

TETHYS ENGINEERING BLAST



15 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

Contribute to *Tethys Engineering*

If you have any new publications (e.g., journal articles, conference papers, workshop reports, theses), relevant announcements, funding or job opportunities, or upcoming events, please email tethys@pnnl.gov to contribute them to the [Knowledge Base](#), [Events Calendar](#), and/or [Tethys Engineering Blast](#) newsletter!

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 Call for Abstracts for the [2nd GloFouling Research & Development Forum on Biofouling Prevention and Management for Maritime Industries](#) is now open through 31 July 2022. Submit your 250-word max abstract to glofouling@imo.org. The conference will take place on 11-14 October in London, UK.

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](#), which will place 8-12 January 2023 in Denver, US. Submission deadlines vary depending on the conference or symposia, but most abstracts are due 24 August 2022.

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, UK.

Calls for Papers

The *Journal of Marine Science and Engineering* is accepting submissions for several Special Issues, including [New Trends in Offshore Renewable Energy Devices](#) (due 1 August 2022), [Advances in Hydrodynamics and Fluid-Structure Interactions of Floating Offshore Structures](#) (due 30 August 2022), and [Mooring Systems of Floating Offshore Structures for Emerging Industries](#) (due 31 August 2022).

Energies is accepting submissions for several Special Issues, including [Offshore Energy Transition](#) (due 7 August 2022) and [Recent Advances in Marine and Offshore Renewable Power Generation Technologies](#) (due 31 August 2022).

Funding & Testing Opportunities

The Testing and Expertise for Marine Energy Research (TEAMER) program, supported by the US DOE, is now accepting [Request For Technical Support \(RFTS\) 7](#) applications through 16 July 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 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.

Student & Employment Opportunities

CalWave is currently seeking an [Electrical Engineer Lead](#), a [Senior Mechanical Design Engineer](#), and a [Systems Modeling and Controls Engineer](#). Additional positions, including a Mechatronic Engineer, are coming soon. View CalWave's [Career page](#) for more information.

CorPower Ocean is currently seeking a [Senior Mechanical Design Engineer](#), [Technical Project Manager](#), [Procurement Engineer](#), [Mechanical Service Technician](#), [Technical Business Developer](#), and an [Instrumentation and Automation Engineer](#).

Upcoming Events

Upcoming Webinar

Pacific Northwest National Laboratory's [Triton Initiative](#) is hosting the next webinar in its *Triton Talks* series on 27 July 2022 from 11:00am-12:00pm PDT (6:00-7:00pm UTC). During the webinar, the Triton Team will present Triton's research on the environmental effects of underwater noise and anthropogenic light associated with marine energy. Register [here](#).

Upcoming Workshop

The University of Surrey is hosting a [Workshop on Synergistic Hybrid Marine Renewable Energy](#) from 21-22 July 2022 in Guildford, UK. The aim of the workshop is to disseminate results on the development of a hybrid energy harvest platform and build up a consortium for future collaborative proposals.

Upcoming Conferences

CEMIE-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 Basque Energy Cluster and Ocean Energy Europe (OEE) are teaming up to deliver a joint ocean energy event, [International Conference on Ocean Energy & Ocean Energy Europe \(ICOE-OEE 2022\)](#), on 18-20 October in Donostia-San Sebastián, Spain. Register [here](#).

New Documents on *Tethys Engineering*

[Global wave energy resource classification system for regional energy planning and project development](#) – Ahn et al. 2022

Efforts to streamline and codify wave energy resource characterization and assessment for regional energy planning and wave energy converter (WEC) project development have motivated the recent development of resource classification systems. Given the unique interplay between WEC absorption and resource attributes, viz, available wave power frequency, directionality, and seasonality, various consensus resource classification metrics have been introduced. However, the main international standards body for the wave energy industry has not reached consensus on a wave energy resource classification system designed with clear goals to facilitate resource assessment, regional energy planning, project site selection, project feasibility studies, and selection of WEC concepts or archetypes that are most suitable for a given wave energy climate.

