TETHYS ENGINEERING BLAST

21 October 2022

Tethys Engineering is an online knowledge hub 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. Email tethys@pnnl.gov to contribute!

Announcements

SULI & CCI Applications

The Department of Energy (DOE) Office of Science is now accepting applications for the Science Undergraduate Laboratory Internships (SULI) program and the Community College Internships (CCI) program. Interns will work directly with national laboratory scientists and engineers that support the DOE mission. The application deadline is 10 January 2023.

MORE-EST Platform

The Polytechnic University of Turin's Marine Offshore Renewable Energy Lab (MOREnergy) recently launched its new open access web platform, MORE-EST, featuring wind and wave energy data for offshore renewable energy projects in Europe.

INORE BECS

The International Network on Offshore Renewable Energy (INORE) has announced a Call for Blue Energy Collaborative Scholarships (BECS) Proposals, targeted at INOREans from Latin America, Africa, and Asia. If you have a research project that can provide collaborative work with other INOREans, the grant can be used for travel expenses and accommodation at the institution where the work will take place or be presented. Applications are due 31 October 2022.

Calls for Abstracts

The Call for Abstracts for the 42nd International Conference on Ocean, Offshore and Arctic Engineering (OMAE 2023) is now open through 24 October 2022. OMAE will take place on 11-16 June 2023 in Melbourne, Australia.

The Call for Abstracts for the 15th European Wave and Tidal Energy Conference Series (EWTEC 2023) is now open through 28 January 2023. Full papers will be due 27 May 2023. EWTEC will take place on 3-7 September 2023 in Bilbao, Spain.

Funding & Testing Opportunities

The U.S. DOE's Water Power Technologies Office (WPTO) has issued a notice of intent to release a $35 million funding opportunity, "Bipartisan Infrastructure Law (BIL), Section 41006(a)(2): U.S. Tidal Energy Advancement", in early 2023 to develop a tidal or river current research, development, and demonstration site and to support in-water demonstration of at least one tidal energy system.

The U.S. DOE's WPTO has also released a $10.3 million funding opportunity, "Marine Energy Systems Innovation at Sea", to accelerate the development and testing of marine energy technologies with a focus on wave and ocean current. Concept papers are due 4 November 2022.

The U.S. Testing and Expertise for Marine Energy Research (TEAMER) program is now accepting Request For Technical Support (RFTS) 8 applications through 4 November 2022. Developers can apply for support in numerical modeling and analysis, bench/lab or tank/flume testing, and open water activities. Visit the TEAMER website for RFTS updates.

WEAMEC (West Atlantic Marine Energy Community) has opened a Call for Projects to support eligible French researchers with writing and structuring marine energy projects that will be carried out by academic members of the community. Applications are due 30 November 2022.

Student & Employment Opportunities

Oregon State University is seeking a Safety and Compliance Officer to join the PacWave team and ensure compliance with all safety and environmental regulations and requirements through the construction and operational phases of the project. Applications are due 31 October 2022.

Oregon State University is also seeking a Marine Energy Testing Manager to manage internal and external outreach and engagement with stakeholders including faculty, national and international testing facilities, and marine industries. Applications are due 30 November 2022.

Aquatera is hiring Expert and Senior Environmental Consultants to help support the development of the global offshore renewable energy sector, while promoting economic growth, social inclusion, and sustainable development. Applications are due 31 October 2022.

Newcastle University is recruiting a Research Assistant/Associate in Electrical Machines and Wave Energy to assist in the design build and deployment of a small-scale wave energy device. Applications are due 11 November 2022.

European Marine Energy Centre (EMEC) is seeking a Project Development Coordinator to identify, develop, and contract opportunities for the Islands Centre for Net Zero (ICNZ) to grow its research and development activities. Applications are due 23 November 2022.

University of Southampton is offering a PhD opportunity to develop efficient deep water anchoring systems for floating offshore renewable energy infrastructure. Applications are due 9 December 2022.

Marine Power Systems (MPS) is seeking a Design Technician to provide design support to the design and engineering team. The Design Technician will be responsible for the creation of 3D models and 2D drawing and high-quality images for communications and marketing purposes.

