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Assessment of benefits of downwind rotors due to weight savings using new and thinner airfoils and improved directional stability of turbine

Offshore wind is a rich energy resource and it will have a strong contribution in the achievement of EU's energy policy objectives for 2020, and later for 2030. At the end of 2011 the total offshore installed capacity in European water was 3813MW (EWEA report) and the target is 40GW by 2020 and 150GW by 2030.

The strong and stable offshore wind consents high power extraction and the environment is favorable for increasing the size, hence the capacity, of wind turbines. Nevertheless rotors of large size imply structural difficulties.

The research work focuses on the design of a new and thinner blade for downwind rotor layout application. In fact the blade can be more flexible in downwind rotors compared to upwind, since in normal operation the blade bends away from the tower, avoiding striking it. The result is that a thinner blade would have better aerodynamic performances, moreover the rotor weight and the blade loads would be reduced. In addition the tower shadow effect and the directional stability of the turbine are investigated.