Power Transformers Subcommittee

March 26, 2025

Denver, Colorado, USA

Meeting Time: 1:30-2:45 p.m.

Chair: Ryan Musgrove
Vice Chair: Alwyn VanderWalt
Secretary: Weijun Li

# Meeting Attendance

The Power Transformers Subcommittee (PTSC) met on Wednesday, March 26 at 1:30 p.m. The attendance record indicates that 98 out of 116 members of the subcommittee were in attendance; a quorum at the meeting was achieved. A total of 241 individuals attended the meeting. PTSC Chair Ryan Musgrove (Oklahoma Gas & Electric) and Secretary Weijun Li (Braintree Electric Light Department) were present. Vice Chair Alwyn VanderWalt (Electrical Consultants, Inc.) was not in attendance.

Seven individuals requested membership by speaking with or emailing PTSC officers after the meeting. Six attended at least 3 out of the last 5 meetings and therefore qualified for “Member” status. The 7th has not been recorded in attendance in 3 out of the last 5 meetings, and therefore not yet qualified for membership.

A total of 34 individuals were added as “Guests” to the subcommittee. Fourteen individuals updated their contact information. Two individuals have been moved from “Member” to “Guest” for not having recorded attendance at the last 3 out of 5 meetings.

With the membership changes stated above, PTSC has a total of 120 members after the Spring 2025 meeting.

The complete attendance record is provided in Attachment K.1.

# Approval of Agenda and Meeting Minutes

The Chair presented the meeting agenda. Daniel Sauer (Eaton Corporation) made a motion to approve the agenda as presented, which was seconded by Ed teNyenhuis (Hitachi Energy). The agenda was approved without objection. The approved agenda can be found in Attachment K.2. Marcos Ferreira (FEMA) made a motion to approve the Fall 2024 meeting minutes, which was seconded by Daniel Sauer (Eaton Corporation). The Fall 2024 meeting minutes were approved without objection.

# Chair’s Remarks

The Chair provided an update on the PTSC roster. Due to the success and ease of Microsoft Forms sign-in QR code, this has replaced paper rosters for this meeting and will be used for meeting attendance going forward. All members should scan the QR code to sign in. Two members had been moved to Guest status due to not having attended at least 3 out of the last 5 meetings. If someone believes their membership status has been incorrectly changed, or is not shown properly, they should speak with the Chair after the meeting or email him. Attendees were reminded to keep their email address up to date. Using IEEE alias as contact email is highly recommended. The Chair also announced that guests who wish to become a member of the Power Transformers Subcommittee should see subcommittee officers after the meeting or contact one of the officers by email requesting membership.

The Chair provided an overview of the future scheduled meetings and proposed locations.

The Chair provided an overview of the working group and task force requirements for scheduling meetings, submission of minutes, and other administrative tasks. The Chair stated that meeting invitations should be initiated at least 2 weeks in advance. The Chair suggested that short meetings be held virtually so they won’t take up in-person meeting slots.

The Chair provided an update on the new system tracking attendance and reminded the membership to create their account in the new committee management system Memberplanet if they haven’t already done so.

The Chair reminded the working groups of patent calls and copyright & participant behavior review at each meeting and note in the minutes.

The Chair emphasized that the name and affiliation of any individual who makes or seconds a motion and the voting results must be recorded in the meeting minutes.

The Chair asked the audience to use a microphone and state their name and affiliation when speaking. The Chair also reminded the group not to interrupt an ongoing motion with the technicality that a motion or second may not be required.

The Chair shared a note from AdCom suggesting that a WG form a comment resolution group to handle comments from the ballot when moving a draft to ballot.

The Chair announced that Patrycja Jarosz is the IEEE staff point of contact for PTSC.

The Chair showed a summary slide and provided an overview of the documents that PTSC is responsible for developing and maintaining.

The Chair introduced 9 new members that were added to the PTSC membership list since the Fall 2024 meeting. The new members are listed below:

Roberto Da Silva (Maschinenfabrik Reinhausen)

Gabriel Delgado (Invenergy)

James Gardner (Prolec GE Waukesha)

Alireza Gorzin (Black & Veatch)

Ronald Hernandez (Doble Engineering Co.)

Nicholas Jensen (Delta Star Inc.)

Timothy Raymond (Consultant)

Yuri Rossini (Siemens Energy)

Drew Welton (Intellirent)

The Chair provided the requirements for establishing & maintaining membership and urged members to participate in all email ballot requests. When a voting member is absent for more than two consecutive scheduled regular meetings and fails to participate by correspondence, the member may be removed.

All attendees were reminded that pictures are not to be taken during any working group or task force meeting of the work being done unless specifically announced that it is allowed by the chair.

# Working Group and Task Force Reports

## Revision of C57.131, Standard Requirements for Tap Changers – Craig Colopy

This group didn’t meet in Denver. The final draft (D1.3) was approved as a revised standard by IEEE SA Standards Board Standards Review Committee (RevCom) on February 15, 2024. The revised document has been published with a new expiration date of December 31, 2034.

## WG C57.156, Guide for Tank Rupture Mitigation of Liquid-Immersed Power Transformers and Reactors – Peter Zhao

This working group met on Monday. A quorum was achieved. WG Chair Peter Zhao (BC Hydro) provided a summary of technical discussions:

A proposal was made to add a new section for the related components. Samuel Brodeur (Hitachi Energy) and Marc Foata (Maschinenfabrik Reinhausen) volunteered for this task and will present a draft section at the next meeting.

Discussed and accepted the proposed changes to Section 5.3.1.

Emilio Morales (Qualitrol Company LLC) confirmed that there is no flow rate curve for mineral insulating oil.

Marc Foata (Maschinenfabrik Reinhausen) made a motion to revise the subclause numbers in Section 5 and the motion was approved unanimously.

The proposed change to Section 5.1 (by Didier Hamoir of Transformer Protector Corp) was partially discussed with no decisions due to time constraints.

The complete meeting minutes can be found in Attachment K.4.2. The next in-person meeting is planned for Fall 2025 in Bonita Springs, Florida.

## Revision of C57.116, Guide for Transformers Directly Connected to Generators – Weijun Li

This working group completed its work in 2022; therefore, they won’t meet again until the next revision cycle, possibly 2027.

## WG IEEE 638, Standard for Qualification of Class 1E Transformers for Nuclear Power Generating Stations – Craig Swinderman

This working group met on Monday with 7 members and 21 guests present. 3 guests requested membership. WG Chair Craig Swinderman (Mitsubishi Electric Power Products) said that the PAR was approved on December 6, 2023 with an expiration date of December 31, 2027. The group reviewed Draft 3 of the document. Annex A has been updated. The WG Chair indicated that further updating of IEEE 638 will be based on changes to another standard IEEE/IEC 60980-344-2020.

The complete meeting minutes can be found in Attachment K.4.4. The next in-person meeting is planned for Fall 2025 in Bonita Springs, Florida.

## WG C57.135, Guide for the Application, Specification, and Testing of Phase-Shifting Transformers – Ewald Schweiger

This working group met on Monday with 60 attendees and achieved a quorum. WG Chair Ewald Schweiger (Siemens Energy) provided an update on document review since the St. Louis meeting.

Kevin Juchem (Hitachi Energy) presented a concept which sections need to be updated or have information moved between Guide C57.135 and Standard 60076-12-1202.

Luc Dorpmanns (Royal SMIT Transformers) presented a comparison of the definitions between Guide C57.135 and Standard 60076-12-1202 with the objective for harmonization. It was decided to prioritize the definitions in the standard and adjust the guide as necessary.

Power System Relaying and Control Committee (PSRC) Chair Michael Thompson (SEL Engineering Services, Inc.) reported that PSRC intends to form a task force to support the phase-shifting transformer work in their meeting in May and started a PAR Study group for the revision of C37.245-2018 IEEE Guide for the Application of Protective Relaying for Phase-Shifting Transformers.

The group recognized that this is a unique opportunity to harmonize, clean up, and enhance the contents of three relevant documents simultaneously: C57.135 (60076-57-135) Guide for the Application, Specification, and Testing of Phase-Shifting Transformers, IEEE/IEC 60076-57-1202 International Standard Power Transformers, Part 57-1202: Liquid-immersed Phase-Shifting Transformers, and C37.245 IEEE Guide for the Application of Protective Relaying for Phase-Shifting Transformers.

This working group continues to look for volunteers to review the existing document for improvements and help with editorial changes.

The complete meeting minutes can be found in Attachment K.4.5. The next in-person meeting is planned for Fall 2025 in Bonita Springs, Florida.

## Revision of C57.143, Guide for Application of Monitoring Equipment to Liquid-Immersed Transformers and Components – Mike Spurlock

This group didn’t meet in Denver. WG Chair Mike Spurlock (Spurlock Engineering Services, LLC) was not in attendance. WG Vice Chair Poorvi Patel (EPRI) reported that the draft guide was approved by the IEEE SA Standards Board in December 2024. A copy of the document was forwarded to the Standards Publications Department, and an editor has been assigned to work on the project. WG Vice Chair Poorvi Patel (EPRI) thanked everyone involved for their contributions.

## WG C57.12.10, Standard Requirements for Liquid-Immersed Power Transformers – Scott Digby

This working group met on Monday and achieved a quorum. This was the 2nd WG meeting. The current document expires December 31, 2027 and the PAR has an expiration date of December 31, 2028.

WG Chair Scott Digby (Duke Energy) reported that Draft D1 had been circulated for comment since the Fall 2024 meeting. 16 of the 32 comments received were non-editorial, which were the focus of this meeting. The group discussed 11 of those 16 comments. There was one notable item – OLTC being located in the LV winding as baseline for standard versus DG site common practice to locate in HV winding. Volunteers will draft text to add context to applicable section.

The group will continue the review of remaining comments as well as any subsequent comments/questions at the next meeting.

The complete meeting minutes can be found in Attachment K.4.7. The next in-person meeting is planned for Fall 2025 in Bonita Springs, Florida.

## WG C57.140, Guide for Evaluation and Reconditioning of Liquid-Immersed Power Transformers – Marcos Ferreira

This was the 1st WG meeting; therefore, a quorum was not needed. There were 69 participants with 40 requesting membership. Marcos Ferreira (FEMA) is the WG Chair.

The WG discovered a conflict between the Title and Scope in the PAR request and the Title and Scope that was approved to go for a PAR from the Fall 2024 Meeting. The WG officers will address this issue. An e-motion will follow.

A total of 6 task forces were assigned to review other IEEE documents to identify information that overlaps with C57.140.

The complete meeting minutes can be found in Attachment K.4.8. The next in-person meeting is planned for Fall 2025 in Bonita Springs, Florida.

## Revision of C57.125, Guide for Failure Investigation, Documentation, Analysis and Reporting for Power Transformers and Shunt Reactors – Hakan Sahin

This working group met on Monday and achieved a quorum. WG Chair Hakan Sahin (Virginia/Georgia Transformer) reported that the draft document received the WG’s approval upon completion of an e-vote. The group reviewed the 3 comments received from the e-vote, decided to seek a PAR extension, and formed a ballot resolution group.

The current document expires on December 31, 2025. In order to have enough time to resolve ballot comments and finalize the document, Hakan Sahin (Virginia/Georgia Transformer) made a motion to approve a 2-year PAR extension to start the ballot process no later than the Fall 2025 meeting, which was seconded by Daniel Sauer (Eaton Corporation). The motion passed with unanimous approval.

Hakan Sahin (Virginia/Georgia Transformer) made another motion to approve the ballot process to start as soon as possible, where the goal is by June of 2025 at the latest. The motion was seconded by Hakim Dulac (Advanced Power Technologies). The motion passed with unanimous approval.

The complete meeting minutes can be found in Attachment K.4.9. The next in-person meeting is planned for Fall 2025 in Bonita Springs, Florida.

## WG C57.157, Guide for Conducting Functional Life Tests on Switch Contacts Used in Insulating Liquid-Immersed Transformers – Adam Sewell

This working group met on Tuesday with a total of 35 attendees. A quorum was achieved. The PAR was approved June 2023 and expires December 2027. WG Chair Adam Sewell (Quality Switch, Inc.) reviewed the project timeline with the group.

The group will create draft 1.0 and will need any input from members on recommended changes/additions/deletions to the current document.

The group also identified the need for obtaining test data for synthetic esters. Quality Switch and Specialty Transformer Components volunteered to work on setting up/performing testing using synthetic esters.

The complete meeting minutes can be found in Attachment K.4.10. The next in-person meeting is planned for Fall 2025 in Bonita Springs, Florida.

## WG C57.170, Guide for the Condition Assessment of Liquid Immersed Transformers, Reactors and Their Components – Kumar Mani

This working group met on Tuesday and achieved a quorum. WG Chair Kumar Mani (Duke Energy) reported that a total of 172 comments were received including 37 technical and 135 editorial/general comments from the initial ballot. The comments resolution group had a total of 11 online meetings to resolve the comments.

Draft 2 of the document will be out for a recirculation ballot within a week after the Denver meeting with the goal of sending the guide to RevCom before the Fall 2025 meeting.

The complete meeting minutes can be found in Attachment K.4.11.

## Revision of C57.150, Guide for the Transportation of Transformers and Reactors Rated 10,000 kVA or Higher – Greg Anderson

This group didn’t meet in Denver. The revised guide was approved and published in 2023, with next revision due December 2033.

## WG PC57.17, Standard Requirements for Arc Furnace Transformers – Jason Varnell

This working group met on Tuesday with a total of 29 attendees. 13 of 22 members were present; therefore, a quorum was achieved. This was the 3rd meeting as a working group. WG Chair Jason Varnell (Doble Engineering) reported that 3 old business items, which were comments from the 1st straw ballot, were reviewed. Individual motions were unanimously approved to accept the proposed revisions that were drafted during the WG meeting.

The new business was to review the 36 comments from the 2nd straw ballot. Time only permitted 15 of the 36 comments to be resolved with unanimous consent of the WG members present. Prior to the Fall 2025 meeting, the remaining 21 comments will be resolved by the previously assigned TF leaders.

Draft 2.0 will be finalized with all comments resolved and then circulated to the WG before the Fall 2025 meeting.

The complete meeting minutes can be found in Attachment K.4.13. The next in-person meeting is planned for Fall 2025 in Bonita Springs, Florida.

## WG C57.107, Recommended Practice for Developing Short-Term Overexcitation V/Hz Curves for Transformers Directly Connected to Generators – Joe Watson

This working group didn’t meet in Denver. This document was approved and published in 2024 with next revision due December 2034.

## WG Liquid-Immersed Phase-Shifting Transformers 60076-57-1202 – Ewald Schweiger

This working group met on Tuesday with 45 attendees and achieved a quorum. WG Chair Ewald Schweiger (Siemens Energy) provided an update on document review since the St. Louis meeting.

Kevin Juchem (Hitachi Energy) reported on the progress of the WG at CENELEC concerning IEC/IEEE 60076-57-1202, including Amendment A11.

Luc Dorpmanns (Royal SMIT Transformers) presented a comparison of the definitions between Guide C57.135 and Standard 60076-12-1202 with the objective for harmonization. It was decided to prioritize the definitions in the standard and adjust the guide as necessary.

Power System Relaying and Control Committee (PSRC) Chair Michael Thompson (SEL Engineering Services, Inc.) provided an update on the status of C37.245 (IEEE Guide for the Application of Protective Relaying for Phase-Shifting Transformers).

The group recognized that this is a unique opportunity to harmonize, clean up, and enhance the contents of three relevant documents simultaneously: C57.135 (60076-57-135) Guide for the Application, Specification, and Testing of Phase-Shifting Transformers, IEEE/IEC 60076-57-1202 International Standard Power Transformers, Part 57-1202: Liquid-immersed Phase-Shifting Transformers, and C37.245 IEEE Guide for the Application of Protective Relaying for Phase-Shifting Transformers.

This working group continues to seek volunteers to review the existing document for improvements.

The complete meeting minutes can be found in Attachment K.4.15. The next in-person meeting is planned for Fall 2025 in Bonita Springs, Florida.

## WG C57.93, IEEE Guide for Installation and Maintenance of Liquid-Immersed Power Transformers – Scott Reed

This working group met on Tuesday and achieved a quorum. This was the 2nd official working group meeting.

WG Chair Scott Reed (MVA) presented the project timeline and stated that the document is being revamped.

The 7 task forces gave their initial updates:

-TF1: Shipping Method and Assembly – Ryan Musgrove (Oklahoma Gas & Electric)

-TF2: Vacuum Processing Methods – Kyle Stechschulte (American Electric Power)

-TF3: Final Testing and Energization – Elizabeth Bray (Southern Company Services)

-TF4: Relocation and Field Repair – Alwyn VanderWalt (Electrical Consultants, Inc.)

-TF5: Maintenance – Weijun Li (Braintree Electric Light Department)

-TF6: Storage – Patrick Rock (American Transmission Co.)

-TF7: Editorial and Definitions – Jesse Duffy (Nashville Electric Service)

The task forces will continue work and report back to the WG at the Fall 2025 meeting.

The complete meeting minutes can be found in Attachment K.4.16. The next in-person meeting is planned for Fall 2025 in Bonita Springs, Florida.

## Liaison to PC57.93a Guide for Installation and Maintenance of Liquid-Immersed Power Transformers – Scott Reed

This is liaison activity related to the topic of low temperature cold starts for transformers with natural ester fluid. The Chinese entity went out to ballot in October 2024 and received 63 comments. All comments were resolved. Because it was an entity PAR, individuals were not permitted to vote on the guide amendment.

