

TETHYS ENGINEERING BLAST



28 January 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!

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

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

Announcements

Request for Information

The U.S. Department of Energy (DOE), in partnership with IDOM and Florida Atlantic University's Southeast National Marine Renewable Energy Center, is [soliciting feedback](#) from current energy converter technology developers and other stakeholders on industry requirements for a Mobile Test Vessel. Please respond by 18 February 2021.

Call for EMEC Earthshot Nominations

The European Marine Energy Centre (EMEC) is [seeking nominations](#) for [The Earthshot Prize](#), which aims to find new solutions to the world's biggest environmental problems. If you have a solution that is inspiring, inclusive, and impactful in one of the five Earthshot categories, please submit a nomination form to EMEC by 12:00pm UTC on 21 February 2022.

OPIN TAP Support

The Ocean Power Innovation Network (OPIN), an international network based in Europe, is offering a free, high-level [Technology Assessment Process \(TAP\)](#) for small and medium-sized enterprises. For more information on applying, read the [OPIN TAP Guidelines to Applicants](#).

Calls for Abstracts

The [Call for Abstracts](#) for the [9th Partnership for Research in Marine Renewable Energy \(PRIMaRE\) Conference](#) is open through 14 February 2022. The conference will take place in Cornwall, UK on 6-7 July 2022.

The [Call for Abstracts](#) for the International Conference on Ocean Energy (ICOE) and Ocean Energy Europe (OEE)'s annual event is now open until 31 March 2022. The Basque Energy Cluster and OEE will host [ICOE-OEE 2022](#) on 18-20 October 2022 in San Sebastián, Spain.

Funding & Testing Opportunities

The Selkie project has teamed up with the Lir-National Ocean Test Facility in Ireland to provide a [free tank testing opportunity](#) to Irish and Welsh wave and tidal energy developers within the Selkie Network. Applications are available [here](#) and are due 31 January 2022.

The Horizon Europe Framework Programme has launched two funding opportunities titled, "[Next generation of renewable energy technologies](#)" and "[Innovative foundations, floating substructures and connection systems for floating PV and ocean energy devices](#)". Proposals for both are due 23 February 2022.

The US DOE recently launched the [Inclusive Energy Innovation Prize](#), which will provide cash prizes of up to \$250,000 to groups and organizations that support entrepreneurship and innovation in communities historically underserved in climate and energy technology funding. Phase One Submissions are due by 5:00pm EST (10:00pm UTC) on 25 February 2022.

The [US Testing Expertise and Access for Marine Energy Research](#) program, sponsored by DOE and directed by Pacific Ocean Energy Trust, is offering [open water support for marine energy testing](#) through its facility network. Open Water Support applications may be submitted at any time, while applications for its [6th Request for Technical Support](#) will be due 17 March 2022.

The Oceanic Platform of the Canary Islands (PLOCAN) [recently announced](#) the launch of its [Winter Access Call](#) for the use of its facilities and services by public research groups and by the private sector, both national and international communities. Applications are due 20 March 2022.

Student/Employment Opportunities

The University of the Highlands and Islands is seeking interdisciplinary candidates for a [fully-funded PhD studentship](#) focused on the impacts of floating offshore wind infrastructure on the distribution and behaviour of fish and marine mammals. Applications are due 31 January 2022.

The University of Plymouth is seeking an [Offshore Renewable Energy Supergen Hub Research Fellow](#) to identify design load cases and demonstrate the impact of a probabilistic design approach in floating offshore renewable energy systems. Applications are due 17 February 2022.

The US DOE's recently launched [Clean Energy Corps](#) is now recruiting 1,000 employees to help research, develop, demonstrate, and deploy solutions to climate change. DOE is looking for candidates in a wide range of career fields and positions are available across the country.

Orbital Marine Power is looking for a [Senior Electrical Engineer](#) to provide input into the design of the power and auxiliary systems of the next generation of floating tidal turbines.

