7.2 Performance Characteristics Subcommittee

7.2.1 Introduction/Attendance

The Performance Characteristics Subcommittee (PCS) met at 11:00 A.M. on Wednesday, March 10, 2004 with 75 members and 33 guests in attendance. 4 of those guests requested membership in PCS.

7.2.2 Approval of Meeting Minutes

The minutes of the October 8, 2003, Meeting in Pittsburgh were approved as written.

7.2.3 Chairman's Remarks

7.2.3.1 Administrative Subcommittee Notes

1) Next Standards meeting dates and locations are as follows:
   Fall 2004: October 24 –28, Las Vegas, NV
   Spring 2005: Jackson, MS

2) IEEE PES meeting future dates and locations are as follows:
   Denver, Colorado: June 6–12, 2004.
   San Francisco, California: June 12 – 16, 2005.

3) The Administration Committee is looking into the possibility of a different format for the Thursday Transformer Standards Committee meeting. Suggestions from members of the Administartive SC were solicited. The Chairman, Vice Chairman, and the Secretary of the Transformer committee will be reviewing those and will come up with a recommendation.

4) The Administrative SC is looking for candidate projects to use internet on-line technology, to hold working sessions between regular meetings, allowing individuals to participate jointly, each from their own work location.

5) Particular attention must be paid to resolve issues with the C57.133 (Guide for S.C.testing) possibly being withdrawn. The PC SC and the Standards SC will work with IEEE to resolve the outstanding issue of the clarity of the figures in the document.

6) The Administration Committee is looking into a process of rewarding members of TFs and WGs who contribute significantly to the activities of, and the documents produced by, these groups. Plaques of appreciation would be presented to these individuals.

7) Minutes of this meeting should be sent to the Transformer committee Secretary, Tom Prevost, before April 30, 2004.

7.2.3.2 Membership

4 new members asked for membership and were added to the PCS Roster:

Miguel Oliva, ABB Cordoba, Spain
Peter Zhao, Hydro One
Dieter Wagner, Hydro One
Sue McNelly, Xcel Energy

The Membership roster will be reviewed, and members who have not attended any of the last 4 meetings will be contacted regarding their removal from the PCS roster; thanking them for past participation, and indicating that with renewal of participation they will be welcome to rejoin the group.

7.2.4 Agenda Changes

None

7.2.5 Working Group and Task Force Reports

7.2.5.1 PCS WG for Continuous Revision to C57.12.90 – Bruce Forsyth, Chairman; Rowland James, Secretary

The PCS working group for Revisions to test code C57.12.90 met in San Diego CA on March 8, 2004 at 9:40 A.M. There were 52 persons in attendance, 34 members and 18 guests. 5 guests requested membership in the working group. After introductions, the minutes from the last meeting were reviewed and approved.

Old Business

Subhash Tuli announced that C57.12.00 and C57.12.90 will be recirculated in April.

There was a discussion of the proposed draft #4 of WGgWG Item #11 “Proposal for Single Phase Excitation Tests”.

1. Section 1.4 Test Procedure - Mark Perkins’ objection to the second test (H_2- H_1, Figure 2 & Table 2) . Was discussed. After some discussion from the floor, consensus was reached to remove this test.

2. Section 1.1 General – Steve Antosz commented that the last sentence in paragraph one “While benchmark data is not required to interpret field test results, it is recommended that a reference test be performed in the factory as a benchmark for subsequent tests.” should be deleted. This comment was approved.

3. Section 1.3 Equipment - Marion Jaroszewski commented that Watts loss is not necessary and since some equipment does not provide this measurement that it should be shown as an optional measurement. After brief discussion it was decided to remove Watts loss as a required measurement.

4. The question was also raised in this section on grounding the guard in the UST mode. This section will remain unchanged (The need for a ground is explained in the section.

5. Bill Boettger – Pointed out typographical errors in test #2 on Table #4.

6. Section 1.4- Bob Hartgrove expressed concern that only four tests (Table 1) are sufficient. Joe Foldi recommended testing in bridging positions where applicable. The group decided that the 4 LTC-positions tests are sufficient. Tom Harbaugh recommended using ma ximum and minimum taps in place of 16R and 16L. A note will be added to explain why these 4 positions are sufficient.

7. Comments on the section on "Operational tests of Load Tap Changers" will be implemented and will be sent to the WG members for survey in the next 2 weeks.

