

Hidden Failure in Protective Relays: Supervision and Control

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(ABSTRACT)

This thesis performs simulations of a relay supervisory system (RSS) that works passively in conjunction with the existing protective relaying system at a substation. During normal system operating conditions, the RSS supervises the relay system to prevent trips due to hidden failures. During wide area network disturbances, it adapts the relay system to increase security of the power system. The RSS works passively in the sense that it waits for events to occur in the existing relay system before taking any action.

The simulation performed includes a model of the RSS, along with simplified models of existing relays, performed in Matlab. A power system model in EMTP provides inputs to the RSS model. Multiple faults are applied to the EMTP model, and the RSS is tested under each fault condition, and with a variety of relay hidden failures. For all tests performed, the simulation of the RSS successfully prevents relay hidden failure from removing circuit elements inadvertently, while allowing correct relay operations to remove circuit elements.