

# **Modeling, sizing and control of an excitation booster for enhancement of synchronous generators fault ride through capability: experimental validation**

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**Abstract—** This paper proposes a complete approach to modeling, sizing and controlling ultracapacitor-based excitation boosters (EB) aimed at improving the fault ride-through (FRT) capability of synchronous generators equipped with bus-fed static excitation systems. The EB model is a simplified one suitable for transient stability simulations. Sizing is performed using transient stability simulations. It is aimed at maximizing the machine critical clearing time subject to machine rotor insulation and ultracapacitor features. The developed control system includes fast voltage sag and loss of synchronism detectors. The proposed approach can be used to design ultracapacitor based EB in real world applications. A dedicated test environment based on 10 kVA synchronous machine has been used to validate the proposed approach.

**Index Terms—** Fault Ride Through Capability, Grid Codes, Bus Fed Static Excitation System, Ultracapacitor, Transient Stability, Excitation Booster.

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