8. A proposal to revise the Zero Sequence Test was discussed. There was enough controversy on this item that the chairman will be discussing it with a few members of the WG before making a final recommendation.

9. A proposal to modify two clauses in the S.C. section of the Standard were discussed; one to change the wording of " Close enough to voltage zero" to a specific value such as 15 degrees (as in IEC), and the other to change the 2% maximum change in Impedance of the transformer after the S.C. test to 1% in Category 4 transformers (as in IEC). Pierre Riffon will submit the modified text to be included in the next review by the WG members

7.2.5.2 PCS WG for Continuous Revision to C57.12.00 - Steve Snyder, Chairman; Dennis Marlow, Secretary

The Working Group met on Monday, March 8 at 1:45 PM. There were 28 members and 49 guests in attendance. The following 3 guests requested membership, and are welcomed into the Working Group, bringing the total membership to 66 members:

Craig Stiegemeier	ABB Inc., St. Louis, MO
Miguel Oliva	ABB Inc., Cordoba, Spain
Peter Zhao	Hydro One, Toronto, Canada

Following introductions, the minutes from the October 6, 2003 Pittsburgh meeting were approved as submitted.

Subhash Tuli reported that the latest draft of standard C57.12.00 would be re-circulated using the existing balloting pool, probably by mid-April 2004.

The Working Group then began discussing the topics of old business, as follows:

WG Item 50, C57.12.00, Section 7.1.5.3: System characteristics for short-circuit calculations. A comment received from the draft 3 ballot of C57.12.00 – 2000 stated that the default value of X0/X1 = 2.0 as given in the standard, is too high. The user suggested a value between 0.60 and 0.40.

This proposal was initially discussed at the autumn 2003 meeting of the Working Group, but it was determined that more data needed to be collected from other users to make a more informed decision. As a result, the PCS committee and this WG were surveyed for more data on system values of X0/X1. Nine (9) utilities responded, and their responses were reported at the meeting. This data showed much diversity, with values ranging

from 0.2 to 5.0, depending largely upon the location on the power system. Comments from several manufacturers indicated that changing this ratio would have very little effect upon the design of most transformers. After much discussion, the WG voted 15 – 0 in favor of changing the standard to a lower number. After more discussion, the value 1.0 was proposed and voted on, with those present accepting this value by a vote of 32 – 0.

WG Item 52, C57.12.00, Section 9.2: Tolerances for Impedance.

A comment received from the draft 3 ballot of C57.12.00 – 2000 stated that the user felt the impedance tolerances given in the standard were not clear, and that the tolerances were too great. The suggestion was to halve the present tolerances and to add a tolerance on different tap positions.

This topic was initially discussed at the autumn 2003 meeting. The PCS committee and this WG had been surveyed on this proposal in July 2003, and the results of this survey provided the basis for the discussions. The survey had shown a definite split, with users in favor of reduced tolerances, and manufacturers wishing to not make a change. Some of the comments from the floor pointed out that for large substation and GSU transformers, it is clearly more critical for closely matched impedances than for distribution units. Also, designs with rectangular core/coil construction with high bus reactance are more difficult to accurately predict the impedance.

After much debate, a vote was taken to determine if there was sufficient interest to support a change to the standard. By a count of 47 – 2, those present voted to **not** change the standard.

WG Item 53, C57.12.00 Table 19 and Sections 8.2 and 8.3.2.2: Routine, design, and other tests for liquid-immersed transformers.

Comments received from drafts 3 & 4 ballots of C57.12.00-2000 requested that the zero-sequence impedance test be made a routine test for transformers 501 kva and larger with wye connected high-voltage and low-voltage grounded neutrals, and that these results be listed on the test report.

The discussion on this topic revealed that a better definition on the scope of the proposed change is necessary. Adopting the changes as proposed would affect a lot of products where the test is not needed or would be meaningless. A quick vote of the attendees showed that 25 were in favor of leaving it classified as an “Other” test, 15 as a “Design” test, and 8 as a “Routine” test. Using e-mail, the chairman will work with the WG members to better define the scope of this proposal, for additional action at the next meeting.

WG Item 54, C57.12.00 Table 19 and Section 8.2: Routine, design, and other tests for liquid-immersed transformers.

