TETHYS ENGINEERING BLAST

14 August 2020

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 (MRE). 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 MRE community, please send it to tethys@pnnl.gov for consideration.

Announcements

Tethys Engineering Peer Review Survey

As part of the international community working to advance the marine renewable energy industry, we would like to hear from you! We ask that you please fill out a brief survey (~3 min) by 31 August 2020 to help us evaluate and guide further development of *Tethys Engineering*.

Mocean Energy Decommissioning Programme Consultation

Mocean Energy has requested consent from Marine Scotland to deploy and test their 1/2-scale M100 wave energy converter prototype at the European Marine Energy Centre's (EMEC) Scapa Flow test site in October 2020. As part of the consenting process, EMEC has opened a consultation on the Decommissioning Programme and would like to invite stakeholders and members of the public to provide responses via email info@emec.org.uk by 5:00pm BST (4:00pm UTC) on 11 September 2020.

MASTS Webinar Recording Available

The Marine Alliance for Science and Technology for Scotland (MASTS) recently held a webinar entitled, "Reshaping wave energy: a method for design optimization". View the recording here.

Funding/Testing Opportunities

The MaRINET2 project, which offers free access to a world-leading network of testing and research infrastructures for offshore renewables across Europe, will open its fifth and final call for free testing access from 1 September 2020 until 16 October 2020.

Interreg North-West Europe's Ocean DEMO (Demonstration Programme for Ocean Energy Pilot Farms and Supporting Technologies) project opened its 3rd Call for Applications. Successful applicants will receive free access to test their ocean energy products and services in real sea environments at the project's network of test centers. Applications close 18 September 2020 at 7:00pm CEST (5:00pm UTC). An informational webinar is now available.

Employment Opportunity

The University of Southampton is seeking applicants for a PhD Studentship in responsive mooring systems for floating renewable energy facilities. Applications are due 31 August 2020.

Upcoming Events

Upcoming Launch Event

Marine Scotland Science will be hosting the Scottish Shelf Waters Reanalysis Service (SSWRS) Launch Event in Edinburgh on 3 November 2020. The SSWRS is a 25 year hindcast of the Scottish Shelf Model (SSM) and will include variables such as hourly horizontal current velocities and water elevation fields, as well as daily mean files (de-tided) of three-dimensional currents, temperature, and salinity, all on the original unstructured model mesh. The launch event will include information about the SSM reanalysis service, how to get started with the SSWRS, and the potential applications of the service, as well as provide an opportunity to network with other users. This is a free, in-person event that may change to a virtual event.

Upcoming Conferences

AUVSI XPONENTIAL 2020, the world's largest event for unmanned and autonomous systems, will now be held virtually from 5-8 October 2020. Registration coming soon.

The Institute of Electrical and Electronics Engineers' 3rd International Conference on Renewable Energy and Power Engineering (REPE 2020) will be held in Edmonton, Canada from 9-11 October 2020. The Call for Papers closes 20 August 2020.

The Ocean Energy Europe Conference & Exhibition (OEE2020) will be held in Brussels, Belgium from 1-2 December 2020. Early bird registration is available here until 31 August 2020.

New Documents on *Tethys Engineering*

Numerical wave modeling for operational and survival analyses of wave energy converters (WECs) at the US Navy Wave Energy Test Site in Hawaii – Li et al. 2020

> The US Navy Wave Energy Test Site is currently operating three grid-connected berths off Marine Corps Base Hawaii in support of technological development through scaled-model testing and pre-commercial prototyping. We have assembled a spectral wave model system comprising WAVEWATCH III and SWAN on a hierarchy of global, regional, and nearshore computational grids. With wind forcing from global forecast and reanalysis datasets as well as their regional downscaling, the system produces operational 7-day wave forecasts and a long-term hindcast. The daily forecasts, validated with real-time buoy measurements, facilitate safe deployment, operation, and retrieval of WECs.

Characterization of the vertical evolution of the three-dimensional turbulence for fatigue design of tidal turbines – Thiébaut et al. 2020

> A system of two coupled four-beam acoustic Doppler current profilers was used to collect turbulence measurements over a 36-h period at a highly energetic tidal energy site in Alderney Race. The present study provides mean vertical profiles of the velocity, the turbulence intensity and the integral lengthscale along the streamwise, spanwise and vertical direction of the tidal current. It is considered that the turbulence metrics presented in this paper will be valuable for tidal-stream energy convertor designers, helping them optimize their designs and improve loading prediction through the machines' lifetime.

Surveying Manganese Oxides as Electrode Materials for Harnessing Salinity Gradient Energy – Fortunato et al. 2020

> The potential energy contained in the controlled mixing of waters with different salt concentrations (i.e., salinity gradient energy) can theoretically provide a substantial fraction of the global electrical demand. One method for generating electricity from salinity gradients is to use electrode-based reactions in electrochemical cells. Here, we examined the relationship between the electrical power densities generated from synthetic NaCl solutions and the crystal structures and morphologies of manganese oxides, which undergo redox reactions coupled to sodium ion uptake and release.

