



13 November 2020

[Tethys](#) is an online knowledge base that facilitates the exchange and dissemination of information on the environmental effects of wind and marine renewable energy (MRE). The bi-weekly *Tethys Blast* highlights new publications in the [Tethys Knowledge Base](#); relevant announcements, opportunities, and upcoming events; and news articles of international interest. [ORJIP Ocean Energy](#) has partnered with OES-Environmental to provide additional content. If you have specific content you would like circulated to the greater wind and MRE communities, please send it to tethys@pnnl.gov for consideration.

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Announcements

[New Report on Powering the Blue Economy](#)

In a new [report](#), The Economist Intelligence Unit examines the past, present and future of energy innovation for the blue economy. The report looks at the energy needs of different ocean economy sectors, assesses groundbreaking innovations and outlines an enabling environment for energy innovation within the blue economy. Based on three case studies and in-depth interviews with 30 energy and blue economy experts, this report provides valuable insights for all stakeholders working to develop new, clean solutions for the blue economy and beyond.

[WPTO-MHK Graduate Student Research Program](#)

The Oak Ridge Institute for Science and Education (ORISE) is now accepting applications for the [WPTO-MHK Graduate Student Research Program](#), which is designed to provide graduate thesis research opportunities in marine and hydrokinetics (MHK) at U.S. Department of Energy (DOE) laboratories and other Water Power Technologies Office (WPTO) approved facilities. Applications are due by 5:00pm EST (10:00pm UTC) on 4 December 2020.

[Collegiate Wind Competition](#)

The U.S. DOE's National Renewable Energy Laboratory (NREL) recently released a request for proposals for student teams interested in competing in the [Collegiate Wind Competition \(CWC\)](#) in May 2022. The competition challenges students to design, build, and test a model wind turbine, and plan and financially analyze a wind power plant. Applications due 8 December 2020.

EWTEC Abstract Submission Deadline Extended

The University of Plymouth has extended the abstract submissions for the [14th European Wave and Tidal Energy Conference \(EWTEC 2021\)](#) until 1 December 2020. EWTEC 2021 will be held in Plymouth, UK from 5-9 September 2021.

Funding/Testing Opportunities

The U.S. Testing Expertise and Access for Marine Energy Research ([TEAMER](#)) Program is now accepting applications for the second round of Requests for Technical Support (RFTS). Applications are due by 18 December 2020.

The TEAMER Network Director is also accepting applications for additional facilities to join the [TEAMER Test Facility Network](#) for RFTS round 3 and beyond. Potential facilities (both physical infrastructure as well as expertise capabilities, such as modeling and analysis services) can apply by 4 December 2020.

Innovate UK has announced an upcoming [Smart Grants funding competition](#) for UK registered organizations to apply for a share of up to £25 million to deliver disruptive research and development innovations. The competition opens on 26 November 2020 and closes at 11:00am UTC on 20 January 2021.

The European Commission has released a [Call for Proposals](#) focused on innovative land-based and offshore renewable energy technologies and their integration into the energy system. Submissions are due by 5:00pm CEST (3:00pm UTC) on 26 January 2021.

The U.S. DOE recently announced the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) [Phase I, Release 2 topics](#), which include several WPTO-related topics. DOE plans to issue the [SBIR/STTR Funding Opportunity](#) Announcement on 14 December 2020. Informational webinars will be held at [2:00pm EST \(7:00pm UTC\) on 17 November 2020](#) and at [3:00pm EST \(8:00pm UTC\) on 3 December 2020](#).

Upcoming Events

Upcoming Webinars

Western EcoSystems Technology, Inc. (WEST) will be hosting a webinar, "Taking Optimized Smart Curtailment From Concept to Reality", at 11:00am MST (6:00pm UTC) on 17 November

2020. During the webinar, WEST and Pattern Energy will discuss lessons learned along the road to an implemented smart curtailment program for bats. RSVP [here](#) for conferencing details.

The Discovery of Sound in the Sea (DOSITS) Team will be hosting a webinar, “Regulatory Approach to Underwater Noise, U.S. Approach Compared to that of the E.U. and Other Locations”, at 4:00pm EST (8:00pm UTC) on 19 November 2020. Register [here](#).

