COLLEGE OF ENGINEERING AND COMPUTER SCIENCE

Experimental Hydrodynamic Performance Assessment Of the SNMREC's 20 kW Ocean Current Turbine

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Designers of open-ocean, marine hydrokinetic (MHK) systems currently rely on aerodynamic performance estimating algorithms to predict the hydrodynamic performance of future systems. They must use these aerodynamic models due to a lack of field-collected experimental data, proven deployment and testing procedures, and established certification criteria. It is imperative to understand how ocean current turbines and other deep water renewable energy systems will perform in the harsh and unpredictable open-ocean operating environment. For that reason, a self-contained instrumentation package is being developed to measure and correlate free-stream ocean current velocity with the hydrodynamic attitude and motion response of a deployed system in real-time. This instrumentation package will record motion-compensated vertical and horizontal current velocity profiles and the six degree-of-freedom motion response of the system. The prototype instrumentation package will be tested using Florida Atlantic University's Southeast National Marine Renewable Energy Center's (SNMREC) experimental scaled ocean current turbine. During these tests, the free-stream current velocity profile and motion response data will be analyzed with the addition of rotor RPM and energy conversion data from onboard monitoring capabilities to develop a set of measured performance metrics to validate the numerical performance estimating algorithms that were used for its design. The ultimate goal of the project is to develop a small, yet rugged and modular, instrumentation package that can be used to log experimental data, develop safe deployment and testing techniques, and establish certification criteria to be used in evaluating the technology readiness level of new systems as they approach full-scale grid integration.