

7.6 POWER TRANSFORMERS – TOM LUNDQUIST, CHAIRMAN

The Power Transformers Subcommittee met on Wednesday, November 2nd, 2011 at 1:30 p.m. with attendance of 161; comprised of 69 members and 92 guests.

The minutes from the Spring 2011 meeting in San Diego, California were approved with no changes.

7.6.1 WORKING GROUP AND TASK FORCE REPORTS

7.6.1.1 WORKING GROUP FOR REVISION OF C57.17, REQUIREMENTS FOR ARC FURNACE TRANSFORMERS – Robert Ganser, Chairman

No meeting was held. The document is complete and a ballot pool was formed. The copyright was released from ANSI. The standard should go out for ballot within days.

7.6.1.2 WORKING GROUP FOR REVISION OF PC57.116, GUIDE FOR TRANSFORMERS DIRECTLY CONNECTED TO GENERATORS – Gary Hoffman, Chairman

1. Introductions

Meeting started at 3:15. The WG Chair, Vice Chair and Secretary were introduced. Initial members are: Gary Hoffman, Bill Griesacker, Randall Kyle, and Bipin Patel as a corresponding member.

2. Roster & Membership

Since this was the first WG meeting initial rosters were passed out. There were a total of 42 in attendance with 16 requesting membership.

3. History

C57.116 was published in 1989 and reaffirmed in 1994. Transformers Committee decided to revise not reaffirm the current document. A PAR was submitted for consideration at the September 2011 NesCom meeting and approved by SASB at the same meeting.

4. Review of WG Scope, Purpose & Project Timeline

Comments from the Reaffirmation ballot were reviewed by the Chair, Vice Chair and Secretary and incorporated as applicable into Draft D1.0. Comments irresolvable were brought to this WG meeting for discussion and action.

Wind power transformers will not be included.

Proposed timetable:

- Review next draft Spring 2012 and form additional task force as necessary
- Review task force work in Fall 2012
- Target to complete draft by Spring 2013 in preparation to ballot
- Additional meetings may be required as necessary, but ready for ballot not later than Fall 2014 meeting

PAR expires December 31, 2015

5. Introduction to Draft D1.0. Hard copies distributed to all in attendance as Electronic Version was not available prior to meeting but will be posted on the TC website shortly.
6. Discussion Topics from Reaffirmation Ballot
 - a. Task Force formed to Clause 10 with respect to:
 - i. Tank heating limits
 - ii. Discussion of tank circulating current problems
 - iii. The coordination of bushing ratings with the bus duct and transformer temperatures
 - iv. The need for special bushings and or gaskets
 - v. Guidance for replacement transformers being used with existing old bus duct.

Randall Kyle will Chair this task force. Volunteers include: Joe Watson, Dave Wallach, John Lackey, and Rod Sauls
 - b. Task Force formed to review Clause 8 with respect to fault contributions including comment from the Reaffirmation Ballot and others made during this WG meeting.

Bill Griesacker will Chair this task force. Volunteers include: Peter Balma Jose Izquierdo, Elimo Morales
 - c. Task Force to review the Normative References to determine if these are all relevant based on the current standards available.

Gary Hoffman will Chair this task force. Volunteers include: Joe Watson and Steve Schroeder

7. New Issues

- a. Attendees were recommended to review Draft D1.0 and forward to the Chair any comments.
- b. A suggestion by Bipin Patel to computer generate all plots. Request attendees to review and give opinion to the Chair concerning the necessity to do so.
- c. Are all terms and references given in plots defined in the guide suggested by Wally Binder. The Chair asks the attendees to review and comment to the Chair. A copy of C50.13 was requested for use by WG members looking into this.
- d. Kipp Yule questioned if transformers such as excitation transformers are adequately covered in the guide. The Chair requests Kipp to investigate and report back.
- e. There were several additional issues raised and the Chair requested the attendees to review the draft and come back with any comments for consideration by the WG.

8. Motion to Adjourn was tendered, seconded and agreed at 4:15 PM

7.6.1.3 WORKING GROUP FOR REVISION OF PC57.125, GUIDE FOR FAILURE INVESTIGATION, DOCUMENTATION, ANALYSIS AND REPORTING FOR POWER TRANSFORMERS AND SHUNT REACTORS – Wally Binder, Chairman

Quorum was established - 18 working group members were present.

