

TETHYS ENGINEERING BLAST



2 July 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

Contributing to *Tethys Engineering*

Did you know the [Tethys Engineering Knowledge Base](#) contains over 5,400 documents from around the world? So long as an English title and abstract are available, *Tethys Engineering* can host documents in any language! If you know of any documents that belong on *Tethys Engineering*, send a link to tethys@pnnl.gov!

DOE Request for Information

The United States (U.S.) Department of Energy (DOE) released a [Request for Information](#) to understand the current barriers and actions needed to make its funding opportunities and innovation and entrepreneurship activities more inclusive, just, and equitable. Responses are due by 5:00pm EDT (9:00pm UTC) on 6 August 2021.

NHA State of Marine Energy Survey

The National Hydropower Association (NHA) has launched a 10-minute [State of Marine Energy Survey](#) to help the association understand the state of U.S. development, challenges facing the sector, and where investment is needed to advance commercialization. The survey is open to all marine energy professionals based in the U.S.

TIGER Survey

The Tidal Stream Industry Energiser Project (TIGER) is creating a volume manufacturing roadmap to evaluate how tidal energy can transition towards upscaled industrialization. As part of the initiative, TIGER has launched a [survey](#) open to all companies with interest in the sector.

Calls for Papers

The *Journal of Marine Science and Engineering* is inviting submissions for several upcoming Special Issues, including "[Marine Renewables–Infrastructures and Physical Testing](#)" (due 31 July 2021), "[Marine Installations and Constructions](#)" (due 25 August 2021), and "[Advances in Oscillating Water Column Wave Energy Converters \(OWC-WEC\)](#)" (due 10 September 2021).

Processes is inviting submissions for several upcoming Special Issues, including "[Wave Energy Technologies in Korea](#)" (due 31 July 2021), "[Wave Energy Technologies in Taiwan](#)" (due 31 August 2021), and "[Desalination Processes by Renewable Energy \(RE\)](#)" (due 31 October 2021).

Funding & Testing Opportunities

In collaboration with Innovate UK, the United Kingdom (U.K.) Department for Business, Energy and Industrial Strategy launched an opportunity for businesses in England, Wales, and Northern Ireland to bid for funding from the [Industrial Energy Transformation Fund](#) (IETF). Applications for the [Phase 1: Spring 2021](#) IETF close on 14 July 2021.

The Offshore Renewable Energy (ORE) Catapult's Marine Energy Engineering Centre of Excellence (MEECE) has launched an [Innovation Challenge](#) to support UK-based applicants developing monitoring methodologies for tracking underwater species behavior in and around tidal stream turbines. Applications are due 11 August 2021.

Innovate UK has also launched another round of [Smart Grants](#) for eligible UK organizations to apply for a share of up to £25 million for game-changing and commercially viable research and development innovation. Applications are due by 10:00am UTC on 25 August 2021.

Interreg North-West Europe recently launched the [4th Ocean DEMO](#) (Demonstration Programme for Ocean Energy Pilot Farms and Supporting Technologies) [Call for Applications](#). Successful applicants will receive free access to test their ocean energy products in real sea environments at the project's network of test centers. Applications are due 10 September 2021.

The Horizon Europe Framework Programme has launched the [European Innovation Council \(EIC\) Accelerator Challenges](#) to support small and medium enterprises developing game-changing innovations, including renewable energy. Applications are due by 6 October 2021.

Student & Employment Opportunities

ORE Catapult is recruiting for an [Intern](#) to join its Analysis & Insights Team in the Research & Disruptive Innovation Directorate. The position will involve data entry and working on ORE Catapult's UK supply chain database. Applications are due by 5 July 2021.

The University of Plymouth is seeking a short term [Post-Doctoral Research Fellow](#) to analyze the tide, wave, wind, and solar contributions to island energy supply as part of the INTERREG Channel Area's Intelligent Community Energy (ICE) project. Applications due by 7 July 2021.

The Pacific Northwest National Laboratory is seeking a [Post Masters Research Associate](#) who will work primarily on projects associated with developing marine energy projects for coastal communities and other small-scale markets, such as aquaculture, mariculture and ocean observing. Applications are due by 9 July 2021.

