Webinar on Ocean Energy
Global Sustainable Water and Energy Solutions Network

Summary
29 June 2021

1. The Global Network on Sustainable Water and Energy Solutions held a virtual seminar on ocean energy on 29 June 2021. The meeting was convened by the United Nations Department of Economic and Social Affairs (UN DESA). More than 40 participants attended from all regions around the world and various sectors including national governments, NGOs, private sector, academic institutions, IGOs and UN system. The objective of the seminar was to share knowledge and experience on ocean energy and provide a platform to ask questions and discuss future plans. (See Annex I – Agenda.)

2. **Welcome:** The meeting was moderated by **Mr. Moez Jomaa of SINTEF**, who welcomed members and spoke on the growing relevance and potential of ocean energy. He also thanked UN DESA, the network, and SINTEF for organizing the meeting.

3. **Opening Remarks: Mr. Ivan Vera of UN DESA**, the coordinator of the network, introduced the seminar. This is the 3rd virtual seminar and they have been successful so far. Mr. Vera introduced the network and emphasized the importance of its work. Water and energy are hugely important goals for the UN, with SDGs 6 and 7, as well as 14, concerning these areas. Some of the biggest barriers that still exist are in deployment and commercialization. We need to emphasize capacity development and technology transfer between stakeholders and experts. The network has a Website and Knowledge Platform on its website and attendees are encouraged to explore it or contribute (link).

4. **Panel Presentations: Sharing Experiences on Integrated Water and Energy Solutions Related to Ocean Energy**
    a. **Mr. Rémi Cerdan, Renewable Energy Innovation in Developing Countries, International Renewable Energy Agency (IRENA):** Mr. Cerdan informed that the majority of installed ocean energy capacity is tidal barrage, followed by tidal stream and then wave conversion. Tidal stream technology is considered to have great potential and makes up the majority of the pipeline of current projects. OTEC (ocean thermal energy conversion) and salinity gradient technology are also in development. Tidal technologies have a lower energy yield than some other projects, but are especially stable and predictable, so they have an important role to play in the energy transition. It is important to integrate energy projects with other projects to develop an interrelated "blue economy." For instance, shipping, cooling, aquaculture, offshore oil and gas, and desalination can all coexist and benefit from ocean energy. Ocean energy can be, and is currently being, used to support SIDS and artificial islands, in parallel with other types of energy. Mr. Cerdan closed with some key recommendations. The technical sector must pursue technology convergence and standardization, conduct resource assessment, and secure capital grants for R&D. In the environmental and social sector, there is a need to improve access to

baseline data and consult and engage the public. Policies need to support innovative financial structures, compensate additional services, and promote innovative business models. Finally, Mr. Cerdan noted that infrastructure needs to improve the availability of networks and firm generation, engage and inform emerging supply chains, and pursue synergies with other renewable energy technology.

b. **Mr. John Olav Tande, Chief Scientist, SINTEF, Norway:** Mr. Tande presented the trajectory of offshore wind comparing it to onshore wind systems. He explained that, in the years to come, we could see offshore wind providing a major source of reliable energy. As R&D continue, wind energy will continue to become cheaper and more efficient. Offshore wind could come to produce 700 GW in the next 20 years if it continues at the same pace as onshore wind. At present, wind energy is most prevalent in Europe and China. The depth of the water in which turbines are built plays a role, with shallower water being easier to build. However, newer projects are planned further away, which is more expensive but could be more productive, with stronger winds. Floating wind projects have also been implemented, with further development continuing, and likely can be made cheaper in the future. The primary challenge presently is implementing these turbines in the deeper ocean. Mr. Tande closed by discussing North Wind, his research organization, and their upcoming conference from 13-15 of January 2022.

c. **Mr. Oliver Wragg, Commercial Director, Orbital Marine Power, Scotland:** Mr. Wragg spoke about tidal stream technology, of which Orbital Marine Power is the leading developer. The O2 turbine, which is on-budget and for which data should be available this year, will be the world's largest tidal turbine. The turbine is anchored in the water, where underwater turbines can harness the power of tides to produce energy. The development of the O2 involved a design collaboration with BMW as well as innovative financing through crowdfunding and 7 million pounds of construction debt finance. Previous turbines had a successful 12-month test period, at times meeting 25% of Orkney Island's electricity demand, and won a number of awards and grants. Moving forward, Orbital Marine Power plans to build two more turbines which should run for 15 years each. Mr. Wragg notes that there is also potential to scale this technology for river flows.

d. **Mr. Hermann Kugeler, Business Development Manager, Makai Ocean Engineering, USA:** Mr. Kugeler introduced Makai Ocean Engineering as a small business with 37 employees, best known for its submarine cable software. They are also involved in subsea R&D and technology and ocean energy. Mr. Kugeler spoke about seawater air conditioning (SWAC), which is notably economically viable today, but primarily focused on strides being made in ocean thermal energy conversion (OTEC), a process in which warm surface seawater is used to boil a working fluid which runs through a turbine and is then recondensed by cold seawater from deeper in the ocean. This system can be a non-variable 24/7 baseload renewable energy resource, but is currently very costly, and requires the correct conditions to provide both warm and cold seawater. In addition, it has a high CAPEX, is not commercial scale, and lacks economies of scale currently. Makai started operation of the OTEC plant in 2015 and is developing the technology still today to make greater strides.

