

TETHYS ENGINEERING BLAST



12 August 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!

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Announcements

Tethys Engineering Photo Library

The [Tethys Engineering Photo Library](#) now contains over 600 photos and illustrations of marine energy devices, arrays, and facilities that are available for free, third-party use with developer attribution! If you have any high-resolution photos to contribute, please [contact us](#).

PNNL RFI

Pacific Northwest National Laboratory (PNNL) is requesting information from developers, owners, and/or manufacturers of tidal or river current energy turbines (CETs) capable of deployment and operation in the tidal channel adjacent to PNNL-Sequim's Marine and Coastal Research Laboratory. The information gained from this [Request for Information](#) (RFI) may inform the specification and eventual procurement of a CET. Responses are due 26 August 2022.

IMPACT Survey

The European Union's Horizon 2020 [IMPACT](#) project, a collaborative project aiming to develop a new dual hardware-in-the-loop testing platform to support the development of wave energy converters, is conducting a [market consultation survey](#) to learn which tests users are most interested in performing with the platform.

Calls for Abstracts

The Marine Alliance for Science and Technology for Scotland (MASTS) has opened the Call for Abstracts for its [12th Annual Science Meeting \(ASM\)](#) through 19 August 2022. MASTS 2022 ASM will take place 8-10 November 2022 in Glasgow, Scotland.

The American Meteorological Society (AMS) has opened the [Call for Abstracts](#) for the [103rd AMS Annual Meeting](#). Submission deadlines vary for the conferences and symposia, but most abstracts are due 24 August 2022. The event will place 8-12 January 2023 in Denver, U.S.

Energy Technology Partnership (ETP), an alliance of 14 Scottish universities, has opened the [Call for Abstracts](#) for the ETP Annual Conference 2022 through 16 September 2022. The ETP Conference will take place on 1 November 2022 in Edinburgh, Scotland.

The [Call for Abstracts](#) for the [33rd International Ocean and Polar Engineering Conference \(ISOPE\)](#) is now open through 20 October 2022. Manuscripts will be due for review by 20 January 2023. ISOPE 2023 will take place 19-23 June 2023 in Ottawa, Canada.

Funding & Testing Opportunities

The European Commission has launched the Innovation Fund's second [Call for Small Scale Projects](#) in renewable energy, energy-intensive industries including substitute products, energy storage, and carbon capture, use and storage. Applications are due 31 August 2022.

The U.S. Testing and Expertise for Marine Energy Research (TEAMER) program is now accepting [Request For Technical Support \(RFTS\) 8](#) applications through 14 October 2022. Developers can apply for support in numerical modeling and analysis, bench/lab or tank/flume testing, and open water activities. Visit the [TEAMER website](#) for RFTS updates.

The European Commission has launched the [LIFE Programme 2022 Calls for Project Proposals](#) for nature conservation, environmental protection, climate action, and clean energy transition projects. Application deadlines vary, but most are due between September and November 2022.

The U.S. Department of Energy Office of Energy Efficiency and Renewable Energy, on behalf of the Water Power Technologies Office, recently released a [Notice of Intent](#) to issue a Funding Opportunity Announcement entitled "Marine Energy Systems Innovation at Sea".

Student & Employment Opportunities

Ghent University is advertising a vacancy for a [Director of the Coastal & Ocean Basin](#) to support and develop research in the field of coastal and offshore engineering and renewable ocean energy. Applications are due 19 August 2022.

Oregon State University is seeking a [Safety and Compliance Officer](#) to join the PacWave team and ensure compliance with all safety and environmental regulations and requirements through the construction and operational phases of the project. Applications are due 24 August 2022.

The European Marine Energy Centre is looking for a [Project Director](#) to shape and drive forward the Islands Centre for Net Zero (ICNZ), which is one of three pan-island projects that form part of the wider Islands Growth Deal. Applications are due 26 August 2022.

University of Plymouth is inviting applications for a [PhD studentship](#) focused on experimental and numerical approaches for investigating the design and performance of hybrid coastal structures that provide coastal protection and clean energy. Applications due 29 August 2022.

Ghent University is looking for a [Project Officer - Measurement and Control Systems](#) to support the operational start of the Coastal & Ocean Basin in Ostend, Belgium, including the design, installation, and operation of the data acquisition network. Applications are due 30 August 2022.

The Polytechnic University of Bari is inviting applications for a [PhD position in Fluid Mechanics](#) to work on a hydrodynamic study of marine energy current turbines. Applications are due 5 September 2022.

Marine Power Systems (MPS) is seeking an [Operations Manager](#) to support the company in the set-up and management of its Operations Department and the development of MPS's novel business model specifically tailored to the needs of offshore renewable energy hardware.

Upcoming Events

Upcoming Webinars

Australia's Blue Economy Cooperative Research Centre is hosting a webinar, "[Risks & Opportunities for the Blue Economy](#)", on 17 August 2022 from 3:00-5:00pm AEST (5:00-7:00am UTC). Register [here](#).

