Annex K 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

K.1 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.

K.2 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.

K.3 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.

K.4 Working Group and Task Force Reports

K.4.1 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.

K.4.2 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.

K.4.3 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.

K.4.4 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.

K.4.5 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.

K.4.6 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.

K.4.7 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.

K.4.8 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.

K.4.9 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.

K.4.10 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.

K.4.11 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.

K.4.12 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.

K.4.13 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.

K.4.14 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.

K.4.15 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.

K.4.16 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.

K.4.17 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.

K.4.18 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.

K.4.19 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.

K.4.20 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.

K.5 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.

K.6 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.

K.7 Adjournment

The meeting adjourned at 2:45 p.m.

K.8 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

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
    a. *WG Revision of C57.131, Tap Changers (no meeting) ..... Craig Colopy*
    b. WG C57.156, Guide for Tank Rupture Mitigation ..... Peter Zhao
    c. *WG Revision of C57.116, GSU Transformers (Completed 2022 – no meeting) ..... Weijun Li*
    d. WG Class 1E Transformer for Nuclear Power gen Std. 638 ..... Craig Swinderman
    e. WG 60076-57-135, Guide for Phase shifting Transformers ..... Ewald Schweiger
    f. WG 60076-57-1202 Liquid Immersed Phase-Shifting Transformers ..... Ewald Schweiger
    g. *WG Revision of C57.143, Monitoring Guide (no meeting) ..... Mike Spurlock*
    h. WG Std Requirement for Liquid-Immersed Power TR – C57.12.10 ..... Scott Digby
    i. WG Guide for Evaluation & Reconditioning of Liquid Immersed TR C57.140 Marcos Ferreira
    j. WG Revision of C57.125, Failure Investigating and Reporting ..... Hakan Sahin
    k. WG C57.157, Guide for Life test of Switch Contacts ..... Adam Sewell
    l. WG C57.170, Condition Assessment Guide ..... Kumar Mani
    m. *WG Revision of C57.150, Transportation Guide (No meeting) ..... Greg Anderson*
    n. WG C57.17, Standard Requirements for Arc Furnace Transformers ..... Jason Varnell
    o. *WG C57.107, Transformer Volts per Hertz (No meeting) ..... Joe Watson*
    p. WG C57.93, Installation and Maintenance Guide ..... Scott Reed
    q. Liaison to PC57.93a – Installation and Maintenance Guide ..... Scott Reed
    r. WG C57.153, Guide for Paralleling Transformers ..... Mark Tostrud
    s. Liaison to Entity PAR C57.145 – Digital Twin for Power Equipment (DTPE) ..... Brian Sparling
    t. Liaison to Entity PAR Guide for PT for Low-Frequency Power Transmission Sheldon Kennedy
8. Old business
    a. 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
        a. Website - https://cmte.ieee.org/pes-substations/scd0/wgd4/
9. New business
10. Adjournment

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**
    a. Chair's Remarks
    b. IEEE-SA Policies
        i. Call for Essential Patents slide presented, and the group made no patent claims.
        ii. Copyright policies slide presented
    c. 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

2. **Approval of the Agenda**
    a. Motion to accept the spring 2025 agenda
        i. Moved: Eduardo Garcia
        ii. Seconded: Dave Murray
        iii. The spring 2025 agenda was unanimously approved.
3. **Approval of Meeting Minutes**
    a. Motion to accept minutes of the fall 2024 meeting (St. Louis).
        i. Moved: Eduardo Garcia
        ii. Seconded: Sanjib Som
        iii. 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.
4. **Technical Topics**
        i. 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.

ii. 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.

iii. 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.

iv. Marc Foata moved a motion to revise Subclause numbering of Clause 5, and Samuel Brodeur seconded it. The motion was approved unanimously.

5. Action Items

a. None

6. Unfinished Business

a. 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.

7. New Business

a. None

8. Next Meeting

a. 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

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.

3. Presentation of IEEE Standards Slides:
   IEEE Essential Patent Slides and Copyright policy were presented, and no issues received from the attendees.

