

Annex K Power Transformers Subcommittee

March 23, 2016

Atlanta, GA USA

Meeting Time: 1:30 p.m.

Chair: Joe Watson

Vice Chair: Bill Griesacker

Secretary: Kipp Yule

K.1 Meeting Attendance

The Power Transformer s Subcommittee met on Wednesday, March 23, 2016, at 1:30 PM. A call of members indicated that 93 of 112 members were in attendance, achieving a quorum at the meeting. Overall, there were 210 attendees with 93 members and 117 guests. (There were 16 new SC members who requested membership after the meeting, so SC membership is currently 128).

K.2 Approval of previous meeting minutes, and meeting agenda

The Chair presented the Agenda, Attachment K.2, and it was approved.

The Chair requested a motion to approve the Fall 2015 Memphis meeting minutes. The motion was made by Dan Sauer and seconded by Wally Bender, and the minutes were subsequently approved by unanimous vote.

K.3 Chair's Remarks

It was reinforced at the Administration SC that record the name and affiliation of all people attending each WG, TF or SC meetings. While this can be done by entering the full list of attendees in the meeting minutes, the Administrative SC has agreed that this can best be accomplished by recording the attendance of each meeting in the AM system. All working groups are required to enter the individual's attendance in the AM system.

Also, there will be Poster Session at IEEE T&D show this year for anyone that wants to explain and showcase the WG activities.

K.4 Working group reports

K.4.1 Revision of C57.12.10 IEEE Standard Requirements for Liquid-Immersed Power Transformers – Gary Hoffman

See details of meeting minutes in Attachment K.4.1. A quorum was achieved. Comprehensive discussion on Clause 4, Clause 5, and Clause 6 are well detailed in the WG minutes. The WG passed a motion to circulate a straw ballot. There was a discussion of the topic of metrification with varying views with regard to a global market, and utility customer expectations, with no conclusion due to time limitation of meeting.

K.4.2 Revision of C57.93 IEEE Guide for Installation and Maintenance of Liquid-Immersed Power Transformers – Mike Lau

See details of meeting minutes in Attachment K.4.2. The PAR expires in 2016. A PAR extension was submitted and is on the NesCom agenda for approval.

The working group officers reviewed draft 1.2 comments and proposed resolutions. Draft 1.3 with the officer recommendations was posted for working group review.

Several issues were identified which require input from the working group to resolve. A comment resolution group is reviewing the draft 1.2 comments, and the officer recommendations, with final comment resolutions to be submitted.

A discussion on the frequency of fan exercising was held, but conclusions were not reached.

A discussion on test voltages applied under vacuum was held. A task force will investigate this issue and make a recommendation to the working group.

The Piper chart in the guide is out of date and will be revised.

K.4.3 Revision of C57.125 Guide for Failure Investigation, Documentation, Analysis and Reporting for Power Transformers and Shunt Reactors – W. Binder

No meeting was held. Revisions to the guide were approved and the document published in December 2015.

K.4.4 TF to Compare C57.131-2012 Standard for Load Tap Changers and IEC 60214-1 ED 2.0 for consideration of recommending adoption of IEC standard (Also WG 60214-2 Tap-Changer Application Guide) - Craig Colopy

See details of meeting minutes in Attachments K.4.3.1. and K.4.3.2. 2.

TF Chairman provided the SC a background relating to the work being done to adopt the IEC standard 60214-1 as a dual logo document preserving main technical differences between C57.131 and 60214-1 in an Annex. General opinion from TF is prospects are very good to bring these two standards together as one significant standard covering all industry available tap-changers. This dual logo document establishes a base for a future joint revision by IEEE and IEC members when the stability of IEC 60214-1 has expired. It was published in 2014 with a preliminary stability date of 2019. Annex E of C57.131 is included within the new joint revision of 60214-2, Tap Changer Application Guide.

The recommendation to Power Transformer Subcommittee is creation of a WG for the purpose of creating a replacement of C57.131-2012 by adoption of IEC 60214-1 with an Annex to include significant technical differences between C57.131 and 60214-1. A motion was made to form the Working Group by Craig Colopy and seconded by Dan Sauer. SC Chair asked for discussion, there was none. The SC Chair asked if there were any objections, being there were none the motion passed.

WG Chair Part 2 explained a recap the seventh work session in Venice were presented by Axel Kramer. A presentation on “DRM Diagnostic Test Technique for OLTCs” was made by Raka Levi and Marcos Ferreira. (See new business regarding tutorial recommendation).

