

# NATF Redacted Operating Experience Report

## Transformer Failure Due to Improper Switching

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## Topic

Transformer Failure Due to Improper Switching

## Description

Following the lockout of a 115 kV transmission line, operators sectionalized the line, returning four substations to service and leaving one substation de-energized. Personnel arriving at the substation found one of two 10.5 MVA transformers (bank B) failed in-service with damage to the bank metering package and severe melting and warping on the 25 kV bus.

The cause of the original fault was not determined; however, relays indicated the original fault was downstream of the bank B transformer. The bank B relays operated correctly and initiated a trip via the transformer protective device. The bank B protective device failed to trip, causing the bank B transformer failure that eventually tripped the transmission line.

Further investigation revealed the protective device was improperly reset after the last operation. The proper method to close and reset the three protective device poles involves inserting the supplied charging handle into each of the poles, rotating the handle clockwise until it reaches its internal stop to close and charge the pole unit, then rotating the handle counter-clockwise to its stop to reset the pole unit mechanism. This normally takes approximately 40 rotations in each direction. The investigation found the counter-clockwise rotations to reset the pole unit mechanism were not completed to full stop on all three poles. It is surmised that the emergency response individual who performed switching the last time counted the charging handle rotations to what they thought were 40 rotations, stopped, and removed the charging handle by disassembling the head unit, leaving the protective device in an abnormal configuration with the pole mechanism trip coil path to the protective relays open.

## Lessons Learned

Design and incorporate a method to remotely monitor the protective device trip and close circuits for future installations.

## Actions Taken

Substation maintenance personnel completed a system-wide check to ensure all devices were properly reset. Personnel will also verify the switches have been properly reset after any future operations and will include additional labeling on each device identifying the proper method to close, charge, and reset the pole units.

Retrofitting trip circuit monitors to each pole mechanism was considered; however, decided against this because of false trip concerns due to trip circuit monitor failures.

## Extent of Condition

Twenty-seven locations were identified on the system, and all were tested and found to be reset and operational.