A request was received to add test requirements for buried tertiary windings, specifically an insulation resistance (Megger) test at 2.5 kV (DC) for 1 minute, and winding DC resistance measurement.

This request was introduced to the working group at this meeting, but time did not permit much discussion. The topic will be discussed at the next WG meeting.

7.2.5.3 Loss Tolerance and Measurement, WG - Ed teNyenhuis, Chairman; Andy Steineman, Secretary

- 16 members and 15 guests attended, with 2 guests requesting membership.
- Minutes from the Pittsburgh meeting, Oct 7, 2003, were read and approved.
- Because of the serious illness of Eddy So, the TF meeting for "Guide of Low Power Factor Power Measurements" was canceled and thus there was no report. Eddy So will be contacted to discuss his future involvement.
- Frequency Conversion Factors of Transformer Performance Parameters
  - Revised wording in C57.12.90 Section 9.4.3 (Impedance voltage) – The WG agreed and discussed the following:
    - It was shown that the impedance voltage is nearly proportional to frequency. The error of using a frequency ratio can be 0.5% for small transformers (< 50MVA) but the error is negligible for large transformers. WG discussed if this would be valid for distribution transformers where the x/r ratio is lower, however since the wording has the word "nearly" this was acceptable to WG.
    - The WG agreed to check the availability of x/r ratios for distribution transformers for the next meeting.
    - The proposed wording was approved by the WG.
  - Revised wording in C57.12.90 Section 12.4.7 - Short Circuit Test – The WG agreed and discussed the following:
    - The voltage applied would be nearly the ratio of the frequency (as per the discussion on impedance voltage)
    - The WG agreed that the correct symmetrical and asymmetrical currents calculated for rated frequency should be applied
    - The WG discussed if the duration of the first asymmetrical peak would be a valid test for either 50 or 60Hz. Since IEC accepts either frequency (see IEC 60076-5 Section 4.2.5.3) the WG agreed that it is a sufficiently valid test. It was also noted that most of the few short circuit test facilities have both frequencies available.
    - Change the word "should" to "would" in the last sentence
    - The WG agreed on the proposed wording with the above change.
  - Revised wording in C57.12.90 Section 11.7 - Temperature Rise Test – The WG agreed to the following:
    - The stray loss must be removed from the winding rise test calculations. This will be revised for the next meeting.
    - It was shown that the injected current must be increased by a few percent to account for the reduced eddy and or stray loss. Revised equations will be shown for the next meeting.
    - It was agreed that there is no correction required for the measured oil or winding rise if the correct rated frequency losses are applied.
    - A comment should be added to the wording that direct hot spot temperature measurements would not be valid since the eddy loss will be not be correct.
    - It was agreed that measured tank rises would be off by a few degrees C and wording should be added on this.
    - Revise in the first paragraph "and stray loss" to "and or stray loss".
    - Revise the current equation as per above comments.
    - Remove the 4th paragraph (on winding rise) and remove the temperature correction equation.

- Revise the 3rd paragraph "measured oil rise" to "measured oil & winding rise"
- Revise the 2nd last paragraph to "The measured tank temperature rises could be in error by a few degrees C since the stray losses will not be correct"
- Revise the last paragraph to "Temperature rise tests at 60Hz instead of 50Hz could be done in a similar manner as done above.

- New Business – The WG discussed:
  - Load noise could be an issue for sound level frequency conversion. Since it is not defined yet in ANSI standards, it was agreed to leave this item to a later time.
  - It was noted that the sound level only applies to no load noise at present. It was agreed by the WG to investigate how FA sound level should be corrected for frequency for the next meeting.
  - It was discussed if the load loss should be corrected if not exactly rated current is applied. Many WG members thought there was a correction for this in 12.90, but it will be investigated for the next meeting.

7.2.5.4 WG on Switching Transients Induced by Transformer / Breaker Interaction, PC57.142,WG - Robert Degeneff, Chairman; Peter Balma, Secretary

The Working Group on Switching Transients Induced by Transformer/Breaker Interaction was called to order at 8:02 AM on March 9, 2004. There were 57 attendees, 24 members, 2 requesting membership, and 31 guests. The agenda for the meeting was reviewed, and the Minutes from the October 7, 2003, meeting in Pittsburgh, PA were approved.

