

## Transmission of Wind Power on Gotland in Sweden



### Cable data

Voltage	+/- 80 kV DC
Power	60 MW
Length	2 x 70 km
Conductor	340 mm <sup>2</sup> Al
Insulation	Polymeric
Weight	2.1 kg/m
Customer	Gotlands Energi AB
Year	1999

### Project content

HVDC Light Cable and accessories  
Cable System design  
Project management  
Installation

Gotlands Energi AB (GEAB), chose HVDC Light after a series of very thorough system studies. Mr. Christer Liljegren of GEAB gave the following as some of the reasons HVDC Light was chosen for the project.

#### **Cables used instead of overhead lines because;**

- Cables are environmentally friendly.
- They are easy to install.
- Storms, falling trees, snow or ice loads do not cause damage to underground cables.
- Cables have no impact on areas of natural beauty.
- The land can be used for other purposes.
- Maintenance, such as the clearance of growing trees from power lanes and checks of insulators, is not required.
- There is no magnetic AC field to cause concern.

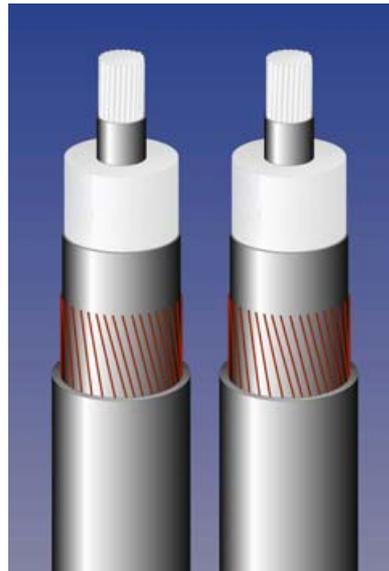
#### **The use of DC instead of AC gives;**

- Reactive and active power control at both terminals.
- Reduced network disturbances from the cement factory.
- Ability to achieve very high voltage quality for the customer.
- Strengthened stability of parallel AC overhead lines and weak networks.

#### **The Gotland HVDC Light**

During the past years, there has been a considerable increase in wind power production on the Swedish island of Gotland. The infrastructure built for existing consumption cannot transmit the increased production.

HVDC Light is the means chosen to transmit 50 MW between the wind power park and the centre of the island. With the Gotland HVDC



Light transmission, the reactive power capabilities are used to control the AC voltages of the networks connected to the converter stations.

The link has been transmitting power since November 1999.

#### **HVDC Light System**

HVDC Light is a modern technology based on bipolar converters and two cables insulated with extruded polymer. Strength and flexibility make the HVDC Light cables well suited for severe installation conditions in underground, aerial and submarine applications.

#### **HVDC Light Cable qualification**

The HVDC Light polymeric cables system is now well qualified for voltage ranges up to  $U_0 = 150$  kV ( $U_m = 165$  kV) The qualification tests comprised of Long Term testing and Type tests all of which were successfully completed. As of May 2000 there was 538 km of HVDC Light Cables in use for commercial transmission. The main installations being;

- Gotland in Sweden 2 x 70 km
- Tjaereborg in Denmark 2 x 4 km
- Directlink in Australia 3 x 2 x 65 km

#### **New applications with polymeric HVDC Light Cables**

Compared with the traditional paper insulated cable previously used for HVDC transmission, the polymeric cable has several advantages due to its excellent mechanical strength and flexibility. These lead to new applications and cost effective installation, such as the ploughing in of land buried cables, as submarine cables for extreme water depths and as land cables in steep, mountainous areas.

#### **Cost effective installation**

Installation costs have been substantially reduced as the cables are ploughed into the ground instead of being laid in excavated cable trenches.

#### **Low magnetic fields from HVDC Light Cables**

A particular advantage of the bipolar HVDC Light Cable System is the virtual elimination of magnetic fields. A standard monopolar HVDC cable scheme with a current of 1000 amps gives a magnetic field of 20 micro Tesla magnitude at a distance of 10 metres. This is approximately half the magnitude of the Earth's natural magnetic field. With HVDC Light Cables the magnetic field is reduced to less than 0.2 micro Tesla which is 1% of the natural magnetism.



The HVDC Light Cables were ploughed into the ground.