Upcoming Conferences

The International Network on Offshore Renewable Energy (INORE) Virtual Symposium 2020 will be held on 19 November 2020. The Virtual Symposium will be held in conjunction with INORE’s Annual General Meeting, and will feature industrial talks, panel discussions, and social networking. Register for free [here](#) by 18 November 2020.

The 4th Symposium of the Scottish Marine Energy Research Programme (ScotMER) will be held virtually from 1-3 December 2020. The Symposium will present recent research on seabirds, mammals, fish, and socioeconomics, as well as provide an update on the Scottish Government’s commitment to a Blue Economy Action Plan and the Sectoral Marine Plan for Offshore Wind. Register for free [here](#).

The National Wind Coordinating Collaborative’s (NWCC) [13th Wind Wildlife Research Meeting](#) will be held virtually from 1-4 December 2020. The meeting will feature a variety of on-demand and live content presented by U.S. and international experts. Register [here](#).

Event Update

The National Hydropower Association (NHA) recently announced the decision to move [Waterpower Week \(WPW\) 2021](#) and the [International Conference on Ocean Energy \(ICOE\) 2021](#) to an all-virtual platform. The events are still planned for 28-30 April 2021.

New Documents on *Tethys*

Marine Renewable Energy

[Potential Environmental Effects of Marine Renewable Energy Development—The State of the Science](#) – Copping et al. 2020

Marine renewable energy (MRE) harnesses energy from the ocean and provides a low-carbon sustainable energy source for national grids and remote uses. The international MRE industry is in the early stages of development, focused largely on tidal and riverine turbines, and wave energy converters (WECs), to harness energy from tides, rivers, and waves, respectively. Although MRE supports climate change mitigation, there are concerns that MRE devices and systems could affect portions of the marine and river environments. The accumulated knowledge of interactions of MRE devices with animals

and habitats to date is summarized here, along with a discussion of preferred management methods for encouraging MRE development in an environmentally responsible manner.

[Asymmetric effects of a modelled tidal turbine on the flow and seabed](#) – Ramírez-Mendoza et al. 2020

The extraction of power from the flow of water has become an important potential source of clean energy. In spite of significant interest in the interaction between energy extraction devices and water currents, comparatively little work has focused on flow asymmetry. Indeed, unusual wake behaviour and limits of turbine array efficiency have typically been attributed to boundary effects rather than the particular turbine geometry. The aim of the present study was to reveal the asymmetries in the hydrodynamic wake and the interactions with the sediment bed due to the presence of a hydrokinetic turbine. We combined: (i) computational fluid dynamics simulations; (ii) optical flow measurements from a series of flume experiments above a fixed rough bed; and (iii) acoustic measurements from a series of flume experiments above a mobile sand bed.

[West Coast Perceptions of Wave Energy: A Survey of California, Oregon, Washington, and British Columbia Residents](#) – Boudet et al. 2020

North America's West Coast represents some of the highest global potentials for wave energy output. We developed and conducted a survey of a sample of residents (N=2000) in California, Oregon, Washington and British Columbia matched on gender, age, race, and education to the general population. Respondents were asked how much they had heard or read about wave energy; what first came to mind when they heard the term; their views of commonly cited risks and benefits; and their overall attitude toward wave energy development. Despite limited familiarity, the results suggest mainly positive attitudes toward wave energy with little variation by state of residence or proximity to the coast. Attitudes varied by gender, race, education and political ideology.

Wind Energy

[A spatial food web model to investigate potential spillover effects of a fishery closure in an offshore wind farm](#) – Halouani et al. 2020

This study investigated the effects of a spatial closure during the exploitation phase of an offshore wind farm in the extended Bay of Seine (English Channel, France) using Ecospace, a spatially and temporally explicit module of Ecopath with Ecosim. To address this question, simulations were conducted through the evaluation of “what-if scenarios” to assess the effectiveness of a fishing exclusion zone inside and surrounding the offshore wind farm. Several biomass, catch and trophic level-based indicators were calculated to evaluate how the exclusion zone could affect fishing activities and main components of the food web. All the indicators were estimated in the extended Bay of Seine and summarized by sub-area.

