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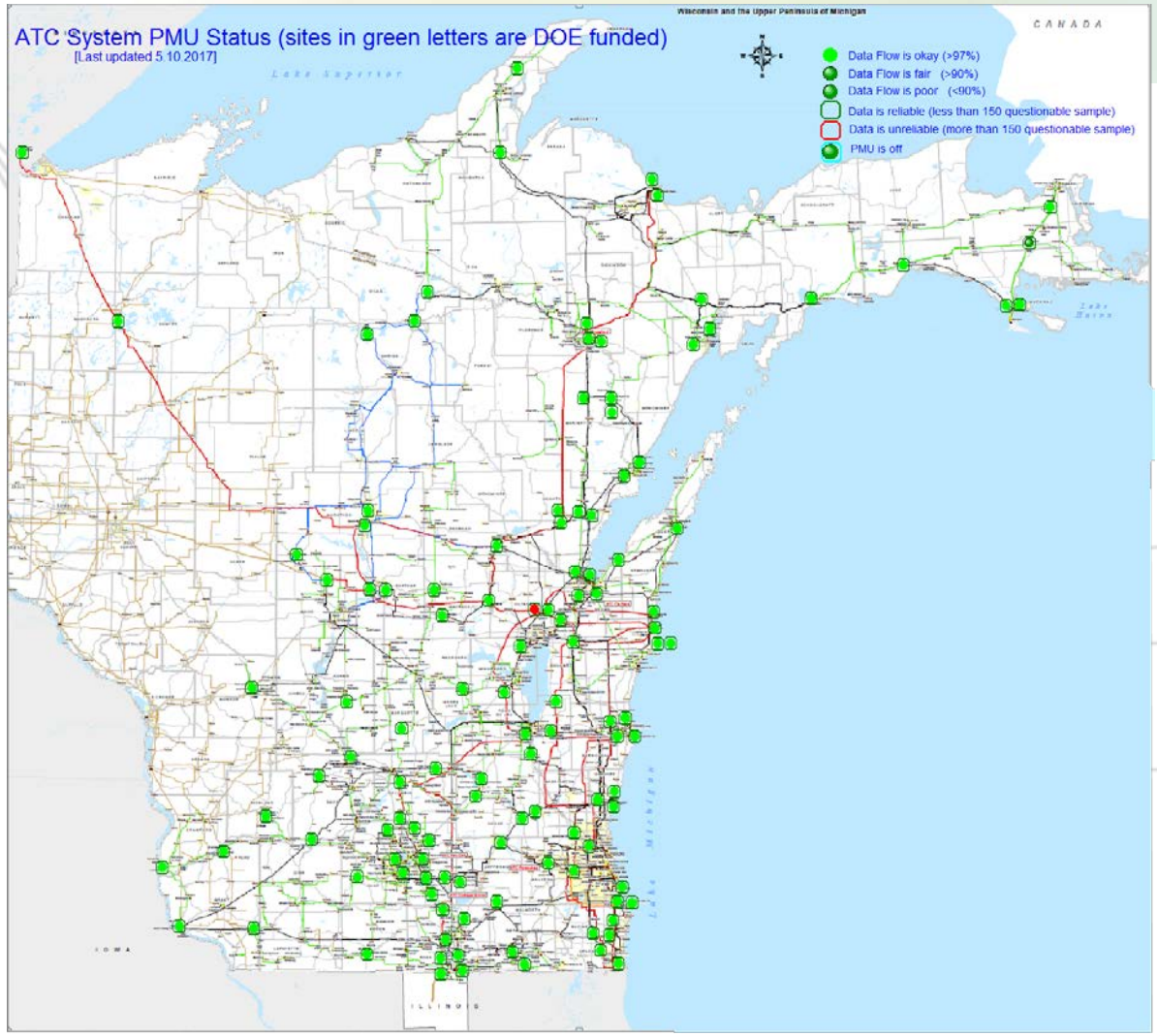
ATC Oscillation Event Review