1. Status: Draft 1.6 has been distributed electronically and has been reviewed by IEEE Editorial Staff. They had the following comments: The header need updated, the copyright date needs to be 2004, revised the "use at your own risk" clause, and requested that figures be redrawn before official balloting

2. Several paragraphs on FRA were added, along with definitions, and a second example.

3. The only remaining issues are any information the Switchgear Committee would like to provide and revision of drawings.

4. The current draft was sent to PCS and this WG for comments. The intention is to then initiate a formal ballot prior to the Fall meeting.

5. Continued coordination with the SWGR Committee is encouraged.

6. A discussion on the level of detail required for modeling transformers indicated that simple or single capacitance models accuracy would be limited to a narrow range of frequencies. It was suggested that a simple terminal model could be utilized to determine if there was a concern, and then, if so the transformer could be studied in detail. It was acknowledged that transformer models become very complicated, particularly at very high frequencies as turn-to-turn capacitances have to be considered. Moreover, one must consider that for small transformers it may make sense to install a snubber versus the effort to study it in detail.

7. There was no new or old business.

7.2.5.5 Revision of C57.21- Standard Requirements, Terminology, and Test Code for Shunt Reactors over 500 KVA, WG – Richard Dudley, Chairman

The W.G. met in the Macaw Room of the Catamaran Resort Hotel from 11:00 a.m. to 12:15 p.m. There were 11 members and 7 guests present. One of the guests, Carlo Arpino, requested membership. The following are the highlights of the meeting:

1. The Chairman informed those present that the Re-circulation Ballot re the Reaffirmation of C57.21 was successful. All pertinent documentation was submitted to the IEEE Standards Board by Peter Balma.

2. The Chairman informed attendees that Anne Bosma of the IEEE Switchgear Committee has reviewed the annex on dielectric stresses imposed on shunt reactors during switching and approved Draft #4 (as written). Therefore, the two proposed annexes are now in good shape; switching stresses and TCRs.

3. Pierre Riffon's proposal to combine the current Tables 5A and 5B into a single Table 5 was reviewed. Pierre's latest revision was the basis for discussions. Note the Chairman will send Pierre's latest revision to Table 5 with the minutes and a presentation by Pierre re the rationale behind his revision. The following are the highlights:

   (i) The combined Table 5 covers "Y" connected shunt reactors only. A discussion took place regarding Delta-connected shunt reactors. If shunt reactors are Delta-connected, they are usually tertiary connected units; 13.8kV, 34.5 kV and 69 kV. Pierre Riffon mentioned that a T.F. chaired by Phil Hopkinson is looking at dielectric test level implications for Delta-connected transformers; C57.12.00. A second table covering test levels for Delta-connected shunt reactors will have to be developed for C57.21 based on the preceding considerations.

   (ii) In developing the combined Table 5 revision, harmonization with IEC was considered. One BIL value is provided per maximum system voltage. Note that the maximum system voltage is used vs. rated voltage. The highest BIL for the maximum system voltage is used in Table 5 due to the switching duty seen by shunt reactors.

   (iii) The chopped wave crest test value is 10% higher than BIL.

   (iv) Front-of-wave test voltage levels have been deleted since front-of-wave tests are not, in practice, carried out. Attendees agreed with this proposed change. It was noted that the test code will have to be revised accordingly; Clause 10.3.5.5 will have to be eliminated.

   (v) Switching impulse test level is 0.83 x BIL.

   (vi) The low frequency overvoltage test and test levels were discussed at length. Pierre's proposal was an attempt to harmonize with the latest revision process now in progress for the IEC reactor standard. A low frequency short duration test (7,200 cycles) is proposed for maximum system voltages up to 121 kV. An enhancement of 1.7 pu for 7,200 cycles followed by a one-hour test at 1.5 pu is proposed for up to 555 kV maximum system

voltage. For 800 kV a one-hour test at 1.7 pu is proposed. The main issue re Pierre's proposal was the impact on manufacturers test capability. Manufacturers will review the impact and report back to the W.G. Pierre Riffon will continue to coordinate with Christoff Ploctner (IEC W.G. Chairman), especially re enhancement levels.

(vii) The Turn-to-Turn test is now applicable to both dry type and oil immersed shunt reactors. Note that the rise time to the first peak of the applied decaying sinusoidal overvoltage is of the same order as the front time of an impulse.

(viii) Differences re test code for dry type and oil immersed shunt reactors should be covered in the notes to Table 5.

