

# TETHYS ENGINEERING BLAST



**7 October 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](mailto:tethys@pnnl.gov) to contribute!

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[Announcements](#)  
[Upcoming Events](#)

[New Documents](#)  
[News & Press Releases](#)

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## Announcements

### *Tethys Engineering Knowledge Base*

The [Tethys Engineering Knowledge Base](#) currently contains over 6,500 documents on the technical and engineering aspects of wave, current, ocean thermal, and salinity gradient energy!

### ORISE Application Opens

The U.S. Department of Energy's (DOE) Water Power Technologies Office (WPTO) and Oak Ridge Institute for Science and Education (ORISE) recently opened applications for the next cohort of students for the [Marine Energy Graduate Student Research Program](#). The program is accepting applications from master's and doctoral students with a marine energy-focused research thesis and/or dissertation at a U.S. institution. Applications are due 2 December 2022.

### FOSTWIN Controller Competition

Sandia National Laboratories, in conjunction with Oregon State University and Evergreen Innovations, is hosting the [FOSWEC Digital-Twin \("FOSTWIN"\) Control Competition](#) to develop an effective power absorption controller for a digital twin of the Floating Oscillating Surge Wave Energy Device (FOSWEC). Try your hand at generating the most electrical power on a real-time digital-twin system for a chance to win reimbursement for travel to a control workshop at the Maneuvering and Sea Keeping Basin. Submissions are due 16 June 2023.

## INORE BECS

The International Network on Offshore Renewable Energy (INORE) has announced a [Call for Blue Energy Collaborative Scholarships \(BECS\) Proposals](#), targeted at INOREans from Latin America, Africa, and Asia. If you have a research project that can provide collaborative work with other INOREans, the grant can be used for travel expenses and accommodation at the institution where the work will take place or be presented. Applications are due 31 October 2022.

## Calls for Abstracts

The [Call for Abstracts](#) for the [33rd International Ocean and Polar Engineering Conference \(ISOPE 2023\)](#) 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.

The [Call for Abstracts](#) for the [42nd International Conference on Ocean, Offshore and Arctic Engineering \(OMAE 2023\)](#) is now open through 24 October 2022. OMAE will take place on 11-16 June 2023 in Melbourne, Australia.

## Calls for Papers

*Energies* is accepting submissions for several Special Issues, including “[Tidal Turbines II](#)” (due 2 November 2022), “[Wind and Wave Energy Resource Assessment and Combined Utilization](#)” (due 4 November 2022), and “[Renewable Offshore Energies](#)” (due 8 November 2022).

*Journal of Marine Science and Engineering* is accepting submissions for several Special Issues, including “[Recent Advances in Wave Energy Resource Assessment](#)” (due 30 November 2022), “[Advances in Offshore Wind and Wave Energies](#)” (due 31 December 2022), and “[Hybrid Systems for Marine Energy 2023](#)” (due 5 January 2023).

## Funding & Testing Opportunities

The U.S. DOE’S WPTO has released a \$10.3 million funding opportunity, “[Marine Energy Systems Innovation at Sea](#)”, to accelerate the development and testing of marine energy technologies with a focus on wave and ocean current. Concept papers are due 4 November 2022. WPTO is hosting an informational webinar on 13 October 2022 at 3:00pm EDT (7:00pm UTC).

The U.S. Testing and Expertise for Marine Energy Research (TEAMER) program is now accepting [Request For Technical Support \(RFTS\) 8](#) applications through 4 November 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.

WEAMEC (West Atlantic Marine Energy Community) has opened a [Call for Projects](#) to support eligible French researchers with writing and structuring marine energy projects that will be carried out by academic members of the community. Applications are due 30 November 2022.

## Student & Employment Opportunities

Ghent University is looking for a [Post-doctoral Assistant](#) to conduct numerical modelling of wave-structure interactions with applications in the field of coastal engineering and offshore renewable energy. Applications are due 11 October 2022.

Pacific Northwest National Laboratory's Coastal Sciences Division is recruiting a [Post Masters Research Associate - Marine Energy](#). The position will work primarily on projects associated with coastal community energy transitions, as well as marine renewable energy for small scale applications, such as aquaculture and ocean observing. Applications are due 19 October 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 31 October 2022.

Newcastle University is recruiting a [Research Assistant/Associate in Electrical Machines and Wave Energy](#) to assist in the design build and deployment of a small-scale wave energy device. Applications are due 11 November 2022.

Oscilla Power, Inc. (OPI) is seeking an [Electrical Engineer](#) who will work on the continued development and improvement of the electrical systems for OPI's wave energy systems.

