

TETHYS ENGINEERING BLAST



16 December 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, as part of the [PRIMRE](#) universe. 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

PRIMRE Highlight

The [Portal and Repository for Information on Marine Renewable Energy \(PRIMRE\)](#) amasses marine energy data and information from multiple knowledge hubs into one centralized site. To learn more about how PRIMRE can help everyone, from startups to universities, get the data they need to advance the marine energy industry, check out “[A Rising Tide Lifts All Boats](#)”.

SULI & CCI Applications

The U.S. Department of Energy (DOE) Office of Science is now accepting applications for the [Science Undergraduate Laboratory Internships \(SULI\)](#) program and the [Community College Internships \(CCI\)](#) program. Interns will work directly with national laboratory scientists and engineers that support the DOE mission. The application deadline is 10 January 2023.

Earthshot Prize Nominations

The European Marine Energy Centre (EMEC) is continuing its role as an Official Nominator for [The Earthshot Prize](#), which is seeking innovations that will help repair and regenerate the planet. EMEC has launched an [open call inviting submissions](#) for consideration until 17 January 2023.

New LCA Tool

Researchers from the University of Exeter have developed a new tool to streamline the Life Cycle Assessment of tidal turbine deployments. The [ETTIE \(Exeter Tidal Turbine Impact Estimator\)](#) allows developers to estimate the greenhouse gas emissions of a tidal turbine deployment based on early-stage design information. Learn more [here](#).

Calls for Abstracts

The [Call for Abstracts](#) for [OCEANS 2023 Limerick Conference & Exhibition](#) is now open through 20 December 2022. The event will take place on 5-8 June 2023 in Limerick, Ireland.

American Clean Power is [accepting submissions](#) for panel and poster presentations opportunities at [CLEANPOWER 2023 Conference & Exhibition](#) through 30 December 2022. The event will take place on 22-25 May 2023 in New Orleans, U.S.

The [Call for Abstracts](#) for the [Marine Energy Wales Conference 2023](#) is now open through 16 January 2023. The conference will take place 21-22 March 2023 in Swansea, UK.

The [Call for Abstracts](#) for the [15th European Wave and Tidal Energy Conference Series \(EWTEC 2023\)](#) is now open through 28 January 2023. Full papers will be due 27 May 2023. EWTEC will take place on 3-7 September 2023 in Bilbao, Spain.

Calls for Papers

Energies is accepting submissions for several Special Issues, including “[Wave Energy Technologies and Optimization Methods](#)” (due 26 January 2023), “[New Challenges in Software for Marine Energy Applications](#)” (due 31 January 2023), and “[Ocean Energy Technologies for Power Generation](#)” (due 3 February 2023).

Journal of Marine Science and Engineering is accepting submissions for several Special Issues, including “[Advanced Marine Energy Harvesting Technologies](#)” (due 10 February 2023,) “[Offshore Renewables for a Transition to a Low Carbon Society](#)” (due 28 February 2023), “[Wave, Tidal and Offshore Wind Energy Site Assessment and Monitoring](#)” (due 5 March 2023).

Funding & Testing Opportunities

ProtoAtlantic is now accepting applications for the [ProtoAtlantic Customized Scale Start-Ups Support Program](#) at the Lir-National Ocean Test Facility in Ireland. The program will provide free facilities access to marine technology (wave, wind, tidal, floating solar, biotechnology, robotics) developers across the Atlantic Area. Applications are due 23 December 2022.

The U.S. DOE has opened applications for the [Small Business Innovation Research \(SBIR\) and Small Business Technology Transfer \(STTR\) Program](#), which offers grants to small businesses to support technological innovation. Letters of intent are due 3 January and applications are due 21 February 2023.

The European Commission has launched two new [Calls for Proposals](#) under the European Maritime, Fisheries and Aquaculture Fund aimed at supporting careers and regional projects for a sustainable blue economy in European Union sea basins. Proposals are due 31 January 2023.

The European Commission has also launched the third call for large-scale projects under the [European Union Innovation Fund](#). The call is open for projects located in European Union Member States, Iceland, and Norway until 16 March 2023.

The Horizon Europe Framework Programme recently launched a funding opportunity entitled, “[Demonstration of sustainable tidal energy farms](#)”, to de-risk tidal technology development and increase knowledge of potential environmental impacts. Applications are due 30 March 2023.

Student & Employment Opportunities

EMEC is seeking a [Senior Electrical Engineer](#) to manage operations of its electrical systems, a [Performance Test Engineer](#) to deliver technical services to research and development projects, and a [Head of Projects](#) to oversee its project portfolio and management office. Applications are due 19 December 2022, 3 January 2023, and 16 January 2023, respectively.