WG Chair advised opportunities for future working sessions:

- Nashville, Tennessee, June 6 – 7 2016,
- Dresden, Germany September 5 – 6 2016
- Vancouver, BC Canada, Oct. 27 – 28 2016

K.4.5 C57.140 Guide for the Evaluation and Reconditioning of Liquid-Immersed Power Transformers – Paul Bowman

See details of meeting minutes in Attachment K.4.4. Based on the work completed and the WG having vote with 2/3 majority, the WG Chair made a motion to SC to Go To Ballot with PC57.140, Dan Sauer seconded the motion. The SC Chair asked for discussion, and with no discussion offered, then asked if there were any objections. There were no objections by the SC members and hence the motion to Go To Ballot passed.

It was noted that the WG Secretary had resigned and at the present time a replacement will not be pursued.

K.4.6 Revision of C57.148 Guide for Control Cabinets for Power Transformers

The TF to study the need for revising C57.148, the Standard for Control Cabinets for Power Transformers met for the first time at 11:00 AM on Monday, March 21st, 2016, with 39 attendees, 23 of whom volunteered for membership in the group.

The Task Force recommended moving forward as a WG and this was later approved by the Subcommittee. Joe Watson will serve as Chair of the WG, Weijun Li will serve as Vice-Chair and Jean-Francois Collin will serve as Secretary. 13 members of the TF volunteered to review the entire existing document to determine which sections should be revised and to report their findings at the WG meeting in Vancouver.

A request for a PAR has been submitted for this revision to the Standard and is expected to be approved before the next meeting in Vancouver. The group will meet again at the Vancouver meeting as a WG if the PAR is approved, or as a TF if the PAR approval is still pending.

A motion was made by Dan Sauer with Second by Robert Thompson, the SC Chair asked if there any objections, being there were no objections, the motion the from a Working Group passed.

K.4.7 Revision of C57.150 Guide for the Transportation of Transformers and Reactors Rated 10,000 kVA or Larger

Will start up working group at next meeting for revision of the Guide. A motion by Craig Swinderman was made to from a Task Force, the Motion passed without any objections.

K.4.8 Development of PC 57.153 Guide for Paralleling Transformers - Tom Jauch

No meeting was held. Nothing reported.

K.4.9 Development of PC57.156 Guide for Transformer Tank Rupture Mitigation of Liquid-Immersed Power Transformers and Reactors - Peter Zhao

Working group did not meet. Robert Thompson reported that a 3rd circulation has been completed, there was one comment that has been resolved. Following a fourth circulation the Guide will then will be sent RevCom. A PAR extension was submitted and approved.

K.4.10 Development of PC57.157 Guide for Conducting Functional Life Tests for De-Energized Tap Changer Contacts - Phil Hopkinson

There was no meeting. The guide was approved and was published. The working group will not meet at the next Transformers Committee meeting.

**K.4.11 Development of Standard Requirements for Phase Shifting Transformers -
IEEE/IEC 60076-57-12 - Raj Ahuja**

The document has completed balloting process. Steve Antosz provided the summary report. Work is complete, and has been balloted in both IEC & IEEE.

K.5 Old Business

None.

K.6 New Business

Marcos Ferreira – Requests the PTSC to sponsor a tutorial on LTC testing. Chair suggests that several companies and users would be invited. Plan would be at future meeting. Motion made by Richard Amos with second by Diana Woods. Discussion by Axle Kramer should include several methods for field testing of LTCs. There was no opposed to future tutorial, the motion passed.

The topic of forming a Task Force on Field Testing of LTCs was discussed. After discussion regarding field testing covered by C57.152, and baseline testing performed in factory. Chair asked for a motion, however, there was no interest and topic was closed. Chair will raise subject in the Standards SC.

There was a request for Volts per Hertz over time from the relay committee, Russ Patterson as to what is the appropriate curve. The Chair suggested this be addressed by an Amendment to C57.116 – (Directly Connected to Generator) where over excitation is covered. There is a Figure 2-15 in the EPRI Power Plant Electrical Reference Series book that shows one manufactures estimate of overexcitation as located by Kipp Yule. Typically, such curves are requested by the buyer to support relay protection setting on new projects; however, the relay committee is trying to determine how to apply to existing installations. Don Anderson pointed out the Volts per Hertz capability curve is very dependent on the transformer design. The chair indicated there could possibly be a method to convert excitation current to Volts per Hertz and it may be applicable to more than just generator connected units. The Chairs asked for a motion if a Task Force should be formed to investigate if a section on Volts per Hertz should be added to C57.116 as an Amendment. Gary Hoffman suggested rather than a Task Force that a Par Study group be considered; however, no change to motion was made and the vote to form the Task Force was passed with no objections.

