

TETHYS ENGINEERING BLAST



3 December 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 Knowledge Base

The [Tethys Engineering Knowledge Base](#) currently contains over 5,700 documents on the technical and engineering aspects of wave, current, salinity gradient, and ocean thermal energy!

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.

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

Funding & Testing Opportunities

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 Horizon Europe Framework Programme recently launched a funding opportunity titled, “[Demonstration of wave energy devices to increase experience in real sea condition](#)”. Proposals are due 5 January 2022.

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 also recently 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.

Student & Employment Opportunity

Pacific Northwest National Laboratory is seeking an [Undergraduate Technical Intern](#) to join its Coastal Science Division and support research on the environmental effects of wind and marine energy. The position will primarily support the *Tethys* and *Tethys Engineering* databases by identifying, adding, and curating content. Applications are due 6 December 2021.

Upcoming Events

Upcoming Workshop

The OceanSET project is hosting its [3rd OceanSET Knowledge Sharing Workshop](#) online at 9:00am UTC on 8 December 2021. The workshop will present results of a survey carried out across ocean energy device developers in Europe, and provide an update on the EuropeWave pre-commercial procurement programme and upcoming wave energy projects. Register [here](#).

Upcoming Webinars

The US DOE’s Water Power Technologies Office is hosting a webinar from 11:30am-1:00pm EST (4:30-6:00pm UTC) on 7 December 2021 to present the relevant [Phase 1 Release 2 Topics](#)

for its [Small Business Innovation Research and Small Business Technology Transfer programs](#), which provide financial support for climate and energy R&D projects. Register [here](#).

The Net Zero Technology Centre, Offshore Renewable Energy Catapult, and ORCA (Offshore Robotics for Certification of Assets) Hub are hosting a webinar titled, “[Robotics and AI: what’s next for offshore energy?](#)”, from 2:00-3:30pm UTC on 7 December 2021. Register [here](#).

The Blue Economy Cooperative Research Centre is hosting a webinar titled, “[Riding the Wave to Zero Emission Energy](#)”, from 11:30am-1:30pm AEDT on 8 December 2021. The webinar will outline the technical aspects, market potential, and barriers associated with different methods and technologies for capturing and converting wave energy to electricity. Register [here](#).

The Next Evolution in Materials and Models for Ocean Energy (NEMMO) project is hosting a free side event, “[On the Cutting Edge of Tidal Blade Design and Materials](#)”, at 1:00pm UTC on 8 December 2021, as part of the Ocean Energy Europe Conference & Exhibition. Register [here](#).

Offshore Renewable Energy Catapult recently launched a series of half-hour lunchtime events, [The Tidal Power Express Event Series](#), to introduce key tidal power innovators. The third event, at 1:00pm UTC on 8 December 2021, will feature SIMEC Atlantis. Register [here](#).

The European Technology and Innovation Platform for Ocean Energy (ETIP Ocean) is hosting a [webinar](#) on the economic and social value of ocean energy at 2:00pm UTC on 14 December 2021. During the webinar, the lead authors of two key studies that calculate the benefits of ocean energy in Europe in terms of Gross Value Added and jobs will present the results. Register [here](#).

Upcoming Conference

The Supergen Offshore Renewable Energy (ORE) Hub is hosting the [4th Supergen ORE Hub Annual Assembly](#) on 18-20 January 2022 in Plymouth, UK and online. To accompany the event, the Hub is also hosting an [Early Career Researcher Forum](#) on 18 January 2022. Register for free.

New Documents on *Tethys Engineering*

[Medium-term variability of the UK's combined tidal energy resource for a net-zero carbon grid](#) – Todeschini et al. 2022

The small area of the United Kingdom relative to weather systems makes renewable energy sources variable on short time scales. Short term variability is therefore a growing concern with increasing amounts of renewable energy integration. In this work, we address how tidal energy can contribute to reducing medium-term variability in the future UK energy mix. Two tidal integration scenarios are defined for 2050: for each scenario, a 5-min interval generation profile is calculated using an oceanographic model of UK tides, and the medium-term variability is assessed. Here we show that tidal power shows a lower level of variability compared to other resources. During spring tides, a national network of tidal power stations can produce continuous, although variable, electricity.

