

TETHYS ENGINEERING BLAST



5 November 2021

Tethys Engineering is an online knowledge base 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. If you have specific content you would like circulated to the greater marine energy community, please send it to tethys@pnnl.gov for consideration.

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Announcements

Tethys Engineering Photo Library

The [Tethys Engineering Photo Library](#) currently hosts over 400 photos of marine energy devices that are available for free, third-party use! If you have photos to contribute, please [contact us](#)!

MHK Graduate Student Research Program

The US Department of Energy (DOE) Water Power Technologies Office and Oak Ridge Institute for Science and Education are now accepting applications for the [Marine & Hydrokinetic \(MHK\) Graduate Student Research Program](#). The program is open to doctoral students at US institutions and provides access to relevant expertise and resources. Applications are due 10 December 2021.

Calls for Abstracts

The Institution of Engineering and Technology is [accepting abstracts](#) for the [11th International Conference on Renewable Power Generation \(RPG 2022\)](#) through 10 December 2021. RPG 2022 will take place in London, UK on 22-23 September 2022.

The [Call for Abstracts](#) for the [All-Energy & Dcarbonise 2022 Exhibition and Conference](#) is open through 17 December 2021. The event will take place in Glasgow, UK on 11-12 May 2022.

Funding & Testing Opportunities

The US DOE plans to provide \$37 million for small businesses pursuing climate and energy research & development projects through its Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs. Letters of intent for the [SBIR/STTR Phase 2 Release 1 FOA](#) are due by 5:00pm EST (10:00pm UTC) on 9 November 2021.

The US Testing Expertise and Access for Marine Energy Research (TEAMER) Program is now offering limited [open water support for marine energy testing](#) through its facility network. Applications for the next TEAMER Request for Technical Support are due 16 December 2021.

The European Maritime, Fisheries and Aquaculture Fund has launched a Call for Proposals to support strategic collaboration in the Atlantic, Black Sea, and Western Mediterranean. Proposals for Topic 1, "[Innovative multi-use projects combining offshore renewable energy with other activities and/or with nature protection in the Atlantic](#)", are due 12 January 2022.

The Horizon Europe Framework Programme recently launched several funding opportunities, including "[Next generation of renewable energy technologies](#)" (proposals due 23 February 2022), "[Innovative foundations, floating substructures and connection systems for floating PV and ocean energy devices](#)" (proposals due 23 February 2022), and "[Demonstration of innovative rotor, blades and control systems for tidal energy devices](#)" (proposals due 26 April 2022).

Student & Employment Opportunities

The University of Plymouth is seeking a [COAST Research Fellow](#) to undertake research in marine and offshore renewable energy and carry out physical model experiments in the Coastal, Ocean and Sediment Transport (COAST) Laboratory. Applications are due 7 November 2021.

Pacific Northwest National Laboratory is seeking a [Mechanical Engineer](#) and an [Electrical Engineer](#) to join its Coastal Sciences Division, which has a robust marine research program focused on renewable ocean energy, climate change impacts in the coastal ocean, marine biotechnology, and more. Applications are due 12 and 18 November 2021, respectively.

The European Marine Energy Centre is looking for an [Environmental Officer](#) to carry out environmental monitoring services within its projects and an [Electrical Engineer](#) to assist with the management of its HV and LV systems. Applications are due by 1:00pm UTC on 17 and 19 November 2021, respectively.

The University of Plymouth is also seeking an [ORE Integration Research Fellow](#) to investigate the integration of offshore renewable energy (ORE) using hydrogen and comparative analysis of the socioeconomic and environmental aspects. Applications are due 21 November 2021.

The Environmental Research Institute at the University of the Highlands and Islands are recruiting for a [Research Fellow - Offshore Renewable Energy and the Environment](#) to work with Ørsted to design novel environmental and ecological monitoring techniques and next-generation oceanographic measurement platforms. Applications are due 22 November 2021.

Upcoming Events

Upcoming Webinars

The International Energy Agency (IEA) Technology Collaboration Programme on Ocean Energy Systems (OES) is hosting a [webinar](#) at 10:00am UTC on 10 November 2021. The webinar is the third in a series focused on IEA-OES Member Countries and will provide an outlook on the latest initiatives and projects in China, Japan, and Australia. Register [here](#).

The Selkie project, which aims to support the marine energy sector in Wales and Ireland, is hosting a webinar, “Project Engineering & Naval Architecture for Marine Operations”, at 9:00am UTC on 11 November 2021, as part of its [Meet the Expert event series](#). Register [here](#).