2. Patent Disclosure Announcement – The Patent Disclosure Presentation was made by the Chair. No patent disclosures were made.
3. Minutes were approved for the Spring 2011 meeting
4. Chairman's Remarks – (Wallace Binder) Chairman discussed the lessons learned from the Switchgear Committee, Working Group C37.10, Guide for Investigation, Analysis and Reporting of Power Circuit Breaker Failures.
5. Review of Work Plan
 - a. Outstanding Ballot Comments TF - Larry Dix reported most of the ballot comments were agreed to by the TF. Balloters have been contacted to discuss comments that required additional discussion.
 - b. New Work TF – The purpose and intent of this task force was discussed. Additional volunteers are being sought.
 - c. C57.117 Merging TF – Current status of the 117 work was discussed. TF members have reviewed and commented on potential 117 clauses for

- deletion or merger into 125. Future work to included formal recommendations for each 117 clause to the complete working group for approval.
- d. WG Chair discussed current structure, layout, and flow of existing document. Chair asked for ideas and comments to be submitted.
 - e. Chair made request for drafting support and photos for inclusion into C57.125 document. Larry Dix volunteered drafting support. Several photo offers were made and these offers will be followed up on by the Secretary of the WG.
 - f. Proof reading and actions to eliminate duplication between 125 and 117 will be addressed at a later meeting.
 - g. Chair requested all WG members review Bibliography and Reference Clauses for errors, omissions and duplication. Results will be discussed at the Spring 2012 meeting.
- 6. Discussed earlier conversations between the C57.125 and the C57.152 WG leadership members. This conversation was meant to minimize overlap between these two documents.
 - 7. It was reported CIGRE was starting a working group similar to the C57.125 working group at this time. A CIGRE working group number has not been assigned at this time.
 - 8. Meeting was adjourned.

7.6.1.4 WORKING GROUP FOR DEVELOPMENT OF PC57.131, STANDARD REQUIREMENTS FOR TAP CHANGERS - William Henning, Chairman

The Working Group on Tap Changer Performance met on Monday, October 31, 2011 at 1:45 pm with 9 members and 26 guests present. Introductions were made, and the minutes were approved.

The chairman gave a report on Recirculation 3, Draft 1.8. As of November 2, the status was:

97 Affirmative Votes

1 Negative Vote

3 Abstentions

98% Affirmative

The recirculation closes on November 7.

Previous drafts have produced negative votes because of the warning label to be affixed to de-energized tap changers, warning not to operate the tap changer while the transformer is energized or under load. Some discussion of the warning label took place at the meeting. Jim Harlow proposed a longer version of the warning message that not only says what not to do but includes the consequences of improper action and a statement of proper action. It also came up that, perhaps, we should not use the word *warning* and not show the message as a figure. It was acknowledged that the subject

requires more study. It was the consensus of those present that the Draft 1.8 submittal to RevCom should not be delayed for this study.

7.6.1.5 WORKING GROUP FOR REVISION OF C57.135, GUIDE FOR THE APPLICATION, SPECIFICATION AND TESTING OF PHASE-SHIFTING TRANSFORMERS – Jin Sim, Chairman

No meeting was held. The guide was published this year. This document was adopted by IEC and the revision was accepted as well. A motion was offered to submit a PAR to create a phase shifting transformer standard, leaving this guide “as-is”. This would be a joint project between IEEE and IEC. It was voted to form the working group to develop a phase shifting standard.

7.6.1.6 WORKING GROUP FOR THE REVISION OF PC57.140, GUIDE FOR EVALUATION AND RECONDITIONING OF LIQUID-IMMERSED POWER TRANSFORMERS – Roland James, Chairman

No minutes received.

7.6.1.7 WORKING GROUP FOR DEVELOPMENT OF PC57.143, GUIDE FOR APPLICATION OF MONITORING TO LIQUID IMMERSED TRANSFORMERS AND COMPONENTS – Donald Chu and Andre Lux, Co-Chairmen

No meeting held.

7.6.1.8 WORKING GROUP FOR DEVELOPMENT OF PC57.148, STANDARD FOR CONTROL CABINETS FOR TRANSFORMERS – Joe Watson, Chairman

No meeting held.

7.6.1.9 WORKING GROUP FOR DEVELOPMENT OF PC57.150, GUIDE FOR THE TRANSPORTATION OF TRANSFORMERS AND REACTORS RATED 10,000 KVA OR LARGER –Greg Anderson, Chairman

There were 13 of 38 members present with 45 guests. A quorum was not achieved. New membership requests will not be entertained as the Guide has already gone out for ballot.

