

# UNIQUE CHALLENGES IN HARNESSING OPEN OCEAN MARINE HYDROKINETIC ENERGY

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The oceans are a tremendous source of renewable energy, yet the majority of this resource is located far from shore and the population centers that could benefit. Presently, tidal energy is quickly becoming a viable alternative to conventional fossil fuels, especially in the upper latitudes such as Europe and North America. These sites tend to be close to shore, in relatively shallow water, and benefit from at least one period of reduced flow during for installation and maintenance activities. Anchoring may utilize large monolithic structures with the generators rigidly fixed to the seafloor.

Open ocean marine hydrokinetic (MHK) power generation, however, poses many more challenges, while retaining the issues of tidal systems. Ideal MHK sites, typically within western boundary currents such as the Gulf Stream, are far offshore in hundreds of meters of water. The ocean currents are relentless, flowing continuously and without significant velocity changes over periods of weeks to months. The high currents reach to depths approaching 200 meters, and in some cases much deeper. The hydrodynamic drag on generators, cables, and support equipment can be tremendous. Once moored, access for inspection, maintenance, and replacement is extremely challenging, and in some cases nearly impossible.

Ocean Current Energy LLC (OCE) has developed equipment address and overcome these MHK difficulties through a novel device that utilizes generator “coins” which may be installed and removed while in the high current, similar to an aerial refueling operation. Likewise, the system is serviced at depth, below the prevailing surface currents. Mooring systems are adapted for deep water and high current, as well as transmitting electrical energy back to shore. The OCE approach to these challenges demonstrate the required “out of the box” tactics of ocean engineering problem solving, while leveraging off the experience gained from similarities in tidal power generation.

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