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## **Tue-Af-Po2.25-02 [113]: Feasibility study for the application of 154 kV smart HTS cables to a power system**

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In South Korea, Korea Electrotechnology Research Institute (KERI) has developed 154 kV smart HTS cables since 2017. The smart HTS cable has a fault current limiting function. There are two types under development, resistive and inductive.

When the HTS conducting layer of a resistive smart HTS cable is quenched by a large fault current flowing to the HTS layer, the resistance of the cable increases and limits the fault current. The resistive type has disadvantages that it has not enough short circuit capacity required by a protective coordination of power systems.

In other hand, the inductive smart HTS cable is more useful to operate in power system. The inductive smart HTS cable maintains the general shape of a conventional HTS cable and places a high permeability material such as an iron core on the outside. When a large fault current flows into the inductive smart HTS cable, the current of the shield layer disappears because of the quenching of the shield layer. At this time, the fault current is limited by an inductive reactance generated by interlinkages between the magnetic field emitted to the outside of the cable and the high permeability material.

We focus on the application of the inductive smart HTS cable. This paper presents the feasibility to apply 154 kV smart HTS cables to a real power transmission system. We propose a concept of smart superconductivity power systems applying 154 kV smart HTS cables. 154 kV smart HTS cables can replace 345 kV conventional cables. In general 154 kV power systems under 345 kV substations are split each other due to a fault current problem. If the smart HTS cable is applied to incoming 154 kV transmission lines of a 345 kV substation, the HTS cable can limit fault currents and the split 154 kV systems can be interconnected and operated as a power system. The proposed smart superconducting power system can dramatically improve the reliability and stability of a power system.

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