The PAR had to be modified to change the word ‘Fluid” to “Liquids.” The PAR revision was submitted. NesCom and RevCom voted on the PAR revision.

There were no meeting minutes for this liaison activity.

## WG C57.153, Guide for Paralleling Regulating Transformers – Mark Tostrud

This working group met on Tuesday and achieved a quorum. WG Chair Mark Tostrud (Dynamic Ratings, Inc.) reviewed the PAR and project timeline with the group.

The group discussed the proposed change to the section discussing how load currents are shared when transformer impedances are not the same. WG Chair Mark Tostrud (Dynamic Ratings, Inc.) provided a status update on the changes to Annex C and requested a volunteer to draft a section on paralleling transformers during reverse power flow due to distributed generation.

A draft guide will be distributed to members and guests once the changes to Annex C are completed.

The complete meeting minutes can be found in Attachment K.4.18. The next in-person meeting is planned for Fall 2025 in Bonita Springs, Florida.

## Liaison to Entity PAR C57.145, Recommended Practice on Digital Twin Modeling and Analysis based on Spatial-temporal Data of Switch Cabinet and Transformer with 110kV and Below – Brian Sparling

This entity PAR was approved in June 2023. Brian Sparling (Kinectrics) is the liaison. The last WG meeting was held on November 15, 2024. Guidance was given that the focus should be more on the transformer if this is to be a power transformer standard.

WG Chair Jiayu Want submitted a status report to IEEE SA on March 4, 2025.

1. Draft Progress

The draft version 4.0 is still under development. The WG plans to produce a draft guide in April and have the fifth WG meeting to discuss it. With the issuance of Draft 3.0, about 40% of work had been done. The current draft includes the suitability for transformers and scope of

failure/defect type in Section 4 (the architecture part), sensors (type, sampling frequency), algorithms (spatial-temporal data) and IT deployment (recommended configurations) in Section 5 (the deployment part), data modeling for diverse entities/procedure, feature extraction using data analysis, digital twin modeling for transformer and criterion designing for failure/defect diagnosis in Section 6 (the data process part). Two recommended scenarios related to substations in Pudong, Shanghai and Chongqing in China and 1 scenario related to transformer are introduced in Section 7.

2. WG Activities

October 10, 2023: Online kick-off meeting

November 1-29, 2023: Material collection

February 6-30, 2024: Draft compiling of responsible parts

After March 2, 2024: Compiled material and produced Draft 1.0 (for the 2nd WG meeting)

March 22, 2024: The 2nd WG meeting

April 1-29, 2024: Material collection

June 6-30, 2024: Draft compiling of responsible parts

After July 2, 2024: Compiled material and produced Draft 2.0 (for the 3rd WG meeting)

July 8, 2024: The 3rd WG meeting

July 11-29, 2024: Material collection

October 6-25, 2024: Draft compiling of responsible parts

October 26 – November 14, 2024: Compiled material and produced Draft 3.0 (for the 4th WG meeting)

November 15, 2024: The 4th WG meeting

November 20-30, 2024: Material collection

January 6-25, 2025: Draft compiling of responsible parts

After March 2, 2025: Compiled material and produced Draft 4.0 (for the 5th WG meeting)

3. WG Members

State Grid Corporation of China

Shanghai Jiao Tong University

Shandong University

Shanghai University of Electric Power

XJ Group Corporation

China Southern Power Grid Co., Ltd.

EPTC (Beijing) Electric Power Research Institute

Siemens Energy

Megger (non-voting)

Shenyang Transformer Research Institute (non-voting)

4. Future Plans

March 26, 2025: Draft 4.0 completion

April 2025: The fifth WG meeting and approval of Draft 4.0 (Ballot Ready Draft)

May 2, 2025: Submit to Pre-MEC and Mandatory Editorial Coordination (MEC)

June 1, 2025: Update draft based on MEC report

June 2, 2025: Submit draft to PE/TR for approval

July 1, 2025: Initiate ballot invitation

July 2025: Initiate SA ballot

There were no meeting minutes for this liaison activity.

## Liaison to Entity PAR “Guide for Power Transformers for Low-frequency (10-30Hz) Power Transmission”

Sheldon Kennedy (Sheldon P. Kennedy Engineering, PLLC), the liaison to this entity PAR, provided the following progress report:

The Entity Working Group met on Webex on Wednesday March 19, 2025 at 8:30 PM EDT.

In attendance were Meng Zhao and Patrycja Jarosz from IEEE and Sheldon Kennedy, Steve Shull and Weijun Li representing the IEEE Transformers Committee.

The Chair, Haojun Liu, called the meeting to order and went through introductions and roster attendance for a quorum. This was the second meeting of the Entity Working Group.

Much of the draft seems to be written specifically for the China offshore windfarm power transmission projects. There are many other low frequency applications at 25 Hz and 16 2/3 Hz in the world that this guide could be useful for.

We pointed out that many of the tables for preferred voltages and kVA ratings are not necessary as this would be an IEEE standard using IEEE C57.12.00. Also, tables specifying required sound levels, no load losses, and load losses are for China only, not for other countries. They should be noted as such or removed. Dimensional requirements seem to be specific to offshore platforms and don’t seem to be required of other applications.

It was noted that the PAR should be modified to be for liquid-immersed transformers.

The overall draft reads more like a specification than a guide or standard. This requires quite a few modifications.

The chair promised a detailed plan for the standard with dates and a follow-up Webex meeting with revisions to Draft 1.

The meeting adjourned at 9:50 PM EDT.

The complete liaison report can be found in Attachment K.4.20.

# Old Business

**IEEE 693 Recommended Practice for Seismic Design of Substations – Substations Standards Committee**

PTSC Chair Ryan Musgrove (Oklahoma Gas & Electric) pointed out that any changes in the next revision of IEEE 693 would likely affect power transformer designs. We need volunteers from the Power Transformers and Bushings subcommittees, especially users and transformer manufacturers, to participate in the review and ballot of IEEE 693 once the document is open for revision. Anyone who is interested in getting involved is encouraged to contact IEEE 693 WG Chair Michael Riley at mjriley@bpa.gov.

Steven Brzoznowski (Bonneville Power Administration) pointed out that IEEE 693 Amendment “P693a” requires more studies and dynamic analysis complicating applications of bushings.

PTSC Chair Ryan Musgrove (Oklahoma Gas & Electric) displayed the following information for attendees’ consideration:

Website - https://cmte.ieee.org/pes-substations/scd0/wgd4/

Next virtual Meeting: Thursday April 3rd 9:00-11:00 AM PDT

IEEE PES Substations Committee Annual Meeting will be held in New Orleans on May 12-16, 2025. Meeting May 14th 8-noon Central, hybrid meeting, virtual available.

# New Business

**IEC/IEEE 60214-2 Guide for Tap-Changers – Part 2: Application Guide – Revision due 2029**

The revision of this document is due in 2029. The Chair will appoint a volunteer to lead a study group to review the document and suggest next steps. IEC/IEEE 60214-2 is an IEC/IEEE Dual Logo standard and is intended to assist in the selection of tap-changers designed in accordance with IEC 60214-1 or IEEE Std C57.131. Note that IEC 60214-1:2014 Tap-changers – Part 1: Performance Requirements and Test Methods will likely be up for revision soon with a possibility of combining with the recently published C57.131 Standard Requirements for Tap Changers. In consideration of IEEE/IEC Dual Logo document, Craig Colopy (Retired) suggested an approach that would be similar to handling the documents for phase-shifting transformers (C57.135 and 600076-57-1202). Patrycja Jarosz (IEEE SA) said that IEEE needs to coordinate with IEC on how to proceed with this project.

**C57.148 – Standard for Control Cabinets for Power Transformers – Revision due 2030**

The revision of this document is due in 2030. The Chair appointed Weijun Li (Braintree Electric Light Department) to lead a study group to review the document and suggest next steps. A tentative approach is to email through PTSC to invite interested individuals to attend virtual meeting(s) after the Denver meeting with an objective to decide on a Title, Scope, and Purpose and give a report at the Fall 2025 PTSC meeting. That way, there won’t be a need for an in-person meeting slot and with approval from the PTSC, will be able to proceed with applying for a PAR and be ready for the first in-person WG meeting in Spring 2026.

# Adjournment

The meeting adjourned at 2:45 p.m.

# Attachments

Attachment K.1 – Attendance

Attachment K.2 – Agenda

*Attachment K.4.1 – C57.131 (No Meeting)*

Attachment K.4.2 – C57.156 Minutes

*Attachment K.4.3 – C57.116 (No Meeting)*

Attachment K.4.4 – IEEE 638 Minutes

Attachment K.4.5 – C57.135 Minutes

*Attachment K.4.6 – C57.143 (No Meeting)*

Attachment K.4.7 – C57.12.10 Minutes

Attachment K.4.8 – C57.140 Minutes

Attachment K.4.9 – C57.125 Minutes

Attachment K.4.10 – C57.157 Minutes

Attachment K.4.11 – C57.170 Minutes

*Attachment K.4.12 – C57.150 (No Meeting)*

Attachment K.4.13 – C57.17 Minutes

*Attachment K.4.14 – C57.107 Minutes (No Meeting)*

Attachment K.4.15 – 60076-57-1202 Minutes

Attachment K.4.16 – C57.93 Minutes

*Attachment K.4.17 – Liaison to PC57.93a (No Meeting Minutes)*

Attachment K.4.18 – C57.153 Minutes

*Attachment K.4.19 – Liaison to Entity PAR for C57.145 (No Meeting Minutes)*

Attachment K.4.20 – Liaison to Entity PAR for Guide for Power Transformers for Low-Frequency Power Transmission (Liaison Report)

**Attachment K.1**

**Attendance Record**

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| --- | --- | --- | --- |
| **Role** | **First Name** | **Last Name** | **Company** |
| Guest | Isaac | Abdalla | HICO America |
| Member | Kayland | Adams | Prolec GE Waukesha |
| Guest | Anthony | Alexander | Hitachi Energy |
| Guest | Rehan | Ali | Siemens Energy |
| Member | Tauhid Haque | Ansari | Hitachi Energy |
| Member | Stephen | Antosz | Stephen Antosz & Associates, Inc |
| Guest | Elise | Arnold | SGB |
| Member | Javier | Arteaga | Hitachi Energy |
| Member | Onome | Avanoma | MJ Consulting |
| Member | Gilles | Bargone | FISO Technologies Inc. |
| Guest | Jason | Beaudoin | Weidmann Electrical Technology |
| Guest | Jean-Noel | Berube | Rugged Monitoring Inc. |
| Member | Enrique | Betancourt | Prolec GE |
| Guest | Naveen | Bhardwaj | Trench Group |
| Guest | Piotr | Blaszczyk | Specialty Transformer Components LLC |
| Member | Daniel | Blaydon | Baltimore Gas & Electric |
| Member | William | Boettger | Boettger Transformer Consulting LLC |
| Member | Paul | Boman | Hartford Steam Boiler |
| Member | Michael | Botti | Hyosung HICO |
| Member | Jeremiah | Bradshaw | Bureau of Reclamation |
| Guest | Garrett | Bradshaw | Howard Industries  |
| Guest | Josipa | Brekalo | Koncar D&ST |
| Guest | Jeffrey | Britton | Doble Engineering Co. |
| Guest | Samuel | Brodeur | Hitachi Energy |
| Guest | Steven | Brzoznowski | Bonneville Power Administration |
| Guest | David | Burke | Xcel energy |
| Member | David | Calitz | Siemens Energy |
| Guest | Juan Alfredo | Carrizales | Prolec GE |
| Member | Juan | Castellanos | Prolec GE |
| Guest | David | Caverly | Trench Limited |
| Guest | Adriana | Cisco Sullberg | Salt River Project |
| Member | Craig | Colopy | Retired - General Interest |
| Guest | Michael | Craven | Qualus Corp. |
| Guest | Daniel | Crockett | Ameren |
| Guest | Janet | Crockett | Fayetteville PWC |
| Member | Juan Carlos | Cruz Valdes | Prolec GE |
| Guest | Marcos | Czernorucki | Hitachi Energy |
| Member | Roberto  | Da Silva | Maschinenfabrik Reinhausen |
| Guest | Tim | Dappen | Cargill |
| Member | Eric | Davis | Consultant |
| Guest | Samson | Debass | EPRI |
| Member | Gabriel | Delgado | Invenergy |
| Guest | Dumitru  | Diaconu | Delta Star Inc |
| Member | Scott | Digby | Duke Energy |
| Guest | Nikolaus | Dillon | Dominion Energy |
| Guest | Luc | Dorpmanns | Royal SMIT Transformers |
| Guest | Zachary | Draper | Delta-X Research Inc. |
| Guest | Jesse | Duffy | Nashville Electric Service |
| Member | Hakim | Dulac | Advanced Power Technologies |
| Member | Samragni | Dutta Roy | Siemens Energy |
| Guest | William | Elliott | AEP-SWEPCO |
| Guest | Eric | Elson | SDGE |
| Member | Evgenii | Ermakov | Hitachi Energy |
| Guest | Egui | Espitia | Reinhausen Mfg |
| Member | Reto | Fausch | RF Solutions |
| Guest | Miguel | Fernandez | Braintree Electric Light Dept. |
| Member | Marcos | Ferreira | FEMA |
| Member | Hugo | Flores | ERMCO |
| Member | Bruce | Forsyth | Cargill |
| Guest | Raymond | Frazier | Ameren |
| Guest | Jean-Philippe | Gagnon | Qualitrol Company LLC |
| Guest | Jose | Gamboa | H-J Family of Companies |
| Member | Eduardo | Garcia Wild | Siemens Energy |
| Member | James | Gardner | Prolec GE Waukesha |
| Guest | Joshua | Garner | RESA Power |
| Member | Rob | Ghosh | GE Vernova |
| Member | Ramsis | Girgis | Hitachi Energy |
| Member | Alireza | Gorzin | Black & Veatch |
| Guest | Shawn | Gossett | Ameren |
| Guest | Matthew | Greenhaw | OG&E |
| Member | Bill | Griesacker | William Griesacker and Associates |
| Member | Niklas | Gustavsson | Hitachi Energy |
| Member | Attila | Gyore | MIDEL |
| Guest | Didier | Hamoir | Transformer Protector Corp |
| Guest | Kevin | Hampton | Siemens Energy |
| Member | Roger | Hayes | GE Vernova |
| Member | Kyle | Heiden | EATON Corporation |
| Guest | Peter | Heinzig | Weidmann Electrical Technology |
| Member | Ronald | Hernandez | Doble Engineering Co. |
| Member | Saramma | Hoffman | PPL Electric Utilities |
| Member | Ryan | Hogg | Bureau of Reclamation |
| Member | Philip | Hopkinson | HVOLT Inc. |
| Guest | Miljenko | Hrkac | Hitachi Energy |
| Guest | Karl | Jakob | Cargill |
| Guest | Balaji | Janakiraman  | Virginia Transformer  |
| Guest | Sukin | Jang | ILJIN Electric |
| Guest | Patrycia | Jarosz  | IEEE SA |
| Member | Nicholas | Jensen | Delta Star Inc. |
| Guest | Chanmin | Jeong | HD Hyundai |
| Member | John | John | Virginia Transformer Corp. |
| Guest | Laszlo | Kadar | Laszlo & Associates |
| Member | Kurt | Kaineder | Trench Austria |
| Guest | Mick | Kasonga | ONCOR Electric |
| Guest | Thomas | Keels | kEElectric Engineering PLLC  |
| Member | Sheldon | Kennedy | Sheldon P. Kennedy Engineering, PLLC |
| Guest | Qasim | Khan | Neetrac Georgia Tech |
| Guest | Yeounsoo | Kim | JST Power Equipment |
| Guest | Heonsu | Kim | LS Electric |
| Member | Zan | Kiparizoski | Howard Industries |
| Member | Egon | Kirchenmayer | Siemens Energy |
| Member | Dmitriy | Klempner | Southern California Edison |
| Guest | Matija | Koprivnjak | Končar D&ST |
| Guest | Nihat | Kosedagi | ERMCO |
| Guest | Rafal | Kowalski | Hitachi Energy |
| Guest | Alexander | Kraetge | OMICRON electronics Deutschland GmbH |
| Guest | Arvind  | Kumar  | Delta star inc  |
| Guest | Andreas | Kurz | MR |
| Guest | Landen | Kwan | NRC |
| Guest | Bernard | Labean Jr. | Consumers Energy |
| Guest | Ashwini | Labh | Hitachi Energy |
| Guest | Komelabbas | Lakhani | Siemens energy |
| Guest | Fernando | Leal | Prolec GE |
| Secretary | Weijun | Li | Braintree Electric Light Dept. |
| Guest | Cesar | Lizcano | Shell USA, Inc. |
| Guest | Luc | Loiselle | Tetra Tech |
| Guest | Ricardo | Lopes | Efacec Energia, SA |
| Member | Jose | Machain | Prolec GE |
| Guest | Geraldo | Magela Júnior | Siemens-Energy |
| Guest | Jinesh | Malde | M&I Materials Inc. |
| Member | Kumar | Mani | Duke Energy |
| Guest | Francis | Mantoan | Siemens Energy |
| Guest | Moses | Manzano | Hyosung HICO |
| Guest | Alonso  | Mario  | Georgia Transformer  |
| Guest | Alberto | Martinez | WEG |
| Guest | Tom | Matson | Xcel Energy |
| Guest | James | McBride | JMX Services, Inc. |
| Member | Thomas | Melle | HIGHVOLT |
| Guest | Toni | Mellin | Vaisala |
| Guest | Omar | Mendez Zamora | Prolec GE |
| Guest | Logan | Merrill | OMICRON |
| Member | Francis | Mills | Power Engineers, Inc. |
| Guest | Juliano | Montanha | Siemens Energy |
| Member | Emilio | Morales-Cruz | Qualitrol Company LLC |
| Guest | Marta | Munoz | Hitachi Energy |
| Guest | Fredy | Murcia | Siemens Energy |
| Member | David | Murray | Tennessee Valley Authority |
| Chair | Ryan | Musgrove | Oklahoma Gas & Electric |
| Guest | Shankar | Nambi | Bechtel |
| Guest | Anthony | Natale | HICO America |
| Member | Kristopher | Neild | Megger |
| Guest | Mark | Newbill | Hitachi Energy |
| Guest | Daniel  | Obregon  | TTE Transformers  |
| Member | Anastasia | O'Malley | Consolidated Edison Co. of NY |
| Guest | Juan | Ortiz  | Reinhausen Manufacturing  |
| Guest | Ashwin | Padmanaban Iyer | STP |
| Guest | Manan | Pandya | Siemens Energy  |
| Guest | Parminder | Panesar | Virginia Transformer Corp. |
| Guest | Dean  | Park | Hyosung HICO |
| Guest | Dwight | Parkinson | EATON Corporation |
| Member | Poorvi | Patel | Electric Power Research Institute (EPRI) |
| Guest | Sanjay | Patel | Smit Transformer |
| Guest | Pedro | Pedro | Efacec Energia |
| Guest | Verena | Pellon | Florida Power & Light |
| Guest | Harry | Pepe | Phenix Technologies, Inc. |
| Guest | Christoph | Ploetner | Siemens Energy |
| Guest | Homero | Portillo | Advanced Power Technologies |
| Guest | Bertrand | Poulin | Hitachi Energy |
| Guest | John | Pruente | APC Construction llc |
| Guest | Crystal  | Qiao | Trench Limited |
| Member | Ion | Radu | Hitachi Energy |
| Guest | Sheila | Ray | US Nuclear Regulatory Commission  |
| Member | Timothy | Raymond | Inductive Reasoning |
| Member | Scott | Reed | MVA |
| Guest | Sebastian | Rehkopf | Maschinenfabrik Reinhausen |
| Guest | Jonathan | Reimer | FortisBC |
| Guest | David | Reyes | ONCOR |
| Guest | Diego | Robalino | Megger |
| Guest | Patrick | Rock | American Transmission Co. |
| Guest | Juan | Rodriguez | Magnetron |
| Guest | Rodrigo | Ronchi | WEG-Voltran |
| Member | Yuri | Rossini | Siemens Energy |
| Member | Marnie | Roussell | Entergy |
| Guest | Christopher | Rutledge | GE Vernova |
| Guest | Hyounggon | Ryu | HD Hyundai electric |
| Member | Mickel | Saad | Hitachi Energy |
| Member | Hakan | Sahin | Virginia/Georgia Transformer |
| Guest | Jesus | Sanchez rodriguez  | Vertiv |
| Member | Dinesh | Sankarakurup | Duke Energy |
| Guest | Amitabh | Sarkar | Virginia Transformer Corp. |
| Guest | Garret | Sarkinen | Xcel Energy |
| Member | Daniel | Sauer | EATON Corporation |
| Member | Alan | Sbravati | Hitachi Energy |
| Member | Markus | Schiessl | SGB |
| Guest | Alfons | Schrammel | Siemens Energy |
| Member | Dan | Schwartz | Quality Switch, Inc. |
| Member | Ewald | Schweiger | Siemens Energy |
| Member | Cihangir | Sen | Duke Energy |
| Guest | Kabir | Sethi | Hitachi Energy |
| Member | Adam | Sewell | Quality Switch, Inc. |
| Guest | Jeremy | Sewell | Quality Switch, Inc. |
| Member | Stephen | Shull | BBC Electrical Services, Inc. |
| Guest | Jonathan | Sinclair | Black & Veatch |
| Guest | Amitkumar | Singh | Consolidated Edison Company of New York |
| Guest | Ahmad | Skeik | Crosslink Technology  |
| Guest | Jason | Snyder | FirstEnergy Corp. |
| Member | William | Solano | Voltyx |
| Member | Sanjib | Som | Pennsylvania Transformer |
| Member | Fabian | Stacy | Hitachi Energy |
| Member | Markus | Stank | Maschinenfabrik Reinhausen |
| Member | Kyle | Stechschulte | American Electric Power |
| Guest | Hampton | Steele | Tennessee Valley Authority |
| Guest | Andrew | Steineman | Delta Star Inc. |
| Guest | Sunny | Swarna | Virginia Transformer Corp |
| Guest | Charles | Sweetser | OMICRON electronics Corp USA |
| Member | Craig | Swinderman | Mitsubishi Electric Power Products |
| Member | Janusz | Szczechowski | Maschinenfabrik Reinhausen |
| Guest | Jonathan | Tan | Northern Transformer |
| Member | Troy | Tanaka | Burns & McDonnell |
| Guest | Marc | Taylor | JFE Shoji Power Canada Inc. |
| Member | Ed | teNyenhuis | Hitachi Energy |
| Guest | Andreas | Thiede | Highvolt |
| Guest | Scott | Thomas | Hitachi Energy |
| Member | Ryan | Thompson | Burns & McDonnell |
| Guest | Timothy | Tillery | Howard Industries |
| Member | Mark | Tostrud | Dynamic Ratings, Inc. |
| Guest | Valentina  | Valori  | Hitachi Energy |
| Member | Jason | Varnell | Doble Engineering Co. |
| Guest | Juan | Velasquez | Magnetron  |
| Guest | Hector | Villa | Ecuatran SA  |
| Member | Dharam | Vir | Prolec GE |
| Member | Richard | vonGemmingen | Dominion Energy |
| Guest | Stephen | Vullo | GE Vernova |
| Member | Pragnesh | Vyas | Cleveland Cliffs |
| Member | David | Wallach | Duke Energy |
| Guest | Alan | Washburn | Burns & McDonnell |
| Member | Joe | Watson | JD Watson and Associates Inc. |
| Member | Bruce | Webb | Knoxville Utilities Board |
| Guest | Matthew | Weisensee | PacifiCorp |
| Guest | Joe | White | Power Engineers |
| Guest | Christopher | Whitten | Hitachi Energy |
| Member | Trenton | Williams | Advanced Power Technologies |
| Guest | Deanna | Woods | PTT |
| Member | Jeffrey | Wright | Duquesne Light Co. |
| Guest | Jiahao | Xie | S&C Electric Company |
| Guest | Fei | Yang | Hitachi Energy |
| Guest | Kwasi | Yeboah | GE Vernova |
| Guest | Tim | Young | Hitachi Energy |
| Member | Joshua | Yun | Virginia Transformer Corp. |
| Guest | Hongzhi | Zhang | Hitachi Energy |
| Member | Kris | Zibert | Allgeier, Martin and Associates |
| Member | Waldemar | Ziomek | PTI Transformers |