Upcoming Events

Upcoming Workshops

The Supergen Offshore Renewable Energy Hub is hosting the closing workshop for the '[From the Wind to the Tide: Using Wind Turbine Vortex Generators to enhance Tidal Turbine performance](#)' project from 3:00-4:30pm UTC on 3 February 2022 online. Register [here](#).

OPIN is hosting a [masterclass](#) on the possibilities and challenges of combining multiple renewable energy generation technologies in one offshore park from 9:00-10:00am UTC on 8 February 2022. The masterclass is based on early lessons learned during the European Scalable Offshore Renewable Energy Sources project. Register for free [here](#).

The [12th Hawai'i Okinawa Clean Energy Workshop](#) will take place online on 15-24 February 2022. This year features four primary themes including, "Renewable Ocean Energy Utilization." Presentations will be available on-demand, and a real-time panel discussion will take place on 24 February 2022 at 3:00pm HST (1:00am UTC). Register for free [here](#).

OES-Environmental is hosting an innovation session on the future of wave energy in Hawaii as part of the [2022 Ocean Sciences Meeting](#) (OSM) from 11:30am-1:30pm PST (7:30-9:30pm UTC) on 1-2 March 2022. The interactive event will use live and online breakout sessions, engaging marine scientists to extract power sustainably and efficiently from waves in Hawaii. OSM 2022 will take place from 24 February to 4 March 2022 online. Register [here](#).

Upcoming Webinars

Sandia National Laboratories' Water Power Program is hosting a webinar on the [Wave Energy Converter Design Optimization Toolbox \(WecOptTool\)](#) on 7 February 2022 from 11:00am-12:30pm EST (4:00-5:30pm UTC). WecOptTool is an open-source software for conducting optimization studies of wave energy converters and their control strategies. The webinar will cover basic concepts for WecOptTool and introduce the [new Python package](#). Register [here](#).

The US DOE Water Power Technologies Office (WPTO) is hosting a [WPTO R&D Deep Dive Webinar](#) on Marine Energy Testing Needs to Inform Infrastructure Investments from 3:00-4:00pm EST (8:00-9:00pm UTC) on 9 February 2022. A multi-lab team will share preliminary analyses on testing needs and discuss opportunities to provide feedback. Register [here](#).

The Dutch Marine Energy Centre and Hatch are hosting a webinar, “[Powering Sustainable Aquaculture with Marine Energy](#)”, from 2:00-3:30pm UTC on 15 February 2022. During the event, marine energy developers will pitch their solutions and companies from the aquaculture sector will join the discussion and draw a plan forward. Register [here](#).

Upcoming Hackathon

The [Blue-Cloud Hackathon](#), an open invitation to marine scientists, data scientists, innovators, students, and anyone who is passionate about the ocean to explore and test Blue-Cloud, will take place 7-9 February 2022. Blue-Cloud is a new, Open Science platform for the marine domain offering a wealth of data, analytical tools, and computing power. Register [here](#).

Upcoming Conferences

The Global Underwater Hub is hosting the [2022 Subsea Expo](#) on 22-24 February 2022 in Aberdeen, Scotland. The exhibition and conference are free to attend. Register [here](#).

Marine Energy Wales is hosting the [Marine Energy Wales Annual Conference 2022](#) on 22-23 March 2022 in Llandudno, Wales. Register [here](#).

New Documents on *Tethys Engineering*

[Powering an island energy system by offshore floating technologies towards 100% renewables: A case for the Maldives](#) – Keiner et al. 2022

Low-lying coastal areas and archipelago countries are particularly threatened by the impacts of climate change. Concurrently, many island states still rely on extensive use of imported fossil fuels, above all diesel for electricity generation, in addition to hydrocarbon-based fuels to supply aviation and marine transportation. Land area is usually scarce and conventional renewable energy solutions cannot be deployed in a sufficient way. This research highlights the possibility of floating offshore technologies being able to fulfil the task of replacing fossil fuels with renewable energy solutions in challenging topographical areas. On the case of the Maldives, floating offshore solar photovoltaics, wave power and offshore wind are modelled on a full hourly resolution in two different scenarios to deal with the need of transportation fuels.

