Tension and Compression vs Cantalivered Design In Floating Wind Turbines

Drew Devitt

American Offshore Energy / New Way Air Bearings

DDevitt@AmericanOffshoreEnergy.com

Abstract

Putting hundreds of tons atop a pole, 100 of meters high but only 10 meters wide at the base is not a "sustainable" recipe for a floating wind turbine. 1000s of tons of steel are necessary, just in the floating base, to withstand the huge cantilevered forces. It makes more sense to borrow from advanced sailboat racing and reach up into the wind with a lightweight structure, keeping the heavier bearings and generator near sea level. Land-based horizontal axis turbines are being put on floating structures only because they are the dominate wind technology, not because someone thought rationally about how to best make a floating wing turbine. This creates a huge opportunity.

It makes more engineering sense, to use sailboat racing technology, to build light weight, low-cost vertical axis wind turbines using tension and compression vs levered designs. Think of a huge cylinder, a cross between bicycle wheels and sailboat masts, strong yet light, mounted on a steel ring at the base permitter. The rotation of the ring is constrained kinematically on three sets of fluid film water bearings, one mounted over each float. A triangular steel radial tension stator structure just under the rotor, holds the bearings almost on the same plane as the rotor base, so no bending moments are induced. Only tension from the up-wind anchor though the radial tension structure to the downwind radial bearings. Also, the rotor may only pull or press on top of the floats. This means the floats see little stress and may be made of light and inexpensive fibre glass. This tension and compression design would be a more rational and sustainable engineering choice and consistent with thousands of years of maritime experience.
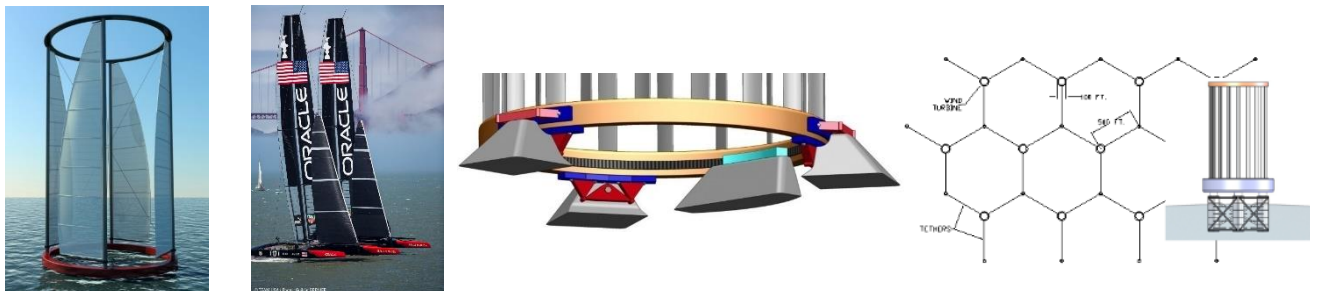
Figures: Conceptual art, Americas Cup "Wing Sails", Bearings and generation at the perimiter, Moring feild lay out and floats.