**Attachment K.2**

**Agenda**

1. Call to order
2. Distribution of Roster
3. Chair remarks
4. New Members
5. Determine quorum
6. Approval of agenda, approval of previous meeting minutes (sent by e-mail)
7. Working Group and Task Force reports
	1. *WG Revision of C57.131, Tap Changers (no meeting) Craig Colopy*
	2. WG C57.156, Guide for Tank Rupture Mitigation Peter Zhao
	3. *WG Revision of C57.116, GSU Transformers (Completed 2022 – no meeting) Weijun Li*
	4. WG Class 1E Transformer for Nuclear Power gen Std. 638 Craig Swinderman
	5. WG 60076-57-135, Guide for Phase shifting Transformers Ewald Schweiger
	6. WG 60076-57-1202 Liquid Immersed Phase-Shifting Transformers Ewald Schweiger
	7. *WG Revision of C57.143, Monitoring Guide (no meeting) Mike Spurlock*
	8. WG Std Requirement for Liquid-Immersed Power TR – C57.12.10 Scott Digby
	9. WG Guide for Evaluation & Reconditioning of Liquid Immersed TR C57.140 Marcos Ferreira
	10. WG Revision of C57.125, Failure Investigating and Reporting Hakan Sahin
	11. WG C57.157, Guide for Life test of Switch Contacts Adam Sewell
	12. WG C57.170, Condition Assessment Guide Kumar Mani
	13. *WG Revision of C57.150, Transportation Guide (No meeting) Greg Anderson*
	14. WG C57.17, Standard Requirements for Arc Furnace Transformers Jason Varnell
	15. *WG C57.107, Transformer Volts per Hertz (No meeting) Joe Watson*
	16. WG C57.93, Installation and Maintenance Guide Scott Reed
	17. Liaison to PC57.93a – Installation and Maintenance Guide Scott Reed
	18. WG C57.153, Guide for Paralleling Transformers Mark Tostrud
	19. Liaison to Entity PAR C57.145 – Digital Twin for Power Equipment (DTPE) Brian Sparling
	20. Liaison to Entity PAR Guide for PT for Low-Frequency Power Transmission Sheldon Kennedy
8. Old business
	1. IEEE 693 Recommended Practice for Seismic Design of Substations – Substations Standards Committee – Need volunteers, especially users and transformer manufacturers. Contact – Michael Riley – mjriley@bpa.gov
		1. Website - https://cmte.ieee.org/pes-substations/scd0/wgd4/
9. New business
10. Adjournment

**Attachment K.4.2**

**Title:** WG Guide for Tank Rupture Mitigation PC57.156

**Time:** 9:30 AM- 10:45 AM, Monday, March 24, 2025

**Place:** Hyatt Regency Denver at the Colorado Convention Center, Denver, CO, US

**Chair:** Peter Zhao **Vice-Chair:** Samuel Brodeur **Secretary:** Hakim Dulac

1. **Call to Order at 9:30am**
	1. Chair’s Remarks
	2. IEEE-SA Policies
		1. Call for Essential Patents slide presented, and the group made no patent claims.
		2. Copyright policies slide presented
	3. Quorum

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| WG active member | Member required for Quorum (> 50%) | Member present | Total attendance(Guest and member) | Quorum established | Non-members that requested Membership |
| 25 | 13 | 14 | 48 | Yes | 13 |

1. **Approval of the Agenda**
	1. Motion to accept the spring 2025 agenda
		1. Moved: Eduardo Garcia
		2. Seconded: Dave Murray
		3. The spring 2025 agenda was unanimously approved.
2. **Approval of Meeting Minutes**
	1. Motion to accept minutes of the fall 2024 meeting (St. Louis).
		1. Moved: Eduardo Garcia
		2. Seconded: Sanjib Som
		3. There was a discussion and explanation on the level of details to be included in the minutes. The fall 2024 meeting minutes were unanimously approved.
3. **Technical Topics**
	* 1. Proposal was made to add a new section dedicated to Related Components. Samuel Brodeur and Marc Foata will work on the contents of new section and present it in the next meeting.
		2. Reviewed the proposed changes for Subclause# 5.3.1. Discussion and amendment were made on wordage. A motion was made by Samuel Brodeur and seconded by Marc Foata to approve the resulted text shown on the screen. The motion was approved unanimously.
		3. The recommendation from the subgroup on Subclause 5.3.3 was to keep the air flow vs Pressure curve as it is. Emilio Morales confirmed that there is no oil flow rate vs pressure curve available and therefore, no changes will be made to Subclause 5.3.3.
		4. Marc Foata moved a motion to revise Subclause numbering of Clause 5, and Samuel Brodeur seconded it. The motion was approved unanimously.
4. **Action Items**
	1. None
5. **Unfinished Business**
	1. The proposal for revision of Subclause# 5.1 was discussed. We did not have time to complete it, however, few people suggested keeping the text as it is. The discussion will continue during the next meeting.
6. **New Business**
	1. None
7. **Next Meeting**
	1. Next Meeting date and location: Bonita Springs FL, October 19-23, 2025.

Reported by:

Hakim Dulac, P.Eng.

WG secretary

Attendance:

|  |  |  |
| --- | --- | --- |
| Name | Affiliation | Member (yes, no, requested) |
| Ashwin Padmanaban Iyer | Transformer protector Corp | Requested |
| David Calitz | Siemens Energy | yes |
| David Murray | TVA | yes |
| David Reyes | Oncor | Requested |
| Derek Hollrah | Burns&McDonnell | yes |
| Didier Hamoir | Transformer Protector CORP. | Requested |
| Eduardo Garcia  | Siemens Energy | yes |
| Emilio Morales Cruz | Qualitrol | Requested |
| Eric Schleismann | Southern Company | no |
| Francis Mills | Power Engineers | Requested |
| Hakim Dulac | APT | yes |
| Hector Garza | Orto de Mexico | no |
| Jason Snyder | FirstEnergy  | no |
| Joe Nims | Allen& Hoshall | no |
| Jose Luis Machain | Prolec GE | yes |
| Joshua Yun | Virginia Transformer | yes |
| Kevin Juchem | Hitachi Energy | no |
| Krzysztof Kulasek | Delta Star | no |
| Manan Pandya | Siemens energy | Requested |
| Marc Foata | MR | yes |
| Martin Munoz | Orto de Mexico | no |
| Michael Botti | Hyosung HICO | yes |
| Moses Manzano | Hyosung HICO | yes |
| Niklas Gustavsson | Hitachi Energy | no |
| Peter Zhao | Hydro One | yes |
| Rehan Ali | Siemens Energy, Inc. | no |
| Ryan Musgrove | Oklahoma Gas & Electric | Requested |
| Samson Debass | EPRI | yes |
| Samuel Brodeur | Hitachi Energy | yes |
| Sanjib Som | PTT, LLC | yes |
| Sebastian Rehkopf | MR | Requested |
| Steven Brzoznowski  | BPA | no |
| Waldemar Ziomek | PTI Transformers | Requested |
| William Solano | Voltyx | Requested |
| Heinrich Rhys | Roechling | no |
| Luc Dorpmanns | Royal SMIT Transformers | no |
| Adams Kayland | Prolec-GE Waukesha | no |
| Greenhaw Matthew | OG&E | Requested |
| Luc Loiselle | Tetra tech | no |
| Pedro Trujillo | Hyundai | no |
| Sethi Kabir | Hitachi Energy Germany Ag | Requested |
| Lakhani Komelabbas | Siemens Energy | no |
| Juan Rodriguez | Magnetron | no |
| Bernard LaBean Jr | Consumers Energy Company | no |
| Jean-philippe Gagnon | Qualitrol | no |
| Geraldo Magela Junior | Siemens Energy | no |
| Ronny Doerr | SGB Smit Group | no |
| Eduardo Orozco  | GE Vernova Grid Solutions | Requested |

**Attachment K.4.4**

Document #: **638**

Document Title: **Qualification of Class 1E Transformers for Nuclear Power Generating Stations**

Chair: Craig Swinderman Vice Chair Robert Allison

Secretary: Dominic Pollaro Percent Complete: 70%

Meeting Date: Monday, March 24, 2025 Time: 11:00 am to 12:15 pm.

Location: Hyatt Regency; Denver, Colorado- Centennial G(3)

Current draft being worked on: 3.0 Dated: March 2025

PAR Expiration date: December 31, 2027

Attendance: Members: 7

 Guests: 21

 Guests requesting membership: 3

 Total\*: 28

\* A list of attendees is included at the end of these minutes.

**Meeting Minutes / Significant Issues / Comments:**

1. Meeting was called to order at 11:00am by Working Group Chair Craig Swinderman.
2. Presentation of Agenda:

The agenda for the meeting was submitted for review in advance of the meeting.

1. Presentation of IEEE Standards Slides:

IEEE Essential Patent Slides and Copyright policy were presented, and no issues received from the attendees.

1. Distribution of attendance sheets:
	1. Attendance was taken with a paper roster.
	2. Please send an email to craig.swinderman@meppi.com with the subject: P638 EMAIL to be added to the P638 email list.
2. Checking the Quorum:
	1. 7 out of 13 members were in attendance of the meeting so quorum was achieved.
3. Approval of the Meeting Minutes from St. Louis Fall 2024 and Agenda for Spring 2025:
	1. Approval of the Fall 2024 meeting unapproved minutes
		1. Robert Allison motioned to approve.
		2. Ryan Musgrove seconded.
		3. Motion was carried unanimously with no objections or abstentions. – Approved.
	2. Approval of the Spring 2025 agenda
		1. Robert Allison motioned to approve.
		2. David Murray seconded.
		3. Motion was carried unanimously with no objections or abstentions. – Approved.
4. Chair announcements:

The PAR for revision of 638 was approved on December 6, 2023, and will expire on December 31, 2027. The target date for completing the updated standard is mid-2026 for submittal to start the ballot process.

1. Old work: Voting on wording changes to P638 Draft 3.

Approval of Section 5.3 Thermal Life qualification

* Motion to Approve - Grace Yuan
* Second - Robert Allison
* No Objections
* Change Approved

Approval of Section 6.1 Line 28

* Motion to Approve - Ryan Musgrove
* Second - Grace Yuan
* No Objections
* Change Approved

Approval of Section Annex A\_A.3.4.2 -“Insulation life-temperature relationship”

* Motion to Approve - Robert Allison
* Second – David Murray
* No Objections
* Change Approved

Section A3.3 Deletion of reference of “(more than 100 h)” & replace with “Details of this relationship can be found in IEEE C57.12.60 and IEEE C57.100.”

