MEASUREMENTS OF OFFSHORE WIND RESOURCE OVER MARYLAND FOR STRATEGIC PLANNING AND DEVELOPMENT OF OFFSHORE WIND ENERGY PROJECTS

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Offshore wind energy promises to be a significant domestic renewable energy source for coastal electricity loads. A database that includes offshore wind resource characteristics such as wind speed, water depth, and distance from shore needs to be generated to properly determine the economics and societal benefit of offshore wind resources to the State of Maryland. To address the need for offshore wind measurements aloft at turbine-rotor heights (100 m), aerosol and wind lidar instruments were able to provide nearly continuous observations in the lower troposphere. In particular, these lidar systems were able to measure profiles of key variables in the Marine Boundary Layer (MBL), such as particle backscatter and wind, with suitable accuracy and resolution. Offshore lidar measurements were conducted during the Maryland Energy Administration (MEA) geophysical survey (July-August 2013) aboard the Scarlet Isabella over the specified Maryland Wind Energy Area (MWEA), 10-25 miles offshore from Ocean City, MD. Characterization of the MD offshore wind resource was determined with Doppler wind lidar measurements (40-220 m) to provide high quality measurements of wind and turbulence profiles above the air-ocean interface. Overall, the wind energy calculated from measured wind speeds suggests significant potential for offshore power generation in the MWEA, with an estimated power output calculated at the turbine-rotor height to be 150.2 W/ m^2, a promising value in assessing the relationship between offshore energy production and the expected coastal electricity requirement of Maryland. Thus, the practical usefulness of offshore wind turbines for alternative energy purposes can be concluded while also decreasing uncertainty and risk regarding potential future wind turbine projects by verifying the estimated wind speeds of Numerical Weather Prediction (NWP) models.

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