4. Distribution of attendance sheets:
   a. Attendance was taken with a paper roster.
   b. Please send an email to craig.swinderman@meppi.com with the subject: P638 EMAIL to be added to the P638 email list.

5. Checking the Quorum:
    a. 7 out of 13 members were in attendance of the meeting so quorum was achieved.

6. Approval of the Meeting Minutes from St. Louis Fall 2024 and Agenda for Spring 2025:
    a. Approval of the Fall 2024 meeting unapproved minutes
        i. Robert Allison motioned to approve.
        ii. Ryan Musgrove seconded.
        iii. Motion was carried unanimously with no objections or abstentions. – Approved.
    b. Approval of the Spring 2025 agenda
        i. Robert Allison motioned to approve.
        ii. David Murray seconded.
        iii. Motion was carried unanimously with no objections or abstentions. – Approved.

7. 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.

8. Old work: <u>Voting on wording changes to P638 Draft 3.</u>

    <u>Approval of Section 5.3 Thermal Life qualification</u>
    - ✓ Motion to Approve - Grace Yuan
    - ✓ Second - Robert Allison
    - ✓ No Objections
    - ✓ Change Approved

    <u>Approval of Section 6.1 Line 28</u>
    - ✓ 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

9. 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.

10. Next meeting: Bonita Springs, FL on Oct. 20, 2025
11. 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.
    - 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:
            a. Joe Watson commented on use of figures and need to clarify decision not to have figures in definitions.
            b. Luc Dorpmanns responded that figures are separate in guide from definitions.
            c. Mike Thompson commented if we do not have definitions will they go into the IEEE technical guideline?
            d. Ewald Schweiger responded he did not know and would check.
            e. Christoph Ploetner commented that IEC does not allow figures in definitions.
            f. Ewald Schweiger suggested we use IEC as template and have the figures in an Annexes.
            g. Sanjay Patel pointed out that the IEC in the short circuit document does have figures in the definition.
            h. Christoph Ploetner indicated that the IEC will be removing figures from definitions in the future.
            i. Kevin Juchem offered that we are not creating new definitions so best may be to retain same approach as before.
            j. Trent Williams commented that the IEEE Dictionary can have multiple definitions for the same term, and we might be re-inventing the wheel.
            k. 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 .
            a. Suggest Annex A for other solutions such as ARS (Advance Retard Switch).
            b. 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 Power 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

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**

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
    a. IEEE Patent Policy and Call for Patents
        i. No comments from group
    b. IEEE SA Copyright Policy
        i. No comments from group
    c. Review of agenda
        i. No comments from group
    d. Reminder on the purpose and the scope of the working group, and the timeline
        i. The expectation from this WG is to review and update the document as it expires on 12/31/2025.
        ii. Projected Completion Date for Submittal to RevCom: Dec 2025
    e. Introductions of the attendees
        i. Attendance was taken by QR Code sign-in…no paper attendance sheets were passed out.

ii. Name/affiliation was announced as attendees spoke during the meeting.

f. Updated membership review and count for quorum
   i. 49 members and 29 were counted as present via hand count.
      1. QUORUM ACHIEVED
   ii. *Attendance list after meeting completed showed 32 members attended*.
   iii. Members are expected to attend and stay in the meeting so business can be conducted.
   iv. 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

g. Approvals of previous minutes and agenda:
   i. 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
   ii. 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
   a. Draft 1.0 was emailed to the 49 WG members before the Spring 2025 meeting and was voted on electronically.
      i. 41 members responded (85% response)
      ii. 35 approved with no comments
      iii. 3 abstained
      iv. 3 approved with comments, making it 38/41 approval (93%)
      v. Zero disapproved
   b. Member comments from the Draft 1.0 email vote were reviewed in the S25 meeting
      i. 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:

During the Spring 2024 meeting changes below were approved

a.

Definition for compressive force
i. MOTION made by A.Sarkar, 2nd – M.Saad to use definition from C57.164
1. Vote was unanimously approved with 1 abstention

Existing Definition: (A) The force that presses the inside coil toward the core. (B) The force attraction that presses coils wound in opposite directions together in a set of pancake coils.

