PACIFIC COMMUNITY

FFIFTH PACIFIC REGIONAL ENERGY AND TRANSPORT MINISTERS' MEETING
(Port Vila, Vanuatu, 8 – 12 May 2023)

AGENDA ITEM E10 – CALL FOR OCEAN ENERGY ACTION – POWERING THE GREEN AND BLUE ECONOMY ASPIRATIONS OF THE PACIFIC

[Jointly submitted by United Nations Industrial Development Organisation (UNIDO), SPC's Pacific Centre for Renewable Energy and Energy Efficiency (PCREEE), and SIDS DOCK]

Purpose

1. The purpose of this paper is to highlight the mid-term and long-term opportunities of ocean renewable energy in the context of the blue and green economy aspirations of Small Island Developing Sates (SIDS) in the Pacific and provides a number of recommendations on ways forward.

Background

2. The ocean makes a significant contribution to the global economy – over USD 1.5 trillion in value added in 2010. The projections suggest that by 2030, the ocean economy could be more than double its contribution to global value added, reaching over USD 3 trillion, and creating 40 million jobs. At latest since COP-26, held in Glasgow in November 2021, and the UN Ocean Conference, held in Lisbon in June 2022, the preservation of the ocean health and the greening of marine and coastal industries were acknowledged as important pillars of global climate mitigation and adaptation action.

3. The blue economy concept includes emerging SIDS-appropriate ocean energy technologies (OETs) as sustainable nature-based solution, which can simultaneously provide energy services to coastal communities and contribute to the decarbonization of the expanding blue industry. Globally, it is estimated that 40% of the population, around 2.4 billion people, live within 100 kilometers from the coast. There is a need to create awareness on the broad range of devices and possible end-uses, which range from power generation to cooling, desalination, by-products for aquaculture and agriculture, as well as green hydrogen production potential. Therefore, to harness the benefits of their large exclusive economic zones (EEZ), most SIDS are developing green and blue economy policies, which are closely aligned with the efforts to increase national climate resilience.

4. In the wider definition, ocean energy includes an array of renewable energy technologies using non-living marine resources (e.g., wave, tidal range/stream, ocean thermal energy conversion, salinity gradients, seawater air conditioning, marine algae and bioenergy) or marine/coastal space (e.g., offshore wind, floating PV, hybrids through co-location, pumped seawater hydropower). Additionally, the definition includes renewable energy and energy efficiency solutions tailored for industries of the blue economy, for example, fisheries and aquaculture, desalination and freshwater, biotechnology (e.g. pharmaceutics, cosmetics), ocean intelligence and observation, maritime and coastal tourism and business hubs, shipping and port infrastructure/services, waste to energy for coastal protection (SIDS DOCK/UNIDO, 2021).

5. Several regional policies and strategies, including the 2050 Strategy for the Blue Pacific Continent, the Framework for Resilient Development in the Pacific: An Integrated Approach to Address Climate Change and Disaster Risk Management (FRDP) 2017 – 2030 and the Framework for Energy Security and Resilience in the Pacific (FESRIP) 2021–2030, which includes ocean energy as an important technology option. In 2019, the Pacific energy ministers called for concerted efforts to adopt new and emerging technologies to increase renewable energy utilization in PICTs.

Current status

6. In contrary to the deployment of off-shore wind power or other renewables, the application of traditional OETs is mostly limited to some industrialized or emerging economies. According to IRENA, by the end of 2020, the cumulative global installed ocean energy capacity – including tidal and wave energy as well as ocean thermal energy conversion (OTEC) and salinity gradient – was only around 515 megawatts (MW). Around 500 MW were generated by two large tidal range projects. Geographically, the projects are located mainly in industrialized countries in Europe, Asia and North America. Theoretically, ocean energy has the potential to meet the entire global electricity demand of today. The global cumulative resource potential ranges from 45.000 terawatt-hours (TWh) to well above 130.000 TWh annually (IRENA, 2020).

7. There are hundreds of different OETs devices which are at different stages of development ranging from R&D (TRL 1-4) to prototyping (TRL 3-6), demonstration (TRL 5-7), pre-commercial (TRL 6-8) and industrial roll-out (TRL 7 to TRL-9). Whereas some of the OETs have already or are close to reach the stage of commercialization, others remain still in the stage of prototyping or demonstration. Large-scale tidal range projects have been deployed commercially in several countries (e.g. France, Canada, China, Russia and South Korea). Tidal stream technology has reached maturity, further R&D and large demonstration projects for wave and other technologies such as OTEC are required. Generally, it is expected, that the OETs will move up to technology readiness level 9 (TRL9) and become commercial within the next decade.