e. **Dr. Elisabetta Tedeschi, Professor, Department of Electric Power Engineering, Norwegian University of Science and Technology (NTNU), University of Trento, Italy:** Dr. Tedeschi remarked that, while oceans cover 71% of the planet and represent a huge and predictable source of energy, ocean energy is largely untapped. Ocean energy needs to meet 2030 and 2050 energy

and climate goals, she says, but there is no one "correct" type of ocean energy and tailor-made solutions are also needed, making it difficult to expand the sector. Dr. Tedeschi suggests that we need to exploit synergies within the energy sector (for instance, combining wave and wind installations) and with other sectors. Specifically, the 5 "blue growth" sectors are biotechnology, aquaculture, renewable energy, tourism, and mineral resources. Ocean energy could provide 10% of the current electricity needs and create 400,000 jobs by 2050. These are largely skilled jobs, so she emphasized the need for higher education and training or else potentially seeing a shortage in the needed labor.

5. **Discussion and Questions**
    - **a.** To encourage cooperation between stakeholders, Mr. Cerdan suggested that we use existing institutions, within which connections already exist or can be facilitated, and that we identify synergies, as mentioned earlier, which can take advantage of co-benefits and provide added incentive to stakeholders. Mr. Tande noted that, while typically the most accessible areas for ocean energy are closer to shore, space further away from the shore are also usable and may be easier to use without conflicting with other uses. These areas could also be collated with other uses, such as wind or solar power. Systems in especially remote areas may be too far for a grid connection or not have enough demand, so there is potential to share or export energy, possibly through green hydrogen.

    - **b.** Dr. Tedeschi noted the possible shortage of skilled professionals in offshore sector in the coming years as the sector grows. Therefore, we need to train and educate young people in a global, inclusive, and cross-sectoral manner. She noted that certain scholarships are available in the EU in this field that are available for anyone.

    - **c.** Some of this development can be very expensive, so to help bring down costs, Mr. Wragg explains that his company focused on driving down operating costs with certain automated or improved maintenance systems. In addition, driving down a capital investment is possible through some of the strategies already mentioned in innovative financing such as constructive debt finance. For OTEC, Mr. Kugeler explained that there is an intense CAPEX, but economies of scale can help from the 10 to 100 MW range. Makai has attempted to bring down the cost by focusing on bringing down the cost of titanium heat exchangers, which make up about 1/3 of the price of an OTEC system. For OTEC, bigger systems are more cost-effective.

    - **d.** Mr. Cerdan explained that his data showed a low level of OTEC output because it was only measured in the Caribbean. OTEC only functions in areas with a temperature differential of around 20°C between the surface and deep water. OTEC actually has a high potential for energy output.

    - **e.** All panelists, when asked if it was beneficial for oil and gas to invest in renewables, remarked that many already are, and it is certainly important. Certain European energy producers especially have pivoted into offshore wind

    - **f.** Mr. Wragg, speaking on green finance, suggested revenue support mechanisms and feed-in tariffs, with an emphasis on cost reduction for first steps towards creating these energy systems. Carbon pricing could likely make the biggest difference in the future by bringing us

closer to the point where renewables drop under the price of fossil fuels, which move higher, shifting demand.

6. **Closing:** In closing, Mr. Vera invited the panelists to share messages that they, as experts, would give to international organizations such as the UN to support the advancement of the deployment and commercialization of ocean energy technologies. Mr. Wragg explained that the biggest factor in the timeline of development is often the collection of baseline environmental data. If international organizations were to collect data on a large scale and make it available publicly, this could help to remove years from project development timelines. In addition, he suggested more risk-adjusted approaches to environmental impacts, as certain industries have had much fewer incidents but are still held to difficult standards. Mr. Tande suggested that these projects are often located in shared or international waters, so enabling national collaboration could help to make these projects more efficient. Mr. Vera finished by inviting panelists to write a case study to be published on the network's website as an opportunity to disseminate knowledge on ocean energy contributing to integrated water and energy solutions.

Annex I – Agenda

Ocean Energy
Agenda

29 June 2021
(09:00– 10:30) NY Time

(Total time : 90 min)

5 min	**Moderator:** *Mr. Moez Jomaa, Senior Research Scientist, SINTEF* **Opening Remarks:** • *Ivan Vera, Senior Advisor, Sustainable Water and Energy Solutions Network, UNDESA*
50 min	**Panel Presentations:** **Sharing experiences on integrated water and energy solutions related to Ocean Energy** • *Mr. Rémi Cerdan, Renewable Energy Innovation in Developing Countries, International Renewable Energy Agency (IRENA)* • *John Olav Tande, Chief Scientist, SINTEF, Norway* • *Oliver Wragg, Commercial Director, Orbital Marine Power, Scotland* • *Hermann Kugeler, Business Development Manager, Makai Ocean Engineering, USA* • *Dr. Elisabetta Tedeschi, Professor, Department of Electric Power Engineering, Norwegian University of Science and Technology (NTNU), University of Trento, Italy*
30 min	**Discussion and Questions**
5 min	**Closing Remarks** (by Moderator)