THE GLOBAL PARTNERSHIP FOR OCEAN WAVE ENERGY TECHNOLOGY:
How a Patent Developed at the Stevens Institute of Technology and United Nations Partnership Will Transform the Energy Supply of Small Island Developing States and Other Coastal Communities

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The Global Partnership for Ocean Wave Energy Technology is a sustainable development multi-stakeholder partnership (MSP) that aims to identify the stakeholders, mechanisms, and funding sources required to develop a zero-emissions technology capable of utility-level electrical power generation from ocean waves. Should deployment of the underlying technology be realized, it has the potential to transform the energy supply of small island developing states (SIDS) and other coastal communities. With the cooperation of SIDS governments to train local people in the skills needed to support the technology, the jobs, and marketable energy products that would result offer the potential for the societal challenge envisioned in the United Nation's 2030 Agenda for Sustainable Development, supporting resilient societies and economies that can adapt to climate change.

The technology underpinning the partnership is known as the Surf-making Wave Energy Converter (SurfWEC) concept. It utilizes United States patent no. US 8,093,736 B2, established January 10, 2012, by its inventor Michael Raftery M.E. and with the Trustees of The Stevens Institute as the assignee. SurfWEC is a hydrokinetic device having a water surface float tethered to a submerged buoyant housing, provided with mechanisms for optimizing the amount of wave energy extracted from the waves by the device. Based on wave conditions, the optimization functionalities include controlling the depth of the housing to produce wave shoaling or storm avoidance, as well as to perform continuous phase control and load control for the purpose of matching the response frequency of the device to the frequency of the incident waves.

While Wave Energy Conversion (WEC) systems have been in development since the first patent in 1799, and there have been WEC development efforts as long as there have been industrial solar and wind efforts, the industry is still in its infancy globally and large commercial deployments have still not taken place. A key challenge for the commercial viability of WEC systems is effective extraction of the kinetic energy in waves by the power takeoff systems. Since the waveform and motion are critical factors influencing the kinetic energy input to WEC power takeoff systems, increasing the wave steepness acting on the WEC body can significantly enhance the velocities of water particles impacting prime movers and increase power takeoff performance. The use of variable-depth platforms to enhance wave steepness and increase power takeoff performance through increased kinetic energy input to prime movers is a novel idea that provides promise for increasing the capacity factor for WEC systems. The application of a variable-depth platform to wave energy conversion is discussed and quantified based on wave tank testing, wave theory, and the kinetic energy equation.

In addition to being a scalable utility-level power generation source to meet many needs, SurfWEC can be utilized for other applications to solve additional sustainability problems, such as (a) desalination of seawater onshore, or at sea with an offshore platform; (b) production of hydrogen onshore, or at sea with an offshore platform from seawater rather than by the conventional method of converting fossil fuels (methane); (c) diversification of the power grid to reduce outages, and a continuous source of electricity for small island states and coastal communities struck by hurricane or cyclone; (d) a reef-like environment with potential to improve ocean health and biodiversity; (e) smart technology that can 'learn' over time, becoming a data source for severe weather early warning systems; and (f) In the most severe storm conditions, the SurfWEC platform can be retracted on-site, autonomously, and remain fully operational.

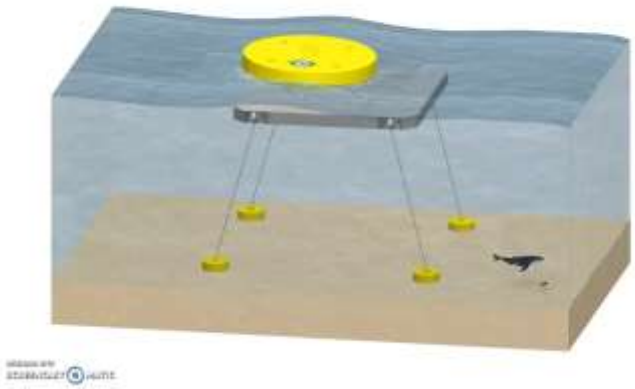

Figure 1 – Surf-making Wave Energy Converter – SurfWEC