

Cable in pipe in a offshore windfarm

Johnny Sørensen

Johnny.soerensen@iemensgamesa.com

ABSTRACT

Traditional offshore cables are cost intensive and made to order for each project. The Cable in Pipe solution aims at using unarmored cables in a PE pipe, simpler cable fabrication and installation to reduce costs for purchasing and installation of array- and infield-cables in relation to offshore wind turbines by 30% compared to traditionally employed offshore cable fabrication and installation techniques.

The presentation will cover the developments so far, the first installation on a commercial project (start of operation in early 2018) as well as an outlook on further developments such as using the concept in conjunction with 66kV multicore cables and further innovations on installation methods.

KEYWORDS

Offshore wind farms, New cable systems, Future grid access, Offshore cable installation technologies, onshore cable in a pipe, easy replacement of cable,

INTRODUCTION

The innovation process involves desk study, practical onshore demonstrations, full scale tests of parts and installation procedure in harbor or other protected environments.

Design of the system was done in close cooperation with external partners such as cable suppliers, pipe suppliers, installation vessel owners and certifying bodies.

Installation techniques were discussed and optimized, resulting in a series of tests to prove the concept as well as the installation process.

The first commercial installation was based on the learnings from the technology development and has been in operation since early 2018.

Main body of abstract

Installation of cables between offshore wind turbines are typically performed using expensive cable laying vessels installing armored cables through a steel J-tube at each turbine foundation and through steel J-tubes at the offshore transformer station. There are a number of disadvantages with this traditional installation method, e.g.

- High cost for cable laying vessels
- Installation through J-tube is time consuming and weather sensitive
- A lot of the damages seen on array cables originate from the installation process, especially on the sections of the cables closest to the turbines.

Solutions developed to lower the costs for the cable system are:

- Flexible J-tube
- Pre-installation of a pipe from turbine foundation to turbine foundation
- Pre-installation of cable on drum onshore prior to offshore installation
- Introduction of a push-pull system for easy installation of the cable in the preinstalled pipe
- Low cost vessel for installation of pipe between turbines

Advantages of the Cable in Pipe solution are

- Ability to utilize un-armored cables
- PE pipe as well as cable can be installed with low cost vessels
- Trenching of pipe and installation of cable will be less critical and can be performed independent of other operations
- Damages on pipe during installation are easy to repair
- Consequences of poor weather conditions will be less due to more cost efficient vessels
- Cable will be exposed to less risk of damage during installation
- A wider range of cable suppliers will be able to bid for the array- and infield cable packages

A series of tests has been performed to validate the cable and pipe design

- Onshore concept test at Lindø (Denmark)
- Full scale concept test in Thyborøn harbor (Denmark)
- Intelligent pigging of installed pipe
- Impact test on pipe and cable
- Stop and Go test in Kalundborg (Denmark)
- Test of installation on cable installation vessel in Fredericia (Denmark)
- Prototype installation in Nissum Bredning project in Denmark