[Are Bat Activity and Mortality Best Predicted by Weather Measured On-Site or at Off-Site Regional Airports?](#) – Good et al. 2020

Curtailing the operation of wind turbines when wind speeds are low is a common and effective method used to reduce bat mortality. However, bats are not always present or killed during periods of lower wind, and additional research is needed to understand the factors that influence bat migration activity and mortality, which could be used to develop smarter curtailment regimes that maximize energy production while reducing bat mortality. Pilot Hill Wind, LLC and Western EcoSystems Technology, Inc. were awarded funding from the American Wind and Wildlife Institute to enhance ongoing research at two facilities in 2018 to quantify potential relationships between bat activity, bat fatalities, and weather patterns that could be used to implement cost-effective strategies for reducing bat mortality.

[Optimizing the visual impact of onshore wind farms upon the landscapes - Comparing recent planning approaches in China and Germany](#) – Guan 2020

In this thesis, an interdisciplinary Landscape Visual Impact Evaluation (LVIE) model has been established in order to solve the conflicts between onshore wind energy development and landscape protection. It aims to recognize, analyze, and evaluate the visual impact of onshore wind farms upon landscapes and put forward effective mitigation measures in planning procedures. Based on literature research and expert interviews, wind farm planning regimes, legislation, policies, planning procedures, and permission in Germany and China were compared with each other and evaluated concerning their respective advantages and disadvantages.

News & Press Releases

Marine Renewable Energy

[C-Power Announces Upcoming Sea Trials for SeaRAY Autonomous Offshore Power System in Partnership with US Department of Energy and Department of Navy](#) – C-Power

C-Power recently announced that it will commence six-month sea trials in partnership with the U.S. Department of Energy and U.S. Navy to test and validate the technical and economic capabilities of its SeaRAY autonomous offshore power system (AOPS). Initially conceived during a U.S. Department of Defense project, the SeaRAY AOPS provides in-situ power, energy storage, and real-time data and communications support that will advance the marine economy toward a future of autonomous, connected and resident technologies. It is designed to support unmanned offshore activities, including subsea vehicles, sensor packages, and operating equipment.

[Flow Batteries to Combine with Tidal Power to Produce World's First Continuous Green Hydrogen](#) – European Marine Energy Centre (EMEC)

EMEC in Orkney, Scotland will deploy an Invinity Energy Systems (AIM:IES) 1.8 MWh flow battery at EMEC's tidal energy test site on the island of Eday. This unique combination of tidal power and flow batteries will be used to power EMEC's hydrogen production plant, demonstrating continuous hydrogen production from variable renewable generation. Funded by the Scottish Government, via Highlands and Islands Enterprise, Invinity's modular flow battery system will be assembled at the company's manufacturing facility in Bathgate, West Lothian and consist of eight Invinity VS3 battery modules linked together into a single system. The project is expected to go live next year.

Canada Makes Historic Investments in Tidal Energy in Nova Scotia – Sustainable Marine Energy

Canada's Minister of Natural Resources recently announced one of Canada's largest-ever investments in tidal energy — \$28.5 million to Sustainable Marine in Nova Scotia to deliver Canada's first floating tidal energy array. Sustainable Marine developed an innovative floating tidal energy platform called PLAT-I that has undergone rigorous testing on the waters of Grand Passage for nearly two years. A second platform is currently being assembled in Meteghan, Nova Scotia and will be launched in Grand Passage later this year for testing before relocation to the Fundy Ocean Research Centre for Energy (FORCE) in 2021. The objective of the project is to provide up to nine megawatts of predictable and clean renewable electricity to Nova Scotia's electrical grid.

AW-Energy's Technical Expertise is at the Forefront in an Industry Initiative to Unlock Future Multi-GW WaveFarms – AW-Energy

In one of the world's latest wave energy initiatives, experts from AW-Energy Oy – the Finnish pioneer in global wave energy technology – will provide answers on how to prepare and deploy large MW WaveFarms. The 3-year project will see AW-Energy develop processes to deliver the world's first large-scale WaveFarm, with up to 24 integrated WaveRoller units. This work will assist in securing 8 WaveFarm projects that will deliver a capacity of 150MW with an estimate annual electricity production of 400 GWh. The first steps are already underway for commercial deliveries, starting with projects in Indonesia, Sri Lanka and Ireland.