4. Table 4A (oil immersed shunt reactors) should include as "OTHER" test a determination of magnetic characteristics; linearity. The current Clause 10.9 covering the test code is inadequate and must be rewritten; a procedure based on that in the HVDC smoothing reactor standard will be developed. Pierre Riffon will produce a draft.

5. Table 3, which covers temperature rise limits, was discussed. The issue was whether temperature rise limits for oil immersed shunt reactors should be changed or better defined. Current temperature rise limits are based on continuous operation at 5% above rated voltage. Should limits be based on continuous operation at maximum system voltage? This is the basis for Pierre Riffon's proposed modification for Table 5. A consistent approach must be used in this version of C57.21.

6. In order to harmonize with IEC continuous operation at maximum system voltage should be the basis used throughout C57.21. The next draft of a revision of C57.21 should reflect this.

7. The Chairman requested feedback from all W.G. members even if it is only to confirm satisfaction with current drafts.

The Chairman will prepare Draft #2 based on the preceding discussions and actions. It will then be circulated to all members. The meeting adjourned at 12:15 p.m.

7.2.5.6 Semi-Conductor Rectifier Transformers, C57.18.10, WG – Sheldon Kennedy, Chairman

- C57.18.10 was reaffirmed after the last meeting. Negative votes were resolved by agreeing to make a revision to the standard and consider the negative comments. At the meeting in Pittsburgh, it was decided that a task force should be formed to consider the comments received during the reaffirmation.

- There were several comments pointing out errors, missing references, and undefined terms. These need immediate attention.

- The Task Force decided to have a corrigenda revision of C57.18.10 to correct the errors and missing or undefined terms. This should be accomplished rather quickly and make the standard more accurate. The other more substantial comments will be

considered in a revision to follow the corrigenda revision, but before the next five-year period of the life of the standard. The Chair will prepare a PAR for a corrigenda revision and submit it to IEEE.

7.2.5.7 Neutral Grounding Devices, PC57.32, WG – Steve Schappell, Chairman

The WG met with 6 members and 14 guests. Draft 1 was handed out. Initial discussion centered on the Definitions section. It was agreed that the standard placement is in the main body, not at annex. Also, should all definitions be covered or only the ones not covered elsewhere in IEEE. Peter Balma will investigate.

An electronic version of the Draft will be posted on the website.

Devki Sharma will work on the Introduction section. Lars Erik Juhlin asked if application information should be listed for NGDs. Devki Sharma will check C62.

Richard Dudley discussed the test section. It was decided to list the test requirements for each device in their section. Richard will contact Christoph Plotner to get info on Peterson coils from the IEC Standard.

Oil immersed reactors were discussed and since they are rare, a reference to C57.21 will be made.

Lars Erik volunteered to revise the Ratings section.

The Chairman will request a copy of C62.22 from Tom Prevost to help the WG. The Chairman and Emilio Morales volunteered to revise the Groundung section. Peter Balma will review sections 6 & 7: Basis for rating insulation classes and dielectric levels.

Fred Elliot asked the WG to verify that the comments from previous WG members were addressed in the new draft. The Chairman will do this.

7.2.5.8 Frequency Response Test Standard/Guide, TF – Rowland James, Chairman; Charles Sweetser, Secretary

The PCS task force met for the development of a guide for Frequency Response Analysis (FRA) in San Diego, California on March 9, 2004 at 3:15 P.M. There were 39 persons in attendance, 21 members and 18 guests of which 3 guests requested membership.

Rowland James made a brief report on the development of the draft and thanked the contributors for the efforts put forth in the development of the guide. He also announced that a PAR will be submitted for approval.

The minutes from the Pittsburgh meeting were presented and approved without comment.

Charles Sweetser reported that he received contributions for all six sections. The contributions were appended as submitted. Each section was then discussed.

- **Section 1:Scope and Application** – Progress has been made on this section. A definition section was added, however definitions are needed. Further input of expanded use and application is also needed. It was recommended to add verbage regarding baseline, sister units, and phase comparisons in section 1.1. Subhash Tuli will review this section for technical content.

- **Section 2: Test Parameters** – Ernst Hanique discussed test leads and emphasized that test lead lengths must not differ more that one centimeter. Fred Elliot and Sokom An reported in absentia that greater repeatability is possible when testing the high voltage because test leads are fully extended. Careful attention should be given to placement of the leads performing measurements on shorter bushings. Richard Breytenbach commented on the use of either magnitude or phase measurements. He stated that they are directly related to one another and therefore there should be no difference in the results. Sokom An will be asked to provide additional review to this section.

