ENERGY HARVESTING, DESALINATION AND COASTAL PROTECTION BY OSCILLATING SURGE WAVE ENERGY CONVERTER

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As recognized by the United Nations, Food, Energy and Water (FEW) nexus is central to sustainable development, and the demand for all these three is increasing due to a rising global population, rapid urbanization, changing diets and economic growth. For the US, over 53% of the population lives within 50 miles of the coast (NOAA), the coastal zone is an interaction region between land and ocean and an interface of geosphere, hydrosphere, atmosphere, and biosphere, as well as greatly affected by human activities, the stability of coastal ecosystem is very weak. Oscillating surge wave energy converter can harvest energy from ocean waves to power saline water desalination and reduce the coastal erosion as physical barrier, and the desalinated fresh water can be used for saline-sodic-alkaline soil reclamation and make it suitable for plant growth and then act as a biological barrier. Power takeoff (PTO) is possibly the single most important element in wave energy technology, and underlines many (possibly most) of the failures to date (*Falcão*). The reason is that the wave energy is concentrated at low frequencies and oscillating velocities, which makes efficient conversion extremely difficult and limits the options for efficient power takeoff. A novel PTO, called mechanical motion rectifier (MMR), is proposed to convert bidirectional motion into unidirectional motion. Tank tests for small-scale prototypes have been down.
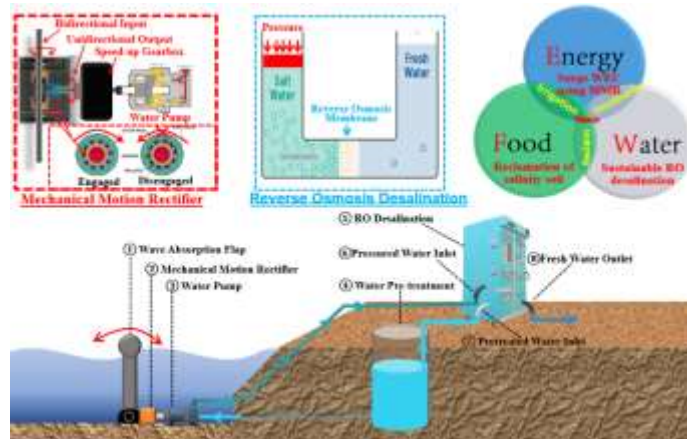

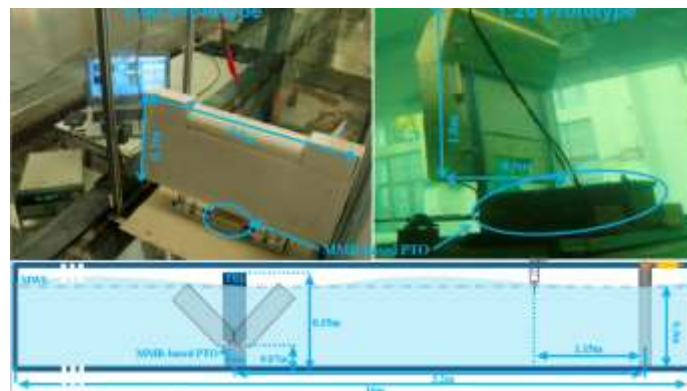*Figure 1 – Design principle for Enhancement of Food-Energy-Water Nexus by Ocean Wave Energy Harvesting*

Figure 2 – Tank test set-up