Technical Webinar Series: Accelerating the development of Offshore Renewables/Ocean Technologies in Small Island Developing States

Webinar I: Offshore Wind and Floating Solar PV

Date: 16 December 2021; **Time:** 17:00 GST – 18:30 GST; **Via Zoom**

Background and Context

Small Island Developing States (SIDS) are endowed with fragile natural environments and a growing population with special circumstances and needs, arising from the adverse impacts of climate change and further exacerbated by the ongoing COVID-19 pandemic. SIDS are also heavily dependent on expensive, imported fossil fuels resulting in high electricity tariffs and often experience power supply disruptions due to inadequate and aged infrastructure. Notwithstanding, SIDS remain committed to ambitious Nationally Determined Contributions (NDCs) under the Paris Agreement and targets in their respective national energy policies and roadmaps focusing on renewable energy. In this regard, International Renewable Energy Agency (IRENA), through the SIDS Lighthouses Initiative (LHI)[1] is supporting SIDS in their energy transformation toward renewables through the implementation of enhanced NDCs and has prioritized the promotion of all renewable energy sources, especially offshore renewables, including ocean energy. Offshore renewables include: Offshore wind power (with fixed or floating foundations) and floating solar photovoltaic (PV) while ocean energy technologies refer to: wave energy, tidal energy, Ocean thermal energy conversion (OTEC) and salinity gradient[2].

As the custodians of vast ocean spaces, SIDS have recognized the significant potential of harnessing ocean energy to transform their economies and provide a pathway to meet their Sustainable Development Goals (SDGs) and Paris Agreement commitments through the decarbonization of the power sector and other end-use applications[3,4]. In addition to providing electricity, ocean energy can bring a multitude of socio-economic benefits to SIDS and coastal communities such as job creation, improved livelihoods, local value chains and enhanced synergies among blue economy actors[5]. Another key benefit of ocean energy technology is their high predictability which makes them well-suited to complement variable renewable energy sources such as wind and solar photovoltaic (PV).

According to IRENA's 1.5°C Scenario[6], installed capacity of ocean energy could reach 72 GW of installed capacity by 2030[7]. However, over the last decade, growth in the sector has been slower than expected.

[1] SIDS Lighthouses Initiative Website: https://islands.irena.org/
[2] IRENA (2020), *Fostering a blue economy: Offshore renewable energy*, International Renewable Energy Agency, Abu Dhabi.
[3] SIDS High-Level Dialogue: *Accelerating Energy Transition in Small Island Developing States to Stimulate Post-Pandemic Recovery*, 01 -02 June 2020, Virtual.
[4] SIDS High- Level Dialogue: *Energy Transformation in Small Island Developing States*, 15 September 2020, Virtual.
[5] IRENA (2020), *Fostering a blue economy: Offshore renewable energy*, International Renewable Energy Agency, Abu Dhabi
[6] IRENA (2021), *World energy transitions outlook: 1.5°C pathway*, International Renewable Energy Agency, Abu Dhabi.
[7] IRENA (2021), *Offshore renewables: An action agenda for deployment*, International Renewable Energy Agency, Abu Dhabi.

Ocean energy technologies are still in developmental stages, with most technologies in the prototype phase and some just reaching commercialization[8]. In particular, the market introduction of these technologies in SIDS face several barriers, related to small market size, high costs and risks associated with renewable energy investment, as well as other limitations related to data availability, policy and regulation, research and development, capacity building and access to finance. Most importantly, SIDS have reiterated the urgent need for increased private sector engagement as well as financial and technical support to assess and develop their ocean potential through suitable and sustainable ocean technologies.[9]

In response to the request from its Members to accelerate the uptake of offshore renewables, IRENA has established a Collaborative Framework on Ocean Energy/Offshore Renewables which serves as an effective vehicle for dialogue, co-operation and coordinated action among stakeholders. In light of this, IRENA is jointly hosting a three (3) part Technical Webinar Series on the development of Ocean Energy Technologies which can be considered by SIDS. The Webinar Series provides an opportunity for those at the forefront to present the latest knowledge and discuss issues pertinent to accelerating the development and deployment of:

i. Offshore Wind and Floating Solar Photovoltaic (PV)
ii. Ocean Thermal Energy Conversion (OTEC)
iii. Wave and Tidal Energy

Webinar I: Offshore Wind and Floating Solar PV

Offshore wind has now become cost-competitive with conventional forms of electricity generation in many settings. Developments in wind turbine technologies as well as in foundations, installation, access, operation and system integration have permitted moves into deeper waters, further from shore, to reach larger sites with better wind resources. Despite the progress made, the offshore wind sector must continue to reduce costs, pursue research, development and demonstration (RD&D) efforts, especially for floating foundations, ease its integration into onshore grid systems, improve its cooperation and coordination among all stakeholders using marine resources and expand the markets that it is able to address, while preserving its focus on the environmental impacts, health and safety [10].