Chair asked if there was any new business for C57.17 Arc Furnace Transformers – none was reported.

Phil Hopkinson provided a view point on regarding if the switching surge test actually is representative of the switching events in the real world. There is Task Force that will meet next meeting and those interested are encouraged to attend.

K.7 Adjournment

The meeting adjourned as scheduled.

K.8 Attachments –Working Group Meeting Minutes and Agenda

Attachment K.2 – S16 PTSC Agenda

Attachment K.4.1 – PC57.12.10 Standard Requirements

Attachment K.4.2 – PC57.93 Installation Guide

Attachment K.4.3.1 – TF IEC 60214-1 / IEEE C57.131 Tap Changer harmonization

Attachment K.4.3.2 – WG 60214-2 IEC Tap Changer Part 2 Application Guide
Attachment K.4.4 – PC57.140 Evaluation and Reconditioning Guide

Unapproved Draft

Attachment K.2

AGENDA

IEEE Transformers Committee / Power Transformers Subcommittee
 Wednesday, March 23, 2016, 1:30-2:45 PM
 Sheraton Atlanta Hotel, Capital Ballroom, Atlanta GA, USA
 Joe Watson – Chair, Bill Griesacker – Vice Chair, Kipp Yule - Secretary

1. Call to order
2. Introduction and distribution of attendance sheets
3. Determination of a quorum
4. Approval/correction of the spring 2015 minutes
5. Report from the Administrative Subcommittee meeting
6. New Business
7. Working Group and Task Force reports

Project	Title	Chair
IEEE/IEC 60076-57-1202	Development of Standard Requirements for Phase Shifting Transformers (PAR to 12/31/2016) *	Raj Ahuja
C57.12.10	Revision of IEEE Standard Requirements for Liquid-Immersed Power Transformers (Next revision due 9/30/2020, PAR to 12/31/2019)	Gary Hoffman
C57.17	Revision of Requirements for Arc Furnace Transformers (Published in 2012, next revision due in 2022) *	Robert Ganser
C57.93	Revision of IEEE Guide for Installation and Maintenance of Liquid-Immersed Power Transformers (Published in 2007, next rev. due in 2018, PAR to 12/31/2016)	Mike Lau
PC57.116	Revision of Guide for Transformers Directly Connected to Generators (Published in 2014, next revision due in 2024) *	Gary Hoffman
PC57.125	Revision of Guide for Failure Investigation, Documentation, Analysis and Reporting for Power Transformers and Shunt Reactors (Published in 2015, next revision due in 2025) *	Wallace Binder
C57.131 IEC 60214-1 IEC 60214-2	IEEE Standard Requirements for Load Tap Changers – Joint IEEE/IEC revision	Craig Colopy
C57.135	IEEE Guide for the Application, Specification and Testing of Phase-Shifting Transformers (Published in 2011, next revision due in 2021) *	Jin Sim
PC57.140	Revision of Guide for Evaluation and Reconditioning of Liquid-Immersed Power Transformers (Published in 2006, next revision due in 2018) (PAR to 12/31/2017)	Paul Boman
C57.143	Guide for Application for Monitoring Equipment to Liquid-Immersed Transformers and Equipment (Published in 2012, next revision due in 2023) *	Donad Chu
C57.148	Standard for Control Cabinets for Power Transformers (Published in 2011, next revision due in 2021)	Joe Watson
C57.150	Guide for the Transportation of Large Power Transformers and Reactors (Published in 2012, next revision due in 2022) *	Greg Anderson
PC57.153	Development of Guide for Paralleling Transformers (Published in 2015, next revision due in 2025) *	Tom Jauch
PC57.156	Development of Guide for Transformer Tank Rupture Mitigation of Liquid-Immersed Power Transformers and Reactors (PAR extended to 12/17) *	Peter Zhao

PC57.157	Development of Guide for Conducting Functional Life Tests for De-Energized Tap Changer Contacts (Published in 2015, next revision due in 2025) *	Phil Hopkinson
IEEE 638	Revision of IEEE Standard for Qualification of Class 1E Transformers for Nuclear power Generating Stations (Published in 2013, next revision due in 2023) *	Craig Swinderman

* No meetings were scheduled during this time for these documents

8. Old Business
9. Collection of Attendance Sheets
10. Adjournment

Unapproved Draft

Attachment K.4.1

Meeting Minutes Posted on PTSC Webpage Revision of C57.12.10, 230kV and Below Safety Requirement
Use the following link:

<http://www.transformerscommittee.org/subcommittees/power/C57.12.10/S16-WGPC.57.12.10-Minutes.pdf>

Unapproved Draft

Attachment K.4.2

WG Revisions to Installation of Power Transformers C57.93

Monday, May 21, 2016 1:45 MM – 3:00 PM

Atlanta, GA

Minutes of the Working Group Meeting

Chair Mike Lau called the WG meeting to order at 1:45 PM on May 21, 2016. 16 of 24 members were present, so a quorum was achieved. 91 guests also attended, for a total attendance of 107. Attendance will be recorded in AMS. Twenty (20) guests requested membership.

A motion to approve the agenda was made by Wally Binder and seconded by Kipp Yule. The motion passed unanimously. A motion to approve the fall 2015 minutes was made by Joe Watson and seconded by Wally Binder. This motion also passed unanimously.

Mike Lau reminded the working group that the PAR expires in 2016. A PAR extension was submitted and is on the NesCom agenda for approval.

The working group officers reviewed draft 1.2 comments and proposed resolutions. Draft 1.3 with the officer recommendations was posted for working group review. Several issues were identified which require input from the working group to resolve. A comment resolution group was formed last fall, comprised of Wally Binder, Patrick Rock, Ken Sullivan, Alwyn VanderWalt, Scott Reed, Stephanie Denzer, Alan Peterson, Rick Simonelli, and the working group officers. Ismar Guner, Don Platts, and Eduardo Wild were added this meeting. This group is tasked with reviewing the draft 1.2 comments and the officer recommendations, then submit final comment resolutions to the working group for acceptance.

A discussion on the frequency of fan exercising was held, but conclusions were reached. A discussion on test voltages applied under vacuum was held. A task force comprising Joe Watson, Ismail Gunar, Larry Kirchner, Mike Miller, and Chuck Sweetser will investigate this issue and make a recommendation to the working group.

The Piper chart in the guide is out of date and will be revised.

The next working group meeting will be in Vancouver, British Columbia Canada in October this year.

A motion to adjourn was made by Tom Melle, and seconded by Wally Binder. The working group meeting adjourned at 3:00 PM.

Respectfully submitted

Mike Lau
WG Chair

Open
Vice Chair
March 21, 2016

Jim Graham
Secretary

Power Transformer Subcommittee Working Group Report

Document #: TF Comparison of IEC 60214-1 and IEEE C57.131

Document Title:

Tap-Changers

Chair: Craig A. Colopy Vice-Chair: Axel Kraemer

Secretary: _____

Current Draft Being Worked On: NA Dated: NA

Meeting Date: 22 March 2015 Time: 13:45 to 15:00

K.9	Attendance:	K.10	Members	<u>23</u>
		K.11	Guests	<u>52</u>
		K.12	Guests Requesting Membership	<u>7</u>
		Total		<u>82</u>

Meeting Minutes / Significant Issues / Comments:

1. Meeting was called to order at 1:45 pm, March 22, 2016.
2. Chairman provided the WG a background relating to the work being done to adopt the IEC standard 60214-1 as a dual logo document preserving main technical differences between C57.131 and 60214-1 in an Annex. General opinion from TF is prospects are very good to bring these two standards together as one significant standard covering all industry available tap-changers. This dual logo document establishes a base for a future joint revision by IEEE and IEC members when the stability of IEC 60214-1 has expired. It was published in 2014 with a preliminary stability date of 2019. Annex E of C57.131 is included within the new joint revision of 60214-2, Tap Changer Application Guide.
3. Comparisons and major technical differences were presented for the following clauses:
 - a. Clause 5 - Requirements for on-load tap-changers (Axel Kraemer)
 - b. Clause 7 - Requirements for de-energized tap-changers (Jeremy Sewell)
4. User ID and Password will be provided once more for a link under the Power Transformer SC for access to clause comparisons, minutes and published tap-changer standards. Published documents of C57.131 -2012 and 60214-1 Ed. 2 are available under an additional secured User ID and Password.
5. Recommendation to be given to Power Transformer Subcommittee for creation of a WG for the purpose of creating a replacement of C57.131-2012 by adoption of IEC 60214-1 with an Annex to include significant technical differences between C57.131 and 60214-1. A PAR will initiated once approval has been established.

