Novel Station-keeping for Redundancy and Dynamic Load Reduction at any Depth

Authors:
Adam Jaffe, Arup

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Floating offshore structures for wind or wave energy must be restrained to prevent them from drifting too far from their desired position. This requirement is called stationkeeping. Historically, heavy chain has been used to provide inertial restraint in shallow waters. Chain becomes uneconomical or introduces difficult design constraints beyond moderate depths. In deeper waters, synthetic lines attached to seabed anchors are preferred. An emerging approach uses shared mooring elements, including anchors or lines which restrain multiple floating structures. While this offers cost advantages, it also introduces a risk of cascading failure. In addition, the design of mooring systems generally must balance tradeoffs between the quality of stationkeeping and the dynamic loads induced in mooring system elements, which may govern their design.

Arup, the global engineering consultancy, introduces a novel approach to stationkeeping for floating offshore structures which is applicable to wind, wave, and other installations. The approach, called Marine Ensemble Tension Stationkeeping (METS), significantly reduces dynamic loads on mooring elements and anchors and provides redundancy to prevent cascading failure in case of element loss. It reduces drift distances of floating structures and thereby limits the excess length required for electricity-carrying cables. It is suitable for shallow to deep waters and is adaptable to any geometric configuration. It uses shared anchors and synthetic mooring lines, minimizing the use of steel chain, impacts on the seabed, and the number of anchors required.

We will describe the novel stationkeeping system, its anticipated benefits, challenges, and next steps.