

TETHYS ENGINEERING BLAST



8 October 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

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EnergyTech University Prize

The US Department of Energy's (DOE) Office of Technology Transitions recently launched the [EnergyTech University Prize](#), a collegiate competition challenging multidisciplinary student teams to develop and present a business plan that leverages DOE national laboratory-developed and other energy technologies. Attend the [informational webinar](#) at 3:00pm EDT (7:00pm UTC) on 20 October 2021 to learn more about participating.

Calls for Abstracts

Abstracts for the [8th Program of International Platform on Ocean Energy for Young Researcher 2021](#) are due 15 October 2021. The event will take place online on 2, 9, and 16 November 2021.

The Call for Abstracts for the [VII Marine Energy Conference](#) will close on 20 October 2021. The conference will take place in Bilbao, Spain on 9 November 2021.

Abstracts for the [32nd International Offshore and Polar Engineering Conference \(ISOPE\)](#) are due 20 October 2021. ISOPE 2022 will take place in Shanghai, China on 5-10 June 2022.

The [Call for Student Research Posters & Videos](#) for the [Marine Renewables Canada 2021 Annual Conference](#) is open through 25 October 2021. Marine Renewables Canada 2021 will take place in Halifax, Nova Scotia on 24-25 November 2021.

Funding & Testing Opportunities

The Supergen Offshore Renewable Energy Hub is inviting applications for the [Early Career Researcher \(ECR\) Research Fund](#), which is designed to support ECRs involved in offshore wind, wave, or tidal energy research with up to £5,000. Applications are due 18 October 2021.

The Danish Energy Agency opened a [Technology Neutral Tender](#) of aid for electricity generated by onshore wind turbines, open door offshore wind turbines, wave power plants, hydroelectric power plants, and solar installations. The deadline for bids is 22 October 2021.

The Basque Energy Agency, Ente Vasco de la Energía, launched a [Call for Applications](#) for its €2.5 million aid program, which aims to promote the demonstration and validation of emerging marine energy technologies within the Basque Country. The call closes on 29 October 2021.

The US DOE plans 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 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 US DOE also 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.

Student & Employment Opportunities

The European Marine Energy Centre (EMEC) is looking for two [Project Officers](#) to provide support with planning, delivering, and monitoring projects as part of its Project Management Office team. Applications are due by 1:00pm BST (12:00pm UTC) on 21 October 2021.

The Fundy Ocean Research Center for Energy (FORCE) is looking to hire an [Environmental Program Manager](#), who will be responsible for managing all aspects of FORCE's environmental program including environmental effects monitoring and contributing towards ongoing sensor technology research. Applications are due by 4:00pm AST (8:00pm UTC) on 22 October 2021.

The Selkie project is seeking candidates for a [Masters by Research](#) focused on geospatial site selection methods for wave and tidal energy technologies. Applications are due 22 October 2021.

Aquatera is looking for junior, senior, and expert [Technical and Environmental Consultants](#) in several areas, including energy systems, environment, and project delivery and management.

Upcoming Events

Upcoming Webinars

Interreg North-West Europe's Ocean Power Innovation Network is hosting a webinar titled, "[Improving confidence through standardisation and certification](#)", on 13 October 2021 from 3:00-4:15pm CEST (1:00-2:15pm UTC). Register [here](#).

Ocean Energy Europe is hosting a webinar titled, "[Looking beyond 2030: Driving innovation via the revised Renewable Energy Directive](#)", on 21 October 2021 from 10:30am-12:00pm CEST (8:30-10:00am UTC), as part of EU Sustainable Energy Week. Register [here](#).

The European Technology and Innovation Platform for Ocean Energy is hosting a webinar titled, "[Benefits & tips for local community engagement](#)", on 21 October 2021 at 10:00am BST (9:00am UTC). Register [here](#).

The Nova Scotia Offshore Energy Research Association is hosting a webinar titled, "[Testing of 360-Degree Imaging Technologies for Improved Animal Detection around Tidal Energy Installations](#)", on 21 October from 1:00-2:00pm ADT (4:00-5:00pm UTC). Register [here](#).

Upcoming Conferences

[Clean Currents 2021](#) will take place on 20-22 October 2021 in Atlanta, US. Register [here](#).

[Offshore Energy Exhibition & Conference 2021](#) will take place on 26-27 October 2021 in Amsterdam, The Netherlands. Register [here](#).

