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C1Or2B-01: Understanding the Response of High Temperature Superconducting Power Cables in Electrical Faults

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High temperature superconducting (HTS) power cables are expected to be used in electric aircraft and ships that will have integrated power systems. There have been a few studies on understanding electrical faults in power systems consisting of HTS cables. However, there are no comprehensive studies on the response of HTS cables for various kinds of electrical faults. We have recently initiated a research project on understanding various electrical faults in shipboard MVDC power system, and the duration of the fault, maximum voltage and current the HTS cables will encounter during the fault. The type of fault and associated maximum voltage and current depends on the power conversion systems and the corresponding fault management protocols. This paper presents investigations on the potential architectures being developed for MVDC power systems, and the type of faults that HTS cables will encounter in such systems. The paper will assess the relative merits of the architectures in terms of their suitability for accommodating the limitations of cryogenically cooled HTS cables and offer resilient power system. Electrical and cryogenic thermal models of HTS cables suitable for assessing the response of HTS cables for electrical faults will also be discussed. HTS cable designs that can endure electrical faults without catastrophic damage and thus result in a resilient MVDC power system will also be discussed.

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