

TETHYS ENGINEERING BLAST



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[Tethys Engineering](#) is an online knowledge base that facilitates the exchange and dissemination of information on the technical and engineering aspects of marine renewable 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.

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Announcements

WPTO Semiannual Stakeholder Webinar

The U.S. Department of Energy's (DOE) Water Power Technologies Office (WPTO) will be hosting its [third Semiannual Stakeholder Webinar](#) on 12 May 2020 from 1:00-2:30pm ET. DOE representatives will highlight recent announcements and publications, share project updates, and discuss upcoming priorities. They will also discuss COVID-19 impacts to events and DOE funded work. The presentation will close with Q&A. Email questions ahead of the webinar to WaterPowerTechnologiesOffice@ee.doe.gov. Register [here](#).

Reddit Ask Me Anything Panel

Pacific Northwest National Laboratory (PNNL) coastal scientists and engineers will be hosting a [Reddit Ask Me Anything](#) panel on the [blue economy](#) on 20 May 2020 from 3:00-5:00pm ET. The panel will discuss how science and technology are advancing the future of the blue economy and answer questions from the online community.

Request for Tender

University College Cork, lead of the [Selkie Project](#), is [seeking a contractor](#) to develop an operations and maintenance (O&M) cost calculation software tool that will assist tidal energy converter and wave energy converter device developers to optimize the reliability of their

constituent components and in tandem, rationalize their array-related O&M activity. The deadline for applications is 19 May 2020.

Funding Opportunities

The U.S. DOE's WPTO has issued a [funding opportunity](#), entitled "Marine Energy Foundational Research and Testing Infrastructure", to build marine energy research capabilities and leverage expertise to help the developing marine energy industry tackle complex scientific and technical problems. Concept papers are due 11 May 2020 and full applications are due on 7 July 2020. A pre-recorded [informational webinar](#) is now available to provide information to potential applicants.

The U.S. DOE announced up to \$38 million in funding for a new Advanced Research Projects Agency-Energy (ARPA-E) program, [Submarine Hydrokinetic And Riverine Kilo-megawatt Systems \(SHARKS\)](#). The program seeks to design economically attractive hydrokinetic turbines for tidal and riverine currents. Concept papers are due 27 May 2020 at 9:30am ET.

The UK Research and Innovation's [Innovate UK Smart Grants](#) fund for research and development projects that can make a significant impact on the UK economy across a variety of fields is still accepting applications. Applications are due 27 May 2020.

Upcoming Events

Upcoming Webinars

The International Renewable Energy Agency (IRENA) and Ocean Energy Europe (OEE) will be hosting a joint [webinar](#) to discuss the role of oceans as a sustainable resource supporting the global energy transition on Tuesday, 12 May 2020 from 10:00-10:30am CET. Register [here](#).

The Nova Scotia Offshore Energy Research Association (OERA) will be hosting a webinar entitled, *Development of Acoustic Doppler Aquatic Animal Monitoring (ADAAM) for application to marine life movement in high-energy tidal channels*, on 21 May 2020 from 1:00-2:00pm ADT. Register [here](#).

Event Update

[AUVSI XPONENTIAL 2020](#), originally rescheduled for August in Boston, Massachusetts, has been postponed again and will now take place from 5-8 October 2020 in Dallas, Texas (US).

New Documents on *Tethys Engineering*

[Experimental and numerical analysis of a multilayer composite ocean current turbine blade](#) – Ke et al. 2020

Ocean environmental corrosion and mechanical load vibration introduce considerable negative effects caused by the fluid-structure-environment interaction. A new design scheme for a blade with salinity corrosion resistance and mechanical fatigue resistance is proposed, based on numerical simulation and fatigue tests. The one-way fluid-structure interaction (FSI) model for an ocean current turbine blade was established and calculated by a computational fluid dynamics solver and finite element method solver. According to the FSI results, the maximum equivalent stress and deformation in extreme operating conditions are found to be within material and structural limits.

Concept and performance of a novel wave energy converter: Variable Aperture Point-Absorber (VAPA) – Zheng et al. 2020

In order to extract energy from waves, a novel wave energy converter (WEC) consisting of a floating, hollow cylinder capped by a roof with a variable aperture is presented in this paper. The power take-off (PTO) system is composed of a linear generator attached to the seabed, driven by the heave motion of the floating cylinder through a tether line. The air pressure within the cylinder can be modified by adjusting the roof aperture. The hydrodynamic characteristics of this WEC are investigated through an analytical model based on potential flow theory, in which the wave diffraction/radiation problems are coupled with the air pressure fluctuation and PTO system.

Sodium-ion concentration flow cell stacks for salinity gradient energy recovery: Power generation of series and parallel configurations – Whiddon et al. 2019

Salinity gradient (SG) energy is a renewable and clean energy resource that exists worldwide from the change in Gibbs free energy when two solutions with different salinities are mixed. More recently, concentration flow cells (CFCs) have been introduced as a new technology for SG energy recovery with the highest reported power density output to date as a result of the utilization of both the electrode potential and Donnan potential. In this study, multiple CFCs are connected to form a consecutive number of stacks, and systematic analysis is conducted to investigate the influence of both parallel and series electrical wire connections on the overall performance.