Gas turbine - new control testing

NASPI / NERC SMS Oscillation Workshop 9/27/2017

Presented by: Jim Kleitsch

Current PMU Installations



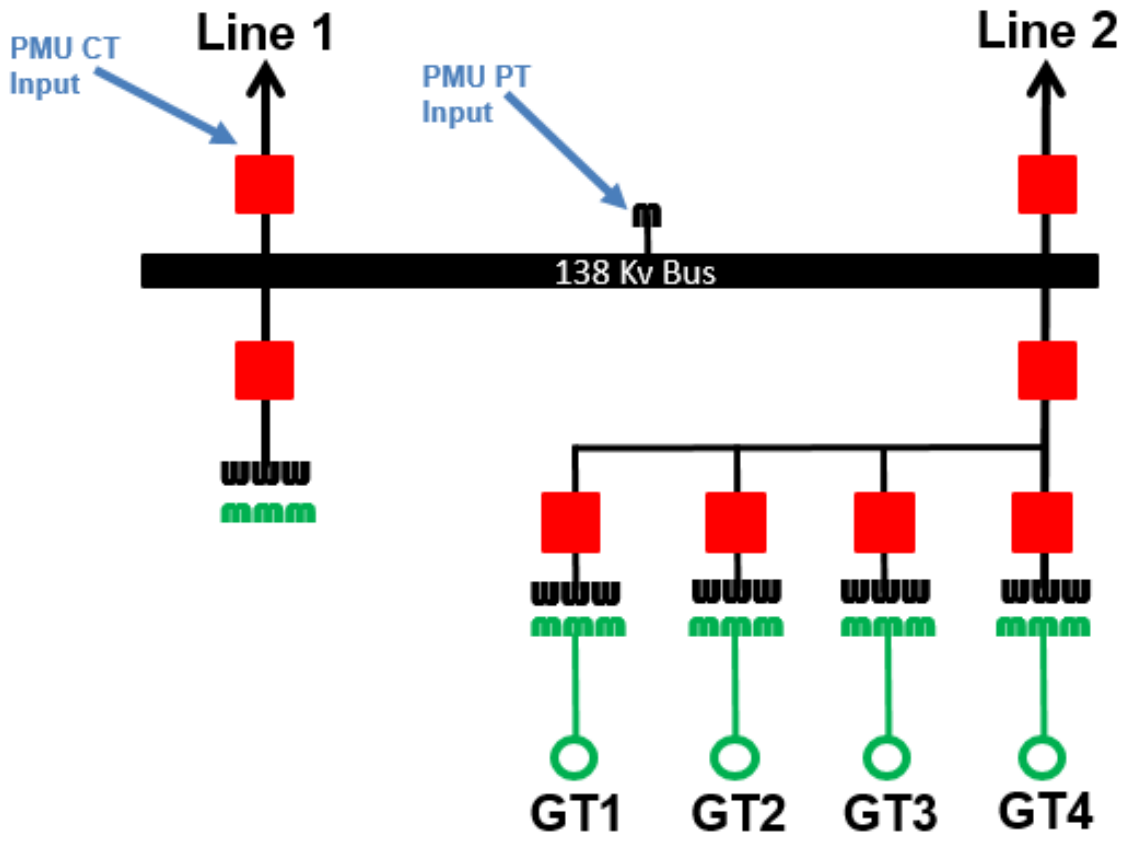
- Currently 120+ PMUs installed and providing data at 30 samples per second
- 24 PMUs monitoring net output of generation plant at GSU high side
  - 5 wind plants
  - 2 nuclear units
  - 11 larger coal plants
  - 4 independent CTs
  - 3 units at a combined cycle facility
- 2 PMUs monitoring net output of multiple (2) units behind single GSUs