The [26th Biennial Coastal & Estuarine Research Federation Conference \(CERF 2021\)](#) will take place on 1-4 and 8-11 November 2021 online. Register [here](#).

[Ocean Energy Europe Conference & Exhibition 2021](#) will take place on 6-7 December 2021 in Brussels, Belgium. Register [here](#).

New Documents on *Tethys Engineering*

Recent Advances in Direct-Drive Power Take-Off (DDPTO) Systems for Wave Energy Converters Based on Switched Reluctance Machines (SRM) – Blanco et al. 2022

This chapter is focused on Power Take-Off (PTO) systems for wave energy converters (WEC), being one of the most important elements since PTOs are responsible to transform the mechanical power captured from the waves into electricity. It presents Direct-Drive PTO (DDPTO) as one of the most reliable solutions to be adapted to some particular types of WEC, such as point absorbers. A discussion about modularity and adaptability, together with intrinsic characteristics of direct-drive PTOs, is also included. Among the different technologies of electric machines that can be used in direct-drive linear PTOs, switched reluctance machines (SRM) are described in further detail. In particular, the Azimuthal Multi-translator SRM is presented as a suitable solution in order to increase power density and reduce costs.

Turbulent flow mapping in a high-flow tidal channel using mobile acoustic Doppler current profilers – Guerra et al. 2021

In this investigation, instrumented mobile platforms are used to spatially map the turbulent flows in Grand Passage, one of the Bay of Fundy's more energetic tidal channels in Nova Scotia, Canada. The aim is to characterize the flow around the PLAT-I floating tidal energy platform developed by Sustainable Marine Energy Canada. GPS-tracked surface drifters equipped with fast-sampling acoustic Doppler current profilers (ADCPs) provide turbulence-resolving vertical profiles of velocity and turbulent kinetic energy dissipation rate along drifter trajectories, while vessel-mounted ADCP transects complement the mean flow velocity measurements. These data are used to construct tridimensional quasi-synoptic maps of mean velocities and turbulence parameters for several stages of the tide around PLAT-I's location including peak ebb and flood currents.

Miniaturized Salinity Gradient Energy Harvesting Devices – Hsu et al. 2021

Harvesting salinity gradient energy, also known as “osmotic energy” or “blue energy”, generated from the free energy mixing of seawater and fresh river water provides a renewable and sustainable alternative for circumventing the recent upsurge in global energy consumption. The osmotic pressure resulting from mixing water streams with different salinities can be converted into electrical energy driven by a potential difference or ionic gradients. This review provides insights into developing miniaturized salinity gradient energy harvesting devices and recent advances in the membranes designed for optimized osmotic power extraction. Furthermore, we present various applications utilizing the salinity gradient energy conversion.

Efficient response of an onshore Oscillating Water Column Wave Energy Converter using a one-phase SPH model coupled with a multiphysics library – Quartier et al. 2021

In this paper the numerical modelling of an Oscillating Water Column (OWC) Wave Energy Converter (WEC) is studied using DualSPHysics, a software that applies the Smoothed Particle Hydrodynamics (SPH) method. SPH is a Lagrangian meshless method used in a growing range of applications within the field of Computational Fluid Dynamics. The power take-off system of the OWC WEC is numerically modelled by adding a force on a plate floating on top of the free surface inside the OWC chamber. That force is implemented in the multiphysics library Project Chrono, which avoids the need of simulating the air phase that is computationally expensive in the SPH methods. Validation is carried out with experimental data received from the Korea Research Institute of Ship and Ocean Engineering and Ocean Energy Systems.

[Design optimization of a marine current turbine having winglet on blade](#) – Kunasekaran et al. 2021

Winglets on a turbine blade can modify flow features and improve a marine current turbine (MCT). In this work, to maximize the power coefficient (CP) and torque (T), cant angle (α), and height (h) of a winglet of an MCT were modified. The problem was solved using a high-fidelity solver code Fluent 2019R2 containing Reynolds-Averaged Navier–Stokes (RANS) equations. The flow domain meshed with tetrahedral elements. Nine different designs were produced to fill the design space for optimization. A set of low fidelity models such as second-order regression, kriging, and neural network models were used to approximate the high-fidelity results. The optimal designs further validated with the high-fidelity simulated results.

