temperature-related salinity variation, chlorophyll turbidity, and temperature-related variations in dissolved oxygen concentrations, to name a few.