

Long-distance, large-scale offshore wind farm connection DoIWin1 HVDC Light® wind farm link



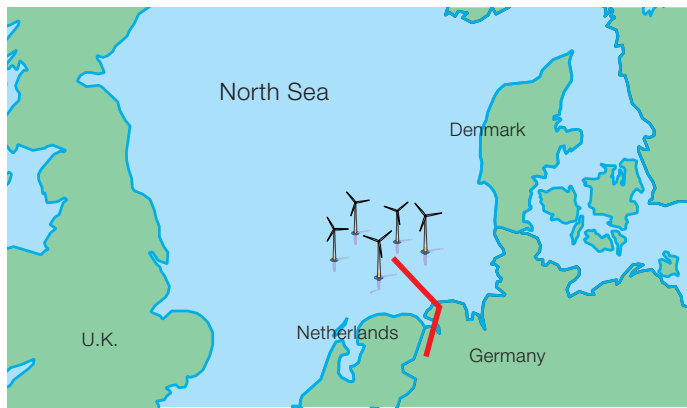
- World's first HVDC Light connection at record voltage of 320 kV
- Connects remote large-scale offshore wind farm cluster to the German power grid
- Helps Germany toward its target of 35 percent renewable electricity by 2020

Scope of supply

- Turnkey HVDC Light transmission system
- HVDC Light converters including offshore platform
- Project management
- HVDC Light cable system
 - Cable system design, engineering and manufacture
 - Onshore and offshore cable laying and installation
 - Civil works
 - Cable joints, transition joints and terminations
 - Testing and commissioning

Cable data

Power rating	800 MW
DC voltage	± 320 kV
AC voltage	155 kV (from the wind farm to the offshore converter station)
Cable length	2 x 75 km submarine HVDC Light cable (Cu) 2 x 90 km underground HVDC Light cable (Al) 7.5 km underground AC cable
Customer	TenneT Offshore GmbH, Germany
Completion	2013



Customer needs

TenneT is one of Europe's largest transmission system operators (TSO). It is responsible for the high-voltage transmission grids in the Netherlands and for a large part of the 220/380 kV power grid in Germany.

The German government has set an aggressive target that 35 percent of the country's electricity is to be produced from renewable sources by 2020. Much of this will be provided by large-scale offshore wind farms in the North Sea. German law stipulates that it is the responsibility of the TSO to provide and bear the cost of connecting offshore wind farms to the mainland power grid. Of the four TSOs in Germany, TenneT is the one most directly involved in meeting the government's requirements for connections to offshore wind farms.

More than 50 offshore wind farms, with a total output of several thousand megawatts, are scheduled to be constructed in the TenneT grid connection area in the North Sea. To meet its obligations, TenneT is providing high-voltage direct current (HVDC) links between clusters of offshore wind farms and the German power transmission grid.

Why ABB?

The technology that makes it possible to transport large amounts of electric power from remote offshore wind farms was pioneered by ABB.

HVDC Light is based on ABB innovations in bipolar converters and extruded polymer cables. Its ability to stabilize the often large fluctuations in wind power quality without additional compensation or grid reinforcement makes it uniquely suitable for large offshore wind farms. Power losses are minimal and environmental impact negligible.

HVDC Light has numerous other benefits. It provides fast and independent control of both active and reactive power, and has black-start capability. The offshore equipment is installed on compact, lightweight platforms. And, the environmentally friendly cables are strong, robust and oil-free: they have a small diameter, neutral electromagnetic fields, and no limitations on cable length or distance.

ABB provided the first of TenneT's HVDC connections to offshore wind farms in the North Sea. Located 125 km out to sea, the 400 MW BorWin1 grid connection integrates the world's most remote offshore wind farm installation into the transmission grid. ABB has also provided TenneT with two other major HVDC connections: the 580 km NorNed link between Norway and the Netherlands (the longest submarine cable link in the world), and the BritNed HVDC link between Great Britain and the Netherlands.

The ABB solution

The solution will be the first commercial installation of HVDC Light at the record level of 320 kV, more than 50 percent higher than the previous highest HVDC Light cable voltage of 200 kV. The increased performance ensures a higher availability and lower losses in the entire system.

A 7.5 km AC cable will run from the Borkum West II wind farm to the DolWin alpha HVDC Light offshore converter station. There, the power will be converted to DC and transported via two 320 kV HVDC Light submarine cables to the coast, a distance of 75 km. At an onshore transition point, the two cables are connected to two HVDC Light underground cables. The power is transported 90 km to a converter station at the Dörpen-West substation, where it is reconverted to AC power and transferred into the high voltage grid.

In addition to developing and type-testing the cable for 320 kV, ABB is executing the entire turnkey project within a short timeframe. This includes laying and installing the submarine and underground cables in a single six-month season.

TenneT has awarded ABB the service and maintenance contract for both the DolWin1 and BorWin1 HVDC Light connections.

Customer benefits

- Turnkey solution from a single supplier and contractor
- High quality products and project execution by the world's leading supplier of HVDC technologies and solutions
- Record-breaking HVDC Light power rating and voltage of 800 MW and 320 kV
- Service and maintenance of the entire offshore and onshore installation

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