Event Background

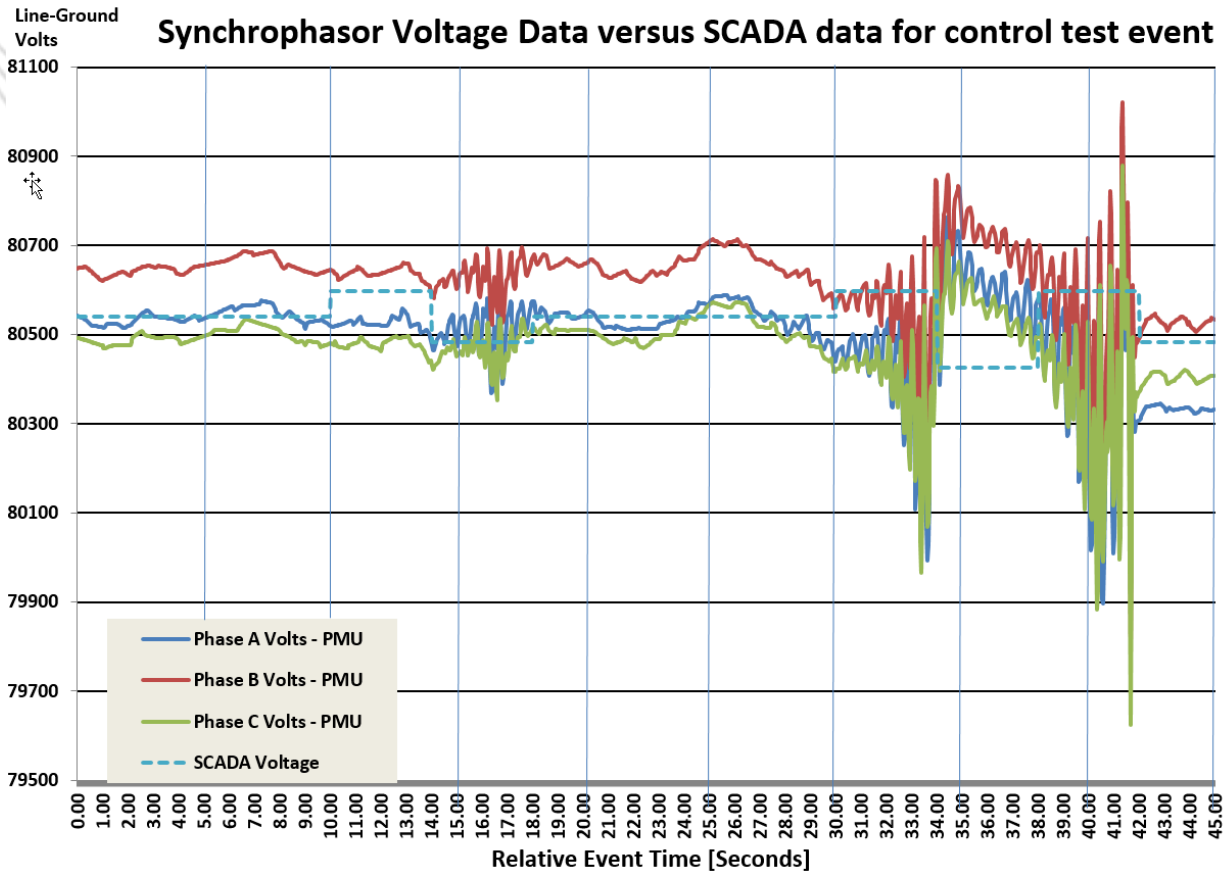
- Generator Owner [GO] implementing new controls on a ~60 MW rated gas turbine connected to an ATC 138 Kv transmission substation
- During the testing the unit had issues and tripped offline
- The GO contacted ATC after the test and asked if we had any data we could share to help analyze what happened
- Luckily (always better to be lucky than good?) we had installed a PMU as part of our DOE project at the station to monitor flows on one of the lines at the station

