Key Facts

Client: Vattenfall

Location of the project: Baltic Sea, Sweden

Quantity of order:
100 kV system with a 20 MW rating
developed to a 150 kV system
with a 260 MW rating

Scope

• Cable system design and engineering, including one 96 km long submarine MI cable as well as 7 km of DC overhead line
• Manufacturing and type testing of cables
• Cable-laying and installation
• Commissioning

Total cable route length: 96 km

Duration: 1953 - 1954 and additions in the 1980’s

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Pioneering link to Gotland

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Creating opportunities.

The story of how the world achieved its first submarine HVDC link and how it enabled new possibilities for Gotland.

The project

The island of Gotland is connected to the Swedish mainland by a submarine cable system.

Gotland was originally self-sufficient in terms of electrical energy, based on fossil fueled generation. A thermal power station in Slite catered for the needs of the entire island, but production costs were relatively high and tariffs were double those on the Swedish mainland. This made it expensive to run industries on Gotland and there were increasing problems with unemployment and depopulation.

In order to break this negative trend the Swedish parliament decided in 1950 to finance a power transmission link from the mainland to the island. The project of establishing the first submarine HVDC (high-voltage direct current) link was ordered by the state-owned utility Vattenfall.

This link was designed to satisfy a greater demand for electricity and at the same time reduce the tariffs on the island in order to simplify life for businesses and islanders. The transmission used HVDC technology due to the long distance, about 96 km, across the sea.

The solution

The turnkey project included the design and engineering as well as the manufacturing, testing, cable-laying and installation of the ground breaking HVDC cable system.

The pioneering HVDC transmission cable system was laid in 1953, between Västervik on the Swedish mainland and Ygne, 10 km south of Visby on Gotland, and operation commenced in 1954. The 96 km long cable system used MI (mass-impregnated) technology. The link then had a rated voltage of 100 kV (kilovolt) and a transmission capacity of 20 MW (megawatt).

In the 1970’s, the converter stations were upgraded and the voltage was raised to 150 kV. The robust and reliable cable system from 1954 continued to be used also with the new transmission capacity of 30 MW. In the 1980’s, further submarine cables were added. First the 130 MW Gotland 2 link, operated independently together with Gotland 1, to cover the electricity needs and enable the reduction of fossil fuel on the island for back-up generation purposes only. In 1987 the Gotland 3 was constructed and Gotland 1 was taken out of service and dismantled. Gotland 2 and 3 now work as a bipolar link but can also be run independently, with the total capacity of 260 MW.

Being the first link with commercial mercury arc HVDC converter stations and HVDC submarine cable system, the Gotland link was awarded the very first IEEE Milestone in Sweden in 2017. It is considered a key historical achievement by the IEEE (Institute of Electrical and Electronics Engineers).

Participation in such ground-breaking projects is part of an inspirational journey. At NKT, we continue to use our knowledge and expertise to enable security of supply of electricity in a sustainable way for future generations.

“The Gotland link was the first submarine HVDC transmission link in the world - a milestone for the development of the magnificent island and ground-breaking for the power transmission capabilities.”