

# TETHYS ENGINEERING BLAST



**13 August 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](mailto:tethys@pnnl.gov) for consideration.

---

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

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

---

## **Announcements**

### Call for Independent Experts

[EuropeWave](#) is looking for [independent experts](#) to take part in the assessment of applications to its Pre-Commercial Procurement programme. Experts should have knowledge of marine energy and mechanical and electrical engineering design processes. Applications due 20 August 2021.

### ETIPP Seeks Regional Partner

The US Department of Energy's (DOE's) [Energy Transitions Initiative Partnership Project](#) (ETIPP) is seeking a regional partner in the Pacific Northwest to engage and support remote and island communities as they plan for energy resilient solutions. With support from the Water Power Technologies Office and others, ETIPP expands on the work of the US DOE's Energy Transitions Initiative. [Regional partner proposals](#) are due August 31.

### Calls for Abstracts

The Marine Technology Society and Oceanic Engineering Society are now accepting abstracts for [OCEANS 2022 Chennai](#). The conference and exposition will take place in Chennai, India on 21-24 February 2022. Abstracts are due by 15 August 2021.

The Marine Alliance for Science and Technology for Scotland (MASTS) is now accepting abstracts for the [11<sup>th</sup> Annual Science Meeting](#), which will take place virtually and in Glasgow, Scotland on 5-7 October 2021. Abstracts are due by 3:00pm UTC on 23 August 2021.

The Call for Abstracts for [Oceanology International](#), which includes a conference track on offshore energy development, is now open. The conference and exhibition will take place in London, UK on 15-17 March 2022. Abstracts are due by 31 August 2021.

### Calls for Papers

*Ocean Engineering* is inviting submissions for a [Special Issue on Wave Energy Conversion](#) until 30 September 2021, and will begin accepting submissions for its [Special Issue on Hybrid Numerical Modelling in Wave-Structure Interactions](#) on 15 October 2021.

The *Journal of Marine Science and Engineering* is inviting submissions for several Special Issues, including "[Ocean Engineering and Oceanography for Carbon Neutralization](#)" (due 25 September 2021), "[Offshore and Onshore Marine Renewable Energy](#)" (due 5 October 2021), and "[Optimization and Energy Maximizing Control Systems for Wave Energy Converters](#)" (due 10 October 2021).

*Processes* is inviting submissions for several Special Issues, including "[Renewable Energy Technologies and Systems: Technical, Environmental, Economic, Social, and Cultural Challenges](#)" (due 30 September 2021), "[Modeling and Operation of Renewable Energy System](#)" (due 31 October 2021), and "[Sustainable Development Processes for Renewable Energy Technology](#)" (due 30 November 2021).

### Funding & Testing Opportunities

The US DOE has issued a Funding Opportunity Announcement (FOA) titled "[Advancing Wave Energy Technologies through Open Water Testing at PacWave](#)" to support R&D at PacWave South and advance wave energy technologies toward commercial viability. Concept papers are due by 5:00pm EDT (9:00pm UTC) on 13 August 2021 and full applications are due 5 October 2021. View the FOA for more details [here](#).

Innovate UK is launching 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 R&D innovation. Applications are due by 10:00am UTC on 25 August 2021.

The US DOE has also announced a plan to provide \$37 million for small businesses pursuing climate and energy R&D projects through its Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs. Letters of intent for the [SBIR/STTR Phase 1 Release 1 FOA](#) are due by 5:00pm EDT (9:00pm UTC) on 30 August 2021. This is the first of four SBIR/STTR FOAs for 2022, so stay tuned for additional opportunities.

Interreg North-West Europe 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 US Testing Expertise and Access for Marine Energy Research (TEAMER) program is now accepting applications for its 4<sup>th</sup> Request for Technical Support (RFTS) through 16 September 2021. Applications will now be reviewed on a quarterly basis and those submitted after the due date will be considered for the next RFTS. Check out the [TEAMER website](#) for more details.

The Oceanic Platform of the Canary Islands (PLOCAN) has opened its [Summer Access Call for 2021](#). Applicants interested in accessing PLOCAN facilities and services are encouraged to contact PLOCAN before submitting their proposal. Applications due 20 September 2021.

### Student & Employment Opportunities

The National University of Ireland Galway is seeking candidates for a [PhD Research Position](#) focused on development of new protocols for introducing complex cyclic loading spectra during fatigue testing of full-scale tidal turbine rotor blades. Applications are due by 22 August 2021.

The Delft University of Technology is seeking candidates for a [PhD in Variable Wave Energy Converter Farms](#). This position will investigate wave structure interactions in large scale wave energy converter farms with different geometries, leading to the design of tools and methodologies. Applications are due by 1 September 2021.