Agenda:

1. Introductions/Member Roll Call

2. Approval of Spring 2010, Houston, Texas Minutes
3. Ballot Status and steps ahead
4. Review of Contributor List
5. Adjourn

Approval of minutes from the Spring 2010, Houston, Texas meeting could not be done due to a lack of quorum.

Greg Anderson gave a short explanation to new people present what the purpose of the guide is and where we are with the document. The document was sent out for ballot September 23 and closed October 23. There were 111 balloters. There were 102 votes received (91%). There were 86 affirmative votes (94%) and 5 negative ballots with comments. There were 11 abstention votes (10%); 2 of these for conflict of interest, 6 for lack of experience and 3 for lack of time.

	Affirmative	Negative	Abstain
General Interest	26	2	5
Gov/Military	1	0	0
Producer	16	1	0
User	43	2	6
Total	86	5	11

Greg indicated that approximately 80% of the comments are editorial and will be corrected. Members were asked to volunteer to serve on a Ballot Resolution Group to resolve the remaining technical comments received from the ballot. The following members volunteered to help with this effort: Dave Wallach, Joe Watson, Martin Heathcote, Bill Darovny, and Bruce Fairris along with Greg Anderson, Ewald Schweiger, and Susan McNelly.

Joe Watson asked about the status of the PAR. The PAR was set to expire at the end of 2011. A request to extend the PAR for one additional year was submitted.

Some of the comments received were regarding field testing. Some tests are considered transportation related testing such as dew point, core ground, and SFRA tests. Field acceptance testing does not belong in the transportation guide. Greg proposed a demarcation point for going from the transportation guide to the installation guide would be at the point the transformer is offloaded onto the foundation. There is also a demarcation point for insurance when the unit is passed from one carrier to another or on delivery.

A comment was made by Fred Elliott that it would be appropriate to at least include a list of the field testing normally done as part of an acceptance process with reference to the installation guide for more details.

Joe Foldi commented that he thinks this is a very important document. However, he indicated that at a minimum some limits or suggested g-force values should be provided for truck, rail, and ocean g-force impact shipments. Greg indicated that we cannot provide discrete limits since this is a guide, not a standard but that we want to educate people on this issue.

A comment was made that Cigre is also working on a transportation guide. Greg indicated that he would like to work with them on future revisions to share ideas and possibly exchange information.

Meeting was adjourned at 8:55am.

7.6.1.10 WORKING GROUP FOR DEVELOPMENT OF PC57.153, GUIDE FOR PARALLELING TRANSFOREMRS – Tom Jauch, Chairman

45 total attendees

17 of 21 members were present

28 guests (10 new)

7 members requesting membership had attended the last two meetings and were added as members

1 member requesting membership was attending his first meeting and was added as guest

- Introductions
- Minutes were reviewed and approved
- Draft of the guide was sent out for comment on 9/1/2011. Comments received prior to 10/27/2011 were included in the draft sent out prior to the meeting.
- A proposal for a new section 7 was presented by Jim Harlow
 - Following this Tom Jauch provided feedback facilitated a discussion on the pros and cons of the proposal
 - Decision was made to send out the new proposed section 7 for review and comment to allow members more time to review the proposed changes
- Requested assistance from members to work on the definitions in the guide
 - Gary Hoffman and Daniel Sauer volunteered
- Reviewed proposed revisions to section 4.1. Members were asked to vote on whether to accept or reject proposed changes.
- Meeting was adjourned at 4:30pm

7.6.1.11 WORKING GROUP FOR DEVELOPMENT OF PC57.156, GUIDE FOR TRANSFORMER TANK RUPTURE MITIGATION OF LIQUID-IMMERSED POWER TRANSFORMERS AND REACTORS— Peter Zhao, Chairman

The first official meeting of the Working Group for the Guide for Tank Rupture Mitigation convened Monday morning at 11:00am. Chairman Peter Zhao presided.

Attendees were reminded that they had each answered a question regarding patent policy as part of registration, and therefore patent issues will no longer be addressed during the meetings.

Attendance was 62 (16 members, 46 guests, with 12 guests requesting membership).

Chairman Zhao provided introductory remarks and previewed the agenda to be covered for the meeting.