For SIDS, access to a stronger and more consistent wind resource as well as the potential for reducing visual impact and concerns relating to competition for land use, provides sound rationale for its deployment. In addition, offshore wind farms can be built quickly, at gigawatt-scale, close to densely populated coastal areas, making it an important addition to the portfolio of technologies to decarbonize the energy sector in a cost-effective manner. With continued technical advancements, innovation and cost reductions, offshore wind is anticipated to grow from a new commercial technology to an industrialized component of the global energy mix.

[8] IRENA (2020), *Innovation outlook: Ocean energy technologies*, International Renewable Energy Agency, Abu Dhabi.
[9] SIDS Global Business Network Virtual Forum: *Leveraging Partnerships for the Sustainable Development of Ocean Energy in Small Island Developing States*, 30 -31 March 2021, Virtual
[10] IRENA (2016). *Innovation Outlook - Offshore Wind*. International Renewable Energy Agency, Abu Dhabi

Floating solar PV is an emerging technology with the potential for rapid growth. The demand for floating solar PV is expanding, especially on islands as the cost of the water surface is generally lower than the cost of land. Currently, most activity on floating PV relates to freshwater artificial reservoirs. Notwithstanding, the combined use of offshore solar PV with offshore wind is possible, because the solar panels can float between the wind turbines at sea, resulting in a hybrid system that can provide more stable power for the grid[11].

This Webinar will discuss the key advancements in offshore wind and floating solar PV technologies and will feature representatives from SIDS, financial institutions and development partners who have prioritized offshore wind and floating solar PV as viable offshore renewable technologies in the short to medium horizon.

Webinar II: Ocean Thermal Energy Conversion

Ocean Thermal Energy Conversion (OTEC) is a process that can produce electricity by using the temperature difference between deep cold ocean water and warm shallow or surface waters. Studies have shown that the African and Indian coast, the tropical west and south-eastern coasts of the Americas, and many Caribbean and Pacific islands have sea surface temperature of 25°C to 30°C which are conducive to OTEC. More specifically, most Caribbean and Pacific countries have the required temperature degrees between 1-10 km of their coastline. Similarly, many African SIDS have viable OTEC resources within less than 25 km of their coastline. As such, OTEC has been regarded as the most suitable, and economically viable for island countries and remote island states in tropical seas where generation can be combined with other functions, such as air-conditioning and freshwater production. Overall, the potential of OTEC has been estimated at 44 000 TWh annually which represents almost two thirds of the global ocean energy potential[12]. In addition, OTEC provides constant, steady power without energy storage requirements and is also dispatchable. Notwithstanding, the siting of OTEC projects, the viability of small scale (1 megawatt, MW) plants, environmental impact as result of changing temperatures and construction and planning processes for OTEC are key considerations[13].

Experiences and best practices from projects in various phases of development will be presented during the Webinar by Governments, project developers and researchers to provide an understanding of OTEC system designs, technical innovation in the field of OTEC, findings of feasibility studies and applications in the tourism sector, as well as other sustainable water use and food production opportunities.

Webinar III: Wave Energy and Tidal Energy

Wave energy utilizes the movement of waves to drive an electric generator. It is less mature compared to other ocean technologies and is at a scale testing to demonstration stage with several wave energy technology concepts under development according to varied wave conditions. Consequently, there is a lack

[11] IRENA (2020), *Fostering a blue economy: Offshore renewable energy*, International Renewable Energy Agency, Abu Dhabi
[12] IRENA (2021), *Offshore renewables: An action agenda for deployment*, International Renewable Energy Agency, Abu Dhabi.
[13] IRENA (2014). *Ocean Thermal Energy Conversion: Technology Brief*. International Renewable Energy Agency, Abu Dhabi

of industrial cohesion and limited supply chains for the variety of components required[14]. In general, wave energy converters are currently following two parallel paths: one aimed at the deployment of largescale devices above 1 MW and eventually arrays of these, and the other aimed at purpose built smaller full-scale devices for specific offshore applications such as providing power to offshore platforms or pumping water to shore for desalination.

For SIDS, wave energy has potential particularly due to the consistency of the resource. Overall, the potential of wave energy has been estimated at 29 500 TWh per year[15]. While large scale commercial application of wave energy technology is not commercially viable, there is an opportunity for SIDS to facilitate deployment testing and research of wave energy devices.

