Composite Mooring System for a Floating Tidal Turbine Platform in Shallow High-Velocity Currents

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Tidal energy systems present a promising opportunity to reduce diesel fuel dependence in remote and off-grid coastal communities; however, reliable station-keeping for floating tidal turbine platforms in shallow, fast-flowing tidal channels requires mooring solutions capable of managing extreme load variations while adhering to strict vertical clearance constraints. To address these challenges, a novel composite mooring system was developed for a floating tidal energy barge deployed in 7 meters water depth with a 5-meter tidal elevation range. The two-point mooring system was designed to withstand asymmetric bidirectional current velocities of up to 3.4 m/s while complying with environmental and transport requirements that call for the prevention of mooring line contact with the seabed or water surface.

The mooring system integrates compliant polymer members and non-compliant Dyneema lines alongside a power and fibre optic umbilical. By leveraging the contraction properties of the polymer during slack tide and the high-strength, low-stretch properties of Dyneema during peak flow, the mooring system combines elastic and geometric compliance features to achieve its design objectives. This presentation discusses the mooring design methodology and the trade-offs between platform alignment and mooring line entanglement, the ProteusDS configuration and simulation results of the composite mooring, the assembly and deployment of the mooring components at the present date, and its effectiveness in securing a tidal energy platform in a highly energetic, bidirectional tidal environment.