Installation engineering of export cables for offshore wind farm connections

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ABSTRACT

In Europe, additional 2,649 MW offshore wind power was installed in 2018.These are large investments. Therefore, it is crucial that these projects can be performed according to plan and risks during all phases can be mitigated at an early stage. An important part is the submarine cable system with many interfaces, on the offshore platforms and at the landfall. Installation of these systems needs to be performed in a controlled and efficient manner. Important, in health and safety prospective as well as for minimizing costly and time-consuming activities offshore. This implies early installation engineering, where visualization, i.e. Virtual Reality (VR) will be a great assistance.

KEYWORDS

Offshore wind power, HVAC, Submarine cables, Installation engineering, Virtual reality

INTRODUCTION

In Europe, additional 2,649 MW offshore wind power was installed in 2018. This corresponds to 409 new offshore wind turbines across 18 wind farms. Europe has by end of 2018 a total installed offshore wind capacity of 18,499 MW, generated by 4,543 grid connected wind turbines across 11 countries. Investments in offshore wind sector was €10.3bn during 2018, a 37% increase from 2017 [1].

Offshore wind farms are a large investment. Early installation engineering is therefore important, since it is crucial that these projects can be performed according to plan and that the risks during all phases can be mitigated at an early stage. An important part is the submarine cable system with many interfaces, on the offshore platforms and at the landfall.

At least two principle types of cable are part of offshore wind installations: export cables and infield cables. Export cables transmit the power from the offshore wind platform to shore. Infield cables (sometimes also referred to as inter-array cables) are the connections between the wind turbines and the substation. The purpose of this paper is to describe the installation engineering of the export power cable at the offshore substation platforms and at the landfalls, with focus on visualization.

Implementing changes in a late stage of the project often leads to high costs and could also introduce new risks, therefore it is important to perform the engineering early in the project. Here 3D-modeling and Virtual Reality (VR) will be a helpful tool. The usage of storyboards, animations, VR and task plans will facilitate the preparation works which is crucial from a health and safety perspective as well as for cost perspective as it increases project efficiency and reduces costly and time-consuming activities offshore.

GENERAL DESCRIPTION OF INSTALLATION ENGINEERING

Engineering during a power cable installation project are performed in different levels depending on when, along the project schedule, they are executed. In the beginning the level is rather basic, whilst at the end the level is very detailed.

In the beginning of the project, the scope of work must be clearly described. Here a general drawing of the cable system could be beneficial to develop. In figure 1, an example of a CSO (Cable System Overview) are shown. This CSO marks the different sites (1-5) and the most critical accessories.

Figure 1, shows a typical setup for an export cable system to an offshore wind substation.
(1) Landfall with a transition joint to land cable.
(2) Offshore platform with terminations.

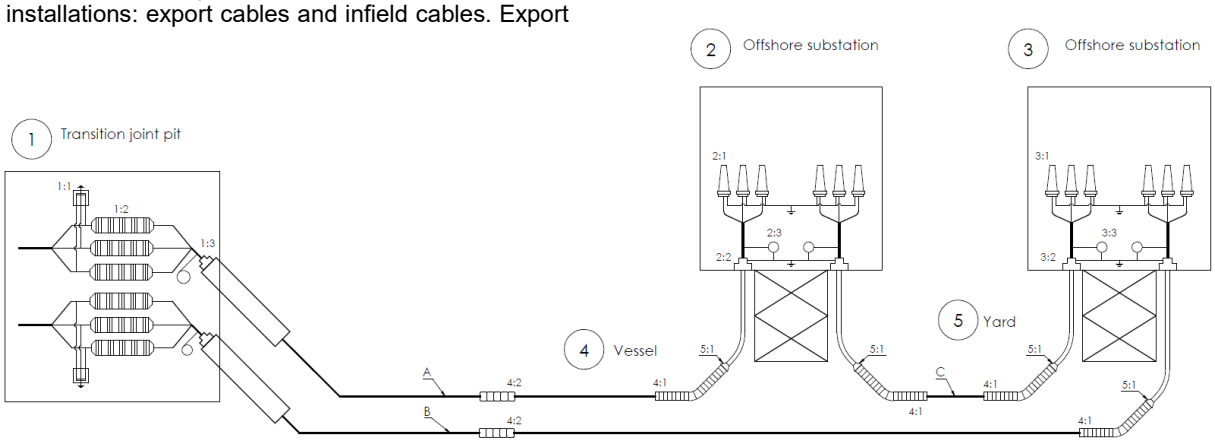

Fig. 1 Typical CSO