

Submarine Cable Link

Texas mainland - South Padre Island Cable Connection



Cable data

Voltage	138 kV AC
Power	250 MVA
Length	40,2 km
Conductor	750 kcmil Cu
Insulation	XLPE
Weight	16.7 kg/m
Customer	CPL, Texas, USA

Project content

- XLPE cable and accessories
- Fibre optic cables
- Cable system design
- Project management
- Installation (at sea, on land)

ABB helped Central Power & Light (CPL) to improve the service reliability to South Padre Island by installing a 138 kV submarine XLPE cable circuit from Port Isabel substation on the mainland to South Padre Island substation. ABB was the turn-key contractor for the project, and ABB High Voltage Cables supplied the 40 km land and submarine cables, as well as taking overall responsibility for installation.

Location

South Padre Island is near the southern end of the long barrier of islands stretching from just south of Houston down the border between Texas and Mexico. Since the very shallow Laguna Madre separates it from the mainland, a quite unique submarine installation was required. Although the cable route across the Laguna Madre exceeds 11.2 km in length, the water is no more than one metre deep for the majority of the route! The shallow depth of Laguna Madre posed a significant problem for access by cable-laying vessels, and barges had to be used. In addition, a significant proportion of the cable route across the Laguna Madre goes through areas of environmentally-sensitive sea grasses, and the very important oyster farms were not to be disturbed.

History

A 138 kV overhead transmission line crossing the Laguna Madre at its southern end had served South Padre Island. There were problems with service-reliability due to severe salt contamination, and tropical storms that damaged the overhead lines on several occasions.

Plans to install an underground transmission line were made in 1988 and after an analysis of the alternative types of cables available, the choice fell on an extruded dielectric cable offered by ABB High Voltage Cables. Our offer was accepted because it gave the customer the most economical combination of quality and service-reliability, and also since the installation had the least environmental impact. The total cost of the project was approximately USD 15 million.



The Cable System

The system consists of 3 x 11.7 km submarine XLPE cable, 3 x 1.7 km land cable and 14 km fibre-optic cable.

The power cable has a 750 kcmil copper conductor with 21.6 mm thick XLPE insulation. In addition to a lead sheath protected by a PE jacket, both the conductor and the core are longitudinally water-sealed. The cable is also fitted with a copper tape and has an outer serving of bitumen-bonded polypropylene yarn.

The fibre-optic link is a steel-wire armoured cable, with eight single mode 1300 nm fibres for control and communications functions, which transmits between the substations without the need for repeater equipment.

Cable Route

The 138 kV XLPE cable and the fibre optic cable start at CPL's Port Isabel substation. From there they run parallel to a highway for about 1.2 km, before crossing the highway to reach the shore of the Laguna Madre. The cable route then proceeds in a straight line for approximately 11.7 km to the shore of South Padre Island, and then to the substation.

Production

The submarine section of the cable was extruded in 1,000 m lengths, which were transported on drums to a sea port, where they were spliced with tape-moulded joints. This process resulted in three continuous lengths, each long enough to cross the Laguna Madre without requiring field-splicing.

The fibre-optic cable was also manufactured in a single length, which also was long enough to reach the island without a splice.

The supply and installation of the power and communication cables complied with IEC 840 and IEC 794 respectively. The power cable impulse tests carried out during the IEC type tests were extended to 825 kV, which is the level required by AEIC CS7-87. The finished cable lengths were also subjected to a 15 minute DC test before leaving Sweden.

Installation

Land cable: The power and communication cables were laid on the mainland using conventional open-cut trench methods. Field-moulded joints were installed at two locations on the land section of the circuit. The sealing ends were supplied with pre-moulded, elastomeric stress cones and special porcelain shells with 5080 mm of creepage distance to mitigate the effect of the severe salt-contamination.

Submarine cable: The three power cables and the fibre-optic cable were laid simultaneously across the Laguna Madre. The depth of bury was increased at the shore ends and when crossing a shipping channel. The entire submarine installation process was completed in three weeks.

Commissioning

The cable system was thoroughly tested before commissioning in 1991, and it has been in continuous service ever since without experiencing any transmission difficulties.

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