* Motion to Approve - Robert Allison
* Second - Grace Yuan
* No Objections – Approved

Section A3.4.1 Deletion of formula & replace with “Details of this relationship can be found in IEEE C57.12.60 and IEEE C57.100.”

* Motion to Approve – Grace Yuan
* Second – Robert Allison
* No Objections – Approved
1. New Work:
* Joseph Tedesco volunteered to update sections 6.4 and 6.5 of the draft P638 to reflect recent changes in Seismic qualification requirements from IEC/IEEE 60980-344 2020, to be completed before next WG meeting.
1. Next meeting: Bonita Springs, FL on Oct. 20, 2025
2. Close of meeting:

The meeting adjourned at 12:00 pm

Submitted by: Craig Swinderman Date: March 25, 2025

List of Meeting Attendees at Spring ‘25 Meeting, including affiliation & voting member status.

|  |  |  |
| --- | --- | --- |
| NAME | COMPANY | ROLE |
| Anthony Alexander | Hitachi Energy | Guest |
| Robert Allison | Dominion Energy | Member |
| Mario Alonso | Georgia Transformer | Guest |
| Jason Beaudoin | Weidmann | Guest |
| Juan Carlos Cruz Valdes | Prolec GE | Guest |
| Ronald Hernandez | Doble Engineering | Guest |
| Chan Min Jeong | HD Hyundai Electric | Guest |
| Yeounsoo Kim | JST Power Equipment | Member |
| Landen Kwan | US NRC | Guest |
| Weijun Li | Braintree | Guest |
| Ricardo Lopes | Efacec | Guest |
| Geraldo Magela, Jr. | Siemens Energy | Guest |
| Logan Merrill | Omicron | Guest |
| David Murray | TVA | Member |
| Ryan Musgrove | OG&E | Member |
| Kris Neild | Megger | Guest |
| Niteshkumar Patel | Hyundai Power Transformers USA | Guest |
| Dominic Pollaro | NASS | Member |
| Sheila Ray | US NRC | Guest |
| Marnie Roussell | Entergy | Guest |
| Hyoung Gon Ryu | HD Hyundai Electric | Guest |
| Ahmad Skeik | Crosslink Technology | Guest |
| Craig Swinderman | Mitsubishi Electric Power Products, Inc. | Member |
| Janusz Szczechowski | Maschinenfabrik Reinhausen | Guest |
| Joseph Tedesco | Hitachi Energy | Guest |
| Pedro Trujillo | Hyundai Power Transformers USA | Guest |
| Christopher Whitten | Hitachi Energy | Guest |
| Grace Yuan | Hitachi Energy | Member |

**Attachment K.4.5**

**Working Group C57.135 - IEC/IEEE 60067-57-135**

Chair: Ewald Schweiger
Secretary: Richard von Gemmingen

**Guide for the Application, Specification and Testing of Phase-Shifting Transformers**

1. Meeting was called to order at 1:45 PM (MDT) on Monday March 24th, 2025,
with “Welcome & Chair’s remarks”.
2. Details about attendance:
	* + Attendance: 58
		+ Members: 19
		+ Guests: 39
3. QR code for electronic sign-in was used instead of paper roster
4. Agenda was displayed
5. Call for essential patents
	* + IEEE slides on essential patents have been provided in the meeting invitation, posted on the internet and were shown and a call for essential patents was made.
		 🡪 No essential patents or issues were reported.
6. Code of Ethics and Conduct
	* + IEEE slide on code of ethics and conduct was reviewed.
7. Copyright Policy
	* + Slides of the IEEE copyright policy have been provided in the meeting invitation, posted on the internet and were shown and request made to identify any potential copyright issues.
8. Participant behavior
	* + The slides on “Participant behavior in IEEE-SA activities is guided by the IEEE Codes of Ethics & Conduct” have been presented.
9. Membership Roster displayed.
10. Quorum check
	* + Total number of members is 27 requiring 14 members for quorum.
		+ 19 members were present. 🡪 Quorum was achieved.
11. Approval of agenda
	* + Eric Davis presented motion to approve the agenda
		+ Marcus Stank provided second.
		+ Motion was unanimously approved by Working Group members
12. Approval of meeting minutes from fall 2024 were posted
	* + The Meeting Minutes were posted on the [PTRC website](https://www.transformerscommittee.org/subcommittees/powertransf/#:~:text=C57.135%20%E2%80%93%20IEEE%20Guide%20for%20the%20Application%2C%20Specification%20and%20Testing%20of%20Phase%2DShifting%20Transformers).
		+ Eric Davis presented motion to approve the agenda.
		+ Marcus Stank provided second.
		+ Motion was unanimously approved by Working Group members.
13. Dual Logo and IEC status updated by Kevin Juchem and Ewald Schweiger
	* + IEC TC 14 Plenary meeting in Rome Italy April of 2024 decided to form a MT (Maintenance Team) with title ‘phase-shifting transformers’ and scope ‘to maintain standards dealing with phase shifting-transformers projects’. MT 60076-57-PST has been established to work on the revision of IEC/IEEE 60076-57-1202 and IEC/ IEEEE 60076-57-135 and appointed Kevin Juchem as convener.
		+ Kevin Juchem provided update on international participants of IEC team.
		+ Ewald Schweiger reiterated how this makes alignment of IEC and IEEE easier for this document.
14. Mike Thompson, PSRC (Power Systems Relaying and Controls Committee) liaison provide update on C37.245 (IEEE Guide for the Application of Protective Relaying for Phase-Shifting Transformers)
	* + PSRC met in January and discussed updating C37.245 in parallel with IEC/IEEE 60067-57-135.
		+ Subcommittee agreed to form a task force to support the revision of our PST Guide / Standard.
		+ Next PSRC meetings will be in May and September this year.
		+ May meeting will be earliest that a PAR study group for C37.245 can be formed.
		+ Update conclude and opportunity was presented to membership for discussion. No discussion or questions were presented.
15. Topic 1 – Definitions:
	* + Luc Dorpmanns presented a review of definitions from the Standard and the guide.
		+ In most cases the definitions align well.
		+ Recommendation is to keep and use definition list from standard and use this in guide.
		+ Christoph Ploetner commented that IEC just finished the IEC definitions and will provide this to Luc.
		+ Motion:
			1. Luc Dorpmanns made motion to: “use definitions as we have in the standard for the guide “.
			2. Kevin Juchem seconded the motion.
			3. After much good discussion, the motion was unanimously approved.
			4. Details of discussion prior to vote on motion:
				1. Joe Watson commented on use of figures and need to clarify decision not to have figures in definitions.
				2. Luc Dorpmanns responded that figures are separate in guide from definitions.
				3. Mike Thompson commented if we do not have definitions will they go into the IEEE technical guideline?
				4. Ewald Schweiger responded he did not know and would check.
				5. Christoph Ploetner commented that IEC does not allow figures in definitions.
				6. Ewald Schweiger suggested we use IEC as template and have the figures in an Annexes.
				7. Sanjay Patel pointed out that the IEC in the short circuit document does have figures in the definition.
				8. Christoph Ploetner indicated that the IEC will be removing figures from definitions in the future.
				9. Kevin Juchem offered that we are not creating new definitions so best may be to retain same approach as before.
				10. Trent Williams commented that the IEEE Dictionary can have multiple definitions for the same term, and we might be re-inventing the wheel.
				11. Ewald Schweiger asked if there was further discussion. None being offered, the motion was voted on and approved.
16. Topic 2 – Changes in content
	* + Kevin Juchem reviewed several sections, (5.4, 6.3, 9, 10 and 12)
			1. Section 5.4 – Suggest this to move to surge coordination.
			2. Section 6.3 – Suggest updating the nameplate section.
			3. Section 9 – suggest updating the Controls systems.
			4. Section 10 – Should be referenced in Standard.
			5. Section 12 – PST modes for low flow .
				1. Suggest Annex A for other solutions such as ARS (Advance Retard Switch).
				2. Suggest Annex B for figures/other etc.
		+ Audience participated in considerable discussion after presentation.
		+ Audience Discussion Details:
			1. Joe Watson commented discussion was all good.
			2. Sanjay Patel asked is the ARS switch patented? Is Maschinenfabrik Reinhausen the only manufacturer? If so, should not be in guideline and suggest Tom Prevost should be consulted.
			3. Ewald Schweiger requested of audience if anyone would investigate if ARS were patented.
			4. Joe Watson indicated he did not believe it is patented but may need a release letter to mention it.
			5. Sanjay Patel asked if he (Joe) was sure.
			6. Ewald Schweiger said he would lead point of investigation on Patent or Trademark.
			7. Trent Williams indicated that ARS can be mentioned but there is a procedure to follow.
			8. Mike Thompson commented that the main concern is you cannot write a standard to give a monopoly. Think of other ways to do the same thing. Also possible is a letter of assurance is obtained indicating the technology is made available you can.
			9. Sanjay Patel was skeptical about how available the technology is if it is single sourced.
			10. Ewald Schweiger repeated his call to audience to assist in checking on this. Sebastian Rehkopf took the task to investigate the status. Also, stated that the precaution taken was to move the ARS out of the Standard and into the Guide.
			11. Kevin Juchem indicated that the guide describes a functionality and use in a product, it is not users fault that only one manufacturer makes this.
			12. Ewald Schweiger asked group if any concerns to move items as proposed by Kevin Juchem.
			13. Mike Thompson suggested that control systems section should still be removed as it needs to be updated, modernized and improved.
			14. Joe Watson stated that nameplates need to have PST specific information added and included in document.
			15. Kevin Juchem also preferred to have additional information in the guide.
			16. Alexander Kraetge stated that updates to testing may be difficult when IEC and IEEE base lines are a little different.
			17. Luc Dorpmans reminded audience that the history of the guide was before the standard was developed so there may be some concerns and now is opportunity to work things out.
			18. Joe Watson indicated testing guide would be helpful to include information on some things that need to be done a little different in field vs. factory such as temporary test bushings etc. versus the actual procedures in the standard.
			19. Mike Thompson indicated anything factory testing should be in the standard, but commissioning testing in the field may be useful in a guide.
			20. Joe Watson reiterated that there is much factory testing which cannot be repeated in the field.
			21. Sanjay Patel indicated this can be true for other transformers, so why make distinction for PST?
			22. Kevin Juchem stated in the special PST testing guide, the first document uses lots of “shall” statements. The “shall” term should not be used in guides.
			23. No motions were presented, and no further discussion was had. The chair then moved forward with meeting status and next steps.
17. Status, and next steps
	* + Feedback from PRC Committee meeting on TF and status on PAR SG C37.245 Protection guide (Michael Thompson).
		+ Update PAR to new title: Technical guideline for the Application, Specification and Testing of Phase-Shifting Transformers.
		+ Continuation of review and collection of your feedback.
18. Old Business
	* + None
19. New Business
	* + Joe Watson recommended that same people work on Guide and Standard to keep best alignment of both documents.
20. Adjournment
	* + Meeting adjourned at 2:43pm.
21. Next meetings (planned):
	* + Virtual meeting – might be scheduled before October 2025.
		+ In-person meeting F25 – October 19-23, 2025 in Bonita Springs, FL.

Respectfully submitted,

Ewald Schweiger – WG Group Chair
Richard von Gemmingen – WG Secretary

List of attendees for this meeting:

|  |  |  |  |
| --- | --- | --- | --- |
| **Last name** | **First name** | **Company / Affiliation** | **Status** |
| Antosz | Stephen | Consultant | G |
| Beaudoin | Jason | Weidmann Electrical Technology | G |
| Calitz | David | Siemens Energy | G |
| Colopy | Craig | Retired | G |
| Crockett  | Janet | Fayettville PWC  | G |
| Czernorucki | Marcos | Hitachi Energy | G |
| Davis | Eric | Consultant | M |
| Dorpmanns | Luc | Royal SMIT Transformers B.V. | M |
| Foster | Patrick | NextEra Energy | G |
| Goglia | Slaven | Koncar Power Transformers Ltd | G |
| Gustavsson | Niklas | Hitachi ABB Power Grids | M |
| Hamoir | Didier | Transformer Protector Corp | G |
| Janakiraman | Balaji | Virginia Transformer Corporation | G |
| Jang | Donghyun | LS Electric | G |
| Jarosz | Patrycia | IEEE SA | G |
| Jeong | Chanmin | HD Hyundai | G |
| Juchem | Kevin | Hitachi Energy | M |
| Kaineder | Kurt | Trench Austria | M |
| Kasonga | Mick | Oncor Electric | G |
| Kim | Heonsu | LS Electric | G |
| Kraetge | Alexander | Omicron Electronics | G |
| Lopes | Ricardo | Efacec Transformers | G |
| Magela junior | Geraldo | Siemens Energy | G |
| Mendez Zamora | Omar | Prolec GE | M |
| Mikulecky | Filip | Koncar Power Transformers Ltd | G |
| Munoz | Martin | Orto de Mexico | G |
| Musgrove | Ryan | OG+E | M / Chair PTSC |
| Natale | Anthony | HICO America | G |
| Neild | Kris | Megger | G |
| Orozco | Eduardo | GE Grid Solutions | G |
| Park | Dean | Hyosung HICO | G |
| Patel | Sanjay | TD-Smit Transformers | M |
| Ploetner | Christoph | Siemens Energy | M |
| Rehkopf | Sebastian | Maschinenfabrik Reinhausen GmbH | M |
| Saeed | Rana | Attendee | G |
| Sarkar | Amitabh | Virginia Transformer Corporation | G |
| Schindler | Stefan | Maschinenfabrik Reinhausen GmbH | G |
| Schrammel | Alfons | Siemens Energy | M |
| Schwartz | Danny | Quality Switch | G |
| Schweiger | Ewald | Siemens Energy | M / Chair |
| Segovic | Dario | Koncar Power Transformers Ltd | G |
| Simon | Preston | Electrical Technologies | G |
| Singh | Amitkumar | Con Edison Company of New York | G |
| Sohail | Muhammad Abdullah | Trench Canada | G |
| Solano | William | Voltyx | G |
| Stank | Markus | Maschinenfabrik Reinhausen | M |
| Stechschulte | Kyle D | AEP | M |
| Thomas | Scott | Hitachi Energy | G |
| Thompson | Michael | SEL Engineering Services, Inc. | M |
| Torchia | Leonard | PSE&G | G |
| Viereck | Karsten | Maschinenfabrik Reinhausen | G |
| Vir | Dharam | Prolec GE Waukesha | G |
| von Gemmingen | Richard | Dominion Energy | M / Secy |
| Watson | Joe | JD Watson and Associates Inc. | M |
| Weisensee | Matthew | Pacificorp | M |
| White | Joe | Power Engineers | G |
| Williams | Trenton | Advanced Power Technologies | M |
| Zhou | AnnaBelinda | JST Power | G |

**Attachment K.4.7**

***WG for the Revision of C57.12.10***

***IEEE Standard Requirements for Liquid-Immersed Powe****r* Transformers

3:15 p.m. – 4:30 p.m. Central Time, Monday, March 24, 2025

Hyatt Regency Denver, Denver, Colorado, USA

*Unapproved Meeting Minutes*

TF Chair Scott Digby called the meeting to order at 3:15 p.m., Monday, March 24, 2025. As this was the second meeting of this new WG, the vice-chair role has not yet been established or filled. WG Secretary is Juan Castellanos.

Total Attendance was: 83

Members 33

Guests requesting Membership: 14

Guests not requesting membership: 36

The total WG membership stands at 60, so quorum was achieved. The meeting attendance list is included at the end of these minutes.

A proposed meeting agenda was presented by the WG Chair, a motion to approve the agenda was made by Mr. Eduardo García, seconded by Mr. John K. John, with no changes the agenda was approved. The minutes from the previous meeting in Saint Louis were presented as well, a motion to approve the minutes was made by Mr. Richard von Gemmingen, seconded by Mr. Eduardo García, with no comments or changes the minutes were approved. Attendance rosters were circulated. The WG Chair made the requisite Call for Patents and there was none noted by those present. The WG Chair presented the IEEESA Copyright Policy slides as well as the IEEE-SA activity participant behavior slides.

During the meeting, the chairman explained that although the PAR expires Dec.31, 2028, the standard expires Dec.31, 2027, therefore the group will look to have the work done in 2026 and go for SA balloting in 2027.

The results of the survey on the circulated draft 1 of the standard were presented. In total, 32 comments were received (16 editorial and 16 general or technical). The editorial comments will be solved through general cleanup, but the intention of the meeting is to focus on the general and technical ones.

Of the 16 general or technical comments, 12 were discussed during the meeting according to the following resolutions based on the comment number from working Spreadsheet:

1.- To revise first column of Table 1, delete: “Rated base kVA < 833 kVA single-phase”, since this range is out of the scope of the standard.

5.- Set up a small group to study this topic (OLTC in the HV): Richard Von Gemmingen, John K, John and Thomas Keels.

6.- DGA monitor valves as optional in Table 4 is already in clause 5, to be specified by the user.

8.- To include provisions in table 4 for adding additional radiators as an option. To write this section down by a small group to study this topic: Saramma Hoffman, Thomas Keels.

11.- To use “sidewall” as proper term.

12.- To add a DETC enclosure as an option to the text.

13.- leave clause as it is.

16.- leave clause as it is.

18.- The chairman will look for someone to help with this point.

19.- Accepted, to add “operating” after liquid.

20.- To include “One SPR per each liquid filled compartment, i.e. the LTC compartment.”