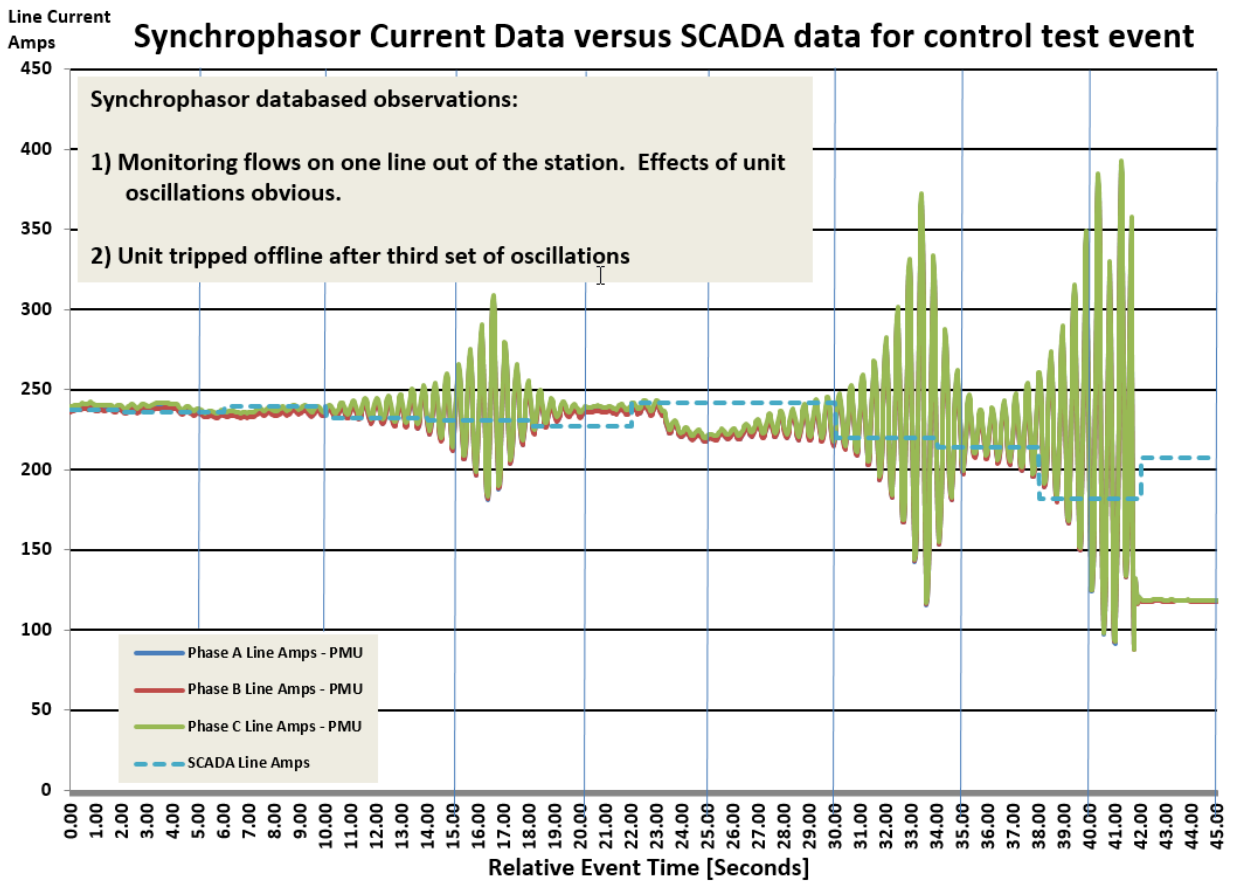
Substation Layout

- The station has multiple Gas Turbines connected to the 138 Kv bus via a single breaker
- Unit GT1 was being tested and was the only unit online at the time of the test
- PMU monitors one of the two 138 Kv lines leaving the station



