

## OFFSHORE WIND PARKS GRID CONNECTION PROJECTS IN GERMAN NORTH SEA

Dongping **Zhang**, Jochen **Jung**, Thomas Jan **Lieboda**, TenneT Offshore GmbH (Germany),  
dongping.zhang@tennet.eu, jochen.jung@tennet.eu, thomasjan.lebioda@tennet.eu

### ABSTRACT

Following the legal obligation, TenneT Offshore GmbH (earlier: E.ON Netz Offshore and transpower offshore gmbh) began to connect wind parks in the German North Sea since 2006. According to the transmission capacity, distance and other technical and environmental constraints, the HVAC and HVDC technologies can be utilized to fulfil the task of the grid connection. To time of this publication, there are two grid connection projects in commissioning, five projects in the implementation phase and four projects in the tender phase. In this paper the detailed information of the projects will be introduced. The experiences and challenges will be reviewed from the point of view of the coastal TSO, especially from the aspects of the cable technology, e.g. engineering, testing, laying and burial as well as logistics.

### KEYWORDS

Grid connection, HVAC, HVDC-VSC, North Sea, Offshore wind parks, XLPE cable

### INTRODUCTION

According to the Study of DENA II [4] and the Information of the German federal government, the offshore installation capacity can be expected more than 10 GW till 2020 and 25 GW to the year 2030 in the German North Sea. But the actual installed capacity is only rd. 100 MW today. It means that lots of wind parks and the grid connection projects must be realized in the next ten years

Following the legal obligation under § 17 Section. 2a EnWG (German law on the acceleration of infrastructure planning), TenneT offshore GmbH (earlier: E.ON Netz Offshore and transpower offshore gmbh) took the challenge of realizing and operating the grid connection of offshore wind parks (OWP) since December 2006.

According to the geographic locations of the OWPs, there are four clusters connections for the planning of the grid integration of the wind parks: BorWin, DoWin, HelWin and SylWin (Fig. 1), which are defined with the allocated high-capacitive transmission routes and the grid coupling point (NVP) to the 400 kV transmission grids.

To the first activities belong the grid connection projects as followed:

Two accomplished projects

- ◆ alpha ventus (test field)
- ◆ BorWin1 (earlier Nord E.ON 1)

Five projects under construction;

- ◆ BorWin2
- ◆ DoWin1
- ◆ HelWin1
- ◆ SylWin1 and
- ◆ Riffgat

Furthermore there are four projects in tender phase:

- ◆ DoWin2
- ◆ BorWin3
- ◆ HelWin2
- ◆ MEG1



Fig. 1 Geographical division of the planned OWP into four clusters with the allocated transmission routes and NVP in the substations (stand 03.2011)

For the realization of those projects there are following criteria to meet [1]:

- ◆ Providing the OWP grid connection in time (requirement of timeliness);
- ◆ Observing all environmental and permission constraints;
- ◆ Ensuring a reliable operation of OWP grid connection;
- ◆ Fulfilling the requirements of the efficient investments criteria.

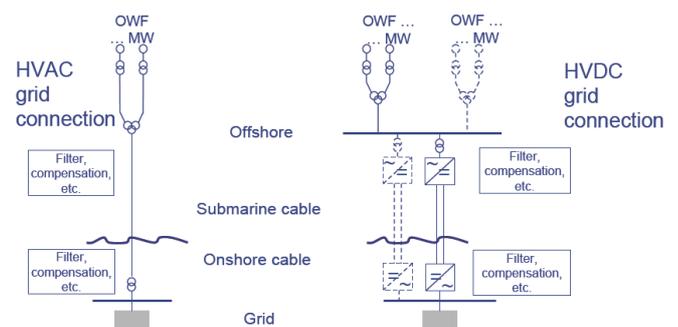


Fig. 2 Schematic representation of the technical variants of OWP grid connection; configuration as HVAC and HVDC systems