

Lesson Learned

Transformer Oil Level Issues During Cold Weather

Category: Bulk Power System Operations

Primary Interest Groups

Transmission Operators (TOP)

Transmission Owners (TO)

Balancing Authorities (BA)

Generator Operators (GOP)

Generator Owners (GO)

Problem Statement

During a winter event, two substation transformers tripped off-line due to low oil levels during the extreme low temperatures. One transformer outage affected over 100 MW at a wind generation facility and the second transformer outage occurred at a major 345kV/138kV substation.

Details

During a winter event, over half of a wind farm facility (approximately 100 MW) could not generate after a substation transformer tripped due to low oil level. This situation could not be resolved for six days because crews were not able to access the facility due to icy roads.

The cold temperatures caused the oil, which was already low in the transformer, to condense resulting in inadequate flow across a sensor. This produced an oil low level protection system trip on the transformer that could only be corrected by adding oil to the transformer.

The investigation found that the low oil level was caused by a contractor not using proper procedures when filling the oil after a repair was made early in the project's history. The oil level did not become an issue until the cold weather event. Evidently the oil level was near the alarm set point for an extended period of time but never reached the set point because of mild temperatures up to that time. It was the first time the transformer had been subjected to very cold temperatures since the work had been completed. There had been no overheating problems with the transformer.

At a major 345kV/138kV substation, an autotransformer also tripped due to low oil level in the conservator tank. The transformer was off-line for a period of 3 ½ hours before crews were able to get to the facility and fix the problem.

Corrective Actions

After accessing the two sites, crews were able to fill the transformers to the proper level and complete the procedures necessary to allow the transformers to be returned to service and allow the curtailed generators to come back online.

Lessons Learned

This event brought forward the following lessons learned:

- Before winter, equipment which may be affected by cold temperatures should be checked to ensure the facility can continue to operate at those temperatures
- Transformers and other equipment oil levels should be checked periodically to ensure they are at the proper level.
- Contractors should be expected to follow proper procedures when performing maintenance activities.

For more information please contact:

Earl Shockley
Senior Director of Reliability Risk Management
earl.shockley@nerc.net
404-446-2560

David Penney
Senior Reliability Engineer
david.penney@texasre.org
512-583-4958

Source of Lesson Learned: TRE

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