

IEEE/PES Transformers Committee

Fall 2024 Meeting Minutes

**St. Louis, MO, USA
October 26-31, 2024**

Unapproved

(These minutes are on the agenda to be approved at the next meeting in Spring 2025)

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NOTE: The Annexes included in these minutes are **unapproved** by the respective subcommittees and are accurate as of the date the Transformers Committee meeting minutes were published. Readers are encouraged to check the Transformers Committee website (www.transformerscommittee.org) for the latest revision of the unapproved and the minutes of the next Transformers Committee meeting for final revisions prior to approval.

- Annex A. Bushings SC – Eric Weatherbee
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- Annex C. Distribution Transformers SC – Jerry Murphy
- Annex D. Dry Type Transformers SC – Casey Ballard
- Annex E. HVDC Converter Transformers & Smoothing Reactors – Ulf Radbrandt
- Annex F. Instrument Transformers SC – Thomas Sizemore
- Annex G. Insulating Fluids SC – Stephanie Mabrey
- Annex H. Insulation Life SC – Sheldon Kennedy
- Annex I. Meetings SC – Tammy Behrens (see Appendix 9)
- Annex J. Performance Characteristics SC – Rogerio Verdolin
- Annex K. Power Transformers SC – Ryan Musgrove
- Annex L. Standards SC – Dan Sauer
- Annex M. Subsurface Trans & Network Protectors SC – George Payerle

General Administrative Items

1 AGENDA

Opening Session

Monday, October 28, 2024: 8:00 am - 9:15 am CDT (UTC-06:00)

(Attendance recorded by roster – attendance required to maintain Member status)

1. Welcome and Announcements David Wallach
2. Meeting Minute Tammy Behrens
3. Approval of Agenda David Wallach
4. Approval of Minutes from Spring 2024 Meeting David Wallach
- Chair's Report & Administrative Subcommittee Report David Wallach
5. Vice Chair's Report Bill Griesacker
6. Secretary's Report Scott Reed
7. Treasurer's Report Troy Tanaka
8. Standards Report Steve Shull
9. Liaison Representative Reports
 - 9.1. CIGRE Craig Swinderman
 - 9.2. IEC TC Reports..... Christoph Ploetner
 - 9.3. Standards Coordinating Committee, SCC4 (Electrical Insulation) Evanne Wang
 - 9.4. ASTM Ed Casserly
 - 9.5. Transactions on Power and Delivery (TPWRD) Editor Liaison Xose Lopez-Fernandez
10. Hot Topics for the Upcoming Week Subcommittee Chairs
11. New Business & Wrap-up David Wallach

Closing Session

Thursday, October 31 2024: 11:00 am - 12:00 pm CDT (UTC-06:00)

1. Chair's Remarks and Announcements David Wallach
2. Meetings Planning Subcommittee Tammy Behrens
3. Reports from Technical Subcommittees (decisions made during the week)
 - 3.1. Bushings Eric Weatherbee
 - 3.2. Dielectric Tests Poorvi Patel
 - 3.3. Distribution Transformers Jerry Murphy
 - 3.4. Dry Type Transformers Casey Ballard
 - 3.5. Transformers and Reactors for HVDC Applications Ulf Radbrandt
 - 3.6. Instrument Transformers Thomas Sizemore
 - 3.7. Insulating Fluids Stephanie Mabrey
 - 3.8. Insulation Life Sam Sharpless
 - 3.9. Performance Characteristics Rogerio Verdolin

- 3.10. Power Transformers Ryan Musgrove
- 3.11. Standards Dan Sauer
- 3.12. Subsurface Transformers & Network Protectors George Payerle
- 4. Additional Report from Standards Coordinator (issues from the week) Steve Shull
- 5. New Business (continued from Monday) and Wrap-up David Wallach

2 ATTENDANCE

2.1 COMMITTEE MEMBER ATTENDANCE

The following table lists all Committee Members who signed the attendance sheet at the opening or closing session meetings. See section 2.2 for a list of non-Committee Members who signed the attendance sheet at these meetings.

Committee Member Attendance:

Names	First Name	Affiliation	Monday 10/28/24	Thursday 10/31/24
Ansari	Tauhid	Hitachi Energy	X	X
Ayers	Donald	Ayers Transformer Consulting	X	
Ballard	Robert	Dupont	X	
Bargone	Gilles	FISO Technologies	X	
Beaster	Barry	The H-J Family of Companies	X	
Bernesjo	Mats	Hitachi Energy	X	
Betancourt	Enrique	Prolec GE	X	
Biggie	Kevin	Weidmann Electrical Technology	X	X
Binder	Wallace	WBBinder Consultant		X
Blaszczyk	Piotr	Specialty Transformer Components	X	X
Blaydon	Daniel	Baltimore Gas & Electric	X	
Blew	David	DS Blew Consulting	X	X
Boettger	William	Boettger Transformer Consulting LLC	X	
Boman	Paul	Hartford Steam Boiler	X	
Castellanos	Juan	Prolec GE	X	
Cheim	Luiz	Hitachi Energy	X	
Chiang	Solomon	The Gund Company	X	X
Chrysler	Rhett	ERMCO	X	
Colopy	Craig	Retired	X	X
Cruz Valdez	Juan Carlos	Prolec-GE	X	X
Dauzat	Thomas	AEP-SWEPCO	X	
Davis	Eric	Consultant	X	
Debass	Samson	EPRI	X	

Del Rio	J. Arturo	Siemens Energy Inc.	X	X
Digby	Scott	Duke Energy	X	X
Elliott	William	AEP-SWEPCO	X	X
Ermakov	Evgenii	Hitachi Energy	X	X
Fausch	Reto	RF Solutions	X	X
Ferreira	Marcos	Quanta Technology	X	
Foata	Marc	MR	X	
Garcia	Eduardo	Siemens Energy	X	X
Gardner	James	Prolec-GE Waukesha	X	X
Griesacker	Bill	W. Griesacker & Associates Inc.	X	X
Gyore	Attila	M&I Materials Ltd	X	X
Harley	John	FirstPower Group LLC	X	X
Hayes	Roger	GE Vernova	X	X
Hernandez	Ronald	Doble Engineering Co.	X	X
Hochanh	Thang	BC Hydro	X	
Hoffman	Gary	Advanced Power Technologies		X
Hogg	Ryan	Bureau of Reclamation	X	
Hopkinson	Philip	HVOLT Inc.	X	
Iman	Mohammad	MGM Transformer Company	X	
John	John	Virginia Transformer Corp.	X	X
Jordan	Stephen	TVA		X
Joshi	Akash	Mott Macdonald	X	
Kaineder	Kurt	Siemens Oesterreich AG	X	
Kennedy	Sheldon	Sheldon P. Kennedy Engineering, PLLC	X	
King	Gary	Howard Industries	X	X
Kiparizoski	Zan	Howard Industries	X	
Klaponski	Brian	Carte International Inc.		X
Kornowski	Marek	Polycast Int'l	X	
Li	Weijun	Braintree Electric Light Department	X	
Lopez-Fernandez	Xose	Universidade de Vigo	X	
Lovins	Colby	Federal Pacific	X	
Mabrey	Stephanie	Weidmann	X	
Mai	Tim-Felix	Siemens	X	
Malde	Jinesh	M&I Materials Ltd	X	
Mani	Kumar	Duke Energy Inc.	X	
Matthews	Lee	Howard Industries	X	X
Milojevic	Goran	DV Power	X	
Mulkey	Daniel	Mulkey Engineering Inc	X	
Murphy	Jerry	Reedy Creek Energy Services	X	X
Murray	David	Tennessee Valley Authority	X	X

Musgrove	Ryan	Oklahoma Gas & Electric	X	X
Naderian	Ali	BBA	X	
Nambi	Shankar	Bechtel Power Corp	X	
Parkinson	Dwight	EATON Corporation	X	X
Patel	Poorvi	EPRI	X	X
Patel	Sanjay	Smit Transformer Sales, Inc	X	X
Payerle	George	Carte International Inc.	X	X
Perjanik	Nicholas	AVO Diagnostics Services	X	
Ploetner	Christoph	Siemens Energy	X	X
Pointner	Klaus	Trench Austria GmbH	X	
Poulin	Bertrand	Hitachi Energy	X	X
Prevost	Thomas	Weidmann Electrical Technologies Inc.	X	X
Radbrandt	Ulf	Hitachi Energy	X	
Radu	Ion	Hitachi Energy	X	
Rave	Martin	ComEd	X	
Raymond	Timothy	EPRI	X	X
Reed	Scott	MVA	X	X
Robalino	Diego	Megger	X	
Roman	Zoltan	GE		
Roussell	Marnie	Entergy	X	X
Saad	Mickel	Hitachi Energy	X	X
Sahin	Hakan	Virginia Transformer Corp.		
Sankarakurup	Dinesh	Duke Energy	X	X
Sarkar	Amitabh	Virginia Transformer Corp.	X	
Sauer	Daniel	EATON Corporation	X	X
Sbravati	Alan	Hitachi Energy		
Schwartz	Dan	Quality Switch, Inc.	X	X
Schweiger	Ewald	Siemens AG	X	X
Sewell	Adam	Quality Switch, Inc.	X	
Sewell	Jeremy	Quality Switch, Inc.	X	X
Sharp	Michael	Trench Limited	X	
Sharpless	Samuel	Rimkus Consulting Group	X	
Shertukde	Hemchandra	University of Hartford	X	
Shull	Stephen	BBC Electrical Service Inc.	X	X
Sizemore	Thomas	ABB Inc.	X	X
Smith	Edward	H-J Enterprises, Inc.	X	X
Snyder	Steven	Retired	X	
Solano	William	Maschinenfabrik Reinhausen	X	X
Som	Sanjib	Pennsylvania Transformer	X	X
Spitzer	Thomas	City Transformer Service Co.	X	
Stankes	David	3M	X	

Stechschulte	Kyle	American Electric Power	X	X
Strech	Kerwin	Siemens Energy	X	
Sweetser	Charles	OMICRON electronics Corp USA	X	
Swinderman	Craig	Mitsubishi Electric Power Products	X	
Tanaka	Troy	Burns & McDonnell	X	X
Tatu	Val	Powersmiths Internation		X
Tedesco	Joseph	Hitachi Energy	X	X
Tendulkar	Vijay	EATON Corporation		X
teNyenhuis	Ed	Hitachi Energy	X	X
Thibault	Mike	Pacific Gas & Electric	X	X
Thompson	Ryan	Burns & McDonnell	X	X
Tillery	Timothy	Howard Industries	X	X
Tostrud	Mark	Dynamic Ratings, Inc.	X	X
Traut	Alan	Howard Industries	X	
Van Der Walt	Alwyn	Electrical Consultants Inc.	X	X
Varghese	Ajith	Prolec-GE Waukesha	X	X
Varnell	Jason	Doble Engineering Co.	X	
Verdell	Joshua	ERMCO	X	X
Verdolin	Rogério	Verdolin Solutions Inc.	X	X
Walker	David	MGM Transformer Company	X	X
Wallace	David	Mississippi State University	X	X
Wallach	David	Duke Energy	X	X
Wang	Evanne	Dupont	X	
Washburn	Alan	Burns & McDonnell	X	X
Watson	Joe	JD Watson and Associates	X	
Weatherbee	Eric	PCORE Electric	X	X
Webb	Bruce	Knoxville Utilities Board	X	
Weisensee	Matthew	PacifiCorp	X	
Welton	Drew	Intellirent	X	
Wright	Jeffrey	Duquesne Light Co.	X	X
Yun	Joshua	Virginia Transformer Corp.	X	
Zarnowski	Michael	Carte International Inc.		X
Zhao	Peter	Hydro One	X	
Zibert	Kris	Allgeier, Martin and Associates	X	
Ziomek	Waldemar	PTI Transformers LP	X	X

Based upon the above attendance totals:

Quorum was achieved at Monday Opening Session (129/193 = 67%).

Quorum was not achieved at Thursday Closing Session (72/193 = 37%).

2.2 GENERAL ATTENDANCE

The attendance of non-Committee Members who signed the attendance sheet is recorded in the QR code generated excel spreadsheet from the Monday and Thursday general meetings. This document is in a separate file to be uploaded with the meeting minutes to the committee web page (www.transformerscommittee.org).

Monday Opening Session

3 APPROVAL OF AGENDA AND PREVIOUS MINUTES – DAVID WALLACH

At 8:00 AM CDT the Chair (David Wallach) called the meeting to order. He welcomed everyone to the in-person meeting.

The Chair reviewed the names and affiliations of the officers of the Committee.

The agenda was reviewed. There were no comments on the agenda so it is approved.

The Spring 2024 minutes were posted. The Chair requested any comments or changes. There were no comments made, therefore the Spring 2024 minutes were approved as published.

4 CHAIR’S REPORT – DAVID WALLACH

Chair’s Report and Remarks – Presented at the Monday General Session – Fall 2024

4.1 IEEE PES TRANSFORMERS COMMITTEE SUBCOMMITTEE CHAIR APPOINTMENTS

The IEEE PES Transformers Committee P&P-2019, Clause 5.2:

A Responsible Subcommittee shall have a Chair and at least one other officer. The chair of a Responsible Subcommittee appoints other officers. Additional officers (e.g., a Vice-Chair, a Secretary, Treasurer) should be chosen, depending on the scope of work. Members of the Responsible Subcommittee are appointed by the Chair of the Responsible Subcommittee.

IEEE PES Transformers Committee P&P-2019, Clause 3.1:

Responsible Subcommittee chairs serve for a term of three years and may be reappointed for a one-year term up to two times, for a maximum term of 5 years. New terms shall begin on January 1 of the first year of the appointment (except in the case of temporary appointments made under Clause 3.2) and shall end on December 31 of the last year of the term.

In 2024, the Transformers Committee has six chairs who have reached their term limit. The Chair of the Transformers Committee makes the following appointments with terms beginning January 1, 2025:

Subcommittee	Chair
Bushing	Scott Digby
Dry Type	David Walker
Transformers and Reactors for HVDC Applications	Klaus Pointner
Instrument Transformers	David Wallace
Performance Characteristics	Sanjib Som
Subsurface Transformers and Network Protectors	Tony Reiss

4.2 IEEE PES TECHNICAL COUNCIL

Power Energy Society (PES) Technical Council is composed of the Chairs of the PES Technical and Coordinating Committees plus the Chairs of Standing Committees reporting to it. The full organizational structure of the PES can be found on the PES website (<https://www.ieee-pes.org>). The PES Technical Committees report to the Technical Council on matters concerning membership, recognition, technical publications, scope, and the coordination of the Power Energy Society generated standards. The Technical Committees work directly with the IEEE-SA Standards Board and the PES Standards Coordinating Committees for standards relating to their respective technical scopes. For further details on the Statement of Purpose and Scope of Activities for the PES Technical Council please see the following website; www.ieee-pes.org/statement-of-purpose-and-scope-of-activities-for-the-pes-technical-council .

4.2.1 Technical Council Officers & Members

The officers and members of the Technical Council are listed below for reference.

TECHNICAL COUNCIL OFFICERS 2024-2025

Chair.....Diane Watkins

Vice Chair.....Jim McBride

Secretary.....Costas Vournas

Past Chair.....Hong Chen

TECHNICAL COMMITTEES**Chair**

Analytic Methods for Power Systems Committee	Steve Miller
Electric Machinery Committee	Jim Lau
Energy Development and Power Generation Committee	Kai Strunz
Energy Storage and Stationary Battery Committee	Steve Vechy
Insulated Conductors Committee	Bert Spear
Nuclear Power Engineering Committee	Mark Bowman
Power System Communications and Cybersecurity Committee	James Formea
Power System Dynamic Performance Committee	Bikash Pa
Power System Instrumentation and Measurements Committee	Jeff Britton
Power System Operation, Planning and Economics Committee	Francois Bouffard
Power System Relaying and Control Committee	Michael Thompson
Smart Buildings, Loads and Customer Systems	Yashen Lin
Substations Committee	Joe Warner
Surge Protective Devices Committee	Steven Hensley
Switchgear Committee	Doug Edwards
Transformers Committee	David Wallach
Transmission and Distribution Committee	Eriks Surmanis

COORDINATING COMMITTEES**Chair**

Energy Internet Coordinating Committee	Hongbin Sun
Intelligent Grid and Emerging Technologies Coordinating Comm	Theo Laughner
Marine Systems Coordinating Committee	Dwight Alexander
Renewable Systems Integration Coordinating Committee	Yingchen Zhang

STANDING COMMITTEES**Chair**

Awards Committee	Hong Chen
Organization & Procedures Committee	Jim McBride
Power and Energy Education Committee.....	Sukumar Kamalasadan
Standards Coordination Committee.....	Todd Irwin
Technical Sessions Committee	Jim McBride
Entity Proposal Management Committee	Hong Chen, Dan Sabin

4.2.2 PES Technical Council Activities

Upcoming Technical Council meetings include the following:

- Nov 1-2, 2024, Location Piscataway, NJ – Joint Technical Council Retreat
- January 12-16, 2025 – Garden Grove, CA - Joint Technical Council
- July 27–31, 2025, Austin, TX – PES GM

4.2.3 PES Technical Council Technology Task Force

Effective September 20, 2024, the Technical Council officers have created a new Task Force under Technical Council focused on the implementation of technology. James Formea has agreed to serve as the Chair. This Task Force will be tasked with leading the implementation of the Association Management System (AMS) for the Technical & Coordinating Committees.

4.2.4 Memberplanet

PES awarded a contract in 2021 to *memberplanet* for committee membership management. The IEEE PES is covering the development cost and will cover the cost of the future annual contract for the *memberplanet* tool (except for pass-through charges for event registration such as credit card transaction fees). *memberplanet* continues to work on the latest modules. In August of 2024, IEEE Staff is began building out the committee structure, levels above the Transformers Committee, but ran into some bugs that memberplanet is trying to resolve causing delays.

The update as of October 2024, the memberplanet team has finalized the following items:

- (Fix) Exclusivity and requirements reverting and not copying correctly.
- (Fix) Document storage tab removed as this was displayed in error.
- (New) Entities are now sorted alphanumeric.

and the team is still actively working through these items:

- Enhancements to Directory module to pick and choose which columns and contact methods to display (Aiming to include this on the 10/11 push)
- Including the Events module for each committee where Events are only visible to those within a specific committee (Nov push)
- Document storage (Nov push)
- Shopping cart approach when adding members to allow for multiple selections across multiple pages (Nov push)
- Updating the tags under the My Committees module to show whether they are a Participant or an Admin (Nov push)

Jim McBride is following progress in his Technical Council roles. I reported in the Spring that with the loss of Greg Anderson earlier this year I asked Bruce Forsyth to help us as a point-of-contact for the Transformers Committee, but he is not able to continue to fulfill this role due to schedule. When the activity for the Transformers Committee ramps up, we will ramp up our efforts and delegate activities as needed. Effective September 20, 2024, the Technical Council officers created a new Task Force under Technical Council focused on the implementation of technology. James Formea has agreed to serve as the Chair. This Task Force will be tasked with leading the implementation of the Association Management System (AMS) for the Technical & Coordinating Committees.

As of this week's meetings, we again ask activity leaders are requested to continue to use their own mailing lists and meeting rosters.

All activity leaders - please also send any email bounces (or email updates) to Ed teNyenhuis to accumulate so that we can investigate and update the membership database so it will be current for when *memberplanet* is ready.

4.2.5 IEEE PES Technical Committee Landing Page

The Technical Council wished to have landing pages that would show up in general web searches. Rather than require each Technical Committee to host their web site with required formats and content, a landing page is being developed for each Technical Committee with basic information such as scope, officers, upcoming events, and a view of each of the subcommittees. The Transformers Committee landing page was drafted in August of 2024 and is expected to be go live October 30, 2024.

[Analytic Methods for Power Systems \(AMPS\)](#)

[Electric Machinery \(EMC\)](#)

[Energy Development & Power Generation \(EDPG\)](#)

[Energy Storage & Stationary Battery \(ESSB\)](#)

[Insulated Conductors \(ICC\)](#)

[Nuclear Power Engineering \(NPEC\)](#)

[Power System Communications & Cybersecurity \(PSCCC\)](#)

[Power System Dynamic Performance \(PSDP\)](#)

[Power System Instrumentation and Measurements \(PSIM\)](#)

[Power System Operation, Planning & Economics \(PSOPE\)](#)

[Power System Relaying and Control \(PSRC\)](#)

[Smart Buildings, Loads and Customer Systems \(SBLCS\)](#)

[Substations](#)

[Surge Protective Devices \(SPDC\)](#)

[Switchgear](#)

[Transformers](#)

[Transmission & Distribution \(T&D\)](#)

4.3 TRANSFORMERS COMMITTEE ACTIVITIES

4.3.1 Spring 2024 Vancouver Meeting

Our Spring 2024 Transformer Committee meeting was a success with 533 attendees and 54 spouse/companions in attendance and we paid our bills (net gain \$50.5k).

4.3.2 Committee Schedule

The location and dates of future committee meetings that are currently planned are as follows:

Spring 2025	Denver, CO	March 23-27, 2025
Fall 2025	Bonita Springs, FL	October 19-23, 2025

Check the Committee website (www.transformerscommittee.org) regularly for information on upcoming meetings.

4.3.3 Avoiding PAR Extensions

Working Group Chairs should pay close attention to the progress of their documents and to strive to complete their assignment(s) within the standard 4-year life of the PAR. To do so, WG Chairs should be careful to avoid scope creep and plan to complete the substantial work on the document in about 3 years to allow sufficient time for the balloting and comment resolution processes.

4.3.4 Meeting App

We continue to use the IEEE EventHub App for our meetings.

4.3.5 Officer's Travel for Committee Required Business

There is travel required by the Officers for IEEE PES Technical Committee work. The Officers have discussed and approved that all relevant and reasonable travel costs for extra meetings that Officers are required to attend shall be reimbursable by the Transformers Committee. Below are the scheduled meetings:

Chair: 2 meetings per year

1. JTCM in January for Technical Council meeting
2. General Meeting in July for Technical Council meeting and O&P Committee
3. Technical Council November Retreat (not included since IEEE PES pays for this trip)

Vice-Chair: 1 meeting in 2024

1. 2024 General Meeting in July for Technical Sessions meeting

Secretary: 1 meeting in 2025

1. GM in July for Technical Sessions meeting for training purposes

Typical business expenses will be covered including air, hotel, meals, mileage, parking, taxi/car, baggage fees, tolls, other. The Treasurer will budget accordingly, for 5-6 meetings per year (and include meeting registration fees, as appropriate).

4.3.6 Website Password Usage

The website password is not for public dissemination. It is for use by our meeting attendees (CM, AP, II) and associated work of the Transformers Committee. Access to the protected information on the Committee website is a benefit of attendance and participation. It may be used by meeting attendees and within attendees' immediate workplace, but not beyond that. A new password is implemented immediately after each fall meeting with an announcement made to share the new password during the closing session.

4.3.7 IEEE Copyright Policy

<https://standards.ieee.org/ipr/index.html>

The Transformers Committee has an obligation to comply with the IEEE Copyright Policy and thereby respect and protect the rights of copyright holders by preventing the inappropriate use of material protected by copyright laws.

Compliance with the Copyright Policy requires a certain amount of due diligence on the part of activity leaders, but it is not a daunting task. To assist activity leaders, a webinar was presented on October 5, 2020, that discussed the application of the Copyright Policy during Transformer Committee standards development processes. The presentation is available on the Committee website for those interested in further information.

4.3.8 Call for Patents (Essential Patent Claims)

<https://standards.ieee.org/about/sasb/patcom/patc.html>

A call for patents is required at every Working Group (WG) meeting. This is a reminder to all WG leaders to call for patents and record the results in the meeting minutes. Note it is not required to show the patent slides; it is only necessary to call for patents and record the response in the minutes. If there is a claim reported, the WG chair shall include in the minutes the name & affiliation of the individual asserting a patent claim. Here is what each WG Chair should ask at the beginning of each WG meeting. This applies only to WG's after the PAR is approved by the IEEE-SA Standards Board.

“If anyone in this meeting is aware of any patent claims that are potentially essential to implementation of the document under consideration by this WG, that fact should be made known to the WG and recorded in the meeting minutes.”

There should be no discussion of any patent claim identified, only that it be identified and recorded. Even if no patent claims are identified, the minutes are to indicate that the call for patents was made.

If a patent holder or patent applicant is identified, then the WG Chair (or designee) should ask the patent holder or patent applicant of a patent claim that might be or become an Essential Patent Claim to complete and submit a Letter of Assurance in accordance with Clause 6 of the IEEE-SA Standards Board Bylaws.

4.3.9 Letters of Assurance

A Letter of Assurance (LoA) is a document submitted to IEEE-SA by a patent holder which documents the submitter's position with regards to ownership, enforcement, or licensing of an Essential Patent Claim that may be incorporated into a specific IEEE document. Table 1 lists Letters of Assurance that pertain to our committee as of February 18, 2024. This listing can be found at

<https://standards.ieee.org/about/sasb/patcom/patents/> and by clicking “IEEE C37.30.2™ – N42 (XLSX)”.

Table 1: Letters of Assurance

Std. No.	Patent Owner	Contact for License	Patent Serial Number	Letter Date	Licensing Assurance Received	Date Record Entered or Revised
C57.12.200	Megger Sweden AB	Niclas Wetterstrand, Product Management Rinkebyvagen 19, SE-182 36 Danderyd, Sweden tel: +46-706917125 email: niclas.wetterstrand@megger.com URL: www.megger.com	8,428,895 (US)	25 Sep 2019	yes	30 Sep 2019
C57.104	Arizona Public Service Company	John Finn - Director Venture Investment Management, Venture Investments 400 North Fifth Street, Mail Station 8103, Phoenix AZ 85004 tel: +1-602-250-3517 email: john.finn@pinnaclewest.com URL: www.aps.com	not indicated	12 Apr 2019	yes	16 Apr 2019
C57.127	ABB Technology Ltd.	Bjorn Dahlstrand, ABB AB, Legal Affairs and Compliance/IP SE 72178, Vasteras, Sweden tel: +46-21345166 fax: +46-21181386 email: bjorn.dahlstrand@seabb.com	6,340,890 (US)	31 Aug 2005	yes	6 Sep 2005
C57.127	General Electric Technology GmbH	Frank Landgraff-Executive Counsel, GE Power Legal Department 3200 Wildwood Parkway Atlanta GA 30339 tel: +1-678-844-5494 email: frank.landgraff@ge.com; URL: https://www.ge.com/power	7,286,968B2 (US)	14 Aug 2018	yes	16 Aug 2018
C57.139	Maschinenfabrik Reinhausen GMBH	Stefanie Hofmeister-Counsel, Corporate Legal Services Falkensteinstrasse 8 D-93059 Regensburg, Germany tel: +49-(0)-94140906811 fax: +49-(0)-94140904015 email: patents@reinhausen.com	not indicated	13 Jan 2013	yes	16 Jan 2013
C57.143	Roger Fenton	Roger Fenton, Principal Engineer, Fenton Solutions 677 N. Shasta Way Upland CA 91786 tel: +1-909-767-8408 email: roger.a.fenton@gmail.com	15/371,085 (US)	9 Oct 2018	yes	12 Oct 2018

Std. No.	Patent Owner	Contact for License	Patent Serial Number	Letter Date	Licensing Assurance Received	Date Record Entered or Revised
C57.143	Roger Fenton	Roger Fenton, Principal Engineer, Fenton Solutions 677 N. Shasta Way Upland CA 91786 tel: +1-909-767-8408 email: roger.a.fenton@gmail.com	10,145,830 (US), 10,613,066 (US), 10,690,643 (US)	3 Aug 2022	yes	5 Aug 2022
C57.143	IntellPower Pty Ltd	Oleg Roizman - Principal, Innovations & Digital Transformation, 10 Warina Road, Carnegie, Victoria, Australia, tel: +61-408109782, email: oleg.roizman@intellpower.com, URL:www.linkedin.com/in/oleg-roizman-23051960	10,101,313 B2 (US)	13 Nov 2021	yes	15 Nov 2021
C57.146	Arizona Public Service Company	John Finn - Director Venture Investment Management, Venture Investments 400 North 5th Street, Mail Station 8103, Phoenix AZ 85004 tel: +1-602-250-3517 email: john.finn@pinnaclewest.com URL: www.aps.com	not indicated	23 May 2024	yes	31 May 2024
C57.147 and C57.155	Cooper Power Systems, LLC	Alan Yerges, Engineering - Power Systems Division IP 11131 Adams Road Franksville WI 53126-0100 tel: +1-262-835-2921 fax: +1-262-835-1515 email: alanpyerges@eaton.com	6,398,986 (US) 6,905,638 (US) 7,651,641 (US)	5 Apr 2017	yes; royalty-free	5 Apr 2017
C57.147 and C57.155	Cooper Power Systems, LLC	Alan Yerges, Engineering - Power Systems Division IP 11131 Adams Road Franksville WI 53126-0100 tel: +1-262-835-2921 fax: +1-262-835-1515 email: alanpyerges@eaton.com	PI 9612097-5	5 Apr 2017	NO	5 Apr 2017
C57.162	IntellPower Pty Ltd	Oleg Roizman - Principal, Innovations & Digital Transformation, 10 Warina Road, Carnegie, Victoria, Australia, tel: +61-408109782, email: oleg.roizman@intellpower.com, URL:www.linkedin.com/in/oleg-roizman-23051960	10,101,313 B2 (US)	13 Nov 2021	yes	15 Nov 2021

Std. No.	Patent Owner	Contact for License	Patent Serial Number	Letter Date	Licensing Assurance Received	Date Record Entered or Revised
C57.163	Advanced Power Technologies, LLC	Gary Hoffman - Managing Member 215 State Road 10 Randolph NJ 07869 tel: +1-973-328-3300 x499 fax: +1-973-328-0666 email: grhoffmann@advpowertech.com URL: www.advpowertech.com	20130285671 (US)	5 May 2014	yes	5 May 2014
C57.167	ZTZ Services International	Daniel Berler - CEO, 15371 NE 21st Avenue, Miami FL 33162, tel: +1-612-703-3335, email: berlerdaniel@ztzservices.us, URL: www.ztzservices.us	not indicated	23 Apr 2021	yes	23 Apr 2021
C57.167	Roger Fenton	Roger Fenton, Principal Engineer, Fenton Solutions 677 N. Shasta Way Upland CA 91786 tel: +1-909-767-8408 email: roger.a.fenton@gmail.com	10,145,830 (US), 10,613,066 (US), 10,690,643 (US)	3 Aug 2022	yes	5 Aug 2022

Respectfully submitted,



David Wallach

Chair, IEEE PES Transformers Committee
Rev. 1, October 15, 2024

5 VICE-CHAIR'S REPORT – BILL GRIESACKER

The Vice-Chair's Report was presented at the Monday General Session.

5.1 IEEE PES CALENDAR OF RECENT AND UPCOMING EVENTS

The following are recent and upcoming PES sponsored conferences and committee events. Please check the PES website at www.ieee-pes.org for further details, and additional events.

2025

- IEEE PES Grid Edge Technologies Conference and Exhibition
January 21-23, 2025, San Diego, California
- IEEE PES General Meeting
July 27-31, 2025, Austin, Texas

2026

- Transmission & distribution Conference and Exhibition
May 4-7, 2026, Chicago, Illinois
- IEEE PES General Meeting
July 19-23, 2026, Montreal, Quebec, Canada

2027

- IEEE PES General Meeting
July 25-29, 2027, San Francisco, California

5.2 2025 IEEE PES GRID EDGE TECHNOLOGIES CONFERENCE & EXPOSITION

5.2.1 Conference Theme

The weblink for the event is [IEEE PES 2025 Grid Edge](#)

There are five technology stages planned for the conference:

- Artificial Intelligence (AI)
- Electrification
- Distributed Energy Resources (DERs)
- Sustainability and Resiliency
- Startup and Innovation Showcase

5.2.2 Conference Papers

There were no transformer related papers submitted for the 2025 Grid Edge Technologies.

5.3 2025 IEEE PES GENERAL MEETING, JULY 27-31, 2025, AUSTIN, TEXAS

5.3.1 Conference Theme

The weblink for the event is [IEEE PES General Meeting 2025](#)

The theme of the conference is *Achieving Deep Decarbonization in the Electric Power System*

5.3.2 Conference Paper Submittals

The paper submission period opened to authors on October 7, 2024 and will close on November 11, 2024. At this time there are no paper submission posted. Once received, papers will then be distributed to various

Technical Committees for peer review based upon the paper content. Below is a summary of the papers assigned to the Transformers Committee:

Total Submissions 0
Transferred 0
Accepted 0
Rejected 0

The following table will be populated with accepted conference papers (transaction and conference)

Paper	Title	Type

5.3.3 Paper Reviewer Recognition (volunteers)

Reviewers will be assigned as appropriate to papers received for the PES 2025 General Meeting.

Sanjib Som Bruce Webb Waldemar Ziomek

Respectfully submitted,
Bill Griesacker
Vice-Chair
October 23, 2024

6 SECRETARY’S REPORT – SCOTT REED

The Secretary’s Report was presented at the Monday General Session.

6.1 MEMBERSHIP REVIEW

The Committee welcomes and encourages active participants to become Members of the Committee. Requirements and application forms can be found in the Organization and Procedures (O&P) Manual, accessible on the Committee website. A link to the Membership Application form can be found on the TransformersCommittee.org homepage in [Information](#) | Information | Forms. Subcommittee Chairs are encouraged to recommend new members to work towards membership and to communicate the process of attaining membership through **active participation** and **contribution** at the WG and SC level. New

member applications may be submitted to the Committee Secretary's attention at any time. Applications will be collected for review and approval in batches at each Administrative Subcommittee meeting.

6.1.1 New Committee Member Approvals

At the Spring 2024 Administrative Subcommittee meeting, four new committee member applications were submitted for consideration. The applications were approved. The new members are listed in the following table.

Name	Affiliation	Sponsor #1	Sponsor #2	Sponsor #3	Membership Category
Fabian Stacy	Hitachi Energy	Eric Weatherbee Bushings SC 5 years	Tommy Spitzer C57.19.100 5 years	Scott Digby C57.10.04 5 years	Producer
John Vartanian	National Grid	George Payerle STNP SC 5 years	Mark Faulkner C57.12.44 6 years	Will Elliott C57.12.53 1.5 years	User
Trenton Williams	Advances Power Technologies	Mike Spurlock C57.143 6 years	Mark Tosturd C57.165 3 years	Ryan Musgrove Power SC 8 years	Producer
Joshua Yun	Virginia Transformer	Rainer Frotscher C57.139 1 year	Stephen Shull C57.15.34 3 years	Jerry Murphy Distribution SC 1 year	Producer

6.1.2 New Member Applications

Six new applications for Committee Membership were received for consideration since the last Administrative Subcommittee meeting. The following table lists the names of the applicants and a summary of their supporting eligibility information.

Name	Affiliation	Sponsor #1	Sponsor #2	Wimberly Sponsor #3	Membership Category
Dave Blew	DE Blue Consulting	George Payerle STNP SC 10 years	John Vartanian C57.12.40 2 years	Mark Faulkner C57.12.44 2 years	User
Ryan Hogg	Bureau of Reclamation	Dan Sauer Standards SC 1 year	Thomas Sizemore ITSC 2 years	Sheldon Kennedy C57.32 2 years	User
Ion Radu	Hitachi Energy	Rogério Verdolin Performance Characteristics SC 5 years	Jerry Murphy Distribution SC 5 year	Ryan Musgrove Power SC 5 years	Producer
Tony Reiss	Custom Materials	George Payerle STNP SC 4 years	Roger Wicks C57.100/IEEE 1276 6 years	R Stephen Shull C57.19.02 6 years	Producer
Val Tatu	Powersmiths International	Casey Bqllard Dry Type SC 1.5 years	David Walker C57.12.91 1.5 years	Ken Klein C57.94 1.5 years	Producer
Michael Zarnowski	Carte	George Payerle STNP SC 2.5 years	John Vartanian C57.12.40 2.5 years	Benjamin Garcia C57.12.24 2.5 years	Producer

6.1.3 Association Management System (AMS) Database

The Transformers Committee AMS database of people, as of 12/31/2021, had three general categories of participation in our activities. These were: **Interested Individual**, **Active Participant**, and **Committee Member**. In addition, the Committee Secretary maintains a list of **Past Committee Members**. The AMS 123 system has been disabled and a new system is under development; more information regarding this new system will be provided as it becomes available.

The following comments are based on the AMS 123 system and will be updated once the new system is functional. A new participant will automatically be assigned the role of Interested Individual when they first sign up. It is the responsibility of everyone to keep his/her profile updated (except for the participant status), although the new memberplanet system is presently under development and is not yet accessible. Based on the level of participation, the committee administrative staff will upgrade the participation status to "Active Participant" when appropriate.

The following table contains a count of the participants grouped by the four general categories (CM totals do not include those requesting membership at this meeting or Members to be moved to Past Member

Status). Note that since AMS is inactive and the memberplanet membership system is under development, only the Committee Member section of the table has been updated.

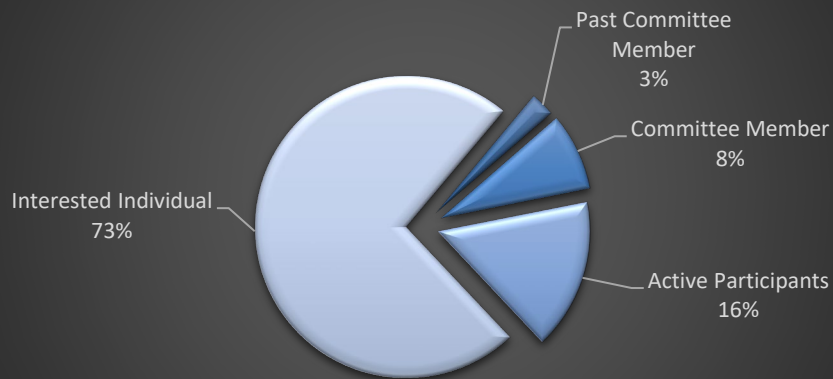
Membership Status	S19	F19	S20	F20	S21	F21*	S22**	F22⁺	S23⁺	F23⁺	S24⁺	F24⁺
<i>Interested Individual</i>	1582	1632	1579	1563	1611	1581	1596	1596	1596	1596	1596	1596
<i>Interested Individual - IEEE Life Member</i>	12	12	11	12	12	12	12	12	12	12	12	12
Total Interested Individuals	1594	1644	1590	1575	1623	1593	1608	1608	1608	1608	1608	1608
<i>Active Participant</i>	349	362	365	362	360	350	348	348	348	348	348	348
<i>Active Participant - IEEE Life Member</i>	6	7	6	6	6	6	6	6	6	6	6	6
Total Active Participants	355	369	371	368	366	356	354	354	354	354	354	354
<i>Committee Member</i>	191	182	179	179	173	175	173	183	196	203	186	180
<i>Committee Member – Emeritus</i>	10	10	11	11	11	12	12	13	12	12	12	13
<i>Committee Member - IEEE Life Member</i>	33	32	33	33	32	33	35	29	22	22	20	19
Total Committee Members	201	192	190	190	184	187	185	196	208	215	198	193
<i>Past Committee Member</i>	38	50	48	48	59	56	53	53	53	53	73	57
<i>Past Committee Member - IEEE Life Member</i>	6	8	12	10	12	12	12	12	12	12	12	12
Total Past Committee Members	44	58	60	58	71	68	65	65	65	65	85	69
TOTAL IN AMS DATABASE	2227	2295	2244	2224	2276	2237	2247	2252	2257	2257	2257	2257

* F21 data as of October 3, 2021

**S22 data as of December 31, 2021

⁺F22, S23, F23, S24 and F24 - only Committee Member section updated due to inactive AMS and memberplanet system not yet available.

Membership Summary



6.2 COMMITTEE, SUBCOMMITTEES, AND WORKING GROUP ROSTERS

In order to provide indemnification to working group and subcommittee members it is crucial that membership lists be maintained. The new memberplanet system, when available, will be most likely be the primary repository for membership records. It is important that each subcommittee and working group chair keep the rosters updated so that this information can be provided to the IEEE SA.

A similar main committee roster has also been developed to track attendance for the Main Committee General Session meeting on Monday & Thursday. The data is used to update participants' membership profile.

6.3 IEEE/PES AND IEEE/SA MEMBERSHIP REQUIREMENTS

As a reminder, all members of the Transformers Committee must also be members in good standing of the Power & Energy Society (IEEE/PES) and the Standards Association (IEEE/SA).

WG Chairs must be members in good standing of the Standards Association (IEEE/SA).

6.4 COMMITTEE MEMBERSHIP MAINTENANCE

The last membership audit was performed in October 2024 prior to the Fall 2024 Transformers Committee Meeting. Nine (9) members had lapsed membership in either IEEE, IEEE-PES, IEEE-SA or all three. Their Transformers Committee membership is pending renewal of the required memberships. The next scheduled audit for membership requirements in accordance with the Committee P&P will be in 2026 (IEEE-PES and IEEE-SA). Past Committee Members can be reinstated to Committee Member if their status changes and they are able to regularly participate within two years of being changed to Past Committee Member.