- The PAR for the guide was approved by IEEE shortly after the Spring 2011 meeting. A first draft of the guide has been completed for review. The PAR schedule is for draft completion by 2014. Attendees encouraged to review the draft on line and submit questions and comments to the chair before Spring meeting in Nashville.
- Attendees were informed that the draft of the guide is posted on the IEEE website, and that they should review it and provide questions/issues back to Chairman Zhao before the Spring 2012 meeting, for discussion at that meeting.
- It was also explained that anyone desiring to become members of this new working group should so indicate on rosters, which were being circulated during the meeting.

A very informative presentation of one supplier's design of a modern isolation barrier (fire wall) system was provided.

Martin Heathcoat provided progress of his effort to define available arc-energy levels for Generator Step-Up transformers (Table 4). He has received a discussion of issues/principles involved, but has not yet translated the information into actual numbers for the table.

A discussion of Figure 5 (Dynamic Load Factor) ensued. Izyaslav Polishchuk cautioned that the data from which this figure was generated is preliminary and that we must be careful before publishing it.

The remainder of the meeting consisted of a discussion, item by item, of Section 7.1 "Design Review" with the following significant comments/observations:

- The working group should remember that we will not prevent the internal fault. Our objective is to prevent or mitigate the rupture from the fault.
- There has been much good information generated already. As we move forward we should be careful to not become the basis for court actions against a manufacturer or user for not complying with our guidelines.
- Mark Scarbough stated that he is aware of an effort to classify transformer tanks as pressure vessels – requiring them to be pressure tested. It was suggested

that the limit of consideration for pressure vessels is somewhere above 15 psig capability.

- It was strongly recommended that we provide a section in the guide to address the issue of whether pressure testing is to be required to validate capability to withstand an internal fault.

Meeting was adjourned at 12:15pm.

7.6.1.12 WORKING GROUP FOR DEVELOPMENT OF PC57.157, GUIDE FOR CONDUCTING FUNCTIONAL LIFE TESTS FOR DE-ENERGIZED TAP CHANGER CONTACTS – Phil Hopkinson, Chairman

The Working Group on Life Tests, De-energized Tap Changers was called to order at 8:00 AM on November 1, 2011. This was the first meeting of the WG, which replaced a TF that had been in existence for many years. Membership on the WG are those attending this first meeting and request membership. There were 54 attendees, 25 members, and 29 guests. A quorum was present.

Reviewed the Agenda for the meeting, and the Minutes from the April 12, 2011, meeting in San Diego, California, were approved.

1. A PAR had been submitted. Need to make sure that the title of the document does not conflict with the scope of the PAR. A modification to the PAR may be required. Chair may need authority from the WG to make changes to the PAR to answer possible questions from NESCOM (such as “what is the meaning of infrequent”).
2. Review of Draft 1 of the Guide provided by Larry Dix.

Title of document is

Draft Guide for Conducting Functional Life Tests for De-Energized Tap-changer Contacts

WG proposed modifying title to:

Draft Guide for Conducting Functional Life Tests for Infrequently Operated Switches Used within Liquid Filled Transformers

Motion: Keep title as it is.

Motion was approved 14-3

Reviewed the purpose of the document, and it was acceptable.

Normative references need to be specifically cited in the document. If not specifically cited, then it belongs in the bibliography. It was also recommended

to not cite the date for the normative references if possible. It limits you to that edition of the document, while the latest edition applies if the date is not cited.

Larry Dix to propose a new scope.

WG members may suggest changes. Proposals should be sent to Larry Dix and Phil Hopkinson.

3. New Business

There was no new business.

The meeting adjourned at 9:15 AM.

7.6.1.13 WORKING GROUP FOR REVISION OF IEEE STD 638-1992, IEEE STANDARD FOR QUALIFICATION OF CLASS 1E TRANSFORMERS FOR NUCLEAR POWER GENERATING STATIONS – Craig Swinderman, Chairman

The Working Group for revision of IEEE 638 did not meet during the Boston session in November 2011.

The revision of the document has been completed, and Draft 8 of the document has been submitted for Mandatory Editorial Coordination.

An Invitation Request to form a Ballot Group has been submitted, and the ballot group should be formed within 30 days. Members from Power Engineering Society Transformers Committee and the Nuclear Power Engineering Committee have been invited.

