7.9 Dielectric Test Subcommittee – Loren B. Wagenaar, Chairman; Stephen Antosz, Secretary

The Dielectric Test Subcommittee (DTSC) met on Wednesday, March 22, 2006, in Costa Mesa, CA with 35 members and 30 guests present. 4 of the guests requested membership and are welcomed into the Subcommittee. See the last page of these minutes for attendance list.

7.9.1 Chairman's Remarks

1) The Chair reviewed highlights of the Administrative Subcommittee meeting held on Sunday:

   a) The next meeting is October 22-26, 2006 in Montreal, QC, Canada. Host will be Thang Hochanh of Hydro Quebec IREQ. The venue is the Delta Centerville Hotel; the room rate is $189 CAD (approximately $165 USD).

   b) The Par submittal process is now done online. WG and TF Chairs received a luncheon tutorial from IEEE staff. Further inquiries should be directed to Bill Chiu.

   c) The Chair asked for comments or input regarding scheduling of meetings at this Costa Mesa event, since there are several conflicts between the major Subcommittee Meetings (for example; Dielectric Test and Insulation Life are held at same time)

   d) The Chair announced his retirement from AEP effective on June 30, 2006. However, he will continue as Chair of this Subcommittee for the immediate future.

2) The minutes of the Fall 2005 meeting in Memphis, TN were approved as written, and are available on the IEEE Transformers Committee Web Site.

7.9.2 Working Group Reports

7.9.2.1 Working Group on Acoustic Partial Discharge Tests in Transformers - J.W. Harley, Chair; Alan Darwin, Secretary

Attendance: 10 members and 32 guests. Attendees introduced themselves.

The minutes from the 24 October 2005 Memphis, TN meeting were approved.

IEEE Patent disclosure requirements were discussed and a request was made for attendees to identify or disclose any patents that may be related to the work of the WG. There were no responses.

The discussion topics focused on PC57.127 Draft Guide for the Detection and Location of Acoustic Emissions from Partial Discharges in Oil-Immersed Power Transformers and Reactors.

1. The invitation to participate in the ballot for the Guide was opened on 2 February 2006 and closed 4 March 2006. There were 81 respondents from the pool of 438. The classifications and percents of the eligible voters were: General Interest 40.7%, Producer 17.3% and User 42.0%. The balloting group is balanced since there is representation from all interested parties, but not domination by any one of those parties. The ballot invitation period will be extended briefly to allow two people who registered within the initial invitation period, but registered incorrectly, to register properly.

2. A number of definitions were questioned during the Mandatory Editorial Coordination process. At the WG meeting, elaborative text was moved from the definitions to the body of the Guide resulting in the creation of two new clauses, "Acoustic signal" and "Velocity of sound in oil," and addition to the text of other clauses. Several definitions were deleted when it was determined they were standard terms in the IEEE Dictionary.

3. Clause 3 "Detection and measurement of partial discharge – background information" was reviewed by the group. This clause had been submitted since the last meeting and edited by a sub-group of WG members.

4. A new case study has been added to Annex D, which is an informative tutorial. This covers the diagnosis of a 500 kV 243MVA core form single phase autotransformer that subsequently failed. The case highlights coordination with DGA trends and the often sporadic occurrence of PD, which in this instance was dependent on loading and relatively small voltage changes.

The consensus of the Working Group is that the PC57.127 Guide is ready to go to Ballot. This will be done in the near future.

7.9.2.2 Working Group on Revision of Low Frequency Tests – Bertrand Poulin, Chair

The meeting was held on Monday March 20th at 11h00 am. After the usual introduction and display of IEEE's Patent policy, the minutes of the previous meeting were approved as written.

