

Lesson Learned

Special Protection Systems Maintenance Precautions

Primary Interest Groups

Balancing Authority
Generator Owner
Generator Operator
Transmission Operator
Transmission Owner

Problem Statement

During the planned maintenance of a special protection system (SPS), blocking switches, used to isolate one relay output from causing an action on another, were operated out of sequence, causing an undesired operation of the SPS that tripped units at a generating station.

Details

The SPS in this instance is designed to remove a situation where the generator may go unstable upon the loss of a specific transmission line. The field report from the maintenance work indicated that the order of operation of the blocking switches caused the SPS scheme to incorrectly believe this transmission line was open at the substation terminal. By operating the blocking switch for the transmission line prior to the switch that disarmed the SPS, the SPS operated during maintenance testing. An unconventional/non-standard blocking switch sequence that existed at this substation was not noted in the design and field drawings.

Corrective Actions

For the short term, written instructions were placed on the protection panels indicating that the blocking switches should be opened in such a manner that the protection outputs are isolated prior to the logic inputs. This was achieved by mounting a red tag with the appropriate instructions affixed to the panels above the DC blocking switches.

As a result of this event, a review of all the bulk power protection schemes within the affected Transmission Operator's system was conducted to identify any similar designs with a plan to fix any problems.

Lesson Learned

- Protection drawings should be reviewed prior to removing protection devices from service at all locations and assumptions should not be made that all sequences are standard.

- All status inputs to the protection scheme should be separated from the protection outputs through the addition of test plugs and switches with an input blocking switch.
- Transmission Engineering and Relay Engineering should review the design and ensure that the exposure to this type of sequencing scheme does not exist during the design and commissioning phases. If any are identified, the necessary changes to mitigate such situations should be made.

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