6.5 SENIOR MEMBERSHIP REMINDER

IEEE members are encouraged to apply for senior membership. Senior membership gains recognition by peers/management and better positions for fellow membership. The requirements are 10 years of experience and 3 references.

More details and application can be found at <https://www.ieee.org/membership/senior/> or under the “information tab” of the Transformers Committee website.

6.6 ESSENTIAL PATENT CLAIMS

All registrants were asked to agree with the following statement:

“I have read the Patent Claim notice on the following webpage, and I understand that if I am aware of any Essential Patent Claim related to issues being discussed or considered for inclusion in standards being developed by one or more Working Groups of the Transformers Committee, it is my responsibility to inform the Chair of the Working Group affected by such claim.”

Working Group Chairs are asked to make a call for Essential Patent Claims at the beginning of each meeting and to record the results in the meeting minutes.

6.7 AFFILIATION

According to the IEEE Standards Board Bylaws, there is a requirement that participants of an IEEE meeting disclose their employer and affiliation. Consultants must state if they are sponsored or not. It is not sufficient to simply announce “My name is John Smith, and I’m a consultant.” If a consultant is sponsored by a client, it must be disclosed. If the consultant does not have a sponsor, the proper introduction is something such as “My name is John Smith, I am a consultant, and I represent myself at this meeting.”

6.8 MEETING MINUTES

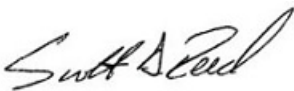
The minutes of the Spring 2024 meeting have been posted to the committee website. Thank you to those who submitted their minutes in a prompt fashion.

Subcommittee Chairs are asked to submit their respective subcommittee meeting minutes for the Fall 2024 meeting held in St. Louis, MO meeting to the Committee Secretary no later than December 12, 2024, which is 6 weeks after the completion of the meeting. It is strongly recommended that meeting minutes be prepared at or just after the meeting while the activities are still fresh in members’ minds. Doing so will help to ensure the activities and decisions made during the meeting are accurately reflected in the minutes.

Subcommittee meeting minutes should be submitted via e-mail to the Committee Secretary, Scott Reed [sreed@mvadiagnostics.com], who will forward them on to the webmaster for posting on the Committee website. The submittal file should be saved as a Word document formatted like this document. The minutes shall record the essential business of each SC, WG, and TF meeting including:

-
- a) Name of group
 - b) Date and location of meeting
 - c) Officer presiding, including the name of the secretary who wrote the minutes
 - d) Meeting participants, including affiliation, and voting member status at the end of the meeting
 - e) Call to order, Chair's remarks
 - f) Reminders of IEEE policies, such as Patent policy and Copyright policy
 - g) The fact that a Call for Patents occurred, and any responses made to such Call
 - h) Approval of minutes of previous meeting
 - i) Approval of agenda
 - j) Technical topics
 - 1) Brief summary of discussion and conclusions
 - 2) Motions exactly as they are stated, including the names of mover and seconder and the outcome of each motion
 - k) Action items
 - l) Items reported out of executive session
 - m) Recesses and time of final adjournment
 - n) Next meeting - date, time, and location

Respectfully submitted,



Scott D. Reed
Secretary
IEEE/PES Transformers Committee
October 10, 2024

7 TREASURER'S REPORT – TROY TANAKA

The Treasurer's Report was presented at the Monday General Session.

The Treasurer's Report is included as **Appendix 10**.

8 STANDARDS REPORT – STEVE SHULL

The Standard Report was presented at the Monday General Session.

The semi-annual Standards Report is included as **Appendix 2**.

9 LIAISON REPORTS

9.1 CIGRE – CRAIG SWINDERMAN

Craig Swinderman prepared a presentation which is shown in **Appendix 3**.

9.2 IEC TC REPORTS – CHRISTOPH PLOETNER

Christoph Ploetner provided a presentation on TC activities. His presentation is available in **Appendix 4**.

9.3 STANDARDS COORDINATING COMMITTEE NO. 4 (ELECTRICAL INSULATION) – EVANNE WANG

Evanne Wang presented an update on SCC04. The presentation is available in **Appendix 5**.

9.4 ASTM – ED CASSERLY

Ed Casserly presented an overview of ASTM D27 activities for electrical insulating liquids and gasses. His presentation is available in **Appendix 6**.

9.5 TRANSACTIONS POWER DELIVERY (XOSE LOPEZ-FERNANDEZ)

Xose Lopez-Fernandez prepared an overview of Transaction Power Delivery activities. His presentation is available in **Appendix 7**.

9.6 NEW BUSINESS

On October 8, 2024, an updated Standards Committee Policy & Procedure manual was sent to the committee members for review. The revised manual was presented to the members for a vote. It was noted there were several minor typos in the document that need corrected. Sanjib Som made a motion to accept the revised manual with the corrected typos and Phil Hopkins seconded the motion. The motion unanimously passed with 164 members supporting the revised manual. It will be submitted to IEEE For review.

9.7 OPENING SESSION ADJOURNMENT

The meeting adjourned at 9:15 AM.

Thursday Closing Session

10 CHAIR'S REMARKS AND ANNOUNCEMENTS

The Chair called the meeting to order at 11:00 AM.

The Agenda was reviewed and approved on Monday.

- Great meeting with positive feedback. A big thank you to HJ Family Companies for hosting the meeting in Vancouver.

11 MEETINGS PLANNING SC MINUTES & REPORT – TAMMY BEHRENS

See **Appendix 9**.

New attendance record of 628 attendees. The Meetings Subcommittee is comprised of the following positions:

- Presentations & Tutorials: Tom Prevost (tprevost@ieee.org)
- Break Sponsor: Ed Smith (edsmith@ieee.org)
- Website: Kris Zibert & Sue McNelly (tc-webmaster@ieee.org)
- Mobile App: David Wallach
- Meeting Schedule: Jerry Murphy (jerry.murphy@ieee.org)
- Memberplanet: Jim McBride
- Photography: George Payerle

-
- Registration Desk, Etc.

Jennifer Quandel, HPN

Upcoming meetings, for latest information see the Transformers Committee web page:

Spring 2025- March 23-27

Denver, CO USA

Hyatt Regency at Colorado Convention Center

The following considerations are taken into account for future meeting sites: local host, consideration of # of attendees, availability of technical tours and activities, restaurants in walking distance, international airport, and affordable (for the market).

12 REPORTS FROM TECHNICAL SUBCOMMITTEES (DECISIONS MADE DURING THE WEEK)

Reports from each Technical SC were presented. The complete unapproved minutes for each Subcommittee are included in full in the attached Annexes.

12.1 BUSHINGS ERIC WEATHERBEE

- PC57.19.01 CHAR. PERF. DIMS. – Held its first WG meeting
- PC57.19.04 5kA+ in Bus Duct – Also held its first WG meeting
- P65700-19-03 DC Bushing – IEEE recirculation passed with 0 comments. IEC CRG completed comment resolution. Awaiting the updated IEC CDV and redline, after which IEEE recirculation ballot will begin, est. Dec 2024.
- PC57.19.100 App. Guide – SubCom granted permission to proceed to ballot.

12.2 DIELECTRIC TESTS POORVI PATEL

- Quorum was reached and business could be conducted
- TF Revision to Low Frequency Tests. Two Motions were passed:
 - Modification to C57.12.90-2021 Subclause 10.8.1, C57.12.00-2020 Table 4 note b and C57.12.00 Subclause 5.10.5.5
 - Addition of PD Testing procedure, Test Levels and acceptance criteria for Class I transformer when PD Testing is needed into C57.12.00 and C57.12.90
- C57.161-1st WG meeting. Four TF were created and TF leaders
- C57.160- PD in Bushings/PTs/CTs is Published
- C57.98-Impulse Guide- 2nd Ballot in the coming days
- New Business
 - TF for DFR of Instrument Transformer
 - TF Review sections 6.8 and Table 10 of C57.12.00 (virtual)

12.3 DISTRIBUTION TRANSFORMERS JERRY MURPHY

- C57.12.32 - WG Std Submersible Enc Integrity – Dan Mulkey; expires 2029
 - WG worked on the revision
- C57.12.34 - WG 3-Phase Padmount Transf – Steve Shull; expires 2032

-
- WG worked on the revision
 - C57.12.35 – WG Bar Coding for Distr Transf - Rhett Chrysler; APPROVED
 - Published
 - C57.12.36 - Distribution Substation Transf – Jerry Murphy; expires 2027
 - WG worked on the revision.
 - C57.12.37 - Electronic Reporting of Test Data – Al Traut; expires 2025
 - WG underway
 - C57.12.38 – WG 1-Phase Padmount Transf – Ali Ghafourian; expires 2024
 - Recirculation ballot completed 28 October with no additional comments
 - C57.12.39 Tank Pressure Coordination – Carlos Gaytan; expires 2027
 - WG 1st meeting; worked on revision
 - C57.15 Voltage Regulators– Dan Sauer; expires 2027
 - Joint IEC document will meet Thursday & Friday this week; Fall 2024
 - C57.12.210 Draft Rec Practice On-load Capacity Switching Distr Trf
 - APPROVED
 - TF Transf Efficiency & Loss Evaluation (DOE Activity) – NEMA Presenter
 - TF Tank Touch Temp – Report final; being formatted as white paper
 - PAR Study Group formed Padmount Step Voltage Regs - Kyle Heiden

12.4 DRY TYPE TRANSFORMERS DAVID WALKER

- As of 1/1/2025 Casey Ballard's term as SC Chair will end. Casey will be followed by new Chair David Walker.
- All DTSC standards that are close to expiration and all active DTSC PARs are actively being worked on.
- SC approved doing a Corrigendum for C57.12.60-2020 to fix an incorrect equation reference.
- Proposed Task Force to review Dry-Type enclosure type names will not be created due to lack of a second to the motion.
- Revision of C57.12.58 Transient Voltage Analysis of Dry-Type Transformer Coil Ken Klein
 - PAR Approved, Working Group Formed, Plan of action for going forward agreed within WG
- Revision of C57.12.01 General Requirements Casey Ballard

-
- Revisions to be wrapped up in Spring 2025. Last two issues- task force examining matching BIL vs voltage to C57.12.91, proposal of short-circuit test time for Class
 - Revision of 259 LV Thermal Aging Dave Stankes
 - Discussed 7 of 8 proposals. Plan on borrowing material from C57.12.60.
 - PAR for ANSI C57.12.55 Enclosures Colby Lovins
 - Working on PAR definition. Will submit PAR request by end of 2024.
 - Revision of C57.94 Install and Operation Guide Ken Klein
 - CRG created and authorized by WG. SC approved going to ballot.
 - Revision of C57.12.59 Through Fault Current Paul Weyandt

Working Group agreed on only minor revisions to bring into agreement with 12.01 regarding minimum impedance and to update curves and tables for the new limits.
 - Revision of C57.12.91 Dry-Type Test Code David Walker
 - Revisions to wrapped up in Spring 2025. Proposal on limits of difference between tested and rated currents in load loss test and how to correct for differences due in Spring meeting. Getting input from IEC standard 60076-1 Clause 11.4.
 - Revision of C57.96 Dry-Type Loading Guide Mike Iman
 - SC approved going to ballot.
 - Revision of C57.16 Air Core Reactors Arturo Del Rio
 - First Ballot completed. Comment resolution started. PAR Extension needed. Then recirculation.
 - Revision of C57.12.52 Sealed Dry-Type Joe Tedesco
 - Published
 - Revision of C57.134 Hottest Spot Colby Lovins
 - In editing after balloting and comment resolution.
 - Revision of C57.124 Partial Discharge Thomas Prevost
 - SC approved for ballot in 2023, CRG and ballot pool formed, ballot delayed due to MEC review required changes.
 - Ballot group to be reformed.

12.5 TRANSFORMER AND REACTORS FOR HVDC APPLICATIONS ULF RADBRANDT

- IEEE 1277 Smoothing Reactors and Converter Reactors
 - Published 2022. No active PAR.
- IEC/IEEE 60076-57-129 Transformers for HVDC applications
- IEEE Chair: Waldemar Ziomek, IEC Convener Frank Trautmann
 - Published 2017. First joint WG meetings, for the revision, today afternoon and tomorrow morning
- IEEE C57.132 Guide for Vibration Testing of HVDC Transformer
 - Chair: Jun Deng, Entity WG, Third WG meeting in October
- New SC Chair, starting next year, Klaus Pointner

12.6 INSTRUMENT TRANSFORMERS THOMAS SIZEMORE

- The WG to revise C57.13 has reviewed all comments in the first draft. At least one survey is planned and online meetings prior to the spring meeting are likely.
- C57.13.9 – Standard for Power-line Carrier Coupling Capacitors and Coupling Capacitor Voltage Transformers. Updated the status of the comment resolution. A PAR extension has been requested to allow time to resolved remaining comments.
- TF to merge C57.13 and C57.13.5 met and discussed a document skeleton for reorganizing the document.
- TF to create a HV LPIT (sensor) standard met, reviewed progress on a PAR and set leadership.
- TC on IT accuracy met to work on VT and CT accuracy clauses. Recent IEC directions were discussed to determine if/how we might move forward with burdens, etc.
- David Wallace has agreed to take the chair role going forward.

12.7 INSULATING FLUIDS STEPHANIE MABREY

- WG C57.130-Factory Temperature Rise Test DGA.
 - Quorum was met and WG able to approved minutes and agenda.(F22-S24)
 - Mike Bonn is the new Secretary.
 - A new DGA data form will be provided to members along with the IEEE email for members to provide data.
 - Data to be submitted by 1/31/25.
- WG C57.139-LTC DGA Data.
 - Data collection completed, 130,000 samples ready for further processing.
 - First statistical evaluations done, ongoing work on Triangle use, etc.

-
- Presentation given on gas emission from welded steel and insulating materials which could impede DGA of vacuum type LTCs.
 - WG C57.146-Silicone DGA.
 - PAR extension approved to December 2026.
 - Reviewed straw ballot comment resolutions
 - Sub-committee unanimously voted to proceed to ballot.
 - WG C57.155- DGA for Ester Fluids.
 - More than 100,000 records received and anonymized however new data is welcome
 - A preliminary review of the data was presented
 - New structure of annexes were presented
 - WG C57.166- Consolidation of Insulating Fluids.
 - No Meeting. Document in Ballot process - Comment Resolution
 - Sub-committee voted to apply for a Par extension – it was unanimously approved.
 - WG C57.637- Reclamation of Insulating Liquids.
 - No Meeting. Ballot resolution group resolved comments
 - Document is ready for ballot once C57.166 publishes.
 - TF C57.104- DGA for Mineral Oil.
 - Presentations for including monitoring data, core overheating gassing, machine learning for monitoring and DGA flowchart change, for proposals to changes in the document.
 - Approved TF to investigate adding monitoring section in Guide

12.8 INSULATION LIFE SAM SHARPLESS

- C57.91 Loading Guide – In comment resolution, will be completed by Spring.
- C57.100 Thermal Test – Published 2022. No active PAR
- C57.119 Temp Rise Tests – Expires 2028. PAR approved by subcommittee.
- C57.154 Hi Temp Guide – Published 2022. No active PAR
- C57.162 Moisture Guide – 834 comments resolved, hoping for extension to finish.
- C57.165 Temp Measurements – In publishing.
- C57.169 Max Winding Rise – Published June 30, 2023. No Active PAR
- IEEE 1276 Hi Temp Materials – Balloting approved by subcommittee.
- C57.12.90 Clause 11 Temp rise tests – Work continues on four items.
- Study group for Cellulose Degradation Tests [Lewand] – PAR decision in Spring.
- New study group underway for non C57-119 system loading [Raymond]
- Two EPMC proposals (0184 and 0197) accepted for supervision.

12.9 PERFORMANCE CHARACTERISTICS ROGERIO VERDOLIN

- WG IEEE Guide for the Evaluation of the environmental impact & life cycle assessment of Transformers & Shunt Reactors PC57.151
 - First meeting of the WG. Volunteers were assigned to lead task forces for each outline point.
- TF PCS Cont. Rev. to Audible Sound C57.12.90
 - Chair presented data on PA noise in air collected from manufacturers and proposed a methodology to determine sound level of PAs and a methodology for measuring sound level of PAs in air.
- TF Transformer Data Required for System Studies
 - First TF meeting. TF members will survey industry to find parameters commonly used system study software input and make a recommendation to the SC on whether a WG should be convened to define and describe these parameters.
- TF PCS Cont. Rev. to C57.12.00
 - Old business included an update to the KVA levels in table 11. A motion passed to prepare an informative note regarding the three-phase kVA rating which will be presented during the Spring meeting.
- WG C57.159 – Standard for DPV Transformers
 - PAR scope and purpose was discussed. There is a question whether transformers connected to inverts on the output of solar panels or BES belong to this group or a separate document.
- TF PCS Cont. Rev. to C57.12.90
 - Discussion continued regarding cold resistance temperature. New business included discussion of adding tolerances on the current applied during load loss and impedance tests. TC57.142
 - CRG continuing to work on comments. There was open discussion on the reliability of surge arresters used internally in transformers.
- C57.158 Application Guide for Tertiary Winding and Stabilizing Windings
 - TF groups gave reports regarding their progress. There was no new business.
- C57.32
 - Task Force work is almost complete. Plan to have WG straw ballot of draft 1 completed before Spring Meeting.
- C57.32.10 Entity

-
- SA Ballot opened April 2024 and close successfully May of 2024. WG responded to each of 20 comments received. Draft recirculated in September of 2024 and is preparing for a second recirc. Draft 6.3 is on the PCS webpage.
 - C57.141 Entity
 - Working on completing Pre-MEC review. WG needs to submit a modified PAR to Nescom before Dec 20th deadline.
 - Needed SC approval to modify PAR to change voltage levels the guide applies to. Motion was made and pass by unanimous consent.
 - IEC/IEEE 60076-16 – Power Transformers – Part 16: Transformers for Wind Turbine Application
 - IEC has decided to incorporate this content into a new guide on transformers for energy transition (wind, solar, BESS, EV, etc.).
 - C57.120 – IEEE Guide for Loss Eval of Dist & Power Transf & Reactors
 - This guide expires in 2027. A motion was made to form a PAR study group to start a revision of the document.

12.10 POWER TRANSFORMERS RYAN MUSGROVE

- WG C57.156 Guide for Tank Rupture Mitigation– quorum achieved, presentation provided on rupture proof LTC solutions. Continuing to work on the document and plan to meet in Denver.
- WG IEEE 638 Class 1E Transformers for Nuclear Power Gen– quorum achieved, continuing to update based on changes from IEEE/IEC 60980-344-2020, will meet in Denver.
- WG IEC/IEEE 60076-57-135 Guide for Phase Shifting Transformers–quorum achieved, presentation made on harmonizing with 60076-57-1202 and C37.245. Still seeking more volunteers experienced with PSTs. Reach out to ryan.musgrove@ieee.org or Ewald Schweiger to join. Will meet in Denver.
- WG C57.143 Monitoring Guide– did not meet. Draft 1.7 approved Oct 12th, 2024 3rd recirculation approved with no comments, scheduled for revcom review Dec 10th. Will not meet in Denver, plan to be published.
- WG C57.12.10 Std. req for tr – 1st meeting, established membership, will be issuing straw ballot to gather comments and suggestions. Will meet in Denver.
- TF C57.140 Guide for Evaluation and Reconditioning of TR – quorum achieved, agreed document needed revised and approved PAR wording with new title and scope unanimously in TF, and Subcommittee. Will meet as WG in Denver, Marcos Ferreira will be WG chair.
- WG C57.125 Failure Investigating and Reporting–quorum achieved. Many modifications discussed and approved. Plan to complete draft with all revisions and distribute to WG for review prior to next meeting. Will meet in Denver.

-
- WG C57.157 Guide for the Life Test of Switch Contacts– quorum achieved, presentation made on esters for review. Continue to work on draft, will meet in Denver.
 - WG C57.170 Condition Assessment Guide– quorum achieved. Initial ballot passed with 172 comments, plan to resolve comments by end of year to re-ballot. Plan to meet in Denver.
 - WG C57.150 Transportation Guide– No meeting – final draft approved 9/21/23 and now shows as published with a 2023 publication date.
 - WF C57.17 Standard Requirements for Arc Furnace Transformers –quorum achieved. Overview of recommended changes reviewed, 2nd straw ballot will be sent, very few comments. Seeking users or manufacturers of Arc Furnace Transformers to possibly participate – ryan.musgrove@ieee.org. Jason Varnell will be the new chair of WG. Will meet in Denver.
 - WG C57.107 Transformer Volts/Hertz – Document approved and published with a 2024 publication date.
 - WG 60076-57-1202 Liquid immersed phase-shifting transformers – 1st meeting. Discussed harmonizing with 60076-1202 and C37.245. Seeking more volunteers, reach out to ryan.musgrove@ieee.org or Ewald Schweiger. Will meet in Denver.
 - WG C57.93 Installation and Maintenance Guide– 1st meeting. Established task forces to review all sections. Will meet in Denver.
 - Liaison to Entity PAR PC57.93a – entity document went out to ballot and comments are being resolved.
 - WG C57.153 Guide for Paralleling Transformers – quorum achieved. Proposed revisions and continuing to work on document. Concerns with application of IEEE P3400 and seek guidance from main Adcom on how we should expect to need to apply this unapproved new document not yet shared with the working groups.
 - Entity PAR C57.145 – Digital Twin for Power Equipment (DTPE) – Working on draft, tentative schedule provided.
 - Entity PAR for Low Frequency Power Transmission – Working on draft, tentative schedule provided.
 - Old business
 - Discussed IEEE 693 document from Substation Standards Committee that appears to have been approved. Seeking experts to be involved in Substation Standards Committee on new document revision.
 - Task force headed by Hemchandra Shertukde for IOT – Still working, vote made to table this until further information is available for the Subcommittee to review.
 - New Business
 - – Will create task forces to review the following documents that are due for revision

- IEEE 693 Recommended Practice for Seismic Design of Substations – Substations Standards Committee – Need volunteers, especially users and transformer and bushing manufacturers and get in contact with Anshel Schiff. Reach out to myself, Eric Weatherbee, or David Wallach if interested
- 60076-16 Power Transformers – Part 16: Transformers for Wind Turbine Applications revision due 12/31/2028 (appears this actually belongs to Performance Characteristics Subcommittee.
- 60214-2 Draft Guide for Tap-Changers – Part 2: Application Guide revision due 12/31/2029
- C57.148 – Standard for Control Cabinets for Power Transformers revision due 12/31/2030
- The above documents are noted as needing to be revised, but will be postponed until conflicts can be minimized with PTSC meeting times.
- SCATE P3476 – Industry standard unique IDs and Smart Tags (QR codes) for power equipment – Alicia Farag presented on this “Supply Chain and Asset Traceability for Energy” standard and is seeking volunteers to help as this will touch several of our Transformer Subcommittees, not just Power Transformers. Minutes and contact information for Alicia will be provided in the minutes - alicia.farag@ieee.org

12.11 STANDARDS DAN SAUER

- Old business – Presentation by Dan Blaydon on the usual and unusual service conditions in base standards and power flow direction notations (or lack thereof). Agreed to table this work until more information is available from the WG on Reverse Power Flow Effects PC57.133
- C57.12.00 – Work is proceeding on the next continuous revision
 - Two business items are approved during this week to add to next revision of C57.12.00. These are related to modification to Induce Over Voltage Factor and new section for Class I PD Testing, approved by TF of low frequency test and Dielectric Test SC.C59.12.90 – Similar to 12.00, work is proceeding on the next continuous revision
 - Looking to close 12.00 & 12.90 for new material after the Spring 2025 meeting
- C57.12.90 – Work is proceeding on the next continuous revision
 - The six Task Forces that are working on material for continuous revision of C57.12.90-2021 all met in St Louis on Monday and Tuesday. There are two business that were approved in a Task Force meeting this.
 - There was again a question about the working of the WG for 12.00 & 12.90. Transformer Committee chair David Wallach and Standards SC Chair clarified that this will be addressed in the next review of the WG P&P

-
- C57.152 Field guide: Ballot is in progress and had to be extended to get required 75% response. WG approved motion to confirm the comment resolution board and volunteers were identified to be part of CRG.
 - IEEE/IEC Cross Reference TF: TF did not had quorum. TF started work to develop an index document to compare IEC and IEEE and have some volunteers confirmed their availability to work with chair to develop further.
 - WG C57.133 on Reverse Power flow had their first meeting . Three presentations were made and initial work/outlined were discussed. WG plan to meet virtually before S25 to get an initial working definition and refine the framework.
 - C57.12.80 Terminology Guide: Recirculation is completed and currently hoping to have document published early 2025.

12.12 SUBSURFACE TRANSFORMERS & NETWORK PROTECTORS GEORGE PAYERLE

- C57.12.23 Single phase submersibles, motion to change scope to include 500kVa units did not pass. discussion on adding rectangular tanks, and using SS fittings to reduce galvanic corrosion.
- C57.12.24 not meeting at this time.
- C57.12.40 Standard was published in May. The WG had a presentation by ConEd and EPRI regarding bushing failures. They will begin to discuss items for next revision at S25.
- C57.12.44 Their standard has been submitted to REVCOM. Did not meet.
- PC57.12.53 WG continues to work out the details of the guide. Their PAR expires at the end of 2026. Will Elliott is looking for a secretary for 12.53
- Leadership change will be effective at S25. Tony Reiss as chair, Nabi Almeida as vice chair/secretary.

13 ADDITIONAL REPORT FROM THE STANDARDS COORDINATOR

This report provides an opportunity to present standard development issues from the week. Please see the Standards Coordinator's report for details. No additional report was offered at the Fall 2024 meeting.

14 NEW BUSINESS

No new business items were brought up.

15 CLOSING SESSION ADJOURNMENT

The meeting was adjourned at approximately 12 PM.

16 RECOGNITION AND AWARDS REPORT – ED TENYENHUIS

16.1 GENERAL

The Transformers Committee appreciates the efforts and contributions made by its many members who volunteer their time to advance the work performed by the Committee. To that end, the Committee dedicates time at each of its meetings to recognize noteworthy events and contributions made by members and participants.

16.2 MEMORIAL TRIBUTES

The Transformers Committee has learned of the passing of two past members since its last meeting. Each of these individuals played an important part of Committee activities and upholding the high standards expected of the Transformers Committee during the time they participated. More information is available on the Committee's memorial page at (<https://www.transformerscommittee.org/home/memorials/>).

16.2.1 Greg Anderson



Greg passed away March 8, 2024

Greg was born and raised near Beaumont, TX. As a child, Greg enjoyed taking things apart to see how they worked. He got his pilot's license before his driver's license. He earned his electrical engineering degree from Lamar University, and his MBA from the University of Kansas. He worked for several companies, including Black and Veatch and OPPD, before starting his own consulting business, GW Anderson and Associates, in 2003.

Greg and his wife, Peggy, were married for 31 years and had two children, Erik & Alicia. Greg enjoyed traveling for work and pleasure and was able to visit many countries around the world. He always wanted the best for his family, friends, and church family, and would go out of his way to help any in need.

Greg was very involved in the Transformers Committee:

- Committee member in 1997
- Chair of the Meeting Planning SC from 2010 – 2017
- Committee Treasurer from 2009 – 2017
- Chair of C57.150, Transportation Guide
- Meritorious Service Award at Fall 2008 meeting in Porto, Portugal
- Distinguished Service Award from the Committee in Fall 2014 meeting
- Most well-known for his meeting planning arrangement and Association Management System (AMS)

Greg was extremely committed to the work of the Transformer Committee.

Greg was remembered by Craig Stiegemeier during the Tuesday Luncheon.

16.2.2 Nigel McQuinn

Nigel passed away July 8, 2024, at 68 years old. He became a Committee member in 1995.

Nigel worked for PSM High Power Lab before becoming self-employed in 1996.



He was involved in many IEEE committees.

He received the IEEE-PES Outstanding Engineer Award by the IEEE Pittsburgh Chapter in 2006.

Nigel's high-speed electric drive motors powered an electric racing car which currently holds several national/world land-speed-records, for both fuel-cell and battery powered vehicles, achieving over 302.9 mph on Utah Salt Flats, USA (Buckeye Bullet).

Nigel was remembered by Phil Hopkinson during the Tuesday Luncheon.

16.3 EMERITUS MEMBERS

The Emeritus Member classification is a non-voting member classification for past voting members who have made longstanding / notable contributions to the Committee and demonstrated a high level of participation in the past but for extenuating reasons are no longer able to meet the other membership requirements.

The following is a list of the Committee's current Emeritus Members:

- Balma, Peter
- Beauchemin, Claude
- Dudley, Richard
- Fallon, Donald
- Haggerty, Norman
- Hanus, Kenneth
- Lundquist, Thomas
- Patel, Bipin
- Pierce, Linden
- Sim, Jin
- Vaillancourt, Georges
- Wagenaar, Loren
- Yule, Kipp

16.4 NEW COMMITTEE MEMBERS

Applications for voting membership in the Transformers Committee are review and approved by the Administrative Subcommittee.

Successful applicants can demonstrate **active participation** in **at least three Committee activities for at least two years** and are sponsored by at least one Subcommittee Chair (*specific details available at www.transformerscommittee.org*).

The Transformers Committee welcomes the following new Voting Member whose membership application was reviewed and approved by the Administrative Subcommittee at its October 25, 2024 meeting:

<u>Name</u>	<u>Affiliation</u>
Dave Blew	DE Blue Consulting
Ryan Hogg	Bureau of Reclamation
Ion Radu	Hitachi Energy
Tony Reiss	Custom Materials
Val Tatu	Powersmiths International
Michael Zarnowski	Carte

16.5 NEW SENIOR MEMBER

The Transformers Committee recognizes Pragnesh Vyas and Amitabh Sarkar who both were recently elevated to IEEE Senior Member and John John who was elevated to Life Senior Member.

16.6 GENERAL SERVICE AWARDS

16.6.1 Certificate of Appreciation – Meeting Host

The Transformers Committee thanks the **HJ Family** of Companies for serving as the Host Company for the Fall 2024 meeting. In addition, the Committee thanks Ed Smith for his dedicated service as Host for the meeting.

16.7 OUTSTANDING SERVICE AWARDS

The Transformers Committee has been fortunate over the years to have had many people willing to volunteer their time to help advance the Committee’s work. At any given time, there are typically dozens of active working groups and task forces. It is through the dedicated efforts of the many volunteers that participate in these activities that the Committee is able to produce and maintain over 100 very important industry standards and guides.

The Transformers Committee is pleased to present Outstanding Service Awards to **Joe Watson** and **Mike Sharp**.

16.8 PES TECHNICAL COMMITTEE AWARDS

The PES Technical Committee Awards are an annual set of awards for each technical committee. The Transformers Committee is pleased to present the below awards for 2024:

9.8.1 Award for Outstanding Standard or Guide

The Award for Outstanding Standard or Guide was given to “C57.168-2023 – IEEE Guide for Low-Frequency Dielectric Testing for Distribution, Power, and Regulating Transformers”.

WG Chair: Daniel Sauer

Secretary: Sergio Hernandez

Significant Contributors: Bertrand Poulin, Hamid Abdelkamel, Drew Welton, Jeffrey Britton, John Foschia, Ajith Varghese, Kyle Stechschulte.

9.8.2 Prize Paper Award

The Prize Paper Award was given to Xose M. Lopez-Fernandez for co-authoring “Three-Phase Three-Legged Wye-Wye Transformers With Only One Neutral Grounded and No Stabilizing Winding—Part I: Zero-Sequence Performance” in the **IEEE TRANSACTIONS ON POWER DELIVERY VOL. 39, NO. 3, Pages 1451 – 1461**.

9.8.3 Recognition Award for Outgoing Committee Chair

This award recognized Ed teNyenhuus who was Committee Chair 2022 – 2023.

9.8.4 Recognition Awards for Outgoing Subcommittee Chairs

- Eric Weatherbee - Bushings Subcommittee Chair (2020 -2024)
- Casey Ballard - Dry Type Subcommittee Chair (2019 -2024)
- Ulf Radbrandt – HVDC Subcommittee Chair (2019 -2024)
- Tom Sizemore – Instrument Subcommittee Chair (2019 -2024)
- Rogerio Verdolin – Performance Characteristics SC (2020-2024)
- George Payerle – STNP Subcommittee Chair (2019 -2024)
- Scott Reed – Insulating Fluids Subcommittee Chair (2020 -2023)

16.9 WORKING GROUP AWARDS

The IEEE Standards Association Standards Board (SASB) presents awards to Working Group Chairs upon publication of a new or revised document and offers the Working Group Chair the opportunity to nominate significant contributors for an IEEE SASB Certificate of Appreciation. At this meeting 3 Working Groups were recognized.

16.9.1 IEEE Std C57.163™-2023 – IEEE Guide for Establishing Power Transformer Capability while under Geomagnetic Disturbances

- WG Chair: Daniel Blaydon
- WG Vice Chair: Ramsis Girgis
- WG Secretary: Scott Digby
- Plaques: Mats Bernesjo
- Certificates of Appreciation: Afshin Rezaei-Zare, Mark Tostrud, Gary Hoffman, Ion Radu, Joe Watson

16.9.2 IEEE Std C57.12.200™-2022 – *IEEE Guide for the Dielectric Frequency Response Measurement of Bushings*

- WG Chair: Jun Deng
- Certificates of Appreciation: Charles Sweetser, Poorvi Patel, Evgeni Ermakov, Ismail Guner

16.9.3 IEEE Std C57.12.40™-2023 – *IEEE Standard for Network, Three-Phase Transformers, 2500 kVA and Smaller; High Voltage, 34 500 V and Below; Low Voltage, 600 V and Below; Subway and Vault Immersed*

- WG Chair: John Vartanian
- WG Secretary: Daniel Schwartz
- Plaques: Brian Klaponski, David Blew
- Certificates of Appreciation: Avijit Shingari, Jeremy Sewell, Michael Zarnowski, Nabi Almeida

16.9.4 IEEE Std C57.169™-2023 – IEEE Guide for Determination of Maximum Winding Temperature Rise in Liquid-Immersed Transformers

- WG Chair: Scott Digby
- WG Secretary: Cihangir John Sen
- Certificates of Appreciation: Gilles Bargone, Gary Hoffman, Jean-Noel Berube, Ryan Musgrove, Ricardo Castro-Lopez, Jason Varnell, Hakim Dulac, Pedro Pedro

16.9.5 IEEE Std C57.150™-2024 – *IEEE Guide for the Transportation of Transformers and Reactors Rated 10 000 kVA or Higher*

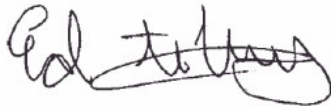
- WG Chair: Gregory Anderson
- WG Vice Chair: Ewald Schweiger
- WG Secretary: Marnie Roussell

- Certificates of Appreciation: Hamid Abdelkamel, Eduardo Garcia, Kraig Nunn, Roger Verdolin, Mario Alonso, Jerzy Kazmierczak, Rakesh Rathi, Krishnamurthy Vijayan, Wallace Binder, Peter Kleine, Amitabh Sarkar, David Wallach, W Boettger, Andrew Lawless, Alfons Schrammel, Joe Watson, Jeremiah Bradshaw, Mario Locarno, Cihangir Sen, Bruce Webb, Paul Dolloff, Ryan Musgrove, Stephen Shull, Daniel Weyer, Marcos Ferreira, Shankar Nambi, Alwyn Van Der Walt, Kris Zibert

16.10 PRESENTATION SLIDES

A brief summary of this Recognition and Awards report was presented at the October 27, 2024 Administrative Subcommittee meeting. A full presentation was made at the Fall 2024 Awards Luncheon on October 29, 2024 in PowerPoint format. The PowerPoint slides are available on the Committee's website at <https://www.transformerscommittee.org/meetings/lastmeetingminutes/>.

Respectfully submitted,



Ed teNyenhuis
Awards Chair and Past Chair
IEEE PES Transformers Committee
Rev. 0 – October 29, 2024

17 ADMINISTRATIVE SUBCOMMITTEE – DAVID WALLACH

The Administrative Subcommittee met on October 27, 2024. The following are the unapproved minutes of that meeting.

17.1 INTRODUCTION OF MEMBERS AND GUESTS

The Chair called the meeting to order and attendees introduced themselves by name, affiliation and role in the Administration Subcommittee. Guests also introduced themselves, by giving their name and affiliation.

Members and Guests Present:

Chair	David Wallach
Vice-Chair	Bill Griesacker
Secretary.....	Scott Reed
Treasurer	Troy Tanaka
Standards Coordinator	Steve Shull

Awards/Past Chair	Ed teNyenhuis
Bushings	Eric Weatherbee
Dielectric Tests	Poorvi Patel
Distribution Transformers	Jerry Murphy
Dry Type Transformers	Casey Ballard
HVDC.....	Ulf Radbrandt
Instrument Transformers.....	Thomas Sizemore
Insulation Life	Sam Sharpless
Insulating Fluids	Stephanie Mabrey
Performance Characteristics	Rogerio Verdolin
Power Transformers	Ryan Musgrove
Standards.....	Dan Sauer
Underground Transformers & Network Protectors	George Payerle

Guests: Malia Zaman, Patricia Jarosz, David Walker, Vice Chair of Dry Type

17.2 APPROVAL OF PREVIOUS MEETING MINUTES

The Chair requested if there were comments on the draft Spring 2024 Administrative Subcommittee meeting minutes. Dan Sauer made a motion to approve the minutes and Sam Sharpless seconded the motion. Objections to unanimous approval of the minutes was requested. No comments were offered and no objections were voiced, therefore the Spring 2024 Administrative Subcommittee minutes were approved by unanimous consent.

17.3 ADDITIONS TO AND/OR APPROVAL OF THE AGENDA

The preliminary agenda was previously distributed in advance of the meeting. Sam Sharples made a motion to approve the agenda and Dan Sauer seconded the motion. There were no objections to unanimous approval of the agenda, therefore the following agenda was approved

	TOPIC	PRESENTER	EST. START
1.	Administrative Topics (:15)	David Wallach	2:00
	1.1. Introductions and Attendance		
	1.2. Affiliation Change Updates		
	1.3. Review and Approval of the Agenda		
	1.4. Approval of Spring 2024 Minutes		
2.	Officer Reports		2:15
	2.1. Chair's Report (:15).....	David Wallach	
	2.2. Vice Chair's Report (:05)	Bill Griesacker	
	2.3. Secretary's Report & New Committee Membership Approval (:10)	Scott Reed	

2.4.	Treasurer's Report (:05)	Troy Tanaka	
2.5.	Recognition & Awards Report (:05)	Ed teNyenhuis	
2.6.	Standards Coordinator's Report (:10)	Steve Shull	
	2.6.1. Standards Report		
	2.6.2. Entity Proposal Report		
3.	IEEE Report		3:05
3.1.	IEEE Staff Update (:10)	Patrycja Jarosz	
4.	Subcommittee Reports (<i>please limit your report to 4 minutes or less</i>)		3:20
4.1.	Bushings	Eric Weatherbee	
4.2.	Dielectric Test	Poorvi Patel	
4.3.	Distribution Transformers	Jerry Murphy	
4.4.	Dry Type Transformers	Casey Ballard	
4.5.	HVDC	Ulf Radbrandt	
4.6.	Instrument Transformers	Thomas Sizemore	
4.7.	Insulating Fluids	Stephanie Mabrey	
4.8.	Insulation Life	Sam Sharpless	
4.9.	Performance Characteristics	Rogério Verdolin	
4.10.	Power Transformers	Ryan Musgrove	
4.11.	Standards	Dan Sauer	
4.12.	Subsurface Transformers & Network Protectors	George Payerle	
5.	Unfinished Business		4:10
5.1.	Update on memberplanet (:10)	David Wallach	
5.2.	P&P Revision	David Wllach	
5.3.	Other (:05)	All	
6.	New Business (:10)		4:40
6.1.	CIGRE Trf Database/Open Source Hosting by Trf Committee	David Wallach	
7.	Wrap Up & Adjournment		4:50
7.1.	Wrap Up & Adjournment (:10)	David Wallach	

17.4 CHAIR'S REPORT – DAVID WALLACH

Refer to Section 4.0 of the Main Minutes for a complete "Chair's Report."

17.5 VICE CHAIR'S REPORT – BILL GRIESACKER

Refer to Section 5.0 of the Main Minutes for a complete "Vice Chair's Report."

17.6 SECRETARY'S REPORT – SCOTT REED

Refer to Section 6.0 of the Main Minutes for a complete "Secretary's Report."

Scott Reed made a motion to approve the following six new member applications, and it was seconded by Dan Sauer, with the consideration that any unverified membership requirements were met:

Name	Affiliation
Dave Blew	DE Blew Consulting
Ryan Hogg	Bureau of Reclamation
Ion Radu	Hitachi Energy
Tony Reiss	Custom Materials
Val Tatu	Powersmiths International
Michael Zarnowski	Carte

The six new member applications were approved unanimously without opposition.

17.7 TREASURER’S REPORT – TROY TANAKA

Refer to Section 7.0 of the Main Minutes for a complete “Treasurer’s Report.”

