NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Lesson Learned

Generation Relaying – Underfrequency Protection Coordination

Primary Interest Groups
Generation Owners (GOs)

Problem Statement
During a bulk power system (BPS) event, system frequency dipped below the auxiliary equipment relay frequency protection setting at a generating plant, causing auxiliary equipment to trip. This resulted in the loss of two generating units, which contributed to a significant load-loss event.

Details
A frequency protective relay scheme was installed on a generating plant's auxiliary equipment, which enabled under- and overfrequency element trip schemes on the equipment feeders. The associated feeders' underfrequency protection scheme was set to trip auxiliary equipment if the frequency was 59.5 Hz or less for two seconds. These underfrequency relay trip settings were installed on the system unnecessarily and weren't coordinated with the generators relay trip settings. A disturbance on the system caused the frequency to decline, and the new medium-voltage equipment relay schemes tripped out the boilers and turbines, which resulted in two generators tripping.

Corrective Actions
The frequency relay trip settings on the auxiliary equipment feeder relays were determined to be unnecessary and were removed. All existing settings associated with the auxiliary equipment at the plant were reviewed to ensure no other unintended trip settings or coordination issues existed.

Lessons Learned
Unintended generator tripping during an underfrequency event can exacerbate the condition.

To ensure reliable generator operation:

- Generator relay protection should be coordinated with all auxiliary power system relaying with specific regard to time-delay settings.
- Auxiliary equipment should be checked to ensure its protection and controls do not unnecessarily limit the generator.
- Before placing new equipment in service, a thorough review should be done of all electrical equipment, with particular attention to relay settings.

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For more Information please contact:

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