TETHYS ENGINEERING BLAST

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The bi-weekly *Tethys Engineering* Blast highlights new publications on *Tethys Engineering*, opportunities in marine renewable energy, and news articles of international interest. We hope you find this a valuable resource to keep you connected to new research, opportunities, and industry milestones.

Announcements

Funding Opportunities

The 4th MaRINET2 Transitional Access Call for offshore renewable testing is open until 30 September 2019. The project offers free access to a world-leading network of testing and research infrastructures, including EMEC's test sites, and is open to offshore wind, wave, and tidal energy technology developers.

The Supergen Offshore Renewable Energy Hub is inviting applications for the Early Career Researcher (ECR) Research Fund. The fund is designed to be a flexible research fund for ECRs to support small activities that either support and develop existing research activities or develop skills further. Applications should be directed at offshore wind, wave, or tidal energy research and are due 11 October 2019. It is anticipated that there will be further calls in spring and autumn 2020 and 2021.

The European Commission has released a Call for Proposals for projects that can improve environmental monitoring of tidal and wave devices and support the development of ocean energy in Europe. The deadline is 15 January 2020.

Call for Abstracts

Abstracts are being accepted for the International Conference on Ocean Energy (ICOE) in Washington D.C. on 19-21 May 2020. The event will showcase innovations in ocean energy technology research and development, prepare ocean renewable energy to benefit the larger "Blue Economy" and the electrical grid, and identify research needed to further advance the state of the technology. Abstracts for poster and oral presentations are due by 11 October 2019 and can be submitted here.

Marine Energy Collegiate Competition

The U.S. Department of Energy (DOE) recently announced the first Marine Energy Collegiate Competition (MECC) designed to challenge interdisciplinary teams of undergraduate and graduate students to offer unique solutions to the burgeoning marine energy industry. The inaugural MECC will be held in conjunction with the International Conference on Ocean Energy (ICOE) in Washington, DC on 19-20 May 2020. An informational webinar will be held 3 October 2019, which you can register for here. Applications are due 18 October 2019.

Upcoming Events

Upcoming Conferences

The Wave Energy Scotland Annual Conference 2019 (WESAC19) will be held in Edinburgh, UK on 5 December 2019. WESAC19 will showcase Wave Energy Scotland's past work and upcoming opportunities. Registration is free and available here.

BlueTech Week 2019 (BTW2019) will be held in San Diego, California on 18-22 November 2019. BTW2019 will include a 2-day Tech Expo as part of the BlueTech Summit. Early bird registration is available until 2 October 2019.

New Documents on *Tethys Engineering*

Numerical benchmarking study of a Cycloidal Wave Energy Converter – Siegel 2019

> A lift based Cycloidal Wave Energy Converter (CycWEC) was investigated using numerical simulations to estimate its mean annual power absorption. Based on the power absorption as well as size and weight estimates a number of performance measures were derived in order to compare this novel Wave Energy Converter (WEC) to other more established devices for which results have been published by Babarit et al. using a similar benchmarking approach. Comparison of these measures with published data for eight more established WEC designs, including heaving buoy, oscillating water column and flap devices shows that the CycWEC performance exceeds that of all other devices.

In-Stream Hydrokinetic Turbine Fault Detection and Fault Tolerant Control - A Benchmark Model – Tang et al. 2019

> Hydrokinetic turbines possess higher operations and maintenance costs due to their isolated nature and harsh operating environment when compared with other sources of renewable energy. As such, techniques must be developed to mitigate these costs through the application of fault-tolerant control (FTC) and machine condition monitoring (MCM) for increased reliability and maintenance forecasting. Hence, the primary objective of this

paper is to address a key limitation in hydrokinetic turbine research: the lack of widely available data for use in developing models by which to conduct FTC and MCM.

Assessment of extreme and metocean conditions in the Maldives for OTEC applications – Rinaldi et al. 2019

The Maldives is a group of tropical atolls, considered globally to be one of the most desirable holiday destinations. Due to the favorable oceanographic and bathymetric conditions, ocean thermal energy conversion (OTEC) systems represent a viable opportunity for clean and reliable power. However, the stresses the OTEC platform will need to endure during adverse environmental conditions are not well defined. In order to overcome this uncertainty, this paper uses hindcast data sets from global weather and ocean models to assess the metocean conditions of the Maldives, with particular reference to extreme conditions.