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## **Upcoming Events**

### Upcoming Workshop

The National Renewable Energy Laboratory (NREL) and the Hydropower Foundation are hosting an [International Workshop on Marine Energy Workforce Development and Education Efforts](#) on 20 October 2022, as part of the International Conference on Ocean Energy in Donostia-San Sebastián. Email [Arielle Cardinal](#) with any questions and to RSVP.

### Upcoming Conferences

The Basque Energy Cluster and Ocean Energy Europe are jointly hosting the [International Conference on Ocean Energy & Ocean Energy Europe \(ICOE-OEE 2022\)](#) on 18-20 October 2022. Register [here](#).

The National Hydropower Association is hosting the [Clean Currents 2022 Tradeshow & Conference](#) on 18-20 October 2022 in Sacramento, U.S. Register [here](#).

Marine Renewables Canada is hosting the [Marine Renewables Canada 2022 Conference](#) on 22-24 November 2022 in Halifax, Nova Scotia. Register [here](#).

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## **New Documents on *Tethys Engineering***

### **[Sea states influence on the behaviour of a bottom mounted full-scale twin vertical axis tidal turbine](#) – Moreau et al. 2022**

As only a few tidal turbine developers have reached full-scale installation, the community lacks clear feedback on the validity of development tools to predict in-situ behaviour. From 2019 to 2021, HydroQuest tested its first 1 MW capacity bottom mounted twin vertical axis tidal turbine (VATT) *OceanQuest* at the Paimpol-Bréhat site, off the coast of Brittany, France. Thus, two years of operational data are available to analyse the behaviour of the full-scale VATT at sea. After describing the environmental conditions and the average performance of the machine, the wave effect on the turbine response is studied. The presence of strong waves multiplies almost by a factor 3 the fluctuation intensities of the torque, the rotational speed of the rotors and the turbine drag, without affecting significantly the mean quantities.

### **[Dynamics of hybrid offshore renewable energy platforms: Heaving point absorbers connected to a semi-submersible floating offshore wind turbine](#) – da Silva et al. 2022**

Hybrid platforms composed of a floating offshore wind turbine (FOWT) and wave energy converters (WECs) may possibly reduce the levelised cost of energy of both energy harvesting devices and improve the platform dynamics. This paper investigates the dynamics of a hybrid platform composed of a semi-submersible FOWT combined with three spherical heaving point absorbers (PAs), either floating or submerged, under turbulent wind and irregular waves conditions. Since the WECs are attached to the floating structure, complex hydrodynamic couplings occur between the floating bodies. In this regard, a parametric investigation of the power-take-off system is performed to understand the wave power absorption and motion characteristics, which are compared against their respective stand-alone configurations.

### **[Superabsorbent graphene oxide/carbon nanotube hybrid Poly\(acrylic acid-co-acrylamide\) hydrogels for efficient salinity gradient energy harvest](#) – Tan et al. 2022**

Hydrogels can be employed to recover salinity gradient (SG) energy as they can exhibit reversible swelling and shrinking behaviors in alternate freshwater and sea water. The swelling ratio and mechanic property of hydrogels are essential for the SG energy harvest. Herein, different amounts of graphene oxide (GO) or carbon nanotube (CNT) were successfully introduced to the matrix of poly(acrylic acid-co-acrylamide) (PAAM) hydrogels. Compared to the original PAAM hydrogels, both the swelling property and mechanic strength of the GO/CNT hybrid PAAM hydrogels were significantly enhanced. The results demonstrated that GO/CNT hybrid hydrogels are efficient for SG energy recovery attributed to the high swelling ability as well as the strong mechanical property.

### **[Numerical Experiments on Hydrodynamic Performance and the Wake of a Self-Starting Vertical Axis Tidal Turbine Array](#) – Zhu et al. 2022**

In this paper, based on the CFD software ANSYS-Fluent, two-dimensional numerical models are established to investigate the hydrodynamic performance of a self-starting H-Darrius vertical axis tidal turbine (VATT) array of three turbines in a triangular layout with 3D in axial and radial distance. Three main aspects are explored in this study: (1) the self-starting performance, power coefficient, flow fields, and blade force of the double-row VATT array, which are compared with a stand-alone turbine, (2) the wake development of the front and rear displacement turbines, and (3) the feasibility of the double-row self-starting VATT array in practical applications.

### **Wave energy generation and storage costs in Australia: an analysis for Wave Swell Energy Limited – Osman et al. 2022**

Wave Swell Energy Ltd (WSE) has commissioned the Australian Commonwealth Scientific and Industrial Research Organisation (CSIRO) to provide an independent analysis of the cost benefit for using wave power as a reliable supply of renewable energy. Part 1 analyses the potential for capital cost and levelised cost of electricity (LCOE) reductions of its proprietary unidirectional oscillating water column wave energy converter (WEC) technology. Part 2 Builds on Part 1 using its capital cost estimates for electrical power generated from wave energy. It then demonstrates the capital cost reductions that can be achieved by including wave energy when the cost of energy storage required to achieve a reliable energy supply is considered in electricity networks that include solar photovoltaic (PV) and wind turbine generators.