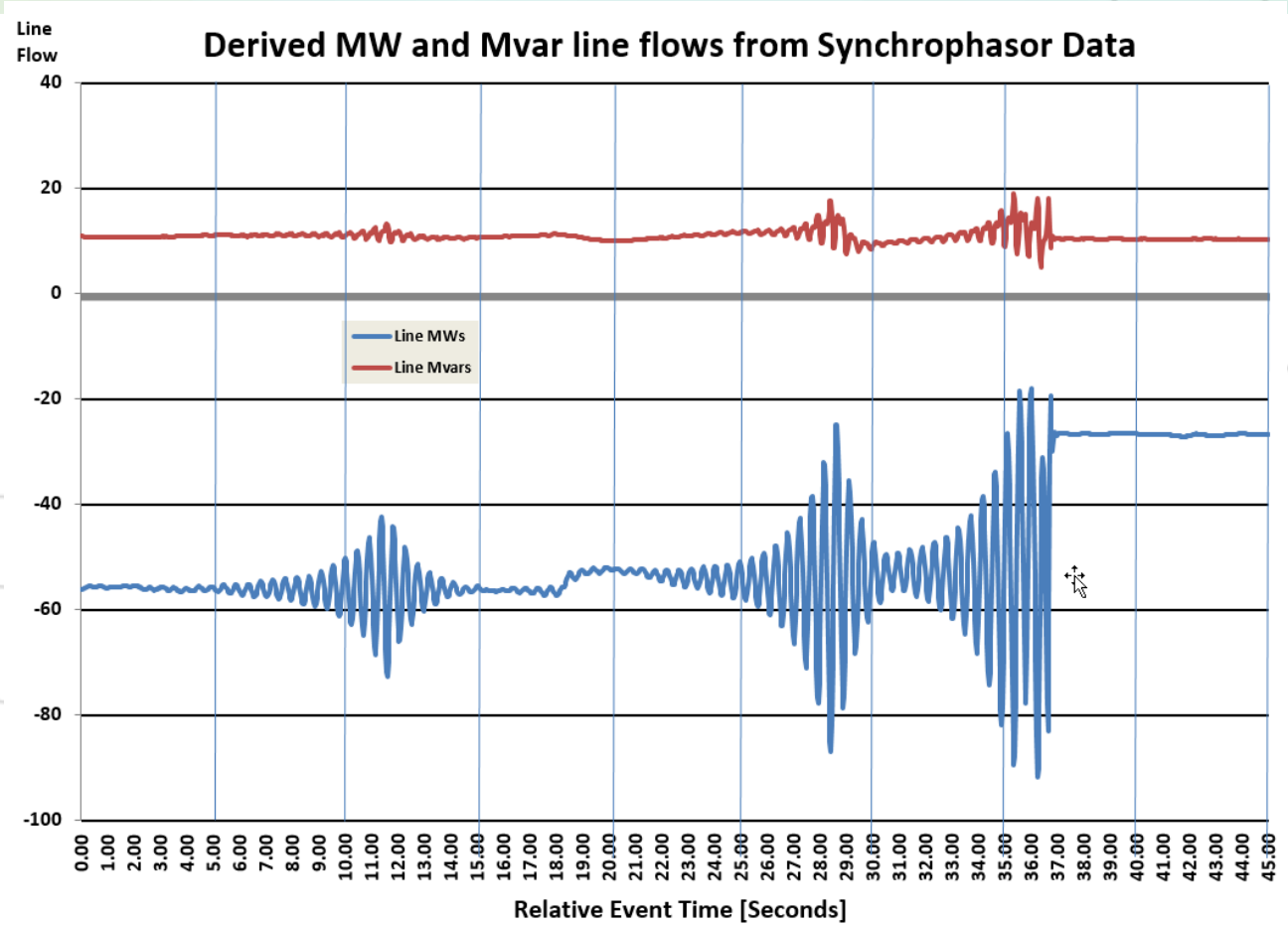
Synchrophasor Data Plots from line monitoring PMU





