Results of Japan's First In-grid Operation of 200 MVA Superconducting Cable System

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Abstract — A high-temperature superconducting (HTS) power cable demonstration project was started in 2007 to evaluate the cable's performance, stability and reliability. This project aims to operate a 66 kV, 200 MVA HTS cable system in a real power grid of the Tokyo Electric Power Company. A 240-meter-long HTS cable was successfully installed and other system components — such as a cable-to-cable joint, terminations and a cooling system — were also constructed at the Asahi Substation in Yokohama. After several completion tests and performance tests on the system, the HTS cable was connected to a real grid from October 29, 2012 to December 25, 2013. The in-grid operation had continued for more than one year without any accidental interruption of the operation or troubles of this system.
The temperatures and pressures of liquid nitrogen flowing in the HTS cable were controlled to within the target values. After the Ingrid operation, the critical current of the HTS cable was measured and it was confirmed that there was no degradation compared to the initial one. In addition, no partial discharge was observed in periodical measurements. It is concluded that the HTS cable system has good performance and stability for longterm, in-grid operation.

Keywords (Index Terms) — High-temperature superconductors, power transmission cable, Superconducting devices, Cooling