24.- Change wording, use “splices” instead of “intermediate terminations”. Refer to control cabinet standard.

The remaining technical comments to be solved in the next meeting in Bonita Springs, FL in October 2025.

There being no new business, the meeting was adjourned.

Respectfully Submitted,

Juan Castellanos, Secretary WG

|  |  |  |  |
| --- | --- | --- | --- |
| First Name | Last Name | Affiliation | Requested membership? |
| Saramma | Hoffman | PPL | Member |
| Ryan  | Musgrove | OG&E | Member |
| Rodrigo | Ronchi | Weg-Voltran | Member |
| Gabriel | Delgado | Invenergy | Member |
| John | John | Virginia Transformer | Member |
| Anthony  | Natale | Hico America | Member |
| Didier  | Hamoir | Transformer Protector Corp. | Member |
| Matthew  | Webb | GE Vernova | Member |
| Juan | Castellanos | Prolec GE | Secretary |
| Giles | Bargone | FISO | Member |
| Scott  | Digby | Duke Energy | Chair |
| Peter | Zhao | Hydro One | Member |
| William | Boettger | Consultant | Member |
| Garret  | Bradshaw | Howard industries | Member |
| Sami  | Debass | EPRI | Member |
| Sunny | Swarna | Virginia Transformer | Member |
| Tim | Dappen | Cargill | Member |
| Scott | Thomas | Hitachi Energy | Member |
| Ashwini | Labh | Hitachi Energy | Member |
| Alireza | Gorzin | Black and Veatch | Member |
| Will  | Elliot | ACP/SWEPCO | Member |
| Thomas  | Keels | Keelectric Engineering | Member |
| Kayland  | Adams | Prolec GE - Waukesha | Member |
| Shankar  | Nambi | Bechtel Energy | Member |
| Jason  | Snyder | First Energy | Member |
| Kyle  | Stechschulte | AEP | Member |
| Martín  | Muñoz | Orto de Mexico | Member |
| Garret | Sarkinen | Xcel Energy | Member |
| Jason | Beaudoin | Weidmann | Member |
| Eduardo | García | Siemens Energy | Member |
| Luc  | Loiselle | Tetra Tech | Member |
| Sebastian  | Renhopf | Machinenfabrik Reinhausen | Member |
| Richard | Von Gemingen | Dominion Energy | Member |
| Wilerson | Calil | Hitachy Energy | Y |
| Jesus M. | Perez | Prolec | Y |
| Ricardo | Castro Lopes | Efacec | Y |
| Muhammad | Sohail | Trench Group | Y |
| Markus | Stank | Machinenfabrik Reinhausen | Y |
| Jasim | Khan | Georgia Tech | Y |
| Jose Luis | Machain | Prolec | Y |
| Sudip  | Chanda |  | Y |
| Hossein | Nabi-Bidheni | Engineer | Y |
| Manan | Pandya | Siemens Energy | Y |
| Salahuddin | Shaikh | NRG | Y |
| Amifkumar | Singh |  | Y |
| Komelabhar | Lalchem |  | Y |
| Polo | Orozco | GE | Y |
| Craig  | Colopy | Retired from Eaton | N |
| Roberto | Da Silva | Machinenfabrik Reinhausen | N |
| Mike | Craven | Qualus Power Service | N |
| Park | Dean | Hyosung - HICO | N |
| Daniel  | Obregon | TTE Transformers | N |
| Andrew  | Steineman | Delta Star | N |
| Dan  | Schwartz | Quality Switch | N |
| Drew | Welton | Intellirent | N |
| Mark | Tostrud | Dynamics Ratings | N |
| Miguel  | Fernandez | Beld | N |
| Jimmy | Smith | Howard | N |
| Jonathan | Stanffer | USBR | N |
| Franjo | Keleman  | Siemens Energy  | N  |
| Kyungchan | An | Hyosung | N |
| Eric  | Elson | SDGE | N |
| Hyounggon | Ryu | HD | N |
|  Troy | Tanaka  | Burns & McDonald  | N |
| Thomas | Propts | Dominion Energy | N |
| Phil | Hopkinson | HVOLT | N |
| Perry | Reeder | Quantas  | N |
| Ronny | Doerr | SGB-Smit Group | N |
| David | Burlo | Xcel Energy | N |
| Onome | Avanoma | Onthoole | N |
| Randy | Roberts | Southern Co. | N |
| Landen | Kuan | NRC | N |
| Sheila | Ray | NRC | N |
| Zachary | Yin  | Sieyuan | N |
| Alex | Zeigher | Hitachi Energy | N |
| Marcus | Scheffer | Meta | N |
| Bill  | Griesacker | Consultant | N |
| Andreas  | Kurz | Reinhausen | N |
| Hector | Garza | Orto | N |
| Asam | Yu | SEEC | N |
| Matt  | Chu | SEEC | N |
| James  | Norton | Oncor | N |
| Joe | Watson | Consultant | N |

**Attachment K.4.8**

 **Working Group C57.140 Meeting** 

**Spring 2025 Meeting**

Centennial H, Denver, CO

Monday, March 24th, 2025

3:15PM – 4:30 PM Mountain Time Zone

Chair: Marcos Ferreira Vice-Chair: Jeremiah Bradshaw Secretary: Traci Hopkins **UNAPPROVED MINUTES**

SUMMARY:

Meeting started at 15:17. In Fall 2024 there was a TF meeting which approved a Title and Scope for going to PAR; however this did not match the information in the PAR. This is the first meeting for the WG of C57.140. There were a total of 69 attendees (40 Members & 29 Guests). Volunteers were identified for Task Force leads and members to review overlapping documents and present their findings at the Fall 2025 meeting. Meeting adjourned at 15:48.

MINUTES:

**●** Topic: Call For Patents

○ No participants spoke up about patent claims.

**●** Topic: IEEE copyright policy

○ Displayed and Discussed

**●** Topic: Title, Scope & Purpose

○ Title, Scope & Purpose were not sent to PAR with the proper wording that was voted on by the TF members; PAR to be resubmitted with correct information. ○ Based on the previous Task Force meeting’s notes, the following needs to be changed in the PAR request.

■ Title: Guide for Life Extension of Liquid Immersed Power Transformers and Reactors

■ Scope: This document provides guidelines to assist the user in extending the useful life of liquid immersed Power Transformers and Reactors.

○ Additional notes, change the title and scope term of “Liquid-Immersed” to “Liquid-Filled”.

■ Stephanie (AVO): In the current draft of C57.12.80 that will be going to ballot soon, the definition for liquid type transformers also states

“liquid-filled” and “liquid-immersed (not preferred)”. Therefore we should use “liquid-filled”

*Comment from Weijun Li (C57.12.80 was approved by IEEE SA Standards Board in December 2024 and will soon be published. Replaced the term of liquid-immersed with liquid-type. The terms of liquid-immersed and liquid-filled are retained as synonyms. The term of “preferred”/”not preferred” has been removed.)*

**●** Topic: Task Forces for review of other related documents

○ The C57.140 officers will work with IEEE SA to obtain the current draft documents of the following:

■ C57.93 (use the current published version)

■ C57.125 (get a draft from WG)

■ C57.143 (get a draft from WG/this document was approved by IEEE SA Standards Board in December 2024; will soon be published)

■ C57.152 (get a draft from WG)

■ C57.170 (get a draft from WG/this document is going to ballot soon)

■ C57.637 (get a draft from WG)

○ Task Force 1: C57.152 Review

■ Dominic Pollaro (NASS) [TF Lead]

■ Jeffrey Oakley (NASS)

○ Task Force 2: C57.170

■ Diego Robalino (Megger) [TF Lead]

■ Evgenii Ermakov (Hitachi)

○ Task Force 3: C57.125

■ Salahuddin Shaikh (NRG) [TF Lead]

■ Juan Ortiz (Reinhausen)

○ Task Force 4: C57.637

■ Ed Tenyenhuis (Hitachi) [TF Lead]

○ Task Force 5: C57.143

■ Emilio Morales (Qualitrol) [TF Lead]

■ Derek Hollrah (Burns & McDonnell)

○ Task Force 6: C57.93

■ Marcos Ferreira (FEMA) [TF Lead]

■ Mickel Saad (Hitachi)

■ Jonathan Sinclair (Black and Veatch)

■ Salahuddin Shaikh (NRG)

■ Jesse Duffy (Nashville Electric Service)

ATTENDANCE RECORD:

* Total of 69 attendees (40 Members & 29 Guests)
* Attendance was taken using QR code
* Spreadsheet of participants below.

NEXT IN-PERSON MEETING:

* To be held during Fall PES Transformers Committee Meeting October 19-23, 2025 in Bonita Springs, FL, USA

ACTION ITEMS:

● Officers:

○ Contact IEEE SA for a PAR modification to include the correct Title and Scope. ○ Email to IEEE SA for obtaining the current draft working version of relevant documents for review.

○ Email the WG with clarification on the conflicts between the title and scope presented and what was agreed upon at the Fall 2024 meeting.

■ Possibly a vote will be presented for the change.

● Task Force Leads:

○ Establish meetings with necessary participants to review the assigned documents for comparison.

|  |  |  |  |
| --- | --- | --- | --- |
| What is your first name? | What is your last name? | What is your affiliation? | Membership Status |
| Marcos | Ferreira | FEMA | **Chair** |
| Paul | Boman | Hsbi&i | Guest |
| John | Bule | None | Guest |
| Olivia | Cordova | Bureau of Reclamation | Guest |
| Egui | Espitia | Reinhausen Manufacturing Inc | Guest |
| Kyle | Feaster | Xcel Energy | Guest |
| Lorne | Gara | Shermco Industries | Guest |
| James | Gardner | Prolec-GE Waukesha | Guest |
| Joshua | Garner | RESA Power | Guest |
| Attila | Gyore | MIDEL and MIVOLT Fluids Ltd | Guest |
| Jean Carlos | Hernandez-mejia | NEETRAC - Georgia Tech | Guest |
| Bernard | LaBean Jr | Consumers Energy Company | Guest |
| Libardo | Lopez  | Hitachi Energy  | Guest |
| Geraldo | Magela Júnior | Siemens-Energy | Guest |
| Jinesh | Malde | MIDEL & MIVOLT FLUIDS INC. | Guest |
| Toni | Mellin | Vaisala | Guest |
| Omar  | Mendez Zamora  | Prolec  | Guest |
| Logan | Merrill | OMICRON | Guest |
| Juan | Ortiz | Reinhausen Manufacturing | Guest |
| Crystal | Qiao | Trench Canada  | Guest |
| Diego | Robalino | Megger | Guest |
| Nithin | Satheesh | Trench Limited | Guest |
| Alan | Sbravati | Hitachi Energy | Guest |
| Sunny | Swarna | Virginia Transformer Corporation  | Guest |
| Charles | Sweetser | Omicron  | Guest |
| James | Thompson | T &R Service | Guest |
| Eduardo  | Tolcachir  | TTE Transformers  | Guest |
| Leon | White | Hedrich North America  | Guest |
| William | Whitehead | MR | Guest |
| Jeffrey | Wright | Duquesne Light | Guest |
| Thomas | Aikens  | Delta Star | Participating Member |
| Mario | Alonso | Georgia Transformer | Participating Member |
| Piotr | Blaszczyk | Specialty Transformer Components | Participating Member |
| Luiz | Cheim | Hitachi | Participating Member |
| James | Cross | Kinectrics AES | Participating Member |
| Jesse | Duffy | Nashville Electric Service  | Participating Member |
| Evgenii  | Ermakov  | Hitachi Energy  | Participating Member |
| Brad | Greaves | Weidmann Electrical Technology, Inc.  | Participating Member |
| Niklas | Gustavsson | Hitachi Energy | Participating Member |
| Roger | Hayes | GE Vernova | Participating Member |
| Ronald  | Hernandez | Doble Engineering | Participating Member |
| Derek | Hollrah | Burns & McDonnell  | Participating Member |
| Laszlo  | Kadar  | Laszlo & Associates  | Participating Member |
| Dmitriy  | Klempner  | Southern California Edison  | Participating Member |
| Mario  | Locarno  | Doble engineering | Participating Member |
| Stephanie | Mabrey | Avo Diagnostics | Participating Member |
| Kumar | Mani | Duke Energy | Participating Member |
| Emilio | Morales-Cruz | Qualitrol  | Participating Member |
| David  | Murray  | TVA | Participating Member |
| mark  | newbill  | Hitachi  | Participating Member |
| Mike | Nolte | Kiewit | Participating Member |
| Jeffrey | Oakley | Member | Participating Member |
| Anastasia  | OMalley | Consolidated Edison Co NY  | Participating Member |
| Dominic | Pollaro  | NASS | Participating Member |
| John | Pruente | APC construction llc | Participating Member |
| Patrick | Rock | American Transmission Company  | Participating Member |
| Mickel | Saad | Hitachi Energy | Participating Member |
| Alaor | Scardazzi  | Siemens Energy | Participating Member |
| Salahuddin  | Shaikh | Transformer SME at NRG Energy Inc | Participating Member |
| Jonathan | Sinclair | Black and Veatch | Participating Member |
| Ed | Tenyenhuis  | Hitachi energy | Participating Member |
| Mark | Tostrud | Dynamic Ratings | Participating Member |
| Cole | Van Dreel | American Transmission Co. | Participating Member |
| Dharam | Vir | Prolec GE | Participating Member |
| Stephen | Vullo | GE Vernova | Participating Member |
| Joe | White | POWER Engineers | Participating Member |
| Deanna  | Woods | PTT | Participating Member |
| Traci | Hopkins | H2scan | **Secretary** |
| Jeremiah | Bradshaw  | Bureau of Reclamation  | **Vice-Chair** |

**Attachment K.4.9**

**Power Transformers Subcommittee**

**Working Group Report**

|  |  |
| --- | --- |
| **Document #:** | **C57.125** |
| **Document Title:** | **Guide for Failure Investigation, Documentation, Analysis and Reporting for Power Transformers and Shunt Reactors** |
| **Chair:** | **Hakan Sahin** | **Vice-Chair** | **Thomas Melle** |
| **Secretary** | **Adam Sewell** | **Percent Complete** | **100%** |

|  |  |  |  |
| --- | --- | --- | --- |
| **Current Draft Being Worked On:** | **1.0** | **Dated:** | **February 2025** |
| **PAR Expiration Date:** | **December 31, 2025** |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Meeting Date:** |  **March 24, 2025** | **Time:** | **4:45pm – 6:00pm** |
| **Location:** | **Denver, CO, USA** |  |  |

|  |  |  |
| --- | --- | --- |
| **Attendance:** | **Members** |  **32 of 49** |
|  | **Guests** | **74** |
|  | **Guests Requesting Membership** | **(20)\*\*** |
|  | **Total**\* | **106** |
| **\* Attendance list for this meeting is shown at end of meeting minutes****\*\*Because WG approved to send draft to ballot, no new WG Members will be added. Member list as of Spring 2025 meeting is final WG list\*\*** |

**Meeting Minutes / Significant Issues / Comments:**

Meeting was called to order at 4:45pm, March 24, 2025 at Hyatt Regency Denver.