[Evaluation of a novel ammonia-water based combined cooling, desalination and power system based on thermodynamic and exergoeconomic analyses](#) – Zhou et al. 2021

It is of great significance and development potential to make full use of ocean thermal energy and seawater resources to solve the problem of energy and fresh water supply in tropical coastal areas. In the present article, an innovative ammonia-water (NH₃-H₂O) based combined cooling, desalination and power (CCDP) system is proposed, consisting of Kalina cycle-based ocean thermal energy conversion (OTEC), ejector refrigeration cycle (ERC) and spray flash evaporation (SFE) desalination unit. An ejector is introduced for coupling the Kalina cycle and ERC, which creates a larger pressure difference across the turbine in favor of higher power output. Besides, a multi-stage SFE desalination system is integrated into the proposed system for making full use of seawater resources and providing fresh water output.

News & Press Releases

[CalWave Successfully Commissioned Open-water Wave Energy Pilot](#) – CalWave

CalWave (“CalWave Power Technologies Inc.”) successfully commissioned its CalWave x1™ on September 16th off the coast of San Diego. This milestone event marks the beginning of California’s first at-sea, long-duration wave energy pilot operating fully

submerged. The CalWave x1™ will be tested for six months with the goal of validating the performance and reliability of the system in open ocean. This project is supported by a US Department of Energy award with the goal to demonstrate CalWave's scalable and patented xWave™ technology. Following this demonstration, CalWave plans to prepare for deployment of a larger unit at PacWave, the first commercial-scale, utility grid-connected wave energy test site in the US rated at 20 MW.

Arup, WES create Convex tool to showcase cost-cutting benefits of concrete for wave energy – Offshore Energy

Arup has found that replacing steel with concrete could reduce the costs of floating wave energy converters by 20%, as part of a project funded by Wave Energy Scotland (WES). Also, a new decision-making tool dubbed Convex has been developed to help wave energy device developers assess the feasibility of incorporating concrete into their designs. WES set out to discover how alternative materials could reduce the cost of wave energy converters (WECs) to ensure the wider wave energy sector could adopt modern innovations, through its structural materials programme calls. Arup was appointed to respond to this challenge and unlock opportunities that could drive down the cost of WECs by researching, designing, modelling and testing new structural materials.

HydroQuest tidal turbine: End of tests on the EDF site in Paimpol Bréhat and new stages of development at the Raz Blanchard – Interreg Tidal Steam Industry Energiser (TIGER)

Immersed at the EDF test site in Paimpol Bréhat (Brittany) since April 2019, the 1MW tidal turbine designed by HydroQuest and built by the Cherbourg shipyard CMN, was disconnected from the electrical grid during various operations carried out between April and early September. The operations to remove the machine and its foundation from the water were carried out at the end of September and the tidal turbine was transported to the port of Cherbourg. It will be inspected in the coming months. Initially scheduled to last one year, the tidal turbine tests were extended for a further year to make the most of the experiment. These two years of continuous operation on the very demanding site of Paimpol Bréhat have notably enabled Hydroquest to certify the power curve of the tidal machine and to prove its robustness, with an availability close to 90%.

ELEMENT set to start onshore testing programme for Nova Innovation's tidal energy turbine – Offshore Energy

EU-backed ELEMENT (Effective Lifetime Extension in the Marine Environment for Tidal Energy) project, whose aim is to slash the cost of tidal energy by 17% using artificial intelligence, is well underway with preparations to start with the onshore testing programme at ORE Catapult's Blyth facility. The onshore testing will see the Nova Innovation's RE50 tidal turbine installed on ORE Catapult's 1MW powertrain test facility as part of the first in a series of test campaigns to verify the ELEMENT control system performance. On the expected successful completion of the onshore testing, the turbine will undergo tow trials before being transported to the Étrel estuary test site in

Brittany. The optimised and validated ELEMENT control system will then be installed on an existing Nova M100 tidal turbine in the Shetland Tidal Array as well.

Orbital Marine Power to feature at Global Investment Summit – Orbital Marine Power

Orbital Marine Power (Orbital) has been chosen as one of only twelve companies invited to take part in the Global Investment Summit (GIS), hosted by the Prime Minister and supported by members of the Royal Family, taking place 19th October in London. The Summit programme and sessions aim to showcase the most innovative green technologies and companies already operating in the UK and will highlight the UK's leading global position and commitment to Net Zero. Working towards delivery of the Prime Minister's Ten Point Plan for a Green Industrial Revolution, the Summit will bring 200 of the world's most prominent decision makers, C-Suite executives, and investors to the UK. Orbital will be exhibiting their ground-breaking tidal turbine technology that has the ability to unlock strong tidal currents in the world's oceans as a source of energy.