2. Definition within C57.164 for compressive force will be put in the document by Chair before being sent to ballot:

ii. 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

> **compressive stress**: Inward stresses on windings, spacers, conductor paper, insulation and pressure rings (or pressure plates) due to radial forces resulting in tangential compressive stress. Also applied to interphase wedges in shell form transformers.

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….

iii. 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

a. 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.
   i. 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
   ii. After some discussion of the MOTION, an amendment was made:
   iii. 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

b. 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
   i. No objection to unanimous approval – MOTION APPROVED

c. 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
   i. No objection to unanimous approval – MOTION APPROVED

ii. 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
    a. 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):

LAST NAME	FIRST NAME	COMPANY/AFFILIATION	Role
Abbas	Mubarak	Virginia Transformer	GUEST
Adams	Kayland	Prolec-GE Waukesha	GUEST
Betancourt	Enrique	Prolec ge	MEMBER
Boettger	William	Boettger Transformer Consulting LLC	MEMBER
Botti	Michael	Hyosung HICO	GUEST-RM
Bradshaw	Jeremiah	Bureau of Reclamation	GUEST
Calil	Wilerson	Hitachi Energy/Member	GUEST-RM
Chanda	Sudip	Delta Star Inc.	GUEST-RM
Chu	Matt	Shihlin Electric	GUEST
Crockett	Daniel	Ameren	MEMBER
Crockett	Janet	Fayettville PWC	GUEST
Cross	James	Kinectrics	GUEST-RM
Da Silva	Roberto	Maschinenfabrik Reinhausen	GUEST
Debass	Sami	EPRI	MEMBER
Dillon	Nikolaus	Dominion Energy	MEMBER
Draper	Zachary	Delta-X Research	MEMBER
Dulac	Hakim	Advanced Power Technologies	MEMBER
Elson	Eric	San Diego Gas and Electric	GUEST
Fausch	Reto	RF Solutions	GUEST
Fernandez	Miguel	Braintree Electric Light Dept.	GUEST-RM
Foata	Marc	MR	GUEST
Forsyth	Bruce	Cargill	MEMBER
Garcia	Eduardo	Siemens Energy	MEMBER
Garner	Joshua	RESA Power	GUEST
Garza	Héctor	Orto de México	GUEST
Goglia	Slaven	Koncar Power Transformers Ltd.	GUEST
Gorzin	Alireza	Black & Veatch	MEMBER
Greaves	Brad	Weidmann Electrical Technology, Inc	GUEST
Hall	Jesse	VTC	GUEST
Hampton	Kevin	Siemens Energy	GUEST
HOLLRAH	DEREK	Burns & McDonnell	GUEST
Jang	Donghyun	LS ELECTRIC	GUEST
Jones	Braxton	SD Myers	GUEST
Keels	Thomas	kEElectric Engineering PLLC	GUEST-RM
Kelemen	Franjo	Koncar Power Transformers Ltd.	GUEST
Khan	Qasim	Neetrac-Georgia Tech	GUEST
kim	dalho	iljin electric	GUEST
Kim	Yeounsoo	JST Power Equipment	GUEST-RM
Klempner	Dmitriy	Southern California Edison	GUEST-RM
Koshel	Anton	Delta Star Inc	GUEST
Kurz	Andreas	Maschinenfabrik Reinhausen	GUEST
Kwai	Yeboah	GE Vernova	GUEST-RM
Labh	Ashwini	Hitachi Energy	GUEST-RM
Li	Weijun	Braintree Electric Light Department	MEMBER
Loiselle	Luc	Tetra tech	GUEST
Lopes	Ricardo	Efacec	GUEST
Lugge	Andrew	Hitachi Energy	GUEST
Machain	Jose Luis	Prolec GE	MEMBER
Mamede	Gabriel	Siemens Energy	GUEST-RM
Mani	Balakrishnan	Delta star Field service	GUEST-RM
MELLE	TOM	HIGHVOLT	MEMBER
Mellin	Toni	Vaisala	GUEST
Merrill	Logan	OMICRON	GUEST