1. Administrative
	1. IEEE Patent Policy and Call for Patents
		1. No comments from group
	2. IEEE SA Copyright Policy
		1. No comments from group
	3. Review of agenda
		1. No comments from group
	4. Reminder on the purpose and the scope of the working group, and the timeline
		1. The expectation from this WG is to review and update the document as it expires on 12/31/2025.
		2. Projected Completion Date for Submittal to RevCom: Dec 2025
	5. Introductions of the attendees
		1. Attendance was taken by QR Code sign-in…no paper attendance sheets were passed out.
		2. Name/affiliation was announced as attendees spoke during the meeting.
	6. Updated membership review and count for quorum
		1. 49 members and 29 were counted as present via hand count.
			1. QUORUM ACHIEVED
		2. *Attendance list after meeting completed showed 32 members attended*.
		3. Members are expected to attend and stay in the meeting so business can be conducted.
		4. Because WG approved to send draft to ballot, no new WG Members will be added. Member list as of Spring 2025 meeting (with 49 members) is final member list
	7. Approvals of previous minutes and agenda:
		1. Approval of the agenda for Spring 2025
			1. MOTION to approve Spring 2025 agenda – D.Murray, 2nd – F.Mills
			2. No objection to unanimous approval – MOTION APPROVED
		2. Approval of the Fall 2024 unapproved meeting minutes
			1. MOTION to approve Fall 2024 unapproved meeting minutes – A.Sarkar, 2nd – D.Schwartz
			2. No objection to unanimous approval – MOTION APPROVED
2. Old Business
	1. Draft 1.0 was emailed to the 49 WG members before the Spring 2025 meeting and was voted on electronically.
		1. 41 members responded (85% response)
		2. 35 approved with no comments
		3. 3 abstained
		4. 3 approved with comments, making it 38/41 approval (93%)
		5. Zero disapproved
	2. Member comments from the Draft 1.0 email vote were reviewed in the S25 meeting
		1. Comment from Weijun Li: Definition of Compressive Force: If I remember correctly, the WG voted to use definition from C57.164 but it appears that it remains unchanged in the updated document. Could you please double check?
			1. Chair’s response: Weijun is correct. The circulated document did not have the compressive force definition updated as it was approved during Spr\_24 meeting:
			2. Definition within C57.164 for compressive force will be put in the document by Chair before being sent to ballot:
		2. Comments on Draft 1.0 from Anastasia O’Malley:
			1. In section 5.3.2.2 Other hazards, suggest adding an additional bullet point, - Chemical hazards:  There are hazards associated with touching transformer oil and other dielectric liquids.  Direct contact can cause skin irritation and potentially other health problems. Always wear appropriate PPE.
			2. In section 5.4.4 Internal inspection of main tank and LTC, in the 4th paragraph, on line 852, suggest adding a sentence before the last sentence: … air at a safe positive pressure.  Note that if the combustible gas content above the oil is excessive (> 0.5% by volume), an intermediary purge, where the displaced oil is followed by tested, dry nitrogen may be recommended.  Appropriate precautions need to be taken regarding PCB contamination in….
		3. Comments on Draft 1.0 from Sanjib Som:
			1. Line 466 -468, page 6 – that a spiral winding has no key-spacer between turns should be mentioned. A helical winding is a spiral winding with key-spacers between turns.
			2. Lines 469-472 , page 6 – they can be connected in series as well (Siemens does). It is inaccurate to presume that it cannot be used for the higher side voltage. We can discuss more if there is a need.
			3. 21000 Annex E, page 79 – if this blank, please delete
3. New Business
	1. The chair announced that since the PAR expires at the end of 2025, the WG will most likely not have enough time to resolve all comments and get the document approved before the PAR expires, a PAR extension should be requested.
		1. MOTION – To have the chair make a motion at the PTSC to request a 1 year PAR extension to start the ballot process no later than Fall 2025 meeting - by B.Forsythe, 2nd – P.Panesar
		2. After some discussion of the MOTION, an amendment was made:
		3. AMMENDMENT - To have the chair make a motion at the PTSC to request a 2 year PAR extension to start the ballot process no later than Fall 2025 meeting – by S.Som, 2nd – F.Mills
			1. No objection to unanimous approval – AMENDMENT APPROVED
	2. MOTION To have the chair request at the PTSC for the ballot process to start as soon as possible by June 2025 at the latest by A.Sarkar, 2nd – S.Som
		1. No objection to unanimous approval – MOTION APPROVED
	3. MOTION To form a comment resolution group and give them the authority to resolve editorial issues and comments where consensus is reached by the CRG. If any of the comments cannot be resolved to a consensus point, they will be brought back to the Working Group for Resolution by P.Panesar, 2nd – D.Schwartz
		1. No objection to unanimous approval – MOTION APPROVED
		2. 11 CRG volunteers announced during the meeting:
			1. S.Debass, B.Forsyth, E.Garcia, W.Li, T.Melle, F.Mills, R.Musgrove, T.Raymond, H.Sahin, A.Sarkar, A.Sewell
			2. J.Yun volunteered to be part of CRG after meeting adjourned
4. Next meeting: October, 20, 2025 at the Fall 2025 Transformers Committee Meeting scheduled for October 19-23, 2025, Bonita Springs, FL, USA.
5. Close of meeting
	1. Meeting adjourned at 5:45pm

Submitted by: Hakan Sahin Date: 4/11/25

**March 24, 2025 Meeting Attendance (RM = Request Membership - Because WG voted to send draft to ballot, no new WG Members will be added. Member list as of Spring 2025 meeting is final WG list):**

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**Attachment K.4.10**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Power Transformers Subcommittee****Working Group Report**

|  |  |
| --- | --- |
| **Document #:** | **C57.157** |
| **Document Title:** | **Guide for Conducting Functional Life Tests on Switch Contacts Used in****Insulating Liquid-Immersed Transformers** |
| **Chair:** | **Adam M. Sewell** | **Vice-Chair** | **N/A** |
| **Secretary** | **Piotr Blaszczyk** | **Percent Complete** | **N/A** |

|  |  |  |  |
| --- | --- | --- | --- |
| **Current Draft Being Worked On:** | **N/A** | **Dated:** | **N/A** |
| **PAR Expiration Date:** | **PAR expires 12/31/2027****Std expires 12/31/2025** |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Meeting Date:** | **25 March 2025** | **Time:** | **8:00am-9:15am**  |
| **Location:** | **Denver, CO, USA** |  |  |

|  |  |  |
| --- | --- | --- |
| **Attendance:** | **Members** | **11 of 18** |
|  | **Guests** | **23** |
|  | **Guests Requesting Membership** | **(4)** |
|  | **Total**\* | **34** |
| **\* Attendance list for this meeting is shown at end of meeting minutes** |

**Meeting Minutes / Significant Issues / Comments:**1. Meeting was called to order at 8:00am, March 25, 2025 at Hyatt Regency Denver at Mineral Hall A (3rd Floor).
2. Presentation of Agenda
3. Presentation of IEEE Standards Slides
	1. Call for Patent Claims & Copyright Notice
	2. No comments from working group about any patent claims or copyright notice
4. Distribution of attendance sheets
	1. Attendance was taken by QR Code sign-in…no paper attendance sheets were passed out.
	2. Please send an email to adamsewell@ieee.org with the subject: C57.157 EMAIL to be added to the C57.157 email list
5. Checking the Quorum – 18 members so 10 needed for quorum.
	1. 11 out of 18 members were in attendance of the meeting so quorum was achieved.
6. Approval of the Spring 2025 Agenda and Fall 2024 Meeting Minutes.
	1. MOTION was made by D.Schwartz and 2nd by M.Newbill to approve Spring 2025 Agenda.
		1. No opposition to unanimous approval of the MOTION – APPROVED
	2. MOTION was made by J.Sewell and 2nd by D.Schwartz to approve Fall 2024 Meeting Minutes.
		1. No opposition to unanimous approval of the MOTION - APPROVE
7. Chair announcements
	1. Current guide is set to expire December 31, 2025
	2. This group was to determine work needed for this standard and create a PAR for revision if needed. Par was created after the Spring 2023 meeting and has PAR Approval Date of 05 Jun 2023 and expiration of 31 Dec 2027.
8. Old work
	1. Request was made to share previous presentations that were used to develop this guide
		1. Chair posted previous presentations and 2015 C57.157 standard on IEEE Collabratec and IEEE TC Power Transformer Subcommittee pages
		2. Chair presented background information on this guide during the S24 meeting by showing one of the presentations that is available on IEEE Collabratec.
	2. Members of this group were tasked to review current guide and previous presentations before Spring 2025 meeting and make suggestions as to what recommendations they have for this guide
	3. Attila Gyore (Midel) presented at the F24 meeting in St. Louis on topic of synthetic esters
		1. History of synthetic ester liquids
		2. Chemistry of synthetic ester liquid and how is it different to mineral oil and natural ester liquids
		3. Standards that apply to synthetic ester liquid (IEEE, ASTM and IEC)
		4. Material compatibility
	4. Presentation was made by F. Faur of his observations of the current guide at S24 meeting:

***Summary***The purpose of the test described in C57.157 is to verify if the contacts of a tap changer would perform adequately over 30 years of its life.The test makes the simplification hypothesis that the contact life depends on the thermal runaway due to the increased resistance of the contact points. The main conclusion after this test is that Ag-Ag contacts perform better than any other combination, and Sn plated contacts perform the worst.While this is true, it is not the only practical option to mitigate the problem of overheating, and not the only cause of overheating. Also, the number of other causes that can trigger a contact failure is so high, that performing the test in every condition is impractical. Having passed the test in one configuration doesn’t guarantee that the same contact or even switch will pass the test in another configuration.***Comments***(in the comments below, when I mention contact, I am referring to the entire body of a stationary or a moving contact, as opposed to the contact point as the sum of A-spots between 2 contacts)1. Trapped hot oilSometimes, either the tap changer manufacturer or the transformer manufacturer adds extra barriers to increase dielectric strength. In this case, the hot oil created by the contact would keep overheating, accelerating the contact failure.
2. Different coefficient of thermal expansionA long moving contact that operates close to its thermal capabilities, would thermally expand differently than the insulating material that separates the stationary contacts. That makes the contact points move slightly every time the temperature changes. Each time the contact moves, it breaks new areas of oxidation that accumulate around the contact points, increasing the electrical resistance and preventing oil cooling. The longer the contacts, the more predominant is this phenomenon.
3. Number of cyclesThe test exclusively assesses the deleterious effects of the contacts' prolonged exposure to high temperatures, disregarding the cycle count in a heavy-duty switch application. In some of the documentation from the time the test was developed, it was *observed that most failures were in peaking, pulsing loads: Rectifier Loads, Motor Starting Loads, Furnace Supplies, or Emergency Generator Transformers*. No failures were observed *in utility transformers or units that had more “homogenized” loads*. That means that an increased number of cycles might be more important than the current, temperature, and time itself.
4. Operating the tap changerIf a contact point is Ag-Cu, then, by operating it several times, part of the silver from AG contacts is smeared over the blank Cu contact. For this reason, pure Ag-Cu contacts don’t exist.
5. Oil propertiesTransformer oil can have different properties that affect contact cooling, gas generation, coke formation, etc. The transformer manufacturer decides what oil to use. I am not referring to structural differences like mineral vs. ester vs. silicone oils. I am referring to subtle differences like additives in the oil, inhibited vs. non-inhibited oil, etc. All those small changes may, among other things, affect oil thermal breakdown and the formation of film deposits and increase contact point resistance.
6. Spring forceSometimes the springs in the contacts lose their compression force in a longer time than the 30 days of testing, leading to contact failure. The test would pass a contact that would fail in the real world with the same symptoms.
7. Insufficient contact sectionThe heat generated by the contact point itself couldn’t be eliminated properly. Sometimes, just increasing the cross-section of the contact could solve the heat problem.
8. Cable & Cable lug heat sinkThe section of the cables and cable lugs and the insulation over the cable affect the elimination of heat from the contacts, or they can even contribute to heating the contacts.
9. Water, gases, and contaminantsThe test doesn’t address the possible presence of water or gases in oil and their effect on the oxidation and aging of the oil. Those can affect the behavior of contacts at elevated temperatures more than the temperature itself.
10. Oxygen concentrationThe oil behaves differently if the tank is sealed, has a nitrogen blanket, has a conservator, or is free breathing.

From the above observation, I think that this test has a similar kind of performance prediction ability to the standard temperature rise test from C57.131, but using more harsh conditions (longer test and higher temperature).Slightly related to the above, in the standard C57.131 I think that it would be beneficial if we could add some comments about the testing conditions: the amount of oil, distance to the walls and oil surface, the length of cables in the oil, the thermal insulation of the tank, dielectric barriers, etc.1. New Work
	1. Synthetic ester testing
		1. Jeremy Sewell highlighted that the previous version of the document did not include testing in synthetic esters so he proposed the formation of a task force to perform testing of this guide standard using synthetic esters.
		2. W.Li shared his experience and observations with the team regarding corrosive sulfur sticking to silver contacts, leading to the blackening of these contacts.
			1. T.Tillery also confirmed the same observation on copper as well as silver-plated contacts
		3. There was a general consensus in the working group that there may be a relation between synthetic esters, corrosive sulfur, and blackened contacts - which would be good to explore by testing.
		4. Quality Switch (D.Schwartz) and Specialty Transformer Components (P.Blaszczyk) volunteered for their companies to work on setting up/performing testing using Synthetic Esters. T.Tillery also volunteered to support the testing by consultation.
	2. The chair announced the desire to create a draft 1.0 to review before the Fall 2025 meeting
		1. Need any input from members on recommended changes / adds / deletes to current guide standard before the Fall 2025 meeting.
2. Next meeting: October 21, 2025 at Fall 2025 Transformers Committee Meeting scheduled for October 19-23 in Bonita Springs, FL, USA.
3. Close of meeting
	1. Meeting adjourned at 8:35am

Submitted by: Adam Sewell Date: March 26, 2025 **Meeting Attendance March 25, 2025 (RM = Request Membership):**

|  |  |  |  |
| --- | --- | --- | --- |
| **LAST NAME** | **FIRST NAME** | **COMPANY/AFFILIATION** | **ROLE** |
| Blaszczyk | Piotr | SPECIALTY TRANSFORMER COMPONENTS | MEMBER |
| Brodeur | Samuel | Hitachi | GUEST |
| Colopy | Craig | Retired from Eaton | GUEST |
| Cruz Valdes | Juan Carlos | PROLEC GE  | MEMBER |
| Faur | Florin | Prolec-GE  | MEMBER |
| Fernandez | Miguel | Braintree Electric | GUEST |
| Galindo | Yazmin | Quality switch | GUEST |
| Gamboa | Jose | H-J Family of companies  | GUEST |
| Grandbois | Luke | IFD Technologies  | GUEST |
| Greaves | Brad | Weidmann Electrical Technology, Inc | GUEST |
| Gustavsson | Niklas | Hitachi Energy | GUEST-RM |
| Heiden | Kyle | Eaton | GUEST |
| Hopkinson | Philip | HVOLT Inc. | GUEST |
| Koinis | Nicholas | CenterPoint Energy | GUEST |
| Labh | Ashwini | Hitachi Energy  | GUEST-RM |
| Li | Weijun | Braintree Electric Light Department | GUEST |
| Machain | José Luis | Prolec GE | GUEST |
| Mantoan | Francis | Siemens Energy | GUEST |
| Merrill | Logan | OMICRON | GUEST |
| Musgrove  | Ryan  | Oklahoma Gas & Electric  | GUEST-RM |
| newbill  | mark  | Hitachi  | MEMBER |
| PEREZ | MARCELINO | PROLEC | GUEST-RM |
| Pruente | John | APC Construction llc | GUEST |
| Rehkopf | Sebastian  | Reinhausen Germany | MEMBER |
| Reyes | David | Oncor | GUEST |
| Rossini | Yuri | Siemens Energy | GUEST |
| Schwartz | Dan | Quality Switch | MEMBER |
| Sewell | Adam | Quality Switch | MEMBER |
| Sewell | Jeremy  | Quality Switch, Inc. | MEMBER |
| Solano | William  | Voltyx  | MEMBER |
| Szczechowski | Janusz | Maschinenfabrik Reinhausen GmbH  | GUEST |
| Tillery | Timothy | Howard Industries | MEMBER |
| Vullo | Stephen | GE Vernova | GUEST |
| Whitten | Christopher | Hitachi Energy | MEMBER |

 |  |

**Attachment K.4.11**

**IEEE PES Transformer Committee Working Group Meeting Minutes**

**PC57.170 for Condition Assessment Guide**

**Tuesday, March 25, 2025**

**09:45 – 10:30 AM**

**Centennial “D, E” – Hyatt Regency Hotel – Denver, CO**

**Chairman: Kumar Mani Vice Chair: James Cross Acting Secretary: James Cross**

* + - 1. Welcome & Introduction: The meeting was called to order at 9:30 am CDT by the Chair.
			2. Attendance and Establishment of Quorum: There were 37 of 63 voting members present by head count. There were 94 guests. Quorum was established.
			3. Call was made for Patent Disclosures: No claims were made.
			4. IEEE Copyright Policy: The Chair presented the IEEE Copyright Policy slides.
			5. Approval of Meeting Agenda: The agenda of the meeting was presented by the chair. Trent Williams moved to accept the agenda. Marcos Ferreira seconded. Carried unanimously.
			6. Approval of Fall 2024 Minutes: Amitabh Sarkar moved to accept minutes of St. Louis Fall 2024 meeting. Seconded by Mickel Saad. Carried unanimously.
			7. IEEE SA Initial Ballot Comment Resolution Report: Saramma Hoffman informed the group that there were 172 comments of which 37 were technical in nature, and the remaining ones were editorial. All comments were successfully resolved after 13 CRG virtual meetings.
			8. Next Steps: PAR Extension Until Dec 31, 2026. The current PAR expires at the end of 2025.
	1. Patrycia recommended that we apply for a PAR extension at this meeting to have it in-hand rather than waiting for the fall meeting. A motion was moved by Poorvi Patel. Ali Naderian seconded.
	2. Stephanie Mabry recommended that it may be a valid risk-avoidance strategy to secure a PAR extension while we have a quorum present.
	3. After many discussions, it was decided to not apply for a PAR extension since the document is ready for circulation and re-balloting now. Poorvi Patel modified her original motion to include this. Scott Reed seconded the amended motion.
	4. Trent suggested that the CRG be authorized to resolve any further comments to the re-balloted document. Ryan Musgrove remarked that the Minutes from the Fall 2023 meeting showed that the WG already voted on establishing a CRG and empowered them to resolve any comments, so the amended motion is a moot point. After this clarification, there was no further discussion on this topic.
1. Next Steps: Ballot Circulation. Discussion from Joshua Yun from Virginia Transformer- Will only the WG members be allowed to comment on the recirculated ballot?

The Chair remarked that as per IEEE SA Ballot rules, only whose who participated in the original ballot can do so in the recirculation ballot. This was confirmed by Patrycja.

1. Unfinished / New Business: Th Chair called for any new / unfinished business. Having heard none, Trent Williams moved to adjourn the meeting which was seconded by Stephanie Mabry. Carried unanimously.

Meeting was adjourned at 1005 Hrs.