17.8 RECOGNITION & AWARDS REPORT – ED TENYENHUIS

Refer to “OTHER REPORTS NOT PRESENTED AT THE GENERAL SESSION” for a complete report presented by the Awards Chair.

17.9 STANDARDS REPORT AND NEW PAR REQUESTS – STEVE SHULL

Refer to Section 8.0 of the Main Minutes for a complete “Standards Report.”

17.10 IEEE STAFF UPDATE – PATRYJCA JOAROSZ

Refer to Appendix 8 of the Main Minutes for the full PowerPoint presentation.

17.11 MEETING PLANNING REPORT – TAMMY BEHRENS

Refer to Appendix 9 of the main Committee minutes for the full Meeting Planning Subcommittee report.

Brief updates on current activities were given by each subcommittee chair; detailed updates are documented in the minutes of each subcommittee.

-
- 17.11.1** Bushings Subcommittee | Eric Weatherbee
 - 17.11.2** Dielectric Test Subcommittee | Poorvi Patel
 - 17.11.3** Distribution Transformers Subcommittee | Jerry Murphy
 - 17.11.4** Dry Type Transformers Subcommittee | David Walker
 - 17.11.5** HVDC Converter Transformers & Reactors Subcommittee | Ulf Radbrandt
 - 17.11.6** Instrument Transformers Subcommittee | Thomas Sizemore
 - 17.11.7** Insulating Fluids Subcommittee | Stephanie Mabrey
 - 17.11.8** Performance Characteristics Subcommittee | Rogerio Verdolin
 - 17.11.9** Power Transformers Subcommittee | Ryan Musgrove
 - 17.11.10** Standards Subcommittee | Dan Sauer
 - 17.11.11** Subsurface Transformers & Network Protectors Subcommittee | George Payerle

17.12 UNFINISHED BUSINESS

17.12.1 Memberplanet: Memberplanet is not ready. The hierarchy was above the IEEE TC has been constructed but there are still bugs.

17.12.2 P&P Revision: This will be voted for approval at the General Session meeting.

17.13 NEW BUSINESS

17.13.1 CIGRE Trf Database/Open Source Hosting by Trf Committee: CIGRE would like to collaborate with IEEE to have jointly have a transformer storage database. This would not be governed by IEEE-SA. IEEE TC would have to have an IEEE Open Source Community Manager and also establish Peer Review. It was decided to revisit this request after we learn more information from CIGRE so we can better understand the value the IEEE TC. IEEE reached out to CIGRE for more information but has not received a reply.

17.13.2 Other: No corporate email banners on TC emails.

17.13.3 Other: Collection of data to support WG and TF activities. Patrycja will follow up with C57.130 regarding the incorrect email sent out for request for data being sent to the chair instead of IEEE.

17.13.5 Emeritus Status:

The following requestees were discussed for input from ADCOM attendees. The chair gathered these inputs and will decide soon.

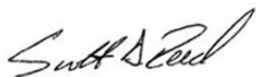
- Bob Rasor and Hali Moleski requested to be moved to Emeritus Status due to no longer attending.
- Aleksandr “Sasha” Levin also requested Emeritus Status and was known to be very involved with the TC.

17.14 ADJOURNMENT

The items on the agenda were completed and the meeting was adjourned at about 5:25 PM.

Respectfully submitted by:

Scott Reed,



Secretary, Transformers Committee

October 27, 2024

October 27, 2024 Adcom Meeting Attendance:

Last Name	First Name	Affiliation	Meeting Date 10/27/24
Ballard	Casey	DuPont	
Griesacker	Bill	William Griesacker and Associates Inc.	X
Jarosz	Patrycja	IEEE	X
Mabrey	Stephanie	AVO	X
Murphy	Jerry	Reedy Creek Energy Services	X
Musgrove	Ryan	Oklahoma Gas & Electric	X
Patel	Poorvi	EPRI	X
Payerle	George	Carte International Inc.	X
Radbrandt	Ulf	Hitachi Energy	X

Reed	Scott	MVA	X
Sauer	Daniel	EATON Corporation	X
Sharpless	Sam	Rimkus Engineering	X
Shull	Stephen	BBC Electrical Services, Inc.	X
Sizemore	Thomas	ABB Inc.	X
Tanaka	Troy	Burns & McDonnell	X
teNyenhuis	Ed	Hitachi Energy	X
Verdolin	Rogério	Verdolin Solutions Inc.	X
Wallach	David	Duke Energy	X
Weatherbee	ERIC	Hubbell	X
Zaman	Malia	IEEE	X

APPENDIX 1

Meeting Schedule

KEY

Note: A PC projector will be furnished in each meeting room. Arrive early to ensure equipment operates/syncs correctly.

> = activity continued into another session / from another session

++ = not a Transformers Committee activity

TBD = To Be Determined

TRACK LEGEND

Admin	Administrative SC	Ins Life	Insulation Life SC
Bush	Bushings SC	Instr TR	Instrument Transformers SC
DiTests	Dielectric Tests SC	Mtgs	Meetings Planning SC
Distr	Distribution Transformers SC	PCS	Performance Characteristics SC
Dry Type	Dry Type Transformers SC	Power	Power Transformers SC
HVDC	HVDC Converter Transfs. and Smoothing Reactors SC	STNP	Submersible Transf. & Network Protectors SC
IF	Insulating Fluids SC	Stds	Standards SC

STATUS LEGEND

N	New
I	In-Progress
NC	Near Completion
B	Ballot Stage
C	Complete
E	Entity

SATURDAY, OCTOBER 26

No Registration and no Meetings, Technical Tours, or Spouse/Companion Tours Planned

SUNDAY, OCTOBER 27

TIME	ACTIVITY	TRACK	MTG CHAIR	STATUS	ROOM (FLOOR)
1:00 PM – 5:30 PM	Meeting Registration				Grand Foyer (4)
2:00 PM – 5:00 PM	Administrative Subcommittee - Closed meeting, by invitation only	Admin	D. Wallach	—	Park View (4)
2:00 PM – 5:00 PM	NEMA Transformers - Closed meeting, by invitation only	++	P. Orr	—	Gateway East (18)
6:00 PM – 8:00 PM	Welcome Reception Renew old friendships and form new ones! This reception will be held inside the Grand Ballroom at the Hyatt, so weather will not be an issue. Bars*, plenty of fabulous food and live music will be provided. Please indicate whether you will attend this reception during the meeting registration process. All registered attendees and spouses/companions are welcome to attend. *Hotel is cashless (except gratuities); credit cards, debit cards and room charges only.				Grand Ballroom (4)

MONDAY, OCTOBER 28 Breaks Sponsored by Hitachi Energy*

TIME	ACTIVITY	TRACK	MTG CHAIR	STATUS	ROOM (FLOOR)
7:00 AM – 5:00 PM	Meeting Registration				Grand Foyer (4)
7:00 AM – 7:50 AM	Newcomers Orientation - Arrive early, grab breakfast from Regency BC and get a good seat - Newcomers and guests are encouraged to attend		B. Griesacker	—	Regency A (2)
7:00 AM – 8:00 AM	Breakfast - Attendees (no spouses/companions please)				Regency BC (2)
8:00 AM – 9:30 AM	Breakfast - Spouses/Companions (no meeting attendees please)				Gateway East (18)
8:00 AM – 9:15 AM	Opening Session - All registered meeting participants are encouraged to attend - See separate document on website for meeting agenda - Attendance required to maintain Committee Member status		D. Wallach	—	Regency DEF (2)
9:30 AM – 4:00 PM	Spouses/Companions Tour: Sites of St. Louis - Start the day with a bus tour of St. Louis (complete with professional guide) - Visit the Cathedral Basilica in the morning and Anheuser-Busch Brewery in the afternoon - Enjoy a traditional Italian meal at Favazza's Restaurant on "The Hill" and Ted Drewes frozen custard for dessert - See website/flyer for details	Tour			
9:15 AM – 9:30 AM	<i>Break (beverages only): Hitachi Energy</i>				Grand Foyer (4)
9:30 AM – 10:45 AM	TF IEEE-IEC Cross Reference	Stds	A. Washburn	I	Grand Ballroom C (4)
9:30 AM – 10:45 AM	TF PAR Study Group Temp Rise Test beyond NP C57.119	Ins Life	E. Schweiger	I	Grand Ballroom AB (4)
9:30 AM – 10:45 AM	WG Guide for Tank Rupture Mitigation C57.156	Power	P. Zhao	I	Grand Ballroom GH (4)
9:30 AM – 10:45 AM	TF Transf Efficiency & Loss Evaluation (DOE Activity)	Distr	P. Hopkinson	I	Grand Ballroom D (4)
9:30 AM – 10:45 AM	TF PD Testing of DTR, Wind & Solar Transf	DiTests	A. Larison	I	Grand Ballroom E (4)
9:30 AM – 10:45 AM	WG Guide DGA in Ester-Immersed Transformers PC57.155	IF	A. Sbravati	I	Grand Ballroom F (4)
10:45 AM – 11:00 AM	<i>Break (beverages only): Hitachi Energy</i>				Grand Foyer (4)
11:00 AM – 12:15 PM	WG Eval Guide Environ Impact of Trans & Reactors PC57.151	PCS	J. Kazmierczak	N	Grand Ballroom AB (4)
11:00 AM – 12:15 PM	WG Guide for DGA in Silicone PC57.146	IF	P. Boman	I	Grand Ballroom C (4)
11:00 AM – 12:15 PM	WG Class 1E Transf.for Nuclear Power Gen Std. 638	Power	C. Swinderman	I	Grand Ballroom F (4)
11:00 AM – 12:15 PM	WG App of High-Temp Insulation Matrs IEEE 1276 Annex B	Ins Life	K. Biggie	I	Grand Ballroom D (4)
11:00 AM – 12:15 PM	TF PAR Study Group Guide for TVA Dry-Type Coil C57.12.58	Dry Type	K. Klein	I	Grand Ballroom E (4)
11:00 AM – 12:15 PM	WG 1ph Submersible Transformers PC57.12.23	STNP	A. Traut	I	Grand Ballroom F (4)
12:15 PM – 1:30 PM	Standards Development Review Luncheon Everyone is welcome to attend. All SC/WG/TF leaders are highly encouraged to attend. Doors open ~12:00 pm. Come early, get a good seat and start eating. Advance on-line registration required. To listen to the presentation without eating lunch, arrive by 12:30 pm.				Regency BC (2)
1:45 PM – 3:00 PM	TF - Test Degredation of Cellulose in Liquid Type Transfs	Ins Life	L. Lewand	I	Grand Ballroom C (4)
1:45 PM – 3:00 PM	WG Dry Type Gen. Requirements C57.12.01	Dry Type	C. Ballard	I	Grand Ballroom AB (4)
1:45 PM – 3:00 PM	WG Guide for Phase Shifting Transf C57.135	Power	E. Schweiger	I	Grand Ballroom GH (4)
1:45 PM – 3:00 PM	TF Audible Sound Revision to Test Code	PCS	R. Girgis	I	Grand Ballroom D (4)
1:45 PM – 3:00 PM	TF DFR Test Guide C57.161	DiTests	E. Ermakov	I	Grand Ballroom F (4)
1:45 PM – 3:00 PM					Grand Ballroom E (4)
3:00 PM – 3:15 PM	<i>Break (beverages and treats): Hitachi Energy</i>				Grand Foyer (4)
3:15 PM – 4:30 PM	WG Test for Eval of Insulation for Dry-Type Transfs P259	Dry Type	D. Stankes	I	Grand Ballroom C (4)
3:15 PM – 4:30 PM	WG Std Reqs for Liquid-Imersed Power Trans C57.12.10	Power	S. Digby	N	Grand Ballroom D (4)
3:15 PM – 4:30 PM	TF PCS Cont. Revisions to C57.12.00	PCS	T. Ansari	I	Grand Ballroom AB (4)
3:15 PM – 4:30 PM	WG Bushing Application Guide C57.19.100	Bush	T. Spitzer	I	Grand Ballroom F (4)
3:15 PM – 4:30 PM	WG 3-ph Padmount Dist Transf. C57.12.34	Distr	S. Shull	I	Grand Ballroom GH (4)
3:15 PM – 4:30 PM	TF Guide Eval & Recon of Liquid Immerse Transf C57.140	Power	S. Som	I	Grand Ballroom E (4)
4:30 PM – 4:45 PM	<i>Break (beverages only): Hitachi Energy</i>				Grand Foyer (4)
4:45 PM – 6:00 PM	TF Core Ground & Winding Insul. Resistance - Perf & Int.	DiTests	D. Robalino	I	Grand Ballroom AB (4)
4:45 PM – 6:00 PM	TF PAR Study Group Unit Substation Transf C57.12.55	Dry Type	S. Nunn	I	Grand Ballroom C (4)
4:45 PM – 6:00 PM	WG Failure Investigation & Reporting PC57.125	Power	H. Sahin	I	Grand Ballroom GH (4)
4:45 PM – 6:00 PM	WG Std Distributed Photo-Voltaic Transf (DPVTs) C57.159	PCS	H. Shertukde	I	Grand Ballroom D (4)
4:45 PM – 6:00 PM	SC HVDC Converter Transfs & Smoothing Reactors	HVDC	U. Radbrandt	-	Grand Ballroom F (4)
4:45 PM – 6:00 PM	WG PC57.15 Std Req Terms & Test Code for V Step Regs	Distr	D. Sauer	I	Grand Ballroom E (4)
6:30 PM – 9:45 PM	Technical Tour: H-J Family of Companies Advance registration required—space is limited! Admission confirmed with badge at bus. Start loading bus at 6:15PM for a 6:30PM departure time. Arrive at H-J at 7:00PM with social time prior to the guided tours followed by a catered dinner. Bus departure at 9:15PM for a 9:45PM arrival at hotel. See website/flyer for more information.	Tech Tour			

TUESDAY, OCTOBER 29 Breaks Sponsored by Intellirent*

TIME	ACTIVITY	TRACK	MTG CHAIR	STATUS	ROOM (FLOOR)
7:00 AM – 11:30 AM	Meeting Registration				Grand Foyer (4)
7:00 AM – 7:50 AM	EL&P Delegation (End-users only please) - Arrive early and grab breakfast from Regency BC (2)		J. Murphy	—	Sterling Studio 6 (2)
7:00 AM – 8:00 AM	Breakfast - Attendees (no spouses/companions please)				Regency BC (2)
8:00 AM – 9:30 AM	Breakfast - Spouses/Companions (no meeting attendees please)				Gateway East (18)
9:30 AM – 4:00 PM	Spouses/Companions: Forest Park & Kirkwood - Day begins in Forest Park with a docent-led tour of the Missouri History Museum and its reimagined 1904 World's Fair Exhibit - Enjoy lunch at One 19 North Tapas Wine Bar - Browse shops, boutiques and a Farmer's Market in Kirkwood, MO in the afternoon - See website/flyer for details	Tour			
8:00 AM – 9:15 AM	WG Guide for Life Tests of Switch Contacts C57.157	Power	A. Sewell	I	Grand Ballroom C (4)
8:00 AM – 9:15 AM	WG Practice for Install & Operation of Dry Type PC57.94	Dry Type	K. Klein	I	Grand Ballroom F (4)
8:00 AM – 9:15 AM	WG Power-Line Carrier Coupling Cap & Volt Transf C57.13.9	Instr TR	Z. Roman	I	Grand Ballroom AB (4)
8:00 AM – 9:15 AM	WG Guide DGA Applied to Factory Temp Rise Test C57.130	IF	B. Forsyth	I	Grand Ballroom D (4)
8:00 AM – 9:15 AM	TF on Revision of Impulse Tests C57.12.00 & C57.12.90	DiTests	S. Plante	I	Grand Ballroom E (4)
8:00 AM – 9:15 AM	WG Encl Int C57.12.28, C57.12.29, C57.12.31, C57.12.32	Distr	D. Mulkey	I	Grand Ballroom GH (4)
9:15 AM – 9:30 AM	Break (beverages only): Intellirent				Grand Foyer (4)
9:30 AM – 10:45 AM	WG Detection of Acoustic Emissions from PD C57.127	DiTests	D. Gross	I	Grand Ballroom AB (4)
9:30 AM – 10:45 AM	TF Std Require for Bushings C57.19.01	Bush	S. Zhang	I	Grand Ballroom GH (4)
9:30 AM – 10:45 AM	TF Instrument Transf. Accuracy	Instr TR	I. Ziger	I	Grand Ballroom C (4)
9:30 AM – 10:45 AM	WG Condition Assessment Guide PC57.170	Power	K. Mani	I	Grand Ballroom D (4)
9:30 AM – 10:45 AM	TF PCS Cont. Rev. to Test Code C57.12.90	PCS	H. Sahin	I	Grand Ballroom E (4)
9:30 AM – 10:45 AM	WG Distr Substation Transf PC57.12.36	Distr	J. Murphy	I	Grand Ballroom F (4)
10:45 AM – 11:00 AM	Break (beverages only): Intellirent				Grand Foyer (4)
11:00 AM – 12:15 PM	WG Sw Transients Ind by TR/Bkr Interaction PC57.142	PCS	J. McBride	I	Grand Ballroom D (4)
11:00 AM – 12:15 PM	WG Liquid-immersed Sec. Network TRs C57.12.40	STNP	J. Vartanian	I	Grand Ballroom AB (4)
11:00 AM – 12:15 PM	WG Standard Requirements for Arc Furnace Transf. C57.17	Power	D. Corsi	I	Grand Ballroom C (4)
11:00 AM – 12:15 PM	WG Requirements for Instrument Transformers PC57.13	Instr TR	D. Wallace	I	Grand Ballroom E (4)
11:00 AM – 12:15 PM	TF Guide for Corrosive Sulfur In Oil- Immersed Trfs & Reactors	IF	L. Lewand	I	Grand Ballroom F (4)
11:00 AM – 12:15 PM	WG PC57.12.59	Dry Type	P. Weyandt	I	Grand Ballroom GH (4)
12:15 PM – 1:30 PM	Awards Luncheon All meeting attendees are encouraged to attend to show appreciation and recognize accomplishments. Doors open ~12:00 pm. Come early, get a good seat and start eating. Advance on-line registration is required.				Regency BC (2)
1:45 PM – 3:00 PM	TF Std Require Bushings above 5kA in Bus Encl. C57.19.04	Bush	S. Digby	I	Grand Ballroom D (4)
1:45 PM – 3:00 PM	TF Cont. Revision to Low Frequency Tests C57.12.90	DiTests	A. Varghese	I	Grand Ballroom E (4)
1:45 PM – 3:00 PM	WG Liquid Immersed Phase- Shifting Transf 60076-57-1202	Power	E. Schweiger	N	Grand Ballroom C (4)
1:45 PM – 3:00 PM	WG DGA in Mineral Oil Transf C57.104	IF	E. teNyenhuus	I	Grand Ballroom AB (4)
1:45 PM – 3:00 PM	TF to Merge C57.13.5 into C57.13	Instr TR	T. Sizemore	I	Grand Ballroom GH (4)
1:45 PM – 3:00 PM	WG Electronic Test Data PC57.12.37	Distr	A. Traut	I	Grand Ballroom F (4)
3:00 PM – 3:15 PM	Break (beverages and pretzels): Intellirent				Grand Foyer (4)
3:15 PM – 4:30 PM	WG Recommend Practice Routine Impulse Tests C57.138	DiTests	H. Sahin	I	Grand Ballroom C (4)
3:15 PM – 4:30 PM	WG Guide for DGA in LTCs C57.139	IF	R. Frotscher	I	Grand Ballroom F (4)
3:15 PM – 4:30 PM	WG Guide for Install & Maintenance of Power Trf C57.93	Power	S. Reed	N	Grand Ballroom D (4)
3:15 PM – 4:30 PM	TF Continuous Rev Clause 11 Temp Rise Tests C57.12.90	Ins Life	D. Sankarakurup	I	Grand Ballroom E (4)
3:15 PM – 4:30 PM	WG Reverse Power Flow Effects on Trans PC57.133	Stds	R. Hogg	N	Grand Ballroom AB (4)
3:15 PM – 4:30 PM	WG Req for Dist Trf Tank Pressure Coordination C57.12.39	Distr	C. Gayton	I	Grand Ballroom GH (4)
4:30 PM – 4:45 PM	Break (beverages only): Intellirent				Grand Foyer (4)
4:45 PM – 6:00 PM	WG Guide for App of Tert & Stabilizing Windings C57.158	PCS	E. Betancourt	I	Grand Ballroom D (4)
4:45 PM – 6:00 PM	WG Guide for Mitigating Corrosion on Sub Trfs C57.12.53	STNP	W. Elliott	I	Grand Ballroom AB (4)
4:45 PM – 6:00 PM	WG Guide for Field Testing PC57.152	Stds	M. Ferreira	I	Grand Ballroom E (4)
4:45 PM – 6:00 PM	WG Guide for Paralleling Transformers C57.153	Power	M. Tostrud	I	Grand Ballroom C (4)
4:45 PM – 6:00 PM	WG Dry Type Test Code C57.12.91	Dry Type	D. Walker	I	Grand Ballroom GH (4)
4:45 PM – 6:00 PM	WG Neutral Grounding Devices C57.32	PCS	S. Kennedy	I	Grand Ballroom F (4)
6:25 PM – 9:45 PM	Technical Tour: WEG Transformers USA Advance registration required—space is limited! Admission confirmed with badge at bus. Start loading bus at 6:15PM for a 6:25PM departure time. Arrive at WEG's distribution transformer factory at 7:15PM for a brief presentation and guided tour followed by a catered dinner. Bus departure at 9:00PM for a 9:45PM arrival at hotel. See website/flyer for more information.	Tech Tour			

FALL 2024 MEETING: OCTOBER 27 TO OCTOBER 31

Hyatt Regency St. Louis at The Arch; St. Louis, Missouri, USA

WEDNESDAY, OCTOBER 30 Breaks Sponsored by Brockhaus Measurements*

No Registration and no Technical Tours or Spouse/Companion Events Planned					
TIME	ACTIVITY	TRACK	MTG CHAIR	STATUS	ROOM (FLOOR)
7:00 AM – 8:00 AM	Breakfast - Attendees (no spouses/companions please)				Regency BC (2)
7:00 AM – 8:00 AM	SC Meetings Planning - Arrive early and grab breakfast from Regency BC (2) - All interested individuals welcome	Mtgs	T. Behrens	—	Sterling Studio 6 (2)
7:00 AM – 8:00 AM	IEC TC-14 Technical Advisory Group - Breakfast Meeting - arrive early and grab breakfast from Regency BC (2) - All interested individuals welcome		T. Prevost	—	Regency A (2)
8:00 AM – 9:30 AM	Breakfast - Spouses/Companions (no meeting attendees please)				Gateway East (18)
8:00 AM – 9:15 AM	SC Instrument Transformers	Instr TR	T. Sizemore	—	Grand Ballroom AB (4)
8:00 AM – 9:15 AM	SC Insulation Life	Ins Life	S. Sharpless	—	Grand Ballroom E (4)
9:15 AM – 9:30 AM	<i>Break (beverages only): Brockhaus Measurements</i>				Grand Foyer (4)
9:30 AM – 10:45 AM	SC Distribution Transformers	Distr	J. Murphy	—	Grand Ballroom E (4)
9:30 AM – 10:45 AM	SC Bushings	Bush	E. Weatherbee	—	Grand Ballroom AB (4)
10:45 AM – 11:00 AM	<i>Break (beverages only): Brockhaus Measurements</i>				Grand Foyer (4)
11:00 AM – 12:15 PM	SC Submersible Transf. & Network Protectors	STNP	G. Payerle	—	Grand Ballroom AB (4)
11:00 AM – 12:15 PM	SC Dielectric Test	DiTests	P. Patel	—	Grand Ballroom E (4)
12:15 PM – 1:30 PM	<i>Lunch Break</i>				
12:15 PM – 1:30 PM	Women in Power Luncheon				Park View (4)
1:30 PM – 2:45 PM	SC Dry Type Transformers	Dry Type	C. Ballard	—	Grand Ballroom AB (4)
1:30 PM – 2:45 PM	SC Power Transformers	Power	R. Musgrove	—	Grand Ballroom E (4)
2:45 PM – 3:00 PM	<i>Break (beverages and treats): Brockhaus Measurements</i>				Grand Foyer (4)
3:00 PM – 4:15 PM	SC Insulating Fluids	IF	S. Mabrey	—	Grand Ballroom AB (4)
3:00 PM – 4:15 PM	SC Performance Characteristics	PCS	R. Verdolin	—	Grand Ballroom E (4)
4:15 PM – 4:30 PM	<i>Break (beverages only): Brockhaus Measurements</i>				Grand Foyer (4)
4:30 PM – 5:45 PM	SC Standards	Stds	D. Sauer	—	Grand Ballroom E (4)
6:00 PM – 10:00 PM	Dinner Social: A Magical Evening at the Gardens - Advance on-line registration required; admission confirmed with name badge at bus loading - Take a short bus ride to the Missouri Botanical Gardens; buses will run between the event and hotel throughout the evening - Join your H-J hosts for hors d'oeuvres, buffet dinner, cash bars, roaming magicians and award-winning Mind Kontrol Magic Show - Gardens gift shop will be open for unique gift purchases - See flyer for details	Social			

THURSDAY, OCTOBER 31

No Meeting Registration, Spouse/Companion Tours, or Social Events Planned					
TIME	ACTIVITY	TRACK	MTG CHAIR	STATUS	ROOM (FLOOR)
7:00 AM – 8:00 AM	Breakfast - Attendees (no spouses/companions please)				Regency BC (2)
8:00 AM – 9:30 AM	Breakfast - Spouses/Companions (no meeting attendees please)				Gateway East (18)
8:00 AM – 9:15 AM	Technical Presentation 1 Tutorial on Condition Assessment - Parts 1 & 2 - Part 1: Introduction to PC57.170 Condition Assessment Guide – Brian Sparling & James Cross - Part 2: Using Bayesian Networks for Condition Assessment (Published Cigre Paper) – Luiz Cheim, Alan Sbravati & Kumar Mani - See flyers on website for details **	Tutorial			Regency DEF (2)
9:15 AM – 9:30 AM	<i>Break (beverages only)</i>				Regency Foyer (2)
9:30 AM – 10:45 AM	Technical Presentation 2 Tutorial on Pragmatic Approach to Seismic Protection of High Voltage Transformer Bushings – Jon Bender & Bjorn Vaagensmith - See flyer on website for details **	Tutorial			Regency DEF (2)
10:45 AM – 11:00 AM	<i>Break (beverages only)</i>				Regency Foyer (2)
11:00 AM – 12:00 PM	Closing Session - All attendees are encouraged to attend - See separate document on website for meeting agenda		D. Wallach		Regency DEF (2)
12:00 PM	<i>Lunch (on your own)</i>				
12:20 PM – 3:00 PM	Technical Tour: The Gund Company (by invitation only) Advance registration required—space is limited! Admission confirmed with badge at bus. Board bus at 12:15PM for a 12:20PM departure. Arrive at The Gund Company at 1:00PM and enjoy lunch followed by a guided tour of the company's electrical insulation manufacturing facility. See website/flyer for more information.	Tech Tour			
1:00 PM – 5:00 PM	WG PC57.15 Std Req Terms & Test Code for V Step Regs	Distr	D. Sauer	I	Regency A (2)
1:00 PM – 5:00 PM	PAR Study IEC-IEEE 60076-57-129 HVDC Converter Trfs	HVDC	W. Ziomek	N	Mills 6 (4)

* Contact Ed Smith (edsmith@ieee.org) if you are interested in sponsoring a day of coffee breaks at a future meeting.

** Contact Tom Prevost (tprevost@ieee.org) if you are interested in making a technical presentation at a future meeting.

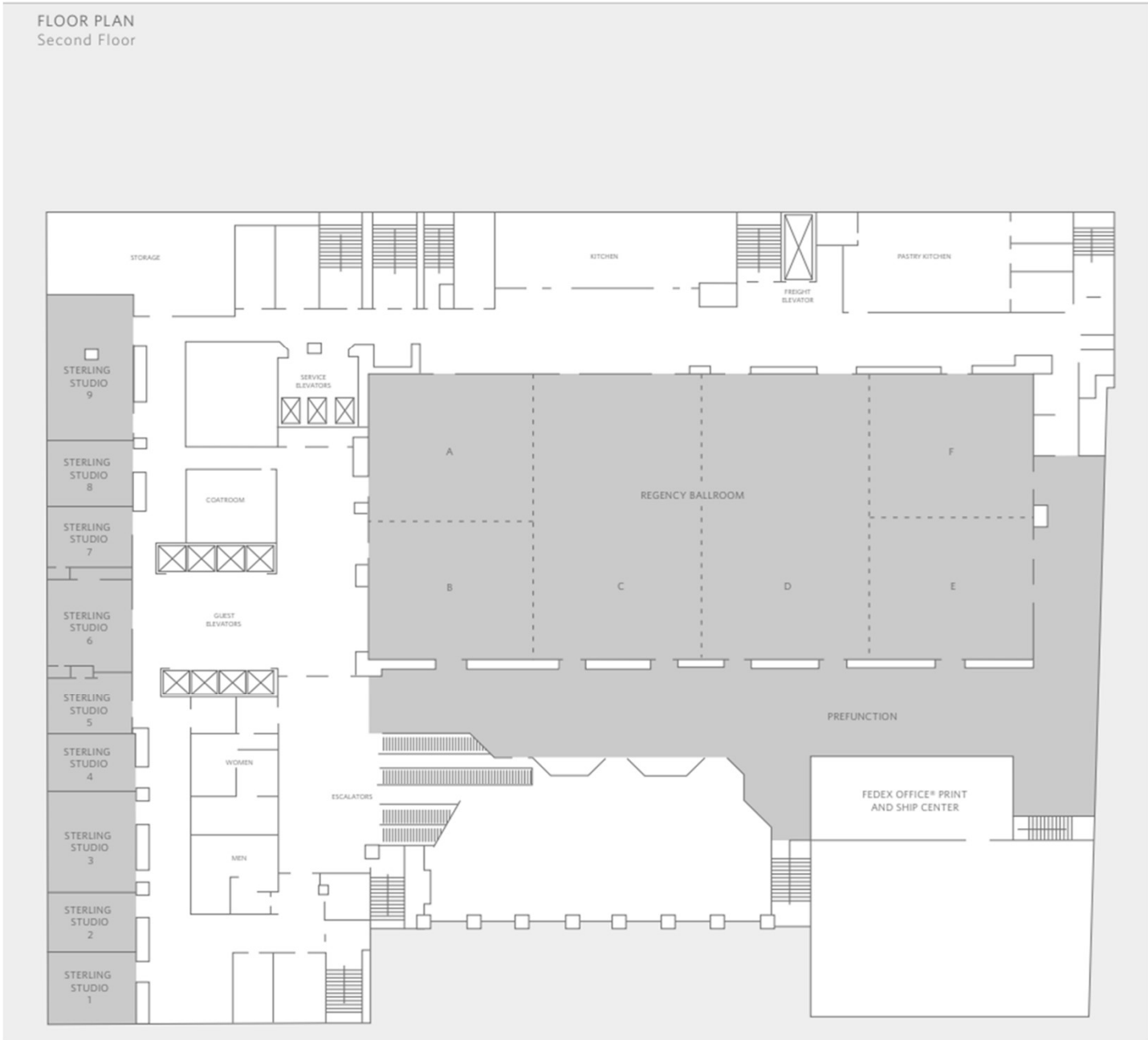
FRIDAY, NOVEMBER 1

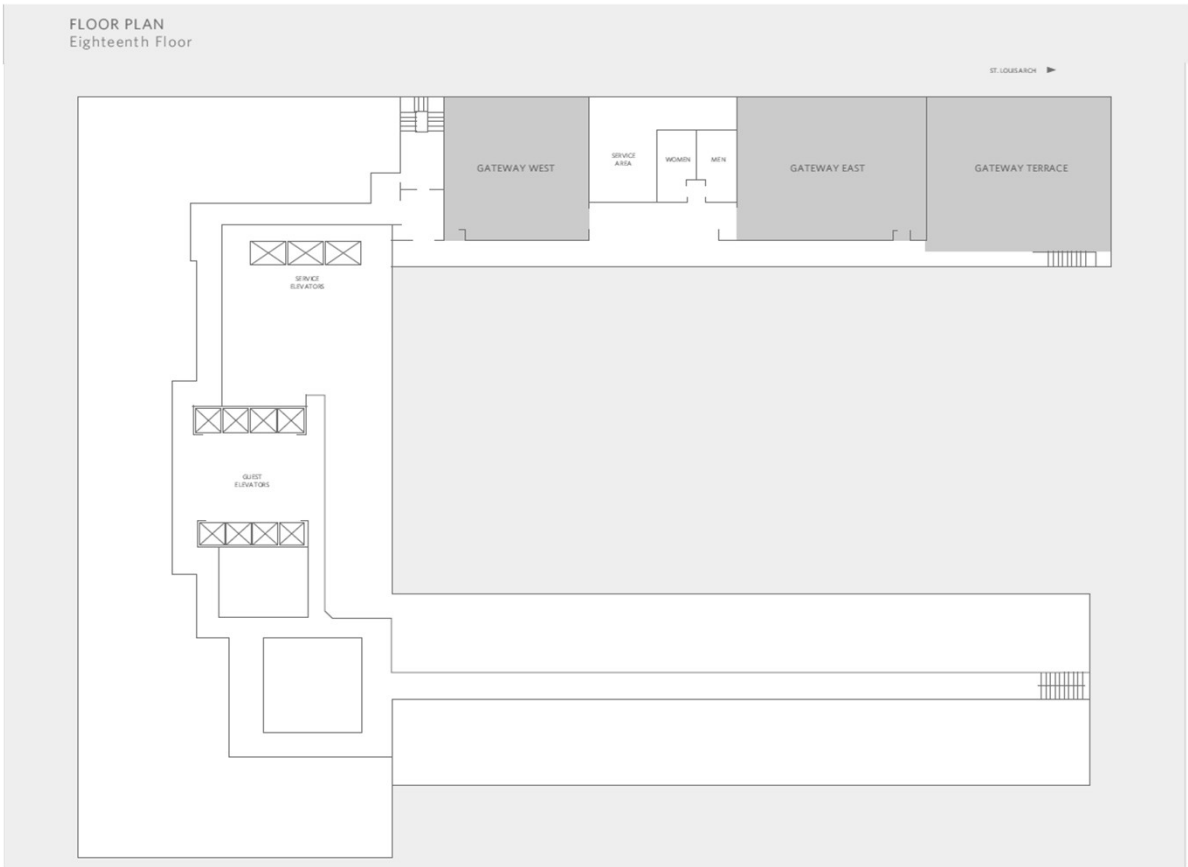
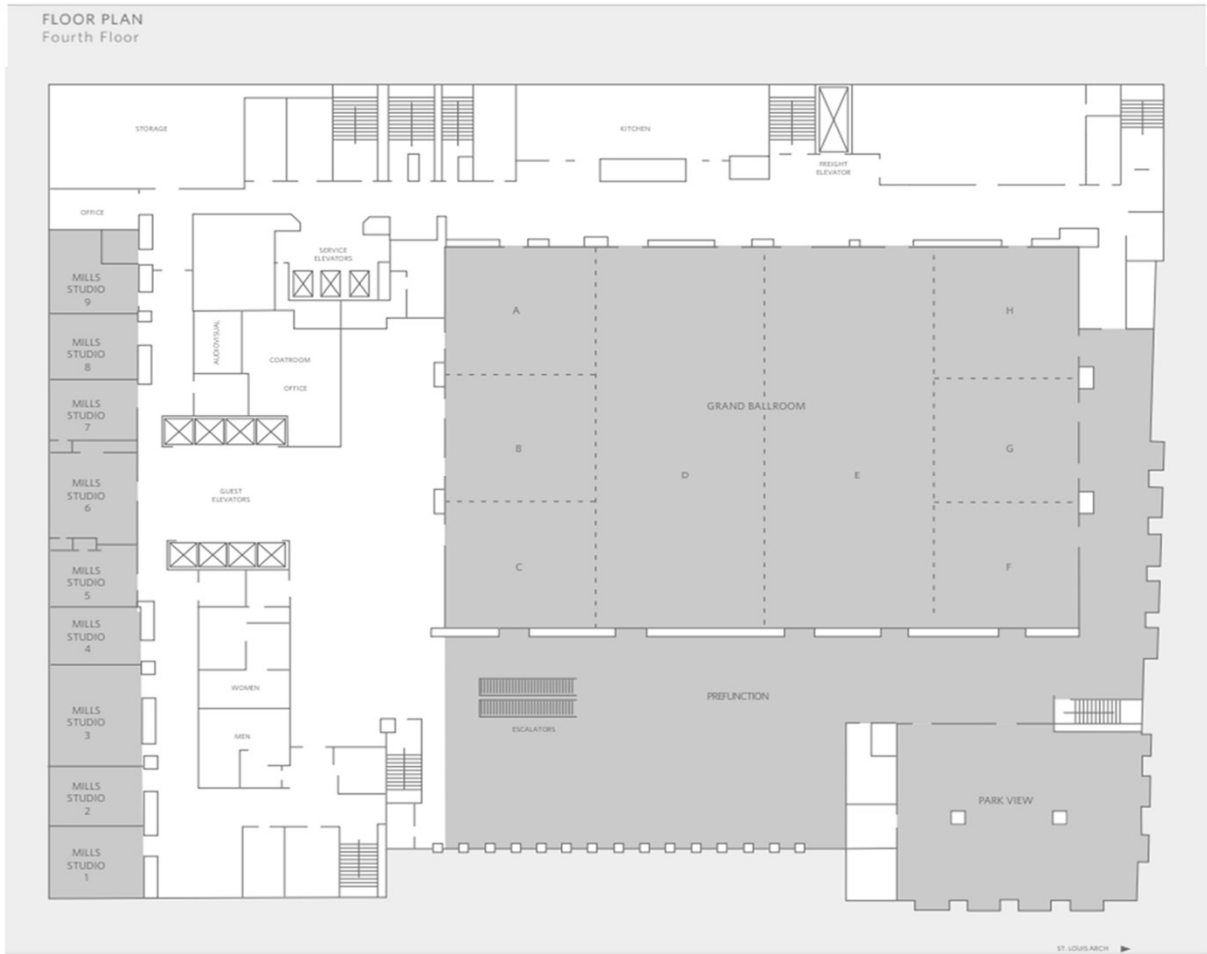
No Meeting Registration, Technical Tours, Spouse/Companion Tours, or Social Events Planned

TIME	ACTIVITY	TRACK	MTG CHAIR	STATUS	ROOM (FLOOR)
8:00 AM – 12:00 PM	PAR Study IEC-IEEE 60076-57-129 HVDC Converter Trfs	HVDC	W. Ziomek	N	Mills 6 (4)

FUTURE COMMITTEE MEETINGS

- Spring 2025: Denver, Colorado USA, March 23 – 27, 2025
- Fall 2025: Bonita Springs, FL USA, October 19 – 23, 2025
- Spring 2026: TBD USA, March , 2026
- Fall 2026: TBD USA, October , 2025