Survey and Assessment of the Ocean Renewable Energy Resources in the US Gulf of Mexico – Musial et al. 2020

The goal of this study is to survey potential offshore renewable energy sources in the Gulf of Mexico and quantify their feasibility relating to resource adequacy, technology maturity, and the potential for competitive cost. The study provides a review of available technologies and concepts for generating offshore renewable energy, including a high-level assessment of the current state of each technology and its potential for future advances. It provides a breakdown of resource capacity for each renewable energy technology as well as a recommendation that offshore wind be pursued for future study as it was found to be the most promising ocean renewable technology.

Triboelectric nanogenerators for a macro-scale blue energy harvesting and self-powered marine environmental monitoring system – Chen et al. 2020

Compared to an electromagnetic generator (EMG), a triboelectric nanogenerator (TENG) has advantages in harvesting the flow energy, particularly in the low frequency range. As a rapid development in TENG for utilizing the ocean energy, it is necessary to summarize its periodic progress. In this review, the recent research achievements of TENG in the ocean energy field are reviewed, which concentrate on the optimized structural design and working mechanism in macro-scale blue energy and small-scale marine sensing systems.

Ocean thermal energy utilization process in underwater vehicles: Modelling, temperature boundary analysis, and sea trail – Zhang et al. 2020

Autonomous underwater vehicles (AUVs) play an important role in the ocean observation and marine scientific research. The utilization of marine environmental energy is a desirable way to enhance the sailing range and endurance of AUVs. In this paper, a detailed model with four sub-models is established to describe the ocean thermal energy utilization process in AUVs, where the factors of system pressure, material's thermal-pressure-physical properties and grid nodes are considered. Based on the model, performance of the utilization system under constant and variable temperature boundaries is analyzed.

News & Press Releases

Tidal Hydrogen Production Storage and Offtake – HydroWing

HydroWing, in partnership with Tocardo, is delighted to introduce the THyPSO (Tidal Hydrogen production, Storage and Offtake), an innovative and novel concept that creates green hydrogen from the sea, contributing to the wider global decarbonisation of energy systems. THyPSO is a floating platform, housing 1 – 6 conventional bi-directional tidal turbines that convert tidal flows into electrical energy, which is then directed through an integrated hydrogen production unit, converting the unlimited supply of surrounding seawater into hydrogen, an energy-dense and versatile commodity.

EMEC and META Strengthen UK Test Site Collaboration – EMEC

The European Marine Energy Centre (EMEC), based in Orkney, Scotland, has signed an agreement with Marine Energy Wales to provide further support to the Marine Energy Test Area (META) in Pembrokeshire, Wales. This builds on an initial collaboration between the two parties in 2018 which resulted in EMEC providing input into the initial feasibility stage of the META project. META consists of eight pre-consented, non-grid connected sites located in and around the Milford Haven Waterway, de-risking the development of marine energy projects by providing the opportunity to test scaled devices, sub-assemblies and components.

Overcoming the Pandemic to Build a Mammoth Turbine in Wuhan – SIMEC Atlantis

In the space of just 18 months, a significant milestone has been achieved in the race to harness the global potential of tidal stream energy. SIMEC Atlantis Energy, through its partnership with ITP Energised, has worked with The China Shipbuilding Industry Corporation and China Three Gorges (CTG) to develop CTG's first SG500 kW tidal stream turbine. The mammoth structure, with a rotor diameter of 18 meters, was installed between the islands of Putuoshan and Huludao in the Zhoushan archipelago in China in the past week.

HydroQuest marks OceanQuest milestone – Offshore Energy

HydroQuest has marked the first anniversary of its 1MW tidal turbine OceanQuest immersion off the coast of Bréhat Island, France. After 12 months of effective operations, the turbine is still fully operational and has started its second year. The OceanQuest tidal turbine landed at EDF's (Électricité de France) Paimpol-Bréhat site in France in the spring of 2019. The demonstration is part of French Agency for Environment and Energy Management (ADEME) call for projects. This 1 MW machine has been manufactured and fully assembled by CMN's (Constructions Mécaniques de Normandie) teams in Cherbourg.

Menter Môn Morlais project working on achieving its full potential – Energy News

Morlais is a tidal stream energy project run by not for profit social enterprise Menter Môn. Morlais aims to develop the Crown Estate's designated 'West Anglesey Demonstration Zone' located off the west coast of Holy Island, north Wales. The project has the potential to make Anglesey a world leader in terms of clean, renewable electricity generation, it's also an opportunity to ensure Anglesey can play a part in meeting future energy needs and tackling climate change. Several tidal energy developers have joined the project so far, with most recent being Sabella, HydroQuest and Magallanes.