Development and Deployment of Saturated-Core Fault Current Limiters in Distribution and Transmission Substations

Franco Moriconi, Francisco De La Rosa, *Senior Member*, IEEE, Frank Darmann, Albert Nelson, *Member*, IEEE, and Larry Masur

Abstract—Zenergy Power has been developing an inductive-type of fault current limiter (FCL) for electric power grid applications. The FCL employs a magnetically saturating reactor concept which acts as a variable inductor in an electric circuit. In March 2009 Zenergy Power, with funding from the California Energy Commission and the U.S. Department of Energy (DOE), installed an FCL in the Avanti distribution circuit of Southern California Edison's Shandin substation in San Bernardino, CA. Rated at 15 kV and 1,250 amperes steady-state, the "Avanti" device is the first superconductor FCL installed in a US utility. In January 2010, the "Avanti" device successfully limited its first series of real-world faults when the circuit experienced multiple single-phase and three-phase faults. After successfully validating the performance of a new "compact" saturated-core FCL, Zenergy Power received contracts to install a 12 kV, 1,250 amperes compact FCL in the CE Electric UK grid in early 2011 and a 138 kV, 1,300 amperes FCL at the Tidd substation of American Electric Power in late 2011.

Index Terms—fault current limiters, high-temperature superconductors, saturable cores, short circuit currents, superconducting magnets

IEEE/CSC & ESAS European Superconductivity News Forum (ESNF), No. 14, October 2010
The published version of this manuscript appeared in *IEEE Transactions on Applied Superconductivity* 21, Issue 3, 1288 - 1293 (2011)