

Lesson Learned

Short Circuit Models (Relay Settings and Equipment Specifications)

Primary Interest Groups

Distribution Providers
Generation Owners
Transmission Operators
Transmission Owners

Problem Statement

An entity applied a setting to a relay in the field that had been previously calculated based on incorrect short-circuit model data. The relay later misoperated during a system fault.

Details

The instantaneous ground overcurrent relay setting had been calculated according to the entity's standard setting criteria, and was based on fault current values predicted by the short-circuit model. However, an analysis of this event showed that the actual fault current values were different from those predicted by the short-circuit model. Further investigation revealed that an incorrect value for zero sequence impedance was used based on standard engineering references rather than manufacturer specifications. The incorrect circuit parameters in the short-circuit model led to the calculation of erroneous fault current values, and ultimately resulted in the design of incorrect relay settings.

Corrective Actions

- Post-event fault current values were input into the entity's criteria for determining the instantaneous ground over-current element. Based on the revised values and after verification the relay data they had was "as built" for the relay, the relay settings were corrected for the relay that misoperated. The entity also corrected their short circuit-model.

Lesson Learned

Incorrect circuit data in short-circuit models can lead to erroneous calculations of fault current and voltages. As a result, incorrect short-circuit current and voltage values will be used for protective relay settings. If incorrect settings are applied to relays in the field, the relays either will not respond or misoperate to actual conditions as intended.

All short circuit, powerflow, and dynamics modeling parameters and impedances should be reviewed and adjusted after all system additions, retirements, and other modifications to ensure that all models reflect the “as-built” system. Every effort must be made to ensure correct and updated system configuration and circuit data values are used when developing short-circuit models and the model reflects actual system equipment. In addition, a procedure should be in place and implemented to periodically (or as required) validate the short-circuit model with current data and information. This procedure should also include spot checks of the model.

For more information please contact:

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