---

## Upcoming Events

### Upcoming Course

The RENOVBLES project, which aims to support the marine sector in the Euroregion, is hosting an online course on artificial intelligence for marine renewables and use cases in marine energy generation using deep learning on 22 September 2021. Learn more [here](#).

### Upcoming Webinar

The Selkie project, which aims to support the marine energy sector in Wales and Ireland, is hosting a webinar at 9:00am UTC on 19 August 2021 as part of its [Meet the Expert event series](#). During the webinar, Mainstay Marine Solutions will cover key successes and challenges of fabrication and engineering for the marine energy sector. Register [here](#).

### Upcoming Conferences

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

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

The National Hydropower Association is hosting the [Clean Currents 2021 Tradeshow & Conference](#) on 20-22 October 2021 in Atlanta, US. Early bird registration is available until 16 August 2021.

---

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

### **[A Decision Support Tool for Long-Term Planning of Marine Operations in Ocean Energy Projects](#) – Fonseca et al. 2021**

Ocean energy is a relevant source of clean renewable energy, and as it is still facing challenges related to its above grid-parity costs, tariffs intended to support in a structured and coherent way are of great relevance and potential impact. The logistics and marine operations required for installing and maintaining these systems are major cost drivers of marine renewable energy projects. Planning the logistics of marine energy projects is a highly complex and intertwined process, and to date, limited advances have been made in the development of decision support tools suitable for ocean energy farm design. The present paper describes the methodology of a novel, opensource, logistic and marine operation planning tool, integrated within DTOceanPlus suite of design tools, and responsible for producing logistic solutions comprised of optimal selections of vessels, port terminals, equipment, as well as operation plans, for ocean energy projects.

### **[Instability of the tip vortices shed by an axial-flow turbine in uniform flow](#) – Posa et al. 2021**

Large-eddy simulation is utilized to reproduce the instability of the tip vortices shed from the blades of an axial-flow turbine. The oscillations of their helical trajectories trigger mutual interaction between them. This accelerates the process of their destabilization, leading to leapfrogging and eventually to breakdown into smaller structures and loss of coherence, initiating wake contraction and momentum recovery from the outer radii towards the wake core. A strong correlation of the tip vortices instability with the behaviour of the Reynolds stresses and turbulence production is observed. In particular, the turbulent shear stress tied to the fluctuations of the radial axial velocity components reveals the significant role of the interaction of each tip vortex with the outer region of the wake of the preceding blade, creating a ‘bridge’ between neighbouring tip vortices.

### **[Impact of tidal currents and model fidelity on wave energy resource assessments](#) – Beya et al. 2021**

Numerous studies have identified wave energy as a valuable renewable energy option in the international effort to decarbonize energy systems. For North America's Pacific Northwest region, most of previous efforts to characterize the wave climate had limited nearshore spatial resolution, were driven by simplistic wave boundary conditions, and/or did not include the effect of wave-current interactions. This work identifies the impact of model fidelity on the wave resource characterization and develops an understanding of

the impact of tidal currents on the region's wave energy resource. A comparison of the outputs from two wave models, identical except for the influence of tidal currents, indicated that tidal current induced differences in the energy period that could exceed  $\pm 5$ s, while the significant wave height and wave power density were consistently decreased across the model domain by up to 4% and 9%, respectively.

### **Modeling, simulation, and equilibrium analysis of tethered coaxial dual-rotor ocean current turbines – Metoyer et al. 2021**

Tethered multirotor axial flow turbines have been proposed to overcome the many challenges associated with extracting ocean current energy where deep waters render seabed mounting strategies infeasible. However, flexible systems are inherently more susceptible to perturbation than fixed systems. The effects of flow misalignment on the hydrokinetic energy conversion of multirotor coaxial turbines have been investigated recently; however, the spatial dynamics and equilibrium behaviors of tethered coaxial turbines have not been well characterized, limiting the ability of designers to explicitly tailor the device behavior. In this work, a computational model of a dual-rotor coaxial turbine is presented, and the model is employed to explore the equilibrium behavior of the turbine with variations in parameters.

### **Indirect air CO<sub>2</sub> capture and refinement based on OTEC seawater outgassing – Straatman & van Sark 2021**

In this paper, we propose a low-cost method to capture and purify CO<sub>2</sub> from ocean water indirectly from the atmosphere. Atmospheric CO<sub>2</sub> dissolves in seawater following Henry's law. In open-cycle ocean thermal energy conversion (OC-OTEC), being a heat engine, large quantities of water are used to generate electricity from temperature differences in the ocean. CO<sub>2</sub> and other gases dissolved in seawater are extracted from seawater by a vacuum compressor, being essential for heat transfer in OC-OTEC. Non-condensable gases containing CO<sub>2</sub> from OC-OTEC are currently considered a waste gas stream. Based on literature, we calculate cold water non-condensables containing up to 14% CO<sub>2</sub>. These non-condensables can be refined further to 80–90% purity with a water absorption process, inspired by those as used in the biogas industry.