Techno-Economic Optimisation for a Wave Energy Converter via Genetic Algorithm – Sirigu et al. 2020

> Although sea and ocean waves have been widely acknowledged to have the potential of providing sustainable and renewable energy, an essential condition for reaching economic viability is to minimise the cost of electricity, as opposed to simply maximising the converted energy at the early design stages. One of the tools empowering developers to follow such a virtuous design pathway is the techno-economic optimisation. The purpose of this paper is to perform a holistic optimisation of the PeWEC (pendulum wave

energy converter), which is a pitching platform converting energy from the oscillation of a pendulum contained in a sealed hull.

Hydrodynamic performance evaluation of a new hydrofoil design for marine current turbines – Nachtane et al. 2020

One of the emerging energy extraction technologies in the tidal energy field is the Horizontal Axis Hydrokinetic Turbine (HAHT) which harness tidal stream energy the same way Horizontal Axis Wind Turbine (HAWT) extract energy from the wind. While HAHT has been the topic of many researches over the past decade, design of hydrofoils plays a vital role in increasing the structural strength of the blade and maximizing the output of the marine current turbines. In this context, a numerical investigation is conducted in this research in which new hydrofoil for marine current turbines underwater conditions was designed and evaluated.

Ocean Energy in Islands and Remote Coastal Areas: Opportunities and Challenges – Ocean Energy Systems 2020

Islands and remote coastal areas face energy challenges that require attention. Ocean energy technologies can be an appealing option for these energy markets, offering advantages compared to other renewable energy technologies such as low visual and environmental impacts and predictability. Furthermore, islands and remote coastal areas tend to coincide with good resource potential for some of these technologies and, due to the high costs of incumbent energy technologies, ocean energy could face fewer difficulties to compete with more mature technologies in these markets.

News & Press Releases

Sustainable Marine Energy secures contract for world's first floating tidal energy array – Sustainable Marine Energy

Sustainable Marine Energy will supply three next generation PLAT-I floating tidal energy systems, with a rated power output of 420kW each, to project entity Spicer Marine Energy who has signed a Design Build and Operate agreement with reconcept GmbH for the first phase of the Pempa'q In-stream Tidal Energy Project. Spicer Marine Energy will deliver and operate the project over its 15-year lifetime, on behalf of reconcept's RE13 Meeresenergie investment fund. Construction work will start at the Fundy Ocean Research Centre for Energy in the 2nd quarter of 2021 where this first platform, alongside a further two, will be installed to deliver phase 1 of the Project.

Ocean Energy Europe (OEE) calls for European target of 100MW by 2025 – OEE

The new EU Strategy on Offshore Renewable Energy must include a target of 100MW of ocean energy installed in Europe by 2025. This would be enough to power 100,000 European homes a year and would pave the way for installing 3GW by 2030 and 100GW

by 2050. This target would provide the political impetus and incentives needed to maintain Europe's position as the global leader in ocean energy and create a new industry for Europe. Four priority actions are needed to achieve this, according to Ocean Energy Europe. First on the list is the formation of a pan-European alliance of EU decision-makers, national governments and industry representatives.

Orbital Marine Power takes final lessons from SR2000 tidal turbine and brings prototype programme to a close – Orbital Marine Power

Orbital Marine Power Ltd, working with Thompsons of Prudhoe and Port of Blyth, have decommissioned their prototype 2MW SR2000 floating tidal turbine. Heavy lift specialists Mammoet managed the tandem lift of the 516-tonne structure out of the water and onto the Blyth quayside in what was the port's largest heavy lift to date. The final phase of the full-scale demonstration project follows a hugely successful test programme which saw over 3,250 MWh of electricity generated by the SR2000 at EMEC in Orkney. Building on the success of the SR2000 Orbital are currently in the process of manufacturing their 2MW O2 turbine to replace the SR2000 at EMEC early next year.

Verdant Power Progresses toward an Autumn Installation of Tidal Energy Turbines in New York City's East River – Verdant Power

Verdant Power has successfully taken additional steps toward the installation of an array of its three, fifth generation (Gen5) tidal power turbines on the Company's novel TriFrame™ mount at its Roosevelt Island Tidal Energy (RITE) Project site in New York City's East River. The turbines were transported from the Company's New Jersey marine engineering support services facility, where the turbines were assembled, to a marine vessel installation services area, where they have been integrated onto a Verdant Power TriFrame™ mount in preparation for delivery and deployment at the RITE Project site.

Desalination Innovation: Academic Teams Exhibit Strong Showing in Waves to Water Prize DESIGN Stage – National Renewable Energy Laboratory

If you were tasked with transforming saltwater into drinking water using only the power of the ocean, how would you do it? Luckily, the winners of the DESIGN Stage of the U.S. Department of Energy Waves to Water Prize have some great ideas—and they are working to turn them into reality! Part of the Water Security Grand Challenge, the Waves to Water Prize will help meet the goal of delivering cost-competitive clean water to vulnerable communities. The prize challenges innovators to develop small, modular, cost-competitive desalination systems that employ ocean waves to generate drinking water for disaster recovery and for remote and coastal communities.