LAST NAME	FIRST NAME	COMPANY/AFFILIATION	Role
Mills	Francis	POWER Engineers	MEMBER
Montanha	Juliano	Siemens Energy	MEMBER
Morales-Cruz	Emilio	Qualitrol	MEMBER
Munoz	Martin	Orto de México	GUEST
Munoz	Marta	Hitachi Energy	GUEST-RM
Murray	David	TVA	MEMBER
Musgrove	Ryan	Oklahoma Gas & Electric	MEMBER
Obregon	Daniel	TTE Transformers	GUEST
O'Malley	Anastasia	consolidated Edison Co of NY	MEMBER
Orozco	Eduardo	GE Vernova Grid Solutions	GUEST-RM
Ortiz	Juan	Reinhausen Manufacturing	GUEST
Pandya	Manan	Siemens Energy	GUEST-RM
Panesar	Parminder	Virginia Transformer Corp	MEMBER
Park	Jaeyong	LS Electric	GUEST
Pedro	Pedro	Efacec Energia	GUEST-RM
Rato	Nuno	Efacec	GUEST
Raymond	Timothy	Inductive Reasoning	MEMBER
Reyes perez	Juan	Hitachi energy	GUEST
Ryu	Hyounggon	HD hyundai electric	GUEST
Saad	Mickel	Hitachi Energy	MEMBER
SAHIN	HAKAN	GEORGIA TRANSFORMER	MEMBER
Sanchez rodriguez	Jesus	Vertiv	GUEST-RM
Sarkar	Amitabh	Virginia Transformer Corporation	MEMBER
Schaffer	Marcus	Meta	GUEST
Schrammel	Alfons	Siemens Energy	GUEST
Schwartz	Dan	Quality Switch	MEMBER
Segovic	Dario	Koncar Power Transformers Ltd.	GUEST
Sethi	Kabir	Hitachi Energy Germany Ag	GUEST-RM
Sewell	Jeremy	Quality Switch, Inc.	GUEST
SEWELL	ADAM	QUALITY SWITCH	MEMBER
Sexton	Aron	Kinectrics	GUEST
Shaikh	Salahuddin	NRG Energy Inc	GUEST-RM
Sinclair	Jonathan	Black and Veatch	GUEST
Singh	Amitkumar	Con Edison Company of New York	GUEST-RM
Snyder	Jason	FirstEnergy	GUEST
SOM	SANJIB	PTT, LLC	MEMBER
steele	Hampton	TVA	GUEST
Sweetser	Charles	OMICRON electronics Corp. USA	GUEST
Szczechowski	Janusz	Maschinenfabrik Reinhausen GmbH	MEMBER
Tan	Jonathan	Northern Transformer	GUEST
Vedantham	Aparna	Virginia transformer corporation	GUEST
VonGemmingen	richard	Dominion Energy	MEMBER
Vullo	Stephen	GE Vernova	GUEST
Wagner	John	AEP	GUEST
Wallace	David	Mississippi State University	GUEST
Washburn	Alan	Burns & McDonnell	MEMBER
Whitehead	William	Reinhausen	GUEST
Woods	Deanna	PTT	MEMBER
Wright	Jeffrey	Duquesne Light	GUEST
Xie	Jiahao	S&C Electric Company	GUEST
YU	ZACHARY	SIEYUAN ELECTRIC COMPANY	GUEST
Yun	Joshua	Virginia Transformer Corp	MEMBER
Zibert	Kris	Allgeier Martin	GUEST