### **Modeling and Optimization of Membrane Process for Salinity Gradient Energy Production – Song 2021**

When hydraulic pressure was added on the feed side of the membrane in the otherwise conventional pressure retarded osmosis (PRO) process, the production rate of the salinity gradient energy could be significantly increased by manipulating the hydraulic pressures on both sides of the membrane. With hydraulic pressure added on the feed side of the membrane, much higher water flux could be obtained than that under the osmotic pressure of the same value. The osmotic pressure of the draw solution, instead of drawing water through the membrane, was mainly reserved to increase the hydraulic pressure of the permeate. In this way, orders of magnitude higher power density than that in the conventional PRO can be obtained with the same salinity gradient.

---

## News & Press Releases

### [CorPower completes world's largest wave energy test-rig](#) – CorPower Ocean

CorPower has constructed the world's largest wave energy test-rig following an intense two-year project. The 45-tonne moving mass system, installed at CorPower's Stockholm base, is capable of simulating ocean wave conditions anywhere in the world. The design, build, and accreditation has been supported by key supplier ABB and accrediting body DNV. Measuring 40m in length and 9m in width, the system will play a fundamental role supporting CorPower's flagship HiWave-5 demonstration project, involving the deployment of the firm's first full-scale WEC (Wave Energy Converter) off the coast of Portugal, later this year. CorPower's commercial scale WEC – 9m in diameter with a 300KW power rating – will spend around 4-months on the test-rig, which can deliver 7.2MW peaks and generate 80.6kNm torque, with 5 m/s maximum speed.

### [DTOcean+, an open-source software suite to design and optimize tidal and wave farms, will be released soon](#) – DTOcean+

The FP7 funded DTOcean project (2014-2017) produced a first generation of freely available, open-source design tools for wave and tidal energy arrays. Built upon this solid foundation, DTOceanPlus (2018-2021) with a total budget of 8 million euros, developed and demonstrated a suite of second-generation advanced design tools for the selection, development, and deployment of ocean energy systems. The consortium was formed to bring together representatives of all key user and stakeholder groups and developers of Europe's leading ocean energy subsystems, devices, and arrays. Two US institutions also took part in the project. The final public release of the open-source software will be at the end of August 2021. To support the future users in their various uses of the suite, project partners are preparing tutorials and user guides that will be released at the same time.

### [First Tidal Turbine Deployed at Bourne Tidal Test Site](#) – Marine Renewable Energy Collaborative (MRECo) of New England

The Bourne Tidal Test Site (BTTS) welcomed its first test turbine after the COVID shutdown. The first turbine deployed at the BTTS was a conceptual design provided by Littoral Power Systems, Inc. of New Bedford. MRECo continues to receive inquiries from turbine developers in the US and from foreign entities because the BTTS offers a stable platform with near laboratory conditions in ocean water. The BTTS is the only permanent test stand designed specifically for tidal devices in the world. This is a partial scale (10-foot diameter vs. 40-foot diameter full scale turbines) test site that allows a transition from testing in university tanks to full scale avoiding some of the failures that have happened with deploying larger prototype turbines too quickly. It is also more cost-effective costing as little as \$30,000 for a test versus several million at full scale sites.

### **\$6M for UH wave energy conversion research – University of Hawai‘i News**

A new infusion of \$6 million from the Naval Facilities Engineering Command, and Expeditionary Warfare Center will allow the Hawai‘i Natural Energy Institute at the University of Hawai‘i at Mānoa, to continue to provide critical research and logistical support to the only grid-connected wave energy testing site in the nation. The U.S. Navy’s Wave Energy Test Site, off Marine Corps Base Hawai‘i provides a unique proving ground for pre-commercial wave energy converters (WECs) to demonstrate performance in an operational setting and advance their technology readiness level. These funds will allow the university to support a number of WEC deployments planned in the 2021 to 2024 timeframe in the form of environmental monitoring, power and survivability performance assessment, and additional logistics support to the Navy and to WEC developer companies.

### **Guinard Energies to power French oyster farm with tidal turbine – Offshore Energy**

French start-up Guinard Energies is preparing to redeploy its P154 tidal turbine in southern Brittany in France, which will be coupled with a photovoltaic installation to provide power for an electric barge servicing an oyster farm. The deployment is part of an ERSEO project, launched in late 2020 by marine services and engineering provider Chantier Bretagne Sud in collaboration with Regional Shellfish Committee, and the oyster farmers association of the Etel estuary. The turbine will be redeployed at Guinard Energies’ site at Ria d’Etel, following the initial installation that took place in 2019. The energy produced will be used to power an electric oyster barge, while the surplus production will be fed into the national grid via the electricity supplier Enercoop.