

Document Title: EA003 - Using Synchrophasor Data to Identify a Failing Potential Transformer

Category: Event Analysis

Time Horizon: Operations Assessment

Party Involved: American Transmission Company

Event Date: November 2013

Event Description: An ATC Operations Engineer was using synchrophasor data to review fault operations and stumbled across the odd voltage signature shown below from a PMU monitoring one of our 69 Kv substations. One of the three voltage phases would “drift” away from the other two phase voltages and then eventually jump back to normal. The behavior was not observed on the voltage data from PMUs at nearby stations so it was determined this was not a system problem.

System Protection personnel were contacted and after reviewing the data performed additional testing to validate the voltage behavior observed on the synchrophasor system. They accessed relaying equipment at the sub and confirmed that the same issue was present on both secondary windings for the PT which pointed to an issue with primary winding. Field personnel were dispatched and all PT connections were verified good which confirmed that this voltage behavior was due to an internal primary winding issue on the PT.

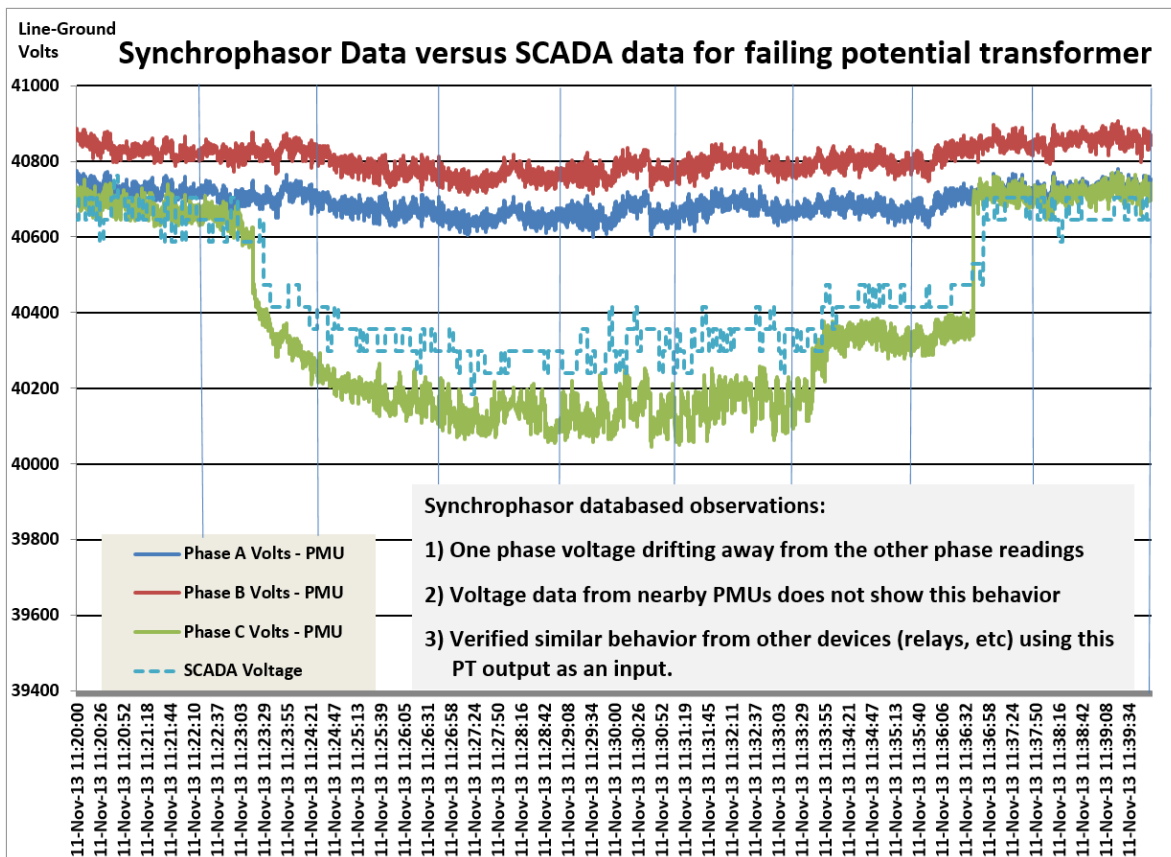


Figure 1 – ATC Potential Transformer Issue Identification

Operational Value

Based on the information and the conclusion that the PT had an internal issue that could lead to failure we made the decision to replace the defective PT. We did this for two reasons:

- The load served from this substation could not be back fed from the distribution system so an unplanned failure of the PT could have resulted in a long-term outage affecting a significant number of customers. Since we had advance notice of a potential issue we were able to schedule crews to install a mobile transformer during normal work hours to serve the load while we replaced the unit before we had a failure.
- The unplanned failure of any high voltage field equipment can affect other facilities in the station and personnel safety especially when the equipment fails violently. We believe we avoided that risk by proactively replacing the equipment before it failed.

Disclaimer – We did test the potential transformer once it was removed from service. The high-level tests we did on the suspect PT did not show an obvious issue but we were not certain it would due to the intermittent nature of the failure/short.

Background

The mission of the North American Synchrophasor Initiative (NASPI) Control Room Solutions Task Team (CRSTT) 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>).

Additional Event Information

See the attached excerpt from an installation report for a similar issue identified on a voltage transformer in the Buraimi station in Oman. (Supplied by Dalibor Brnobić with Studio elektronike Rijeka, d.o.o)



Buraimi_ss_VT_prob
lem.pdf

References