1. Next Meeting: Bonita Springs, FL. Oct 19-23, 2025.

**ATTENDANCE ROSTER**

|  |  |  |  |
| --- | --- | --- | --- |
| **First Name** | **Last Name** | **Affiliation** | **Member / Guest** |
| Jean Noel | Berube | Rugged Monitoring | G |
| Enrique  | Betancourt | Prolec GE  | M |
| Paul  | Boman | Hartford Steam Boiler  | G |
| Piotr | Bloszczyk | Transformer Components | G |
| Jeremiah | Bradshaw |  BOR | M |
| Wilkerson  | Calil | Hitachi Energy | G |
| Camilo | Callasar | Trench Group | G |
| Sudip | Chanda | Virginia Transformer Corp. | G |
| Luiz  | Cheim | Hitachi Energy |  M |
| James  | Cross | Kinectrics Inc. |  M/VC |
| Roberto | Da Silva | Reinhausen | G |
| Sami | Debass | EPRI | G |
| Zack | Draper | Delta X | M |
| Hakim  | Dulac | Qualitrol |  M |
| William  | Elliot | AEP-SWEPCO | G |
| Evgenii  | Ermakov | Hitachi Energy |  M |
| Marco  | Espindola | Hitachi Energy | M |
| Todd | Felton | AVO Diagnostics | G |
| Miguel | Fernandez | Beld | G |
| Marcos | Ferriera | FEMA | M |
| Florin | Faur | SPX Transformer Solutions, Inc. | G |
| Alan | Fujimori | Romagnole | G |
| Lorne | Gara | Felus | G |
| Eduardo | Garcia Wild | Siemens Energy | M |
| James | Gardner | Prolec GE Waukesha | G |
| Slaven | Goglia | Siemens Energy | G |
| Bill | Greaves | Weidmann | G |
| Attila  | Gyore | M&I Materials | G |
| Roger | Hayes | GE Vernova | G |
| Saramma  | Hoffman | PPL | M |
| Phil | Hopkinson | HIVOLT | G |
| Brexton | Jones | SD Myers | G |
| Patrcyza | Jarosz | IEEE | G |
| Thomas | Keels | kEElectric Engineering PLLC | G |
| Dimitriy | Kelmpner | SCE | M |
| Andreas | Kurz | Reinhausen | G |
| Weijun  | Li | Braintree Electric Light Department | M |
| Cesar | Lizcano | Shell | G |
| Luc | Loiselle | Tetratech | G |
| Ricardo | Lopes | EFACEC | G |
| Stephanie | Mabrey | AVO Diagnostics Services | M |
| Jinesh | Malde | M&I Materials | M |
| Balakrishna | Mani | Delta Star | G |
| Kumar  | Mani | Duke Energy | M/C |
| Evan  | Manning | Clearwater Energy | G |
| Logan | Merill | Omricon Energy | G |
| Toni | Mellin | Vaisala | G |
| Emilio  | Morales Cruz | Qualitrol | M |
| Ryan | Musgrove | OG&E | M |
| Ali | Naderian | Potencia | M |
| Mark | Newbill | Hitachi Energy | G |
| Shane | Oakley | NASS | G |
| Anastasia | O’Malley | ConEd | G |
| Juan | Ortiz | Reinhausen Manufacturing | G |
| Poorvi | Patel | EPRI | M |
| Pedro | Pedro | EFACEC | G |
| Nick | Perjanik | AVO Diagnostics | G |
| Verena | Pellon | FPL | G |
| Tim  | Peterson | Nomos Systems / North American Substation Services | G |
| John | Pruente | APC Construction | M |
| Gerard | Puleo | Midel | G |
| Tim  | Raymond | EPRI | M |
| Scott  | Reed | MVA | M |
| Sebastian | Rehkopf | Reinhausen | G |
| Diego | Robalino | Megger | G |
| Antonio | Robles | USBR | G |
| Chris  | Rutledge | GE Vernova | G |
| Mickel  | Saad | Hitachi Energy | M |
| Amitabh  | Sarkar  | Virginia Transformer Corp. | M |
| Alan  | Sbravati | Hitachi Energy | M |
| Alaor | Scardazzi | Siemens Energy | G |
| Stephan | Schindler | Reinhausen | G |
| Salahuddin  | Shaikh | NRG | G |
| Michael | Sharp | Trench Group | G |
| Hemant | Shertukde | University of Hartford | M |
| Jonathan  | Sinclair | PPL Electric Utilities  | M |
| Amitkumar  | Singh | Consolidated Edison Company of New York | G |
| Jason | Snyder | First Energy | G |
| Marcus | Stank | Reinhausen | G |
| Charles | Sweetser | Omricon Energy | M |
| James  | Thompson | SVTV | G |
| Mark | Tostrud | Dynamic Ratings | M |
| Dharam | Vir | Prolec Energy | M |
| Dominique | Violette | Nomos Systems | G |
| Alan  | Washburn | Burns & McDonnell | M |
| Drew  | Welton | Intellirent | G |
| Peter | Werelius | Megger | G |
| Stephan | Wirth | Coil Innovation | G |
| Joe | White | Power Engineers | M |
| Trenton  | Williams | Advanced Power Technologies  | M |
| Deanna | Woods | Quanta Services | G |
| Jeffrey  | Wright | Duquesne Light | M |
| Kwasi | Yeboah | GE Vernova | M |
| Joshua | Yun | Virginia Transformer  | M |

**Attachment K.4.13**

**Working Group Meeting for IEEE Standard PC57.17**

Denver, Colorado, USA Meeting – March 25th, 2025 11:00-12:15 pm MST

Chair: Jason Varnell Secretary: Trenton Williams

1. The meeting was called to order at 11:00 AM MST.
2. There were 29 active participants present, which consisted of 13 of the 22 members. Quorum was achieved.
3. Three (3) participants requested membership and one participant denied due to attendance, two participants were granted membership due to attendance. Therefore, the new membership total after the S25 meeting is 24.
4. The chair reviewed the IEEE patent slides and the group made no patent claims.
5. The chair reviewed the copyright policy with the group.
6. A motion was made by Dan Sauer (Eaton) and seconded by Mark Newbill (Hitachi Energy) to approve the Spring 2025 meeting agenda. There were no objections to unanimous approval of the agenda. A motion was made by Sanjib Som (PTTI) and seconded by Dan Sauer (Eaton) to approve the Fall 2024 St. Louis Working group meeting minutes. There were no objections to unanimous approval of the Fall 2024 St. Louis working group meeting minutes.
7. **Old Business:** Review and resolve comments from Jerzy Kazmierczak from previous meeting:
	1. Subclause 4.2 comment was resolved by adding a note to Table 4 for clarification on units rated greater than 100kVA. Sanjib Som (PTTI) volunteered to provide this language to the officers prior to the next WG meeting.
	2. Clause 5 Comment resolved also by adding a similar note to Tables 5 & 6 which will also be provided by Sanjib.
	3. Subclause 6.1 comment review.
		1. Motion made by Dan Sauer (Eaton) and seconded by Jason Beaudoin (Weidmann) to strike lines 9 through 15 of subclause 6.1. Discussion followed. Motion Failed.
		2. Dan Sauer (Eaton) makes a motion to accept the proposed wording of “The furnace transformer impedance is determined based upon the following conditions”. Sanjib Som (PTTI) seconded and motion passed with unanimous approval.
8. **New Business:**
	1. The Chair reviewed with the group the previously submitted straw ballot comments as time permitted. The working group agreed to resolutions to the first 15 of 36 comments.
	2. It was determined that the additional 21 comments that had not been visited during the meeting will be handed to the previous TF leaders (see below) for review and revision. The document will then be recirculated for additional review of these changes.
		1. **Clause 4: Ratings**
			1. Dan Sauer (Eaton Corporation), Jason Beaudoin (Weidmann), Sheldon Kennedy (Consultant).
		2. **Clause 7: Connections**
			1. Sanjib Som (Pennsylvania Transformer), Emilio Morales (Qualitrol) and Thrinadha Katapalli (Virginia Transformers).
		3. **Clause 8: Testing**
			1. Jason Varnell (Doble Engineering).
		4. **Clause 9: Construction**
			1. Sanjib Som (Pennsylvania Transformer)
		5. **Annex A – DC Arc Furnace**
			1. Dan Sauer (Eaton Corporation) and Jerzy Kazmierczak (Hitachi Energy).
		6. **Annex C – Replacement and Remanufacturing of Low Voltage Bus Bars**
			1. Jason Beaudoin (Weidmann) and Jason Varnell (Doble Engineering).
		7. **Annex E - High Temperature Insulation Application (including Fiber Optics)**
			1. Gilles Bargone (FISO) and Emilio Morales (Qualitrol).
9. The next working group meeting will be in Bonita Springs, FL, USA during the Fall 2025 Transformers Committee Meeting.
10. The meeting adjourned at 12:15 PM MST.

**Attendance Record:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Status as of 3/25/2025 (Prior to S25 Meeting)** | **Last Name** | **First Name** | **Affiliation** |
| Member | BARGONE | GILLES | FISO |
| Member | BEAUDOIN | JASON | WEIDMANN |
| Member | BOETTGER | WILLIAM | BOETTGER TRANSFOMER CONSULTING LLC |
| Guest | COLOPY | CRAIG | CONSULTANT |
| Guest | FAUR | FLORIN | PROLEC-GE WAUKESHA |
| Member | GORZIN | ALIREZA | BLACK & VEATCH |
| Member | KENNEDY | SHELDON | SHELDON KENNEDY ENGINEERING PLLC |
| Guest | KOWALSKI | RAFAL | HITACHI ENERGY |
| Guest | LUGGE | ANDREW | HITACHI ENERGY |
| Guest | MENDEZ | OMAR | PROLEC-GE |
| Member | MORALES-CRUZ | EMILIO | QUALITROL |
| Guest | MURCIA | FREDY | SIEMENS ENERGY |
| Member | MUSGROVE | RYAN | OG&E |
| Member | NEWBILL | MARK | HITACHI ENERGY |
| Member | SAUER | DAN | EATON |
| Member | SOM | SANJIB | PTTI |
| Guest | TENYENHAUS | EDWIN | HITACHI ENERGY |
| CHAIR | VARNELL | JASON | Doble Engineering Co. |
| SECRETARY | WILLIAMS | TRENTON | ADVANCED POWER TECHNOLOGY |
| Member | WHITTEN | CHRISTOPHER | HITACHI ENERGY |
| Guest | ZEIGHER | ALEX | HITACHI ENERGY |
| Guest | QUINONES | MANUEL | GE VERNOVA |
| Guest | MACHAIN | JOSE LUIS | PROLEC GE |
| Guest | ORTIZ | JUAN | REINHAUSEN |
| Guest | KADAR | LASZLO | LASZLO & ASSOCIATES |
| Guest | BHARDWAJ | NAVEEN | TRENCH GROUP |
| Guest | SZCZECHHOWSKI | JANUSZ | REINHAUSEN |
| Guest | LOPEZ | LIBARDO | HITACHI ENERGY |
| Guest | NOLTE | MIKE | KIEWIT |

**Attachment K.4.15**

Working Group – 60076-57-1202

Chair: Ewald Schweiger

**60076-57-1202
IEC/IEEE International Standard Power Transformers Part 57-1202:
Liquid immersed phase-shifting transformers**

1. Meeting started at 1:45 PM (CDT) on Tuesday March 25th.
2. This was the second meeting as WG (Working Group).
* Attendance: 46
* Members: 12
* Guests: 34
1. Call for patents & Copyright statement
	* + The slides on essential patents from IEEE have been uploaded on the internet and were presented during the meeting. A call for essential patents was made.
		 🡪 No essential patents or issues were reported.
		+ The slides on IEEE copyright policy from IEEE have been uploaded on the internet and were presented during the meeting. A call for essential patents was made.
		🡪 No issues were reported.
		+ The slides on “Participant behavior in IEEE-SA activities is guided by the IEEE Codes of Ethics & Conduct” have been presented
2. Establish quorum
	* A quorum was achieved.
	* Total number of members is 14 requiring 8 members for quorum.
	* 12 members were present establishing quorum.
3. Approval of agenda
4. Motion to approve agenda was made by Markus Stank and second by Luc Dorpmanns.
No discussion or objections were made.
5. Motion was carried unanimously with no objections or abstentions.
6. Approval of meeting minutes of the previous Virtual meeting on October 29th, 2024
7. The Meeting Minutes were posted on the [PTRC website](https://www.transformerscommittee.org/subcommittees/powertransf/#:~:text=C57.135%20%E2%80%93%20IEEE%20Guide%20for%20the%20Application%2C%20Specification%20and%20Testing%20of%20Phase%2DShifting%20Transformers).
8. Motion to approve agenda was made by Christoph Ploetner and second by Sebastian Rehkopf.
No further discussion or objections were made.
9. Motion was carried unanimously with no objections or abstentions.
10. Kevin Juchem and Ewald Schweiger have refreshed the Dual Logo and IEC status
	* + At the IEC TC 14 Plenary session held in Rome, Italy, in April 2024, a decision was made to establish a Maintenance Team (MT) designated 'phase-shifting transformers' with the responsibility 'to upkeep the standards pertaining to phase-shifting transformer projects.' Consequently, MT 60076-57-PST was formed to undertake the revision of standards IEC/IEEE 60076-57-1202 and IEC/IEEE 60076-57-135, with Kevin Juchem being named the convener.
		+ Kevin Juchem updated on the global composition of the IEC team.
		+ Ewald Schweiger emphasized that this development streamlines the harmonization between IEC and IEEE standards for this particular document.
11. Kevin Juchem reported on the progress of the Working Group (WG) at CENELEC concerning the standard EN IEC/IEEE 60076-57-1202:2025, including Amendment A11:
	* + The vote by the national committees was positive (100%), leading to its scheduled implementation at the national level.
		+ Additional information: A single editorial remark was made: The angle brackets surrounding in Paragraph 3.20 should be eliminated.
12. Mike Thompson, the liaison from the Power Systems Relaying and Controls Committee (PSRC), provided an update on the status of C37.245 (IEEE Guide for the Application of Protective Relaying for Phase-Shifting Transformers).
	* + The PSRC convened in January and considered revising C37.245 concurrently with IEC/IEEE 60067-57-135.
		+ The subcommittee concurred on establishing a task force to aid in updating the PST Guide/Standard.
		+ The PSRC is scheduled to meet again in May and September of this year.
		+ The May gathering will be the first occasion to create a PAR (Project Authorization Request) study group for C37.245.
		+ The update concluded, and the floor was opened for discussion among the members; however, no discussions or questions ensued.
13. Luc Dorpmanns presented a review of definitions from the Standard and the guide.
	* + The plan to move forward is to keep and use the definitions from the standard and use this in guide.
		No change in the standard (60076-57-1202).
14. Kevin Juchem presented the review of the content and suggested two changes
	* + 1. Annex B – Behavior of a phase shifting transformer with non-symmetrical fault currents
			Due it is informative to move this to the guide.
			2. Annex F – Additional information on advanced retard switch
			Due it is informative to move this to the guide.
15. Planned next steps
	1. *Please Continue to review* and look for duplication, errors, corrections needed and improvements (Standard posted – PTSC site).
	*Volunteers are requested to reach out to the ones who took over tasks and / or officers.*
	2. Collection of feedback (via email)
16. The meeting was adjourned at 2:15 PM (MDT)
17. Next meetings (planned):
	* Virtual meeting – might be scheduled before October 2025.
	* In-person meeting F25 – October 19-23, 2025 in Bonita Springs, FL.

Respectfully submitted,
Ewald Schweiger - WG Chair

List of attendees for this meeting on the next page

List of attendees for this meeting:

|  |  |  |  |
| --- | --- | --- | --- |
| **Last Name** | **First name** | **Affiliation** | **Status** |
| An | Kyungchan | Hyosung | G |
| Antosz  | Stephen  | Consultant  | G |
| Beaudoin  | Jason  | Weidmann  | G |
| Berube  | Jean-Noel  | Rugged Monitoring Quebec Inc  | G |
| Bhattiprolu  | Prudhvi Anand  | AES  | G |
| Brodeur | Samuel | Hitachi | G |
| Cai | Jim | JSHP transformer  | G |
| Calitz  | David | Siemens Energy  | G |
| Colopy | Craig | Retired from EATON  | G |
| Czernorucki | Marcos | Hitachi Energy | G |
| Dorpmanns | Luc | Royal SMIT Transformers  | M |
| Espitia | Wguu | Reinhausen Manufacturing Inc | G |
| Fedor  | Ken | SGB-Smit Group | G |
| Foster | Patrick | NextEra  | G |
| Hamoir | Didier | Transformer Protector Corporation  | G |
| Hampton | Kevin | Siemens Energy | G |
| Heiden | Kyle | Eaton | G |
| Jeong | chanmin | HD Hyundai  | G |
| Juchem | Kevin | Hitachi Energy Germany AG  | G |
| Kaineder | Kurt | TRENCH  | G |
| Lopes  | Ricardo  | Efacec  | G |
| Magela junior | Geraldo | Siemens-Energy | G |
| Mendez Zamora  | Omar  | Prolec  | G |
| Merrill | Logan | OMICRON | G |
| Murcia | Fredy | Siemens Energy | G |
| Musgrove  | Ryan  | Oklahoma Gas & Electric  | M / Chair PTSC |
| Neild | Kris | Megger | G |
| Padmanaban Iyer | Ashwin | STP | G |
| Patel | Nitesh | Hyundai Power Transformers  | G |
| Patel | Sanjay | Royal Smit Transformers  | M |
| Pellon | Verena | FPL NextEra  | G |
| Ploetner  | Christoph  | Siemens Energy  | M |
| Rehkopf  | Sebastian  | Reinhausen Germany | M |
| Schrammel  | Alfons  | Siemens Energy  | M |
| Schweiger | Ewald | Siemens Energy | M / Chair |
| Shannon | Michael | Rea Magnet Wite | G |
| Shertukde | Hemchandra | UHART | G |
| Stank | Markus | Maschinenfabrik Reinhausen | M |
| Thompson | Michael | SEL Engineering Services  | M |
| Torchia  | Leonard  | PSE&G  | G |
| Vermeulen | Harrie | Royal Smit Transformers | G |
| Vir | Dharam | PROLEC GE | G |
| Washburn | Alan | Burns & McDonnell | M |
| Watson | Joe | JD Watson and Associates  | M |
| Weisensee  | Matt | PacifiCorp  | M |
| White | Jor | POWER Engineers | G |

**Attachment K.4.16**

WG Guide for Installation and Maintenance of Power Trf C57.93

Tuesday, March 25th, 2025

3:15 – 4:30 PM

Hyatt Regency, Centennial G (3)

Denver, CO

Chairman: Scott Reed

Vice Chairman: Alwyn VanderWalt

Secretary: Kyle Stechschulte

The meeting was called to order at 3:15 pm by Chair Scott Reed. This is the second meeting for this Working Group. The current guide expires 12/31/2029. The PAR for this WG expires 12/31/2028.