National Renewable Energy Laboratory has rescheduled its webinar, "New Functionality and Water Power Technologies Office Wave Hindcast Data in the [Marine Energy Atlas](#)", to 30 August 2022 from 11:00am-12:00pm MDT (5:00-6:00pm UTC). Register [here](#).

The Portal and Repository for Information on Marine Renewable Energy ([PRIMRE](#)) is hosting a webinar to highlight the release of the new [Marine Energy Projects Database](#), which provides a catalog of devices, projects, and test sites around the world, on 20 September 2022 from 8:00-9:00am PDT (3:00-4:00pm UTC). Register [here](#).

Upcoming Conferences

CEMIE-Océano (Centro Mexicano de Innovación en Energía Océano) is hosting the [2nd International Congress on Marine Energy](#), a hybrid scientific and technical forum on the advancement of marine energies in Mexico and in the rest of the world, from 22-24 August 2022 in Mexico City, Mexico and online.

The Supergen Offshore Renewable Energy Hub is hosting its [Autumn Early Career Researchers Forum](#) on 28 September 2022 and its [Autumn Assembly](#) on 29 September 2022. Both events will take place in-person at the University of Oxford in Oxford, UK. Learn more [here](#).

New Documents on *Tethys Engineering*

[A data-driven long-term metocean data forecasting approach for the design of marine renewable energy systems](#) – Penalba et al. 2022

The potential of Marine Renewable Energy (MRE) systems is usually evaluated based on recent metocean data and assuming the stationarity of the MRE resource. Yet, different studies in the literature have shown long-term resource variations and even the connection between ocean warming and wave power variations. Therefore, it is crucial to accurately characterise the future resource, including these long-term variations. To that end, this paper presents a novel data-driven forecasting approach through the combination of machine-learning (ML) and oceanic engineering concepts. First, the historical resource is characterised in the Bay of Biscay, including the different long-term trends identified based upon the dataset obtained via the SIMAR model ensemble.

[Flow effects of finite-sized tidal turbine arrays in the Chacao Channel, Southern Chile](#) – Soto-Rivas et al. 2022

To characterize energy resources and study of hydrodynamic effects induced by marine hydrokinetic devices in tidal channels, numerical models need to provide reliable representations of turbine arrays. In regions disconnected from the grid, near coastal protected areas and other relevant economic activities, there is a pressing need to evaluate the impacts of limited-size arrays. Here, we use the emblematic Chacao Channel in Southern Chile to understand the effects of bathymetry and array placement on energy extraction in strongly tidal channels. We implement in FVCOM a parameterization from a previously derived high-resolution model to represent a group of turbines in different locations. We first analyze the complexity of the bathymetry to define the appropriate grid size and obtain a correct representation of the interaction of turbines with the bed morphology.

[Study on improving the storage efficiency of ocean thermal energy storage \(OTES\) unit by using fins](#) – Li et al. 2022

It is a central challenge for energy self-supplied underwater vehicles converting the huge ocean thermal energy to electrical energy effectively. However, the energy storage efficiency of ocean thermal energy storage (OTES) unit limits the conversion efficiency. Fins are proposed for OTES unit to improve energy storage efficiency in this paper. Firstly, this paper develops a non-stationary model of solidification heat transfer for OTES unit and uses FLUENT to accomplish its numerical analysis. Then, the influence of radial fin and fractal fin on the solidification behavior of phase change material (PCM) are compared. Finally, several fractal fins with different fractal levels, bifurcation angles

and ambient temperature are analyzed for the evolution of the liquid phase rate and temperature distribution of PCM.

A tube-shaped solid–liquid-interfaced triboelectric–electromagnetic hybrid nanogenerator for efficient ocean wave energy harvesting – Sun et al. 2022

Ocean waves, the most widely distributed energy source within the marine environment, promise renewable energy for next-generation self-sufficient ocean exploration and monitoring instrumentation. Triboelectric nanogenerator (TENG) technology has shown the potential in harvesting ocean wave energy. However, most TENG designs suffer from challenges such as relatively low contact intimacy and energy power density, limiting their practical application. This paper proposes a solid–liquid-interfaced, tube-shaped triboelectric–electromagnetic hybrid nanogenerator (TTEHG) to efficiently capture wave energy. Owing to the solid–liquid interface in conjunction with the coupled TENG and the electromagnetic generator (EMG) design, the TTEHG features a reduced frictional loss and broadened range of harvestable wave energy.

Joint coordination of optimal power management and energy storage system sizing for a full-scale marine current turbine considering microgrid integration constraint – Trabelsi et al. 2022

The issues of variability and uncertainty of tidal speed result in severe challenges for standalone microgrid (as island grids for examples) operators. Indeed, to maintain the system power balance, existing classical generators which are associated with tidal power units must be able to frequently change their operating point, either up or down, to respond to the fast fluctuations of tidal power and consumption and sometimes exceed their maximal ramp capability. This in turn accelerates aging process and results in serious damage. The switching to a safer and more reliable system seems to be a promising and long-term solution. This paper proposes to associate a supercapacitor-based Energy Storage System (SC-ESS) to a tidal turbine to smooth the fast power production fluctuations.