Offshore Renewable Energy Catapult is launching a series of half-hour lunchtime events, [The Tidal Power Express Event Series](#), to introduce key tidal power innovators. The first event, at 1:00pm UTC on 24 November 2021, will feature Nova Innovation. Register [here](#).

Marine Energy Wales and Marine Renewables Canada are hosting a joint [webinar](#) from 3:00-5:00pm UTC on 1 December 2021 to promote international shared learning across the marine renewable energy sector. Register [here](#).

Upcoming Conferences

The [VII Marine Energy Conference](#), which focuses on innovations in offshore renewable energies in the Basque Country, will take place on 9 November 2021 in Bilbao, Spain.

WavEC Offshore Renewables, in collaboration with the Embassy of Japan in Portugal, is hosting the [WavEC Annual Seminar](#) on 30 November 2021 online. Register for free [here](#).

New Documents on *Tethys Engineering*

[Wave-to-wire models of wells and impulse turbines for oscillating water column wave energy converters operating in the Mediterranean Sea – Ciappi et al. 2021](#)

Despite the huge potential, energy harnessing from sea waves is often still at a demonstrative stage. Oscillating water column (OWC) wave energy converters have proven to be one of the few suitable solutions to this end. A wave-to-wire analytical code modelling an entire wave energy converter based on the OWC technology, operating with either a Wells or an impulse turbine, was developed. The hydrodynamics, thermodynamics, and aerodynamics of the caisson were determined with a rigid piston approach. Two original low-order aerodynamic models were created for the two turbines, providing an interesting compromise between accuracy and computational cost. Finally, a control strategy was applied to monitor the instant rotor angular velocity and torque in both design and off-design conditions.

[A review of the UK and British Channel Islands practical tidal stream energy resource – Coles et al. 2021](#)

This review provides a critical, multi-faceted assessment of the practical contribution tidal stream energy can make to the UK and British Channel Islands future energy mix. Evidence is presented that broadly supports the latest national-scale practical resource estimate, of 34 TWh/year, equivalent to 11% of the UK's current annual electricity demand. Based on the findings presented in this review, we recommend that an updated national-scale practical resource study is undertaken that implements high-fidelity, site-specific modelling, with improved model validation from the wide range of field measurements that are now available from the major sites.

[Temperature effects on salinity gradient energy harvesting and utilized membrane properties – Experimental and numerical investigation – Abdelkader & Sharqawy 2021](#)

Salinity gradient energy (SGE) is a source of renewable energy which utilizes the osmotic pressure difference between two water streams of different salinities. The present paper investigates the effect of environmental water temperature variations on the performance of the pressure retarded osmosis (PRO) process employed to harvest SGE. Using experimental and numerical approaches, the effect of water temperature on water and salt permeabilities as well as membrane structure parameter have been measured using a bench scale system and a commercially available FO membrane. The water and salt permeability coefficients have been found to increase with the water temperature while the membrane structure parameter decreases.

[A review of wave energy technology from a research and commercial perspective – Guo & Ringwood 2021](#)

Although wave energy prototypes have been proposed for more than 100 years, they have still not reached full commercialisation. The reasons for this are varied, but include the diversity of device operating principles, the variety of onshore/nearshore/offshore deployment possibilities, the diversity of the wave climate at various potential wave energy sites, and the consequent lack of convergence in technology and consensus. Although a number of reviews on wave energy technology are already in the published literature, such a dynamic environment merits an up-to-date analysis and this review examines the wave energy landscape from a technological, research and commercial perspective.

[Assessing the performance and the wake recovery rate of flapping-foil turbines with end-plates and detached end-plates – Villeneuve et al. 2021](#)

Three-dimensional numerical simulations of hydrokinetic flapping-foil turbines with fully-prescribed motions are carried out using a Delayed Detached-Eddy Simulation (DDES) approach. The objective is to assess the efficiency and the wake recovery rate of flapping-foil turbines equipped with either end-plates or detached end-plates. The power coefficient and the mean streamwise velocity recovery in the wake of a turbine with

different geometries of end-plates and detached end-plates are analyzed and the results are compared to a high-efficiency reference turbine without end-plates. We show that the turbine efficiency is significantly increased when detached end-plates are used. Indeed, the best configuration simulated in this work has an efficiency value that is 21% larger than that of the reference turbine.

