

TETHYS ENGINEERING BLAST



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[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. 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.

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Announcements

Call for Abstracts

The [European Geosciences Union \(EGU\) General Assembly 2020](#) will be held in Vienna, Austria on 3-8 May 2020. Please consider submitting an abstract to the session, [Marine Renewable Energy: Resource Characterisation, Interactions, and Impacts](#). The abstract submission deadline is 15 January 2020 at 13:00 CET.

Funding Opportunities

The U.S. Department of Energy (DOE) has released a [Funding Opportunity Announcement](#) for the DOE Small Business Innovation Research and Small Business Technology Transfer programs. Letters of intent to apply are due 6 January 2020 and applications are due 24 February.

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.

The €13 million [OceanDEMO project](#) has announced the [2nd call for applications](#). The project aims to accelerate ocean energy's transition from single prototype to multi-device farms by providing access to world-leading test centers. Applications close 31 January 2020.

The Marine Energy Alliance (MEA) has opened their [2nd Call for Applications](#). The aim of MEA is to progress the technical and commercial maturity level of early-stage (TRL 3/4) marine energy technology companies with the overall goal of reducing the risk of device failure in subsequent demonstration phases. Applications are due 14 February 2020.

Upcoming Events

Upcoming Webinar

The Ocean Energy Research Association (OERA) will be hosting a [webinar](#) entitled, “Turbulence in High-Flow Tidal Channels” from 1:00-2:00pm AST on 23 January 2020. Register [here](#).

Upcoming Conferences

The inaugural [Pan American Marine Energy Conference \(PAMEC\)](#) will be held in San Jose, Costa Rica on 26-28 January 2020.

The [14th Arctic Frontiers Conference](#) will be held in Tromsø, Norway on 26-30 January 2020.

[Ocean Sciences 2020](#) will be held in San Diego, CA on 16-21 February 2020. Early bird registration ends 8 January 2020.

New Documents on *Tethys Engineering*

[Adaptive backstepping control for maximizing marine current power generation based on uncertainty and disturbance estimation](#) – Yin 2020

This paper focuses on the design and implementation of the high-efficiency control for maximizing the marine current power generation and hence an adaptive backstepping controller with uncertainty and disturbance estimation is proposed for a generic horizontal marine turbine. The turbine design principle and dynamics modelling are presented and then the control problem is formulated. Consequently, the controller is designed to be composed of a marine turbine speed control loop and a q-axis current control loop while the uncertainty and disturbance is estimated and compensated.

[Experimental Study of a Lift-Type Wave Energy Converter Rotor in a Freewheeling Mode](#) – Yang et al. 2020

In pursuit of energy harvesting from ocean waves, our recent progress on studying wave interaction with a lift-type rotor is discussed in this paper. The particular focus is on the characterization of the rotor's unidirectional responsiveness in waves. For the parametric study of the rotor, hydrofoil blades using different cross-sectional profiles and chord lengths have been employed to configure the rotor. The rotor was then tested in a wave

flume under various wave conditions in a freewheeling mode. Experimental results were analyzed and discussed.

Pumping power minimization of an evaporator in ocean thermal energy conversion system based on constructal theory – Wu et al. 2019

Constructal design of an evaporator in ocean thermal energy conversion system (OTECS) is carried out by taking the minimum dimensionless pumping power (DPP) as optimization objective. The effective volume and heat transfer rate (HTR) of the evaporator are taken as constraints in the constructal optimization. The optimal heat transfer plate (HTP) width of the evaporator is obtained. The effects of the structure and flow parameters and types of working fluid on the minimum DPP and optimal HTP width are analyzed.

A numerical study on the performance of a superhydrophobic coated very low head (VLH) axial hydraulic turbine using entropy generation method – Haghighi et al. 2020

Fluids slip on superhydrophobic surfaces. The slip velocity is modeled by Navier's slip-length. A user defined function (UDF) in ANSYS Fluent 15.0 was developed to implement the slip boundary condition. The UDF was validated for different values of slip length by two benchmark solutions in laminar and turbulent flows. We utilized a periodic approach to model the VLH turbine in steady-state condition. For modeling, single-phase is assumed and the shear stress transport model was used for turbulence modeling.

A sensitivity study on the effect of mass distribution of a single-tether spherical point absorber – Meng et al. 2019

In previous work, a single-tether submerged spherical point absorber with asymmetric mass distribution (SPAMD) was proposed to enable harvesting wave energy induced by the surge and heave motion of the buoy. In this paper, a 3DOF (surge, heave and pitch) spectral-domain model considering viscous drag was developed, to investigate the sensitivity of the mass distribution on the power output of the SPAMD in irregular waves. The aim of the sensitivity study is to provide a guideline for the wave energy industry when designing such devices.

Modeling the influence of divalent ions on membrane resistance and electric power in reverse electrodialysis – Gomez-Coma et al. 2019

The prospects and potential of Reverse Electrodialysis (RED) for energy harvesting from natural streams with salinity gradient demand more in-depth studies to understand and overcome the limitations posed by divalent ions. This work investigates experimentally the effect of ion species on membrane resistance, providing for the first time mathematical correlations useful to predict power performance in RED stacks under a wide range of compositions of salinity gradient solutions.

News & Press Releases

[British Virgin Islands to boost marine sector; aims for 60% renewable energy by 2030](#) – Cayman News

The government of the British Virgin Islands says 2020 is dedicated to launching initiatives to reduce the territory's carbon footprint and programmes meant to empower the nation's workforce. Also included in this plan, are moves to improve the infrastructure at state-owned HL Stoutt Community College, which was left severely damaged after hurricane Irma. The ministry of education is specifically committed to improving the quality of the schools marine programme, and will cover tuition costs for all Virgin Islanders interested in becoming certified in different areas of the marine sector.

[Membrane inspired by bone and cartilage efficiently produces electricity from saltwater](#) – Science News

Inspired by membranes in the body tissues of living organisms, scientists have combined aramid nanofibers used in Kevlar with boron nitride to construct a membrane for harvesting ocean energy that is both strong like bone and suited for ion transport like cartilage. The research, published December 18 in the journal Joule, overcomes major design challenges for technologies that harness osmotic energy (pressure and salinity gradient differences between freshwater and ocean water) to generate an eco-friendly and widely available form of renewable energy.

[SEFA Grant Supports Solar-Hydro Hybrid Project](#) – Marine Energy

The African Development Bank-managed Sustainable Energy Fund for Africa (SEFA) has approved a \$990,000 grant to support the preparation of a 9-MW solar-hydro hybrid project in Burundi. The project consists of two plants, each featuring a solar and a hydro component as well as a local distribution network and interconnection to the national power grid. The hybrid design is anticipated to regularize the power output during dry and wet season and mitigate power shortfalls caused by climate change.

[AW-Energy Oy Secures New European Patents for WaveRoller](#) – Marine Energy

AW-Energy Oy, Finnish wave energy technology developer, has been granted new patents protecting the use of WaveRoller in 38 countries across Europe from the European Patent Office (EPO). The patents cover WaveRoller's energy system and its power transfer application, in addition to a range of operating improvements made to the device, particularly on failsafe operating improvements to protect against varying ocean conditions.

[Offshore Energy Outlook for 2020](#) – Marine Technology News

The “new normal” is a phrase tossed around often in offshore energy circles today as those servicing and operating in the sector grapple with the harsh realities of the prolonged industry downturn. On top of this, there's another new reality for oil and gas

companies to come to grips with: the so-called “energy transition”. Increasingly, more environmentally conscious governments, societies and investors are piling pressure on the industry and calling for emissions reductions and a shift toward renewable energy.