

TETHYS ENGINEERING BLAST



29 July 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

PRIMRE Highlight: MHKDR

The [Marine and Hydrokinetic Data Repository \(MHKDR\)](#) is a repository for data collected by U.S. Department of Energy Water Power Technologies Office-funded projects, including results of tank and open water device tests, resource characterization data and model outputs, techno-economic analyses, and more. MHKDR is one of seven Knowledge Hubs within the [Portal and Repository for Information on Marine Renewable Energy \(PRIMRE\)](#). Learn more [here](#).

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.

WES Seeking Suppliers

Wave Energy Scotland (WES) is looking for a suitably qualified supplier to carry out a study into the technoeconomic benefits of sharing supply chains, physical infrastructure, and services between wave energy and floating offshore wind systems. [Proposals](#) are due 3 August 2022.

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 is launching 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.

Student & Employment Opportunities

Wave Energy Scotland is advertising a 3-6 months [Placement Opportunity](#) for a candidate to report on the opportunities for ocean energy in Scottish waters, with a particular focus on wave energy. Applications are due 5 August 2022.

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.

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.

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.

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 is hosting a webinar, "New Functionality and Water Power Technologies Office Wave Hindcast Data in the Marine Energy Atlas", on 24 August 2022 from 10:00-11:00am MDT (4:00-5:00pm UTC). Access the Atlas [here](#). 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](#).

The International Network on Offshore Renewable Energy (INORE) is hosting the [2022 INORE European Symposium](#) on 11-17 October 2022 in Zarautz, Spain. [Applications](#) to attend the Symposium, free of charge, are due 22 August 2022.

New Documents on *Tethys Engineering*

[Drone-based large-scale particle image velocimetry applied to tidal stream energy resource assessment](#) – Fairley et al. 2022

Resource quantification is vital in developing a tidal stream energy site but challenging in high energy areas. Drone-based large-scale particle image velocimetry (LSPIV) may provide a novel, low cost, low risk approach that improves spatial coverage compared to ADCP methods. For the first time, this study quantifies performance of the technique for tidal stream resource assessment, using three sites. Videos of the sea surface were captured while concurrent validation data were obtained (ADCP and surface drifters). Currents were estimated from the videos using LSPIV software. Variation in accuracy

was attributed to wind, site geometry and current velocity. Root mean square errors (RMSEs) against drifters were 0.44 m s^{-1} for high winds (31 kmh) compared to 0.22 m s^{-1} for low winds (10 kmh).

[A coupled numerical framework for hybrid floating offshore wind turbine and oscillating water column wave energy converters](#) – Zhang et al. 2022

Integrating floating offshore wind turbines with oscillating-water-column wave energy converters has been seen as a promising solution for hybrid offshore renewable energy production, as the cost-effective wave energy devices could possibly help increase the overall power absorption, reduce platform dynamic responses, and mitigate loads for critical wind turbine structures etc. As most existing research works on dynamic analysis of these hybrid concepts are based on frequency-domain simulations or scale model experiments, this work focuses on establishing an aero-hydro-elastic-servo-mooring coupled numerical framework for integrated time-domain dynamic analysis. In particular, the water column dynamics are characterised based on an equivalent virtual oscillating body approach so that the time-domain analysis capability for oscillating-water-columns with power take-off control is enabled.

[Bibliometric analysis for ocean renewable energy: An comprehensive review for hotspots, frontiers, and emerging trends](#) – Hu et al. 2022

The ocean is a huge energy conversion field, and ocean renewable energy (ORE) can provide us with a constant source of energy. Research on ORE collection and utilization has been emerging in recent years, and the number of ORE research results has been increasing. This paper visualizes the trends and current research status of ORE by performing bibliometric analysis using VOSviewer and CiteSpace. The results are analyzed in terms of annual publications, countries, institutions, authors, journals, keywords, topics, and references. The results indicate that current research hotspots include (1) theoretical calculations and simulation modeling, (2) design of ocean renewable energy devices (OREDs), (3) deployment of OREDs and optimization improvements, and (4) evaluation of ORE projects.

[Hydrodynamic performance of a mono-tangent backward-rotating impeller based on tidal current energy utilization](#) – Wu et al. 2022

Owing to the continuous consumption of fossil fuel and increasing environmental problems, there is an urgent need to develop technologies for the efficient use of clean energy. In this study, a mono-tangent backward-rotating impeller based on tidal current energy utilization is proposed, and its hydrodynamic performance was studied using the computational fluid dynamics method by establishing a hydrodynamic model of the backward-rotating impeller. The influences of the number of blades, impeller aspect ratio, and different flow speeds on the coefficient of power (c_p) of the mono-tangent impeller were investigated. The results show that the value of c_p of the mono-tangent impeller with four blades is higher than that of the impellers with two, three, five, and six blades.