The effects of surge motion on the dynamics and wake characteristics of a floating tidal stream turbine under free surface condition – Peng et al. 2022

In this paper, a Computational Fluid Dynamics (CFD) code is used to investigate the tidal stream turbine performance under free surface condition and with surge motion: amplitudes of $1/24$ – $1/4$ rotor diameter and period of 3–12 s. The CFD model is evaluated against experiments of a piled turbine in a circulating flume, providing a difference of only 1.46% at rated tip speed ratio. The unsteady power and thrust follow the sum of a constant, velocity-induced, and acceleration-induced terms. In all tests, the damping term for the power response is approximately 3 times the steady power coefficient ($C_p \sim 0.33$), whilst for the thrust, 1.6 times the steady thrust coefficient ($C_z \sim 0.77$). Ignoring the small acceleration-induced coefficient leads to negligible simulation errors.

Unlocking the Potential of Marine Energy Using Hydrogen Generation Technologies – Thorson et al. 2022

To unlock the full potential of marine energy, efficient methods of storing and transporting captured marine energy are needed so that the energy can be used when and where it is needed. A promising solution to these energy storage and transportation challenges is to combine marine energy and hydrogen generation technologies. Herein, we provide a high-level analysis of the unique value proposition and technical challenges of combining marine energy and hydrogen technologies. First, we review marine energy technologies, electrolysis technologies, and hydrogen storage methods. Next, we consider specific applications and opportunities for combining the two technologies. Finally, we identify critical R&D challenges that must be overcome to successfully combine marine energy and hydrogen generation technologies.

Self-tuning, load-mitigating feedback control of a 3-DOF point absorber – Forbush et al. 2022

A simple, self-tuning multi-objective controller is demonstrated in simulation for a 3-DOF (surge, heave, pitch) point absorber. In previous work, the proposed control architecture has been shown to be effective in experiments for a variety of device archetypes for the single objective of the maximization of electrical power capture: here this architecture is extended to reduce device loading as well. In particular, power take-off (PTO) actuation forces and the minimization of fatigue damage (determined from the sum of wave-exerted and PTO forces) are considered as additional objectives for the self-tuning controller. Because the power surface is consistently fairly flat in the vicinity of control parameters that maximize power capture in contrasting sea-states, it is found to be generally possible to mitigate either fatigue damage or PTO load.

Performance analysis of a horizontal axis ocean current turbine with spanwise microgrooved surface – Dang et al. 2022

The design of turbine blade is a vital issue in the performance of horizontal axis ocean current turbine (HAOCT). The purpose of this paper is to conduct the performance analysis for HAOCT blade with spanwise microgrooved surface, including hydrodynamic analysis and hydrodynamic noise analysis. To recognize the flow around the blades, and to obtain the radiated noise of the turbines, four turbines with different configurations of microgrooved surface are tested through computational fluid dynamics (CFD) method. The hydrodynamic characteristics are obtained based on large eddy simulation (LES), then Ffowcs Williams-Hawkings (FW-H) analogy is used to predict the rotating noise generated by the HAOCT. The accuracy of the numerical predictions of flow field is checked against existing experimental data, with good agreement achieved.

Salinity-gradient power harvesting using osmotic energy conversion with designed interfacial nanostructures under thermal modulation – Ren et al. 2022

Osmotic energy conversion (OEC) is attractive for salinity-gradient power utilization. Nevertheless, the OEC still faces a challenge of relatively low power density owing to the limited ionic mass transfer. In this paper, we present designed interfacial nanostructures (DINS) to enhance ion selective transport in nanopores. The maximum osmotic power under 50-fold salt concentration ratio is ameliorated by 180.6%, when DINS are applied in nanopore region. When DINS are partially applied at low salt concentration side rather than high salt concentration side, the maximum osmotic power under 50-fold salt concentration ratio is enhanced by 139.1%. Once the temperature of aqueous solution at low concentration side with high original electric double layer thickness is raised up, the maximum osmotic power under 50-fold salt concentration ratio is consolidated by 19.8%.