ORE Catapult is also recruiting for a [Regional Innovation Manager](#) to promote and grow ORE Catapult's impact in the South West. The position will be responsible for coordinating technical development, project management guidance, and standards and acceptance criteria. Applications are due by 12 July 2021.

Swansea University is seeking a [Research Assistant](#) to join a project aiming to synthesize ultra-low dissipative and high fatigue life filled polymers with the required stiffness to be used in flexible polymeric structures for wave energy. Applications are due by 22 July 2021.

Upcoming Events

Upcoming Training

The DTOceanPlus project is hosting an online training session to demonstrate its suite of second-generation advanced design tools for the selection, development, and deployment of ocean energy systems. On 6 July 2021, the team will demonstrate the Stage Gate tool, with links to other tools. Learn more and register [here](#).

Upcoming Webinars

The International Integrated Wave Energy Research Group is hosting a webinar, "European Green Deal and Its Targets in terms of Ocean Energy", at 1:00pm CEST (10:00am UTC) on 6 July 2021. Register [here](#) by 5 July 2021.

The Selkie Project, which aims to support the marine energy sector in Wales and Ireland, is organizing a [‘Meet the Expert’ event series](#) focused on providing business support for companies looking to diversify in to the marine energy sector.

- Register [here](#) for the fifth event at 9:00am UTC on 8 July 2021, where Watson Ord Renewables will cover key topics in health & safety requirements for offshore renewables developments.

- Register [here](#) for the sixth event at 1:00pm UTC on 8 July 2021, where Irish Marine Safety will cover topics in safety training, management systems, risk assessments, and emergency procedures required for marine energy activities in Ireland.

In collaboration with the International Energy Agency (IEA) Ocean Energy Systems Technology Collaboration Programme (OES TCP), the Ocean Power Innovation Network (OPIN) is hosting a [webinar](#) at 3:00pm CEST (1:00pm UTC) on 15 July 2021. This webinar will provide an overview of activities and highlight progress made by OPIN & IEA-OES in 2020. Register [here](#).

The U.S. DOE Water Power Technologies Office (WPTO) is hosting its [Semiannual Stakeholder Webinar](#) at 3:30pm EDT (7:30pm UTC) on 15 July 2021. During the webinar, the new Acting Director of WPTO will share water power highlights from the President's Fiscal Year 2022 budget request, and program representatives will highlight ongoing programs and open opportunities. Register [here](#).

As part of its *R&D Deep Dive Webinar Series*, the U.S. DOE WPTO is also hosting a webinar, "Contributing Data and Information to PRIMRE", at 3:00pm EDT (7:00pm UTC) on 28 July 2021. This webinar will provide a brief introduction to [PRIMRE](#) (Portal and Repository for Information on Marine Renewable Energy), WPTO's centralized system for storing, curating, and disseminating data and information for all aspects of marine energy, and then focus on how you can contribute your data to the various knowledge hubs that make up PRIMRE, including the *MHK Data Repository*, *Tethys*, and *Tethys Engineering*. Register [here](#).

Upcoming Conferences

The [Offshore Technology Conference \(OTC 2021\)](#) will take place 16-19 August 2021 in Houston, Texas (U.S.) and virtually.

[OCEANS 2021 San Diego – Porto](#) will take place 20-23 September 2021 in San Diego, California (U.S.) and virtually. Early bird registration is available until 16 August 2021.

The [Ocean Energy Europe Conference & Exhibition \(OEE 2021\)](#) will take place 6-7 December 2021 in Brussels, Belgium. Early bird registration is available until 15 August 2021.

New Documents on *Tethys Engineering*

[Wave energy resources assessment for the multi-modal sea state of Hawaii](#) – Li et al. 2021

This paper describes development and validation of a 32-year wave hindcast for Hawaii as part of the energy resources assessment for the US and affiliated territories. The nested model system comprises structured WAVEWATCH III for the globe and unstructured SWAN around the Hawaiian Islands with wind forcing from the Climate Forecast System Reanalysis and its regional downscaling. The development effort follows the International Electrotechnical Commission (IEC) standards. The hindcast is first validated with buoy measurements in terms of the six IEC wave energy resources

parameters. The comparison shows good overall agreement but with greater uncertainties for some of the parameters intended for narrowband spectra.