Next, Dr. Lemke presented his report on the task force meeting for the revision of C57.113 (IEEE Guide for Electrical Measurements of Partial Discharges in Transformers). The minutes of this meeting are found in Appendix 1. The main topics are:

I. The process of revision of the guide is going well. Comments and suggestions after draft 3 were incorporated in draft 4 and circulated. New comments were received and will be addressed in draft 5 before the next meeting.
II. The main topic of discussion during the meeting was around the evaluation of the maximum repetitive apparent charge and the train pulse response of detectors, which leads to smoothing of the detector's response for easier and proper evaluation of results. (see minutes for details)
III. As the document has reached a point where it will soon be ready for balloting, it is time to initiate a PAR so that a balloting group be formed and the balloting process can take place in the near future. The PAR will be requested for C57.113 to become a "recommended practice" rather than a guide, as its content fits better with IEEE's definition of a recommended practice rather than a guide.

The rest of the meeting was devoted to the review and discussion of comments and suggestions received since the last meeting of the working group.

- For the induced test, it is suggested to measure the pd level before the enhancement and after the enhancement. It is proposed that a maximum increase of 150 pC between these two measurements be added as a new criteria. If not met, a new enhancement must be made. This proposal raised discussions and objections although most people present agreed with the principle.

- 10.8.2 Induced test on class 2 power transformers – test procedure. For the case of transformers equipped with pumps, make it mandatory to run the pumps during the induced test. The chairman proposed to suggest this test in the standard as a type test

only. This suggestion will be added in the next revision of the standard (not the next recirculation for 2006). It was also proposed that this suggestion was limited to transformers with oil forced in the windings by pumps (ODAF cooling only).

- Since last meeting, many members have suggested that the maximum apparent charge level be reduced from 500 pC to 300 pC for the 1.5 pu one hour test. This topic has been discussed in the past and no consensus has ever been reached. Members pointed out that there is no evidence that adopting this criteria would lead to better transformers nor better detection of eventual defects. Transformer designers do not design for 300 pC or 500 pC. It is measured at test. It was suggested that some words be added in case the criteria is not met, that the transformer need not to be rejected, but the cause of the pd be investigated and decision be made base on the result of the investigation by the manufacturer and his customer.

These three issues will be addressed in the next revision of C57.12.90 with new proposals and we will see what comments are received.

APPENDIX 1

Unapproved Minutes of the Meeting
Task Force Electrical Partial Discharge Measurement
Hilton Hotel, Costa Mesa, CA March 20, 2006

1. Introduction
The Chairman opened the meeting at 8:00 a.m. and welcomed the members and guests. There were 72 attendees present, 28 of them TF members and 44 guests.

2. IEEE Patent Policy
The IEEE Patent Policy was discussed based on the submitted transparencies. There were no any patent issues for this TF Meeting.

3. Approval of Agenda
The submitted tentative agenda was approved as it was.

4. Approval of Minutes of the previous Meeting
The minutes of the previous TF meeting in Memphis, TN, were approved as written.

5. Activities for revision the IEEE Guide C57.113
The comments and suggestions after the third draft were incorporated in the draft 4, which was circulated prior this meeting and reviewed today. The discussion was focussed mainly on the following topics:

- Evaluation of PD test results, see chapter 6.0. It was agreed that no quantitative values will be presented because this is the issue of IEEE guide C57.12.90.
- Fundamentals for PD pulse processing, such as the quasi-integration used for measuring the apparent charge, q, as well as the pulse train response in order to evaluate the largest repeatedly apparent charge magnitude, q_m, see Appendix 7.2.
- Practical examples for both, noise signatures and PD pattern recognition.

6. Future work
The future work will deal with the incorporation of the comments and suggestions of this meeting in the final document. In particular, besides additional practical examples for noise signatures and PD pattern recognition the References presented in chapter 2.0 as well as the Bibliography listed in appendix F will be reviewed and updated if necessary.

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

The WG met on March 21, 2006, from 3:15 pm to 4:30 pm. Fourteen members and thirty-three guests attended the meeting two guest requested membership. Peter Heinzig chaired the meeting in the absence of Pierre Riffon. The agenda was accepted as written. The minutes of the Memphis meeting were approved as written.

The IEEE patent disclosure requirement policy was discussed. Reference to the package posted on the IEEE Transformers Committee web site was made. None of the members and guests present during the meeting was aware of any patents related to the work of the WG.

