

## Primary Interest Groups

Transmission Owners (TO), Transmission Operators (TOP)

## Overview

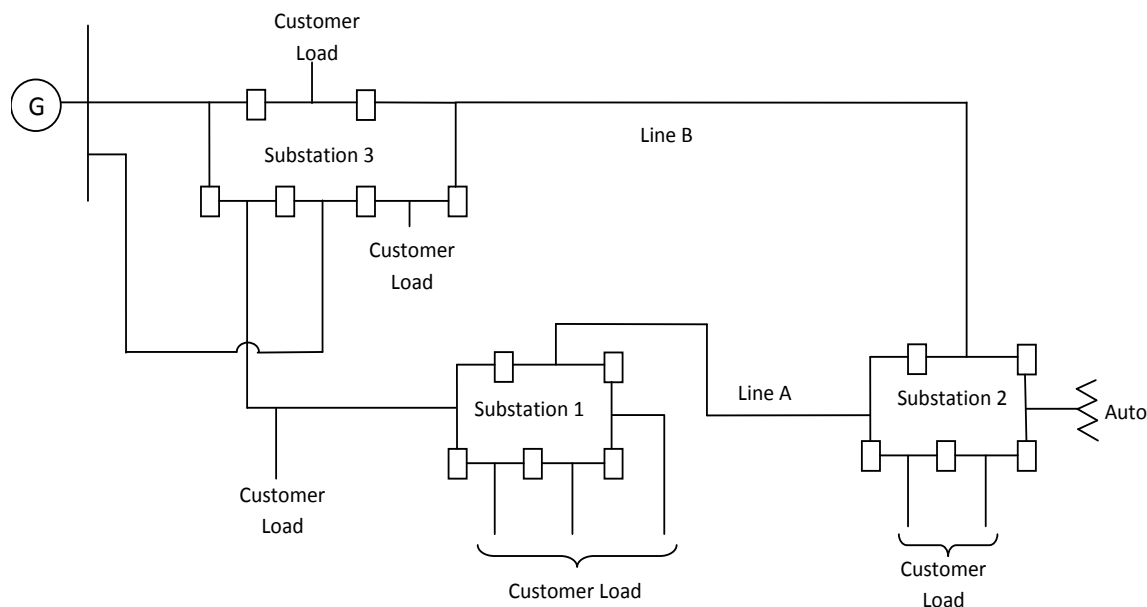
Two Protection System Misoperations occurred during a transmission event causing the loss of approximately 198 MW of local generation and 145 MW of firm load (approximately 16,500 customers).

- Back-up relay settings on dual differential communication-assisted line protection schemes operating instantaneously and over reached for a close in fault on the next line segment due to a communication channel outage.
- Breaker failure initiate signals were mis-wired causing an unnecessary trip of adjacent breakers.

## Details

A permanent phase-to-ground Fault occurred on Line A, which is a two-terminal line. Both ends correctly operated on the initial Fault with high speed clearing. Simultaneously, the back-up relay on the line panel for Line B tripped the local breakers at Substation 3. The operation by the back-up relay occurred because the communications channel for the backup relaying was not in service at the time of the fault. The protection scheme in place was set for instantaneous trip setting for the loss of communication.

The Line A panel at Substation 1 transmitted breaker failure initiate logic to adjacent line panels. However, the adjacent line panels, due to wiring errors, incorrectly received breaker failure trip signals which resulted in unnecessary trips of additional breakers at Substation 1. During the investigation, it was found that the panels at Substation 1 had relay breaker failure *initiate* outputs tied to breaker failure *trip* inputs. Construction prints issued by a contract engineering firm were not reviewed by relay personnel, resulting in a wiring error by a construction contractor.



### **Corrective Actions**

The following actions were taken to correct the problem:

- The line protection scheme was modified at all substations to place a time delay to prevent overreach for faults outside of the zone of protection.
- The operation of all breaker failure contacts were blocked until breaker failure circuits on all transmission panels in service area were reviewed and, if needed, corrected.

### **Lessons Learned**

- The settings and protection scheme have been reviewed and the company's system protection manual has been modified to incorporate a time delay on the back-up elements to allow close in faults to clear before the back-up element reacts.
- The scope of work for contract engineering for relay projects will have a hard stop for the issuance of construction prints until they have been reviewed and approved.

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