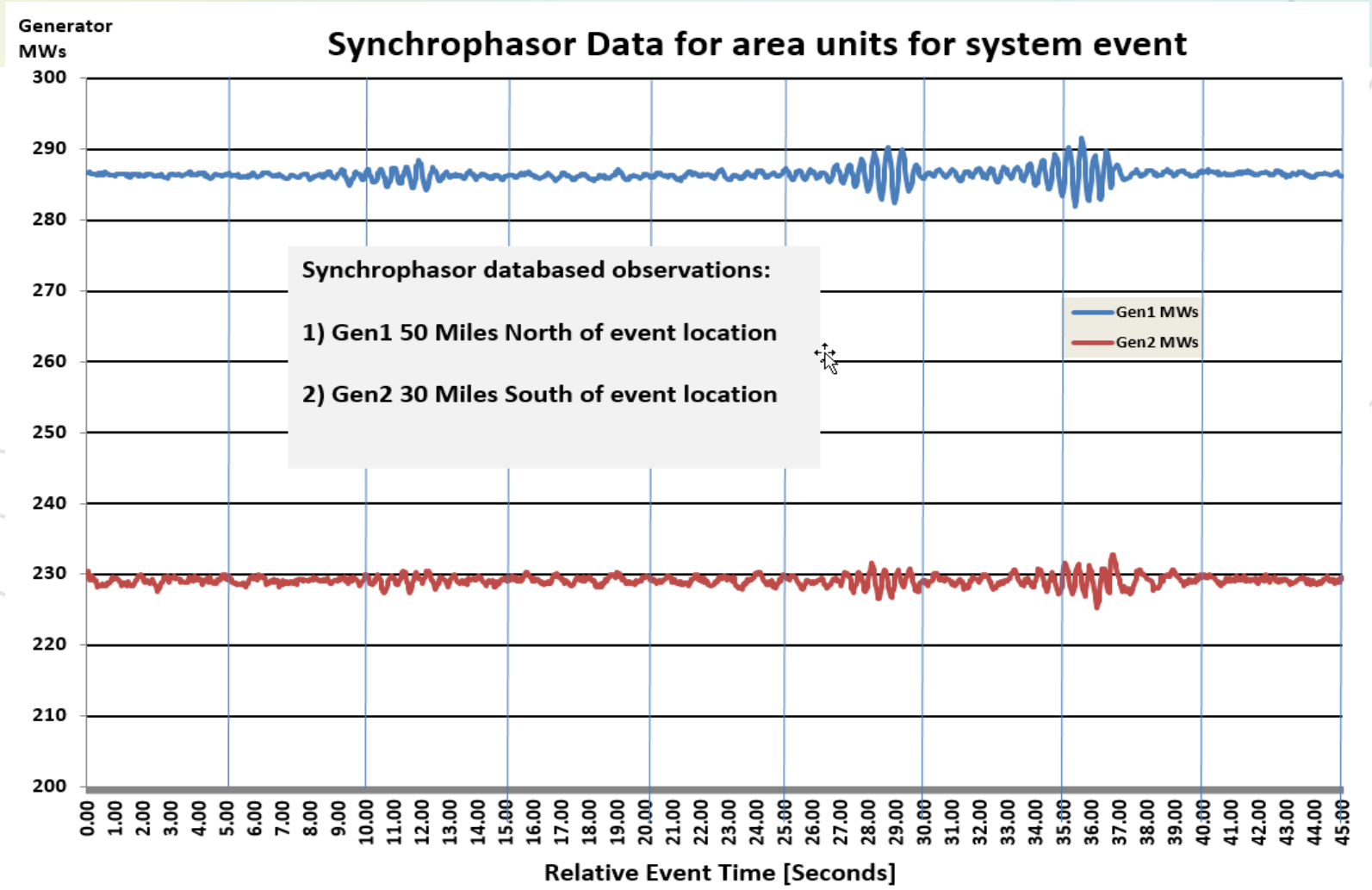
Derived MW / Mvar Line Flows from Synchrophasor Data

- We do not bring back MWs and Mvars directly so the magnitude of the impact on the system was not clear
- Used EXCEL after the fact to derive line flows.
- Significant oscillations in line flows (70 MWs peak to peak)



