10.10 Dielectric Tests Subcommittee – Loren Wagenaar, Chair; Thang Hochanh, Vice-Chair; Joe Melanson, Acting Secretary

The Dielectric Tests Subcommittee (DISC) met on Wednesday, November 2 at 11:00 am with 175 persons in attendance. There were 78 of 128 members, and 97 guests present. Eleven returning guests requested membership and will have their participation status reviewed prior to acceptance

10.10.1 Chair's Remarks

1. The Chair first announced that Secretary Dennis Marlow could not attend this meeting and that Joe Melanson agreed to fill in.

2. The Chair briefly reviewed highlights of the Administrative Subcommittee meeting held on Sunday afternoon. The meeting schedule will be tentatively changed at the next meeting in Nashville, TN. The Monday and Tuesday schedule will remain the same except 1) a general session of the main committee (TC) will held in the first time slot on Monday, and 2) the two tutorial sessions will now be held on Thursday morning. The two time slots previously used by the tutorials will be used for meetings. Phil Hopkinson expressed his displeasure with the new schedule and predicted that several members would leave after the last Wednesday time slot.

3. The following meetings of the TC are:

    a) Sping 2012, (Renaissance Hotel $149) – Nashville, TN - hosted by Baron Associates
    b) Fall 2012 – Milwaukee, WI – hosted by Waukesha Electric Systems
    c) Spring 2013 – Munich, Germany – hosted by Reinhausen

    Additional meeting sites are listed on the main committee website.

4. The officers of the main committee will change places starting on January 1. Present chair Ed Smith will move to the Awards chair, present vice chair Bill Chiu will move to chair, present secretary Don Platts will move to vice chair, and Steve Antosz will become secretary.

5. The patent policy remains the same, but the method for achieving compliance has changed. Rather than the chairs having to ask for patents before each meeting session, the new method is to handle this on a one time basis at the time of meeting registration.

10.10.2 Quorum and Approval of Minutes

1. A show of hands of committee members present showed that a quorum of members were in attendance at the start of the meeting.

2. The minutes of the Spring 2011 meeting in San Diego were approved without correction.

10.10.3 Working Group Reports

10.10.3.1 Working Group on External Dielectric Clearances, Eric Davis, Chair; Dennis Marlow, Secretary

The basic parameters that affect the BIL and SIL breakdown voltages were reviewed. These parameters include the impulse shape, impulse polarity, gap configuration and atmospheric conditions. This background information will be posted in a secure portion of the DISC's web site. We are currently working with IEEE to get the necessary permissions to post the papers and standards.

The WG also reviewed and refined several survey questions regarding BIL. The survey along with the background information discussed above will be sent to the members of the DISC.

10.10.3.2 Working Group for Revision of the Impulse Test Guides C57.98, Art Molden, Chair; Joe Melanson, Co-Chair

The meeting started at 9:30 AM on Tuesday November 1, 2011. Introductions were made of the attendees. Chair Art Molden was unable to attend. There being four members present a quorum was declared, and the minutes of the spring meeting in San Diego were approved.

The Guide has been completed, balloted and forwarded to RevCom.

The Chair acknowledged the special contributions from Art Molden and Bertrand Poulin to the Guide during the revisions. The attendees also acknowledged their efforts to make the Guide a more informative and in depth document.

The meeting was then adjourned and turned over to John Crotty, the chair of the next working group charged with revision of the Recommended Practice for Routine Impulse Test of Distribution Transformers.

10.10.3.3 Working Group for Revision of C57.138, Recommended Practice for Routine Impulse Test of Distribution Transformers; John Crotty, Chair

The group met briefly at 9:45 AM on Tuesday, November 1, 2011 in their kick off meeting. The chair reported that the PAR had already been approved and circulated a signup sheet for those interested in working on the revision. He will send out comments from the reaffirmation ballot sent out in 2005. Work on the revised document will begin in Nashville.

10.10.3.4 Working Group on Revision of Low Frequency Tests; Bertrand Poulin, Chair; Bill Griesacker, Secretary

There were 86 attendees, 20 members and 68 guests; 17 guests requested membership. There were well more than 50 % of the working group members present at the meeting, therefore there was a quorum present at the meeting.

The minutes from the spring 2011 meeting in San Diego, CA were brought to the table; the minutes were approved.

