TETHYS ENGINEERING BLAST

11 September 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

Marine Energy Collegiate Competition

The U.S. Department of Energy's Water Power Technologies Office (WPTO) is now accepting applications for the 2021 Marine Energy Collegiate Competition (MECC). The competition challenges undergraduate and graduate students to explore opportunities for MRE technologies in existing maritime industries via real-world concept development. Applications are due 30 September 2020. Learn more about the competition and application process during an informational webinar at 1:00pm PDT (8:00pm UTC) on 23 September 2020. Register here.

Call for Abstracts

The University of Plymouth is now accepting abstract submissions for the 14th European Wave and Tidal Energy Conference (EWTEC 2021) in Plymouth, UK from 5-9 September 2021. Relevant EWTEC 2021 themes include resource characterization, device development and testing, hydrodynamic modelling, and more. Abstract submission closes on 1 November 2020.

UK Consultation

The UK Department for Business, Energy & Industrial Strategy (BEIS) has launched a consultation on how the government can support MRE projects, such as floating offshore wind,

tidal, and wave energy. The consultation invites views from developers and other interested parties on project funding and costs, environmental impacts, and supply chain benefits. The consultation closes at 11:45pm BST (10:45pm UTC) on 30 September 2020.

Funding/Testing Opportunities

Interreg North-West Europe's Ocean DEMO (Demonstration Programme for Ocean Energy Pilot Farms and Supporting Technologies) 3rd Call for Applications closes at 7:00pm CEST (5:00pm UTC) on 18 September 2020. 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.

The Swedish Energy Agency recently opened a call for the development of cost-effective and sustainable marine energy systems. The call is open for project proposals related to generation, reliability and survivability, environmental impact, operational and maintenance strategies, and testing and demonstration. Applications are due 21 September 2020.

The Interreg Atlantic Area-funded PORTOS (Ports Towards Energy Self-Sufficiency) Project, which aims to promote the implementation of wave, tidal, and wind energy at Atlantic Area ports, has opened its 2nd call for renewable energy device testing. Applications are due by 2 October 2020.

The Marine Renewables Infrastructure Network (MaRINET2) has opened its fifth and final call for fully funded access to a world-leading network of testing and research infrastructures in Europe. An open call for virtual access to data sets and a free-of-charge training programme are also available through the project. Applications are due 16 October 2020. A webinar recording to assist candidates with their application and share updates on the process is available here.

Employment Opportunities

Offshore Renewable Energy Catapult (ORE Catapult) is seeking a Research Engineer and an Innovation Manager to be based within their Marine Energy Engineering Centre of Excellence (MEECE) in Pembrokeshire, Wales. Applications due 11 September 2020.

Upcoming Events

Upcoming Webinars

The European Marnie Energy Centre (EMEC) will be hosting the second of a series of six supply chain seminar events as part of the TIGER (Tidal Stream Industry Energiser) project on 15 September 2020 at 2:00pm BST (1:00pm UTC). This webinar, supported by Orbital Marine Power, will raise awareness of tidal stream supply chain opportunities for structural fabricators and explore potential areas for collaboration to achieve cost reductions. Register here.

Marine-i and the EU-funded ICE (Intelligent Community Energy) Project will be hosting a webinar series to explore opportunities for incorporating MRE into smart grids, especially in isolated communities. Each webinar will begin at 10:00am BST (9:00am UTC).

- 17 September: Smart Grid Technologies for Island Communities/Ports (Register here)
- 1 October: Opportunities for Marine Technologies and Smart Solutions (Register here)

WaveEC Offshore Renewables will be hosting a webinar entitled, "High-Performance Computational Modelling and Data Science Capabilities for a Renewable Blue Ocean", on 18 September 2020 at 2:30pm WEST (1:30pm UTC). Register here.

Upcoming Conferences

AUVSI XPONENTIAL 2020, the world's largest event for unmanned and autonomous systems, will be held online from 5-8 October 2020. Register here.

Paving the Wave's World Conference on Floating Solutions 2020 will be held in Rotterdam, Netherlands from 6-8 October 2020. Register here by 16 September 2020.

New Documents on *Tethys Engineering*

On the impact of long-term wave trends on the geometry optimisation of oscillating water column wave energy converters – Ulazia et al. 2020

> Wave trends have been shown to be relevant to energy generation in various areas of the world. Accordingly, this article describes the impact of wave trends on the design of oscillating water column wave energy converters. First, wave trends across the North-East Atlantic Ocean are analysed based on the ERA5 reanalysis. In addition, an empirical model that provides the capture width of an oscillating water column is employed, identifying an approximately linear relationship between the average wavelength and the optimal width of the chamber.

Hydrodynamic characteristics and flow structures of pitching hydrofoil with special emphasis on the added force effect – Zhang et al. 2020

> The objective of this paper is to investigate the hydrodynamic characteristics and corresponding flow structures of a pitching Clark-Y hydrofoil with special emphasis on the added force effect. The experiments were performed in the looped cavitation tunnel, and the hydrodynamic characteristics are obtained by the dynamic moment measurement system. Results show that the added force effect on the hydrodynamic force is negligible compared with the contributions from the vorticity within the flow in the stall phase. As the pitching rate increases, the added force effect becomes more significant, thus leading to the higher lift of the up stage and the lower lift of the down stage.