[A review of commercial numerical modelling approaches for axial hydrokinetic turbine wake analysis in channel flow](#) – Niebuhr et al. 2022

Computational fluid dynamics is employed for detailed prediction of the hydrokinetic turbine performance and wake modelling. Of these, Reynolds-averaged Navier-Stokes (RANS) models are most widely used due to their ability to resolve power performance and detailed flow features at relatively low computational costs and acceptable accuracy. The limitations of these models are often not well understood when applied to complex turbine and wake dynamics which could lead to potential inaccurate and inappropriate

conclusions. This paper focuses on the prediction of the wake generation, dissipation and flow recovery using commercially available modelling software. The approach and findings of previous numerical investigations on this matter are reviewed and compared to experimental measurements reported for a dual-rotor reference turbine.

Rational design of high power density “Blue Energy Harvester” pressure retarded osmosis (PRO) membranes using artificial intelligence-based modeling and optimization – Rath et al. 2022

The challenge in harvesting Salinity Gradient Power (SGP) through pressure retarded osmosis (PRO) requires design of high power density (PD) membranes and optimized process for operation. Recent studies show that for a feasible PRO operation the minimum net PD should be around 50 W/m². In this study, a data-driven approach has been adopted for designing optimum membranes as well as operating conditions. 200 papers, from last decade, were extensively reviewed and 34 experimental research articles were shortlisted for possible data mining, to predict water flux (WF) and PD. Comprehensive screened/pre-processed data related to both membrane and process (16 inputs) was obtained from 18 articles amounting to 339 data points.

Flexible Seaweed-Like Triboelectric Nanogenerator as a Wave Energy Harvester Powering Marine Internet of Things – Wang et al. 2021

The marine internet of things (MIoT), an increasingly important foundation for ocean development and protection, consists of a variety of marine distributed sensors under water. These sensors of the MIoT have always been highly dependent on batteries. To realize in situ power supply, a flexible seaweed-like triboelectric nanogenerator (S-TENG) capable of harvesting wave energy is proposed in this study. The flexible structure, designed with inspiration from the seaweed structure, processes extensive marine application scenarios. The bending and recovering of the S-TENG structure under wave excitations are converted to electricity. As the output performance increases with the number of parallel connected S-TENG units, an S-TENG system with multiple units could serve for floating buoys, coastal power stations, and even submerged devices.

Dynamic Stability of the Coupled Pontoon-Ocean Turbine-Floater Platform-Rope System under Harmonic Wave Excitation and Steady Ocean Current – Lin et al. 2021

This research proposes a mooring design which keeps the ocean current turbine, static, balanced, and fixed at a predetermined depth under water, to ensure that the ocean current generator can effectively use current to generate electricity, and that the water pressure remains adequate value before critical pressure damage occurs. In addition, a pontoon is connected to the ocean current generator with a rope. In this study, the linear elastic model is used to simulate the motion equation of the overall mooring system. A theoretical solution of the static and dynamic stability analysis of the mooring system is proposed. The dynamic behaviors of the turbine, the floating platform, the pontoon, and the tension of the rope under the effects of waves and ocean currents are investigated.

[Theoretical and experimental study on the performance of a high-efficiency thermodynamic cycle for ocean thermal energy conversion](#) – Peng et al. 2022

A new high-efficiency ocean thermal energy conversion (OTEC) system using non-azeotropic mixed working fluids with two regenerative cycles is proposed. Based on the first law of thermodynamics, a numerical calculation model for the proposed cycle was established to study the effects of the mass fraction of mixed working fluids, turbine inlet pressure and seawater temperature on the performance of the cycle system. An experimental plant of the OTEC system was established to study the effects of seawater temperature and turbine inlet pressure on the cycle thermal efficiency. The results show that the cycle thermal efficiency and net output power of the system both increase with a decrease in cold seawater temperature or an increase in warm seawater temperature.