Tidal Energy technologies refer to those which harnesses the potential energy difference in water levels (tidal range) or incoming and outgoing water (tidal current). These technologies face various deployment challenges with several technologies under investigation. Tidal energy potential increases with the range, but it can only be harnessed in a limited number of countries that possess the necessary resources. Due to the geographical limitation, the theoretical potential of tidal energy is the smallest of any ocean energy technology with much lower potentials than solar or wind. Despite this, its main advantage is that tides are not influenced by weather but by cyclical constellations and can therefore be predicted well in advance for the short and long term[16].

This Webinar will explain the status of wave and tidal technologies, the suitability of various types of wave and tidal energy technologies in the Atlantic Ocean, Indian Ocean and South China Sea (AIS), Caribbean and Pacific Region and potential applications in SIDS.

Objectives

The aim of the Webinar Series is to:

1. To promote offshore renewable energy development in SIDS, including ocean energy through the sharing of global, regional and national experiences, best practices and lessons learned on various offshore energy technologies.
2. To identify enabling policy, regulatory, technology and financial frameworks for increased deployment of offshore, including ocean energy technologies towards the transformative decarbonization of societies.
3. To explore opportunities to advance ocean energy technologies beyond assessment to deployment through investment, partnerships, R&D and demonstration projects.

Intended Outcomes

1. Deeper understanding of the application and benefits of offshore, including ocean energy technologies.
2. Increased awareness of the limiting factors which hamper offshore, including ocean energy deployment and the opportunities to accelerate their development in SIDS.

[14] IRENA (2014). *Wave Energy Technology Brief*. International Renewable Energy Agency, Abu Dhabi
[15] IRENA (2021), *Offshore renewables: An action agenda for deployment*, International Renewable Energy Agency, Abu Dhabi..
[16] IRENA (2020), *Innovation outlook: Ocean energy technologies*, International Renewable Energy Agency, Abu Dhabi.

3. Increased understanding of the needs of Governments, financing institutions and other actors to move beyond assessment to deployment.
4. Increased understanding of the opportunities for partnership among stakeholders in the offshore renewable energy/ocean energy sector.
5. Recommendations which can inform IRENA's Collaborative Framework on Ocean Energy/Offshore Renewables and the Ocean Energy Development Platform Agendas.

Target Audience

Participants will be from the public, private sectors and civil society and the event will strive for broad participation from SIDS and partner countries. Participants will include, but are not limited to: Representatives of the SIDS Governments, development partners, international and multilateral organisations, SIDS Chambers of Commerce at the local and regional levels, private sector, International Financial Institutions, Supra-/ Inter-governmental Organizations, Academic institutions and think tanks, Civil Society Organisations (CSOs), philanthropists, as well as other relevant stakeholders and experts.

Agenda

Moderated by **Mr. Paul Holthus,** *President & Chief Executive Officer, World Ocean Council*

Time in GST	Session
17:00 – 17:05	**Welcome and Opening Remarks** ▪ **Ms. Gauri Singh,** Deputy Director General, International Renewable Energy Agency **Keynote Address** ▪ **Mr. Courtenay Rattray,** UN Under-Secretary General and High Representative, United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States
17:05 – 17:20	**Scene Setting Presentation** ▪ **Mr. Ben Backwell,** Chief Executive Officer, Global Wind Energy Council
17:20 – 17:40	**Case examples: Applications and Benefits of offshore technologies: Offshore Wind and Floating Solar PV** ▪ **Ms. Kate Johannesen,** Head of Project and Technology Development and Renewables Consultant Engineer, Xodus Group ▪ **Ms. Jen Tan,** Head of Integrated Solutions (Singapore & Southeast Asia),

	Sembcorp
17:40 – 18:10	**Financing Offshore Wind and Floating Solar PV** - **Ms. Racquel Moses,** Chief Executive Officer, Caribbean Climate-Smart Accelerator - **Mr. Lano Fonua,** Operations Officer, Energy, Caribbean Development Bank - **Mr. Mark Leybourne,** Senior Energy Specialist, World Bank
18:10- 18:30	**Advancing deployment of Offshore Wind and Floating Solar PV** - **Ms. Cherri- Ann Farquharson**, Knowledge Management and Capacity Development Expert, Caribbean Centre for Renewable Energy and Energy Efficiency - **Mr. Simona Kilei**, Director, Department of Energy, Ministry of Transport, Energy & Tourism, Tuvalu