Optimal Risk-Based Inspection Planning for Offshore Wind Turbines

Wind turbines for electricity production have increased significantly the last years both in production capability and size. This development is expected to continue also in the coming years. The Support structure for offshore wind turbines is typically a steel structure consisting of a tower and monopile, tripod or jacket type foundation. Monopiles are at present the most typical foundation, but tripods and jackets are expected to be used in the future at larger water depths. The Support structures are facing deterioration processes such as fatigue and corrosion. To "control" this deterioration, inspection and maintenance activities are developed. This paper considers aspects of inspection and maintenance planning of fatigue prone details in jacket and tripod types of wind turbine support structures. Based oil risk-based inspection planning methods used for oil & gas installations, a framework for optimal inspection and maintenance planning of offshore wind turbines is presented. Special aspects for offshore wind turbines are considered: usually the wind loading are dominating the wave loading, wake effects in wind farms are important and the reliability level is typically significantly lower than for oil & gas installations. An illustrative example is presented. As part of the results, inspection times are Calculated, showing that earlier inspections are needed at in-the-wind farm sites due to the increase of fatigue coming from wake turbulence.