

HVDC Light™

The world's first HVDC Light™ offshore converter



Cable data

Voltage	+/- 80 kV DC
Power	2 x 40 MW
Route length	68 km
Conductor	300 mm ² Cu
Water depth	350 m
Cable length	4 x 68 km = 272 km
Weight	15 kg/m
Customer	Statoil SF, Norway
Year	2004

Project features

HVDC Light Cable and Accessories
Cable System design
Project Management
Submarine Installation
Onshore Installation

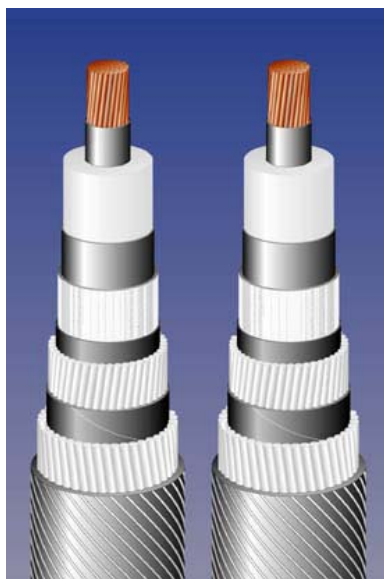


1st order for HVDC Light™ technology for sustainable development in the offshore market

ABB has designed and built two 68-kilometre submarine high-voltage power feeders to the Troll A gas production platform at the continental shelf in the North Sea west of Norway. Using ABB's HVDC Light™ technology, the Powerformers® (motors with cable wound extra high voltage windings), driving the compressors, is fed from environmental friendly produced power from shore enable the offshore industry to meet their goals towards sustainable development.

Government-owned Statoil ASA representing the Troll Group placed the order. The Troll Group comprises of Statoil ASA, Petoro AS, Norsk Hydro Produksjon a.s, A/S Norske Shell, TotalFinaElf Exploration Norge AS and ConocoPhillips Norge.

ABB has provided a complete HVDC Light transmission system, made up of high-tech extruded cables buried in the ground and seabed, with a converter station at the onshore and offshore ends of the feeders. The onshore station converts 132 kV AC-voltage to ± 60 kV DC-voltage and transmit 2 x 40 MW power to the offshore station where the DC-voltage is converted to 56 kV AC-voltage. The offshore station acts as inverters in electric Powerformer® (motor) drive systems for compressors which boost gas pressure to maintain gas delivery output. The offshore converter regulates the frequency and voltage in order to achieve smooth start and a variable speed of the Powerformer between 3570 and 5355 rpm. This unique combination of efficient and environmental friendly transmission solution over long distance and features for controlling electric motor drives as well as the unique durable DC-cable design for tough installation conditions, secured this first order for HVDC Light™ technology to the offshore industry.



HVDC Light™ technology

HVDC Light™ is a concept of modern technology based on bi-polar converters and extruded DC cables with power units up to 350 MW. HVDC Light™ converters give high-speed control of active and reactive power in both the AC and DC networks. HVDC Light Cable is a cable with extruded polymer insulation and specifically adapted for direct voltage. The strength and flexibility of HVDC Light Cables makes them well suited for severe installation conditions both as an underground land cable and as a submarine cable. HVDC Light™ therefore provides the ideal medium for transmitting power over any distance underground or under the sea.

HVDC Light Cable qualification

The HVDC Light polymeric cable system is at present (2004) qualified up to 150 kV ($U_m=165$ kV). The qualification tests comprised of successful Long Term and Type testing. As of December 2003, 1342 km of HVDC Light Cable has been delivered, including Troll A and the projects at Gotland in Sweden, Tjaereborg in Denmark, Directlink and Murray Link in Australia and Cross Sound - Long island to Connecticut - in the United States of America.

New applications with polymeric HVDC Light Cables

Compared with traditional paper insulated cable, the polymeric cable has a number of advantages due to its excellent mechanical strength and flexibility. These advantages allow the use in areas of;

- Steeps (e.g. offshore platform risers)
- Extreme water depths
- Tough installation conditions
- Dynamic movements (vibrations)

Installation at the Troll A platform

The submarine HVDC Light cables for the two 40 MW drives consists of 4 nos. of single conductor cables. All are installed in the same 423 m long J-tube from just above the sea bottom at 300 m water depth to level 30 m above the sea level on the platform. The cables, loaded on the cable laying vessel, were pulled simultaneously in through the J-tube, hung-off at top and sealed off at both top and bottom of the J-tube. The J-tube was then filled with an inhibitor fluid to prevent corrosion. In order to limit the pull break force in case of fishing trolleys or boat anchors hooking on to the cable package, the hang-off is equipped with a weak link disrupting at 250 kN.

The remaining installation was performed by conventional submarine and land installation methods.

Low magnetic fields from HVDC Light Cables

The HVDC Light Cable System has the advantage, due to its bi-polar construction, of virtually eliminating magnetic radiation generated from the current in the conductors. This feature is of great importance for obtaining required permits from environmental agencies.

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