A 1-year PAR Extension request has been submitted to NESCOM for the Standards Board December agenda, in order to allow time to complete the balloting process and address any comments received in order to complete the work for submitting the standard.

7.6.1.14 TASK FORCE FOR DVP-GRID TRANSFORMERS, WHITE PAPER– Hemchandra Shertukde, Chairman

The meeting was convened with 12 members (out of current 23 members - quorum) and 18 guests present. 6 guests requested membership.

The IEEE patent recommendations were addressed; no patents or patent claims were identified in relation to the work of TF.

Old Business

San Diego's meeting minutes were approved.

New business

- The TF Chair reviewed the e-mail from the PT Committee Chairman T. Lundquist:

- after PT SC meeting in Boston, TF will be dissolved
- the work is completed as the assignment is accomplished
- the Chair of PT SC has the request to determine which SC a WG shall be assigned
- Bill Bartley has a copy of the PAR and it's on hold until SC is determined
- Bill Chiu has a copy of the proposed paper for review to determine, if it may be published as a result of the TF work

- B. Chiu commented that he is not completely sure that the questions assigned to the TF were completely and clear answered, specifically – what are the issues that are not addressed in other standards. This initiated a discussion.

- S. Levin reviewed the Conclusion Chapter of the Position paper for the group. He also described the TF poll results, confirming that TF recommended to continue work towards the Guide in the WG format.
- D. Ayers commented that the recommendations on the resolution of the specific technical aspects may have been in other standards, but users may not aware about those aspects at all. Guide would describe the operating conditions and points of attention in one document.
- Jin Sim questioned whether TF concluded their work. He referred to C57.12.00 (unusual service conditions) and commented that he thinks that all specific issues of DPV Grid Transformers can be addressed within existing standards.
- E. Betancourt – different players (transformer and inverter OEM, owners and end users) involved in the process. Practically, there is no much support shown by inverter manufacturers. The specific issues with large inverters may include, inrush current, electrostatic shielding, etc.). Document addressing the typical operational environment can be helpful.
- J. Watson informed PT SC concluded that TF completed the assignment. The decision on the publishing the TF work paper is a different question.
- K. Yule commented that, as a buyer of the systems, he recognized that standard commodity transformer approach may not be appropriate for all cases (wind industry example), but he would not like to see that inverter industry drives the solution that require very sophisticated and expensive transformers.
- S. Schroeder reminded that it maybe better to try addressing the specific constrains of the application on the early stages, then start working on them after problem occurred (again, wind industry examples)

- PAR and WG.

- S. Levin reviewed the PAR document on the User's Guide submitted to PT SC.
- B. Chiu – in order to decide on the next steps in this work, the PAR shall have sponsor.
- H. Shertukde – can new SC of “special transformers” be created?

- B. Chiu had the motion to request TF Chair to submit PAR to the Performance Characteristic SC as a new business. It was seconded and approved with 11 members approved and 1 abstained.

With no new business the TF was disbanded.
Meeting adjourned at 12:00 AM.

7.6.2 OLD BUSINESS

None.

7.6.3 NEW BUSINESS

- a. The task force for DPV-Grid transformers has completed their work and the task force was dissolved.
- b. Mike Lau will be Chair for the WG for revision of C57.93 "IEEE Guide for Installation of Liquid-Immersed Power Transformers" Revision PAR will be applied for after January 1, 2012.

7.6.4 STATUS OF "INACTIVE" GROUPS

WORKING GROUP FOR THE REVISION OF C57.93, INSTALLATION OF LIQUID-FILLED TRANSFORMERS - Michael Lau, Chairman

This group is not meeting; major work on this document is complete; waiting for publishing.

TASK FORCE FOR WIND FARM TRANSFORMERS – Joe Watson, Chairman

Work of this group is complete; the task force is inactive.

TASK FORCE FOR EVALUATING THE NEEDS OF TRANSFORMERS USED WITH SVC – Peter Zhao, Chairman

Fall 2009 - The work of this task force is concluded. A report was issued and it is being considered if an educational paper should be published.

TASK FORCE FOR WIND GENERATOR STEP-UP TRANSFORMERS – David Buckmaster, Chairman

This task force was moved to Performance Characteristics Subcommittee.

WORKING GROUP FOR REVISION OF C57.12.10, STANDARD REQUIREMENTS FOR LIQUID IMMERSSED POWER TRANSFORMERS – Gary Hoffman, Chairman

The standard was published.