Optimal strategies of deployment of far offshore co-located wind-wave energy farms – Saenz-Aguirre et al. 2022

The generation of green hydrogen, that is, generated from renewable energies represents an important step towards a carbon-free economy. In this paper, the optimal locations in the Atlantic Ocean for hybrid co-located wind and wave energy farms to generate hydrogen are identified. Special focus is put on the auxiliary hydrogen generation of the wave energy converters. The methodology developed is based on the Maximum Covariance Analysis and also incorporates the constrain derived from the distance to the coast on both sides of the Atlantic. The locations identified could be the optimal destination of special vessels intended to generate hydrogen from wind and waves.

A capacitor-based power equivalent model for salinity-gradient osmotic energy conversion – Liu et al. 2021

Converting the salinity-gradient into electricity via ion migration in nanoconfined channels driven by the salt concentration gap between sea and river water is an important renewable energy utilization method. The osmotic energy conversion device is regarded as a power source with constant voltage output in the conventional constant voltage source (V-source) power equivalent circuit model, which is based on a steady state with constant concentration on both sides of the membrane. In this study, an unsteady equivalent capacitor–capacitor/resistor (C-CR) power equivalent circuit model is proposed to consider the salt concentration variation during actual operation.

Influence of helical triangle blade on the performance of vertical axis marine current turbine – Zhu et al. 2021

The vertical axis marine current turbine is emerging as a promising candidate for renewable energy applications, while its wide application is currently limited by low and unsteady power output. In this paper, the influence of helical triangle blade on the performance of vertical axis marine current turbine has been investigated. Four types of helical triangle blades with helical wrap angle of 15°, 30°, 45° and 60° at half blade height have been studied, and compared with conventional straight blades. It is found that the stability of the power output of the turbines is improved by the helical triangle blade with the increase of helical wrap angle up to 15°. The helical triangle blade with 15° helical wrap angle named as “HT blade” has the best performance.

Wave energy cost projections: A report for Wave Swell Energy Limited – Hayward 2021

CSIRO was commissioned by Wave Swell Energy Ltd (WSE) to independently analyse the potential for capital cost and levelised cost of electricity reductions of its proprietary unidirectional oscillating water column wave energy converter (WEC) technology. The analysis is based on the widely accepted concept of “learning-by-doing”. As to be expected, individual firm learning rate data was not available for WSE’s WEC as it is a novel technology that has had limited deployment thus far. An estimated learning rate based on industry wide learning rates was used as the next best approach. It is not known

how different an individual firm's learning rate might be compared to the industry wide learning rate, which is a source of some uncertainty in the methodology.

Potential Ocean Thermal Energy Conversion in Indonesian Waters Territory – Suprijo et al. 2021

This study aims to estimate Ocean Thermal Energy Conversion (OTEC) resources in Indonesian Seas using six years (from 2011 to 2016) daily basis data resulted from numerical simulation of high-resolution (1/10°) ocean model, namely Japan Coastal Ocean Predictability Experiment (JCOPE), with covering a wide area (e.g. 9°N to 11°S and 95°E to 141°E). Estimation of thermal power resources was calculated based on temperature differences between surface layer and deep layer with water depth of 20 m and 1000 m from sea surface respectively. The area, where is favorable for OTEC operation in Indonesia waters, is estimated about 3,773,552.7 square kilometers with total potential power rate that can be harvested around 451.7 GW per day.