SUBCOMMITTEE MEETING LIST

FALL 2024 MEETING: OCTOBER 27 TO OCTOBER 31

Hyatt Regency St. Louis at The Arch; St. Louis, Missouri, USA

Date	Time Start	Time End	Session Title	Track	Chair	Room/Location
10/27/2024	2:00 PM	5:00 PM	Administrative Subcommittee - Closed meeting, by invitation only	Admin	D. Wallach	Park View (4)
10/28/2024	3:15 PM	4:30 PM	WG Bushing Application Guide C57.19.100	Bush	T. Spitzer	Grand Ballroom F (4)
10/29/2024	9:30 AM	10:45 AM	TF Std Require for Bushings C57.19.01	Bush	S. Zhang	Grand Ballroom GH (4)
10/29/2024	1:45 PM	3:00 PM	TF Std Require Bushings above 5kA in Bus Encl. C57.19.04	Bush	S. Digby	Grand Ballroom D (4)
10/30/2024	9:30 AM	10:45 AM	SC Bushings	Bush	E. Weatherbee	Grand Ballroom AB (4)
10/28/2024	9:30 AM	10:45 AM	TF Transf Efficiency & Loss Evaluation (DOE Activity)	Distr	P. Hopkinson	Grand Ballroom D (4)
10/28/2024	3:15 PM	4:30 PM	WG 3-ph Padmount Dist Transf. C57.12.34	Distr	S. Shull	Grand Ballroom GH (4)
10/28/2024	4:45 PM	6:00 PM	WG PC57.15 Std Req Terms & Test Code for V Step Regs	Distr	D. Sauer	Grand Ballroom E (4)
10/29/2024	8:00 AM	9:15 AM	WG Encl Int C57.12.28, C57.12.29, C57.12.31, C57.12.32	Distr	D. Mulkey	Grand Ballroom GH (4)
10/29/2024	9:30 AM	10:45 AM	WG Distr Substation Transf PC57.12.36	Distr	J. Murphy	Grand Ballroom F (4)
10/29/2024	1:45 PM	3:00 PM	WG Electronic Test Data PC57.12.37	Distr	A. Traut	Grand Ballroom F (4)
10/29/2024	3:15 PM	4:30 PM	WG Req for Dist Trf Tank Pressure Coordination C57.12.39	Distr	C. Gayton	Grand Ballroom GH (4)
10/30/2024	9:30 AM	10:45 AM	SC Distribution Transformers	Distr	J. Murphy	Grand Ballroom E (4)
10/31/2024	1:00 PM	5:00 PM	WG PC57.15 Std Req Terms & Test Code for V Step Regs	Distr	D. Sauer	Regency A (2)
10/28/2024	9:30 AM	10:45 AM	TF PD Testing of DTR, Wind & Solar Transf	DiTests	A. Larison	Grand Ballroom E (4)
10/28/2024	1:45 PM	3:00 PM	TF DFR Test Guide C57.161	DiTests	E. Ermakov	Grand Ballroom F (4)
10/28/2024	4:45 PM	6:00 PM	TF Core Ground & Winding Insul. Resistance - Perf & Int.	DiTests	D. Robalino	Grand Ballroom AB (4)
10/29/2024	8:00 AM	9:15 AM	TF on Revision of Impulse Tests C57.12.00 & C57.12.90	DiTests	S. Plante	Grand Ballroom E (4)
10/29/2024	9:30 AM	10:45 AM	WG Detection of Acoustic Emissions from PD C57.127	DiTests	D. Gross	Grand Ballroom AB (4)
10/29/2024	1:45 PM	3:00 PM	TF Cont. Revision to Low Frequency Tests C57.12.90	DiTests	A. Varghese	Grand Ballroom E (4)
10/29/2024	3:15 PM	4:30 PM	WG Recommend Practice Routine Impulse Tests C57.138	DiTests	H. Sahin	Grand Ballroom C (4)
10/30/2024	11:00 AM	12:15 PM	SC Dielectric Test	DiTests	P. Patel	Grand Ballroom E (4)
10/28/2024	11:00 AM	12:15 PM	TF PAR Study Group Guide for TVA Dry-Type Coil C57.12.58	Dry Type	K. Klein	Grand Ballroom E (4)
10/28/2024	1:45 PM	3:00 PM	WG Dry Type Gen. Requirements C57.12.01	Dry Type	C. Ballard	Grand Ballroom AB (4)
10/28/2024	3:15 PM	4:30 PM	WG Test for Eval of Insulation for Dry-Type Transfs P259	Dry Type	D. Stankes	Grand Ballroom C (4)
10/28/2024	4:45 PM	6:00 PM	TF PAR Study Group Unit Substation Transf C57.12.55	Dry Type	S. Nunn	Grand Ballroom C (4)
10/29/2024	8:00 AM	9:15 AM	WG Practice for Install & Operation of Dry Type PC57.94	Dry Type	K. Klein	Grand Ballroom F (4)
10/29/2024	11:00 AM	12:15 PM	WG PC57.12.59	Dry Type	P. Weyandt	Grand Ballroom GH (4)
10/29/2024	4:45 PM	6:00 PM	WG Dry Type Test Code C57.12.91	Dry Type	D. Walker	Grand Ballroom GH (4)
10/30/2024	1:30 PM	2:45 PM	SC Dry Type Transformers	Dry Type	C. Ballard	Grand Ballroom AB (4)
10/28/2024	4:45 PM	6:00 PM	SC HVDC Converter Transfs & Smoothing Reactors	HVDC	U. Radbrandt	Grand Ballroom F (4)
10/31/2024	1:00 PM	5:00 PM	PAR Study IEC_IEEE 60076-57-129 HVDC Converter Trfs	HVDC	W. Ziomek	Mills 6 (4)
11/1/2024	8:00 AM	12:00 PM	PAR Study IEC_IEEE 60076-57-129 HVDC Converter Trfs	HVDC	W. Ziomek	Mills 6 (4)
10/28/2024	9:30 AM	10:45 AM	WG Guide DGA in Ester-Immersed Transformers PC57.155	IF	A. Sbravati	Grand Ballroom F (4)
10/28/2024	11:00 AM	12:15 PM	WG Guide for DGA in Silicone PC57.146	IF	P. Boman	Grand Ballroom C (4)
10/29/2024	8:00 AM	9:15 AM	WG Guide DGA Applied to Factory Temp Rise Test C57.130	IF	B. Forsyth	Grand Ballroom D (4)
10/29/2024	11:00 AM	12:15 PM	TF Guide for Corrosive Sulfur In Oil- Immersed Trfs & Reactors	IF	L. Lewand	Grand Ballroom F (4)
10/29/2024	1:45 PM	3:00 PM	WG DGA in Mineral Oil Transf C57.104	IF	E. teNyenhuis	Grand Ballroom AB (4)
10/29/2024	3:15 PM	4:30 PM	WG Guide for DGA in LTCs C57.139	IF	R. Frotscher	Grand Ballroom F (4)
10/30/2024	3:00 PM	4:15 PM	SC Insulating Fluids	IF	S. Mabrey	Grand Ballroom AB (4)
10/28/2024	9:30 AM	10:45 AM	TF PAR Study Group Temp Rise Test beyond NP C57.119	Ins Life	E. Schweiger	Grand Ballroom AB (4)
10/28/2024	11:00 AM	12:15 PM	WG App of High-Temp Insulation Matr IEEE 1276 Annex B	Ins Life	K. Biggie	Grand Ballroom D (4)
10/28/2024	1:45 PM	3:00 PM	TF - Test Degredation of Cellulose in Liquid Type Transfs	Ins Life	L. Lewand	Grand Ballroom C (4)
10/29/2024	3:15 PM	4:30 PM	TF Continuous Rev Clause 11 Temp Rise Tests C57.12.90	Ins Life	D. Sankarakurup	Grand Ballroom E (4)
10/30/2024	8:00 AM	9:15 AM	SC Insulation Life	Ins Life	S. Sharpless	Grand Ballroom E (4)
10/29/2024	8:00 AM	9:15 AM	WG Power-Line Carrier Coupling Cap & Volt Transf C57.13.9	Instr TR	Z. Roman	Grand Ballroom AB (4)
10/29/2024	9:30 AM	10:45 AM	TF Instrument Transf. Accuracy	Instr TR	I. Ziger	Grand Ballroom C (4)
10/29/2024	11:00 AM	12:15 PM	WG Requirements for Instrument Transformers PC57.13	Instr TR	D. Wallace	Grand Ballroom E (4)
10/29/2024	1:45 PM	3:00 PM	TF to Merge C57.13.5 into C57.13	Instr TR	T. Sizemore	Grand Ballroom GH (4)
10/30/2024	8:00 AM	9:15 AM	SC Instrument Transformers	Instr TR	T. Sizemore	Grand Ballroom AB (4)
10/30/2024	7:00 AM	8:00 AM	SC Meetings Planning - Arrive early and grab breakfast from Regency BC (2) - All interested individuals welcome	Mtgs	T. Behrens	Sterling Studio 6 (2)

SUBCOMMITTEE MEETING LIST

FALL 2024 MEETING: OCTOBER 27 TO OCTOBER 31

Hyatt Regency St. Louis at The Arch; St. Louis, Missouri, USA

Date	Time Start	Time End	Session Title	Track	Chair	Room/Location
10/28/2024	11:00 AM	12:15 PM	WG Eval Guide Environ Impact of Trans & Reactors PC57.151	PCS	J. Kazmierczak	Grand Ballroom AB (4)
10/28/2024	1:45 PM	3:00 PM	TF Audible Sound Revision to Test Code	PCS	R. Girgis	Grand Ballroom D (4)
10/28/2024	3:15 PM	4:30 PM	TF PCS Cont. Revisions to C57.12.00	PCS	T. Ansari	Grand Ballroom AB (4)
10/28/2024	4:45 PM	6:00 PM	WG Std Distributed Photo-Voltaic Transf (DPVTs) C57.159	PCS	H. Shertukde	Grand Ballroom D (4)
10/29/2024	9:30 AM	10:45 AM	TF PCS Cont. Rev. to Test Code C57.12.90	PCS	H. Sahin	Grand Ballroom E (4)
10/29/2024	11:00 AM	12:15 PM	WG Sw Transients Ind by TR/Bkr Interaction PC57.142	PCS	J. McBride	Grand Ballroom D (4)
10/29/2024	4:45 PM	6:00 PM	WG Guide for App of Tert & Stabilizing Windings C57.158	PCS	E. Betancourt	Grand Ballroom D (4)
10/29/2024	4:45 PM	6:00 PM	WG Neutral Grounding Devices C57.32	PCS	S. Kennedy	Grand Ballroom F (4)
10/30/2024	3:00 PM	4:15 PM	SC Performance Characteristics	PCS	R. Verdolin	Grand Ballroom E (4)
10/28/2024	9:30 AM	10:45 AM	WG Guide for Tank Rupture Mitigation C57.156	Power	P. Zhao	Grand Ballroom GH (4)
10/28/2024	11:00 AM	12:15 PM	WG Class 1E Transf.for Nuclear Power Gen Std. 638	Power	C. Swinderman	Grand Ballroom F (4)
10/28/2024	1:45 PM	3:00 PM	WG Guide for Phase Shifting Transf C57.135	Power	E. Schweiger	Grand Ballroom GH (4)
10/28/2024	3:15 PM	4:30 PM	TF Guide Eval & Recon of Liquid Immerse Transf C57.140	Power	S. Som	Grand Ballroom E (4)
10/28/2024	3:15 PM	4:30 PM	WG Std Reqs for Liquid-Immersed Power Trans C57.12.10	Power	S. Digby	Grand Ballroom D (4)
10/28/2024	4:45 PM	6:00 PM	WG Failure Investigation & Reporting PC57.125	Power	H. Sahin	Grand Ballroom GH (4)
10/29/2024	8:00 AM	9:15 AM	WG Guide for Life Tests of Switch Contacts C57.157	Power	A. Sewell	Grand Ballroom C (4)
10/29/2024	9:30 AM	10:45 AM	WG Condition Assessment Guide PC57.170	Power	K. Mani	Grand Ballroom D (4)
10/29/2024	11:00 AM	12:15 PM	WG Standard Requirements for Arc Furnace Transf. C57.17	Power	D. Corsi	Grand Ballroom C (4)
10/29/2024	1:45 PM	3:00 PM	WG Liquid Immersed Phase- Shifting Transf 60076-57-1202	Power	E. Schweiger	Grand Ballroom C (4)
10/29/2024	3:15 PM	4:30 PM	WG Guide for Install & Maintenance of Power Trf C57.93	Power	S. Reed	Grand Ballroom D (4)
10/29/2024	4:45 PM	6:00 PM	WG Guide for Paralleling Transformers C57.153	Power	M. Tostrud	Grand Ballroom C (4)
10/30/2024	1:30 PM	2:45 PM	SC Power Transformers	Power	R. Musgrove	Grand Ballroom E (4)
10/28/2024	9:30 AM	10:45 AM	TF IEEE-IEC Cross Reference	Stds	A. Washburn	Grand Ballroom C (4)
10/29/2024	3:15 PM	4:30 PM	WG Reverse Power Flow Effects on Trans PC57.133	Stds	R. Hogg	Grand Ballroom AB (4)
10/29/2024	4:45 PM	6:00 PM	WG Guide for Field Testing PC57.152	Stds	M. Ferreira	Grand Ballroom E (4)
10/30/2024	4:30 PM	5:45 PM	SC Standards	Stds	D. Sauer	Grand Ballroom E (4)
10/28/2024	11:00 AM	12:15 PM	WG 1ph Submersible Transformers PC57.12.23	STNP	A. Traut	Grand Ballroom GH (4)
10/29/2024	11:00 AM	12:15 PM	WG Liquid-immersed Sec. Network TRs C57.12.40	STNP	J. Vartanian	Grand Ballroom AB (4)
10/29/2024	4:45 PM	6:00 PM	WG Guide for Mitigating Corrosion on Sub Trfs C57.12.53	STNP	W. Elliott	Grand Ballroom AB (4)
10/30/2024	11:00 AM	12:15 PM	SC Submersible Transf. & Network Protectors	STNP	G. Payerle	Grand Ballroom AB (4)

APPENDIX 2

Semi-Annual Standards Report

Standards Report

October 2024 – Fall Meeting
St. Louis
Stephen Shull

Location of Standards Report

PES Transformers Committee

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WELCOME TO THE TRANSFORMERS COMMITTEE WEBSITE!

The Transformers Committee is one of the largest and most active of the 17 technical committees within the IEEE Power and Energy Society (PES). The Committee is comprised of technical and managerial representatives from manufacturers, consultants, vendors and end users of electrical transformers and components. The continuing scope of the Committee is to develop and update standards and guidelines for the design, testing, repair, installation, operation and maintenance of transformers, reactors and associated components that are used within electric utility and industrial power systems.

NOTICES:

Path to Standards
Report

A link for the upcoming [Spring 2024 Vancouver](#) meeting, March 10 – 14, is now available.

page for web/conf call meetings. We will make every effort to publicize them in advance when notified.

requests to tc-webmaster@ieee.org.



Location of Standards Report

PES Transformers Committee



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2024 Spring-Vancouver

Latest Mtg Minutes

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NOTICES:

The meeting information and registration link for the upcoming [Spring 2024 Vancouver](#) meeting, March 10 – 14, is now available.

Please regularly check the [Meeting Calendar](#) page for web/conf call meetings. We will make every effort to publicize them in advance when notified.

For more information or to submit comments, please email transformers-standards@ieee.org.

Path to Standards
Report



Latest Mtg Minutes

LATEST COMMITTEE MINUTES – FALL 2024 ST. LOUIS, MISSOURI MEETING

Minutes of previous meetings

NOTE: Meeting minutes are considered unapproved until they are approved at the next meeting held.

Executive Reports:

Main Minutes .
Chair's Report .
Vice Chair's Report .
Secretary's Report .
[Standards Status Report](#) . 14Oct2024
IEEE Standards Association Report .
Treasurer's Report .
Editor's Report .
Recognition and Awards: Report . Presentation .



Current Standards
Report

The next date for submission to NesCom ends on
December 20, 2024.

Next NesCom Meeting is on January 29, 2025

There are 20 documents in “Inactive-Reserve” status.

Of the Standards in the “Inactive-Reserve” status, there are three without PARs.

- C57.13.2 – IEEE Conformance Test Procedure for Instrument Transformers
- C57.13.6 – Standard for High Accuracy Instrument Transformers; and
- C57.144 – Guide to Metric Conversion of Transformer Standards.

Standards Status

C57.120	IEEE Guide for Loss Evaluation of Distribution and Power Transformers and Reactors	12/31/2027
C57.140	IEEE Guide for Evaluation and Reconditioning of Liquid Immersed Power Transformers	12/31/2027
C57.13.7	IEEE Standard for Current Transformers with Maximum Milliampere Secondary Current of 250 mA	12/31/2028
C57.147	IEEE Guide for Acceptance and Maintenance of Natural Insulating Liquid in Transformers	12/31/2028
C57.119	IEEE Recommended Practice for Performing Temperature Rise Tests on Liquid Immersed Power Transformers at Loads Beyond Nameplate Ratings	12/31/2028
60076-16	IEC/IEEE International Standard - Power transformers - Part 16: Transformers for wind turbine applications	12/31/2028
C57.109	IEEE Guide for Liquid-Immersed Transformers Through-Fault-Current Duration	12/31/2028
C57.110	IEEE Recommended Practice for Establishing Liquid Immersed and Dry-Type Power and Distribution Transformer Capability when Supplying Nonsinusoidal Load Currents	12/31/2028
60076-16	Power Transformers - Part 16: Transformers for Wind Turbine Application	12/31/2028

PAR/Standards Status

60076-16	IEC/IEEE International Standard - Power transformers - Part 16: Transformers for wind turbine applications	2028
C57.109	IEEE Guide for Liquid-Immersed Transformers Through-Fault-Current Duration	2028
C57.110	IEEE Recommended Practice for Establishing Liquid Immersed and Dry-Type Power and Distribution Transformer Capability when Supplying Non-sinusoidal Load Currents.	2028
C57.119	IEEE Recommended Practice for Performing Temperature Rise Tests on Liquid-Immersed Power Transformers at Loads Beyond Nameplate Ratings	2028
C57.13.7	IEEE Standard for Current Transformers with Maximum Milliampere Secondary Current of 250 mA	2028
C57.147	IEEE Guide for Acceptance and Maintenance of Natural Ester Insulating Liquid in Transformers	2028
C57.161	IEEE Guide for Dielectric Frequency Response Test	2028
C57.19.04	IEEE Standard for Performance Characteristics and Dimensions for High Current Power Transformer Bushings with Rated Continuous Current in Excess of 5000 A in Bus Enclosures	2028
60214-2	IEEE/IEC International Standard for TAP-changers --Part 2: Application guidelines	2029
C57.104	IEEE Guide for the Interpretation of Gases Generated in Mineral Oil-Immersed Transformers	2029
C57.105	IEEE Guide for Application of Transformer Connections in Three-Phase Electrical Systems	2029
C57.12.51	IEEE Guide for Mechanical Interchangeability of Ventilated Dry-Type Transformers	2029
C57.123	IEEE Guide for Transformer Loss Measurement	2029
C57.13.5	IEEE Standard for Performance and Test Requirements for Instrument Transformers of a Nominal System Voltage of 115 kV and Above	2029
C57.93	IEEE Guide for Installation and Maintenance of Liquid-Immersed Power Transformers	2029

External Proposal Management (EPM) Committee Report

Proposal ID #	Title of Proposal/Project	Please list similar/overlapping standards:	Committee willing to take oversight of proposal?	Committee Oversight Further Details
P0136	Recommended Practice for Acoustic Fingerprint-Based Online Monitoring Systems in Substation Equipment	IEEE Standard C57.127	Maybe	This is too broad a scope as it covers multiple Standard Committees. The Transformer Committee currently has IEEE Standard C57.127, "Guide for the Detection, Location and Interpretation of Sources of Acoustic Emissions from Electrical Discharges in Power Transformers and Power Reactors" which would cover this topic for transformers.
P0148	Guide for arc test of liquid-Immersed High-Voltage Direct-Current (HVDC) converter transformers		Maybe	The SCR will be Ulf Radbrandt. His email is ulf.radbrandt@hitachienergy.com. Ulf comments: What is special for converter transformers in this? Should it be a more general guide covering more than converter transformers. • With the wording "converter transformer" in the title, it should probably belong to the HVDC SC but perhaps it should be a more general guide (covering more than converter transformers). • Before saying yes to this, there should be some more information about what is special for converter transformers. There may be overlapping standards: "The subject is not clear enough to target a standard." The submitter of P0148 is working on resolving the questions and comments from Ulf.

External Proposal Management (EPM) Committee Report

Proposal ID #	Title of Proposal/Project	Please list similar/overlapping standards:	Committee willing to take oversight of proposal?	Committee Oversight Further Details
P0173	Guide for Technical Specification of Smart Distribution Transformer Terminal	C57.167, IEEE Guide for Monitoring Distribution Transformers	Yes	C57.167 currently covers this topic. If the proposer has additional information that might be of consideration, the committee would consider opening up a PAR on this existing Standard to address any of their concerns or additions.
P0184	Guide for measurement of the polymerization degree of insulating paper/paperboard for power transformers based on terahertz time domain spectroscopy		Under Consideration	Tom Prevost is familiar with this methodology. His opinion is that it is still unproven technology with too many unknowns. However, it does merit a review of state of the art. Tom will lead a discussion on this technology at the ILSC.
P0197	Guide for Inversion Detection of Hot-spot Temperature and Loading Capacity in Oil-immersed Transformer		Under Consideration	To be discussed at the ILSC.
P0203	Recommended Practice for Inspection of Oil-Filled Equipment in Substation.	IEEE Draft Guide for Installation and Maintenance of Liquid-Immersed Power Transformers	Maybe	This covers a wide range of equipment. Our standards are for Transformers. We would encourage the proposer to join this working group for the Transformer portion of this proposal. We would also suggest that the proposer segregate the equipment to fit into existing IEEE standards.
P0217	Guide for Identification and Analysis of Noise Contribution from Large-scale Power Facilities to the Surrounding Environmental Noise	C57.136-2023 - IEEE Guide for Audible Sound of Liquid-Immersed Power Transformers	Maybe	There is a current standard for Power Transformers that covers this Topic. It is suggested the scope of the PAR is too Broad and should be restricted to each piece of equipment targeted.

Posted Organization Chart

IEEE PES Transformers

Chair: David Wallach

Vice Chair: Bill Griesacker Secretary: Scott Reed Treasurer: Troy Tanaka

Past Chair: Ed teNyenhuis Standards Coordinator: Stephen Shull

Administrative
Chair: David Wallach

Meeting Planning
Chair: Tammy Behrens

Bushings
Chair: Eric Weatherbee
Pg 2

Insulating Fluids
Chair: Stephanie Mabrey
Pg 5

Dielectric Tests
Chair: Dr. Poorvi Patel
Pg 2

Insulation Life
Chair: Sam Sharpless
Pg 5

Distribution Transformers
Chair: Jerry Murphy
Pg 3

Performance Characteristics
Chair: Rogerio Verdolin
Pg 6

Dry Type Transformers
Chair: Casey Ballard
Pg 3

Power Transformers
Chair: Ryan Musgrove
Pg 7

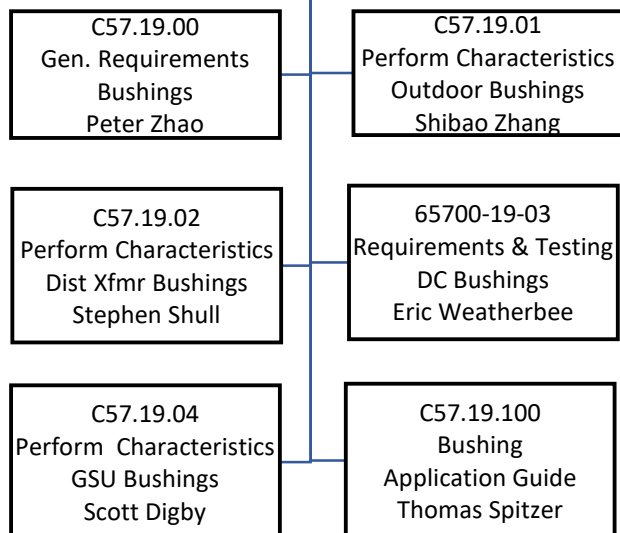
Transformers and Reactors for HVDC
Application
Chair: Ulf Radbrandt
Pg 4

Standards
Chair: Dan Sauer
Pg 8

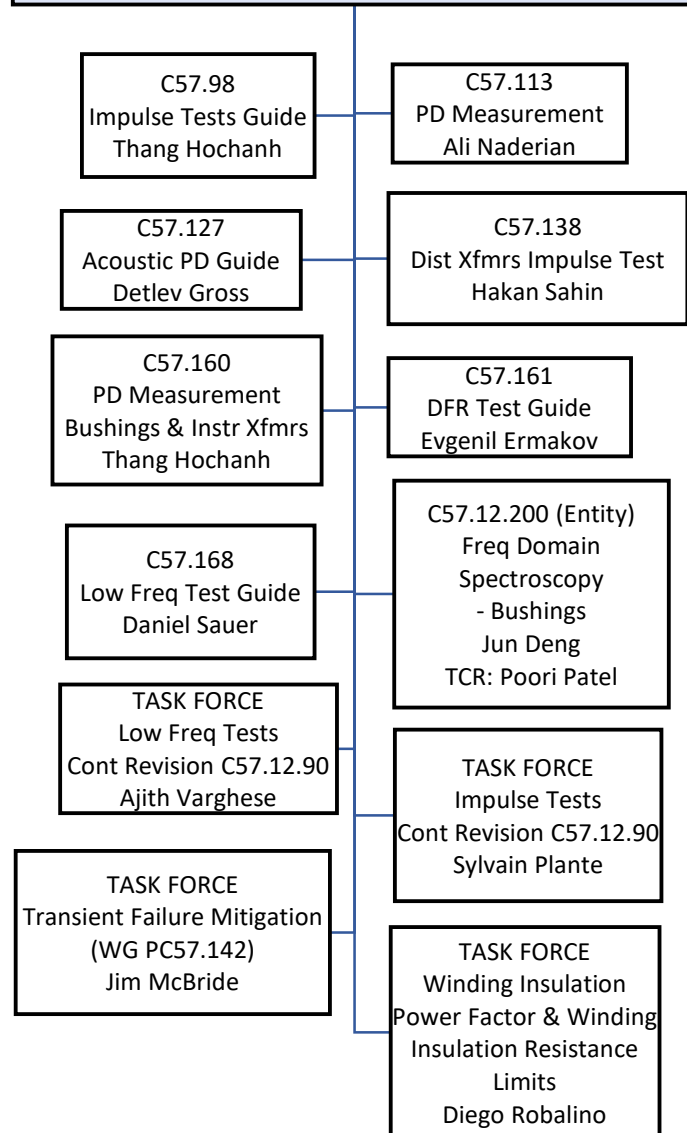
Instrument Transformers
Chair: Thomas Sizemore
Pg 4

Subsurface Transformers
& Network Protectors
Chair: George Payerle
Pg 4

Bushings Chair - Eric Weatherbee



Dielectric Tests Chair - Dr. Poorvi Patel



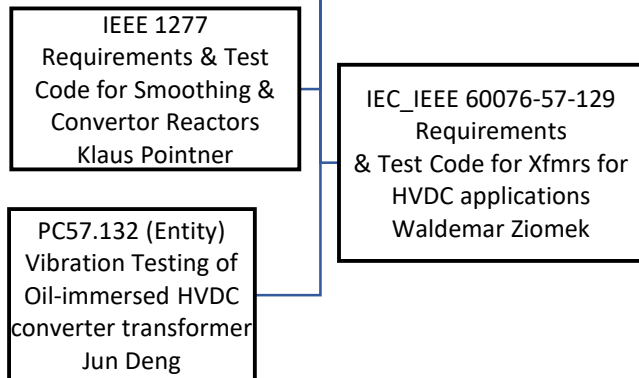
Distribution Transformers Chair - Jerry Murphy

C57.12.20 OH Distribution Xfmrs Alan Traut	C57.12.28,C57.12.29 C57.12.30, C57.12.31 & C57.12.32 Enclosure Integrity Dan Mulkey
C57.12.34 Gen Requirements 3-PH Pad Mount Stephen Shull	C57.12.35 Bar Coding Rhett Chrysler
C57.12.36 Dist Sub Xfmrs Jerry Murphy	C57.12.37 Elec Rpt of Test Data Alan Traut
C57.12.38 1-PH Pad Mount Self-cool <2500 KVA Ali Ghafourian	C57.12.39 Dist Tank Pressure Carlos Gaytan
C57.15 Voltage Regulators Dan Sauer	C57.167 Dist Xfmrs Monitoring Guide Gary Hoffman
TASK FORCE Distr Xfmr Efficiency & Loss Phil Hopkinson	PC57.210 (Entity) On-Load Capacity Switching Jinli Wang TCR: Jerry Murphy
TASK FORCE Tank Touch Temperature Bruce Webb	TASK FORCE Padmounted Voltage Regulator Kyle Heiden

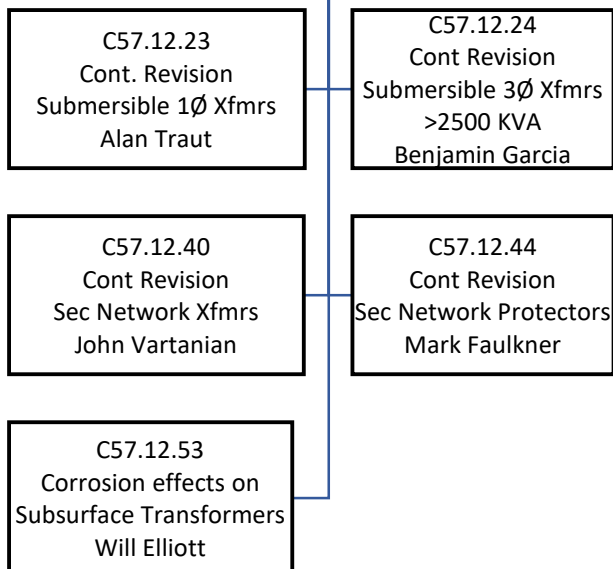
Dry Type Transformers Chair - Casey Ballard

C57.12.01 Gen Requirements Dry Type Xfmrs Casey Ballard	C57.12.51 Gen Requirements Vented 3-PH > 500 KVA Sanjib Som
C57.12.52 Gen Requirements Sealed > 500 KVA Joeseeph Tedesco	C57.12.58 Transient Analysis Roger Wicks
C57.12.59 Dry Type Through Fault Current Duration Paul Weyand	C57.12.60 Thermal Eval of Dry Type Xfmrs Roger Wicks
C57.12.91 Test Code Dry Type Xfmrs David Walker	C57.16 Dry Type Air Core Reactors Arturo Del Rio
C57.94 Dry Type Xfmrs OP & Maint Guide Ken Klein	C57.96 Loading Guide Dry Type Xfmrs Aniruddha Narawane
C57.124 Dry Type PD & Apparent Charge Thomas Prevost	C57.134 Dry Type Xfmrs Hottest Spot Colby Lovins
IEEE 259 Eval - Dry Type Xfmrs Insulation Systems David Stankes	TASK FORCE OLD C57.12.55 Enclosure Requirements Shawn Nunn

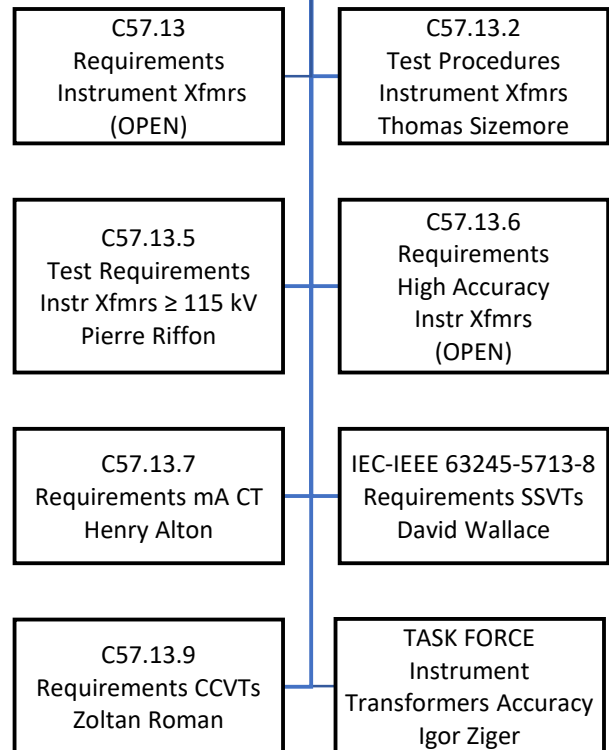
Transformers & Reactors for HVDC Applications Chair - Ulf Radbrandt

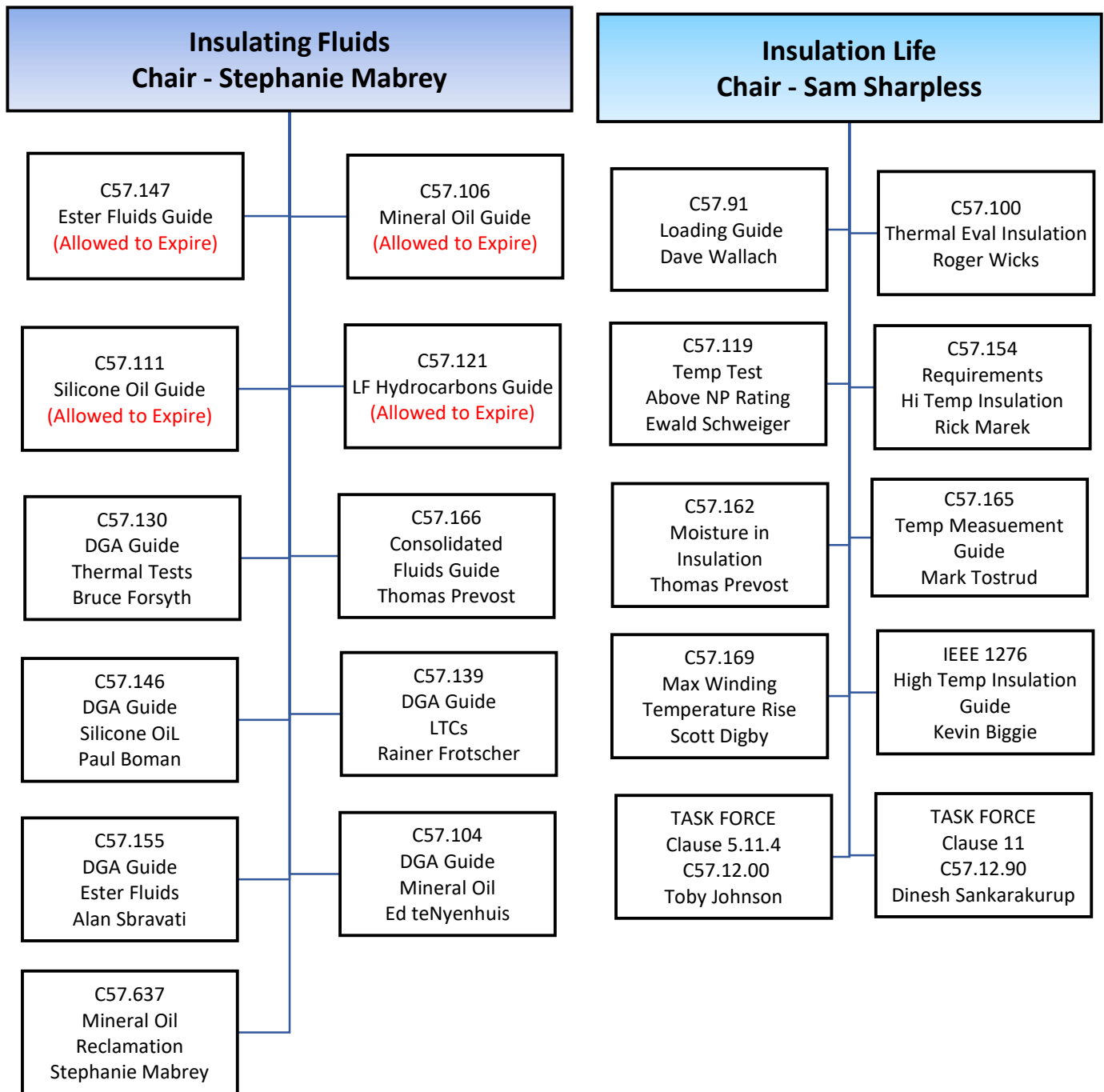


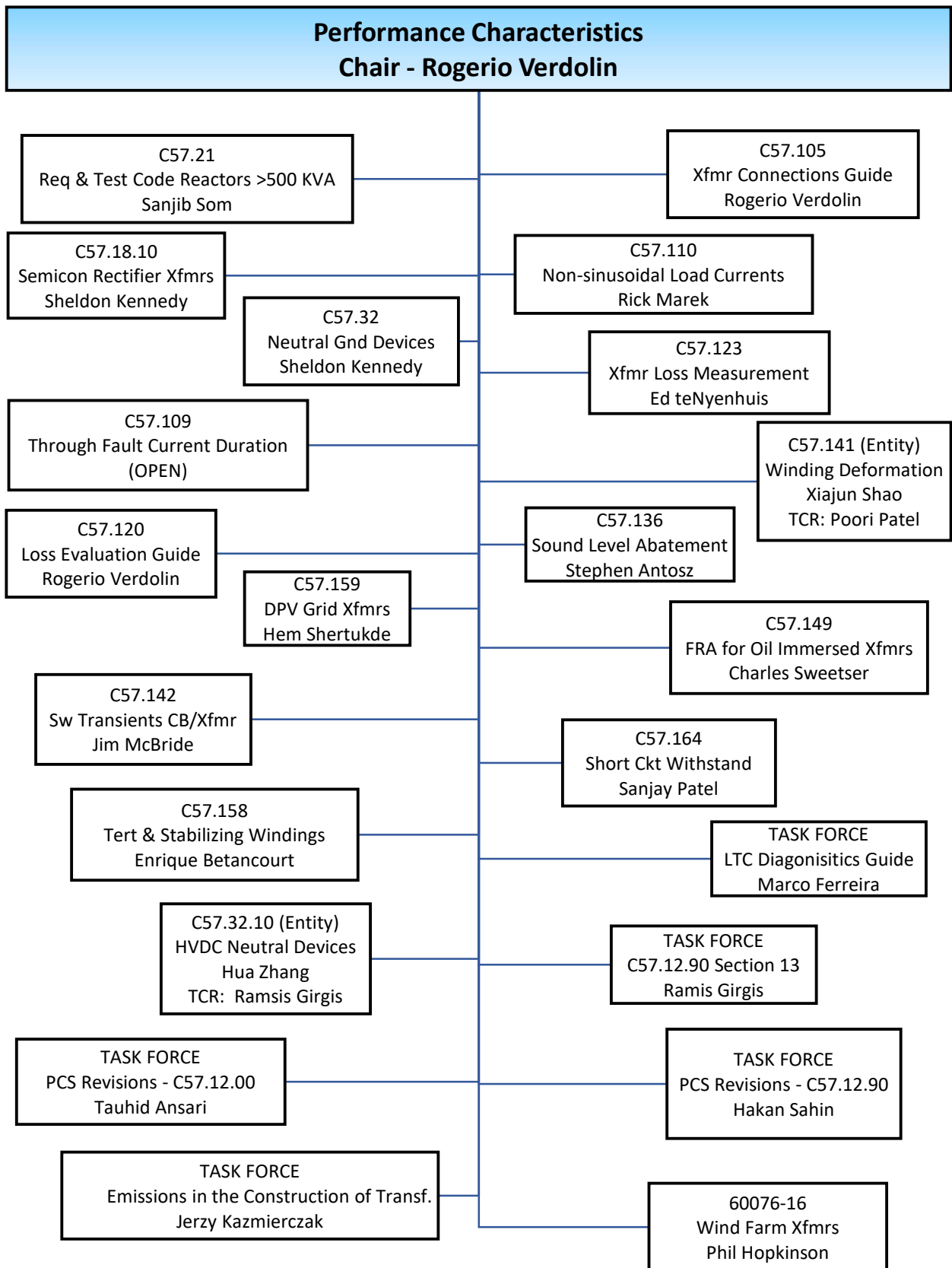
Subsurface Transformers & Network Protectors Chair - George Payerle

