

New HTS Cable Project in Japan: Basic Study on Ground Fault Characteristics of 66 kV Class Cables

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Abstract — In July 2014, a new high-temperature superconducting (HTS) cable project supported by the New Energy and Industrial Technology Development Organization (NEDO) began in Japan. The aim of this project is to verify and improve the safety and reliability of HTS cable systems. The main verification targets are system safety in the event of the following accidents: (1) ground fault, (2) short-circuit current, (3) cryostat failure. We are also developing technologies such as (4) a low heat loss cryostat and (5) a high efficiency cooling system.

If a ground fault occurs, it is a matter of concern that the pressure in the cryostat increases due to the arc energy. It is an additional concern if the arc penetrates the cryostat so that the liquid nitrogen leaks out of the cable. It is important to know the amount of energy in the arc in order to numerically predict the outcomes of a ground fault. We performed basic ground fault tests using sheet samples immersed in liquid nitrogen while measuring the arc energy and also examining the structure of a protection layer that can prevent arc penetration to the outside of the cable core.

Keywords (Index Terms) — High-temperature superconductors, power cables, dielectric breakdown.