

500m High-Tc Superconducting (HTS) Power Cable Testing Facility

Purpose: A high-Tc superconducting (HTS) power cable has a lot of features such as drastically smaller losses compared to conventional XLPE cables and ability to transport a huge power, so that it is one of major candidates of new technologies for bulk power transmission devices. In order to realize the HTS power cables, many tasks have to be revealed in detail such as basic operational properties and circulation properties of liquid nitrogen (LN₂) in a long distance cryogenic tube because the HTS materials have to be cooled down by LN₂. From these viewpoints, CRIEPI executed a verification test of a 500-m HTS power cable as a part of R&D of fundamental technologies for superconducting AC power equipment (Super-ACE) project of the Ministry of Economy, Trade and Industry (METI) of Japan, consigned by the New Energy and Industrial Technology Development Organization (NEDO) of Japan started in FY2000.

Main Specifications:

In this testing project, the following tests were carried out to verify the properties of the HTS power cable.

(1) Laying test

Installability of the HTS cable was evaluated concerning whether the HTS cable can be laid with conventional laying method for underground duct, during laying the HTS cable on the field test site.

(2) Basic property test

Many kinds of properties were investigated such as cooling property, thermal contraction in cooling period, heat invasion and pressure losses in normal operation condition, voltage withstand test and critical current, thermal expansion in warm-up period and so forth.

(3) Rated loading test

Investigations were executed for cooling properties in re-cooling period and soundness of the electrical insulation and cooling system in application of rated voltage and current for about a month.

(4) Load fluctuation test

Fluctuated current was applied to simulate the daily load fluctuation of the actual grid, and the follow-up ability of the cooling system was evaluated.

(5) Overloading test

Current flow duration was investigated in case of suspension of the cooling system in order to determine the heat-runaway limit, and voltage withstand test was executed in order to investigate the inception and extinction of partial discharges in the condition of rapid increase of ac loss.

Location and Date of Installation

Yokosuka Campus, April 2004

(The project had been finished on the end of March 2005, the facilities has been removed from April 2005.)



500-m HTS power cable testing facilities