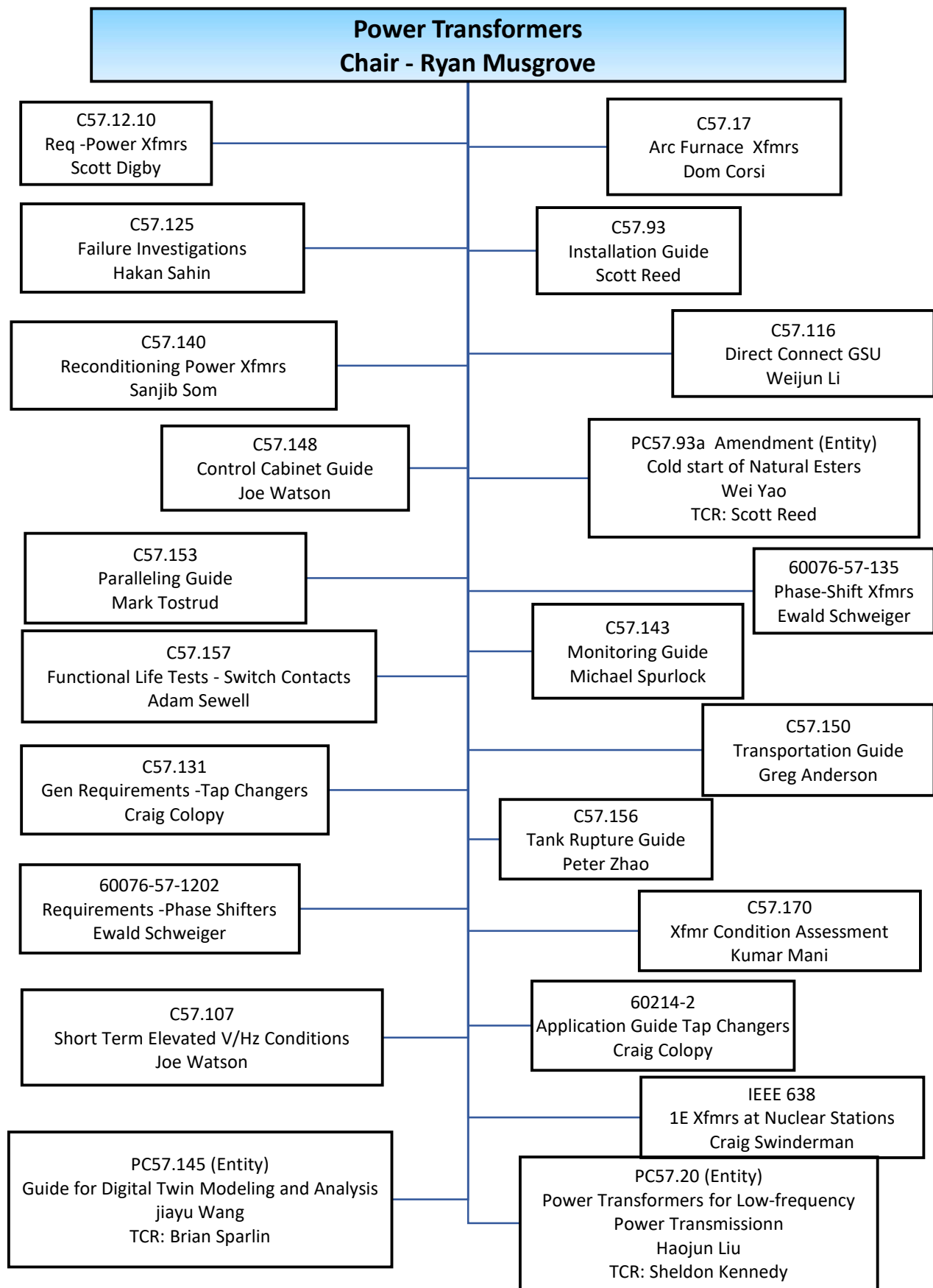


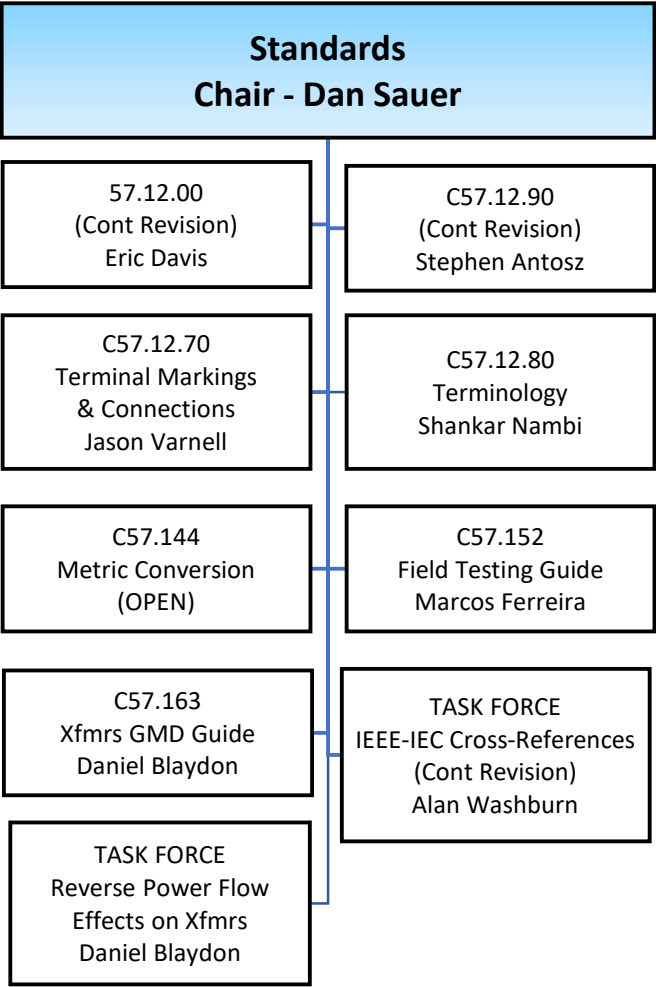
Instrument Transformers Chair - Thomas Sizemore











Posted Status Report of Transformer Standards

IEEE/PES TRANSFORMERS COMMITTEE

Status Report of Transformers Standards

STANDARD		Working Group Chair	Approved Year	PAR Issue Date	Standard Status
BALLOT TYPE		Phone	Rev Due Date	PAR Expiration	Remark
PROJECT		Email			
SubCommittee BUSHINGS					
CHAIR:	Eric Weatherbee	eweatherbee@hubbell.com	(585) 768 - 1272		
65700-19-03	IEC/IEEE International Standard -- Bushings for DC application	Eric Weatherbee	2014	9/23/2021	ACTIVE + PAR for Revision
Individual		(585) 768 - 1272	12/31/2024		SA BALLOT RECIRCULATION: Closed 6/15/2024 with no comments.
PC5700-19-03		eweatherbee@hubbell.com		12/31/2025	
C57.19.00	IEEE Standard General Requirements and Test Procedure for Power Apparatus Bushings		2023		ACTIVE
Individual			12/31/2033		
C57.19.01	IEEE Standard Performance Characteristics and Dimensions for Outdoor Apparatus Bushings	Shibao Zhang	2017	5/22/2024	ACTIVE + PAR for Revision
Individual		(585) 768-1273	12/31/2027		
PC57.19.01		szhang@hubbell.com		12/31/208	
C57.19.02	Standard for Design and Performance Requirements for Bushings Applied to Liquid Immersed Distribution Transformers		2023		ACTIVE
Individual			12/31/2033		
C57.19.04	IEEE Standard for Performance Characteristics and Dimensions for High Current Power Transformer Bushings with Rated Continuous Current in Excess of 5000 A in Bus Enclosures	Scott Digby	2018	9/16/2024	ACTIVE + PAR for Revision
Individual		(919) 546 - 5798	12/31/2028		
PC57.19.04		scott.digby@duke-energy.com		12/31/2028	
C57.19.100	IEEE Guide for Application of Power Apparatus Bushings	Thomas Spitzer	2012	5/21/2019	INACTIVE-RESERVED PAR for Revision+1 PAR Extension
Individual		(817) 584 - 6567	12/31/2022		
PC57.19.100		t.spitzer@sbcglobal.net		12/31/2025	

IEEE/PES TRANSFORMERS COMMITTEE

Status Report of Transformers Standards

STANDARD		Working Group Chair	Approved Year	PAR Issue Date	Standard Status
BALLOT TYPE		Phone	Rev Due Date	PAR Expiration	Remark
PROJECT		Email			
SubCommittee DIELECTRIC TESTS					
CHAIR: Dr. Poorvi Patel		ppatel@epri.com	(704) 232 - 4551		
C57.113	IEEE Guide for Partial Discharge Measurement in Liquid-Filled Power Transformers and Shunt Reactors		2023		ACTIVE
Individual			12/31/2033		
C57.12.200	IEEE Guide for the Frequency Domain Spectroscopy Measurement of Transformer Bushings		2022		ACTIVE
Entity			12/31/2032		
C57.127	IEEE Guide for the Detection, Location and Interpretation of Sources of Acoustic Emissions from Electrical Discharges in Power Transformers and Power Reactors	Dellev Gross +49 (241) 98091740 gross@ieee.org	2018	2/15/2024	ACTIVE + PAR for Revision
Individual			12/31/2028	12/31/2028	
PC57.127					
C57.138	IEEE Recommended Practice for Routine Impulse Test for Distribution Transformers	Hakan Sahin (208) 220-6963 hakanshaun@gmail.com	2016	6/16/2022	ACTIVE + PAR for Revision
Individual			12/31/2026	12/31/2026	
PC57.138					
C57.160	Draft Guide for the Electrical Measurement of Partial Discharges in High Voltage Bushings and Instrument Transformers		2023		ACTIVE
Individual			12/31/2033		
C57.161	IEEE Guide for Dielectric Frequency Response Test	Evgenii Ermakav evgenii@ieee.org	2018	5/22/2024	ACTIVE + PAR for Revision
Individual			12/31/2028	12/31/2026	
PC57.161					
C57.168	IEEE Guide for Low Frequency Dielectric Testing for Distribution, Power and Regulating Transformers		2023		ACTIVE
Individual			12/31/2033		
C57.98	IEEE Guide for Transformer Impulse Tests	Thang Hochanh (819) 821-3636 thanghochanh@surplec.com	2011	10/27/2018	INACTIVE-RESERVED + PAR Revision+ 1PAR Extension
Individual			12/31/2021	12/31/2024	SA PREBALLOT: Invitation to close on 10/27/2024. Chair has requested 2 year PAR extension and this is on REVCOM agenda
PC57.98					

IEEE/PES TRANSFORMERS COMMITTEE

Status Report of Transformers Standards

STANDARD		Working Group Chair	Approved Year	PAR Issue Date	Standard Status
BALLOT TYPE		Phone	Rev Due Date	PAR Expiration	Remark
PROJECT		Email			
SubCommittee DISTRIBUTION TRANSFORMERS					
CHAIR: Jerry Murphy		jerry.murphy@ieee.org	(407) 824 - 4194		
C57.12.20	IEEE Standard for Overhead Type Distribution Transformers, 500 kVA and Smaller, High-Voltage 34 500 Volts and Below; Low-Voltage, 7970/13 800 Y Volts and Below		2023		ACTIVE
Individual			12/31/2033		
C57.12.28	IEEE Standard for Pad Mounted Equipment - Enclosure Integrity		2023		ACTIVE
Individual			12/31/2033		
C57.12.29	IEEE Standard for Pad Mounted Equipment - Enclosure Integrity for Coastal Environments		2023		ACTIVE
Individual			12/31/2033		CO-STD-COM – Switchgear
C57.12.30	IEEE Standard for Pole-Mounted Equipment - Enclosures for Coastal Environment		2020		ACTIVE
Individual			12/31/2030		CO-STD-COM – Switchgear
C57.12.31	IEEE Standard for Pole Mounted Equipment - Enclosure Integrity		2020		ACTIVE
Individual			12/31/2030		CO-STD-COM – Switchgear
C57.12.32	IEEE Standard for Submersible Equipment - Enclosure Integrity	Daniel Mulkey	2019	12/6/2023	ACTIVE + PAR for Revision
Individual		(707) 776 - 7346	12/31/2029		
PC57.12.32		dhmulkey@ieee.org		12/31/2027	
C57.12.34	IEEE Standard Requirements for Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers, 10 MVA and Smaller; High-Voltage, 34.5 kV Nominal System Voltage and Below; Low-Voltage, 15 kV Nominal System Voltage and Below	Stephen Shull	2022	2/15/2023	ACTIVE + PAR for Revision
Individual		(417) 206 - 4047	12/31/2032		
PC57.12.34		sdshull@ieee.org		12/31/2027	
C57.12.35	IEEE Standard Bar Coding for Distribution Transformers and Step-Voltage Regulators		2024		ACTIVE
Individual			12/31/2034		

IEEE/PES TRANSFORMERS COMMITTEE

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STANDARD		Working Group Chair	Approved Year	PAR Issue Date	Standard Status
BALLOT TYPE		Phone	Rev Due Date	PAR Expiration	Remark
PROJECT		Email			
SubCommittee DISTRIBUTION TRANSFORMERS					
CHAIR: Jerry Murphy		jerry.murphy@ieee.org	(407) 824 - 4194		
C57.12.36	IEEE Standard Requirements for Liquid-Immersed Distribution Substation Transformers	Jerry Murphy	2017	6/29/2023	ACTIVE + PAR for Revision
Individual		(407) 824 - 4194	12/31/2027		
PC57.12.36		jerry.murphy@ieee.org		12/31/2027	
C57.12.37	IEEE Standard for the Electronic Reporting of Transformer Test Data	Alan Traut	2015	2/15/2024	ACTIVE + PAR for Revision
Individual		(601) 422 - 1198	12/31/2025		
PC57.12.37		atraut@ieee.org		12/31/2028	
C57.12.38	IEEE Standard for Pad-Mounted-Type, Self-Cooled, Single-Phase Distribution Transformers 250 kVA and Smaller: High Voltage, 34 500 GrdY/19 920 V and Below; Low Voltage, 480/240 V and Below	Ali Ghafourian	2014	10/28/2017	ACTIVE + PAR for Revision + 2 PAR Extension
Individual		(706) 202 - 7212	12/31/2024		Main Document PAR shown. Corrigenda PAR is currently active until 2024 but will be allowed to expire. SA BALLOT: Closed 3/8/2023 with 96 comments to resolve. Currently in comment resolution.
PC57.12.38		asghar.ghafourian@gmail.com		12/31/2025	
C57.12.39	IEEE Standard for Requirements for Distribution Transformer Tank Pressure Coordination	Carlos Gaytan	2017	2/15/2024	ACTIVE + PAR for Revision
Individual		52 818 030 - 2162	12/31/2027		
PC57.12.39		gaytan@ieee.org		12/31/2028	
C57.15	IEEE Standard Requirements, Terminology, and Test Code for Step-Voltage Regulators	Daniel Sauer	2017	2/15/2024	ACTIVE + PAR for Revision
Individual		(262) 896 - 2417	12/31/2027		
PC57.12.39		dmsauer@mtu.edu		12/31/2028	
C57.167	IEEE Guide for Monitoring Distribution Transformers		2023		ACTIVE
Individual			12/31/2033		
C57.210	IEEE Recommended Practice for On-load Capacity Switching Distribution Transformers		2024		ACTIVE
Entity			12/31/2033		ORIGINALLY AN ENTITY STD. THIS NOW HAS THE OPPORTUNITY TO BE CHANGED TO INDIVIDUAL STD ORIGINAL TCR: Jerry Murphy

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STANDARD		Working Group Chair	Approved Year	PAR Issue Date	Standard Status
BALLOT TYPE		Phone	Rev Due Date	PAR Expiration	Remark
PROJECT		Email			
SubCommittee DRY TYPE TRANSFORMERS					
CHAIR: Casey Ballard		robert.c.ballard@ieee.org		(804) 292 - 5207	
259	IEEE Standard Test Procedure for Evaluation of Systems of Insulation for Dry-Type Specialty and General-Purpose Transformers	David Stankes (512) 984 - 5026 dsstankes@mmm.com	1999 12/31/2020	12/3/2020 12/31/2026	INACTIVE-RESERVED+ PAR for Revision+1PAR extension Standard was allowed to expire by the SC. However, when revising IEEE C57.12.60, the need for this standard was recognized.
Individual					
P259					
C57.12.01	IEEE Standard for General Requirements for Dry-Type Distribution and Power Transformers	Casey Ballard (804) 292 - 5207 robert.c.ballard@ieee.org	2020 12/31/2030	2/23/2022 12/31/2026	ACTIVE + PAR for Revision This standard is under continuous revision.
Individual					
PC57.12.01					
C57.12.51	IEEE Guide for Mechanical Interchangeability of Ventilated Dry-Type Transformers		2019 12/31/2029		ACTIVE
Individual					
C57.12.52	IEEE Standard for Sealed Dry-Type Power Transformers, 501 kVA and Higher, Three-Phase, with High-Voltage 601 to 34500 Volts, Low-Voltage 208Y/120 to 4160 Volts--General Requirements		2024 12/31/2034		ACTIVE
Individual					
C57.12.58	IEEE Guide for Conducting a Transient Voltage Analysis of a Dry-Type Transformer Coil	Ken Kline ken.klein@kearsargepower.com	2017 12/31/2027	5/22/2024 12/31/2028	ACTIVE + PAR for Revision
Individual					
PC57.12.58					
C57.12.59	IEEE Guide for Dry-Type Transformer Through-Fault Current Duration	Paul Weyandt paul.weyanandt@se.com	2015 12/31/2025	6/16/2022 12/31/2026	ACTIVE + PAR for Revision
Individual					
PC59.12.59					
C57.12.60	IEEE Standard for Thermal Evaluation of Insulation Systems for Dry-Type Power and Distribution Transformers		2020 12/31/2030		ACTIVE
Individual					
C57.12.91	IEEE Standard Test Code for Dry-Type Distribution and Power Transformers	David Walker (520) 484 - 5338 djwalker1260@gmail.com	2020 12/31/2030	2/23/2022 12/31/2026	ACTIVE + PAR for Revision This standard is under continuous revision.
Individual					
PC57.12.91					

IEEE/PES TRANSFORMERS COMMITTEE

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STANDARD		Working Group Chair	Approved Year	PAR Issue Date	Standard Status
BALLOT TYPE		Phone			
PROJECT		Email	Rev Due Date	PAR Expiration	Remark
SubCommittee DRY TYPE TRANSFORMERS					
CHAIR: Casey Ballard		robert.c.ballard@ieee.org		(804) 292 - 5207	
C57.124	IEEE Recommended Practice for the Detection of Partial Discharge and the Measurement of Apparent Charge in Dry-Type Transformers	Thomas Prevost (802) 751 - 3458 tprevost@ieee.org	1991 12/31/2019	6/15/2017 12/31/2025	INACTIVE-RESERVED +PAR for Revision+2PAR Extension SA PREBALLOT: Invitation Complete 11/30/2023. For the next revision it has been proposed that C57.113 and this document be combined to reduce the effort.
Individual					
PC57.124					
C57.134	IEEE Guide for Determination of Hottest Spot Temperature in Dry Type Transformers		2024 12/31/2034		ACTIVE
Individual					
C57.16	IEEE Standard Requirements, Terminology, and Test Code for Dry-Type Air- Core Series- Connected Reactors	J. Arturo Del Rio (919) 449 - 5675 a.delrio@ieee.org	2011 12/31/2021	2/5/2016 12/31/2024	INACTIVE-RESERVED +PAR for Revision+2PAR Extension SA BALLOT: Closes on 10/17/2024 Chair to submit a PAR extension as per email 10/11/2024
Individual					
PC57.16					
C57.94	IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers	Ken Kline ken.klein@kearsargepower.com	2015 12/31/2025	2/23/2022 12/31/2026	ACTIVE + PAR for Revision
Individual					
PC57.94					
C57.96	IEEE Guide for Loading Dry-Type Distribution and Power Transformers	Aniruddha Narawane (804) 229 - 5956 aniraj200@yahoo.com	2013 12/31/2023	2/10/2021 12/31/2025	ACTIVE + PAR for Revision SA PREBALLOT: Invitation to close 10/16/2024
Individual					
PC57.96					

IEEE/PES TRANSFORMERS COMMITTEE

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STANDARD		Working Group Chair	Approved Year	PAR Issue Date	Standard Status
BALLOT TYPE		Phone			
PROJECT		Email	Rev Due Date	PAR Expiration	Remark
SubCommittee INSTRUMENT TRANSFORMERS					
CHAIR: Thomas Sizemore		thomas.sizemore.us@ieee.org		(252) 827 - 3235	
Entity	Draft Guide for Calibration of Energized Current Transformers for 34.5 kV and Below	Yunguo Yang		3/22/2022	Active PAR
PC57.13.10		 77766711@qq.com		12/31/2026	TCR: Thomas Sizemore
Individual	Draft Standard for Power-Line Carrier Coupling Capacitors and Coupling Capacitor Voltage Transformers	Zoltan Roman		3/23/2017	Active PAR + 2 PAR Extension
PC57.13.9		(706) 360 - 4964 zoltan.roman@ge.com		12/31/2024	SA BALLOT: Closed 10/21/2022 with 662 comments to resolve. Currently in Comment Resolution. Chair to submit a PAR extension as per email 10/11/2024. CO-STD-COM – PSCC
C57.13	IEEE Standard Requirements for Instrument Transformers	David Wallace	2016	3/24/2022	ACTIVE + PAR for Revision
Individual		(662) 325 - 2009 daweleceng@aol.com	12/31/2026		
PC57.13				12/31/2026	
C57.13.2	IEEE Conformance Test Procedure for Instrument Transformers		2005		INACTIVE-RESERVED
Individual			12/31/2020		
C57.13.5	IEEE Standard of Performance and Test Requirements for Instrument Transformers of a Nominal System Voltage of 115 kV and Above		2019		ACTIVE
Individual			12/31/2029		
C57.13.6	IEEE Standard for High Accuracy Instrument Transformers		2005		INACTIVE-RESERVED
Individual			12/31/2020		To be combined into C57.13 and no longer maintained.
C57.13.7	IEEE Standard for Current Transformers with Maximum Milliampere Secondary Current of 250 mA		2018		ACTIVE
Individual			12/31/2028		
P63253-5713-8	IEC/IEEE Standard Requirements for Station Service Voltage Transformers		2024		ACTIVE
Individual			12/31/2034		

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STANDARD		Working Group Chair	Approved Year	PAR Issue Date	Standard Status
BALLOT TYPE		Phone			
PROJECT		Email	Rev Due Date	PAR Expiration	Remark
SubCommittee INSULATING FLUIDS					
CHAIR: Stephaney Mabrey		stephanie.mabrey@avodiagnostics.com (214) 502 - 2969			
Individual PC57.166	Draft Guide for Acceptance and Maintenance of Insulating Liquids in Transformers and Related Equipment	Thomas Prevost (802) 751 - 3458 tprevost@ieee.org		3/8/2018 12/31/2024	Active PAR + 1 PAR Extension This Standard will combine C57.106, C57.111, C57.121 and C57.147 plus added content. SA BALLOT: Closed 3/16/2024 with 352 comments to resolve. Chair plans to submit PAR extension as per email 10/11/2024.
C57.104 Individual PC57.104	IEEE Guide for the Interpretation of Gases Generated in Mineral Oil-Immersed Transformers	Ed teNyenhuis (416) 270 - 9026 edt@ieee.org	2019 12/31/2029	5/22/2024 12/31/2028	ACTIVE + PAR for Revision
C57.106 Individual	IEEE Guide for Acceptance and Maintenance of Mineral Insulating Oil in Electrical Equipment		2015 12/31/2025		ACTIVE This will be contained in the new C57.166 standard.
C57.111 Individual	IEEE Guide for Acceptance of Silicone Insulating Fluid and Its Maintenance in Transformers		1989 3/19/2019		INACTIVE-RESERVED This will be contained in the new C57.166 standard.
C57.121 Individual	IEEE Guide for Acceptance and Maintenance of Less-Flammable Hydrocarbon Fluid in Transformers		1998 12/9/2019		INACTIVE-RESERVED This will be contained in the new C57.166 standard.
C57.130 Individual PC57.130	IEEE Guide for the Use of Dissolved Gas Analysis Applied to Factory Temperature Rise Tests for the Evaluation of Mineral Oil-Immersed Transformers and Reactors	Bruce Forsyth (405) 473 - 8300 bruce.forsyth@ieee.org	2015 12/31/2025	3/24/2022 12/31/2026	ACTIVE - PAR for Revision
C57.139 Individual PC57.139	IEEE Guide for Dissolved Gas Analysis in Transformer Load Tap Changers	Rainer Frotscher r.frotscher@reinhausen.com	2015 12/31/2025	3/24/2022 12/31/2026	ACTIVE - PAR for Revision
C57.146 Individual PC57.146	IEEE Guide for Interpretation of Gasses Generated in Silicone-Immersed Transformers	Paul Boman (785) 256 - 7161 paul_boman@hsb.com	2005 12/31/2021	3/5/2020 12/31/2026	INACTIVE-RESERVED +PAR for Revision+1PAR extension

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STANDARD		Working Group Chair	Approved Year	PAR Issue Date	Standard Status
BALLOT TYPE		Phone	Rev Due Date	PAR Expiration	Remark
PROJECT		Email			
SubCommittee INSULATING FLUIDS					
CHAIR: Stephaney Mabrey		stephanie.mabrey@avodiagnostics.com	(214) 502 - 2969		
C57.147	IEEE Guide for Acceptance and Maintenance of Natural Insulating Liquid in Transformers		2018		ACTIVE
Individual			12/31/2028		This will be contained in the new C57.166 standard.
C57.155	IEEE Guide for Interpretation of Gases Generated in Natural Ester and Synthetic Ester-Immersed Transformers	Alan Sbravati	2014	9/23/2021	ACTIVE + PAR for Revision
Individual		(612) 413 - 4599	12/31/2024		
PC57.155		alan_sbravati@cargill.com		12/31/2025	
C57.637	IEEE Guide for the Reclamation of Mineral Insulating Oil and Criteria for Its Use	Stephanie Mabrey	2015	9/23/2021	ACTIVE + PAR for Revision
Individual		(214) 502 - 2969	12/31/2025		
PC57.637		stephaniemabrey@avodiagnostics.com		12/31/2025	

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STANDARD		Working Group Chair	Approved Year	PAR Issue Date	Standard Status
BALLOT TYPE		Phone			
PROJECT		Email	Rev Due Date	PAR Expiration	Remark
SubCommittee INSULATION LIFE					
CHAIR: Samuel Sharpless		slsharpless@rimkus.com		(407) 661 - 1245	
Individual PC57.162	Draft Guide for the Interpretation of Moisture Related Parameters in Liquid Immersed Transformers and Reactors	Thomas Prevost (802) 751 - 3458 tprevost@ieee.org		8/23/2013 12/31/2024	Active PAR + 4 PAR Extensions SA BALLOT: Closed 10/21/22 with 808 comments to resolve. Currently in Comment Resolution. Chair to submit a PAR extension as per email 10/11/2024
1276 Individual P1276a	IEEE Guide for the Application of High-Temperature Insulation Materials in Liquid-Immersed Distribution, Power, and Regulating Transformers	Kevin Biggie kevin.biggie@weidmann-group.com	2020 12/31/2030	3/23/2022 12/31/2026	ACTIVE + PAR for Amendment Amendment: Update to Annex B and corresponding reference in Annex D.
1538 Individual	IEEE Guide for Determination of Maximum Winding Temperature Rise in Liquid Filled Transformer		2000 12/31/2021		INACTIVE-RESERVED Please note that this document will be allowed to go inactive as it is being replaced by C57.169.
1538a Individual	IEEE Guide for Determination of Maximum Winding-Temperature Rise in Liquid Immersed Transformers -- Amendment 1		2015 12/31/2021		INACTIVE-RESERVED Please note that this document will be allowed to go inactive as it is being replaced by C57.169.
C57.100 Individual	IEEE Standard Test Procedure for Thermal Evaluation of Liquid-Immersed Distribution and Power Transformers		2022 12/31/2032		ACTIVE
C57.119 Individual	IEEE Recommended Practice for Performing Temperature Rise Tests on Liquid Immersed Power Transformers at Loads Beyond Nameplate Ratings		2018 12/31/2028		ACTIVE
C57.154 Individual	IEEE Standard for Liquid-Immersed Transformers Designed to Operate at Temperatures Above Conventional Limits Using High-Temperature Insulation Systems		2022 12/31/2032		ACTIVE
C57.165 Individual	IEEE Guide for Temperature Measurements for Liquid Immersed Transformers and Reactors		2024 12/31/2034		ACTIVE

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STANDARD		Working Group Chair	Approved Year	PAR Issue Date	Standard Status
BALLOT TYPE		Phone			
PROJECT		Email	Rev Due Date	PAR Expiration	Remark
SubCommittee INSULATION LIFE					
CHAIR: Samuel Sharpless		slsharpless@rimkus.com		(407) 661 - 1245	
C57.169	IEEE Guide for Determination of Maximum Winding Temperature Rise in Liquid-Immersed Transformers		2023		ACTIVE
Individual			12/31/2033		
C57.91	IEEE Guide for Loading Mineral-Oil-Immersed Transformers and Step-Voltage Regulators	David Wallach	2011	9/28/2017	INACTIVE-RESERVED+PAR for Revision+1 PAR Extension
Individual		(980) 373 - 4167	12/31/2021		SA BALLOT: Closed 2/14/2024 with 448 comments to resolve. Currently in Comment Resolution
PC57.91		david.wallach@duke-energy.com		12/31/2025	

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Status Report of Transformers Standards

STANDARD	Working Group Chair	Approved Year	PAR Issue Date	Standard Status
BALLOT TYPE	Phone	Rev Due Date	PAR Expiration	Remark
PROJECT	Email			
SubCommittee PERFORMANCE CHARACTERISTICS				
CHAIR: Rogério Verdolin		roger.verdolin@ieee.org (403) 850 - 4304		
Entity C57.32.10	Draft Guide for the Selection of Neutral-Grounding Devices for High Voltage Direct Current (HVDC) Converter Transformers Zhang Hua zhanghua002@163.com	10/30/2018	Active PAR	SA BALLOT: Second Recirculation to close 10/13/2024 TCR: Rogério Verdolin
Entity PC57.141	Draft Guide for Detection, Monitoring, and Evaluation of Winding Deformation in Liquid-Immersed Power Transformers Xianjun Shao shaonianjun0575@163.com	9/23/2021	Active PAR	TCR: Poori Patel
Individual PC57.151	Draft Guide for the Evaluation of the Environmental Impact and Life Cycle Assessment of Transformers and Shunt Reactors Jerzy Kazmierczak jerzy.kazmierczak@hitachienergy.com	9/26/2024	Active PAR	
60076-16 Individual	IEC/IEEE International Standard - Power transformers - Part 16: Transformers for wind turbine applications	2018 12/31/2028	ACTIVE	
C57.105 Individual	IEEE Guide for Application of Transformer Connections in Three-Phase Distribution Systems	2019 12/31/2029	ACTIVE	
C57.105/COR 1 Individual	IEEE Guide for Application of Transformer Connections in Three-Phase Electrical Systems - 2019 STD Corrigendum 1 Update Table 1—Application characteristics of connections	2023 12/31/2033	ACTIVE	
C57.109 Individual	IEEE Guide for Liquid-Immersed Transformers Through-Fault-Current Duration	2018 12/31/2028	ACTIVE	
C57.110 Individual	IEEE Recommended Practice for Establishing Liquid Immersed and Dry-Type Power and Distribution Transformer Capability when Supplying Nonsinusoidal Load Currents	2018 12/31/2028	ACTIVE	
C57.120 Individual	IEEE Guide for Loss Evaluation of Distribution and Power Transformers and Reactors	2017 12/31/2027	ACTIVE	

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BALLOT TYPE		Phone	Rev Due Date	PAR Expiration	Remark
PROJECT		Email			
SubCommittee PERFORMANCE CHARACTERISTICS					
CHAIR: Rogério Verdolin		roger.verdolin@ieee.org	(403) 850 - 4304		
C57.123	IEEE Guide for Transformer Loss Measurement		2019		ACTIVE
Individual			12/31/2029		
C57.136	IEEE Guide for Sound Level Abatement and Determination for Liquid- Immersed Power Transformers and Shunt Reactors Rated Over 500 kVA		2023		ACTIVE
Individual			12/31/2033		
C57.142	IEEE Guide To Describe The Occurrence And Mitigation Of Switching Transients Induced By Transformer-Breaker Interaction	Jim McBride (770) 460-6626 jim@jmxhv.com	2010	3/23/2017	INACTIVE-RESERVED+PAR Revision+2 PAR Extensions
Individual			12/31/2020		SA BALLOT: Closed on 4/27/22 with 305 comments to resolve. Currently in Comment Resolution.
PC57.142				12/31/2025	CO-STD-COM – Switchgear
C57.149	IEEE Guide for the Application and Interpretation of Frequency Response Analysis for Oil Immersed Transformers		2024		ACTIVE
Individual			12/31/2034		
C57.158	IEEE Guide for the Application of Tertiary and Stabilizing Windings in Power Transformers	Enrique Betancourt 52 818 030 - 2135 ebetanco@ieee.org	2017	6/29/2023	ACTIVE + PAR for Revision
Individual			12/31/2027		
PC57.158				12/31/2027	
C57.159	IEEE Guide on Transformers for Application in Distributed Photovoltaic (DPV) Power Generation Systems	Hemchandra Shertukde (860) 768 - 4847 shertukde@hartford.edu	2016	2/15/2024	ACTIVE + PAR for Revision
Individual			12/31/2026		
PC57.159				12/31/2028	
C57.164	IEEE Guide for Establishing Short Circuit Withstand Capabilities of Liquid Immersed Power Transformers, Regulators, and Reactors		2021		Active
Individual			12/31/2031		
C57.18.10	IEEE Standard Practices and Requirements for Semiconductor Power Rectifier Transformers		2021		ACTIVE
Individual			12/31/2031		

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STANDARD		Working Group Chair	Approved Year	PAR Issue Date	Standard Status
BALLOT TYPE		Phone	Rev Due Date	PAR Expiration	Remark
PROJECT		Email			
SubCommittee PERFORMANCE CHARACTERISTICS					
CHAIR: Rogério Verdolin		roger.verdolin@ieee.org		(403) 850 - 4304	
C57.21	IEEE Standard Requirements, Terminology, and Test Code for Shunt Reactors Rated Over 500 kVA		2021		ACTIVE
Individual			12/31/2031		
C57.32	IEEE Standard Requirements, Terminology, and Testing Procedures for Neutral Grounding Devices	Sheldon Kennedy	2015	2/15/2023	ACTIVE + PAR for Revision
Individual		(716) 896 - 6500	12/31/2025		
PC57.32		skennedy@niagaratransformer.com		12/31/2027	
C57.32a	IEEE Standard for Requirements, Terminology, and Test Procedure for Neutral Grounding Devices--Amendment 1: Neutral Grounding Resistors Clause (AM)		2020		ACTIVE
Individual			12/31/2025		TO BE INCLUDED IN THE NEW REVISION OF C57.32.

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STANDARD		Working Group Chair	Approved Year	PAR Issue Date	Standard Status
BALLOT TYPE		Phone			
PROJECT		Email	Rev Due Date	PAR Expiration	Remark
SubCommittee POWER TRANSFORMERS					
CHAIR: Ryan Musgrove		ryan.musgrove@ieee.org		(405) 747 - 7960	
Entity	Draft Guide for Digital Twin Modeling and Analysis of Power Transformers with High Voltages 69 kV up to 161 kV	Jiayu Wang		6/5/2023	ACTIVE PAR
PC57.145		wjy911106@163.com		12/31/2027	TCR: Brian Sparlin
Individual	Draft Guide for the Condition Assessment of Liquid Immersed Transformers, Reactors and Their Components	Kumar Mani		9/5/2019	ACTIVE + PAR Revision + 1 PAR Extension
PC57.170		(919) 546 - 2791 kumar.mani@duke-energy.com		12/31/2025	SA BALLOT: Closed on 10/02/2024 with 171 comment to resolve. Currently in comment resolution.
Entity	Draft Guide for Power Transformers for Low-frequency (10 Hz to 30 Hz) Power Transmission	Haojun Liu		2/15/2024	Active PAR
PC57.20		liu_haojun@zj.sgcc.com.cn		12/31/2028	TCR: Sheldon Kennedy
Entity	Draft Guide for Installation and Maintenance of Liquid-Immersed Power Transformers Amendment: Cold Start of Power Transformers filled with Natural Ester Fluids	Wei Yao		3/5/2020	Active PAR for Amendment
PC57.93a		 yaoweidky@163.com		12/31/2024	SA BALLOT: CLOSES ON 10/17/2024 Chair states that if there are no comments, it will be submitted to REVCOM. If comments are present, will submit PAR extension request. All as per email 10/11/2024. TCR: Scott Reed
60076-16	Power Transformers - Part 16: Transformers for Wind Turbine Application		2018		ACTIVE
Individual			12/31/2028		
NONE					
60076-57-1202	IEC/IEEE International Standard Power transformers --Part 57-1202: Liquid immersed phase-shifting transformers	Ewald Schweiger	2024	9/26/2024	ACTIVE + PAR for Revision
Individual			12/31/2028		
PC60076-57-120				12/31/2028	
60214-2	IEEE Draft Standard for Tap-Changers - Part 2: Application Guide		2019		ACTIVE
Individual			12/31/2029		
638	IEEE Standard for Qualification of Class 1E Transformers for Nuclear Power Generating Stations	Craig Swinderman	2013	12/6/2023	ACTIVE + PAR for Revision
Individual		(724) 816 - 4476	12/31/2023		
P638		craig.swinderman@meppi.com		12/31/2027	

IEEE/PES TRANSFORMERS COMMITTEE

Status Report of Transformers Standards

STANDARD		Working Group Chair	Approved Year	PAR Issue Date	Standard Status
BALLOT TYPE		Phone	Rev Due Date	PAR Expiration	Remark
PROJECT		Email			
SubCommittee POWER TRANSFORMERS					
CHAIR: Ryan Musgrove		ryan.musgrove@ieee.org	(405) 747 - 7960		
C57.107	IEEE Recommended Practice for Developing Design-Specific Operational Limits for Transformers Connected to Generators or Power Systems Subject to Significant Short-Term Changes in Voltage or Frequency		2024		ACTIVE
Individual			12/31/2034		
C57.116	IEEE Guide for Transformers Directly Connected to Generators		2022		ACTIVE
Individual			12/31/2032		
C57.12.10	IEEE Standard Requirements for Liquid-Immersed Power Transformers		2017	9/26/2024	ACTIVE + PAR for Revision
Individual			12/31/2027		
PC57.12.10				12/31/2028	
C57.125	IEEE Guide for Failure Investigation, Documentation, Analysis, and Reporting for Power Transformers and Shunt Reactors	Hakan Sahin (208) 220-6963 hakanshaun@gmail.com	2015	5/21/2021	ACTIVE+ PAR for Revision
Individual			12/31/2025		
PC57.125				12/31/2025	
C57.131	IEEE Standard Requirements for Tap Changers		2024		ACTIVE
Individual			12/31/2034		
C57.135	IEEE Guide for the Application, Specification and Testing of Phase- Shifting Transformers	Ewald Schweiger	2011	6/16/2022	INACTIVE-RESERVED + PAR for Revision
Individual			12/31/2021		
PC57.135				12/31/2026	
C57.140	IEEE Guide for Evaluation and Reconditioning of Liquid Immersed Power Transformers		2017		ACTIVE
Individual			12/31/2027		
C57.143	IEEE Guide for Application for Monitoring Equipment to Liquid-Immersed Transformers and Components	Mike Spurlock (614) 933 - 2284 mspurlock@ieee.org	2012	2/17/2017	INACTIVE-RESERVED + PAR Revision+ 1 PAR extension
Individual			12/31/2022		SA BALLOT: Closed 6/11/23 with 572 comments to resolve. Currently in Comment Resolution.
PC57.143				12/31/2025	

IEEE/PES TRANSFORMERS COMMITTEE

Status Report of Transformers Standards

STANDARD		Working Group Chair	Approved Year	PAR Issue Date	Standard Status
BALLOT TYPE		Phone	Rev Due Date	PAR Expiration	Remark
PROJECT		Email			
SubCommittee POWER TRANSFORMERS					
CHAIR: Ryan Musgrove		ryan.musgrove@ieee.org	(405) 747 - 7960		
C57.148	IEEE Standard for Control Cabinets for Power Transformers		2020		ACTIVE
Individual			12/31/2030		
C57.150	IEEE Guide for the Transportation of Transformers and Reactors Rated 10 000 kVA or Higher		2023		ACTIVE
Individual			12/31/2033		
C57.153	IEEE Guide for Paralleling Power Transformers	Mark Tostrud	2015	11/8/2023	ACTIVE + PAR for Revision
Individual		(262) 746 - 1230	12/31/2025		
PC57.153		mark.tostrud@dynamicratings.com		12/31/2027	
C57.156	IEEE Guide for Tank Rupture Mitigation of Liquid-Immersed Power Transformers and Reactors	Peter Zhao	2016	6/5/2023	ACTIVE + PAR for Revision
Individual		(416) 345 - 5926	12/31/2026		
PC57.156		peter.zhao@hydroone.com		12/31/2027	
C57.157	IEEE Guide for Conducting Functional Life Tests on Switch Contacts Used in Insulating Liquid-Immersed Transformers	Adam Sewell	2015	6/5/2023	ACTIVE + PAR for Revision
Individual		(330) 872 - 5707	12/31/2025		
PC57.157		adamsewell@qualityswitch.com		12/31/2027	
C57.17	IEEE Standard Requirements for Arc Furnace Transformers	Domenico Corsi	2012	6/5/2023	INACTIVE-RESERVED + PAR for Revision
Individual			12/31/2022		
PC57.17		transkraft@neo.rr.com		12/31/2027	
C57.93	IEEE Approved Draft Guide for Installation and Maintenance of Liquid-Immersed Power Transformers	Scott Reed	2019	5/22/2024	ACTIVE +PAR for Revision
Individual		(330) 498 - 6259	12/31/2029		
PC57.93		sreed@mvadiagnostics.com		12/31/2028	

IEEE/PES TRANSFORMERS COMMITTEE

Status Report of Transformers Standards

STANDARD		Working Group Chair	Approved Year	PAR Issue Date	Standard Status
BALLOT TYPE		Phone			
PROJECT		Email	Rev Due Date	PAR Expiration	Remark
SubCommittee STANDARDS					
CHAIR: Daniel Sauer		dmsauer@mtu.edu	(262) 896 - 2417		
Individual	Draft Guide for Evaluating Transformer Performance under Reverse Power Flow	Ryan Hogg		5/22/2024	Active PAR
PC57.133		rhogg@ieee.org		12/31/2028	
Individual	Draft Guide for the Evaluation of the Environmental Impact and Life Cycle Assessment of Transformers and Shunt Reactors			9/26/2024	Active PAR
PC57.151				12/31/2028	
C57.12.00	IEEE Standard for General Requirements For Liquid-Immersed Distribution, Power, and Regulating Transformers	Eric Davis	2021	5/13/2022	ACTIVE - PAR for Revision
Individual		(816) 760 - 2627	12/31/2031		This standard is under continuous revision.
PC57.12.00		edavis@burnsmcd.com		12/31/2026	
C57.12.70	IEEE Standard For Standard Terminal Markings and Connections for Distribution and Power Transformers		2020		ACTIVE
Individual			12/31/2030		
C57.12.80	IEEE Standard Terminology for Power and Distribution Transformers	Daniel Sauer	2010	3/23/2017	INACTIVE-RESERVED+PAR for Revision+2 PAR Extension
Individual		(262) 896 - 2417	12/31/2020		ON REVCOM AGENDA (12/10/2024)
PC57.12.80		dmsauer@mtu.edu		12/31/2025	
C57.12.90	IEEE Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers	Stephen Antosz	2021	5/13/2022	ACTIVE - PAR for Revision
Individual		(412) 498 - 3916	12/31/2031		This standard is under continuous revision
PC57.12.90		santos@ieee.org		12/31/2026	
C57.144	IEEE Guide for Metric Conversion of Transformer Standards		2004		INACTIVE-RESERVED
Individual			12/31/2020		This was to be incorporated into P947 but this project has been withdrawn. This needs to be reviewed in light of QUSCOM (formerly SCC14) documents.
C57.152	IEEE Guide for Diagnostic Field Testing of Fluid-Filled Power Transformers, Regulators, and Reactors	Marcos Ferreira	2013	6/13/2019	ACTIVE + PAR Revision + 1 PAR Extension
Individual		(971) 703 - 0777	12/31/2023		SA BALLOT:Closed on 10/4/2024 with 122 comments to resolve. Currently in Comment Resolution.
PC57.152		mferreira@comcast.net		12/31/2025	

IEEE/PES TRANSFORMERS COMMITTEE
Status Report of Transformers Standards

STANDARD	Working Group Chair	Approved Year	PAR Issue Date	Standard Status
BALLOT TYPE	Phone	Rev Due Date	PAR Expiration	Remark
PROJECT	Email			
SubCommittee STANDARDS				
CHAIR:	Daniel Sauer	dmsauer@mtu.edu	(262) 896 - 2417	
C57.163	IEEE Guide for Establishing Power Transformer Capability while under Geomagnetic Disturbances	2023		ACTIVE
Individual		12/31/2033		

IEEE/PES TRANSFORMERS COMMITTEE

Status Report of Transformers Standards

STANDARD		Working Group Chair	Approved Year	PAR Issue Date	Standard Status
BALLOT TYPE		Phone			
PROJECT		Email	Rev Due Date	PAR Expiration	Remark
SubCommittee SUBSURFACE TRANSFORMERS & NETWORK PROTECTORS					
CHAIR: George Payerle		georgepayerle@gmail.com	(330) 908 - 0418		
Individual	Draft Guide for Mitigating Corrosion on Subsurface Transformers and Network Protectors	William Elliott (318) 286-2868 will.elliott@alumni.lsu.edu		2/23/2022	Active PAR
PC57.12.53				12/31/2026	
C57.12.23	IEEE Standard for Submersible Single-Phase Transformers: 250 kVA and Smaller; High Voltage 34 500 GrdY/19 920 V and Below; Low Voltage 600 V and Below	Alan Traut (601) 422 - 1198 atraut@ieee.org	2018	2/5/2024	ACTIVE + PAR for Revision
Individual			12/31/2028		
PC57.12.23				12/31/2028	
C57.12.24	IEEE Standard for Submersible, Three-Phase Transformers, 3750 kVA and Smaller: High Voltage, 34 500 GrdY/19 920 Volts and Below; Low Voltage, 600 Volts and Below		2023		ACTIVE
Individual			12/31/2033		
C57.12.40	IEEE Standard for Network, Three-Phase Transformers, 2500 kVA and Smaller; High Voltage, 34 500 V and Below; Low Voltage, 600 V and Below; Subway and Vault Types (Liquid Immersed)		2024		ACTIVE
Individual			12/31/2034		
C57.12.44	IEEE Standard Requirements for Secondary Network Protectors	Mark Faulkner (864) 993-0509 markafaulkner@eaton.com	2014	3/26/2015	ACTIVE + PAR for Revision + 3 PAR Extension
Individual			12/31/2024		SA BALLOT: Second Recirculation to close on 10/14/24
PC57.12.44				12/31/2024	
C57.12.57	IEEE Requirements for Ventilated Dry-Type Network Transformers 2500 kVA and Below, Three-Phase with High Voltage 34 500 Volts and Below, Low Voltage 216Y/125 and 480Y/125 Volts		1992		INACTIVE-RESERVED
Individual			12/31/2000		THIS STANDARD WILL STAY IN THE "INACTIVE-RESERVED" STATUS AND WILL NOT BE REVISED DUE TO LOW USE OF THIS PRODUCT.