10.10.3.4.1 TF on PD in PTs, CTs and Bushings, Thang Hochanh, Chair

Thang presented the minutes for the TF. A proposed bushing test circuit was sent out for comment. The document has been drafted and is ready to be sent for review and comments. A PAR will be initiated for this work. Full minutes are given in the Annex.

10.10.3.4.2 TF on Electrical Partial Discharge Measurements Guide, **C57.113, Eberhard Lemke Chair**

The TF did not meet as the document is being published.

Note: A check after the meeting reveals that the guide was published on August 20, 2010.

WG Discussion

Old Business: The topic of requiring induced testing on 69 kV transformers was discussed. Two e-mails were sent out, 119 responses were received for a 33 % return rate. Reviewed negative votes and the accompanying comments which will be used to guide a draft proposal(s) for new requirements in the standards (i.e. C57.12.00, C57.12.90). Suggestions were given to consider other criteria, such as MVA along with kV, to determine if this test should be required. It was voted 12 to 0 to issue a new survey proposing that the induced test is required for 69 kV and an MVA level. Values such as greater than 10, 12 and 15 MVA were proposed.

New business: It was discussed if it should be required to perform the induced test on transformers with reactive type LTCs on a bridging position. One philosophy is to adjust the LTC so that there is the closest match on primary and secondary winding terminals to the calculated test voltage. One possibility would be to require a bridging tap position (or a position that the PA has induced voltage during test) with a secondary requirement to select the tap position which provides the closest terminal voltage. This may impose limiting requirements on the generator that may not be able to deliver the power required by the test at higher frequencies. A survey proposal will be prepared to get a general consensus if this topic should be addressed.

The meeting adjourned at 3:00 p.m.

Annex. Minutes of TF on Partial Discharge in Bushings and PTs/CTs, Chair Thang Hochanh; Arturo Del Rio, Secretary

The task force met on Monday October 31st, 2011, at 3:15pm with 50 attendees. Of those, 12 members and 38 guests with 3 guests requesting and granted membership.

- The meeting was opened with a request for patent disclosures and introductions.
- The minutes for the S11 San Diego meeting were presented. Volunteers were reminded of the previously offered contributions to the draft; W. Hauschild offered to have the section of shielding ready for next meeting after clarifying details with the Chair.
- The TF Chair presented a draft version of the preferred connection diagrams for carrying out PD tests in laboratory settings for transformer bushings and instrument transformers both in balanced method and open-end method. Also, alternate connection set ups were presented and discussed. These diagrams are intended to be part of the guide.

The diagrams will be e-mailed to the members of the task force for review and comments.

- The TF Chair presented a table summarizing the different aspects to be considered prior and during the PD test including physical set up, oil tank size, use and size of corona rings, use and size of static shields in the oil side of a bushing, influence of ground planes during the test, cleaning and preparation of equipment prior to the test, set up and test connections and instrumentation. This table will be e-mailed to the members of the task force for review and comments.
- The final item in the agenda was a presentation by Barrett Wimberly on routine partial discharge for CTs 72.5 kV and 800 kV.
- TF chair requested comments and feedback from the members regarding the material and schematics presented.
- Meeting was adjourned at 4:30 pm.

Minutes by Arturo Del Rio.

10.10.3.4 Working Group on Revision of Impulse Tests – Pierre Riffon, Chair; Peter Heinzig, Vice-Chair

The WG did not meet because of a lack of a quorum.

10.10.4 Liaison Reports

10.10.4.1 High Voltage Test Techniques (HVTT), IEEE Standard 4 - Arthur Molden

There was no report due to the fact that Art was not present at the meeting

10.10.4.2 PCS TF on Dielectric Frequency Response Testing – George Frimpong

Four groups were formed during the San Diego to handle various aspects of the project. These groups presented progress reports at this meeting.

- **Subtask 1 – Literature Survey**
  George Frimpong presented a list of abstracts from papers related to the modeling and estimation of moisture in transformers using DFR and other dielectric response methods. In all a total of 25 key papers have been identified, some of which deal with verification of DFR for moisture estimation.
    - Mary Foster from Omicron suggested the inclusion of the CIGRE **Working Group D1.01 (TF 14), Report 414 on Dielectric Response Diagnoses for Transformer Windings, 2010**.
- **Subtask 2 – DFR Method Description**
  Peter Werelius presented the material that has been put together to explain the basics of the DFR method.
- **Subtask 3 – Verification/Validation**
  Tom Prevost and Diego Robalino presented case studies on transformers for which DFR measurements and other moisture determining measurements (dew point and Karl Fischer on paper samples) were performed. Tom requested anyone who has cases of DFR moisture measurements in conjunction with other moisture measurements to send these to him and Diego for review and inclusion in the task force report. For