- **Section 3: Measurement Parameters (test plan)** - A section on safety is included in this section. Diagrams have been added to illustrate various test setups. Charles Sweetser discussed types of test; namely, open circuit, short circuit, inter-winding tests, and displayed typical test curves. He asked the TF if we should establish a convention. This section will be further reviewed by Richard Breytenbach.

- **Section 4: Test Records** – Open data formats and nameplate data requirements were discussed. This section requires further development to determine what will be the recommended format and required fields. Bertrand Poulin and Barry Ward will address this section.

- **Section 5: Analysis and Interpretation** – Three perspectives were submitted regarding interpretation (Sweep, Impulse, and Objective Winding Asymmetry). The group expressed that we need to document what we already know. Richard Breytenbach made a brief presentation on FRA interpretation and explained the significance of the lower frequency range (core displacement) and the mid range, 50-200 kHz (bulk winding movements). Larry Coffeen gave a presentation on NEETRAC's technology that will produce a predictive maintenance system that is designed to detect loose coils. Richard Breytenbach, Larry Coffeen, and Charles Sweetser will work on this section.

- **Section 6**: **Appendix I –** Bob Degeneff will continue to develop this section.

Charles Sweetser announced that the Task Force will establish a relationship with CIGRE regarding FRA testing

7.2.5.9 Core Over-excitation TF – Craig Steigemeier, Chairman

The meeting took place at 8:00 am on March 8th, 2004. There were 79 Guests in attendance, 55 of them requested membership.

This was the first meeting of the Core Over-excitation Task Force. This Task Force is charged with the identification of limits for core over-excitation and coming up with suggestions for modification of appropriate standards.

Background information based on the 2nd panel presentation made at the Fall 2003 Pittsburgh meeting was presented. This Panel Discussion, titled "Power Systems Over-voltage Requirements and Their Impact on Transformer Design", initiated the focus on the general topic of over excitation of the transformer core. Panel members included Donald Chu, Ramsis Girgis, Harold Moore, Bipin Patel, and Gustav Preininger.

A written suggestion was received from Harold Moore (not in attendance) for specific items to add to the standards and to include in a tutorial. General consensus was reached to improve/enhance the over-voltage definition in standards and to create an educational tool to enhance the general understanding of over voltages and their impact on the transformer. The expected affected standards are C57.12.00 (IEEE Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers), Section 4.1.6 (Operation above rated voltage or below rated frequency) and C57.104-1991 (IEEE Guide for the Interpretation of Gases Generated in Oil-Immersed Transformers).

A discussion was held to review the key factors that should be incorporated in standards and/or in a tutorial. These factors include the need for IEC standard coordination, covering various loading scenarios (step-up, step-down, generator startup, etc.), the need for a general curve of capability versus power factor, coordination with unit connected generator standard, and sound level.

Volunteers were requested for a small group of the task force that would create a proposal for standard enhancement and an educational guide or tutorial before the fall meeting. The volunteer group assembled included 3 manufacturers and 10 utility/consultant organizations. The task Force Working Volunteers included:

Peter Balma, PSE&G
Stephen Beckman, Fort Pierce
Donald Chu - ConEd
Ramsis Girgis - ABB
Peter Heinzig - Siemens
Harold Moore - Consultant
Rowland James - Entergy
Miguel Oliva - ABB
Bipin Patel – Southern Comp
Gustav Preininger - Consultant
Ed teNyenhuis - ABB
Bob Tillman – Alabama Power
Subhash Tuli – Waukesha
Loren Wagenaar – AEP
Dieter Wagner – Hydro One
Peter Zhao – Hydro One

E-mail and/or web meetings will be used to trade information before the fall meeting so that a proposal for a standards modification or enhancement and an instructional guide may be reviewed at the fall meeting.

7.2.6 Project Reports

7.2.6.1 Status of C57.133 - Guide for Short Circuit Testing - Nigel McQuin, Chairman

IEEE removed the PAR of this Guide and therefore the document has been withdrawn. Niguel was absent from this meeting. The Performance characteristics and Standards SCs will work with IEEE to resolve the outstanding issue of the clarity of the figures in the document.