News & Press Releases

[DOE Announces \\$25 Million for Cutting-Edge Wave Energy Research](#) – US DOE

The U.S. DOE recently announced \$25 million in funding to support increased research, development, and demonstration of technologies that harness wave power to create electricity. The funding supports eight projects that will make up the first round of open-water testing at the PacWave South test site off the Oregon coast. These awards will strengthen wave energy technologies to accelerate their commercial viability and deploy them at scale to help decarbonize the grid and reach President Biden's goal of net-zero carbon emissions by 2050. The eight projects focus on testing designs for use in remote areas or on small, local energy grids; developing designs that can be either connected to or disconnected from the electricity grid; and environmental monitoring technologies, instrumentation systems that operators use to control devices, and other technologies.

[SABELLA and Nova Innovation celebrate tidal success in Wales](#) – Nova Innovation

Tidal energy leaders SABELLA and Nova Innovation are celebrating after securing a 12MW berth at one of the world's largest tidal energy sites off the coast of Holy Island, Anglesey in Wales. Morlais is the first project win for SABELLA and Nova Innovation after they announced in June 2021 that they will be working together on tidal energy site development. Each company will develop 6MW in the 12MW berth which covers an area of 0.65km². A 12MW tidal turbine site could power up to 10,000 homes a year. Natural Resources Wales has granted a marine license that will allow tidal turbines to be installed. Construction and operation of the project will take place in phases to allow for environmental monitoring of wildlife and habitat.

[Bombora Wave Power and Mitsui O.S.K. Lines, Ltd. strengthen their collaboration through a £3.54m investment](#) – Bombora Wave Power

Bombora Wave Power, the award-winning ocean energy company, recently announced it has received an investment of £3.54m from Mitsui O.S.K. Lines, Ltd (MOL) to further

commercialise its mWave™ energy generation technology. The investment by MOL, one of the world's largest shipping companies, follows 18 months of close collaboration between the parties and is a further endorsement of Bombora's technology and the global opportunity that mWave™ represents. MOL's funding will be used to further the development and operational capability of Bombora's patented mWave™ technology, including the completion of its 1.5MW mWave™ validation project due to be installed off the coast of Pembrokeshire in the coming months.

FORCE tidal energy sites available for all to explore in new 3D animation – Offshore Energy

Tidal energy sites of the Fundy Ocean Research Centre for Energy (FORCE) in Canada have been made available for exploration with the 3D animation created by 3D Wave Design. The 3D animation has been a part of the Canada Ocean Supercluster's Vitality project – aimed at addressing shared data challenges of the country's ocean economy and advancing ocean data analysis, management and visualization. FORCE is Canada's lead research facility for tidal stream technology, created to better understand how this technology can play a role in Canada's clean energy future and help respond to climate change impacts. The 3D animation of the tidal energy site and planned tidal energy projects that are expected to hit the waters of the Bay of Fundy in the coming years is available for exploration [here](#).

AWS Wave Energy Converter Arrives in Orkney for EMEC Demo – EMEC

A new wave energy converter, developed by Inverness-based AWS Ocean Energy, has arrived in Orkney ahead of its imminent deployment at the European Marine Energy Centre (EMEC). The 16 kW Archimedes Waveswing arrived at Hatston Pier, Kirkwall on Tuesday evening, 25 January 2022, before being transported to Copland's Dock in Stromness where it will be readied for deployment at EMEC's Scapa Flow test site in February. When deployed, the Archimedes Waveswing is moored to the seabed and sits below the surface of the sea, reacting to changes in pressure caused by passing waves. The £3.4 million prototype project has been funded by Wave Energy Scotland as part of the Novel Wave Energy Converter development programme.

MPS Lands £3.5M of Funding from UK Government – Marine Power Systems (MPS)

MPS have been awarded £3.5m of grant funding through the UK Government Floating Offshore Wind Demonstration Programme to further develop their floating platform technology and wave energy converter. They are the only UK floating offshore wind developer to be awarded this funding. MPS have developed a modular and flexible floating platform technology that is the only solution of its type that can be configured to harness wind and wave energy or as a combined solution at grid scale. MPS are now working on the deployment of a grid connected commercial megawatt scale wind and wave device in northern Spain at the Biscay Marine Energy Platform as well as the deployment of a pre-commercial scale array at EMEC, Orkney.