8. In this scenario, currently required subsidies for some OETs will decrease significantly. In 2020, the levelized cost of energy (LCoE) for tidal steam was estimated between USD 0.20/kWh and USD 0.45/kWh and for wave energy between USD 0.30/kWh and USD 0.55/kWh (IRENA, 2020). Due to economies of scale, it is estimated that tidal technologies will reach levelized cost of energy (LCoE) of 0.15 EUR/kWh by 2025 and of 0.10 EUR/kWh by 2030. Wave energy technologies are expected to reach the same targets with a five-year delay, 0.15 EUR/kWh in 2030, and 0.10 EUR/kWh by 2035 (European Commission, 2022). It is estimated that the LCOE of OTEC plants below 10 MW may lie between USD 0.20/kWh and 0.67/kWh (OES, 2020). Large-scale tidal range projects, using conventional hydro-power technology and intelligence, were already deployed commercially.

9. It is estimated that economies of scale will allow ocean energy to achieve similar cost reductions as wind and solar, given the similarity in business models. The European industry works towards a full industrial roll out within the next ten (10) years. It is envisaged, that ten percent (10%) of the electricity demand of the European Union (EU) will be covered by renewable ocean energy sources by 2050. In recent years, the efforts of the industry to develop demonstration projects overseas has notably increased and there is increased interest of institutional funds and venture capital.

Issues and Opportunities

10. Together with other renewables, ocean energy offers the opportunity to reduce fossil fuel import dependency. It is estimated that SIDS import annually more than 200 million barrels of petroleum, which costs billions of USD and is a major cause of debt and negative balance of trade in SIDS.

11. Due to the high predictability of some technologies, ocean energy can complement other intermediate renewables such as solar PV and wind and reduce land use for energy generation. Certain solutions can generate baseline electricity (e.g. OTEC) and offer co-benefits for climate adaptation and costal protection (e.g. tidal range, SWAC). OETs can become enablers for the economic diversification

efforts within the blue and green economy and help SIDS to leapfrog to new emerging sectors requiring different scales and quality of energy. Such efforts can build on existing intelligence and technology (e.g. floating platforms) of the maritime and fossil fuel sector.

12. However, due to certain limitations and despite some implemented prototypes, so far PICTs have been unable to take advantage of OETs and there is limited capacity and awareness regarding the planning, installation, operation, economics and quality assurance of such systems. There are barriers in the areas of planning, policy and regulation, knowledge, awareness, human and entrepreneurial capacity, as well as access to technology and finance. It shall be noted that some technologies, such as OTEC, require more advocacy as due to the geographic concentration of the resource potential they are of particular interest for SIDS and LDCs and less for northern industrialized countries.

13. There is need to proof the feasibility and viability of such solutions in various climate zones and to familiarize PICTs experts and policy makers with the leading industry processes and practices. Despite the interest of the ocean energy industry to test solutions in tropical climates, there are hardly international platforms, which promote knowledge transfer to SIDS/LDCs and feasibility intelligence. Apart from national oriented R&D grants there is hardly concessional climate or development financing for OETS project in developing countries available

14. Therefore, to address this shortcoming, SIDS DOCK and UNIDO launched the Global Ocean Energy Alliance (GLOEA) for SIDS during various events at the COP26 in 2021 and the UN Ocean Conference in 2022. The initiative is being supported by various Prime Ministers from the Pacific, Caribbean and Africa. The GLOEA is intended to build a bridge between the industry and research players which need to test new solutions in various climates and contexts, and the interest of SIDS to get access to technology and expertise, as well as with investors, project developers and government for the implementation of projects.

15. A major focus of the GLOEA will lie on the development and implementation of a pipeline of bankable ocean energy lighthouse projects in the Pacific, Caribbean, Indian Ocean and Africa. The GLOEA aims to establish a global community of vested interest with the capacity to develop a pipeline of bankable ocean energy projects. For example, currently the GLOEA is supporting the development of a 1,5 MW OTEC pilot facility in Sao Tome and Principe, and a two-megawatt Wave Power Park in Tonga.

Recommendations

16. The meeting is invited to:

(i) **agree** for SPC/PCREEE, UNIDO and SIDS DOCK to develop an ocean energy program, which aims to mitigate barriers and brings latest innovations to the Pacific, including cooperation with other centres of the Global Network of Regional Sustainable Energy Centers (GN-SEC).

(ii) **request** PICTs and international partners to undertake technical assessments, including (i) marine spatial planning, (ii) mainstreaming OETs into energy, blue economy and climate scenarios, and (iii) the potential co-location benefits of OETs such as aquaculture, desalination, marine tourism.

(iii) **request** partners to operationalize the Global Ocean Energy Alliance (GOEA) as a tool to attract investment from donors, private sector and emerging green and blue financing instruments, and advocate for funding from the GEF and GCF.

(iv) **request** UNIDO/SIDS DOCK to support the development of SIDS-appropriate OETs quality infrastructure, model documents for licensing, regulation and environmental and social safeguards, as well as tailored trainings to be mainstreamed into curricular of universities and vocational centers, and to facilitate partnerships with relevant agencies.