7.2.6.2 Status of Revision of C57.110-1998 - IEEE Recommended Practice for Establishing Transformer Capability When Supplying Nonsinusoidal Load Currents – Rick Marek, Chairman

Reaffirmation of the document is to be finalized by end of 2004. Rick will form a TF at the fall meeting to resolve some of the issues raised earlier.

7.2.6.3 Panel Discussion "Zero Sequence Impedance" – Ramsis Girgis Chairman

Mr. Gerry Rosselli of San Diego Gas & Electric gave this tutorial. A large group of over 50 individulas attended the tutorial. Gerry presented his proposed test, which he personally developed recently. As reported by Gerry, there is not a test available in the industry Standards today to measure the Z0 impedance of transformers with interconnected windings. The method is based on performing three 3-phase tests and using a simple formula to calculate the Z0 impedance of the transformer. The method can also be used for any transformer. Gerry presented comparison data to confirm the accuracy of the new method.

Subsequent to the tutorial, a group of 3 members of the C57.12.90 WG and Gerry was formed and will be developing text for this and alternate tests for discussion at the next WG meeting in the fall. Bruce Forsyth was nominated to chair this group. The presentation will be posted on the transformer committee website next week.

7.2.7 Old Business

None

7.2.8 New Business

None

Attendance at this San Diego Meeting

MEMBERS

1. Dennis Allan
2. Stephen Antosz
3. Javier Arteaga
4. Donald Ayers
5. Peter Balma
6. Ronald L. Barker
7. Barry L. Beaster
8. Steve Beckman
9. Enrique Betancort
10. Wallace Binder
11. William Boettger
12. Jeffrey Britton
13. Carl Bush
14. Donald Cash
15. Mark Cheatham
16. Bill Chiu
17. Donald Chu
18. Craig Colopy
19. Florian Costa
20. John C. Crouse
21. Alan W. Darwin
22. Ron Daubert
23. Robert Degeneff
24. Charlie Drexler
25. Richard F. Dudley
26. Klaus Eckholz
27. Fred E. Elliott
28. Donald J. Fallon
29. Reto Fausch
30. Joe Foldi
31. Jim Fyvie
32. Bob Ganser
33. Andreas Garnitschnig
34. Harry Gianakoros
35. Ramsis Girgis
36. Myron Gruber
37. Robert Grunert
38. Ernst Hanique
39. Bob Hartgrove
40. Roger Hayes
41. Peter Heinzig
42. Thang Hochanh
43. Philip Hopkinson
44. Tim Huff
45. Rowland James
46. Marion Jaroszewski
47. Virenda Jhonsa
48. Sheldon Kennedy
49. Vladimir Khalin
50. John Lackey
51. Boyd Leuenberger
52. Tom Lundquist
53. Richard Marek
54. Dennis Marlow
55. John Matthews
56. Paulette A. Payne
57. Bertrand Poulin
58. Gustav Preininger
59. Mark Rivers
60. Steven Schappel
61. Ewald Schweiger
62. Devki Sharma
63. H. Jin Sim
64. Steve Snyder
65. Andy Speegle
66. Andy Steineman
67. Craig Steigemeier
68. Raman Subramanian
69. Charles Sweetser
70. Robert Thompson
71. Bob Tillman
72. Subhash Tuli
73. Loren Wagenaar
74. Albert Walls
75. Waldemar Ziomek

GUESTS

1. Pritpal Singh
2. Miguel Oliva *
3. Jurgen Gerth
4. otto von Staden
5. Peter Zhao *
6. Eberhard Lemke
7. Hasse Nordman
8. Krzystof Kulasek
9. Ramon Garcia
10. Bo Blackmon
11. Steve Holsomback
12. Ken McKinney
13. Jim Wiseman
14. Dieter Wagner *
15. C.J. Kalra
16. Pierre Riffon
17. Bruce Fairris
18. Dan de la Cruz
19. Kipp Yule
20. Tony Weeks
21. Jane Verner
22. Jerry Allen
23. E Toni Jauch
24. Emilio Morales
25. Chris Baumgartner
26. Don Russell
27. Clark Jacobson
28. Jeff Schneider
29. Marcel Fortin
30. Al Traut
31. Dilip Shah
32. Sue McNelly *
33. Frank Chmiel

* Guests requesting Membership.