Floating Power Plant is offering an [opportunity for candidates holding a Ph.D.](#) to join its business developing floating wind, wave, and hydrogen platforms for island communities. Applications are due 31 December 2022.

The Center for Ocean Engineering at the University of New Hampshire is inviting applications for a tenure-track position at the [Assistant, Associate, or Full Professor](#) rank who can contribute to ocean renewable energy research and other focus areas. Applications are 22 January 2023.

Upcoming Events

Upcoming Conferences

[Oceanology International \(Oi\) Americas 2023](#) will take place 14-16 February 2023 in San Diego, U.S. Register [here](#).

The [42nd International Conference on Ocean, Offshore & Arctic Engineering \(OMAE 2023\)](#) will take place on 11-16 June 2023 in Melbourne, Australia.

Marine Renewables Canada recently announced that the [2023 Marine Renewables Canada Conference](#) will take place on 14-16 November 2023 in Ottawa, Canada. Save the date!

New Documents on *Tethys Engineering*

[A designed two-body hinged raft wave energy converter: From experimental study to annual power prediction for the EMEC site using WEC-Sim – Jin et al. 2023](#)

The present study aims at providing more data and insights for the hinged type WEC, especially focusing on the two-body hinged raft WECs. Two WECs are considered: a well-studied generic hinged raft WEC (G-HRWEC) and a 1:25 scale designed hinged raft WEC (D-HRWEC). The open-source tool WEC-Sim is employed in numerical studies. Referring to the published numerical data for G-HRWEC, corrections are proposed to the WEC-Sim model which are shown to realise the ability of WEC-Sim to model the two-body hinged WEC. For the 1:25 scale D-HRWEC, the physical results show that the relative hinge motion between the rafts is predominately linear under small waves, but significant nonlinearities like viscosity, submergence and overtopping exist under large oscillations.

Experimental investigation of the influence of mast proximity on rotor loads for horizontal axis tidal turbines – Shoukat et al. 2022

The current study investigates the influence of the tower distance from the rotor plane on turbine performance, and on rotor loading. A test scale instrumented tidal stream turbine is studied in a water flume tank at the laboratory of IFREMER in Boulogne-sur-Mer, France. Experiments are carried out with 14 different tower positions and the turbine performance coefficients are compared. Both mean C_p and C_t values remain unaffected for these different positions. However, the structural rotor loading is found to fluctuate significantly as the distance between the tower and rotor is reduced. Load measurements are analysed in terms of coefficient of variation, through frequency analysis, in relation with the azimuthal position of the rotor and finally in terms of exceedance.

Towards cost-effective osmotic power harnessing: Mass exchanger network synthesis for multi-stream pressure-retarded osmosis systems – Xu et al. 2023

Pressure-retarded osmosis (PRO) is a promising technique for osmotic power generation by recovering salinity gradient from high concentration effluents. Prior research has shown that the PRO systems integrating multiple draw/feed streams can achieve a 20+% increase in energy recovery compared with standalone design. However, to date few approaches have been developed to fully utilize this potential. Herein, we propose a novel method for the multi-stream PRO system that optimizes its modules (mass exchangers) layout as a mass exchanger network in three steps. In the first step, the maximum energy conversion is determined and used as an energy target for subsequent mass exchanger network synthesis.

Experimental Performance Analysis of a Hybrid Wave Energy Harvesting System Combining E-Motions with Triboelectric Nanogenerators – Clemente et al. 2022

This paper discusses a disruptive approach to wave energy conversion, based on a hybrid solution: the E-Motions wave energy converter with integrated triboelectric nanogenerators. To demonstrate it, a physical modelling study was carried out with nine E-Motions sub-variants, which were based on three original hull designs (half-cylinder (HC), half-sphere (HS) and trapezoidal prism (TP)). A unidirectional lateral tribo-device was incorporated within the E-Motions' hull during the experiments. The physical

models were subjected to eight irregular sea-states from a reference study on the Portuguese coastline. Results point towards a significant hydrodynamic roll response, with peaks of up to 40 °/m.

Research on variable speed constant frequency energy generation based on deep learning for disordered ocean current energy – Wei et al. 2022

There are short-term disorderly fluctuations in the flow rate of ocean current energy. The uncontrolled input of kinetic energy from the ocean current can lead to poor quality of power generated by current energy generators. The existing technology of current energy generation uses mechanical rigid transmission, which is prone to fatigue damage and low reliability under variable load fluctuations. In this paper, a joint simulation platform based on AMESim and Simulink is constructed based on 50kW hydraulic transmission and control power generation equipment. This paper establishes a mathematical model of the hydraulic transmission control system and proposes a constant frequency control algorithm based on a deep learning prediction model to improve the steady-state accuracy of the hydraulic motor speed.

