Document Title: GEN-03 – Automatic Voltage Regulator (AVR) Malfunction

Category: Generator Equipment Failures & Settings Issues

Time Horizon: Real-time Operations

Party Involved: New York Independent System Operator (NYISO)

Event Date: May 2013

Event Description: NYISO System Operators observed transient voltage oscillations in Supervisory Control and Data Acquisition (SCADA) data. The oscillations lasted for three minutes and appeared on many of the western New York 345 kV busses.

Phasor Measurement Unit (PMU) data revealed that Real Power and voltage were fluctuating. Analysts used software for ringdown and modal analysis of the oscillation characteristics and found oscillations of +/- 2 kV in the 1.25 Hz oscillatory mode. This led NYISO to conclude that the cause of the voltage oscillations was likely local and generation-related. The NYISO System Operators identified the bus with the most severe voltage oscillations and asked the plant operator at the generating station closest to that bus to troubleshoot the issue. The plant operator systematically tested the excitation systems for each of the generating units in the complex and found one that had a malfunctioning generator Automatic Voltage Regulator (AVR) control system.

The voltage trend below illustrates the oscillations observed on the western New York system.

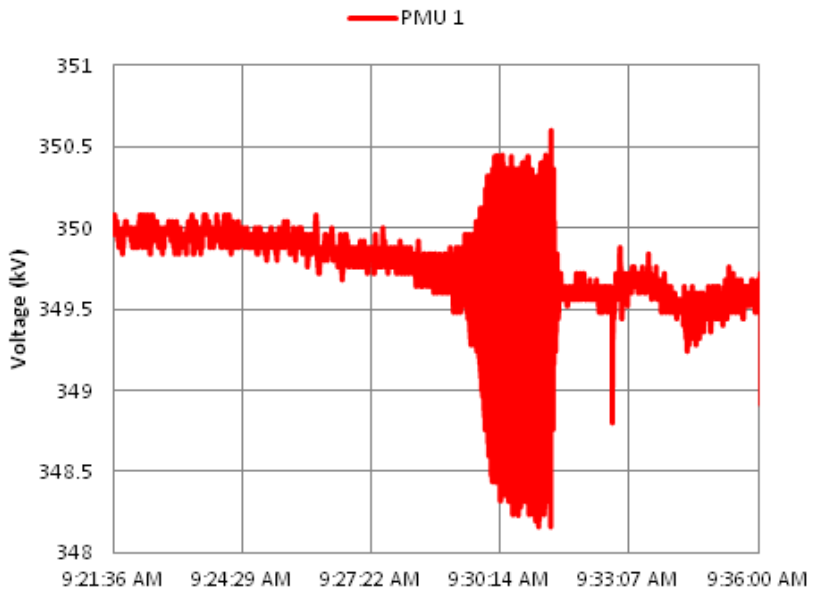

Figure 1 - Voltage Oscillation

Operational Value

System Operators recognized Real Power and voltage oscillations, identified the geographical area from which the oscillations originated and determined the cause to be a malfunctioning generator AVR control system.

Oscillations are much easier to detect with PMU data than SCADA data. Undamped oscillations can result in undesirable conditions and events (e.g., equipment damage, outages, instability, etc.). Identifying and correcting the AVR control system issue described in this case allowed NYISO to eliminate the oscillations and reduced risk of the AVR operating improperly during a system disturbance.

Background

The North American Synchrophasor Initiative (NASPI) Control Room Solutions Task Team (CRSTT) mission is to work collectively with other NASPI task teams to advance the use of real-time synchrophasor applications for improving control room operations and grid reliability. This team utilizes its experience and regional diversity to provide advice, direction, support and guidance to NASPI stakeholders and other organizations involved in the development and implementation of real-time synchrophasor applications.

This is one of a series of operational use case documents being developed by CRSTT members to describe the various manners in which grid operators and electric utilities are using synchrophasor data to provide value in the Operations Horizon. Existing versions of these papers, along with other CRSTT work products can be found on the CRSTT page of the NASPI website (https://www.naspi.org/crstt).

References

1. NASPI Technical Report titled *Diagnosing Equipment Health and Mis-operations with PMU Data* dated March 20, 2015.
2. NASPI CRSTT work product titled *Using PMU Data to Diagnose Equipment Health and Misops Sheet.*