Meeting Minutes
IEEE / PES Transformers Committee
Performance Characteristics Subcommittee
TF to Investigate the Interaction between Substation Transients and Transformers in HV and EHV Applications
Memphis, TN
Tuesday, November 03, 2015
3:15 PM – 4:30 PM
Ballroom C
Chairman – Jim McBride
Secretary – Tom Melle

1) Welcome and Chair's Remarks. TF objectives were presented.
2) Circulation of Attendance Sheets
3) There were 88 individuals in attendance with 21 members present. Quorum was achieved.
4) Spring 2015 Meeting Minutes presented and approved with no opposition
5) Fall 2015 Agenda presented and approved with no opposition
6) Chair began presentation and discussion of Capacitor Switching Transients
    - There was a review of comments submitted by Pierre Riffon on the methods of describing capacitor bank switching operations. The three methods were simple LC circuit, back-back capacitor banks switching, and traveling waves. The Chair remarked that after reviewing the failures in this category, none had been identified as the primary cause of the failure. The Chair presented a few example traces that supported this conclusion.
    - Phil Hopkinson commented that a data capture of recorded waves should be presented if conclusions are made; however agreed that Capacitor Switching typically does not cause failures.

Chair briefly reviewed the case studies which are a basis of the TF work and described the failure categories that have been identified in the preliminary task force paper:

A - System faults and capacitor switching produces traveling waves with reflections that excite lightly loaded transformers to resonance.
B – Generator step-up transformers operating in back feed mode are excited to resonance by system transients.

C- High frequency switching operations close to the transformer terminals which excite internal resonance due to multiple re-ignitions and re-strikes.

Chair requested that the members of the TF make a motion on the inclusion of capacitor bank interactions in the TF summary paper. Pierre Riffon restated with capacitors there is no fast collapse to ground. Phil Hopkinson made a motion that capacitor banks be included with indication of factors that may or may not contribute to failure. The motion was seconded by Rogerio Verdolin. Motion passed with 19 approvals.

7) The Chair indicated that new switching transient information on re-strikes during bus de-energization transients had been received from Pierre Riffon (~ 300-500 kHz). This new information was added to Failure Category C: *High frequency switching operations close to the transformer terminals excite internal resonance due to multiple re-ignitions and restrikes.* In addition, Figure 2 was added to the document.

8) General discussion, suggestions and comments regarding the Conclusions / Recommendations section ensued:

- Xose Lopez suggested adding monitoring and mitigation information to the TF paper. This suggestion was discussed by the members of the task force and those present expressed no objections to adding this information. During the discussion of monitoring, modeling, and system studies, Bertrand Poulin suggested that all these tools must be utilized to realize a complete understanding of system interactions.

- Sanjib Som suggested separating the Conclusions and Recommendations sections and also suggested that the TF summary paper be submitted for publication as an IEEE transaction paper

- Rogerio Verdolin mentioned that proper instrumentation is required to measure these high frequency transients in the field. The Chair suggested that these measurement devices should have a bandwidth of at least 2 MHz.

- Waldemar Ziomek indicated that he was involved with transient studies that indicated the stress on a transformer can vary significantly due to the methods of neutral grounding used on the unit. Alvaro

Portillo agreed with this statement. Discussion ensued over resonant frequency and the severity to neutral grounding and its effect on the response of the transformer. There was discussion that this may not be material for inclusion in the TF summary paper. Waldemar Ziomek made a motion to include this information as possible material for revision of C57.142. The motion was seconded by Pierre Riffon and passed.

The Chair commented that design reviews be expanded to include these neutral grounding topics, stressing the need for good communication between transformer manufacturers and end-users.

9) An update from the CIGRE Modeling working group presented by Xose Lopez will be made available to the task force.

10) Phil Hopkinson presented possible upstream/downstream interactions of two transformers. Low power factor / highly inductive combinations were emphasized. Again, this presentation will be made available to the task force and might be considered for inclusion in the C57.142 revisions.

11) Chair indicated that some more specific information had been added to the GSU back feed section of the TF Paper. This information was provided by Bertrand Poulin.

12) New Business – none presented

13) A motion to adjourn the meeting was made by Joe Melanson and seconded by Xose Lopez. The meeting was adjourned at 4:30PM.

Respectfully Submitted,
Tom Melle, TF Secretary
11/03/2015