Peak forces on a point absorbing wave energy converter impacted by tsunami waves - Sjökvist and Göteman 2019

How to simulate tsunami waves at an intermediate depth is studied in this paper by using three different simulation approaches for tsunamis, a soliton, a simulated high incident current and a dam-break approach. The surface wave profiles as well as the velocity- and pressure profiles for the undisturbed waves are compared. A wave energy converter model, previously validated with wave tank experiment, is then used to study the survivability of the Uppsala University wave energy device for the different waves. The force in the mooring line is studied together with the resulting force on a bottom mounted column, corresponding to the linear generator on the seabed.

Turbines for modular tidal current energy converters – Kaufmann et al. 2019

Harnessing marine currents driven by the tidal cycle have triggered the development of various power conversion systems. However, the comparably high levelized cost of electricity is still the main hindrance for a faster market penetration. The paper describes a novel strategy to decrease the cost: A number of small prefabricated turbines of low complexity form an arbitrary scalable array of turbines; a modular design of the key unit “turbine” allows an easy adaption to the tidal current velocity profile at a particular site; hydraulically optimized turbine blades ensure maximum annual energy production and minimum immersion depth.

An ultrathin and highly porous silica nanochannel membrane: toward highly efficient salinity energy conversion – Yan et al. 2019

Artificial solid-state nanochannels are capable of regulating unipolar ion transport in their confined space and thus converting the Gibbs free energy stored in the salinity gradients to electricity. In order to achieve a large conversion efficiency, highly ion-selective and permeable nanochannel membranes are inevitably desired. In this work we report the salinity energy conversion using an ultrathin silica isoporous membrane (SIM, ~90 nm in

thickness) that consists of straight, uniform and close packed nanochannels (diameter, 2–3 nm; pore density, ~4 × 1012 cm−2, corresponding to a porosity of 16.7%).

News & Current Events

DOE and NOAA Announce Prize Competition to Power Ocean Observing Platforms with Marine Renewable Energy Prize Builds on Efforts to Spur U.S. Innovation - DOE

The U.S. Department of Energy (DOE), along with NOAA, announced a $3 million prize competition to generate innovation in marine energy-powered ocean observing platforms. The Powering the Blue Economy™ Ocean Observing Prize will draw upon American innovators to accelerate technology development through a series of contests to demonstrate marine renewable energy-powered ocean observing platforms. The Ocean Observing Prize will provide innovators a pathway from concept to design to construction, with two separate competitions and prize awards during each phase.

GKinetic's First Submerged Tidal Device – Gkinetic

Irish hydrokinetic turbine developer, GKinetic Energy Ltd, returned to the IFREMER test facility in Boulogne-sur-Mer, France last week for a full 5 days of intensive testing on an optimised device that was both submerged and deployed at the surface for comparative analysis. The testing is part of a much larger, overall project that is assessing the technical and commercial feasibility of a 250kW, submerged, tidal device utilising GKinetic's core technology concept.

Mako tidal energy demonstration site opens in Singapore – Renewable Energy Magazine

The Mako Tidal Energy Site at the Sentosa Boardwalk in Singapore has opened, following the signing of a collaboration agreement between Mako Energy Pte Ltd and Sentosa Development Corporation in December 2018. The collaboration agreement allows Mako Energy, a Singapore-based marine renewable energy company and a subsidiary of the Elemental Energy Technologies Group, to use a part of the Sentosa Boardwalk as a testbed site for the installation of tidal turbines. The site will demonstrate the scalable tidal energy system under South East Asian conditions.

Biome Renewables Tests PowerCone Tidal Tech in Ireland – Marine Energy

Biome Renewables has started the testing of its PowerCone tidal technology in Strangford Loch, Northern Ireland in cooperation with Queens University Belfast and Cuan Marine Services. The turbine prototype was built using the Renishaw Canada metal printer with the support of the Nova Scotia Community College. The system, designed and engineered using the latest software from nTopology, ANSYS and SOLIDWORKS, was flown across the Atlantic.

Energy Department Announces Network Director for Marine Energy Research and Testing Program – DOE

The U.S. Department of Energy (DOE) announced the selection of the Pacific Ocean Energy Trust (POET) as Network Director for the U.S. Testing Expertise and Access for Marine Energy Research (TEAMER) Program, to ensure it runs effectively and efficiently. The three-year program supports testing and research for marine energy technologies and will provide access to test facilities and technical expertise to assist with numerical modeling and data collection in operational and extreme conditions.