Engineering the interlayer spacing of molybdenum disulfide for efficient salinity gradient energy recovery in concentration flow cells – Zhu et al. 2020

Salinity gradient (SG) energy is a large untapped energy source available worldwide. Here we applied MoS_2 with tunable interlayer spacing to a concentration flow cell for efficient SG energy recovery. By expanding the interlayer from 0.63 nm to 0.96 nm, the ion diffusion resistance was significantly reduced and the pseudocapacitance was largely promoted. These enhanced electrochemical properties resulted in a superior performance of the concentration flow cell on SG energy extraction. The cell with interlayer-expanded MoS_2 electrodes produced 11 times of the average power density compared with the cell with original MoS_2 electrodes when using model seawater and river water solutions.

Economical layout optimization of wave energy parks clustered in electrical subsystems – Giassi et al. 2020

To obtain a maximum power output and minimized capital and operational costs, the layout of wave energy parks needs to be optimally designed. An economical model for large-scale wave energy systems is built and merged into an evolutionary optimization routine for arrays of point-absorbing energy converters. The model includes all the parameters that affect the total system revenue such as electrical cable lengths, distance from grid connection point, number of substations and hydrodynamic interaction among the devices, with the goal to find the optimal layout which minimizes the levelized cost of electricity.

Exhaustive closed loop behavior of an one degree of freedom first-generation device for harnessing energy from marine currents – del Horno et al. 2020

The use of ballast systems to carry out automatic emersion/immersion maneuvers for first generation tidal energy converters (TECs) has aroused the interest of researchers and technicians as new technique by which lower installation and operation and maintenance (O&M) costs (a reduction of the installation costs by 10% and O&M by 15%). Very simple dynamic models have been obtained and subsequently employed in order to propose various control schemes with which to carry out this sort of maneuvers in devices with different degrees of freedom. This paper provides a detailed study of the closed loop behavior of a gravity-based first generation TEC, which performs only vertical movements with a single degree of freedom.

Working Fluid Candidates Selection for 100kW Ocean Thermal Power Generation Based on Environmental, Safety, and Thermodynamic Constrains – Halimi et al. 2020

Due to its equatorial location, Indonesia has a huge amount of ocean thermal energy resource. However, this alternative renewable energy resource is still not well developed yet. In this paper, a selection procedure of working fluid for a 100 kW ocean thermal power generation is presented. The screening process was based on environmental, safety and thermodynamic constrains to obtain the best working fluid for this application. Five working fluid candidates are analyzed (ammonia, butane, butene, isobutane, isobutene).

News & Press Releases

N.S. company wins tidal energy berth, must retrieve stranded Cape Sharp turbine – CBC

> A Nova Scotia tidal energy company has won the competition to fill the vacant berth at the Fundy Ocean Research Centre for Energy site in Parrsboro, N.S. As part of the agreement, Big Moon Power must remove the failed Cape Sharp tidal turbine that is still sitting on the ocean floor in the Bay of Fundy. Big Moon Power has provided a security deposit of $4.5 million related to its commitment to retrieve the tidal turbine. The 1,300-tonne turbine has been stranded on the bottom of the Minas Passage since 2018 when a parent company of Cape Sharp Tidal Venture, OpenHydro Group, filed for liquidation.

Ocean Energy: Promising new technologies to help Europe achieve its ambitious climate goals – The Community Research and Development Information Service (CORDIS)

> As Europe aims to be carbon-neutral by 2050 and invest significantly in renewable forms of energy over the coming decades, there's one source of green energy that shows great promise – and it's not even green, more of a blue. The oceans offer enormous potential as a source of clean, green energy, and the technologies to realise this, whilst still to fully mature, should definitely be on the radar. In this CORDIS Results Pack, we introduce you to 10 EU-funded projects that are paving the way for the wider development and deployment of these ocean energy innovations.

Canadian Government invests in Nova Scotia Tidal Energy Project – Nova Innovation

> Nova Innovation has secured an investment of $4 million from the Canadian federal government for Phase 1 of its 1.5 MW tidal energy project in Nova Scotia. The project, located in the Petit Passage at the gateway of the Bay of Fundy, will use Nova's proven technology to produce clean, predictable tidal energy. Up to fifteen turbines will operate on the seabed, harnessing one of the planet's most powerful tides. Nova believes the smaller profile of its M100 D turbines, at 100 kW, will enable them to withstand the Fundy tide and operate without endangering marine life.

Transforming Saltwater into Prize Winnings: Waves to Water Industry Teams Win Big in DESIGN Stage – National Renewable Energy Laboratory

> June's arrival brought both warm days and the announcement of the winners of the DESIGN Stage, the second stage of the Waves to Water Prize. The ask? Develop innovative wave-powered systems that can transform saltwater into drinking water. The incentive? $3.3 million in prizes. The competition was tough: Out of an impressive pool of challengers, 17 winners emerged, five of which hailed from the marine energy industry. Part of the American-Made Challenges series, the Waves to Water Prize is supported by the U.S. Department of Energy's Water Power Technologies Office (WPTO) and is administered by the National Renewable Energy Laboratory.

How remote Arctic communities can tap into river power – ArcticToday

The Kvichak River in southwestern Alaska hosts the largest sockeye salmon run in the world, bringing in millions of dollars from commercial fishing and attracting sport fishers to one of the premier locations in the state. The river has provided subsistence for Alaska Native peoples for thousands of years. And now it's also home to a turbine that generates energy for Igiugig, an Alaska Native village of 70 people on the river's banks. The RivGen technology, developed by the Maine-based Ocean Renewable Power Company, generates electricity from tidal and river currents without using a dam.