6. An initial WG meeting is planned to take place in Vancouver, Spring 2016
7. Meeting closed at 3:00 pm, Mar 22.

Submitted by: Craig A. Colopy

Date: 11/03/2015

Power Transformer Subcommittee Working Group Report

Document #: WG TC Application Guide IEC 60214-2

Document Title: Tap-Changers

Chair: Craig A. Colopy Vice-Chair: Axel Kraemer

Secretary: _____

Current Draft Being Worked On: NA Dated: NA

Meeting Date: 22 March 2015 Time: 15:15 to 16:30

K.13	Attendance:	K.14	Members	<u>17</u>
		K.15	Guests	<u>26</u>
		K.16	Guests Requesting Membership	<u>7</u>
		Total		<u>50</u>

Meeting Minutes / Significant Issues / Comments:

8. Meeting was called to order at 3:15 pm, March 22, 2016.
9. Chairman provided the WG a background relating to the work being done to adopt the IEC standard 60214-1 as a dual logo document preserving main technical differences between C57.131 and 60214-1 in an Annex. Annex E of C57.131 is included within the latest draft of 60214-2, Tap Changer Application Guide.
10. Minutes from the seventh work session in Venice, February 25th and 26th, along with key changes in latest draft were presented by Axel Kramer.
11. A presentation on “DRM Diagnostic Test Technique for OLTCs” was made by Raka Levi and Marcos Ferreira. It was suggested this presentation be one discussion from a tutorial on OLTC Diagnostic Techniques to be provided by a panel for a future IEEE Transformer Committee meeting group.
12. User ID and Password will be provided once more for a link under the Power Transformer SC for access to drafts, minutes and supporting documentation.
13. Future Work Sessions:
 - a. Nashville, Tennessee, June 6 – 7 2016, Hosted by Dave Geibel, ABB
 - b. Dresden, Germany September 5 – 6 2016 hosted by Axel Kraemer, Reinhausen
 - c. Vancouver, BC Canada, Oct. 27 – 28 2016, IEEE Transformer Committee meeting
14. Meeting closed at 4:30 pm, Mar 22.

Submitted by: Craig A. Colopy

Date: 3/22/2016

Minutes from Guide for the Evaluation and Reconditioning of Liquid Immersed Power Transformers PC57.140

Meeting was held in Atlanta GA, from 3:45-6:00pm March 21st 2016

Chairman: Paul Boman

Vice Chairman: Brian Sparling

62 attendees, 26 members were present, we did not achieve a quorum.

Motion to accept the agenda as proposed, made by David Sundin, second by Derek Baronowski

Minutes from previous meetings were provided to the Working Group in advance but the Minutes were not approved at this time. As this was not an intended to be a full WG meeting, it was to present the status of the proposed document

The Chairman provided a summary of the electronic ballot amongst the WG members with approved 43 and disapproved 5 which meets the 2/3's majority required to move forward to the Subcommittee for a Sponsor Ballot approval.

Summary on draft 5 of the Guide:

The suggestions made in the previous meeting were incorporated into the latest Working Group Approved draft which included;

- Added notes regarding the use of FURAN analysis used in determining the physical state of the solid insulation. The white paper produced on FURAN'S by a TF chaired by Tom Prevost was added as a reference into Draft 5.
- Added notes regarding the use of alternative insulating fluids for retro filling an existing unit, or into a refurbished or rebuilt unit, with respect to its capabilities of the 'effect of drying' the solid insulation. Notes were added regarding the owners responsibilities to review on a case by case basis, the potential re-rating of the unit to be retro-filled with a Natural Ester, by the original OEM.

The review of some of the figures used in Draft 5, were found to be without suitable references to the original work from which they were included (even though they are copied from the original document) This process is now a necessary step in the final preparation of the document before submission to the SC to seek approval to proceed to a formal ballot.

The Working Group was queried on information regarding the Guide figure sources. Gary Hoffman suggested contacting Bill Bartley. Bill Bartley was later contacted confirmed that he drew figures 3 to 6 and Juan Thierry drew figures 7 to 12 with a simple drawing program. This meet the MEC review requirements and develop the Sponsor Ballot Pool.

Ballot resolution committee to be made up in preparation for the ballot.

Some discussion about Annex A (retro-filling with other fluids), related to potential new fluids under development. Chairman stated that comments can be made during the Sponsor Ballot, but will not be added into the draft already approved by the WG members.

A suggestion was made to include the examination of gasket materials to be used or to be determined by the original OEM, if they are suitable for use with alternative insulating fluids.

Meeting was adjourn.

Respectfully Submitted,

Paul Boman, Chairman