Thermodynamic analysis and turbine design of a 100 kW OTEC-ORC with binary non-azeotropic working fluid – Ma et al. 2023

The present paper deals with the performance analysis of an ocean thermal energy conversion (OTEC) plant based on the organic Rankine cycle (ORC) with a theoretical output power of 100 kW where a non-azeotropic mixture has been used as the working fluid. Hydrofluoroolefins (HFOs) are selected as the components of the binary non-azeotropic working fluid due to their desired thermodynamic properties, higher safety and stability, lower cost and environmental friendliness i.e., zero ODP (Ozone Depletion Potential) and low GWP (Global Warming Potential). In this study, R1224yd(Z) is adopted as the first component due to its lower flammability and toxicity comparing with other HFOs.

News & Press Releases

WPTO Announces over \$16 Million in New National Lab-Led Hydropower and Marine Projects – Water Power Technologies Office (WPTO)

The U.S. DOE WPTO recently announced over \$16 million in new projects to further hydropower and marine energy research and development. These awards encompass \$5.6 million for hydropower projects and \$10.5 million for marine energy projects across six national laboratories. Researchers at Argonne National Laboratory, Idaho National Laboratory, National Renewable Energy Laboratory, Oak Ridge National Laboratory, Pacific Northwest National Laboratory, and Sandia National Laboratories will lead these projects. The 11 marine energy projects cover four topic areas, including power at sea, new remote coastal community work, design and development of a pioneer array test article, and environmental monitoring.

Eco Wave Power's Wave Energy Conversion Unit Arrives at AltaSea at the Port of Los Angeles – Eco Wave Power

Eco Wave Power recently announced that the energy conversion unit, formerly deployed in Gibraltar, has officially arrived at its new home, AltaSea at the Port of Los Angeles, United States, where it will be installed as a pilot station in the coming months. This is the first U.S. location for Eco Wave Power's technology, which is already deployed in Israel with plans for further deployments in Spain, Portugal, Turkey and other locations, as part of the Company's current 404.7 MW project pipeline. Eco Wave Power entered a collaboration agreement with AltaSea in early 2022 and announced plans to relocate the energy conversion unit from Gibraltar to AltaSea's 35-acre campus located at the Port of Los Angeles, the nation's busiest seaport.

UK outlines fifth contracts for difference structure and launches consultation for next – Offshore Energy

UK's Department for Business, Energy & Industrial Strategy has published key documents relating to the pot structure and administrative strike prices for renewable energy projects in the fifth round of contracts for difference (CfD), while also launching the consultation that will shape the next ones. Pot 2 has been reserved for newer technologies, and will support projects larger than 5MW that feature tidal energy, wave energy, geothermal and floating offshore wind. The delivery years for these projects have been set for 2026/27, and 2027/28. The strike price for tidal stream energy projects has been set at £202/MWh, while the wave energy projects stand at £245/MWh. When it comes to the floating wind, the administrative strike price has been set at £116/MWh.

IIT Madras Researchers Develop & Deploy an Ocean Wave Energy Converter to Generate Electricity from Sea Waves – Indian Institute of Technology Madras (IIT Madras)

IIT Madras researchers have developed an 'Ocean Wave Energy Converter' that can generate electricity from sea waves. The trials of this device were successfully completed during the second week of November 2022. The device was deployed at a location about 6 km off the coast of Tuticorin, Tamil Nadu, at a location with a depth of 20 m. This device targets generating 1MW of power from ocean waves in the next three years. The success of this project will help fulfil several objectives such as the United Nations Ocean decade and sustainable development goals. India's goals include deep water missions, clean energy and achieving a blue economy. It could help India meet its climate change-related goals of generating 500 GW of electricity by 2030 through renewable energy.

Liverpool eyes South Korean know-how on tidal range power projects – Offshore Energy

Liverpool City Region has signed an agreement with Korea Water Resources Corporation (K-water) to cooperate and share lessons that could help the region develop the world's largest tidal power scheme on the River Mersey. Liverpool City Region's mayor has signed a memorandum of agreement with the vice president of South Korea's state water company, paving the way for closer cooperation between the parties on tidal energy

developments. K-water owns and operates the Sihwa Lake tidal range power scheme, currently the world's largest, while Liverpool City Region plans to develop the Mersey Tidal Power Project, which has the potential to generate enough clean energy to power up to one million homes and create thousands of jobs in its construction and operation.