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 expires 12/31/2027

PAR Expiration Date: **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
    a. Call for Patent Claims & Copyright Notice
    b. No comments from working group about any patent claims or copyright notice
4. Distribution of attendance sheets
    a. Attendance was taken by QR Code sign-in…no paper attendance sheets were passed out.
    b. 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.
    a. 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.
    a. MOTION was made by D.Schwartz and 2nd by M.Newbill to approve Spring 2025 Agenda.
        i. No opposition to unanimous approval of the MOTION – APPROVED
    b. MOTION was made by J.Sewell and 2nd by D.Schwartz to approve Fall 2024 Meeting Minutes.
        i. No opposition to unanimous approval of the MOTION - APPROVE
7. Chair announcements
    a. Current guide is set to expire December 31, 2025
    b. 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
    a. Request was made to share previous presentations that were used to develop this guide
        i. Chair posted previous presentations and 2015 C57.157 standard on IEEE Collabratec and IEEE TC Power Transformer Subcommittee pages
        ii. Chair presented background information on this guide during the S24 meeting by showing one of the presentations that is available on IEEE Collabratec.
    b. 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
    c. Attila Gyore (Midel) presented at the F24 meeting in St. Louis on topic of synthetic esters
        i. History of synthetic ester liquids
        ii. Chemistry of synthetic ester liquid and how is it different to mineral oil and natural ester liquids
        iii. Standards that apply to synthetic ester liquid (IEEE, ASTM and IEC)
        iv. Material compatibility
    d. 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 oil

   Sometimes, 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 expansion
   A 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 cycles
   The 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 changer
   If 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 properties
   Transformer 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 force
   Sometimes 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 section
   The 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 sink
   The 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 contaminants
   The 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 concentration
    The 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.

9. New Work
    a. Synthetic ester testing
        i. 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.
        ii. 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
        iii. 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.
        iv. 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.
    b. The chair announced the desire to create a draft 1.0 to review before the Fall 2025 meeting
        i. Need any input from members on recommended changes / adds / deletes to current guide standard before the Fall 2025 meeting.
10. Next meeting: October 21, 2025 at Fall 2025 Transformers Committee Meeting scheduled for October 19-23 in Bonita Springs, FL, USA.
11. Close of meeting
    a. 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.
   b. 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.
   c. Stephanie Mabry recommended that it may be a valid risk-avoidance strategy to secure a PAR extension while we have a quorum present.
   d. 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.
   e. 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.
9. 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.
10. 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.
11. 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:
    a. 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.
    b. Clause 5 Comment resolved also by adding a similar note to Tables 5 & 6 which will also be provided by Sanjib.
    c. Subclause 6.1 comment review.
        i. 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.
        ii. 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:**
    a. 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.
    b. 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.
        i. Clause 4: Ratings
            1. Dan Sauer (Eaton Corporation), Jason Beaudoin (Weidmann), Sheldon Kennedy (Consultant).
        ii. Clause 7: Connections
            1. Sanjib Som (Pennsylvania Transformer), Emilio Morales (Qualitrol) and Thrinadha Katapalli (Virginia Transformers).
        iii. Clause 8: Testing
            1. Jason Varnell (Doble Engineering).
        iv. Clause 9: Construction
            1. Sanjib Som (Pennsylvania Transformer)
        v. Annex A – DC Arc Furnace
            1. Dan Sauer (Eaton Corporation) and Jerzy Kazmierczak (Hitachi Energy).
        vi. Annex C – Replacement and Remanufacturing of Low Voltage Bus Bars
            1. Jason Beaudoin (Weidmann) and Jason Varnell (Doble Engineering).
        vii. 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
3) 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
4) Establish quorum
    - A quorum was achieved.
    - Total number of members is 14 requiring 8 members for quorum.
    - 12 members were present establishing quorum.
5) Approval of agenda
    a) Motion to approve agenda was made by Markus Stank and second by Luc Dorpmanns.
    No discussion or objections were made.
    b) Motion was carried unanimously with no objections or abstentions.
6) Approval of meeting minutes of the previous Virtual meeting on October 29th, 2024
    a) The Meeting Minutes were posted on the PTRC website.
    b) Motion to approve agenda was made by Christoph Ploetner and second by Sebastian Rehkopf.
    No further discussion or objections were made.
    c) Motion was carried unanimously with no objections or abstentions.
7) 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.

8) 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.

9) 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.

10) 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).

11) 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.

12) Planned next steps
    a. *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.
    b. Collection of feedback (via email)

13) The meeting was adjourned at 2:15 PM (MDT)

14) 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

4.1. 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

6.1 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.

6.2 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