Integration of Wave Energy Converters within Floating Offshore Structures

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Integration of Ocean Renewable Energy (ORE) devices within multi-use maritime structures stands as one potentially effective method to reduce the high Levelised Cost of Electricity (LCOE) currently associated with the sector. LCOE is a metric that is commonly used in comparing varying types of energy generation technologies which relates lifetime energy production to lifetime costs. Integration within fixed structures such as breakwaters and sea-walls are feasible, but this is very much depth limited from an economic standpoint. The integration of ORE devices into floating structures allows for deployment in locations within both nearshore and offshore zones, where industries such as aquaculture and offshore wind are targeting in the next steps of their development.

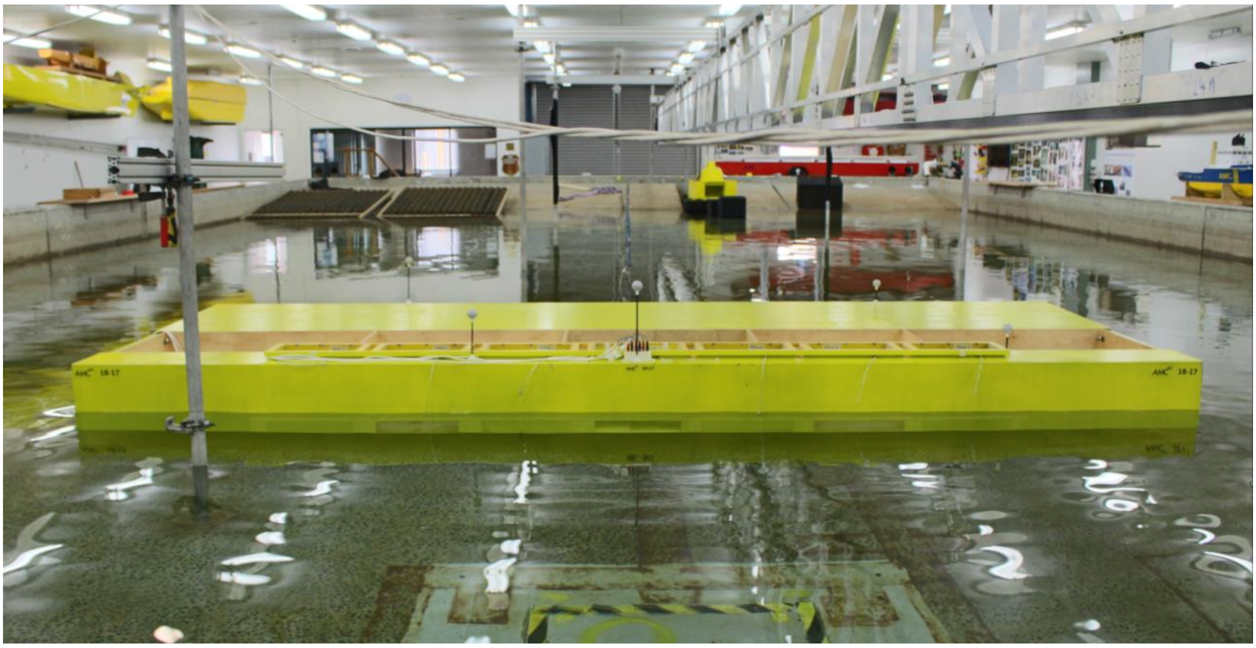

Figure 38 A photo taken of the Oscillating Water Column device integrated floating breakwater configured in the Australian Maritime College Model Test Basin. The model is a 1:20 scale device which was subjected to both regular and irregular waves during the experimental investigation. The results obtained provide a foundation for future development through the Technical Readiness Levels (TRLs) in aim of achieving commercial applicability.

This paper provides a summary of an experimental proof-of-concept investigation of a generic floating breakwater integrated with multiple Oscillating Water Column (OWC) wave energy converters. The investigation evaluates the performance of both the OWC devices and the breakwater for their respective purposes in both regular and irregular sea states. Parameters including device configuration, breakwater width, pneumatic damping and incident heading are investigated to establish the performance feasibility of such a concept. The results of the experimental investigation show benefitsto the motions and transmission characteristics of the floating breakwater through OWC device integration, along with positive energy extraction capacities for the installed devices. The negative device interaction observed when installed with low spacing between devices and the subsequent performance enhancement through increased device spacing were key findings. These results providea foundation for future development in floating structure integrated wave energy devices as the researchlooks towards mooring arrangements and array configurations of devices. The device applications aretargeted at the offshore aquaculture industry as a form of energy generation and material/consumablestorage solutions, along with multi-device coupling between floating offshore wind structures and wave energy converters.

Keywords: Floating Breakwater, Wave Energy Converter, Oscillating Water Column, Coastal Structures