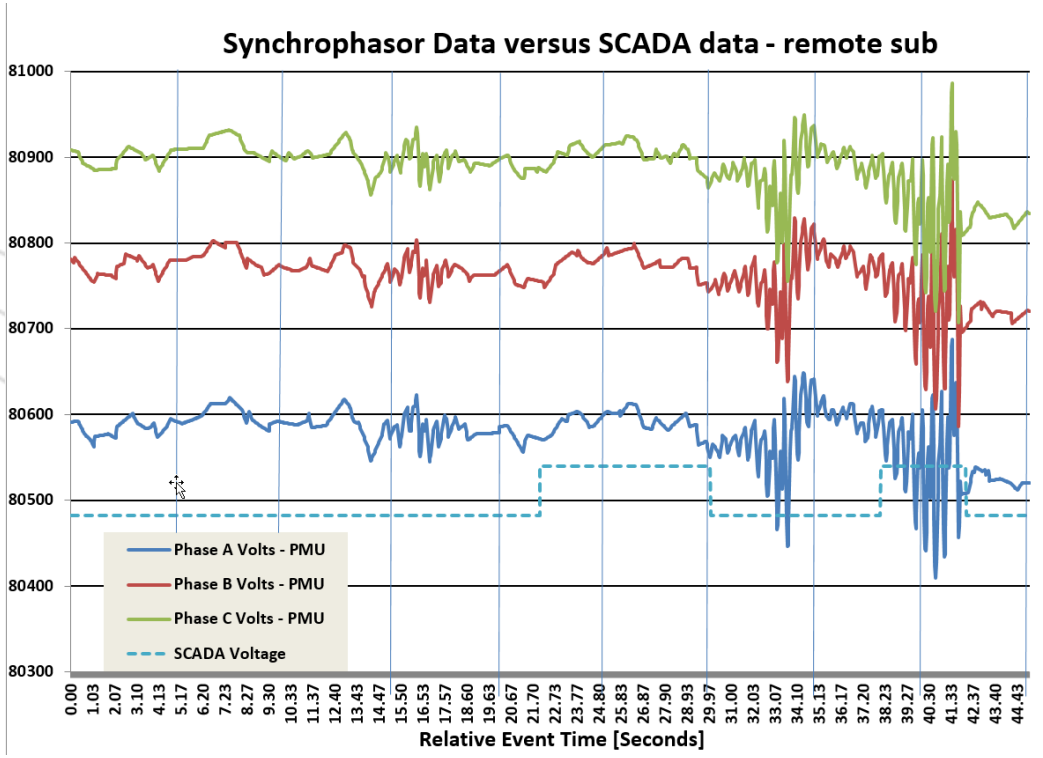
Impacts on nearby units

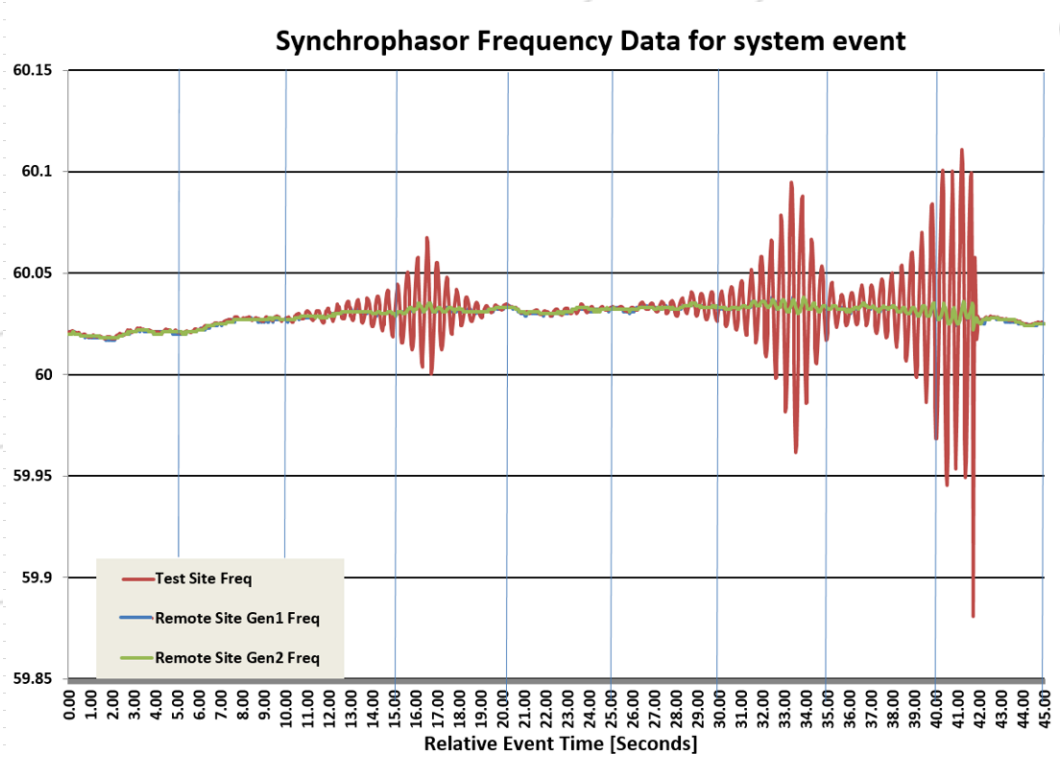
- There were also MW impacts on some, but not all, nearby units
- Minimal Mvar impacts



Impacts at nearby stations

- Minimal frequency impact away from test site
- Voltage impact visible but much smaller magnitude





Event Recap

- Forced oscillations in the 2Hz range. MW flows impacted more than Mvar flows
- Cause of oscillations were issues with new controls that were addressed by the vendor/GO. Unit protection prevented this from becoming a larger system issue
- We had no tools to detect the oscillation so it would not have been identified if the GO hadn't reached out for information
- We are working to implement PhasorPoint Oscillation monitoring. May have alerted for this event although short duration may have been an issue

Q & A

Questions?