This paper presents new advancement of the high power, high frequency Emitter Turn-off (ETO) Thyristor, and its application in the high power energy storage systems using UltraCAPacitors to provide short bursts of real as well as reactive power for voltage support and power flow control.

A high-power energy storage application utilizing the high performance ETO and a Transmission Ultra Capacitor (TUCAP) are currently under development at Virginia Tech and EPRI-PEAC with sponsorships from DOE and TVA. The power conversion system is based on a 4.5 MVA ETO based cascaded multilevel voltage source converter. The converter structure utilizes a modular H-bridge Building Block (HBBB) and therefore reaching higher output voltage can be easily achieved. The ultimate objective is to design, build, and test a TUCAP in a mobile trailer that can operate at 12.8kV to 13.2 kV and thus not require an intermediate transformer.

The TUCAP is a high-voltage, high-power ultracapacitor system that is designed to provide real power as required by the ETO multilevel converter. The initial target for the TUCAP demonstration system is an ultracapacitor system consisting of four parallel strings operating at a nominal voltage of 2 kVDC, with a power output capability of 3MW for 3 seconds or 4.5MW for 2 seconds. A single 2kVDC string, capable of producing 1.5 MW for 2 seconds, is presently under construction as a demonstration. Test data from this string will be presented at this conference.

The TUCAP-ETO energy storage system will be used to provide fast active and reactive power compensation to the critical transmission line and distribution grid. In this paper, simulation results of the TUCAP-ETO STATCOM system in active and reactive power compensation modes will be presented. The value proposition for TUCAPs compared to other sources of dynamic reactive compensation will also be explored.

Information of the contact author:

dtbradshaw@tva.gov