### **Pre-expansion ejector absorption power cycle for ocean thermal energy conversion – Yi et al. 2022**

Ocean thermal energy conversion technology has limited applications due to low energy utilization efficiency. This study proposes a pre-expansion ejector absorption power cycle for ocean thermal energy conversion. To enhance the turbine output, a pre-expansion separator heated by discharged warm seawater, along with an ejector, was introduced between the generator and absorber. A thermodynamic analysis strategy for the proposed cycle was conducted using MATLAB and Aspen Plus. A performance comparison between the pre-expansion ejector absorption cycle, traditional ejection cycle, and non-ejection two-stage absorption cycle under the ocean thermal energy working conditions was conducted.

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## **News & Press Releases**

### **CorPower Ocean and Maersk Supply Services install subsea cable for HiWave-5 Project – CorPower Ocean**

CorPower Ocean and Maersk Supply Services have successfully installed a 6.2km subsea export cable off the coast of northern Portugal to energise the flagship HiWave-5 Project. The 100-tonne cable was installed using the Maersk Achiever vessel and will provide power and data connection from an on-land substation in Aguçadoura to the wave energy

demonstration site 5.5km offshore. Now connected to the national grid of Portugal, the site will initially accommodate the recently unveiled CorPower C4 Wave Energy Converter (WEC) which later form part of a larger four-system array, and one of the world's first grid-connected wave farms.

### **Minesto's tidal array buildout progressing on schedule – Minesto**

Minesto, leading marine energy developer, recently announced that the site development of the world's first tidal energy kite array in Hestfjord, Faroe Islands, is efficiently progressing according to plan. The total planned capacity of the array is about 30 MW, including twenty-four kite systems at 1.2 MW each. The annual yield of the site is estimated to be 84 GWh, which is equivalent of 20% of the total Faroese energy consumption in 2021. The assessment work undertaken covers all aspects of the site development, including environmental assessment, and the infield cable routing and grid connection works. The focus ahead is to finalise the installation configuration of the first four kites forming the first 5 MW phase, as well as securing onshore service assets.

### **Ocean Power Technologies Awarded Contract with Department of Homeland Security Science and Technology Directorate on Maritime Domain Awareness – Sensors (MDA-S) Initiative – Ocean Power Technologies**

Ocean Power Technologies, Inc. (OPT), a leader in innovative and cost-effective low-carbon marine data, power, and consulting service solutions, has been selected for a \$529,025 procurement by Amentum Services. OPT was awarded the procurement to assist Amentum in providing the U.S. Department of Defense (DoD) Information Analysis Center (IAC) with land, air, space, and port & coastal surveillance services in support of the U.S. Department of Homeland Security (DHS) Science & Technology Directorate (S&T). OPT will provide the required hardware, hardware deployment support, software, software deployment support, integration services, surveillance and telemetry data, and associated training in support of a PB3 PowerBuoy® equipped with OPT's proprietary Maritime Domain Awareness solution.

### **Sustainable Marine Anchors Future of Offshore Renewable Energy with Launch of Swift Anchors and Next-Gen Rock Anchor Installation System – Sustainable Marine**

Blue economy solutions provider Sustainable Marine is unveiling its next-gen remotely operated rock anchor installation system at Wind Energy Hamburg 2022. The novel system, dubbed AROV2, is the culmination of a decade of research, development and demonstration into direct embedment anchors drilled into the seabed. It will form a key asset for Sustainable Marine's new 'Swift Anchors' division, which offers a broad range of solutions to facilitate faster and more cost-effective mooring installations for the offshore renewables sector, including floating wind. Swift Anchors' technology has been informed by Sustainable Marine's vast experience deploying its own brand of floating tidal energy platforms.

### **Deployment Milestones to Fast Track Commercial Uptake – GKinetic Energy**

Hydrokinetic solutions provider GKinetic Energy Ltd has concluded a pivotal deployment of its 12kW unit at Strangford Lough, Northern Ireland. The deployment has resulted in major technical, commercial and environmental progressions for the company as they build out their project pipeline for 2023 and 2024. The deployment was part of the VATTS (Vertical Axis Tidal Turbines in Strangford) project led by Queen's University Belfast and funded by the Centre for Advanced Sustainable Energy (CASE), supported by Invest Northern Ireland through their competence centre programme. Other partners included Grant's Electrical Services and The Electric Storage Company. The machine supplied by GKinetic has been funded by the +CityxChange project and is scheduled to be redeployed in Limerick City subject to planning.