[The Suitability of the Pacific Islands for Harnessing Ocean Thermal Energy and the Feasibility of OTEC Plants for Onshore or Offshore Processing](#) – Kim et al. 2021

Ocean Thermal Energy Conversion (OTEC) relies on the thermal differences between ocean surface waters and cooler waters at c. 1000 m depth. The highest and most reliable thermal differentials are in the low latitudes, 20° either side of the equator, including the Pacific Islands region. Whilst in theory OTEC can utilize an inexhaustible amount of stored energy within the oceans, in practice the industry remains in its technical infancy, but with an increasing relevance to a post-fossil-fuel, environmentally conscious world. This paper analyses the economics of using OTEC in combination with existing and potential future industries of importance to the Pacific (and other oceanic) regions, including tuna fisheries, seabed minerals and green hydrogen.

News & Press Releases

[U.S. DOE awards \\$10 million to new marine energy research centre](#) – Offshore Energy

A consortium of academic institutions, including the University of New Hampshire, Stony Brook University, Lehigh University and Coastal Studies Institute, has formed a new research and development centre focused on ongoing needs for sustainable renewable ocean energy. Atlantic Marine Energy Centre (AMEC) will be one of only four National Marine Renewable Energy Centres in the country. The consortium and several energy partners will collaborate to advance ocean energy technology through research, education and outreach, complementing work from the U.S. Department of Energy's National Labs. The scientific understanding and overall effectiveness of wave energy and tidal energy conversion, including wave-powered water pumps and tidal turbine farms, is going to be AMEC's focus.

[Five Portuguese institutions join efforts to boost open sea tests of ocean technologies](#) – WavEC

Five Portuguese institutions—CEiiA, +ATLANTIC CoLAB, Fórum Oceano, INESC TEC, and WavEC—have decided to take a decisive step in the joint effort they started in 2020, and have come together to create OceanACT, a 100% Portuguese consortium that aims to promote the testing of innovative ocean technologies in Portugal. The main objective of this Consortium is to create the OceanACT-Atlantic Lab for Future Technologies, a development, test, demonstration, and qualification centre for technologically innovative services and products within the framework of the Blue

Economy, which will be responsible for managing and boosting the offshore demonstration infrastructures available in the country.

U.S. Launches Net-Zero World Initiative to Accelerate Global Energy System Decarbonization – US DOE

The United States of America recently announced the Net Zero World Initiative — a new partnership between countries working to implement their climate ambition pledges and accelerate transitions to net zero, resilient, and inclusive energy systems. Through Net Zero World, led by the U.S. Department of Energy (DOE) as part of the Build Back Better World initiative, countries committed to raising their climate ambitions will work across U.S. government and DOE’s national laboratories to create and implement highly tailored, actionable technology road maps and investment strategies that put net zero within reach. The U.S. government will also partner with a growing list of philanthropies think tanks, businesses, and universities. Argentina, Chile, Egypt, Indonesia, Nigeria, and Ukraine are founding country partners, and additional countries are on track to join soon.

£1.7BN Blue Eden Project Announced for Swansea – Marine Energy Wales

A £1.7 billion project creating thousands of well-paid jobs and placing Wales at the forefront of renewable energy innovation has been announced by an international consortium. The ground-breaking project proposed for Swansea’s waterfront will include a newly designed tidal lagoon, featuring state-of-the-art underwater turbines generating 320 megawatts of renewable energy from the 9.5km structure. The lagoon is part of the larger proposed Blue Eden project that’s being led by Bridgend-based DST Innovations and a number of business partners, with support from Swansea Council and Associated British Ports. Made possible by funding from the private sector, the innovative and economy-boosting Blue Eden will be delivered in three phases over 12 years.

Supergen Offshore Renewable Energy Hub launches a new children’s adventure book to communicate offshore renewable energy – Supergen Offshore Renewable Energy Hub

A new children’s adventure book in offshore renewable energy (ORE) has been launched by the Supergen ORE Hub as part of their COP26 activities. The Supergen ORE Hub is an Engineering and Physical Sciences Research Council funded project which provides research leadership to connect academia, industry, policymakers and the public, inspire innovation and maximise societal value in offshore renewable energy. The book aims to communicate the often-complex subject of offshore wind, wave and tidal energy to 4-6 year olds and those reading with them, as well as encouraging girls and those from other underrepresented groups to consider a career in engineering. The book has been developed as a response to an equality, diversity and inclusion scoping study, which reported that gender beliefs and stereotypes are often embedded at an early age.