Upcoming Events

Upcoming Conferences

ETP (formerly Energy Technology Partnership) is hosting its 11th Annual Conference 2022: A Net Zero Conference for Emerging Researchers on 1 November 2022 in Edinburgh, UK and online. Register here.

The Maritime Association is hosting its 14th Annual BlueTech Week on 14-18 November 2022 in San Diego, U.S. Register here.

Marine Renewable Canada is hosting its 2022 Conference on 22-24 November 2022 in Halifax, Nova Scotia. Register here.

New Documents on *Tethys Engineering*

Supporting Ocean Energy Technology Development and Commercialisation: Coherent Application of Guidance, Standards and Certification – Ocean Energy Systems & International Electrochemical Commission 2022

> The pathway from early-stage technology to commercial exploitation requires a varying mix of support and guidance, from public sector funding through various types of private investment. The goals of these supporters are wide ranging, from socio-economic growth and domestic infrastructure requirements, through to pure financial gain. Like more mature sectors, the ocean energy sector has a growing body of a guidance and support provision, designed to promote and accelerate commercial exploitation of prospective technologies. As the interests and objectives of stakeholders evolve along the development pathway, so does the guidance required to support the sector's passage –

from early-stage conceptualisation to commercial readiness. This article discusses four such sources of guidance and is written by the providers who are collaborating to ensure they deliver a complementary and coherent set of recommendations.

Comprehensive review on the feasibility of developing wave energy as a renewable energy resource in Australia – Wimalaratna et al. 2022

This study examines the viability of further developing Wave Energy (WE) as a renewable energy source in Australia by evaluating the current constraints and challenges to achieving a satisfactory level of WE generation in the country. As a result, this study emphasizes the trustworthiness of WE in terms of several criteria. The availability of WE Resource within Australia and the status of producing WE are reviewed in this study. It also highlighted certain Australian technologies and devices that are now being tested or deployed in real-time. Moreover, this review is expanded by comparing the key developers in the sector to Australia to uncover some of the contributing elements in other countries that may have contributed to the growth of the WE generation in other nations.

Optimizing offshore renewable portfolios under resource variability – de Faria et al. 2022

The deployment of offshore wind, wave, and ocean current technologies can be coordinated to provide maximum economic benefit. We develop a model formulation based on Mean-Variance portfolio theory to identify the optimal site locations for a given number of wind, wave, and ocean current turbines subject to constraints on their energy collection system and the maximum number of turbines per site location. A model relaxation is also developed to improve the computational efficiency of the optimization process, allowing the inclusion of more than 5000 candidate generation sites. The model is tested using renewable resource estimates from the coast of North Carolina, along the eastern US coast.

Cost reduction pathway of tidal stream energy in the UK and France – Frost 2022

Tidal stream energy (TSE) is an exciting, emerging form of renewable energy. The completely predictable nature of the tidal resource makes TSE unique among renewables. This could give it a key place in our energy system as a highly predictable form of higher quality energy, improving energy security. In 2020 the European industry hit a milestone of 60GWh of production. Despite this, political support for the sector has been inconsistent. This has slowed down investment and technology development, compared to alternatives like solar and offshore wind that have benefited from significant public development funding and energy generation subsidy. Consequently, there has not been the chance to unlock cost reduction through deploying commercial scale arrays, and there are only a handful of projects across the UK and France to date as markets merge across the globe.

Energy assessment of potential locations for OWC instalation at the Portuguese coast – Anastas et al. 2022

This work aims to determine the exploitable wave energy resource at five potential sites close to harbour protection facilities at the Portuguese coast, namely at the Azores archipelago, at Madeira Island and at Sines, on the coast of mainland Portugal. For that purpose, a third-generation wave model SWAN is used to transfer the offshore estimates of sea wave conditions to those points over the last 40 years. Sea states and wind fields are provided by the climate reanalysis datasets ERA5. Using sea states as boundary conditions and wind fields as forcings in the numerical domains of the SWAN model, the sea states were propagated shoreward, in order to estimate and analyse the wave conditions in the regions of interest.