IEEE/PES TRANSFORMERS COMMITTEE

Status Report of Transformers Standards

STANDARD		Working Group Chair	Approved Year	PAR Issue Date	Standard Status
BALLOT TYPE		Phone			
PROJECT		Email	Rev Due Date	PAR Expiration	Remark
SubCommittee TRANSFORMERS AND REACTORS FOR HVDC APPLICATIONS					
CHAIR:	Ulf Radbrandt	ulf.radbrandt@ieee.org		4 (624) 078 - 3357	
Entity PC57.132	Draft Guide for Vibration Testing of Oil-immersed High-voltage Direct Current (HVDC) Converter Transformer (± 160 kV dc to ± 1100 kV dc)	Dr Jun Deng		3/30/2023	Active PAR
		13822116195@139.com		12/31/2027	TCR: Ulf Radbrandt
1277	IEEE Standard General Requirements and Test Code for Dry-Type and Oil-Immersed Smoothing Reactors and for Dry-Type Converter Reactors for DC Power Transmission		2020		ACTIVE
Individual			12/31/2030		
60076-57-129	IEC/IEEE International Standard - Power transformers--Part 57-129: Transformers for HVDC applications	Waldemar Ziomek	2017	2/15/2024	ACTIVE + PAR for Revision
Individual		(204) 474 - 5739 wziomek@ptitransformers.com	12/31/2027		
PC60076-57-129				12/31/2028	

APPENDIX 3

CIGRE Liaison Report

CIGRÉ

International Council on Large Electric Systems

Liaison Report on SCA2
Transformers for
IEEE Transformers
Committee- Fall 2024
Meeting

- Oct. 28, 2024



CIGRÉ Study Committees

SC A1: Rotating Electrical Machines

SC A2: Transformers

SC A3: High Voltage Equipment

SC B1: Insulated Cables

SC B2: Overhead Lines

SC B3: Substations

SC B4: HVDC and Power Electronics

SC B5: Protection and Automation

SC C1: System Development and Economics

SC C2: System Operation and Control

SC C3: System Environmental Performance

SC C4: System Technical Performance

SC C5: Electricity Markets and Regulation

SC C6: Distribution Systems and Dispersed Generation

SC D1: Materials and Emerging Test Techniques

SC D2: Information Systems and Telecommunication

SC A2 Recent Publications

- **Brochure 937:** Condition of Cellulose Insulation in Oil Immersed Transformers After Factory Acceptance Tests (Sep. 2024)
- **Brochure 939:** Analysis of AC Transformer Reliability (Sep. 2024)
- **Brochure 940:** Power Transformer Audible Sound Requirements (Sep. 2024)

SC A2 WG Activities

No.	Working Group	Topic	Status
1	A2.56	Transformer Efficiency	Comment resolution
2	A2.57	Effects of DC Bias	Pre-publication
3	A2.58	Site Installation and Pre-commissioning of Power Transformers and Shunt Reactors	Active
4	A2.60	Dynamic Thermal Performance of Power Transformers	Active
5	A2.63	Transformer Impulse Testing	Active
6	A2/D2.65	Transformer Digital Twin- concept and future perspectives	Active
7	A2/D1.66	Breathing systems of liquid filled transformers and reactors	Active
8	A2.67	Guideline for Online Dissolved Gas Analysis Monitoring	Active
9	A2.68	Failure Survey of Lower Voltage Generator Step Up Transformers installed in Wind farms and Photovoltaic Parks	Active

SC A2 WG Activities

No.	Working Group	Topic	Status
10	A2.69	Guide for Transformer Maintenance	Active
11	A2.70	Life Cycle Assessment (LCA) of Transformers	Active
12	A2/D1.71	Modern Insulating Liquids Qualification for OLTC, Bushings and other accessories.	Active
13	A2/D1.72	Retrofill of mineral oil in transformers - Motivations, Considerations and Guidance	Active
14	D1/A2.77	Improved understanding of dynamic behavior of winding insulating materials in liquid insulated power transformers	Active
15	D1/A2.79	Improved understanding of dynamic behavior of winding insulating materials in liquid insulated power transformers	Starting
16	D1/A2.80	Functional properties of non-metallic solid materials for liquid filled transformers and reactors and their compatibility with insulating liquids	Starting

Upcoming New Working Groups

1. **B3/A2/A3/C3/D1.66 Guidelines for Life Cycle Assessment in Substations considering the carbon footprint evaluation** Target completion Q2 2026.
2. **A2.73 Enhancing the exchange of Transformer information through digitalization.** Target completion Q4 2027.
3. **A2/ D1.74 Online moisture monitoring of transformers for ageing assessment.** Target completion Q4 2028.

If interested in contributing, please contact your appropriate CIGRÉ National Committee Representative.

TF and AG activities

- Task Force (TF): Power Transformers Sound Levels on Site
- Task Force (TF): Silver Corrosion in Transformers
- Advisory Group (AG) A2.06: Greenbook – Transformer Life Management. Expected to be published by Q1 2025

Upcoming Events

- **CIGRÉ USNC Grid of the Future**
 - Raleigh, NC, Nov. 11-14, 2024
 - Hosted by Quanta Technology
 - Sheraton Raleigh Hotel
 - Additional details at www.cigre-usnc.org
- **CIGRÉ International Symposium**
 - Montreal, Quebec, Canada, Sep. 29-Oct. 2, 2025
 - Palais des Congrès de Montreal
 - Paper abstract submittals by Nov. 27, 2024
 - Additional details at www.cigre.org
- **CIGRÉ A2/D1 Study Committee Colloquium**
 - Seoul, S. Korea, Oct. 26-Nov. 1, 2025
 - COEX Intercontinental Hotel
 - Paper preferential subjects:
 - Environmental Performance
 - Testing and Maintenance
 - Failure Prevention and Investigation
- **CIGRÉ Paris Session 2026**
 - Paris, France, August 2026
 - Palais des Congrès
 - Additional details to follow

IEEE Liaison Report

THANK YOU!



APPENDIX 4

IEC TC Liaison Report



IEC Liaison Report

TC 14 Power Transformers

Chair: Christoph Ploetner, DE / Secretary: Stephany Lavy, UK

TC 10 Fluids for electrotechnical applications

Chair: Ivanka Hoehlein-Atanasova, DE / Secretary: **Riccardo Maina, IT**

TC 15 Solid electrical insulating materials

Chair: **Lars Schmidt, DE** / Secretary: Solomon Chiang, US

IEEE Transformers Committee Meeting
2024 October, St. Louis, MO, US



IEEE Transformers Subcommittee

IEC Technical Subcommittee

IEEE Transformers Subcommittee

IEC Technical Committee

1. Bushings (Eric Weatherbee).....	SC 36A
2. Dielectric Tests (Poorvi Patel).....	TC 14
3. Distribution Transformers (Jerry Murphy).....	TC 14
4. Dry Type Transformers (Casey Ballard).....	TC 14
5. Transformers and Reactors for HVDC Applications (Ulf Radbrandt)	TC 14
6. Instrument Transformers (Thomas Sizemore).....	TC 38
7. Insulating Fluids (Stephanie Mabrey).....	TC 10
8. Insulation Life (Sam Sharpless).....	TC 14, TC 15, TC 112
9. Performance Characteristics (Rogerio Verdolin).....	TC 14
10. Power Transformers (Ryan Musgrove).....	TC 14
11. Standards (Dan Sauer).....	TC 14
12. Subsurface Transformers & Network Protectors (George Payerle)	TC 14



TC 14 General Information – Chris Ploetner

- Membership countries 48
- Active experts 248
- Currently active MT, PT, WG, AG, AHG 10 + 3 joint groups
- Documents in charge of (TR, TS, IS) 40
- Documents under maintenance / in development 12 / 0
- **IEC/IEEE dual logo documents 6 (4 out of 6 in revision)**
- No documents published since last report
- Past Plenary Meetings
 - 2024, April 18th in Rome (IT) and October 21st in Edinburgh (UK)
- Next Plenary Meetings
 - 2025, September in New Delhi (India)



Revision of TC 14 documents in progress (12)

1.	IEC 60076-1	General
2.	IEC 60076-2	Thermal performance measurement and test procedures for liquid-immersed transformers
3.	IEC 60076-4	Lightning impulse and switching impulse tests of power transformers and reactors
4.	IEC 60076-5	Ability to withstand short circuit
5.	IEC 60076-6	Reactors
6.	IEC 60076-9	Terminal and tapping markings
7.	IEC 60076-18	Measurement of frequency response
8.	IEC 60076-19	Uncertainties in the measurement of the losses of power transf.
9.	IEC 62032 / IEEE C57.135	Technical guideline for the Application, Specification, and Testing of Phase-Shifting Transformers – >> to become IEC/IEEE 60076-57-135
10.	IEC/IEEE 60076-57-1202	Liquid-immersed phase-shifting transformers
11.	IEC/IEEE 60076-57-129	HVDC Converter Transformers
12.	IEC 60076-21 / IEEE C57.15	Step-voltage regulators
13.	IEC 60076-26	Functional requirements of insulating liquids for use in power transformers (jointly with TC 10)

Chair / Convener

E. Schweiger /
K. Juchem

W. Ziomek /
F. Trautmann

D. Sauer /
D. Sauer



TC 10 General Information – Ed Casserly

- **42** Member countries; **8** Active MT, PT, WG, AG, JMT; **214** Experts
- **63** Documents under supervision; **14** Documents in revision / development
- 1 Document published since last report (5 at FDIS stage):
 - IEC 60422:2024 Mineral insulating oils in electrical equipment - Supervision and maintenance guidance - 2024-07-18
- Last plenary meeting, 2024 April 18/19 Rome (IT) – jointly with TC 14
 - Hybrid meeting – 84 participants (48 in-person) - 4 USNC TAG members
- Next plenary meeting, September 2025 New Delhi (India) – jointly with TC 14
 - Hybrid meeting



TC 10 Standards Currently Under Revision

For details see TC 10 webpage

- MT24 (Ivanka Höhle-Atanasova, DE)
 - **In maintenance** – 61619 ED2: Insulating liquids - Contamination by polychlorinated biphenyls (PCBs) - Method of determination by capillary column gas chromatography (Riccardo Maina, IT)
 - **In maintenance** – 61198 ED2: Mineral insulating oils - Methods for the **determination of 2-furfural** and related compounds (Riccardo Maina, IT)
 - **In maintenance** – 60814 ED2: Insulating liquids - Oil-impregnated paper and pressboard - Determination of water by automatic coulometric Karl Fischer titration (Senja Leivo, FI)
- MT30 (Massimo Pompili, IT)
 - **FDIS - 60156 ED4**: Insulating liquids - Determination of the breakdown voltage - Test method
 - **In maintenance** – 60897 ED2: Methods for the determination of the lightning breakdown voltage of insulating liquids
- MT36 (Attila Györe, HU, nominated)
 - **FDIS - 62770 ED2**: Unused natural esters for transformers and similar electrical equipment
 - **FDIS - 61203 ED2**: Synthetic organic esters - Guide for maintenance of transformer esters
 - **FDIS - 61039 ED3**: Classification of insulating liquids
 - **In maintenance** – 61099 ED3: Insulating liquids - Specifications for unused synthetic organic esters for electrical purposes



TC 10 Standards Currently Under Revision

For details see TC 10 webpage

- MT43 (Griffin Burk, US, new convenor)
 - CD - 60666 ED3: Detection and determination of specified additives in mineral insulating oils
- WG41 (Yannick Kieffel, FR)
 - CD – 63359 ED1: Fluids for electrotechnical application: Specifications for the re-use of mixtures of gases alternative to SF₆
 - **FDIS – 63360 ED1**: Fluids for electrotechnical application - Specification of gases alternative to SF₆ to be used in electrical power equipment
- WG45 (Ivanka Höhlelein-Atanasova, DE)
 - CD - 63585 ED1: Interpretation of DGA analysis in natural and synthetic esters



Partially concurrent with ASTM D27.03

New TC 10 Standards in Development (1)

- WG46 (Yihua Qian, CN)
 - Retro-filling mineral oil immersed transformers with alternative insulating liquids



TC 15 General Information – Solomon Chiang

Scope: Solid electrical insulating materials incl. coatings and varnishes

- **39** Member countries; **10** MT, PT, WG; **86** Experts dealing with
 - plastic films, combined flexible materials, mica products, pressboard and related material, cellulosic paper products, flexible insulating sleeving, rigid fibrous reinforced laminates, resins and varnishes
- **188** Documents under supervision; 17 active projects (revision/development)
- **7** Documents published since 2023 – for details see TC 15 webpage
- Last plenary meeting, October 2023, St. Louis, Missouri, US
 - Hybrid meeting – 30 participants (7 in-person) - 6 USNC TAG representatives
- Next in-person plenary meeting, November 2024-11-(11-14), Vienna (AT) -29 registered
- 2025 in-person plenary meeting. Oct 14-17. Tokyo Japan



TC 15 Projects of interest to the IEEE Transformers Committee

(1) Definition of Thermally Upgraded Paper (TUP)

TC 15, TC 14 and IEEE TX met online on May 17th , 2024 to reach agreement on the Definition

Proposal for definition to be introduced in IEC 60554-1:

“Thermally upgraded paper or presspaper (TUP)

- Kraft insulating paper or presspaper which contains Nitrogen, as dicyanamide (DICY), and complies with the requirements of 60554-3-3, 60554-3-5 and 60554-3-6 with initial Nitrogen content of 1.3% or greater. **This applies exclusively to TUP which contains DICY based on industry proven experience.** Nitrogen content in TUP for qualification and QA shall be determined by analytical test methods described in 60554-2.

OR

- Kraft insulating paper or presspaper which has minimum of 50% tensile retention after ageing test as described in Annex D, clause D.1 of IEEE C57.100-2022.”



TC 15 Projects of interest to the IEEE Transformers Committee

(2) TC15 -- MT14 + MT15 agreed to move the press paper standard from IEC 60641-X (in resp. of MT14) to new IEC 60554-3-6 (in resp. of MT 15) to better match scopes of both MTs

MT 14 – **Pressboard** and related material

MT 15 – Cellulosic **paper products**

SPECIFICATION FOR CELLULOSIC PAPERS FOR ELECTRICAL PURPOSES –

New IEC 60554-3-6 from IEC 60641-3-2

Part 3: Specifications for individual materials –

**Sheet 6: Requirements for presspaper,
types P.2.1, P.4.1, P.4.2, P.4.3 and P.6.1**

APPENDIX 5

Standards Coordinating Committee No. 4

Standards Committee 04 (SC04)

Evanne Wang for Dr. Nancy Frost

IEEE/PES Transformers Committee

Oct 28, 2024

St. Louis

Scope

- *Standards Committee 04 oversees development of standards for Electrical Insulation that span the scope of multiple Technical Committees and Societies (e.g., Dielectric and Electrical Insulation, and Power Engineering) within IEEE. Reporting to IEEE PES Transformers Committee as well as IEEE SESCom.*
- **Scope:**
 - To formulate guiding principles for the evaluation of insulation materials and systems for electrical and electronic applications.
 - To formulate principles for the identification of insulation materials and systems based on functional tests and/or experience.
 - To coordinate the preparation of standards for functional test programs and diagnostic methods for the evaluation of insulation materials and systems.

Standards

- **IEEE 1-2000 (R2011)** Recommended Practice – General Temperature Limits in the Rating of Electrical Equipment and for the Evaluation of Electrical Insulation
- **IEEE 98-2016** Standard for the Preparation of Test Procedures for the Thermal Evaluation of Solid Electrical Insulating Materials
- **IEEE 99-2019** Recommended Practice for the Preparation of Test Procedures for the Thermal Evaluation of Insulation Systems for Electrical Equipment

Current Activities

- **IEEE 1** - Standard expired 12/31/2021, and current PAR expires 12/31/2024. The Chair has submitted a PAR extension in October 2024, and the revisions are going to ballot in November 2024.

Join us: IEEE 1 Chair – Brad Greaves (brad.greaves@weidmann-group.com)

- **IEEE 98** - This standard is the next in the series to be revised. Interest from other standards that utilized IEEE 98 is being gathered from IEEE PES as well as IEEE NPE, in an effort to be more seamless and proactive in potential updates to the standard. It is anticipated to initiate work on this standard in 2025.

Join us: SC04 Chair - Nancy Frost (DrNancyFrost@gmail.com)

- **IEEE 99** - Revisions to this standard are on hold until IEEE 98 is completed.
- **SC04 membership** - SC04 roster has had several expert retirements. If you have interest and are knowledgeable in this area, please contact the SC04 chair.

Join us: SC04 Chair - Nancy Frost (DrNancyFrost@gmail.com)

Participate

- SC04 Chair – Nancy Frost (DrNancyFrost@gmail.com)
- IEEE 1 Chair – Brad Greaves (brad.greaves@weidmann-group.com)

APPENDIX 6

ASTM

ASTM Committee D27

Electrical Insulating Liquids and Gases

Liaison Report

Ed Casserly

IEEE/PES Transformers Committee

Oct 28, 2024

St. Louis

Committee D27 on Electrical Insulating Liquids and Gases

ASTM Committee D27 on Electrical Insulating Liquids and Gases was formed in 1959. D27 meets twice each year, in May and November, with about 30 members participating in 12 meetings over two days. The Committee, with a membership of approximately 110 members, currently has jurisdiction of over 50 approved standards that are published in the Annual Book of ASTM Standards, Volume 10.03.

Committee Officers

Chairman: Lance R. Lewand
Vice-chairman: Edward W. Casserly
Secretary: Michael Bonn

Meetings

Last Meeting: June 10-11, 2024
Philadelphia, PA
Next Meeting: Nov 11-12, 2024
Orlando, FL

D27 Committee Membership

Classification	Official	Non-Official	Total
Producer (Liquid/Gas)	21	10	31
<u>User</u>	<u>12</u>	<u>2</u>	<u>14</u>
Consumer	0	0	0
General Interest	40	23	63
Total	73	39	112

- Organized by company, organization, or individual
- 1 official vote per company, organization, or individual
- Unanimous approvals – all negatives must be resolved, even from non-voting members

- Need the voice of transformer OEMs and utilities

ASTM D27 Mineral Insulating Liquids

D27.01 - Mineral Oils, Griffin Burk:

1. ASTM D8180-23 - **New standard**: Specification for Re-refined Mineral Insulating Liquid Used in Electrical Apparatus, approved Jan 1, 2023.
2. ASTM D5222-23 – Specification for Less Flammable High Molecular Weight Hydrocarbon Mineral Electrical Insulating Liquids, approved January 1, 2023.
 - **New title**, previously, “High Fire Point Mineral Electrical Insulating Oils”
3. ASTM D3487-24 – Specification for Mineral Insulating Oil Used in Electrical Apparatus, approved June 1, 2024.

ASTM D27 Ester Insulating Liquids

D27.02 - Gases and Non-Mineral Oil Liquids, Todd Felton:

1. **ASTM D8240-22** Specification for Less-Flammable Synthetic Ester Liquids Used in Electrical Apparatus (IEC 61099), **approved August, 2022**.
 - **New standard; requires disclosure of additives.**
2. **ASTM D6871-17** Specification for Natural (Vegetable Oil) Ester Fluids Used in Electrical Apparatus.
 - **Currently under revision, WK81903**
 - **Expected to include disclosure requirement consistent with D8240 and IEC Standards**

ASTM D27 Analysis of Additives

D27.03 - Analytical Tests, Claude Beauchemin:

1. **WK81449** New Standard For the determination of additives in insulating liquids - Part 1 - Determination of phenolic antioxidants using liquid chromatography (LC)
 - (Technical Contact: Casserly, Edward W)
2. Work is on-going. Part 1 is on the determination of phenolic antioxidants using liquid chromatography (LC) and a draft has been issued.
 - Concurrent with IEC TC10 MT43 revision of 60666.

ASTM D27 Corrosive Sulfur

D27.06 – Chemical Tests, Lance Lewand:

1. **ASTM D1275-24** Corrosive Sulfur in Electrical Insulating Liquids
 - (Technical Contact: Lewand, Lance)
 - **Will be reopened to address Silver Corrosion concerns**

ASTM D27 Future Work

D27.15 - Planning, Resources and Development, Kevin Wirtz:

1. WK68133 – Oxidation Stability of Natural and Synthetic Ester Liquids using OIT by DSC – submitted for development to D27.06 SC. Current draft to be posted to collaboration site is v11.
2. Oxidation of Natural Ester Liquids using Non-DSC Methods – L. Lewand
Working on use of D2112 to assess.
3. Partial Discharge – Dominique Bolliger (in cooperation with IEC TC10 MT30)
4. Relative Saturation of Water in Insulating Liquids – Lance Lewand

APPENDIX 7

Transactions Power Delivery



During 2024 until October 14, 2024, a total of 61 papers were and are in the editorial review in the transformer area of IEEE Transactions on Power Delivery for possible publication. For all of these papers the recommendations were as follows:

Accept	3
Revise & Resubmit	3
Under review	23
Reject ..	25
Editorial / Administrative Reject	7

TOTAL (During 2024 until October 14, 2024) **61**
The above numbers include reviews managed by all editors.



IEEE PES TRANSFORMERS COMMITTEE
Fall 2024 Meeting: St. Luis, Missouri USA October 27– 34, 2024

Editor’s Report (14.10.2024)
Xose LOPEZ-FERNANDEZ

IEEE TRANSACTIONS ON
POWER DELIVERY



IEEE POWER & ENERGY SOCIETY
Power & Energy Society*

OCTOBER 2024

VOLUME 39

NUMBER 5

ITPDE5

(ISSN 0885-8977)

The papers accepted for publication are shown below:

DOI /Accepted	Title / Accepted
10.1109/TPWRD.2024.3474013	Analyzing the Effects of Lightning Strike on Distribution Transformer Failure via Geographically and Temporally Weighted Regression
10.1109/TPWRD.2024.3458804	A Flux Matching Method for Mitigating the Inrush Current of Single-Phase Power Transformers
10.1109/TPWRD.2024.3454230	A Novel Graphical Method for Interpretating Dissolved Gases and Fault Diagnosis in Power Transformer Based on Dynamique Axes in Circular Form



IEEE PES TRANSFORMERS COMMITTEE

Fall 2024 Meeting: St. Luis, Missouri USA October 27– 34, 2024

Editor's Report (14.10.2024)
Xose LOPEZ-FERNANDEZ

IEEE TRANSACTIONS ON **POWER DELIVERY**



IEEE POWER & ENERGY SOCIETY

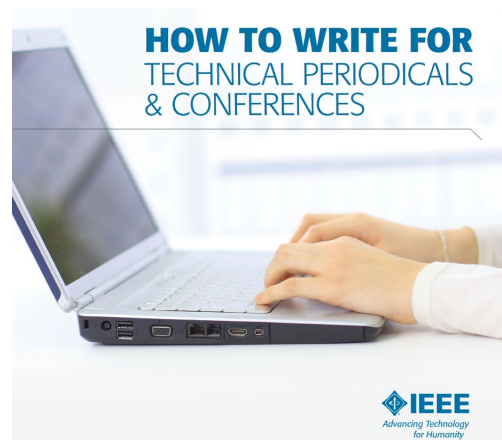
OCTOBER 2024

VOLUME 39

NUMBER 5

ITPDE5

(ISSN 0885-8977)



It is important for all interested individuals to follow the norm for writing papers as provided in IEEE. The link is <https://cmte.ieee.org/tpwrd/>, particularly helpful is “How to Write for Technical Periodicals and Conferences”: https://eps.ieee.org/images/files/mc-ieee_author_guide_interactive.pdf

All individuals involved in IEEE Transformers Committee activities are courage to consider joining as reviewers. Those interested can send an email to xmlopez@ieee.org, specifying their “Specialty / Area of Expertise” of interest, such as:

- Power Transformers
- Instrument Transformers
- Insulating fluids category
- Insulation life
- Audible Noise and Vibration
- Transformer Modeling Techniques
- HVDC Converter Transformers
- Reactors
- Monitoring
- Design
- Heating
- Etc

APPENDIX 8

IEEE Staff Update Presentation

PES TRANSFORMERS COMMITTEE FALL MEETING

**PES TRANSFORMERS ADMINISTRATIVE SUBCOMMITTEE
FALL 2024**

PATRYCJA JAROSZ

P.JAROSZ@IEEE.ORG

ST. LOUIS, MI

OCTOBER 2024

IEEE STANDARDS ASSOCIATION

IEEE SA UPDATES

- ☐ Summary of Updates
- ☐ Staff Update
- ☐ PAR/Standards Status Update, Entity PARs Status, EPM Update, IEEE/IEC Update
- ☐ eTool: ListServ for WGs
- ☐ Presenting of Patent, Copyright and Behavioral Slides during WG meetings
- ☐ Status of SC P&P
- ☐ Upcoming policy on taxes and meeting expenses (conference Services)
- ☐ IEEE SA Support Portal
- ☐ Annex : Past policy updates

SUMMARY OF UPDATES FROM IEEE SA

- ❑ ***WG chairs to complete:* Understanding IEEE SA's Antitrust, Competition, and Commercial Terms Policies**
 - ❑ Training has moved to the volunteer ILN site.
 - ❑ IEEE SA Staff will reach out to you via email if you have not completed the training.
- ❑ **Reminder to email the WG Membership Roster to your PM for Standards Development WGs**
 - ❑ The membership list should include - Last Name, First Name, email address and Membership Status (Voting/Non-Member)
 - ❑ IEEE SA Staff will reach out to WG Officers if MyProject Roster has not yet been submitted.
- ❑ **WG Awards are now submitted in myProject, a WG roster is necessary to complete the awards submission.**
 - ❑ Phone numbers and addresses for the recipients are now required Phone numbers for the recipients is now required
- ❑ **Upcoming policy on taxes and meeting expenses (Conference Services)**
 - ❑ Standards Committees or Working Groups shall collect as part of standards development meeting fees any applicable indirect and direct tax payments for the meetings.

STAFF UPDATE

Patrycja	
Bushings	Dry Type
HVDC	Power Transformers
Insulation Life	Distribution
Instrumentation	Dielectric
Performance Characteristics	Insulation Fluids
Standards	
STNP	

IEEE-SA UPDATES – PAR/STANDARDS STATUS

2024 – 7 PARS are expiring

- ☐ All 7 are either in the ballot invitation/initial ballot/comment resolution stage
 - ☐ PC57.98, PC57.16, PC57.166, PC57.162, PC57.13.9, PC57.93a- PAR extensions are on the December 9, 2024 Nescom Agenda
 - ☐ PC57.12.44- On December 10, 2024 Revcom Agenda

2025 – 16 PARS are expiring

- ☐ 8 PARs in SA Ballot stage
- ☐ 6 in WG development stage
- ☐ 2 on RevCom (December 2024) - 2 PARS on RevCom, PC57.12.80, PC57.143

Expiring Standards in 2024

- ☐ 4 Standards will become inactive
 - ☐ 65700-19-03, PC57.155, PC57.12.38 and PC57.12.44

Expiring Standards in 2025

- ☐ 12 Standards will become inactive
 - ☐ PC57.12.37, PC57.12.59, PC57.94, PC57.139, PC57.637, PC57.130, PC57.32, PC57.32a, PC57.157, PC57.125, PC57.153, PC57.106 (does not have an active PAR)

IEEE-SA UPDATES – ENTITY PAR STATUS

Entity PARs

- ❑ **PC57.32.10-** Guide for the Selection of Neutral-point Insulation Grade and Grounding Reactor of Converter Transformers in HVDC Transmission
 - ❑ *In Recirculation until October 28, 2024*
- ❑ **PC57.93a-** Draft Guide for Installation and Maintenance of Liquid-Immersed Power Transformers
 - ❑ *Currently in comment resolution*
- ❑ **PC57.141-** Guide for Detection, Monitoring, and Evaluation of Winding Deformation in Liquid-Immersed Power Transformers
- ❑ **PC57.13.10-** Guide for Calibration of Energized Current Transformers for 34.5 kV and Below
- ❑ **PC57.132-** Guide for Vibration Testing of Oil-immersed High-voltage Direct Current (HVDC) Converter Transformer (± 160 kV dc to ± 1100 kV dc) (EPM)
- ❑ **PC57.145-** Guide for Digital Twin Modeling and Analysis of Power Transformers with High Voltages Greater than or Equal to 69 kV up to and Including 161 kV (EPM)
- ❑ **PC57.20-** Guide for Power Transformers for Low-frequency (10 Hz to 30 Hz) Power Transmission (EPM)
- ❑ **PC57.12.210-** Recommended Practice for On-load Capacity Switching Distribution Transformers
 - ❑ *Approved at the September 25th, 2024 Revcom Meeting*

IEEE-SA UPDATES – EPM STATUS

Pending EPM PARS

- ❑ **P0148:** Guide for arc test of liquid-Immersed High-Voltage Direct-Current (HVDC) converter transformers
Action: Set up a call for P0148 with Subcommittee and PAR proposers
- ❑ **P0173:** Guide for the Technical Specification of Smart Distribution Transformer Terminal - Action: M. Zaman to inform proposers and SC21 that TR will become co-SC of P0173
- ❑ **P0197:** Guide for Inversion Detection of Hot-spot Temperature and Loading Capacity in Oil-immersed Transformer
- ❑ **P0184:** Guide for measurement of the polymerization degree of insulating paper/paperboard for power transformers based on terahertz time domain spectroscopy
- ❑ **P0217:** Guide for Identification and Analysis of Noise Contribution from Large-scale Power Facilities to the Surrounding Environmental Noise

IEEE/IEC DUAL LOGO UPDATE (ACTIVE PROJECTS)

Joint Development of standards with IEC

Published Standards

- ❑ **IEC/IEEE P65700-19-03-2014:** Standard Requirements, Terminology, and Test Code for Bushings for DC Applications Rated 110 kV BIL and Above
- ❑ **IEC/IEEE P60076-57-1202-2016:** Standard Requirements for Liquid Immersed Phase-Shifting Transformers
- ❑ **IEC/IEEE P60076-57-129-2017:** Converter Transformers for HVDC Applications
- ❑ **IEC/IEEE P60076-16-2018:** Standard Requirements for Wind Turbine Generator Transformers
- ❑ **IEEE PC57.15/IEC 60076-2017:** Guide for the Application, Specification and Testing of Phase-Shifting Transformers

IEEE/IEC DUAL LOGO UPDATE (ACTIVE PROJECTS)

Standards Under Development

- ❑ **IEEE/IEC P63253-5713-8:** Standard Requirements for Station Service Voltage Transformers
 - ❑ Approved by Revcom on September 25, 2024 Meeting
 - ❑ Both IEEE and IEC are working on the Publication process
- ❑ **IEEE/IEC P65700-19-03:** Standard - Bushings for DC Application
 - ❑ PAR for the revision was approved September 2021 and expires December 31, 2025
 - ❑ Currently in comment resolution
 - ❑ CDV closed 8/16/24 at IEC
- ❑ **IEEE/IEC PC57.15:** Standard- Power transformers - Part 21: Standard requirements, terminology, and test code for step-voltage regulators
 - ❑ PAR for the revision was approved February 2024 and will expire December 31, 2028
 - ❑ Draft development
- ❑ **IEEE/IEC P60076-57-129:** Standard - Power transformers--Part 57-129: Transformers for HVDC applications
 - ❑ PAR for the revision was approved February 2024 and will expire December 31, 2028
 - ❑ Draft development
- ❑ **IEEE/IEC P60076-57-1202:** Standard Power Transformers Part 57-1202: Liquid immersed phase-shifting transformers
 - ❑ PAR for the revision was approved September 2024 and will expire December 31, 2028
 - ❑ Draft development

ETool: Listserv

IEEE ListServ is the email list management tool for Working Group (WG) email communication. Through this list, the WG can communicate with individuals interested in the WG activities.

- ☐ The Listserv provides an email alias that can be used by the WG.
- ☐ There can be an email list for WG members only and another email list to be used for all others that have an interest in the WG activities.
- ☐ **Please contact Patrycja for assistance if there is interest in setting up a GDPR compliant IEEE ListServ email list. Please specify if the Listserv will be a WG only or Public ListServ.**
- ☐ Participants must be notified that they have been added to the Listserv.
- ☐ A Welcome Email via the Listserv must be sent (Patrycja will provide the template to WG Officers) to the participants on the Listserv and for the participants to be provided the option to opt out of receiving emails if they chose to do so.
- ☐ WG Officers maintain the Listserv and are provided with Administrator access.

PRESENTING OF PATENT, COPYRIGHT AND BEHAVIORAL SLIDES DURING MEETINGS

Patent Slides

- Based on Clause 6.3.2 in the *IEEE SA Standards Board Operations Manual* the Patent Slides shall be presented at every Standards Development meeting once there is an approved PAR.

6.3.2 Call for patents

38

IEEE SA STANDARDS BOARD OPERATIONS MANUAL

2024

The chair or the chair's delegate of an IEEE standards-developing working group or the chair of a Standards Committee shall be responsible for informing the participants at a meeting that if any individual believes that Patent Claims might be Essential Patent Claims, that fact should be made known to the entire working group and duly recorded in the minutes of the working group meeting. This request shall occur at every standards-developing meeting once the PAR is approved by the IEEE SA Standards Board.

The chair or the chair's delegate shall ask any patent holder or patent applicant of a Patent Claim that might be or become an Essential Patent Claim to complete and submit a Letter of Assurance in accordance with Clause 6 of the *IEEE SA Standards Board Bylaws*. Information about the draft standard will be made available upon request.

PRESENTING OF PATENT, COPYRIGHT AND BEHAVIORAL SLIDES DURING MEETINGS

Copyright Slides

- Based on Clause 6.1 in the *IEEE SA Standards Board Operations Manual* the Copyright Slides can be either presented at every meeting or distributed prior to the meeting along with the meeting agenda. If slides are distributed before the meeting, all participants will be informed at the beginning of the meeting that the slides were shared prior to the meeting. The presentation of the slides or the prior notice to participants shall be noted in the meeting minutes.

6.1 Copyright

IEEE owns the copyright of draft IEEE standards and approved IEEE standards (see 7.2 of the *IEEE SA Standards Board Bylaws*).

Contributions made by participants in an IEEE SA standards development meeting, whether the Contributions are Published or not, are subject to the IEEE SA Copyright Policy set forth in Clause 7 of the *IEEE SA Standards Board Bylaws*.

The IEEE SA Copyright slide shall be either presented at the beginning of every IEEE SA standards development meeting, or distributed prior to the meeting along with the meeting agenda. If the slide is distributed with the meeting agenda, all meeting participants shall be informed at the beginning of the meeting that all material submitted during the meeting is a Contribution and is subject to the IEEE SA copyright policy. The presentation of the slide or the notice to meeting participants shall be documented in the minutes of the meeting.

PRESENTING OF PATENT, COPYRIGHT AND BEHAVIORAL SLIDES DURING MEETINGS

Behavioral Slides for Individual & Entity Working Groups

- ❑ Based on Clause 5.3.3 in the *IEEE SA Standards Board Operations Manual* the Behavioral Slides can be either presented at every meeting or distributed prior to the meeting along with the meeting agenda. If slides are distributed before the meeting, all participants will be informed at the beginning of the meeting that the slides were shared prior to the meeting. The presentation of the slides or the prior notice to participants shall be noted in the meeting minutes.

5.3.3 Standards development meetings

Standards development meetings are to be conducted consistent with the principles of fairness and openness, and without dominance.

The IEEE SA Individual method or Entity method participant behavior slide set, as applicable, shall be either presented at the beginning of every IEEE SA standards development meeting or distributed prior to the meeting along with the meeting agenda. If the slides are distributed with the meeting agenda, all meeting participants shall be informed at the beginning of the meeting that participant behavior shall comply with the outlined requirements. The presentation of the slides or the notice to meeting participants shall be documented in the minutes of the meeting.

PE/TR STDS COMM. P&PS DUE 2024

AudCom Baselines URL

- ☐ The above URL has the baselines for the Standards Committee, Individual and Entity based Working Groups
- ☐ The Standards Committee is currently reviewing an updated SC P&P that will be submitted.