The first technical subject on the agenda was the review of the revised proposal made on impulse test procedure for transformers having non-linear devices. The WG was informed that the proposal agreed during the Memphis meeting was sent on March 9, 2006 to Subhash Tuli for inclusion in the next IEEE C57.12.90 draft for ballot. The proposal will be sent again, this time to Stephen Antosz, because the responsibility for C57.12.90 was handed over to him in the meantime.

The second technical subject on the agenda was the review of the revised proposal on lightning impulse test procedure for cases where the tail time of the impulse wave-shape can not be obtained. The several editorial and technical comments included after the Memphis meeting were discussed and revised during the WG meeting. No changes were made during discussion. This revised version will be surveyed within the WG membership prior the next meeting. Furthermore the WG was informed that the table of minimum suggested impulse generator capacitance and energy levels was sent to Arthur Molden on March 10, 2006 for inclusion in the next revision of the impulse guide C57.98, as agreed during the Memphis meeting.

The last technical item on the agenda was the review of the comments falling under the WG responsibility received on the last C57.12.00 and C57.12.90 drafts for ballots during the meeting. A proposal with all the changes agreed during the discussion will be surveyed prior the next meeting within the WG.

Because the WG ran out of time, some comments on the survey on C57.12.90 could not be discussed and will be postponed to the next WG meeting.

7.9.2.4 Working Group for Revision of the Impulse Test Guides C57.98 and C57.138 – Art Molden, Chair; Joe Melanson, Secretary

The meeting started at 3:15PM on Monday April 20th, with 21 attendees present of which 6 were members, 15 were guests of which 5 requested membership.

The ANSI patent policy slides were presented to our membership. The group had an opportunity to identify any patent conflicts and none were disclosed. There were no comments regarding the slides.

The group introductions were made.

A new draft of the guide had been made available to the members via the grouper web site. This draft was the first produced using the IEEE word processing template and included all the latest changes figures and tables current at that time.

The discussions started with a request by chairman Art Molden for help in producing some additional illustrations for sections of the guide. Reto Fausch, Ramon Garcia and Earnst

Hanique volunteered to correct and create the figures in the required electronic format. As it now stands the major portion of work still to be done is to complete an Annex, produce the additional figures and to complete the editing and formatting as per the IEEE style guide. It is hoped that with this additional help offered by the members the guide will be complete and ready for a final review by the next meeting. The PAR for this project expires this year and a request for extension will be submitted shortly.

An item of new business was that as decided at the Memphis meeting, a table of minimum impulse generator capacitance and energy ratings produced by the working group for The Revision of Impulse Tests will now be included in our guide.

7.9.2.5 Working Group on Liquid-Filled Transformers Dielectric Test Tables – Phil Hopkinson, Chair; Scott Choinski, Secretary

The Working Group on Dielectric Test Tables, Liquid-Filled was called to order at 1:45 PM. There were 42 attendees, 21 members, 2 requesting membership and 19 guests. Reviewed the agenda for the meeting, and the IEEE patent policy. There were no patent issues presented. The Minutes from the October 25, 2005, meeting in Memphis, TN were approved.

The Working Group reviewed Subhash Tuli's proposed table combining the three tables in to one table. Straw poll indicated a clear majority preferred the three tables.

It was also agreed to remove Front Of Wave test requirements from the High Frequency table and place it in an appendix that will be inserted in C57.12.00.

Several mark-ups made to the tables during the meeting.

Phil Hopkinson will send revised charts to respective Chairs of C57.12.00 and C57.12.90, and post the revisions on the IEEE Transformers Committee's website.

It was agreed at the DTSC meeting that another survey on the table would be taken of the DTSC. It was noted that there have been several changes made to the tables. The chair urged members of the DTSC to vote on this and other DTSC surveys and cautioned that no response can be interpreted as a "don't care" vote.

7.9.3 Liaison Reports

7.9.3.1 Status of C57.12.00 – Dong Kim; and C57.12.90 – Stephen Antosz

Separate recirculation ballots will be sent in April 2006. These cover only issues from the 2002 ballots. The ballots will be sent to the same ballot pools as in 2002. The only items open for consideration are the ones that were commented on in 2002. All future changes are still being compiled in Draft 3 of both documents and will be balloted in the future.