News & Press Releases

Minesto's tidal power plant in grid-connected operation - commercial performance verified – Minesto

The first tidal power plant from Minesto's product line Dragon Class, Dragon 4 (100 kW), has been commissioned in Vestmannasund, Faroe Islands, in early summer. The first phase of electricity generation shows that predicted performance is achieved in line with Minesto's previous forecasts and simulation results. "We are very pleased to have completed the commissioning of Dragon 4 and that the electricity generation is fully in line with our predictions. We are now moving into operational mode and continuing to implement planned upgrades in parallel," says Bernt Erik Westre, CTO of Minesto. The progression in Vestmanna creates positive effects for the coming scale-up, and the work of realizing the first full-scale tidal energy array in Hestfjord, Faroe Islands, proceeds according to plan.

Wave-powered breakwater DIKWE starts sea trials in France – Offshore Energy

The DIKWE project – being developed by a consortium of French companies including Legendre Group, GEPS Techno, and Ifremer – has seen the deployment of a prototype

breakwater equipped with wave energy converters in Sainte Anne-du-Portzic, near Brest. Dubbed the first 'positive energy breakwater', DIKWE concept has a dual-purpose – to provide protection for the port and the coastline, while simultaneously exploiting the force of the waves to produce clean energy. Initiated in 2020, the first phase of the project consisted of testing the 1:15 scale prototype in the Ifremer wave basin in Brest. This step validated the design of the prototype and confirmed the first numerical calculations, with an estimate of up to 60% capture of wave energy. The second stage consists of testing the new prototype on a quarter scale, this time on Ifremer's sea trial site near Brest.

Bombora advances 1.5GW wave demonstrator – reNEWS

Bombora Wave Power is conducting final tests at the 1.5GW Pembrokeshire Demonstration Project in Wales as it prepares to deploy its wave energy converter (WEC) technology in open water. The system known as mWave, which Bombora describes as the "world's most powerful" WEC, can be configured to suit either fixed-bed nearshore foundation systems or floating offshore ocean environments. Bombora COO Dave Rigg said: "In the coming months we will complete the final assembly process on the quayside in Pembroke Dock before loadout to the operational site at East Pickard Bay, where the mWave technology will be validated in the open ocean, advancing it to Technology Readiness Level 7/8."

Lhyfe installs green hydrogen production solution on Geps Techno's floating platform – Offshore Energy

French green hydrogen technology developer Lhyfe has started working on the installation of an electrolyser on Geps Techno's hybrid renewable energy platform, which will produce green hydrogen from marine renewable energy sources. The electrolyser is being installed at the site of offshore engineering and shipbuilding company Chantiers de l'Atlantique, with whom Lhyfe signed an agreement in June 2022 to collaborate on the development of offshore hydrogen production platforms. Geps Techno's hybrid floating renewable energy platform combines solar, wind and wave energy, and is expected to be deployed later in 2022. The deployment of the platform will take place at the SEM-REV site, off the coast of Saint-Nazaire in France.

Mocean Energy Starts Tank Testing Models for 250kW Wave Energy Machine – Marine Technology News

Mocean Energy has started tank testing models of its 250kW Blue Horizon wave energy machine as part of the EU-funded EuropeWave program. The Edinburgh-based wave power company is one of seven technology developers awarded contracts for phase 1 of the €20 million R&D scheme, which will ultimately see three prototype technologies tested at the European Marine Energy Centre (EMEC) in Orkney and the Biscay Marine Energy Platform (BiMEP) in Spain. The eight-day development program is taking place at the FloWave test facility at the University of Edinburgh, which is able to generate representative sea states for both sites. Blue Horizon is a mid-scale wave energy machine designed to deliver grid power to remote and island communities.