

Project Proposal BSc Thesis: Concept design of bottom founded (steel) space frame support structures for large wind turbines

Introduction

The most common design used for support structures of offshore wind turbines is the mono pile (MP) in combination with a transition piece (TP). With increasing water depth and increasing turbine size the diameter of the monopile will become too large to be economical, and ultimately for large size/water depth combinations may no longer be feasible. In these cases piled steel jackets and/or (steel) tower structures may be better option.

The problem

The design of jackets (and towers) is well established for oil- and gas developments. However, the requirements for such structures in wind farm applications has not yet been developed. For wind farm applications the jacket/tower structures will need to fulfill different requirements and these structures will experience quite different loadings.

Specific attention may be given to the dynamic behavior, ease of fabrication and speed of installation (in view of a large number of structures within one wind park).

Approach

1. Perform a literature study to compare substructure design requirements for oil- and gas industry with those for offshore wind application. Also identify the requirements for wind farm applications: differences with oil- and gas applications in view of fabrication and installation. Furthermore determine a set of requirements for an optimized wind turbine support structure design.
2. Identify types of support structures (brainstorm) taking the requirements into account.
3. Determine the advantages and practical limits for mono piles (water depth - turbine combination) for application in the North Sea. Determine advantages and disadvantages of the support structures in phase 2 for application in wind farms.
4. Identify selection criteria for a range of applications. Based on this and the design requirements: can we select a winner? Prepare concept sketches and preliminary substructure design.