completeness we ask also for cases where DFR did not work in estimating moisture in the solid insulation. Tom presented a list of information to include with the cases.
    - The chair clarified that the task force will focus only on cases related to moisture determination in power transformer solid insulation.
    - A table to address DFR measurement parameters and to quantify their diagnostic value was presented. The table will be reviewed by the subgroup before the next meeting.
  - Next Step for Subtask 3
    - Complete draft of this section by end of January 2012 and distribute among subtask members for comment
- **Subtask 4 -** Mario Locarno presented a review of existing IEEE, CIGRE and IEC documents that have a relation to moisture estimation in transformer solid insulation. In all about 20 documents were found that mention moisture estimation or DFR.

10.10.5 Old Business

The WG on the Revision of Low Frequency Tests presented a tutorial on Monday afternoon. The presentation was well received.

Phil Hopkinson reported on the status of comment resolution on the dielectric tables in C57.12.00. One of the comments was raised by Fred Elliott relative to 500 kV, in that the latest table has test voltage requirements of 520 kV and 460 kV for the enhanced and one hour induced test, respectively, whereas the previous levels were 550 kV and 475 kV, respectively. There are a few additional comments generated during the ballot. Phil commented that WG may be re-activated and asked for volunteers.

Dennis Marlow raised the issue of the order of switching and lightning impulse tests at the last meeting. This issue was raised at the meeting, but there was no discussion, perhaps because Dennis was not in attendance.

10.10.6 New Business

Front of Wave Test. Joe Melanson proposed that Annex A in C57.12.00 be changed to remove the Rate of Rise column in the table, to add tolerances to time of flashover, and to remove the statement in the title block stating that this test is no longer specified but is documented for historical purposes. This proposal was not surveyed at the meeting, but an amendment to the proposal was to survey all members of the DISC on this issue. Both the amendment and the proposal to survey all members passed. Joe and the Chair will put out a survey on this issue.

Polarization Index Tests. The chair received an inquiry from an engineer from a testing organization questioning why requirements for this test were not stated in C57.12.90. This test is a field diagnostic test, and test requirements are stated in the revision of C57.152, Guide for Diagnostic Field Testing in Fluid Filled Transformers, Regulators and Reactors. General consensus of the DISC was that users who wanted this test as a baseline should place a requirement for such in their specifications, but requirements for it should not appear in C57.12.90 at this time.

Revision of C57.127-2007, Guide for the Detection of Acoustic Emissions from Partial Discharges in Oil-Immersed Power Transformers. Information at the meeting was that this guide

would have to be revised by the end of 2012. However, discussion at the Standards SC indicates that under the new rules, it does not have to be revised until the end of 2018. Hence, if this is the case, there is ample time to revise this document in a timely fashion. The .chair will confirm the required date and will attempt to determine the need for revision.

Tutorial on IEEE 4 Revision. In view of the several changes made in the latest revision of IEEE 4, Art Molden has suggested that a tutorial be given to the TC. A major change deals with the "k-factor," which is a correction factor for the overshoot on the front of lightning impulse waves. The proposal was discussed, and one thought was that it should be presented only to the DISC. However, the counter argument was that while this is a complex subject directed specially at impulse testing, it is of general concern to both users and manufacturers. A vote was taken and the general consensus was that it should be a TC tutorial. The chair will contact the tutorial coordinator to determine the next available date for a tutorial and also contact Art to advise him of the DISC approval of the proposal.

Class I/Class II Classification for Transformers. This subject was raised in the Administrative SC and has major impact on the DISC, which has the majority of special test requirements for Class II transformers. Bill Chiu presented power point slides discussing the diminishing need for these classifications. The chair pointed out that this topic had been raised several times before, that a 2010 DISC survey indicated that about 70 % approval for impulse testing all power transformers, and that this is not a large enough approval rate for a Standards Association ballot. This topic was discussed further at the Standards SC, and the PCS has agreed to follow the lead of the DISC. The DISC chair has agreed to take the lead on this assignment, and Bill Chiu's presentation will be posted on the Standards SC website.

10.10.7 Meeting adjourned 12.15 PM. Minutes respectfully submitted by Joe Melanson and Loren Wagenaar