

The world's most remote offshore wind farm BorWin1 HVDC Light® offshore wind farm link



- Connection of wind farm 125 km off the coast made possible by HVDC Light®
- Wind power quality stabilized without additional compensation or grid reinforcement
- Displaces 1.5 million tons of CO₂ emissions a year

Scope of supply

- Turnkey HVDC Light® transmission system
- HVDC Light® converters
- HVDC Light® cable system
- Cable system design and testing
- Onshore and offshore laying and installation
- Civil works
- Commissioning

Cable data

Voltage	+/- 150 kV DC, 170 kV AC
Power	400 MW
Length	2x125 km submarine HVDC Light® cable (Cu) 2x75 km underground HVDC Light® cable (Al) 1 km 3-core submarine XLPE cable (Cu)
Customer	transpower, Germany
Year	2011



Cable route

AC power from the 80 wind turbines runs to an AC platform from which a 170 kV XLPE (cross-linked polyethylene) submarine cable delivers the power 1 km to an offshore HVDC Light® converter station platform. There the power is converted to DC and transmitted in two parallel 1200 mm² HVDC Light® submarine cables to the island of Norderney, where they are joined to two 1600 mm² HVDC Light® submarine cables. Those cables run to a transition point onshore where they are connected to two 2300 mm² HVDC Light® underground cables, which transmit the power a distance of 75 km to the HVDC Light® converter station at the Diele substation. At Diele the power is converted to AC and fed into the transpower 380 kV transmission grid.

Protecting the environment

HVDC Light® is a uniquely environmentally friendly technology. There is no visual or audible impact from unsightly overhead lines, no magnetic fields from the cables or electromagnetic fields from the converter stations, and no risk of oil spills as the cable insulation is polymeric and not oil-based. Underground cables are laid using minimal impact cable plows, and submarine cables can be laid in deep water and on or under any type of seabed (sand, rock or reef).

"ABB has delivered the world's longest submarine cable (NorNed) and the world's longest underground cable (Murraylink)."

ABB's award-winning expertise in executing cable projects in fragile coastal and marine environments was an important factor in the customer's choice of supplier. This part of the North Sea coast is a protected national park known as the Wadden Sea, an extensive and sensitive band of tidal mudflats and coastal wetlands famous for its rich variety of flora and fauna. BorWin1 is expected to avoid 1.5 million tons of CO₂ emissions a year by replacing fossil fuel power generation.

Customer benefits

- Complete HVDC Light® power transmission solution from one supplier
- All cable and converter station components manufactured by ABB
- Supplier expertise and reliability – ABB is a market and technology leader in both HVDC solutions and high voltage submarine and underground cables
- Environmentally friendly technology

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When completed and ready for operations in 2011, BorWin1 will be the largest and most remote offshore wind farm in the world. Located 125 kilometers off the German mainland in the North Sea the link will deliver up to 400 megawatts (MW) of emission-free electricity to the German power grid via an HVDC Light® (high voltage direct current) power transmission system. BorWin1 consists of 80 wind turbines, each with a generating capacity of 5 MW. ABB was selected by grid operator transpower to supply a complete HVDC Light® solution to connect the wind farm to the AC onshore power transmission network.

In July 2010, transpower awarded ABB an additional contract to provide an 800 MW HVDC Light® power link for the DoWin1 cluster in the North Sea. The solution includes 165 km of submarine and underground cables. At 320 kV it will be the highest voltage level of extruded cable ever used for HVDC.

Why ABB and HVDC Light®?

HVDC Light® is an ABB innovation that enables large volumes of power to be transported over long distances via submarine and underground 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.

"ABB is the world's leading supplier of power equipment and services to the wind power industry."

ABB pioneered HVDC in the 1950s and HVDC Light® in the 1990s. HVDC Light® is based on ABB innovations in bipolar converters and extruded polymer cables. The voltage source converters provide independent control of both active and reactive power and 100 percent of the power supplied at both ends of the link. The HVDC Light cables are insulated with extruded polymer and are exceptionally effective, robust and environmentally friendly.

Scope of supply

ABB supplied a complete HVDC Light® solution including converter stations, 150 kV DC submarine and underground cables, cable accessories, submarine and underground cable laying, civil works, installation, testing and commissioning.