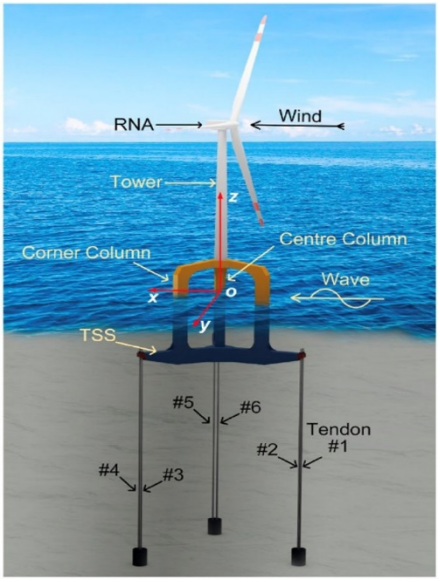
Fatigue assessment of offshore floating wind turbine

Background and motivation

Wind energy is considered as one of the most advantageous and effective renewable energy sources due to its low operating cost and extensive availability. Compared with onshore wind energy, offshore wind energy is more attractive in that offshore winds are more reliable with large reserves and its development needs fewer land resources. With the increase of water depth, floating offshore wind turbines (FOWTs) are more economical than bottom-fixed wind turbines. Currently, the design and manufacturing of FOWTs adopt practices and technology employed in the offshore oil and gas industry. One of the main challenging tasks for designing FOWTs is to analyzing their fatigue damage caused by the combined loads from wind and waves. A coupled numerical model has already been established using the aero-hydro-servo-elastic simulation tool FAST. The model and numerical code will be provided to students to simulate various combination of wind and wave loads applied on the FOWT, for various working scenarios.



The conceptual structural details of Floating offshore wind turbine under the wind and wave loads (used in this thesis).

Objectives and goals

In this project, you will need to perform the following tasks:

- Process the combination of wind and wave environment in North Sea to provide environmental inputs to estimate the loads applied FOWTs
- Estimate the aerodynamic and hydrodynamic loads applied on the FOWT based on existing numerical model and codes
- Perform the fatigue assessment of various combination of wind and wave loads
- Check the reliability of working conditions of the FOWTs in North Sea

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