Submarine Cable Link
The NorNed HVDC Connection, Norway – Netherlands

One of the longest and most powerful HVDC submarine systems in the world
Enables reliable power trading between Norway and the Netherlands

Scope of supply
- HVDC cable and accessories for 420 km
- HVDC converter stations

Cable data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>+450 kV DC</td>
</tr>
<tr>
<td>Power</td>
<td>700 MW</td>
</tr>
<tr>
<td>Length</td>
<td>580 km</td>
</tr>
<tr>
<td>Conductor</td>
<td>270 km 2 x 790 mm² Cu (flat cable)</td>
</tr>
<tr>
<td></td>
<td>2 x 150 km 700 mm² Cu (single core cable)</td>
</tr>
<tr>
<td>Insulation</td>
<td>MI</td>
</tr>
<tr>
<td>Weight</td>
<td>84 kg/m flat cable</td>
</tr>
<tr>
<td></td>
<td>37 kg/m single core cable</td>
</tr>
<tr>
<td>Customer</td>
<td>Statnett, Norway and TenneT, Netherlands</td>
</tr>
<tr>
<td>Year</td>
<td>2008</td>
</tr>
</tbody>
</table>
Customer needs

The NorNed project was undertaken by the two state-owned power grid companies, Statnett in Norway and TenneT in the Netherlands. The goal of this HVDC transmission link is to connect the power grid of Norway and the Netherlands and enable power trading between the two countries as well as increasing the reliability of electricity supply.

- Stretching over 580 km, it became the longest submarine HVDC cables ever constructed.
- At 700 MW, the cable is one of the most powerful HVDC cables in commercial operation.

Why ABB?

The wide range of expertise within the ABB Group was vital for the rapid and successful completion of the project. ABB’s knowledge and proven solutions for similar projects such as the Baltic cable between Sweden and Germany and the SwePol between Sweden and Poland gave the customers confidence for ABB’s delivery of the NorNed project. The technology system for both converter stations and cables were pioneered by ABB.

Providing 420 km cables as well as the converter stations at both ends. The wide range of know-how within the ABB Group was vital for the rapid and successful development and completion of the project. Earlier, ABB have delivered similar solutions such as the Baltic cable, between Sweden and Germany, and the SwePol cable, between Sweden and Poland.

The ABB solution

The NorNed cable is a MI cable: mass-impregnated, non-draining, paper-insulated HVDC cable. Two different designs were used for the shallow part of the route: a twin-core cable and a single-core cable. Both cable types have copper conductors consisting of concentric layers of keystone-shaped strands, optimizing a smooth surface with very compact construction.

A layer of semi-conducting carbon paper on the surface of the conductor eliminates any possible unevenness, which would otherwise increase the field-strength locally. Outside the paper-insulation is a conductive layer of carbon and mettallized paper. A hermetically sealed lead sheath with a PE jacket protects the insulation from moisture or water penetration. The mechanical strength of the cable is provided by steel tape and two layers of steel-wire armour. The steel wires are applied in opposite directions to form a counter-helix, which eliminates any torsional stress. An outer serving of bitumen-bonded polypropylene yarn protects the cable from corrosion.

The shallow section of the NorNed cable was manufactured in ABB’s factory in Karlskrona, Sweden, which is specially designed to cater for the production of submarine high voltage cables. The cable was produced in six continuous lengths of up to 154 km of single-core and 75 km of twin-core flat MI cable, which minimizes the need for jointing operations over long cable interconnections.

The cable route begins with a land section of 1.5 km to the shore from Eemshaven converter station in the Netherlands. A twin-core cable runs for a distance of 270 km from the Dutch coast and splits into conventional single core cables.

The submarine cable weighs nearly 35,000 metric tons and was laid in sections, joined with only five field splices. For the twin-core cable specially designed handling equipment was utilized on the cable laying vessel.

The NorNed HVDC project has been operating since 2008 and is a successful link between Norway and the Netherlands.

For more information please contact:

ABB AB
High Voltage Cables
Phone: +46 455 556 00
Fax: +46 455 556 55
E-Mail: sehvc@se.abb.com
www.abb.com/cables

Note:
We reserve the right to make technical changes or modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail. ABB AB does not accept any responsibility whatsoever for potential errors or possible lack of information in this document. We reserve all rights in this document and in the subject matter and illustrations contained therein. Any reproduction, disclosure to third parties or utilization of its contents – in whole or in parts – is forbidden without prior written consent of ABB AB.

Copyright © 2013 ABB. All rights reserved.