Spatial and temporal variations of the flow characteristics at a tidal stream power site: A high-resolution numerical study – Mercier and Guillou 2022

The upcoming commercial development of tidal stream power requires a profound knowledge of tidal streams. In this article, the spatial and temporal variations of the flow characteristics are investigated through numerical simulations, at fine spatial and temporal resolutions. The study highlights the necessity of local site characterisation prior to turbine installation, due to the high spatial variability of the flow characteristics over distances of less than 100 m. The high variability in space and time of the flow characteristics at the scale of a turbine and its impact on the blade angle of attack underscore the relevance of a good blade pitch control strategy. The study of extreme events in term of maximal flow velocity and variations in the flow direction gives insight for the structural dimensioning of future tidal stream power devices.

News & Press Releases

Ambitious Project Will Create Step Change for Wave Energy Industry – OceanEnergy

A €19.6 million partnership project aiming to be the stepping stone towards large scale wave energy commercialisation, will be launched this week at the International Conference on Ocean Energy in San Sebastián, Spain. WEDUSEA (Wave Energy Demonstration at Utility Scale to Enable Arrays) is a pioneering collaboration between 14 partners, spanning industry and academia from across the UK, Ireland, France, Germany and Spain. It is co-ordinated by the Irish company OceanEnergy. The project is co-funded by the EU Horizon Europe Programme and by Innovate UK, the UK's innovation agency. The WEDUSEA project will demonstrate a grid connected 1MW OE35 floating wave energy converter at the European Marine Energy Centre Test Site in Orkney, Scotland.

Small WEC Analysis Tool Offers Key Baseline Data on Wave Energy Converters – National Renewable Energy Laboratory (NREL)

Surfers know the power of a single wave. So does a ship in the midst of a storm. And thanks to a new tool developed by NREL researchers, so does anyone designing a wave energy converter aimed at harnessing that power. Wave energy converters, or WECs,

come in many shapes and sizes and create different amounts of energy in different types of waves. That means a WEC that performs well in the big waves of California's Humboldt Bay will not necessarily be efficient at capturing the energy of the low and slow swells in North Carolina's Outer Banks. Researchers from the U.S. DOE WPTO and NREL collaborated on the recently developed Small WEC Analysis tool, an online, publicly available graphical user interface. The goal of the site is to provide baseline information about the performance of different types of WECs in various ocean settings.

Indonesia Power and HydroWing inks deal to support and develop tidal energy projects in Indonesia – HydroWing

UK-based tidal energy developer HydroWing has signed a Memorandum of Understanding (MoU) with state-owned company Indonesia Power to support and develop tidal energy projects in Indonesia. The MoU between Indonesia Power (IP) and HydroWing, signed early September 2022, will accelerate tidal energy development in Indonesia through site identification, resource assessment and front-end engineering. Both teams will jointly study selected sites in coming weeks to build a first of a kind business case and pilot project. Together with solar energy and battery storage, tidal energy will provide the baseload of a reliant and clean energy system. Teams have jointly visited the first site late September to prepare a resource assessment campaign to be organised before the end of 2022. This deployment will be the first tidal energy power plant in Indonesia.

With Marine Power, It's Not the Size of Your Turbine, It's the Motion of the Ocean – Esquire

A big chunk of our clean-energy pie will be wind and solar. Somewhat smaller slices will be geothermal and nuclear and hydropower. But the last part, maybe the last 10 percent or so, might come down to more niche technologies like hydrogen fuel cells and marine power. The latter represents the cutting edge of clean energy research and development, and it's primarily happening at the DOE, where the WPTO is seeking to develop, test, and tinker with different devices until they're commercially viable, at which point private firms will take it away. In general, these devices fit into a few main categories: wave, tidal, river current, and gradients. Jennifer Garson, director of WPTO, and Tim Ramsey, the Marine Energy Program Manager, explained all of this—and how marine energy could play a role in responding to natural disasters.

Exowave starts testing wave energy prototype offshore Belgium – Offshore Energy

Danish clean energy start-up Exowave has deployed the scale model of its wave energy technology at the Blue Accelerator test platform, located just off the Port of Ostend in Belgium. Exowave's scale model, weighing 19 tons with the height of 7.2 meters, has been deployed on the seabed at the end of September for a test campaign in real, offshore environment. The wave energy technology has been connected to the Blue Accelerator with a data cable to collect information on the conversion of wave energy in

different wave heights and current strength. After the test period, the wave energy converter will be disconnected and retrieved to the port.