Numerical Investigation of the Scaling Effects for a Point Absorber – Pierart et al. 2022

In order to design and evaluate the behaviour of a numerically optimised wave energy converter (WEC), a recommended procedure is to initially study small scale models in controlled laboratory conditions and then progress further up until the full-scale is reached. At any point, an important step is the correct selection of the wave theory to model the dynamical behaviour of the WEC. Most authors recommend the selection of a wave theory based on dimensional parameters, which usually does not consider the model scale. In this work, the scale effects for a point absorber are studied based on numerical simulations for three different regular waves conditions. Furthermore, three different wave theories are used to simulate two scales 1:1 and 1:50. The WEC-wave interaction is modelled by using a numerical wave tank implemented in ANSYS-Fluent with a floating object representing the WEC.

An External Ocean Thermal Energy Power Generation Modular Device for Powering Smart Float – Zhang et al. 2022

Smart Float is a new multi-modal underwater vehicle, a tool for ocean observation and detection, whose performance is limited by its underwater voyage distance and endurance like most underwater vehicles. The utilization of marine energy provides an ideal way to overcome these limitations. In this paper, an external ocean thermal energy power generation module is developed for Smart Float, which can be used for multiple times of energy storage and power generation and is expected to be further applied to small and medium-sized underwater vehicles. The integration of the proposed device will cause changes in the counterweight characteristic, hydrodynamic characteristic, and heat transfer characteristic of the vehicle, which are deeply analyzed in this study, and adaptive modification solutions are proposed according to the analysis results.

News & Press Releases

CorPower Ocean delivers first commercial-scale composite WEC hull – CorPower Ocean

CorPower Ocean has teamed up with composite machinery specialist Autonational and composite tank experts CPT Tankwell to successfully develop its first commercial-scale hull in Viana do Castelo (Portugal), using a custom-built machine, installed inside an environmentally controlled work cell that will become the future regarding mobility and scalability of CorPower's composite manufacturing capabilities. The composite hull forms an integral part of CorPower Ocean's next generation C4 Wave Energy Converter (WEC) which was recently unveiled at a global launch event in Stockholm, Sweden. Over the last year, process characterization work on quarter-scale models has enabled rapid iterations and continuous tuning to reach targeted quality and material properties reviewed by DNV as a certification body – paving the way for final commercial scale construction.

Twelve Small Businesses Receive Funding to Further Hydropower and Marine Energy Research and Development – U.S. Department of Energy

The U.S. Department of Energy (DOE) recently announced \$12 million for 12 hydropower and marine energy projects as part of the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) program. These small business-led projects, selected by DOE's Water Power Technologies Office, will drive innovation in water power technologies and contribute to the Biden administration's goals of a carbon-free power sector by 2035 and net-zero-emissions economy by 2050. The 12 projects cover several topics, including the co-development of marine energy technology at smaller scales and low-cost, user-friendly monitoring tools for marine hydrokinetic sites.

ENCORE releases courses to speed up innovation in marine energy – Offshore Energy

The ENCORE (Energizing Coastal Regions with Offshore Renewable Energy) project and its partners have released a number of e-learning courses, designed to train and prepare talent to further advance the marine energy industry. One of the main goals of the ENCORE project is to develop a strategy to bring future innovations to market faster. This includes the development of an education program to train and prepare talent to further advance the industry, with input from various stakeholders including the IEC Academy. The development of this education package was accomplished by working with the International Electrotechnical Commission (IEC) Technical Committee 114 and IEC System for Certification to Standards relating to Equipment for use in Renewable Energy applications (IECRE).

IEA-OES publishes 6 interviews on the use of sea water as a renewable source for heating, cooling and power production – IEA-OES

The International Energy Agency's Technology Collaboration Programme on Ocean Energy Systems (IEA-OES) recently published six interviews which give a flavour of successful projects in different parts of the world taking advantage of the temperature of the ocean for heating, cooling and power production. These interviews focus on Ocean Thermal Energy Conversion (OTEC) demonstration plants, Sea Water Air Conditioning (SWAC) and Sea Water Heat Pump (SWHP) systems, sharing experiences, challenges, and lessons learned. How much public and private funding has been granted to develop these projects? Its economic feasibility? Which most critical risks have been encountered and how could they be overcome? Difficulties faced on operations & maintenance challenges? These and more questions are responded by the interviewees.

SWEL looks for partners to help commercialize wave energy device – Offshore Energy

Sea Wave Energy Limited (SWEL), an R&D company based in Cyprus and UK, is looking to form strategic alliances to assist it with the final tests on a pilot Waveline Magnet model, and drive forward the commercialization of its wave energy technology. Having concluded exhaustive studies and tests on the Waveline Magnet (WLM)

technology at Ecole Centrale de Nantes (ECN) test facility, with the support of Marine Energy Alliance (MEA) and industry leaders, SWEL is ready to bring its technology to the next level and display its tangible potential to solve the decades-old enigma of wave energy. SWEL's WLM device is comprised of an array of flexible assemblies linked by a spine power system.