NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Lesson Learned

Verification of Apparatus State within Switching Procedures

Primary Interest Groups
Distribution Providers
Generator Operators
Generator Owners
Transmission Operators
Transmission Owners

Problem Statement
Operating personnel did not verify that all phases of a circuit breaker had opened following a switching operation in a generating station switchyard. The subsequent operation of an energized disconnect switch resulted in the inadvertent tripping of six 230kV transmission lines and three generators.

Details
While preparing for an outage at a generating station, operating personnel were performing switching operations. During switching, the "B" phase of a 230kV breaker failed to open caused by a failure in its "B" phase operating mechanism. It was not readily apparent to plant personnel that the "B" phase on the breaker had failed in the closed position while the breaker physically indicated open via the 52a contact used in the protection interlocking scheme.

During subsequent switching, the opening of a 230kV disconnect switch caused a phase to ground fault. The fault caused all six of the 230 kV lines feeding the station switchyard to trip at their remote ends and subsequently tripped three generators.

Corrective Actions
The entity modified its switching procedures to include verification that all phases of sources have actually been removed by breaker operation prior to operating disconnect switches.

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Lesson Learned

When performing switching in a switchyard, it is advisable that when operating switches (associated with power circuit breakers) always confirm all three phases of the power circuit breakers are open using visual recognition or potential sensing devices to avoid making or breaking a connection with the associated disconnect switches. In addition:

- When opening motorized operated disconnect switches and three-phase gang-operated disconnect switches, always visually verify that all three phases of the switches have opened.
- Operating personnel should reconfirm each step of the switching procedure.
- Switching procedures should include three-part communications.
- Entities should ensure plant personnel are trained and qualified to perform transmission switching.

For more information please contact:

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