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

A meeting took place in Lake Placid, NY during the week of November 14th, 2005. During a 5 day period some 12 to 15 active members of the working group reviewed and restructured all the new Standard 4 text, arranging it into a format ready to be compiled into the IEEE word processor template. It is hoped that the first draft of this revision will be ready later this year. The Project Par expires this year and an extension request will be submitted shortly.

7.9.3.3 Surge Protection Devices – Bob Degeneff

Not present. No report.

7.9.4 Old Business

7.9.4.1 Simplification of C57.12.90, Mark Perkins proposal

The basic premise is to move tutorial information into appropriate guides. The focus issue right now is regarding high energy levels for impulse generators. It was pointed out that inclusion of this information in C57.98 was the only method by which this information can be included. There is not enough support within the DTSC to include it in C57.12.90.

7.9.4.2 Front of Wave Test Levels, Subhash Tuli

It was agreed at the last meeting that this issue would be dropped. Information pertaining to front of wave test and test levels will be put into an annex of C57.12.00.

7.9.5 New Business

7.9.5.1.1 Switching Impulse Test Configuration

Roger Hayes asked a series of questions on Switching Impulse Testing, regarding a standard test configuration for three-phase wye connected transformers. Depending on the test setup, it can result in higher phase-to-phase and/or higher phase-to-ground stresses. These must be known and accounted for at time of design. A poll was taken of those present at the meeting, and all manufacturers indicated that they test from phase to ground. It is proposed that C57.12.90 state clearly a standard test setup.

This issue was discussed, but no decisions made.

Chair's comment after the meeting: Further and closer inspection of Figs. 36 and 37 of C57.98 shows that the same voltages are applied whether voltage is applied phase to phase or phase to ground, provided of course that the correct magnitudes are applied in the first place. The figures are not very clear in the details, particularly in just where the E/3 voltage appears, and this should probably be modified to make the intent more clear. The chair's interpretation is that $E_{ph\text{-}ph} = 1.5\ E_{ph\text{-}gnd}$ in both cases.

7.9.6 Meeting Adjourned

Attendance at this Costa Mesa meeting of the Dielectric Test Subcommittee

Members Present

1. David Aho
2. Stephen Antosz
3. Javier Artiega
4. Stephen Beckman
5. Oscar Bello
6. Bill Boettger
7. Alain Bolliger
8. Carl Bush
9. Scott Choinski
10. Alan Darwin
11. Fred Elliott
12. Reto Fausch
13. Ramon Garcia
14. Bill Griesacker
15. Ernst Hanique
16. Jack Harley
17. Roger Hayes
18. Peter Heinzig
19. Thang Hochanh
20. Philip Hopkinson
21. Vladimir Khalin
22. Eberhard Lemke
23. Boyd Leuenberger
24. Dennis Marlow
25. Joe Melanson
26. Kent Miller
27. Art Molden
28. Bertrand Poulin
29. Jean-Christophe Riboud
30. Devki Sharma
31. Thomas Spitzer
32. Andrew Steineman
33. Craig Stiegemeier
34. Subhash Tuli
35. Loren Wagenaar

Guests Present

1. Nelson Alfonso **
2. Michael Busch
3. Alan Wilks
4. Jeff Serzan
5. Fran Huguet
6. Terence Lee **
7. Carl Shawver
8. Samuel Oriti
9. John Stein
10. Michael Spurlock
11. C.J. Kalra
12. Sergiy Razuvayev
13. Juergen Gerth
14. Laszlo Kadar
15. J. Arturo Del Rio
16. Jermel Miller
17. Ryland Revelle
18. David Stinson
19. Bertrand Legrand
20. Surinder Sandhu
21. John Caskey
22. Marcel Fortin
23. Rogelio Martinez
24. George Frimpnng **
25. Richard Tellez
26. Hosseiv Rezai
27. Edward Moe **
28. Alvaro Cancino
29. Axel Kraemer
30. Alan Traut

** Requested Membership**.**