Sea-trial verification of a novel system for monitoring biofouling and testing anti-fouling coatings in highly energetic environments targeted by the marine renewable energy industry – Want et al. 2021

A novel system was developed to deploy settlement panels to monitor biofouling growth in situ and evaluate antifouling coatings at depths representative of operational conditions of full-scale marine renewable energy devices. Biofouling loading, species diversity, and succession were assessed at depths ranging from 25-40 m at four test sites in Orkney (UK) featuring extreme wave and tidal current exposure to more sheltered conditions. Evaluations were carried out over a period of 8 months with intermediate retrieval of samples after 3 months. Early pioneer fouling communities, comprised of colonial hydroids, were succeeded by tube-forming amphipods across sites while solitary tunicates dominated in greater shelter.

Preparing for the future: The impact of sea-level rise on salinity gradient energy in estuaries – Haddout & Priya 2021

In the present work, the effect of sea level rise (SLR) on blue energy (SGE) in estuaries is investigated for the first time by means of 2D-numerical computation; and the model results are plotted by Ocean Data View (ODV). The Sebou estuary (Morocco) was selected as an example location due to the availability of field survey data and is an optimal site for energy production. To assess the impacts of SLR on salinity gradient energy, three scenarios of sea level rise were used in the model simulation by adding water depths of 0.3 ($\Delta H-30$), 0.6 ($\Delta H-60$), and 0.9 ($\Delta H-90$), combined with freshwater conditions at upstream of the mouth. Firstly, the model was then combined to assess the impact of transport time scales (i.e., Flushing Time (TF) and Residence Time (RT)) due to possible sea-level rise on blue energy in the mouth of the estuary.

The performance of a weir-mounted tidal turbine: An experimental investigation – Verbeek & Uijttewaal 2021

The tidal flow between bridge pillars and through open barriers is a promising source of ocean energy which can be exploited using tidal stream turbines, as proven recently by operational demonstration plants. The aim of this study is to clarify the consequences for the power output of tidal turbines when placing them in a hydraulic structure. To this end, experimental measurements of turbine power and wakes are performed, using a down-scaled turbine mounted at a submerged weir. The results are compared to an analytical model, validating its range of application for optimising turbine-weir geometries. The experimental data show that the power coefficient of the turbine can be increased by optimising the blockage of the channel and the distance between the turbine and the structure, which is related to the wake configuration.

[A Numerical Simulation of a Variable-Shape Buoy Wave Energy Converter](#) – Zou & Abdelkhalik 2021

Wave energy converters (WECs) usually require reactive power for increased levels of energy conversion, resulting in the need for more complex power take-off (PTO) units, compared to WECs that do not require reactive power. A WEC without reactive power produces much less energy, though. The concept of Variable Shape Buoy Wave Energy Converters (VSB WECs) is proposed to allow continuous shape-change aiming at eliminating the need for reactive power, while converting power at a high level. The proposed concept involves complex and nonlinear interactions between the device and the waves. This paper presents a Computational Fluid Dynamics (CFD) tool that is set up to simulate VSB WECs, using the ANSYS 2-way fluid–structure interaction (FSI) tool.

[Sensitivity Analysis of OTEC-CC-MX-1 kWe Plant Prototype](#) – Tobal-Cupul et al. 2021

The Mexican Caribbean Sea has potential zones for Ocean Thermal Energy Conversion (OTEC) implementation. Universidad del Caribe and Instituto de Ciencias del Mar y Limnología, with the support of the Mexican Centre of Innovation in Ocean Energy, designed and constructed a prototype OTEC plant (OTEC-CC-MX-1 kWe), which is the first initiative in Mexico for exploitation of this type of renewable energy. This paper presents a sensitivity analysis whose objective was to know, before carrying out the experimental tests, the behavior of OTEC-CC-MX-1 kWe regarding temperature differences, as well as the non-possible operating conditions, which allows us to assess possible modifications in the prototype installation.