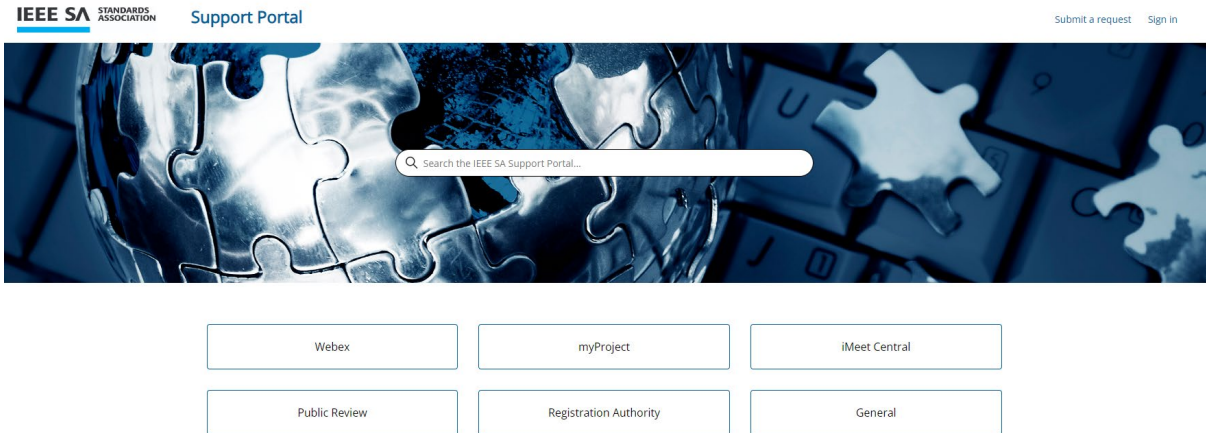
Steps to upload the P&Ps to AudCom

UPCOMING POLICY ON TAXES & MEETING EXPENSES (CONFERENCE SERVICES)

- ❑ Standard Committees or Working Groups shall collect as part of standards development meeting fees any applicable indirect and direct tax payments for the meetings.
- ❑ IEEE SA policies and procedures have been updated to reflect the requirement for payment of taxes associated with IEEE SA meeting fees (see subclause 5.3.5 of the *IEEE SA Standards Board Operations Manual*). IEEE SA has set up an alias (sa-mtg-tax@ieee.org) to help IEEE SA Standards Committees (SCs) and Working Groups (WGs) who charge meeting fees to coordinate payment of applicable taxes (this applies anywhere in the world, including within the US).
- ❑ Note that IEEE intends to roll out automation of a tax engine in some of its systems. One system will be IEEE Cvent, which is managed by IEEE CEE. This rollout is expected within 1 to 2 years. IEEE SA strongly recommends that IEEE SA groups that charge meeting fees transition to using Cvent for meeting registrations once Cvent is rolled out.

IEEE SA SUPPORT PORTAL

- ❑ The IEEE SA [Support Portal](https://standards-support.ieee.org/hc/en-us) can be used to find instructions on how to complete different Standards Development tasks (Example: awards, ballot, myProject, Webex, iMeet, Public Review, Registration Authority).
- ❑ This is the link: <https://standards-support.ieee.org/hc/en-us>



QUESTIONS?



PAST POLICY CHANGES AND UPDATES

ENTITY PARTICIPATION UPDATES

Previous Entity Participation:

- ☐ Can observe one meeting to see if interested in joining as a Corporate Member
- ☐ Corporate membership is needed to gain access to materials and participate."

Current Changes:

- ☐ Entity nonmembers may observe any Entity WG Meeting(s)
- ☐ At the discretion of the WG Chair
- ☐ Entity nonmembers may be able to speak
- ☐ Entity nonmembers may have read-only access to meeting materials

Update: Note – IEEE SA no longer provides Basic and Advanced Corporate Membership options. There is only a single IEEE SA corporate membership.

STANDARDS COMMITTEE REPRESENTATIVE & DRAFT DISTRIBUTION

- ❑ Availability of the Entity draft for the [Public Review Process](#) comments being readily available to the Standards Committee overseeing the project.
- ❑ The SCR (Standards Committee Representative) who has access to the draft is able to *share it with those in the Standards Committee with an interest* in the project.
- ❑ There is no cost associated with this. We have created the below FAQ to have guidance for the SCR. <https://standards.ieee.org/faqs/share/>

Can the Standards Committee Representative of an entity-based Working Group share the draft with participants in its Standards Committee?

Yes, the Standards Committee Representative should share the draft(s) with a subgroup of identified participants that have an interest in the scope of the Working Group within the Standards Committee.

REQUEST FOR IEC STANDARDS (NEW PROCESS)

- ❑ IEEE SA Working Groups (WGs) that wish to obtain IEC documents first must utilize the IEC [Products & Services Portal \(iec.ch\)](http://iec.ch) website.
 - ❑ A lot of information is already available for all IEC deliverables (concerned IEC TC, scope, table of content, introduction, preview of the document, normative references).
 - ❑ This website is public, and WGs should first review the website for information on the document(s) they want to review.
 - ❑ If additional information or a more detailed review is needed, then the WG will need to contact their IEEE SA PM to submit a special request with the rationale for why the document(s) is/ are needed.
 - If the special request is approved by IEC, only a small number of individuals would be granted time-restricted access to the IEC document(s).
 - The WG Chair should select two individuals to review the document(s)
- ❑ Category A and C liaisons relationships follow a different process and this “new process” does not apply, nothing has changed with the liaisons.

MYPROJECT - WG AWARDS

- ❑ [Working Group Awards](#) Once there is Final approval of a project by the IEEE SASB, it is an important opportunity to recognize standards development participants with working group awards (plaques and certificates)
- ❑ *This myProject feature will allow a Working Group Chair or Vice-Chair to populate a list of award recipients based on involvement levels set in the Working Group roster.*
- *The system will automatically pull the recipient's address from their IEEE account profile if they have provided one.*
NOTE: Roster needs to be up to date in order to populate the awards list
- **Phone numbers and addresses for the recipients are now required**
- ❑ *Select the type of award the individual should receive and select a delivery method.*
- ❑ *Once all selections are made, the information can be submitted to the IEEE SA Awards Administrator for processing.*

[Steps for WG awards process](#)

CONTACT US!

Patrycja Jarosz

Program Coordinator

p.jarosz@ieee.org

908-726-8288

APPENDIX 9

Meeting Planning

SC Meetings Planning

Fall 2024 Meeting

Saint Louis, MO

General Session

October 28, 2024

Tammy Behrens

Prolec

Meetings Subcommittee Chair

THANK YOU TO OUR MEETING HOSTS!



THE HJ FAMILY
OF COMPANIES
■ SINCE 1969 ■

Ed Smith, Sandie Burnett & Team

**THANK YOU TO EVERYONE
THAT UTILIZED THE
TRANSFORMERS COMMITTEE
ROOM BLOCK!**

Meeting Attendance

	2022 Fall Charlotte	2023 Spring Milwaukee	2023 Fall Kansas City	2024 Spring Vancouver	2024 Fall St. Louis
Attendees	535 (544 – 9)	513 (521 – 8)	569 (576 – 7)	533 (551 – 18)	637*
Spouses/ Companions/ Guests	37 (38 – 1)	24 (24 – 0)	34 (34 – 0)	54 (54 – 0)	37*

Meeting attendance record is held by the 2018
100th anniversary meeting in Pittsburg, PA at 626...

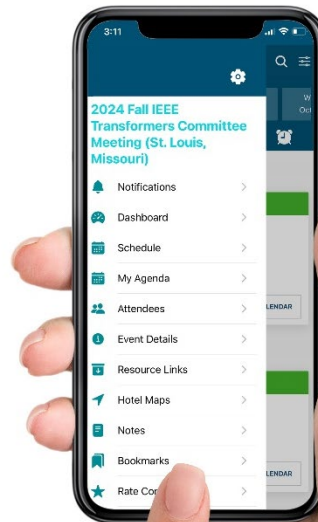
*Registrations
as of 10/27/24

MEETING APP

IEEE

EventHub

You must login with your IEEE account credentials to see the available events. If you do not have an IEEE login, you can create a free login.



EL&P Delegation

(end users only, please)

Tuesday, 7AM

Sterling 6 (2nd Floor)

(get breakfast from Regency Ballroom)

Miscellaneous Announcements

Buses for all technical tours and Wednesday night social will load from the entrance/exit near Starbucks.

All breaks on Monday through Wednesday will take place in the Grand Foyer on the 4th floor, including the one right after this general session; Thursday breaks will be in Regency foyer as everything that day is on this floor.

You will need your room key card to access all hotel floors except the Lobby level. If you are not staying at the hotel, you will need to take the escalators to travel up from the lobby or between floors 2 and 4.

Grand AB, C, F, GH breakout room entrances are in the secondary hallways.

Paper rosters will again need to be utilized – please print clearly.

Future Meetings



SPRING 2025 — March 23-27

Denver, CO

Hyatt Regency at Colorado
Convention Center

FALL 2025 — October 19-23

Bonita Springs, FL

Hyatt Regency Coconut Point
Resort & Spa

Considerations for Future Meeting Sites

- local host
- consideration of # of attendees
- availability of technical tours and activities
- restaurants in walking distance
- international airport
- affordable (for the market)

**PLEASE CONTACT ME WITH ANY
FEEDBACK, COMMENTS OR
QUESTIONS AT
TAMMY.BEHRENS@PROLEC.ENERGY**

**Thank you for all your work this week
and over the course of the year!**

SC Meetings Planning

Fall 2024 Meeting

Saint Louis, MO

Closing Session

October 31, 2024

Tammy Behrens

Prolec

Meetings Subcommittee Chair

Meeting Attendance

	2022 Fall Charlotte	2023 Spring Milwaukee	2023 Fall Kansas City	2024 Spring Vancouver	2024 Fall St. Louis
Attendees	535 (544 – 9)	513 (521 – 8)	569 (576 – 7)	533 (551 – 18)	628 (643 – 15)
Spouses/ Companions/ Guests	37 (38 – 1)	24 (24 – 0)	34 (34 – 0)	54 (54 – 0)	36 (37 – 1)

Meeting attendance record WAS held by the 2018 100th anniversary meeting in Pittsburgh, PA at **626**...

THANK YOU TO OUR MEETING HOSTS!



THE HJ FAMILY
OF COMPANIES
■ SINCE 1969 ■

Ed Smith, Sandie Burnett & Team

AND TO
Xcel Energy
FOR HOSTING OUR
NEXT MEETING IN
DENVER!

Future Meetings



SPRING 2025 — March 23-27

Denver, CO

Hyatt Regency at Colorado
Convention Center

FALL 2025 — October 19-23

Bonita Springs, FL

Hyatt Regency Coconut Point
Resort & Spa

Room Block Open!

Meetings Subcommittee

- Presentations & Tutorials: Tom Prevost (tprevost@ieee.org)
 - Break Sponsor: Ed Smith (edwards@h-j.com)
 - Website: Kris Zibert & Sue McNelly (spmcnelly14@gmail.com)
 - Mobile App: David Wallach
 - Meeting Schedule: Jerry Murphy (jerry.murphy@ieee.org)
 - Member Planet: Jim McBride & Bruce Forsyth
 - Photography: George Payerle
-
- Registration Desk, Etc.
 - Jennifer Quandel, HPN

**PLEASE CONTACT ME WITH ANY
FEEDBACK, COMMENTS OR
QUESTIONS AT
TAMMY.BEHRENS@PROLEC.ENERGY**

**Thank you for all your work this week
and over the course of the year!**

APPENDIX 10

Treasurer's Report

MEMORANDUM

September 9, 2024

To: David Wallach, Chair
IEEE PES Transformers Committee

RE: IEEE PES Transformers Committee Treasurer's Report
Fall 2024 Meeting
(Reporting period 02/01/2024 to 08/31/2024)

Dear David,

The finances of the Committee are in sound financial condition. As of August 31st (end of this reporting period), the checking account balance was \$334,723.13.

FYI: August 31st is a "snapshot in time" after the final income/expenses for the Fall 2023 Kansas City meeting were finalized and most income/expenses are resolved from the Spring 2024 Vancouver meeting. This report also includes \$4,250.00 paid in deposits towards the upcoming Fall 2024 St. Louis Meeting.

Report period notes:

- The Fall 2023 Kansas City Meeting reports a final profit of \$114,827.97.
- The Spring 2024 Vancouver Meeting reports a preliminary profit of \$50,539.81.
- A financial audit for 2023 is required as the committee's revenues/expenses have met minimum financial thresholds. Documentation has been sent to IEEE for audit.

See attached summary of the balance of this reporting period, and the previous periods.

Sincerely,

Troy Tanaka, Treasurer
IEEE PES Transformers Committee

IEEE PES TRANSFORMERS COMMITTEE
Treasurer's Report - Fall 2024
(for reporting period 02/01/2024 to 08/31/2024)

F24

A	Ledger Balance at Period Opening; 2/01/2024	\$ 361,559.34
	<u>Misc Income, not related to a specific meeting</u>	
B1	interest, approx 6 months	\$ 10,383.95
B2	misc income; shirt sales, CD-ROM sales, book sales, etc.	\$ 0.00
B	Total Misc Income, not meeting related	\$ 10,383.95
	<u>Misc Expenses, not related to a specific meeting</u>	
c1	Authorized.Net	\$ (385.00)
c3	equipment purchases; projectors & cases, etc.	\$ 0.00
c4	technology; RFID tech, meeting app, WiFi equip, printers & ink, cables, etc	\$ 0.00
c5	conferences, JTCM, PES GM, remote meetings, etc.	\$ (2,985.64)
c6	other misc. expenses; shirts, audit, books, office supplies, name badges, etc.	\$ (217.10)
c7	memorial	\$ 0.00
C	Total Misc. Expenses, not meeting related	(\$3,587.74)
	<u>Fall 2023 Meeting</u>	
D1	Late Revenue, meeting registrations	\$ 0.00
D2	Misc late Revenue (incentives, late sponsor contributions, etc.)	\$ 0.00
D3	Late meeting expenses	\$ 0.00
D	Total Late Income/(expenses), Fall 2023 Meeting	\$0.00
	Previous Revenue/Expenses	\$114,827.97
	Gain/(Loss) Fall 2023 Meeting	\$114,827.97
	<u>Spring 2024 Meeting</u>	
E1	Revenue, meeting registrations	\$ 250,218.05
E2	Revenue, coffee break sponsors	\$ 10,679.80
E3	Meeting expenses	\$ (290,280.27)
E	Profit/Loss between 02/01/2024 to 8/31/2024	(\$29,382.42)
	Meeting income (expenses) Prior to 2/01/2024	\$79,922.23
	Profit/(Loss), Spring 2024 Meeting*	\$50,539.81
	<u>Expenses, Future Meetings (deposits paid, etc)</u>	
	Future Meeting Revenue between 02/01/2024 to 08/31/2024	\$0.00
	Future Meeting Expenses between 02/01/2024 to 08/31/2024	(\$4,250.00)
F	Total Meeting Revenue/(Expenses) for Future Meetings between 02/01/2024 to 08/31/2024	(\$4,250.00)
G	Net Income (loss), between Spring 2024 and Fall 2024 meetings (B+C+D+E+F)	(\$26,836.21)
	Ledger/Bank Balance at Period Closing, 08/31/2024 (A + G)	\$ 334,723.13

Fall 2023 - KC Expenses/Revenue Reporting Through 8/31/24

	EXPENSES	REVENUE
<u>Meeting Revenue</u>		
Revenue from Registrations		\$ 338,805.00
Break Sponsors		\$ 9,000.00
Hotel Credits		\$ 14,014.56
<u>Meeting Expenses</u>		
Food and Beverage	\$ (157,272.85)	
Hotel Deposit - Used for Food and Beverage	-	
Audio Visual	\$ (33,209.32)	
Internet	-	
Sunday Night Social	\$ (1,250.00)	
Wednesday Night Social	\$ (13,451.68)	
Spouse Socials	\$ (2,519.52)	
Event Hub	-	
Cvent	\$ (11,794.44)	
Awards	\$ (147.95)	
Quandel Hospitality LLC	\$ (10,181.53)	
Transportation	\$ (6,860.00)	
Shipping Costs	-	
Credit Card Fees associated with Registration	\$ (10,167.30)	
Miscellaneous	\$ (137.00)	
<u>Total Revenue/Expenses</u>	\$ (246,991.59)	\$ 361,819.56

<u>F23 Gain/Losses</u>	\$ 114,827.97

Spring 2024 - Vancouver Expenses/Revenue Reporting Through 8/31/24

	EXPENSES	REVENUE
<u>Meeting Revenue</u>		
Revenue from Registrations		\$ 359,916.00
Break Sponsors		\$ 20,179.80
Hotel Credits		\$ 24,369.05
<u>Meeting Expenses</u>		
Food and Beverage	\$ (199,307.13)	
Audio Visual	\$ (31,180.79)	
Internet	-	
Sunday Night Social	\$ (1,111.89)	
Wednesday Night Social	\$ (54,488.61)	
Spouse Socials	\$ (29,617.33)	
Cvent	\$ (10,353.56)	
Awards	\$ (697.66)	
Quandel Hospitality LLC	\$ (9,755.94)	
Transportation	\$ (4,615.74)	
Shipping Costs	\$ (833.01)	
Credit Card Fees associated with Registration	\$ (11,707.79)	
Miscellaneous	\$ (255.59)	
<u>Total Revenue/Expenses</u>	\$ (353,925.04)	\$ 404,464.85

<u>S24 Gain/Losses</u>	\$ 50,539.81

Note:

1. Break Sponsors includes additional revenue of \$10,679.80 by previous meeting sponsor (IFD Technologies)
2. Hotel Credits includes \$14,758.13 from Destination Vancouver

ANNEX A Bushings Subcommittee

ST Louis, Missouri USA
October 30, 2024, 09:30 AM

Chair:	Eric Weatherbee, PCORE Electric, Inc. / Hubbell Power Systems
Vice-Chair (presiding officer):	Scott Digby, Duke Energy
Secretary:	Fabian (Durand) Stacy, Hitachi Energy

A.1 Opening of the Meeting

A.1.1 Call to Order / Chairman's Opening Remarks

The Chair thanked the SC for their outstanding support and volunteer work. They then informed the SC that this is their final meeting as Chair, as the 5-year term limit has been reached. The Chair stated that our outstanding VC, Mr. Scott Digby, will assume the role at the first of the year and that anyone interested in an officer's position should speak with Mr. Digby.

The Chair presented and reviewed the proposed agenda that was circulated to the SC members by the Chair prior to the meeting. There were no comments concerning the proposed agenda.

The Chair requested that each person use the microphone, state their name and affiliation when addressing the subcommittee.

The Chair reminded the WG chairs and secretaries that their meeting minutes need to be submitted to the Subcommittee officers no later than 15 days after their WG or TF meetings took place.

A.1.2 Reminders of IEEE policies

The requisite IEEE-SA information concerning the Call for Patents, the Copyright Policy, and the Individual Participation Guidelines had been transmitted to SC Members and Participants along with the meeting agenda prior to this meeting.

A.1.3 New Members

It was reported that 6 new members have been accepted into the Subcommittee. The new members were Gabriel Delgado, Derek Hollrah, Jose Luis Machain, Francis Mills, Richard vonGemmingen and Matthew Weisensee.

A.1.4 Attendance

Participant rosters were circulated during the meeting to record the meeting attendance. The Chair presented a list of the 81 current voting members to perform a quorum check. Quorum was achieved. Per subsequent review of the rosters the meeting had 129 attendees, of which 54 were members and 75 guests, with 10 guests requesting Membership. Refer to [Appendix A](#) for meeting participants, their affiliation, and voting member status.

Table 1 – Meeting Attendance

Total	129
Members – Quorum Achieved	54
Guests	75
Guests Requesting Membership*	10

*Review of the historical attendance records indicates that of the 10 guests requesting Membership, 4 meet the eligibility requirements (Edwin Betancourt, Junho Lee, Markus Schiessl, and Fei Yang) and will be added to the membership roster effective at the next SC meeting.

A.1.5 Agenda Approval

As 54 of the 81 members were in attendance, a quorum was achieved. There were no comments on the proposed agenda. A motion was made by Sanjib Som and seconded by Peter Zhao to approve the agenda as proposed. This motion was carried by unanimous consent.

A.1.6 Previous Meeting's Minutes Approval

There were no comments on the minutes that had been posted. A motion was made by Kurt Kaineder and seconded by Juan Carlos Cruz Valdes to approve the minutes as posted. This motion carried by unanimous consent.

A.1.7 Status of Bushing Standards

The Chair presented the Standards Status Report for standards and guides under the Bushing SC, see [Appendix B](#).

A.2 Working Group and Taskforce reports

A.2.1 WG C57.19.00-2023 – Peter Zhao, Chair; **VACANT, Vice-Chair**; Eric Weatherbee, Secretary

No meeting was held due to the publication of the new revision of the standard last year

A.2.2 WG PC57.19.01 – Dr. Shibao Zhang, Chair; **VACANT, Vice-Chair**; Dominic Pollaro, Secretary

See the complete WG minutes in [Appendix C](#) of this report

The first WG meeting was held as the PAR was approved on 05/22/24. The Chair informed the WG of their purposed timeline with the first draft balloting target of January 2028. Two key topics discussed; 1) Consolidation of test tap dimensions to determine if these dimensions should be defined in the standard similar to the voltage tap dimensions, 2) Adding Dry Switching impulse as reference for 345-765 kV bushings.

A.2.3 WG C57.19.02 Distribution Transformer Bushings – Steven Shull, Chair; Ed Smith, Vice-Chair, Rhett Chrysler, Secretary

No meeting due to the status of the publication.

A.2.4 IEC/IEEE 65700-19-03 Bushings for DC Application – Eric Weatherbee (IEEE) and Lars Jonsson (IEC), Co-Chairs; Sami Debass, Vice-Chair; J. Arturo Del Rio, Secretary

See the complete WG minutes in [Appendix C](#) of this report.

The WG Chair reported that WG did not meet but the IEEE side will soon have a recirculation ballot to confirm the IEC comment resolutions were acceptable. The topic was further discussed in regard to the IEC side during the IEC Liaison report, see A.3.1.

A.2.5 WG C57.19.04-2018 – Scott Digby, Chair; Rich vonGemmingen, Vice-Chair; Anthony Natale , Secretary

See the complete WG minutes in [Appendix C](#) of this report.

The WG held its first meeting as the PAR was approved 09/25/24. Some key discussions were 1) Question if it's proper that Dry Switching is currently included, 2) The Chair sought a new liaison to C37.23, IEEE Standard for Metal-Enclosed Bus, Jeff Door volunteered to fill this role, 3) The WG was informed that there is work being done on how to make the test tap connection accessible outside of the bus for testing of the bushings inside without opening the bus, this will be discussed in future meetings with examples or presentations.

A.2.6 WG PC57.19.100-2012 – Tommy Spitzer, Chair; **VACANT, Vice-Chair; Fabian (Durand) Stacy, Secretary**

See complete WG minutes in [Appendix D](#) of this report.

The WG held a meeting but was unable to obtain a quorum. The WG Chair stated that the WG had previously approved proceeding to the ballot with the current draft and that they will seek SC approval in the upcoming meeting.

The WG Chair made a motion during SC meeting requesting approval to proceed to ballot, Sanjib Som seconded, and the motion was approved by unanimous consent.

A.3 External Liaison Reports

A.3.1 IEC Bushing Standards Activity – Kurt Kaineder, IEEE/IEC Liaison

See the complete report in [Appendix D](#) of this report.

Some of the key information included the following: 1) DC bushing standard is on track to be published early 2025, 2) Tap adapter standardization for 550kV and above, IEEE will review their results as similar subject is being addressed in 19.01. 2) Dimensional Standardization Part 1 will involve MV bushings only and is currently being considered as a non-mandatory specification but may become a standard/mandatory in the future. Mr. Zhao again requested that IEC review the IEEE dimensional requirements for consideration.

A.3.2 Amendment to IEEE 693, Recommended Practice for the Seismic Design of Substations - Durand Stacy

The Chair reported that the appeal to improper procedure prior to WG voting on proceeding to ballot and the CRG resolutions was denied and informed the SC that the first TF meeting for the full document revision will be a hybrid meeting on 01/16/2025 and provided website link and email contact for the 693 Chair.

A.4 Unfinished Business

A.5 New Business

Egon Kirchenmayer stated that their company will be providing updated testing methods with results for determining if its possiblea and or practical to determine if a bushing may be prone to PD during FAT.

A.6 Adjournment

A.7 Next Meeting: Spring 2025, Denver Colorado – March 23-27

Last Name	First Name	Role	Company
Abbas	Mubarak	M	Siemens Energy
Adams	Kayland	M	Prolec-GE Waukesha
Beaster	Barry	M	H-J Family of Companies
Boettger	William	M	Boettger Transformer Consulting LLC
Calitz	David	M	Siemens Energy
Castellanos	Juan	M	Prolec GE
Cruz Valdes	Juan Carlos	M	Prolec GE
Debass	Samson (Sami)	M	EPRI
Del Rio	J. Arturo	M	HSP-US LLC
Delgado	Gabriel	M	Invenergy
Digby	Scott	M	Duke Energy
Dinh	Huan	M	Hitachi Energy
Door	Jeffrey	M	H-J Family of Companies
Ermakov	Evgenii	M	Hitachi Energy
Frazier	Raymond	M	Ameren
Gamboa	Jose	M	H-J Family of Companies
Garcia Wild	Eduardo	M	Siemens Energy
Guner	Ismail	M	Hydro-Quebec
Gustavsson	Niklas	M	Hitachi Energy
Hayes	Roger	M	GE Verona
Hernandez	Ronald	M	Doble Engineering Co.
Hollrah	Derek	M	Burns & McDonnell
Kaineder	Kurt	M	Trench Austria
Kazmierczak	Jerzy	M	Hitachi Energy
Kirchenmayer	Egon	M	Siemens Energy
Kornowski	Marek	M	Polycast International
Machain	Jose Luis	M	Prolec-GE
Mills	Francis	M	POWER Engineers Inc.
Patel	Poorvi	M	Electric Power Research Institute (EPRI)
Plante	Sylvain	M	Hydro-Quebec
Radbrandt	Ulf	M	Hitachi Energy
Raymond	Timothy	M	Inductive Reasoning
Reed	Scott	M	MVA
Riopel	Sebastien	M	Electro Composites ULC
Sarkar	Amitabh	M	Virginia Transformer Corp.
Schleismann	Eric	M	Southern Company Services
Schweiger	Ewald	M	Siemens Energy
Sen	Cihangir	M	Duke Energy
Solano	William	M	Voltex
Som	Sanjib	M	Pennsylvania Transformer
Spitzer	Thomas	M	City Transformer Service Co.
Staley	Brad	M	Leeward Renewable Energy

Tanaka	Troy	M	Burns & McDonnell
Van Der Walt	Alwyn	M	Electrical Consultants, Inc.
Varnell	Jason	M	Doble Engineering Co.
Vir	Dharam	M	Prolec GE Waukesha Inc
vonGemmingen	Richard	M	Dominion Energy
Wallach	David	M	Duke Energy
Weatherbee	Eric	M	PCORE Electric
Weisensee	Matthew	M	PacifiCorp
Werelius	Peter	M	Megger
Whitten	Christopher	M	Hitachi Energy
Zhang	Shibao	M	PCORE Electric
Zhao	Peter	M	Hydro One
Alexander	Anthony	G	Hitachi Energy
Ashwini	Labh	G	Hitachi Energy
Baumgartner	Christopher	G	We Energies
Bayonee	Hugo	G	H-J Family of Companies
Benitez	Orlando	G	Hyosung HICO
BETANCOURT	EDWIN	G	SIEMENS ENERGY
Bhardwaj	naveen	G	Trench Group
Bohrn	Joshua	G	PacifiCorp
Bolar	Sanket	G	Oncor Electric Delivery
Brzoznowski	Steven	G	Bonneville Power Administration
Craven	Mike	G	Qualus Power Services
Dillon	Nikolaus	G	Dominion Energy
Dolloff	Paul	G	East Kentucky Power
Dopplmair	Peter	G	Trench Group
Duffy	Jesse	G	Nashville Electric Service
Dugger	Kenneth	G	Voltix/NASS
Elson	Eric	G	SDGE
Ferreira	Marcos	G	Quanta Technology
Fong	Sanford	G	Georgia Power
Garcia Paredes	David	G	Virginia Transformer Corp.
Gorzin	Alireza	G	Black & Veatch
Grushlewize	Samuel	G	GE Vernova
Hampton	Kevin	G	Siemens Energy
Herron	Bill	G	MR
Hossain	Saif	G	Trench Limited
Jarosz	Patrycja	G	IEEE SA
Jeong	Chanh	G	ILJIN Electric Co., Ltd.
Johnson	Christopher	G	Oncor
Johnson	Reeve	G	Hitachi Energy
Kim	Younhui	G	ILJIN Electric Co., Ltd.
Kowalski	Rafal	G	Hitachi Energy

Kumar	Arvind	G	Delta Star Inc.
Kurz	Andreas	G	MR
Kwiatkowski	Mateusz	G	Hitachi Energy
Lange	Nathan	G	HSP US LLC
Lee	Jihun	G	HD Hyundai Electric
Lee	Junho	G	Hyundai Electric
Lim	DongGi	G	ILJIN Electric Co., Ltd.
Loiselle	Luc	G	Tetra Tech
Manzano	Moses	G	Hyosung HICO
Marathe	Swapnil	G	Megger
Natale	Anthony	G	HICO America
Nissle	Boris	G	MGC Moser Glaser AG
O'Malley	Anastasia	G	Consolidated Edison Co. of NY
Park	Dean	G	Hyosung HICO
Perkins	Jason	G	Modu Electric
Pollaro	Dominic	G	NASS
Prado	Gustavo	G	Siemens Energy
Rashid	Adnan	G	Measurement Canada / ISED
Reyes	David	G	Oncor
Richardson	Michael	G	Ameren
Robalino	Diego	G	Megger
Sanchez Rodriguez	Jesus	G	Voltyx/NASS
Sankarakurup	Dinesh	G	Duke Energy
Schiessl	Markus	G	SGB
Schrammel	Alfons	G	Siemens Energy
Snyder	Jason	G	FirstEnergy
Stechschulte	Kyle	G	American Electric Power
Steele	Hampton	G	Tennessee Valley Authority
Stockton	David	G	Stockton Consulting
Sweetser	Charles	G	OMICRON electronics Corp USA
Tan	Jonathan	G	Northern Transformer
Tekle	Samuel	G	WEG Transformers
Thomas	Scott	G	Hitachi Energy
Trujillo	Pedro	G	Hyundai
Vaagensmith	Bjorn	G	Idaho National Laboratory
Van Dreel	Cole	G	American Transmission Co.
Wagner	John	G	AEP
Wang	Luke	G	BC Hydro
Watson	Joshua	G	Nebraska Public Power District
Wong	Terry	G	Trench Limited
Wright	Jeffrey	G	Duquesne Light Co.
Yang	Fei	G	Hitachi Energy

Young	Tim	G	Hitachi Energy
Zambrano	Jose	G	HSP US

F24 Unofficial Standards Status Report

Standard Project	Title	WG Chair	Pub Year Rev. Due Date	PAR Issue Par Expiration	Comments
C57.19.00	IEEE Standard General Requirements and Test Procedure for Power Apparatus Bushings	P. Zhao	2023 2033		Not Active
PC57.19.01	IEEE Standard Performance Characteristics and Dimensions for Outdoor Apparatus Bushings	S. Zhang	2017 12/2027	2024 12/2028	PAR has been approved, held first WG meeting
C57.19.02	Standard for the Design and Performance Requirements of Bushings Applied to Liquid Immersed Distribution Transformers	S. Shull	2023 2033		Not Active
P65700-19-03	IEC/IEEE International Standard -- Bushings for DC application	Eric Weatherbee	2014 12/2024	2021 12/2025	IEC Comments have been resolved. No IEEE comments received. Estimate recirculation Spring 2025
PC57.19.04	Standard Performance Characteristics and Dimensions for High Current Power Transformer Bushings with Rated Continuous Current in Excess of 5000 A in Bus Enclosures	S. Digby	2018 12/2028	2024 12/2028	PAR has been approved, held first WG meeting
PC57.19.100	IEEE Guide for Application of Power Apparatus Bushings	T. Spitzer	2012 12/2022	2019 12/2025	WG voted to move forward to ballot, needs SubCom approval

IEEE PES TRANSFORMER COMMITTEE

FALL 2024 St. Louis

F24 IEEE WG MEETING SUMMARY FOR BUSHING PC57.19.01

Chair: Shibao Zhang Secretary: Dominic Pollaro

SEE COMPLETE MINUTES ON TRANSFORMER COMMITTEE WEBSITE, www.transcommittee.org

Summary of Meeting

The TF Std Requirements for Bushings C57.19.01 committee met @ 9:30 am on Tuesday October 29, 2024

PAR Approved 5/22/24 to finish the revision by end of 2028

59 Attended in Total,

24 out of 46 TG Members Attended, Quorum Reached

Motion to Approve Agenda = APPROVED

Motion to Approve TF Minutes = NO OBJECTION

Motion to Approve Timeline = APPROVED

We expect to get the draft ready for balloting by January 31, 2028

Key Topics Discussed

Topic 1: Bushing Test Tap Dimensions

Topic 2: Dry Switching Impulse for 345/500/765 kV bushings

Visit www.transcommittee.org for finalized meeting minutes for F24

Working Group PC57.19.04
Standard Requirements for Bushings
above 5000A in Bus Enclosures
October 29, 2024 1:45-3:00 PM
St. Louis, Missouri
 UNAPPROVED MINUTES

1. Introduction

- Meeting was called to order at 1:47PM by Chair Scott Digby.
- Minutes recorded by Secretary Anthony Natale. Vice Chair is Rich von Gemmingen.

2. Agenda Review

- Meeting was called to order at 1:47PM by Chair Scott Digby.
- Minutes recorded by Secretary Anthony Natale. Vice Chair is Rich von Gemmingen.
- Agenda was presented
- PAR Status : PAR has been approved by NesCom Sept 25, 2024 for 4 years with an expiration date of Dec 31, 2028. This gives 9 Transformer Committee meeting. Reserving the final year for balloting means revision work should be complete and ready for sponsor ballot by the end of 2027

3. Membership

- As this is the first meeting of this WG, 23 members of the TF carried over. 37 people were in attendance including 15 of the 23 members. 10 guests requested membership and will be granted, giving us 33 members.

Previous Members	
Beaster	Barry
Cruz Valdes	Juan Carlos
DelRio	Arturo
Digby	Scott
Door	Jeffrey
Flores	Hugo
Gamboa	Jose
Hermann	Florian
Kaineder	Kurt
Locarno	Mario
Mani	Kumar
Mikulecky	Filip
Natale	Anthony
Pollaro	Dominic
Riopel	Sebastien
Spitzer	Tommy
Stacy	Fabian
Stockton	David
Thomas	Scott
Vermette	Yves
vonGemmingen	Richard
Webb	Matthew
Whitten	Christopher

New Members	
Abbas	Mubarak
Patel	Nirav
Young	Tim
Alexander	Anthony
Catugas	Marcelo
Giraldo	Orlando
Tyler	Lee
Speegle	Andy
Zhang	Shibao
Weatherbee	Eric

4. Call for Essential Patents, IEEE Copyright Policy, Behavior Policy

- Slides were shown. No essential patents were identified.

5. Approval of Minutes

- Minutes from TF were shown. Motion to approve the minutes was made by Juan Carlos Cruz Valdes and seconded by David Stockton. Minutes were approved by unanimous consent.

6. Document Overview

- Call was made for open discussion
- Sebastien Riopel from Electrocomposites stated they are not seeing many references to the standard from customers yet but good to have.
- Shibao Zhang from Pcore Electric pointed out that switching impulse is included even though the transformer standard does not directly test this. Also the NOTE references the values from C57.12.00. The question then became whether it's necessary to include these. This would require further discussion or a possible survey of the group.
- A question was posed to the group for any feedback on the testing requirements. Sebastian Riopel noted he felt it was sufficient and provided proper clarification on the differences between 19.01 and 19.04
- It was stated that the document refers to C37.23, IEEE Standard for Metal-Enclosed Bus, specifically Table 5 from the 2015 version. Previously the group had a liaison to that working group in Devki Sharma, but he is no longer active. Jeff Door is a member of C37.23 working group and volunteered to be a new liaison.

7. Next Steps

- Document will be circulated to the working group for comments.

8. New Business

- Art Del Rio brought up that he attended a workshop recently for GSU users. At this workshop, a test method for testing GSU bushings inside bus duct was discussed. Extensions that connect to the bushing test taps to bring the connection outside the bus for testing are being used to prevent having to open the bus duct to get into tight spaces for testing GSU bushings. A question was posed about this being a topic for a future meeting along with some examples or a presentation of what's being used to determine if this information belongs in this standard or the Bushing Application Guide 19.100.

9. Adjournment

- Meeting was adjourned at 2:17 pm.
- Next meeting will be at the Spring 2025 Transformers Committee meeting in Denver.

10. Attendance List

Last Name	First Name	Company Name
Abbas	Mubarak	HSP-US
Alexander	Anthony	Hitachi Energy
Avelino	Paulo	Hitachi Energy
Bayona	Hugo	H-J Family of Companies
Beaster	Barry	H-J Family of Companies
Catugas	Marcelo	Neil Services
Cruz Valdes	Juan Carlos	Prolec GE Internacional
DelRio	Arturo	HSP-US
Digby	Scott	Duke Energy
Door	Jeffrey	H-J Family of Companies
Dopplmair	Peter	Trench Group
Fu	Peng	Chint Electric
Gamboa	Jose	H-J Family of Companies
Giraldo	Orlando	The HJ Family of Companies
Johnson	Reeve	Hitachi Energy
Lange	Nathan	HSP-US LLC
Locarno	Mario	Doble Engineering Co
Natale	Anthony	HICO America
Nissle	Boris	MGC Moser-Glaser
Pandza	Tihomir	Siemens Energy KPT
Patel	Nirav	Yash Highvoltage Ltd
Plisic	Goran	Siemens Energy KPT
Riopel	Sebastien	Electro Composites Inc.
Schindler	Stefan	Machinenfabrik Reinhausen
Speegle	Andy	Entergy
Spitzer	Tommy	City Transformer Service Co
Stockton	David	Stockton Business Consulting
Takan	Can	MGC Moser-Glaser
Thomas	Scott	Hitachi Energy
Tyler	Lee	Warco Inc
vonGemmingen	Richard	Dominion Energy
Weatherbee	Eric	Pcore Electric
Webb	Matthew	GE Vernova
Whitten	Christopher	Hitachi Energy
Young	Tim	Hitachi Energy
Zambrano	Jose	HSP-US LLC
Zhang	Shibao	Pcore Electric

IEEE PC57.19.100**Guide for Application of Power Apparatus Bushing WG**

Minutes of 2024 Fall Meeting
Monday, October 28, 2024- 3:15-4:30 PM
HYATT Regency – St. Louis, Mo

Tommy Spitzer– Chair**Durand Stacy – Secretary**

The WG met on Monday, Oct. 28, 2024, at 3:15 PM in the Grand Ballroom F.

1. Welcoming and Call for Patents, Copyrights

- The meeting was called to order at 3:15 PM by the WG Chair.

2. Quorum

- Total of 49 participants: 9 members and 40 guests.
- A quorum was not met so no official business was conducted

3. Status of document

Draft 9 was approved to go to ballot by email voting. We had 11 of 19 members respond with 10 of the 11 voting to approve. I asked the bushing subcommittee for approval to go to ballot and it was granted.