News & Press Releases

UK government announces biggest investment into Britain's tidal power – UK Government

The UK government will invest £20 million per year in Tidal Stream electricity as part of its flagship renewable energy auction scheme, kickstarting a brand-new chapter for the tidal industry and creating jobs across the UK. As part of the fourth allocation round of the Contracts for Difference Scheme due to open next month, the UK government will ensure that £20 million per year will be ringfenced for Tidal Stream projects, giving the marine energy sector a chance to develop their technology and lower their costs in a similar way to the UK's world-leading offshore wind industry. This will bring the total funding for this allocation round to £285 million per year.

Bermuda and Seabased Sign Agreement for Site of 40 MW Wave Energy Power Park – Seabased

Fresh on the heels of COP26, Bermuda is leading in the energy transition by inaugurating the third vertical of renewable energy: blue ocean power. On 22 November in Hamilton, Bermuda, Deputy Premier and Minister of Home Affairs Hon. Walter Roban JP, MP, announced an agreement to move forward on the development of what promises to be the world's first utility-scale commercial ocean wave power park. With a 40MW capacity, the park will fuel the island's grid, providing roughly 10% of Bermuda's energy needs. As part of the project, Seabased has been working with stakeholders in Bermuda and is finalizing an Environmental Impact Report.

Tidal energy pioneer Nova Innovation takes FLITE in Indonesia – Nova Innovation

Nova Innovation has won funding that could deliver the first ever tidal turbine array in Indonesia. Innovate UK has awarded £200k to Nova's FLITE (Feasibility of Larantuka

and Indonesian Tidal Energy) project that will deliver a feasibility study for a 7MW tidal array in Larantuka Strait. Larantuka Strait lies between the islands of Flores and Adonara and has one of the strongest tidal currents in Indonesia. The array would utilise Nova's next generation 100kW tidal turbines – innovative, world-leading technology that has been powering homes and businesses in Shetland since 2016. FLITE is the first Asian project for Scottish-based Nova Innovation, who have teamed up with leading Indonesian University Institut Teknologi Sepuluh Nopember (ITS) to deliver the work.

SeaRAY Could Power Offshore Work and Help Protect Oceans With Energy From Ocean Waves – US DOE

About 80% of the ocean is still a mystery and this vast, unmapped territory is home to an unknown number of species—about 91% of which are unclassified. Now, a bright yellow device called the SeaRAY autonomous offshore power system (AOPS) could help scientists study the unmapped ocean and, at the same time, protect its mysterious species from more pollutants. The small, portable device makes clean energy from the ocean's waves and collects and sends data, like an oceanic cell tower. Although many previous marine energy systems only produced small amounts of power, the SeaRAY AOPS can generate between 100 watts and 20 kilowatts—enough energy to power anything from a seafloor data-gathering system to a medium-sized subsea vehicle or surface vessel.

Sustainable Marine set to deliver Atlantic Canada's first instream tidal energy in early 2022 – Ocean Energy Europe

Sustainable Marine is set to demonstrate that Nova Scotia can produce vast amounts of clean and predictable energy from its world-famous tidal streams, after completing construction of its substation at Grand Passage. The firm has now successfully constructed an onshore electrical substation in the Bay of Fundy, which will harness the untapped power from some of the world's highest tides via the PLAT-I tidal energy platform – which is now installed and due to be grid-connected and generating energy by early 2022. This news comes as Sustainable Marine ramps up capacity in the province, following a multi-million-dollar investment in the most advanced marine operations support vessel of its kind on the East Coast of Canada, the Tidal Pioneer.

Wave Swell Energy Wins Energy Globe Award – Wave Swell Energy

Wave Swell Energy (WSE) was recently announced as the winner of the Energy Globe Awards in the Fire (Energy Generation) category. The Energy Globe Awards, conducted annually since 2000, are considered to be one of the world's most prestigious awards for sustainability, with three other categories being Air, Water, and Earth. WSE is very pleased to receive such notable recognition on a global scale, particularly in light of its successful King Island project and the independent assessment of the potential of its UniWave technology by Australia's national science agency, the Commonwealth Scientific and Industrial Research Organisation.