Optimizing pore structure of nanoporous membranes for high-performance salinity gradient power conversion – Tao et al. 2022

Nanofluidic salinity gradient power (SGP) harvesting has attracted more attention due to its abundant source and easy-to-implement nature, but its applicability is hampered by the high resistance and undesirable ion selectivity of the commercial ion-exchange membranes. The rational design and optimization of advanced membrane architectures are therefore urgently needed, which require a deep understanding of the relationship between ion transport and porous structure. Herein, a regular network model is defined to mimic the nanoporous membrane, allowing us to study the influence of porous structure on the SGP conversion using the Poisson-Nernst-Planck equations. We find that the slight change of inner porous structure can substantially affect the concentration polarization at the membrane-solution interface, which is dominated by the nanopores along the direct transport direction.

News & Press Releases

[DOE and NOAA Announce Winners of Ocean Observing Prize BUILD Contest to Advance Hurricane-Monitoring Systems](#) – U.S. DOE

The U.S. Department of Energy (DOE) and the National Oceanic and Atmospheric Administration (NOAA) recently announced the winners of \$500,000 in the BUILD Contest, the second phase in the Powering the Blue Economy™: Ocean Observing Prize DEVELOP Competition. The prize challenges competitors to develop solutions that use marine energy to power hurricane-monitoring systems. In June, the competitors tested their early-stage prototypes in the Maneuvering and Seakeeping Basin (MASK)—also known as the U.S. Navy’s indoor ocean—at the Naval Surface Warfare Center’s facility in Carderock, Maryland. The basin holds more than 12 million gallons of water and can simulate diverse wave conditions, helping uncover the capabilities of new wave-powered technologies.

[Wello and BIDD sign commercial agreement](#) – Wello Oy

Finnish wave technology provider Wello Oy and the Barbadian Barbados Investment and Development Corporation (BIDD) (now Export Barbados (BIDD)) signed an agreement for deployment of a 5 MW wave energy farm in Barbados. Export Barbados (BIDD) is an agency of the Barbados Government, whose mandate is to contribute to the diversification and growth of its local economy through new investment, increased exports, and employment creation by fostering the development of competitive business enterprises. Wello, is a Finnish company with over a decade of experience in wave energy conversion technology. In November Wello visited Barbados to visit and review different locations where the wave site could be deployed, and Consett Bay was selected. The project kick-off will commence immediately; both Wello and BIDD want to see wave energy deployed as soon as possible.

[MPS to Demo Wave Energy Array at EMEC](#) – Marine Power Systems (MPS)

Marine Power Systems has signed up to demonstrate a multi-megawatt wave energy array at the European Marine Energy Centre (EMEC) in Orkney, Scotland. The Swansea-based marine energy developer will bring its first commercial scale array demonstration to two berths at EMEC’s Billia Croo wave test site, off the west coast of Orkney, in 2025-2026. MPS’s PelaGen wave energy converter (WEC) design has a unique wave energy capture mechanism enabling energy to be harnessed during the heave and surge of a wave. Each device is designed to capture over a megawatt of power. The PelaGen WECs will be deployed on MPS’s modular floating platform, PelaFlex. Based on a tetrahedral design to provide enhanced stability, the platform has a low overall steel mass with only 10 primary, and 4 distinct, parts. PelaFlex has been designed to deliver low cost across the entire product lifecycle.

Eco Wave Power Commences Real Conditions Test Runs of its Newest EWP-EDF One Wave Energy Project at Jaffa Port, Israel – Eco Wave Power

Eco Wave Power recently announced that it has officially commenced test runs of its newly installed wave energy pilot project at the Port of Jaffa in Tel Aviv, Israel. The EWP-EDF One project is executed in collaboration and co-funding from EDF Renewables IL and the Israeli Energy Ministry, which recognized the Eco Wave Power technology as “Pioneering Technology.” The real-conditions testing was initiated in July 2022 with the purpose of examining the operation of the mechanical and hydraulic subsystems of the project. During the testing, the Eco Wave Power floaters were lowered to the water and tested for the very first time, resulting in a green light for the next phases of the project, which will include grid connection and testing of the overall system, to be followed by full operation. Once testing and final works are completed including the grid-connection, the Company will have an official launch of its power station.

TIGER – UK GOV CfD Allocation Round 4 – Tidal Stream Industry Energiser

The Interreg FCE Programme and TIGER Project recently announced that revenue subsidy has been allocated to four tidal stream projects through the latest round of the UK government’s competitive Contract for Difference (CfD) scheme. The CfD scheme is the government’s main mechanism for supporting low-carbon electricity generation and it is the first time that tidal stream energy has had a budget ring fence guaranteeing tidal stream technologies access. Despite this ring fence, technologies and projects must still competitively bid for the lowest levelised cost of Energy (LCoE), a comparative measure of how much it costs for different technologies to produce electricity. The CfD revenue subsidy is used by new renewable energy projects to guarantee the price of electricity received for electricity exported to the electricity network (or grid).