Chairman posted the Patent Claim and Copyright slides. No notifications or comments were received.

The Working Group has 50 current members and required 26 members be present to achieve a quorum. 72 guests and members were in attendance, 27 members and 45 guests achieving a quorum. There were 2 guests requesting membership that met attendance requirements. Membership was granted to the following guests:

Juan Carlos Cruz Valdes

Marcos Ferreira

A motion was made by Marcos Ferreira and seconded by Ewald Schweiger to approve the agenda. It was unanimously approved by the working group.

A motion was made by Ewald Schweiger and seconded by Ryan Musgrove to approve the Fall 2024 meeting minutes. It was unanimously approved by the working group.

The chair shared the title and scope as approved for the PAR.

The 7 task force leaders presented progress to the group:

TF1 Shipping and Assembly–Ryan Musgrove

TF2 Vacuum Processing Methods—Kyle Stechschulte

TF3 Final Testing and Energization—Elizabeth Bray; WG Chair Scott Reed and TF member Mario Locarno presented progress on behalf of TF Chair Elizabeth Bray due to her absence.

TF4 Relocation and Field Repair—Alwyn VanderWalt; WG Chair Scott Reed presented progress on behalf of TF Chair Alwyn VanderWalt due to his absence. WG Chair also called for volunteers to join this TF as there were no TF members other than Alwyn VanderWalt

TF5 Maintenance—Weijun Li

TF6 Storage—Pat Rock

TF7 Editorial and Definitions—Jesse Duffey

The Chair called on the task force leaders to report back progress for the fall meeting. The next WG meeting will be in Bonita Springs, FL in October 2025.

The meeting was adjourned at 4:15 p.m.

|  |  |  |  |
| --- | --- | --- | --- |
| **First Name** | **Last Name** | **Affiliation** | **Member** |
| Jason  | Beaudoin | Weidmann  |  |
| Prudhvi Anand  | Bhattiprolu  | AES  |  |
| Jeremiah | Bradshaw | Bureau of Reclamation  | Member |
| sudip | chanda | Delta Star Inc | Member |
| Matt | Chu | Shihlin Electric |  |
| Juan Carlos | Cruz Valdes | PROLEC GE | New Member |
| Gabriel | Delgado | Invenergy | Member |
| Jesse | Duffy | Nashville Electric Service  | Member |
| Orozco | Eduardo  | GE Vernova Grid Solutions |  |
| Miguel | Fernandez | Braintree Electric |  |
| Marcos | Ferreira | FEMA | New Member |
| Lorne | Gara | Shermco | Member |
| Miguel | Garcia | Hitachi Energy |  |
| Slaven | Goglia | Koncar Power Transformers Ltd. |  |
| Brad | Greaves | Weidmann Electrical Technology, Inc |  |
| Niklas | Gustavsson | niklas.gustavsson@hitachienergy.com |  |
| Roger | Hayes | GE Vernova | Member |
| Portillo | Homer | Advanced Power Technologies |  |
| Braxton | Jones | SD Myers |  |
| Laszlo  | Kadar  | Laszlo & Associates  |  |
| Mick | Kasonga | Oncor |  |
| Thomas A. | Keels | kEElectric Engineering PLLC  | Member |
| Sheldon | Kennedy | Sheldon P Kennedy Engineering PLLC |  |
| Yeoundoo | Kim | JST power equipment | Member |
| Landen | Kwan | NRC |  |
| Bernard | LaBean Jr | Consumers Energy Company |  |
| ANDREW | LAWLESS | Potencia Partners  |  |
| Lance | Lewand | Doble |  |
| Weijun | Li | Braintree Electric Light Department | Member |
| José Luis | Machain | Prolec GE | Member |
| Geraldo | Magela Junior | Siemens-energy |  |
| Jinesh  | Malde | MIDEL & MIVOLT fluids Inc. |  |
| Balakrishnan | Mani | Delta star field service | Member |
| Logan | Merrill | OMICRON |  |
| David  | Murray  | TVA | Member |
| Ryan | Musgrove | Oklahoma Gas & Electric | Member |
| Mike | Nolte | Kiewit |  |
| Anastasia  | Omalley | Con Edison NY |  |
| Juan | Ortiz | Reinhausen Manufacturing  |  |
| Parminder | Panesar | Virginia Transformer Corp  | Member |
| Rakesh  | Patel | Hitachi Energy  |  |
| Poorvi  | Patel | EPRI  |  |
| Nirav | Patel | Yash Highvoltage Ltd |  |
| Pedro | Pedro  | Efacec Energia | Member |
| Verena | Pellon | FPL and NextEra  |  |
| Nuno | Rato | Efacec  |  |
| Sheila | Ray | US Nuclear Regulatory Commission  |  |
| Scott  | Reed | Mva | Member |
| David | Reyes | Oncor |  |
| Diego | Robalino | MEGGER | Member |
| Randy  | Roberts | Southern Company  |  |
| Antonio | Robles | Bureau of Reclamation  |  |
| Patrick | Rock | American Transmission Company  | Member |
| Mickel | Saad | Hitachi Energy |  |
| Alan | Sbravati | Hitachi Energy |  |
| Alaor | Scardazzi  | Siemens Energy  | Member |
| Stefan | Schindler | Maschinenfabrik Reinhausen  |  |
| Ewald | Schweiger | Siemens Energy | Member |
| Jonathan | Sinclair | Black and Veatch |  |
| Tommy  | Spitzer | Self employed  | Member |
| Kyle | Stechschulte | AEP | Member |
| H. Allen  | Steele  | TVA | Member |
| David | Stockton | SBC | Member |
| Charles | Sweetser | Omicron  |  |
| Jonathan | Tan | Northern Transformer | Member |
| Troy | Tanaka | Burns & McDonnell | Member |
| Clifton | Thompson | RMS Energy  |  |
| John | Wagner | AEP |  |
| Matthew | Webb | GE VERNOVA |  |
| William | Whitehead | Reinhausen |  |
| Eva | Zarco | Yash |  |
| Kris | Zibert | Allgeier Martin | Member |

**Attachment K.4.18**

Unapproved Meeting Minutes

PC57.153 WG Guide for Paralleling Regulating Transformers

Minutes from March 25, 2025 – Denver Meeting

Officers

Chair – Mark Tostrud

Vice Chair – Cihangir Sen

Secretary – Zan Kiparizoski

1. Call to Order

The meeting was called to order at 4:45 PM on March 25, 2025

2. Chairs Remarks

After the officer’s introduction, couple of changes to the previously sent agenda were noted. These changes include the addition of the modified example under item 4.4, as proposed by Zan Kiparizoski. Members and guests were also informed that the previously sent, non-approved meeting notes from the Fall 2024 meeting contained a minor typo in the name of Francis Mills under section 5. This error has been corrected in the revised meeting minutes.

**2.1 Essential Patent Claims**

IEEE SA slides related to the Essential Patent Claims were reviewed. The Chair provided an opportunity to identify any patent related claim. No claims were made.

**2.2 Copyright Policy**

IEEE slides related to Copyright Policy were reviewed. No copyright issues were raised.

**2.3 Participant Behavior**

IEEE slides related to participant behavior in the individual working group/task force process were reviewed. There were no comments.

3. Attendance

* There were 35 attendees in the meeting
	+ 15 members were present
	+ 2 guests requested membership
* Quorum check
* Quorum was achieved, 15 of 21 members were present

4. Approval of the agenda and minutes from the last task force meeting

**Meeting Agenda**

As noted in the chair’s remarks, modifications were made to the emailed agenda and the non-approved minutes from the Fall 2024 meeting.

* Welcome and call to order
* QR Code Attendance Registration and Distribution of attendance rosters
* Call for Essential Patents
* Review of IEEE-SA Copyright policy
* Review of Code of Conduct Policy
* Introductions
* Review and approval of the meeting agenda
* Review and approval of the minutes from the Fall 2024 meeting
* Review of changes in the latest draft
	+ Annex C was updated
	+ Recommended actions during reverse power flow was added
	+ Bibliography reference B.1 was removed
* Old Business
	+ Use of Inclusive Language in Technical Terminology and Communications (IEEE P3400)
		- Standard is still in draft but will likely be approved before we go to ballot
		- Concerns were raised over the terminology for the “Master/Follower” parallel method
		- Discussion on how to proceed
* Are we ready for a straw ballot?
* Next Meeting(s)
	+ Virtual - TBD
	+ In Person – October 21, 2025 – Bonita Springs, FL
* Adjourn

**4.2 Approval of the revised minutes from the last working group meeting in Fall 2024 and the revised agenda**

Motion to approve the revised agenda and minutes.

* Motion by Dan Sauer
* Seconded by Francis Mills
* Unanimous approval

No objection to unanimous approval of the revised meeting minutes from Fall 2024 working group meeting and revised agenda.

5. Review and discussion of modifications to the example under 4.4.1 of the existing guide.

The discussion moved to Zan Kiparizoski’s proposal to expand the current guide by adding more detailed descriptions. The proposed text was presented to the attendees for review. The existing example in the guide explains how the load is split between different transformers, and Zan’s proposal builds on this by providing additional details. There was general agreement that the proposed changes would be beneficial to end users by making the information clearer and more comprehensive.

6. Old Business

* 1. **Review and discussion of Reverse Power Flow section**

The discussion focused on adding a section for reverse power flow, as the current guide lacks this content. An existing example shows a generator in parallel with a transformer serving a load, but it does not represent reverse power flow. The group discussed modifying sections 1.1.1, 1.1.2, and 1.1.3 in the existing draft as a foundation for the new content.

Key points included voltage control, how power flows from the generator through the transformer back into the system, and the challenge of covering all possible scenarios. It was agreed to reference these sections and add a dedicated section on reverse power flow. Several ideas were discussed, and the chair asked for a volunteer to take on the task of writing this section. The chair mentioned that Beckwith offered to help draft the section.

Dan Sauer volunteered to contribute to drafting this section. Mark Tostrud (chair) will update and distribute the latest draft to the group, including reference sections 1.1.1, 1.1.2, and 1.1.3, to serve as a base for the reverse power flow section.

**6.2 Review of the draft for the Annex C , concept of the apparent circulating currents**

The chair will submit the draft for Annex C, which is approximately 80% complete. Karsten Viereck has worked on this section, and once finalized, all annex documents will be compiled and distributed to the group for review. Due to the complexity of the wording and multiple formulas, it was agreed that discussing Annex C at this stage would not be an efficient use of time. Instead, the draft will be shared with guests and members for their review and comments.

* 1. **Use of Inclusive Language in Technical Terminology and Communication**

The final item discussed was the master-follower topic, which had been tabled during the previous meeting. It was noted that this question will not be addressed further.

7. Comments on LTC vs OLTC terminology

Craig Colopy proposed a change to use the term "OLTC" instead of "LTC." The chair noted that this topic has been discussed in the past and that the current draft uses "LTC." The chair will refer the matter to the subcommittee for a recommendation on whether to use "LTC" or "OLTC," acknowledging that about half of the relevant standards use one term and the other half use the other. Dan Sauer and Weijun Li also pointed out that the term *LTC* is defined in the latest revision of C57.12.80, which was recently approved by the IEEE Standards Board. The term *OLTC* is included as a synonym; therefore, retaining the term *LTC* in C57.153 should be acceptable.

8. New Business

No new business was identified.

9. Next Meeting

The next scheduled meeting will be at the Fall standard meetings, 2025 in Bonita Springs, FL.

10.The meeting adjourned at 5:45 PM

11.Minutes

The minutes were recorded by Zan Kiparizoski – secretary and reviewed by Mark Tostrud – Chair and John Sen Vice-chair

|  |
| --- |
| **C57.153 – Guide for Paralleling Regulating Transformers** |
| **Last Name** | **First Name** | **Affiliation** | **Role** |
| Bargone | Gilles | FISO | Member |
| Bhattirolu | Prudhvi | AES | Guest |
| Blaydon | Daniel | Baltimor Electric | Member |
| Carrizales | Juan Alfredo | Prolec GE | Guest |
| Colopy | Craig |   | Guest |
| Elson | Eric | San Diego G&E | Guest |
| Espitla | Equi | MR | Guest |
| **Last Name** | **First Name** | **Affiliation** | **Role** |
| Fernandez | Miguel | Braintree Electric Light Dept. | Guest |
| Heiden | Kyle | Eaton | Member |
| Hoffman | Saramma | PPL | Member |
| Kiparizoski | Zan | Howard Industries | Secretary |
| Koinis | Nicholas | Center Point Energy | Guest |
| Lapointe | Sylvian | Rugged Monitoring | Guest |
| Li | Weijun | Braintree Electric Light Dept. | Member |
| Loiselle | Luc | Tetra Tech | Guest |
| Lopes | Ricardo | EFACEC | Guest |
| Machain | Luis | Prolec GE | Guest |
| Mills | Francis | Power Engineers | Member |
| Musgrove | Ryan | Oklahoma Gas&Electric | Member |
| Orozco | Eduardo | GE Vernova | Guest |
| Park | Den | Hico | Guest |
| Radu | Ion | Hitachi Energy | Member |
| Rock | Pat | American Transmission | Guest |
| Rossini | Yuri | Siemens Energy | Guest |
| Sauer | Dan  | Eaton | Member |
| Sen | Cihangir | Duke Energy | Vice-Chair |
| Shertkde | Hemchandra | Uhart/Ddi | Guest |
| Shrammel | Alfons | Siemens Energy | Guest |
| Stank | Markus | Reinhausen | Guest |
| Tostrud | Mark  | Dynamic Ratings | Chair |
| Viereck | Karsten | Reinhausen | Member |
| Vijay | Gunja | Powertech Labs | Guest |
| Vir | Dharam | Prolec GE | Member |
| William | Solano | Voltyx | Guest |
| Zhang | Shibao | Pcore Electric | Member |

**Attachment K.4.20**

IEEE PC57.20 Entity WG Meeting Liaison Report – March 19, 2025

IEEE PC57.20 Entity Draft Guide for Power Transformers for Low-Frequency (10 – 30 Hz) Power Transmission - Draft 1,0

The Entity Working Group met on Webex on Wednesday March 19, 2025 at 8:30 PM EDT. In attendance were Meng Zhao and Patrycja Jarosz from IEEE and Sheldon Kennedy, Steve Shull and Weijun Li representing the IEEE Transformers Committee. The Chair, Haojun Liu, called the meeting to order and went through introductions and roster attendance for a quorum. This was the second meeting of the Entity Working Group. The first meeting on February 25, 2025 apparently failed due to problems with WEBEX or understanding how to use it.

Sheldon Kennedy submitted comments to the draft prior to the meeting. Much of the draft seems to be written specifically for the China offshore windfarm power transmission projects, but that is not what the PAR states. It should be a useable standard for other parts of the world that still utilize lower frequency applications like some isolated portions of 25 Hz in the United States, as well as some traction power systems and others. In Europe, 16 2/3 Hz is sometimes used for traction power systems, as well. Most of the applications are legacy systems that have not upgraded to 60 Hz or 50 Hz.

We pointed out that many of the tables for preferred voltages and kVA ratings are not necessary as this would be an IEEE standard using IEEE C57.12.00. Also, tables specifying required sound levels, no load losses, and load losses are for China only, not for other countries. They should be noted as such or removed. Dimensional requirements seem to be specific to offshore platforms and don’t seem to be required of other applications.

It was noted that the PAR should be modified to be for liquid-filled transformers.

The overall draft reads more like a specification than a guide or standard. This requires quite a few modifications.

The Chair and working group seem to not be knowledgeable of Robert’s Rules of Order requirements. The chair seemed very willing to make the modifications we suggested but did not understand that he had to a motion, a second and a vote by the working group in order to make any modifications.

**Completed Events**

Feb. 15th, 2024          PAR Approval

Apr. 9th, 2024            Kick-off meeting

Feb. 11th, 2025         Complete Draft 1.0

Mar. 20th, 2025        Second WG meeting

**Future Plan**

Jun. 7th, 2025     Complete the Draft 2.0

Jun 30th, 2025    Third WG meeting

Mar. 8th, 2026         Final Draft (Ballot Ready Draft)

Apr. 10th, 2026    Mandatory Editorial Coordination (MEC)

Aug. 11th, 2026    Initiate SA Ballot

Mar. 23th, 2027        Submit to Review Committee (RevCom) / Final Recirculation

July. 19th, 2027    Publication

The chair seemed to rush to adjournment, and we adjourned about 9.50 PM EDT.

Respectfully submitted,

Sheldon P. Kennedy

April 3, 2025