Welsh Government Invests in the World's First Blue Energy Island – Nova Innovation

Nova Innovation has secured an investment of £1.2 million from the Welsh Government for its Enlli tidal energy project in north Wales. The Enlli project creates the opportunity to generate electricity from the natural ebb and flow of the tide between Ynys Enlli—'The Island in the Currents'—and the mainland of the Llŷn Peninsula. It has the potential to help the 'Island in the Currents' switch from a dependency on diesel generation to become the world's first blue energy island. The funding provided through the European Regional Development Fund will support the environmental consenting and engineering design work for this ground-breaking project. Nova plans to install five 100 kW turbines on the seabed with a view to install more turbines in the future.

Wind Energy

[First robotic ‘blade walk’ on a wind turbine opens door to significant cost cuts in offshore renewables](#) – Offshore Renewable Energy (ORE) Catapult

The UK has achieved the world’s first blade walk by a robot on an offshore wind turbine, thanks to BladeBUG and the ORE Catapult. Over two days in mid-October, the six-legged inspect-and-repair robot repeatedly scaled blades at ORE Catapult’s 7MW Levenmouth Demonstration turbine off the coast of Fife. BladeBUG represents a 30% cost reduction on current blade inspection techniques, which are conducted by rope-access technicians, with a measurable knock-on effect to the levelised cost of energy. For next generation turbines, ORE Catapult predicts the cost savings could reach as much as 50 per cent.

[First ever V164-9.5 MW turbine installed on a floating wind project](#) – MHI Vestas

MHI Vestas Offshore Wind has installed the largest and most powerful offshore wind turbine on a floating platform for the Kincardine offshore wind project. The first V164-9.5 MW turbine was installed on a Principle Power WindFloat platform, the first of 5 such units to be installed at the Kincardine project. This advance in turbine nameplate capacity is a continuation of MHI Vestas’ world-leading floating wind credentials, including the recent installation of WindFloat Atlantic. Kincardine, being developed by Cobra Group, is set to be the largest floating wind farm in the world by nameplate capacity. The five units at the project will be installed about 15km off the coast of Kincardineshire, at water depths ranging from 60m to 80m. This first 9.5MW unit is expected to be anchored at the project site in December 2020.

[Wind power industry to install 71.3 GW in 2020, showing resilience during COVID-19 crisis](#) – Global Wind Energy Council (GWEC)

According to the latest market outlook published by GWEC Market Intelligence, 71.3 GW of wind power capacity is expected to be installed in 2020 despite the impacts of COVID-19, which is only a 6 per cent reduction from pre-COVID forecasts. This is a significant increase from original predictions that expected wind power installations to be reduced by up to 20 per cent due to the pandemic, demonstrating the resilience of the wind power industry across the globe. From 2020 to 2024, the cumulative global wind energy market will install 348 GW of new capacity, bringing total global wind power capacity to nearly 1,000 GW by the end of 2024, which is an increase of 54 per cent for total wind power installations compared to 2019.

[GE Haliade-X Breaks 300 MWh Daily Output Ceiling](#) – Offshore Wind

The prototype GE Haliade-X offshore wind turbine has produced 312 MWh of electricity in a single 24-hour period, once again setting a new world record. The prototype turbine, installed in the Port of Rotterdam, produced its first power in November 2019 and has since set several world records for 24-hour output. The most recent record of 312 MWh

was reached after the prototype had been optimized to operate at a 13 MW power output. This is an improvement of 24 MWh compared to the previous record 24-hour output of 288 MWh set in February 2020 when the unit operated at 12 MW. GE plans to start the serial production of the Haliade-X at the Saint-Nazaire factory in France during the second half of 2021.

Ørsted and bp to develop renewable hydrogen project in Germany – Ørsted

Ørsted and bp have agreed to jointly develop a potential large-scale renewable hydrogen project at bp's Lingen Refinery in North West Germany. The project, which is expected to be operational in 2024, will comprise a 50 MW electrolyser system capable of generating one ton of renewable hydrogen per hour or almost 9,000 tonnes a year. This would be sufficient to replace approximately 20 percent of the refinery's current fossil-based hydrogen consumption, avoiding around 80,000 tonnes CO₂ equivalent emissions a year – equivalent to emissions from around 45,000 cars in Germany. The project is also intended to support a longer-term ambition to build more than 500MW of renewable hydrogen capacity at Lingen. The electrolyser is expected to be powered by an Ørsted North Sea offshore wind farm.