News & Press Releases

[Euskadi, international wave energy test centre: Finnish firm Wello's Penguin device to undergo two years of trials at BiMEP](#) – Biscay Marine Energy Platform (BiMEP)

A new floating wave energy collector recently arrived in the Basque Country where it is to undergo two years of tests at the BiMEP facilities in Armintza. Tech firm Wello chose the Basque marine energy test site for preliminary trials on its technology prior to future commercial roll-out. Regional Vice-Minister for Industry and President of BiMEP, Javier Zarraonandia, together with Director General of the Basque Energy Agency, Iñigo Ansola, and the Director of Renewable Energies and the Electricity Market at the IDAE, Víctor Marcos Morell, recently paid a visit to the Penguin wave power generation device. The device has a maximum power of 1 MW and although it is still at trial phase, it could generate up to 1 million kWh. This power will be transferred to the land via BiMEP's subsea cables and then sent to the grid.

[A Milestone for Tidal Energy: Verdant Power Successfully Retrieves a Test Turbine After Six Months of Continuous Operation in New York](#) – U.S. DOE WPTO

On a chilly and rainy afternoon in May, Verdant Power staff and marine energy enthusiasts were buzzing with excitement after a successful retrieve-and-replace (R&R) operation of one of the three tidal turbines at Verdant Power's Roosevelt Island Tidal Energy (RITE) Project on New York's East River. By providing tidal energy to the local utility grid, Verdant Power's RITE Project exemplifies how tidal power can be incorporated into the existing power system. The R&R operation was intended to demonstrate Verdant Power's new TriFrame™ mount, which was designed to ease operations and maintenance tasks for marine energy systems. Supported by the U.S. DOE's WPTO, the RITE Project aims to demonstrate clean distributed energy to New York and how such technology could be used throughout the world.

Nova and SABELLA join forces to develop tidal energy projects in France and UK – Nova Innovation

Nova Innovation and SABELLA are pleased to announce a Memorandum of Understanding (MoU) between the two leading tidal energy technology companies. The collaboration will accelerate development of tidal energy sites for both Scottish and French companies, combining expertise to drive rapid scale up of installed capacity in the tidal energy sector in both the UK and France. The alliance will include co-operation across French and UK sites, driving down costs, catalysing opportunities for funding, and delivering economies of scale to tackle the climate emergency. Nova Innovation and SABELLA will share information on site development, technical expertise, environmental data and their thriving networks to accelerate the time it takes to deploy projects and maximise cost efficiency of site development.

U.S. DOE funds corrosion and biofouling research for marine energy devices – Offshore Energy

The U.S. DOE Office of Technology Transitions has awarded funding for a research project that will seek to optimise non-toxic coatings for control of biofouling and corrosion on marine energy devices and facilities. Pacific Northwest National Laboratory (PNNL) will lead a project to scale up, field test, and optimise the non-toxic, durable, economical coatings for control of biofouling and corrosion on marine energy devices and facilities. The project will be based on PNNL's patented Superhydrophobic Lubricant Infused Composite (SLIC) technology. SLIC provides antifouling performance, durability, and decreased hydrodynamic drag without using toxic materials that can help prevent biofouling of water power civil works in both freshwater and marine environments.

CorPower ramps up Portugal operations ahead of HiWave-5 deployment – CorPower Ocean

CorPower's Portuguese operation continues to gather pace with qualification of its composite hull fabrication facility, ahead of the flagship HiWave-5 deployment later this year. The facility located in the commercial Port of Viana do Castelo has been operational since the beginning of 2021. CorPower's composite team has in cooperation

with machine and materials suppliers now reached an important milestone with qualification of the fabrication process. The process characterization work has been performed on $\frac{1}{4}$ scale models of CorPower's upcoming C4 hull design, which has allowed rapid iterations with continuous tuning to reach the targeted quality and material properties. With this milestone reached, the team is now preparing for fabrication of full-scale hulls.