Respectfully submitted,

Chair: Tommy Spitzer (t.spitzer@sbcglobal.net)

Secretary: Durand Stacy (durand.stacy@hitachienergy.com)

Attendance and status:

First Name	Last Name	Company	Status
Anthony	Alexander	Dominion Energy	Guest
Robert	Allison	Dominion	Guest
Barry	Beaster	H-J Family of Companies	Guest
Eun	Cho	Hico	Guest
Juan Carlos	Cruz Valdes	Prolec GE	Guest
Sami	Dubass	EPRI	Member
J. Arturo	Del Rio	HSP-US	Member
Paul	Dollof	East Kentucky Power	Guest
Jeffrey	Door	H-J Family of Companies	Guest
Peter	Doppchair	Trench	Guest
Jesse	Duffy	Nashville Electric	Guest

Sanford	Fong	Georgia Power	Guest
James	Gardner	Prolec GE	Guest
Orlando	Giraldo	H-J Family of Companies	Guest
Saif	Hossain	Trench	Guest
Patrycja	Jarosz	IEEE	Guest
Reeve	Johnson	Hitachi Energy	Guest
Kurt	Kaineder	Trench	Guest
Egon	Kirchenmayer	Siemens Energy	Member
Seungmo	Kim	Hico	Guest
Ashwini	Labh	Hitachi Energy	Guest
Mario	Locarno	Doble Engineering Co.	Member
Boris	Nissle	MGC Moser-Glaser	Guest
Goran	Plisic	Siemens Energy	Guest
Giraldo	Orlando	H-J Family of Companies	Guest
Nirav	Patel	Yash Highvoltage	Guest
Poorvi	Patel	EPRI	Guest
Dominic	Pollaro	NASS	Guest
David	Reyes	Oncor	Guest
Sebastien	Riopel	Electro Composites ULC	Member
Eric	Schleismann	Southern Company Services	Guest
Cody	Schott	H-J Family of Companies	Guest
Thomas	Spitzer	City Transformer Service Co.	Chair
David	Stockton	Yash Highvoltage	Guest
Can	Takan	MGC Moser-Glaser	Guest
Troy	Tanaka	Burns & McDonnell	Guest
Eduardo	Tolcachiz	TTE Transformers	Guest
Lee	Tyler	Warco	Guest
John	Wagner	AEP	Guest
Joshua	Watson	NPPD	Guest
Eric	Weatherbee	PCORE Electric	Member
Mathew	Weisensee	PacifiCorp	Guest
Peter	Werelius	Megger	Guest
Christopher	Whitton	Hitachi Energy	Member
Terry	Wong	Trench	Guest
Tim	Young	Hitachi Energy	Guest
Jose	Zambrano	Siemens	Guest
Shibao	Zhang	PCORE Electric	Member
Richard	vonGemmingen	Dominion Energy	Guest

BUSHING SC MEETING

IEC Liaison Report - Fall 2024

IEEE PES TRANSFORMERS COMMITTEE
Location: ST. LOUIS
Kurt Kaineder






1

TC 36A Team, Structure and Meetings

Role	Name	Term Of Office	NC
Chair	Mr Lars Jonsson	2026-12-31	SE
Secretary	Mrs Laura De Fina		IT

- Last General Meeting was held in Milan, Italy, on 15 June 2023
- Next General Meeting will hold jointly with TC 36. Probably in China in spring 2025

Membership:

- 15 Participating Countries
- 24 Observer Countries
- 205 experts recorded in the Expert System




2

Working Groups and related activities

- **JWG 10** Bushing application guide (J-C Riboud - FR)
WG is working on the document (IEC 63548)
- **MT 5** Maintenance Team for the revision of IEC 60137: (Lars – SE)
Insulated bushings for alternating voltages above 1kV.
Start the revision work of IEC 60137 with Call of experts
Sep. 29th. Nominations by the national committees still open!
The work will start from Jan 2025.
- **MT 6** Bushings seismic qualification (P. Cardano - IT) - IEC TS 61463
No activity in progress now. By the end of this year the process
of review of IEC TS 61463 ed.2 will start.
- **JMT 9** DLMT: HVDC Bushings (L. Jonsson - SE), IEC/IEEE 65700-19-0
“Bushings for DC application” CDV was circulated IEC and IEEE
in May and voted positively. All comments (IEC, IEEE) reviewed
and new version for re-balloting and FDIS submission in
preparation Q1/2025. Publication 2025




3

IEC/IEEE 65700-19-03 ED2 Bushings for DC application

- Last Meeting October 9th and 10th, for closing the last comments on CVD
- 22 comments reviewed and resolved
- RESULT OF VOTING ON CDV (RVC) - 36A/252/RVC published

Next steps:

- Updated CDV document for re-balloting in IEEE – expected by November 18th.
- Assuming the vote is positive and no technical comments, it will go to the IEC Editing team for a 12-week review
- Assuming there are no technical changes after this process, it is my understanding that IEEE will not require another balloting
- The document will then go for final voting in IEC – FDIS
- Standard to be published in 2025

Appreciation from Lars Johnson




Working Groups and related activities

- JWG 7 Dimensional bushing standardization linked to TC 14
(F. Mauri – IT and P. Cardano IT) (IEC TS 63493-1 & 2)
Transformer bushings dimensional standardization:
 - Part 1: Medium voltage and low voltage bushings
 - Part 2: High voltage bushings
- For part 1, the document IEC/36A/248/Q with the proposal for changing title and scope of document IEC TS 63493 part 1, was circulated in June and then approved in August.
- Basically, due to difficulties to standardize the several typologies of MV LV bushings, the scope of the document has been limited to the "Medium Voltage bushings with Um from 12 kV up to and including 52 kV and Ir from 630 A up to and including 3150 A". The SC 36 A will agree how to proceed regarding the interchangeability criteria for the bushings removed from Part 1 during the next plenary meeting.
36A/253/CD circulated and open for comments till January 31st.




5

Working Groups and related activities

- 36A/251/NP PNW TS 36A-251 ED1: General requirements for tap adapter of capacitance graded bushing
Circulation Oct. 18th, Closing Jan. 10th, 2025
- Proposed Scope:
This document gives the general requirements on composition, technical requirements, test items and requirements, inspection rules, marking, packaging, transportation, storage, on-site installation, acceptance criteria, and maintenance of the capacitance graded bushing tap adapter.
This document is applicable to the selection, testing, and application of the tap adapter of capacitance graded bushing for 550kV and below
- Topic was raised during last General Meeting in Rome. Chinese Committee representatives presented the proposal.
Proposal is now for vote by the national committees!




IEEE PES TRANSFORMERS COMMITTEE
Annex B DIELECTRIC TEST SUBCOMMITTEE

The meeting was held at the Hyatt Regency, St. Louis, Missouri, USA

Dielectric Tests Subcommittee		
Chair: Poorvi Patel	Vice-Chair: Thang Hochanh	Secretary: Diego Robalino
Room: Grand Ballroom E	Date: Wednesday, October 30, 2024	Time: 11:00 am to 12:15 pm
Total DTSC Members: 155	Members present at the meeting: 104	Attendance according to sign in sheet: 213
Guests present: 109	Membership requested: 27	Membership accepted: 3
Members moved to Guest Status: 19		

Chair's Remarks

The SC Chair welcomed members and guests to the fall 2024 meeting in St. Louis, Missouri.

Five sets of the SC roster were distributed for attendance record. SC Secretary requested unanimous approval to record the meeting for the sole purpose of minutes reporting. None are against it, and the meeting is recorded (only voice no video).

Considering the lack of a better system, SC Secretary prepared a QR code for the attendees to record attendance and SC meeting attendees were requested to use it.



Explanation about the roster sheet provided to review e-mail address and provide any corrections to update the attendance list.

First, SC Chair reviewed policies and procedures according to IEEE SA. It was stated the need to identify potential essential patent claims. DTSC members and guests are reminded to inform SC Chair, SC Secretary or IEEE SA representative for our SC (Patrycja Jarosz, +19087268288, p.jarosz@ieee.org) of potential patent claims. Copyright policies, participation behavior, compliance with all applicable laws, including antitrust and competition laws.

It was requested to all attendees approach the microphone for questions and comments during the meeting stating name and affiliation.

Future events:

2025 IEEE PES- Grid Edge	January 21-23, San-Diego, CA
IEEE PES Transformer Committee Meeting Spring 2025	March 23-27, Denver, CO
IEEE PES General Meeting	July 27 – 31, Austin, TX
IEEE PES Transformer Committee Meeting Fall 2025	TBD, Bonita Springs, FL
IEEE DEIS Electrical Insulation Conference 2025	June 8 – 12, South Padre Island, TX

Next, SC Chair requested all TF and WG leaders to submit minutes on or before November 13th, 2024 including revised and updated attendance list. The information to be sent to SC Secretary via e-mail (diego_robolino@ieee.org). The information must be consolidated and submitted to the Main Committee by December 05, 2024. Also, a reminder was made for any online meeting happening in-between the in-person meetings also should keep a recorded attendance and minutes.

- **ADCOM highlights**

Patrycja Jarosz is now the Standards Program Coordinator for the entire Transformer Committee. She looks after any questions related to PAR generation or extensions. Her contact information was provided for guests and members if questions arise.

 Patrycja Jarosz

 p.jarosz@ieee.org

 +1 9087268288

Regarding WG and SC officer Training, it has become optional but highly recommended. IEEE SA's Antitrust, Competition, and Commercial Terms Policies remain mandatory for Standards Committee / Working Group Officers to complete within 90 days of appointment.

Training link: <https://iln.ieee.org/Public/ContentDetails.aspx?id=AE404C2328DA4A39AAD7AB5117681F05>

- **Optional** training that all current and future officers need to complete
- **Mandatory-** IEEE SA's Antitrust, Competition, and Commercial Terms Policies training shall be performed after appointment
 - Standards Committee/Working Group Officers within 90 days of appointment
 - Training is on demand
- **Recommend everyone to go through the training**

Memberplanet

- Testing is ongoing with no target date when it will be released.

List Serv-email address

- The SC Vice-Chair indicated that all WG and TF leaders are requested to send the list of members or non-members to Patrycja to be updated in **MyProject.**, she will generate the email address and set you up as admin to be able to change the list as well. Let her know if you want one email address for Members and Guests
- **PAR Changes, Modification and Extension**
 - Must have WG Approval
 - Must have SC Approval
- **Status of Active Standards**

Project	Title	Valid until	PAR Status
C57.127	Guide for the Detection of Acoustic Emissions from Partial Discharges	2028	WG inactive
C57.160	Guide for the Elec. Measurement of PD in HV bushings and Instrument Transformers	2033	WG inactive - PUBLISHED
C57.113	Recommended practice for PD Measurement Power	2034	WG Inactive Published
C57.98	Guide for Transformer Impulse Tests	2021	PAR 2024 extension granted (2 years)
C57.138	Recommended Practice for Routine Impulse Tests for Distribution Transformers	2026	PAR 2028
C57.161	Guide for DFR Measurements	2028	PAR 2028
C57.168	Low-Frequency Test Guide	2034	WG inactive
C57.12.200	Bushing Dielectric Frequency Response Guide (ENTITY WG)	2032	WG inactive

Next, NesCom/RevCom meeting dates and deadlines were reviewed.

Standard Board Meeting	Submittal Deadlines
29th -30th of October 2024	
09th-10th of December of 2024	
29th of January 2025	20 th of December 2024

SC Secretary's Report

SC Secretary brought back the attention to the use of the QR code, and some answers were recorded indicating that not all attendees were aware of their status (member or guest).

Agreed to display the members' names before scanning the QR code. Lesson learned. It is part of using an alternative system.

Sign-in sheet explanation. Emphasizing on where to sign attendance and where to request membership.

- Total Attendees to DTSC S24 meeting: **196**
 - o Total Members attended: **94** (out of 151)
- Requested Membership: **6**
 - o Rejected Membership: **0**
 - o Approved Membership: **6**

FIRST NAME	LAST NAME
Gabriel	Delgado
Rich	Frye
Alireza	Gorzin

Ravi	Gupta
Evan	Knapp
Xose	Lopez-Fernandez

- Total Members for Fall 2024 meeting: **157**
- Required for Quorum: **79**
- Requirements to become a DTSC Member:
 - o Attend **3** out of the last **5** DTSC meetings

A list of members was presented to the audience to establish a quorum during this meeting and QR code was displayed. Looking at the list of members, we requested to raise hands for headcount.

The headcount was completed with **88** members attending the meeting. **Therefore, the quorum was achieved.** The final review will be carried out against roster signatures and QR code data.

- o **Quorum, Approval of Minutes, and Agenda**

Once quorum was established, SC Chair requested a motion to approve the agenda for today's meeting:

- Motion by Evgenii Ermakov, second Sanjib Som.
- No objection to the unanimous approval of the agenda hence approved.

Chairperson requested a motion to approve the Spring 2024 minutes from Vancouver meeting including revisions made later to its publication:

- Motion by Jim McBride, second Sami Debass
- No objection to the unanimous approval of the agenda for the Fall 2024 meeting, hence approved.

Attendance Summary

	By Roster	By QR code
Total Attendees	213	181
Total # Of Members	155	155
Members Present	104	84
Quorum Present	YES (67.1%)	YES (54.2%)

SC Discussions and Motion passed.

New Business:

1. During the past meeting it was raised the question to form a DFR guide for Instrument Transformers
 - Diego Robalino indicated that a DFR guide was published in 2018, a DFR guide dedicated to bushings was published in 2022. There is experience within the group in the application of DFR on Instrument Transformers and a TF could be created to investigate the topic.

- SC Chair indicated that instrument transformer testing for DFR is different to that of power transformers and bushings and therefore the topic will not fit within the C57.161 DFR guide. A dedicated document is an option for this SC to consider. SC Chair opened a discussion on the topic.
 - Diego Robalino brings the **motion to start a Task Force for a DFR guide for instrument Transformers**.
 - Motion seconded by Evgenii Ermakov. No discussion and no objections to the motion. **Motion carries**.
2. Tauhid Ansari – indicated that to his TF in the continuous revision of C57.12.00 a topic was identified not to belong to this task force and it is brought up to the DTSC.
- Section 6.8. related to clearance between bushings.
 - Dan Sauer indicated that external dielectric clearance belongs to DTSC. A dedicated table was generated by a task force led by Eric David. The table and the text attached to it belongs to this SC. At the moment there is no TF or WG dealing with the topic but it is suggested to create one.
 - Bertrand Poulin made a statement about connectors not to be specified by manufacturers but by utilities in a way that those will not interfere with needed clearances. He suggested to leave the topic as is and the utility should be consulted in the selection of corona shield or other accessory.
 - Additional comments include the need for this table as it has been removed.
 - The ideal condition would be to have the utility and the manufacturer working together on the selection of those accessories but the discussion indicates low probability of that happening.
 - Dan Sauer clarified that Table 10 does exist in the document. SC Chair asked for follow up action.
 - Tauhid Ansari makes a **motion to create a Task Force to review section 6.8 text and table and report suggestions to this SC**. Thang Hochanh seconds the motion.
 - Ajith Varghese opens discussion around the Table 10 in the document, explanation is required for the text and the table.
 - Motion clarified by Tauhid Ansari.
 - SC Chair asks for any one against the motion. None heard. **Motion carries** and Tauhid Ansari will lead the TF and get the people to support this effort.
3. Ajith Varghese – During the presentation of TF on Low frequency Dielectric Tests made the following motions:
- a. Motion to for the DTSC to approve the modifications revisions on the text of the following sections:
- C57.12.90 section 10.8.1 General
 - Each Class II power transformer shall receive an induced-voltage test with the required test **voltage** levels from IEEE Std C57.12.00-2021 Table 4 columns 6 and 7 based on the HV voltage class corresponding to the maximum system voltage. The required test voltage levels shall be induced in the high-voltage winding. The tap connections shall be chosen, when possible, so that test levels developed in the other windings during the one-hour test are x times their nominal system maximum operating voltages, as specified in Table 4 of IEEE Std C57.12.00-2021, where x (also referred to as the “overvoltage factor” in the text that follows) is the ratio of the line-to-line test voltage on the high-voltage winding to the nominal system maximum operating voltage.
 - C57.12.00 Table 4 – Note b
 - ~~The induced-voltage tests~~ ^b **levels in the table above are based on an overvoltage factor of approximately 1.58 × nominal system voltage for the one hour test and 1.80 × nominal system voltage for the enhanced 7200 cycle test**
 - C57.12.00 section 5.10.5.5 Induced-voltage test for Class II power transformers
 - ~~With the transformer connected and excited as it will be in service, an induced-voltage test shall be performed as indicated in Figure 2, at voltage levels indicated in Columns 6 and 7 of Table 4. Minimum line to ground induced test levels for Class II power transformers shall be a multiple of corresponding line to ground nominal system voltage as follows: 1.58 times for one hour tests and 1.8 times for 7200 cycles enhancement level tests.~~
 - Dan Sauer seconds the motion
 - Ajith elaborated on the topic. No additional discussion.

- SC Chair asked if anyone opposed approval, none heard.
- SC Chair asked for anyone abstain, none heard.
- **The motion to modify the text passes with DTSC approval.**

b. Motion for the DTSC to approve the text that was surveyed and is attached in the TF report below.

- Class I PD : RLFT surveyed text (C57.12.90) that was approved for Motion at DTSC, scheduled 10/30/2024

10.7 Induced-voltage tests for distribution and Class I power transformers for distribution and Class I power transformers **without partial discharge test**

No changes to existing clauses 10.7.1 to 10.7.7.4

10.8 Induced-voltage tests for Class I power transformers with partial discharge test specifically requested by the purchaser

- Dan Sauer seconds the motion
- Minor discussion within the group. Less than 34 kV is excluded, 34.5 kV is included. Important to mention nominal system voltage. Document is based on nominal system voltage and not BIL.
- SC Chair asked for objections to unanimous approval. None heard.
- SC Chair asked for abstains to approval. None heard. **Therefore, motion carries with approval from the DTSC.**

4. During DFR revision presentation by Evgenii Ermakov a question from the floor. Brian McBride asked if to be consistent with the language of other standards, the title should read “Liquid Filled” instead of “Liquid Immersed”?

- The discussion analyzed that a PAR is already in place and a change of the title implies a new PAR. Therefore, consideration for a future revision. There is no preference established in the standards.

Old Business: No old business

Taskforce and Working Group Reports

Reports are in the order presented during the meeting

TF Core Ground and Winding Insulation Resistance

Chair: Diego Robalino

Acting Secretary: Swapnil Marathe

Monday, October 28, 2024.

Hyatt Regency, St. Louis at the Arch – Missouri Grand Ballroom A/B (4) 16:45 – 18:00

Minutes prepared by Swapnil Marathe, Secretary (in absence of Aniruddha)

- The meeting called to order by the WG Chair at 16:45

Total TF Members: 53	Members present at the meeting: 23	Attendance according to sign in sheet: 86
Guests present: 63	Membership requested: 20	Membership accepted: 8
Members moved to Guest Status: 12		

• Attendance Summary

	By Roster	By QR code
Total Attendees	86	62
Total # Of Members	53	53
Members Present	23	19
Quorum Present	NO (43.4%)	NO (35.8%)

- Patent statement from IEEE SA presented to attendees
- IEEE SA Policies presented to attendees
- Welcome new members of this TF:

Aikons	Tom
Duffy	Jesse
Ermakov	Evgenii
Leal	Fernando
Shaikh	Abdulmajid
Van Dreel	Cole
Vyas	Pragnesh

- Presentation by Tubos Trans Electric: 359 Units were tested by Mr. Eduardo Tolcachir
 - Two Construction type on Low Voltage side: Helical and Foil
 - Primary side is always cylindrical.
 - Questions from attendees:
 - Fernando Luis Garcia, EPRI - Was there any other test conducted to compliment or correlate with the IR testing done on the 359 transformers

- No additional testing has been performed to validate good or bad IR results as part of this experimental work
- Mixed transformers in the fleet – new and in-service.
- Presentation by Mr. Ajith M. Varghese: “IR Core to Ground”
 - To verify only one grounding from core to ground.
 - Test at 500V to 2.5kV DC for 1 Min:
 - Measurement shows a random selection of factory units
 - Generally speaking, results are around 6 GOhm
 - As a general rule of thumb, values greater than 2 GOhms are considered acceptable
 - Nameplate should show if core is internally grounded.
 - Tank and Frame should be grounded.
 - IR test to core is dependent on temperature but there are no IEEE references for temperature correction.
 - Natural Esters liquid typically have a lower IR value.
 - Abnormal Results and Possible causes
 - Core is shorted to gnd
 - Bolt stuck between the core and gnd.
 - Core laminations edges touching tank /frame
 - 10X or lower values compares to previous results.
 - Overheating Core= DGA
 - Moisture increase= Vacuum/ Dry
 - Question from attendees:
 - Tauhid Ansari, Hitachi Energy:
 - Any study done with PI on transformers core-ground test?
 - Ajith Varghese: Not many cases. New transformers have more than 2.0 . IR rises from 1 min to 10 min
- Sub Task Force Groups and Leader selection

Sub Task Force	Scope	Leader	Volunteers
1	Test Performance – Consistency and Best Practices	Diego Robalino	Eduardo Tolcachir Marcos Ferreira Zach Weiss
2	Factors Affecting IR measurements – Consistency and Best Practices	Jesse Duffy	Joseph Tadesco Samragui Dutta Roy Eduardo Tolcachir Pragnesh Vyas Mario Alonso Zach Weiss
3	Magnitude and Interpretation	Tauhid Ansari	Dan Sauer Tauhid Ansari Krish Vijayan Ali Naderian
4	Core Ground Resistance	Ajith Varghese	Sanjib Som Fernando Leal Jean Carlos Hernandez Krish Vijayan Parminder Panesar Joseph Tadesco Jesse Duffy

5	Frame (core clamp) to ground: Depending on the design – to include Ground Resistance	Eduardo Tolcachir	Krish Vijayan Jaber Shalabi

- Fernando Leal - Prolec GE - Sent results to Diego for IR frame to gnd on new transformers.
- Without quorum no minutes were approved
- Meeting was adjourned at 17:35.

Role	First Name	Last Name	Affiliation
M	Kayland	Adams	Prolec-GE Waukesha
M	Tauhid	Ansari	Hitachi Energy
M	Onome	Avanoma	MJ Consulting
G	Alejandro	Ayala	
G	Orlando	Benitez	
G	Edwin	Betancourt	-
G	Daniel	Blaydon	Baltimore Gas and Electric
M	William	Boettger	-
G	Michael	Botti	Hyosung HICO
G	Garrett	Bradshaw	Howard Industries
G	Steven	Brzoznowski	BPA
M	David	Calitz	Siemens Energy
G	Adriana	Cisco	Salt River Project
G	Gabriel	Delgado	Invenergy
G	Gustavo	do Prado	Siemens Energy
G	Fernando	Duarte	
M	Jesse	Duffy	Nashville Electric Service
G	William	Elliott	AEP SWEPCO
G	Eric	Elson	-
G	Marco	Espindola	Hitachi Energy
G	Lorne	Gara	Shermco Industries
G	David	Garcia Paredes	
G	Orlando	Giraldo	THE H-J FAMILY OF COMPANIES
M	Attila	Gyore	MIDEL and MIVOLT Fluids Ltd
G	Roger	Hayes	-
G	Sergio	Hernandez Cano	Hammond power solutions
G	Giovanni	Hernandez Decanini	Virginia Transformer
G	Benjamin	Hershberger	Midwest Transformer
G	Saramma	Hoffman	
G	Ryan	Hogg	Bureau of Reclamation
G	Thomas	Holifield	Howard Industries
G	MD Rashid	Hussain	Mississippi State University
G	Fawaz	Iqbal	OMICRON
M	John	John	Virginia Transformer Corp
G	Ryan	Jonak	Portland General Electric
M	Zan	Kiparizoski	Howard Industries
G	Egon	Kirchenmaya	-
G	Brian	Klaponski	Carte
G	Arvind	Kumar	Delta Star Inc
G	Mathieu	Lachance	
M	Fernando	Leal	PROLEC GE

G	Kangjin	Lee	Cheryong Electric
G	Junho	Lee	HD Hyundai Electric
G	Jihun	Lee	HD Hyundai Electric
G	Mario	Locarno	-
G	Luc	Loiselle	Tetra tech
M	Kushal	Mahajan	Sungrow
G	Swapnil	Marathe	Megger
G	Daniel	Martinez	-
G	Nader	Masoud	Central Moloney
G	Fernando	Meza	
G	Ismael	Naja	Eaton Corp.
G	Anthony	Natale	HICO America
G	Brody	Nesudd	-
G	Joe	Nims	Allen & Hoshall
G	Michael	Nolte	Kiewit
G	Cuauhtemoc	Ortiz	NPT
G	Dwight	Parkinson	Eaton
M	Poorvi	Patel	-
M	Rakesh	Patel	-
G	Harry	Pepe	Phenix Technologies
Chair	Diego	Robalino	-
G	Alberto	Sandoval	-
G	Garret	Sarkinen	Xcel Energy
G	Markus	Schiessl	SGB
M	Cihangir	Sen	Duke Energy
M	Abdulmajid	Shaikh	Delta Star Inc
M	Jaber	Shalabi	-
G	Steven	Snyder	-
G	Andy	Speegle	-
G	Kyle	Stechschulte	AEP
G	Andrew	Steineman	Delta Star, Inc.
G	Mathew	Sze	
G	Jonathan	Tan	Northern Transformer
M	Marc	Taylor	JFE Shoji Canada
G	Fernando	Tirado	Prolec GE
M	Eduardo	Tolcachir	Tte Transformers
G	Risto	Trifunoski	Trench group
M	Ajith	Varghese	Prolec GE Waukesha
M	Krish	Vijayan	-
G	John	Wagner	AEP
M	David	Wallach	Duke Energy
G	Joshua	Watson	
M	Zachery	Weiss	WEG transformers
G	Michael	Zarnowski	Carte
G	Jie	zhang	CHINT ELECTRIC CO.,LTD.

TF Revision to Low Frequency Dielectric Tests

St. Louis, Missouri, USA Meeting – October 29, 2024 1:45-3:30pm CST

Chair: Ajith Varghese

Vice Chair: Markus Schiessl

Secretary: Jason Varnell

1. The meeting was called to order at 1:45 PM.
2. 94 individuals were in attendance. A quorum was achieved with 35 of 58 total members present. 17 individuals requested membership; however, only 15 were given member status based on attendance and participation and will be added after the F24 meeting. 12 Members that were not present had missed two out of the last three meetings and will be moved to guest after the F24 meeting, which means there will be 61 members.
3. A motion was made by Philp Hopkinson (HVOLT) and seconded by Don Ayers (Ayers Transformer Consulting) to approve the Fall 2024 meeting agenda. There were no objections to unanimous approval of the agenda. A motion was made by Detlev Gross (Power Diagnostix) and seconded by Daniel Sauer (Eaton Corp.) to approve the Spring 2024 task force meeting minutes. There were no objections to unanimous approval of the Spring 2024 task force meeting minutes.
4. Overvoltage Factor for Induced Voltage Testing:

The chair shared the survey results from the March 21, 2024 TF survey on the topic of contradictions within C57.12.00 and C57.12.90 related to the overvoltage factor for induced voltage testing. There were 39 responses. 34 approved without comment. 1 approved with comment. 2 disapproved with comment. The chair shared all comments from the survey. The TF unanimously agreed to leave the surveyed text as-is and the recommended changes were not incorporated. There was one minor editorial correction to the surveyed text. A motion was made by Steve Antosz (Stephen Antosz & Associates, Inc) to send the modified surveyed text to the DTSC SC meeting that is scheduled for October 30, 2024. The motion was seconded by Detlev Gross (Power Diagnostix). The motion passed with unanimous approval. The TF approved text is as stated below:

C57.12.90

10.8.1 General

Each Class II power transformer shall receive an induced-voltage test with the required test voltage levels from IEEE Std C57.12.00-2021 Table 4 columns 6 and 7 based on the HV voltage class corresponding to the maximum system voltage. The required test voltage levels shall be induced in the high-voltage winding. The tap connections shall be chosen, when possible, so that test levels developed in the other windings during the one-hour test are x times their nominal system maximum operating voltages, as specified in Table 4 of IEEE Std C57.12.00-2021, where x (also referred to as the “overvoltage factor” in the text that follows) is the ratio of the line-to-line test voltage on the high-voltage winding to the nominal system maximum operating voltage.

C57.12.00

Table 4 – Note b

^b The induced-voltage tests levels in the table above are based on an overvoltage factor of approximately 1.58 shall be conducted at 1.58 × nominal system voltage for the one hour test and 1.80 × nominal system voltage for the enhanced 7200 cycle test

C57.12.00

5.10.5.5 Induced-voltage test for Class II power transformers

With the transformer connected and excited as it will be in service, an induced-voltage test shall be performed as indicated in Figure 2, at voltage levels indicated in Columns 6 and 7 of Table 4. Minimum line-to-ground induced test levels for Class II power transformers shall be a multiple of corresponding line-to-ground nominal system voltage as follows: 1.58 times for one hour tests and 1.8 times for 7200 cycles enhancement level tests.

Note: Above approved changes to section 5.10.5.5 (deletion of last sentence) will be incorporated into previously approved changes to this section for addition of testing at 1.05 X NSV.

5. Task Force on PD Testing of Class 1 Power Transformers – Don Ayers

The Task Force did not meet in person during the week of the Fall 2024 IEEE Transformers Committee meeting. Don Ayers (Ayers Transformer Consulting) surveyed the RLFT TF and DTSC on March 28, 2024. The survey had 81 % approval the recommended changes to C57.12.00 and 80 % approval for the recommended changes to C57.12.90. Don Ayers presented the 14 negative comments. The TF on PD Testing of Class 1 Power Transformers agreed that technical changes to the surveyed text were not required. The RLFT agreed to accept the surveyed text as-is with only minor editorial changes. A motion was made by Don Ayers to send the modified surveyed text to the DTSC SC meeting that is scheduled for October 30, 2024. The motion was seconded by Tuahid Ansari (Hitachi Energy). The motion passed with unanimous approval.

The TF approved text is as stated in Annex A (Below).

6. Task Force on PD Testing and Limits – Liquid DTR, Wind and Solar Transformer - Andrew Larison

The TF chair was not present for the RLFT and no update was given. The minutes from their TF meeting is included in Annex B (Below).

7. Old business

There was no old business.

8. New business

There was no new business.

9. The meeting was adjourned at 3:00 p.m. The next meeting will be in Denver, Colorado, USA at the Spring 2025 IEEE Transformers Committee Meeting.

Attendance Record

Role	First Name	Last Name	Company
Guest	Kayland	Adams	Prolec-GE Waukesha
Member	Tauhid Haque	Ansari	Hitachi ABB Power Grids
Member	Stephen	Antosz	Stephen Antosz & Associates, Inc
Member	Elise	Arnold	SGB
Member	Donald	Ayers	Ayers Transformer Consulting
Member	Christopher	Baumgartner	We Energies
Guest	Duvier	Bedoya	Hitachi ABB Power Grids
Guest	Edwin	Betancourt	Siemens Energy
Member	Daniel	Blaydon	Baltimore Gas & Electric
Member	William	Boettger	Boettger Transformer Consulting LLC
Member	Alain	Bolliger	HV TECHNOLOGIES, Inc.
Member	Dominique	Bolliger	HV TECHNOLOGIES, Inc.
Guest	Michael	Botti	Hyosung HICO
Member	David	Calitz	Siemens Energy
Guest	Juan	Carrizales	Prolec GE
Guest	Bhaumik	Choksi	Hitachi Energy
Guest	Eric	Davis	Consultant
Guest	Scott	Dennis	Hitachi ABB Power Grids
Guest	Nikolaus	Dillon	Dominion Energy
Guest	Eric	Elson	SDG&E
Guest	Reto	Fausch	RF Solutions
Guest	Joseph	Foldi	Foldi & Associates, Inc.
Member	Raymond	Frazier	Ameren
Member	Rich	Frye	Eaton
Guest	Renjie	Fu	ERMCO
Guest	David	Garcia-Pareoles	Virginia Transformer Company
Guest	Eduardo	Garcia Wild	Siemens Energy
Guest	Alexander	Gaun	Coil Innovation GMBH
Guest	Carlos	Gaytan	Prolec GE
Guest	Jose Antonio	Gonzalez Ceballos	Virginia/ Georgia Transformers
Member	Bill	Griesacker	Consultant
Member	Detlev	Gross	Power Diagnostix Consult GmbH
Member	Sergio	Hernandez Cano	Hammond Power Solutions
Member	Saramma	Hoffman	PPL

Member	Philip	Hopkinson	HVOLT Inc.
Guest	Miljenko	Hrkac	Hitachi Energy
Guest	Marion	Jaroszewski	Delta Star Inc.
Guest	Nick	Jensen	Delta Star
Guest	Sheldon	Kennedy	SHELDON P. KENNEDY ENGINEERING
Guest	Yeounsoo	Kim	MEPPI
Guest	Zan	Kiparizoski	Howard Industries
Guest	Evan	Knapp	Eaton
Guest	Nihat	Kosedagi	Hitachi Energy
Guest	Arvind	Kumar	Delta Star
Member	Mark	Lachman	Doble Engineering Co.
Guest	David	Larochelle	NDB Technologies
Guest	Jihun	Lee	Hyundai Electric
Guest	Junho	Lee	HD Hyundai
Guest	Kang Jin	Lee	Changong Electric
Guest	Moonhee	Lee	Hammond Power Solutions
Guest	Xose	Lopez-Fernandez	Universidade de Vigo
Member	Gabriel	Mamede	Siemens Energy
Guest	Moses	Manzano	Hyosung HICO
Guest	Swapnil	Marathe	Megger
Guest	Alberto	Martinez	WEG USA
Guest	James	McBride	JMX Services, Inc.
Member	Marta	Munoz	Hitachi Energy
Guest	Hugo	Murillo	The H-J Family
Guest	Joe	Nims	Allen & Hoshall, Inc.
Guest	Cuauhtemol	Ortiz	NIAGARA POWER TRANSFORMERS
Guest	Manan	Pandya	Siemens Energy
Member	Harry	Pepe	Phenix Technologies, Inc.
Member	Sylvain	Plante	Hydro-Quebec
Guest	Klaus	Pointner	Trench Austria GmbH
Guest	Bertrand	Poulin	Hitachi ABB Power Grids
Guest	Ulf	Radbrandt	Hitachi ABB Power Grids
Guest	Juan	Reyes Perez	Hitachi Energy
Guest	Michael	Richardson	Ameren
Member	Rodrigo	Ronchi	WEG-Voltran
Member	Hakan	Sahin	Virginia and Georgia Transformers
Member	Daniel	Sauer	EATON Corporation
Vice-Chair	Markus	Schiessl	SGB
Member	Eric	Schleismann	Southern Company Services
Guest	Cihangir	Sen	Duke Energy
Guest	Aron	Sexton	Kinectrics
Member	AbdulMajid	Shaikh	Delta Star Inc.
Member	Christopher	Slattery	FirstEnergy Corp.
Member	Kyle	Stechschulte	American Electric Power
Guest	H. Allen	Steele	TVA
Member	Matthew	Sze	OMICRON electronics Corp USA
Guest	Jonathan	Tan	Northern Transformer
Guest	Samuel	Tekle	WEG Transformers USA Inc.
Guest	Andreas	Thiede	Highvolt Dresden
Guest	Pedro	Tryillo	Hyundai
Chair	Ajith	Varghese	Prolec-GE Waukesha
Secretary	Jason	Varnell	Doble Engineering Co.
Guest	Kannan	Veeran	Virginia Georgia Transformer
Member	Krishnamurthy	Vijayan	Pennsylvania Transformers
Member	Pragnesh	Vyas	Sunbelt-Solomon
Guest	David	Wallach	Duke Energy
Guest	Jeffrey	Wright	Duquesne Light Co.
Guest	Fei	Yang	Hitachi Energy
Guest	Hongzhi	Zhang	Hitachi Energy
Member	Kris	Zibert	Allgeier, Martin and Associates

Class I PD : RLFT surveyed text (C57.12.90) that was approved for Motion at DTSC, scheduled 10/30/2024

10.7 Induced-voltage tests for distribution and Class I power transformers for distribution and Class I power transformers **without partial discharge test**

No changes to existing clauses 10.7.1 to 10.7.7.4

10.8 Induced-voltage tests for Class I power transformers with partial discharge test specifically requested by the purchaser

10.8.1 General

Each Class I power transformer shall receive an induced-voltage test with the required test levels induced in the high-voltage winding. The tap connections shall be chosen, when possible, so that test levels developed in the other windings during the one-hour test are x times their maximum operating voltages, as specified in Table 3, Part C of IEEE Std C57.12.00-2021, where x (also referred to as the “overvoltage factor” in the text that follows) is the ratio of the test voltage on the high-voltage winding to the maximum operating voltage.

For a transformer built with a single magnetic core holding all windings, all windings are excited at a unique induction level, often referred to as “volts-per-turn.” During an induced-voltage test, with the transformer connected and excited as in service, all windings are excited at the same overvoltage factor, regardless of what tap is selected. Each winding turn receives the same voltage. The tap connections shall be chosen, when possible, such that voltages developed across other windings meet or exceed the required overvoltage factor.

The situation is quite different when transformers are equipped with auxiliary devices with separate magnetic cores, such as preventive autotransformer (reactor), series (booster) transformer, or series regulator. Different magnetic cores can be excited at different levels during operation or testing. In certain tap positions, these auxiliary devices do not have their core excited at all and no voltage appears across their windings. For such cases, the selection of the tap-changer position shall be guided by the principles described below. One exception is when such auxiliary devices are not excited on a permanent basis but used only as transitional devices. If equalizing windings are used, the highest voltage impressed across the preventive autotransformer will occur in either the bridging or non-bridging positions. This is because the preventive autotransformer is energized in all tap positions (bridging and non-bridging).

NOTE 1—Equalizing windings are described in IEEE Std C57.131 and IEC 60214-1.

For transformers equipped with a series (booster) transformer, preventive autotransformer (reactor), or any other device, the selected tap position of the load tap-changer (LTC) shall be the one that produces the highest voltage across the windings of the series transformer, preventive autotransformer, and other auxiliary devices as applicable. There can be a conflict of choosing such a tap position when more than one such device is present. In such a case, the selected tap position of the LTC should be the best compromise so that all devices are tested with overvoltage. One common example is the case where a series transformer and preventive autotransformer are both present. In this case, the tap selected shall be the one that is closest to the position that produces the highest voltage across the windings of the series transformer and simultaneously excites the preventive autotransformer,

which is typically a bridging position (not applicable when the preventive autotransformer is energized only during transition).

In order to test the series (booster) transformer, preventive autotransformer, and other devices, at the required minimum overvoltage factor, the voltage developed on the terminals of other windings may exceed the one-hour level mentioned in Table 3, Part C of IEEE Std C57.12.00-2021. In such cases, an alternative tap position may be selected by agreement between the manufacturer and the purchaser to avoid overstressing components such as bushings. [Annex D](#) shows examples that can serve as a guide to select the LTC tap position for transformers having series (booster) transformer and/or preventive autotransformers.

For certain types of devices such as series reactors used as current limiting devices, there is no voltage developed across their windings during the induced voltage test as these devices are only excited when current flows in their windings. There is no option available to apply any overvoltage for these devices during the induced test.

NOTE 2-The selection of the tap-changer position for induced test should be agreed upon between manufacturer and purchaser prior to design to avoid conflicts during final acceptance tests.

10.8.2 Test procedure

The voltage shall first be raised to the one-hour level and held for a minimum of 1 min or until a stable partial discharge level is obtained to verify that there are no partial discharge problems. The level of partial discharges shall be recorded just before raising the voltage to the enhancement level. The voltage shall then be raised to the enhancement level and held for 7200 cycles. The voltage shall then be reduced directly to the one-hour level and held for 1 h.

During this 1 h period, partial discharge measurements shall be made at 5 min intervals. Partial discharge acceptance criteria shall be per subclause [10.8.5](#) and these measurements shall be made in accordance with [10.10](#).

The pressure inside the transformer tank during the induced test shall not be increased by artificial means for the purpose of reducing the PD level. The liquid level and pressure inside of the transformer tank and/or conservator tank shall be configured such that the oil head pressure during the induced test does not exceed the pressure under usual service conditions. Any exceptions that increase tank pressure by more than 3.5 kPa (0.5 psi) over normal operating pressure, such as the use of an elevated test facility conservator tank, requires customer approval prior to test. A note shall be added to the certified test report confirming this approval.

NOTE—Increasing the pressure for diagnostic purposes, such as to identify and possibly reduce suspected bubbles in the liquid, may be done as a remedial step to diagnose a source of high PD. To be considered valid, the test needs to be repeated with no added pressure as stated previously.

10.8.3 Connections

The transformer shall be excited exactly as it will be in service. The voltage may be induced from any winding or from special windings or taps provided for test purposes. Single-phase transformers shall be excited from single-phase sources. Three-phase transformers shall be excited from three-phase sources. The neutral terminals and other terminals that are normally grounded in service shall be solidly grounded. This will stress all of the insulation at the same per unit of overstress.

10.8.4 Frequency

The test frequency shall be increased, relative to operating frequency, as required to avoid core saturation. The requirements in 10.7.2 are also applicable in the case of this induced test.

10.8.5 Failure detection

Failure may be indicated by the presence of smoke and bubbles rising in the insulating liquid, an audible sound such as a thump, or a sudden increase in the test current. Any such indication shall be carefully investigated by observation, by repeating the test, and by other diagnostic tests to determine whether a failure has occurred. In terms of interpretation of partial discharge measurements, the results shall be considered acceptable and no further partial discharge tests required under the following conditions:

- a) For transformers with nominal system voltage (NSV) of 34.5KV and above, the magnitude of the partial discharge level does not exceed 250 pC during the 1 h test period. For transformers below 34.5 kV NSV, the magnitude of the partial discharge level shall be set by agreement between the purchaser and the manufacturer.
- b) For transformers with nominal system voltage (NSV) of 34.5 kV and above the increase in partial discharge levels during the 1 h period does not exceed 50 pC. For transformers rated below 34.5 kV NSV, the increase of the partial discharge level shall be set by agreement between the purchaser and the manufacturer.
- c) The partial discharge levels during the 1 h period do not exhibit any steadily rising trend, and no sudden sustained increase in the levels occurs during the last 20 min of the test.

Judgment should be used on the 5 min readings so that momentary excursions of the partial discharge readings caused by cranes or other ambient sources are not recorded. Also, the test may be extended or repeated until acceptable results are obtained.

A failure to meet the partial discharge acceptance criterion shall not warrant immediate rejection, but it shall lead to consultation between purchaser and manufacturer about further investigations.

Note: Wording “ with nominal system voltage (NSV) of ” was not part of Text approved by RLFT but added to the text approved by DiElectric SC

Annex A-2

Class I PD: RLFT surveyed (C57.12.00 Table 3) that was approved for Motion at DTSC, scheduled 10/30/2024

Table 3—Dielectric insulation levels for distribution and Class I power transformers, voltages in kV

Maximum system voltage (kV rms)	Nominal system voltage ^{a, z} (kV rms)	Applied-voltage test ^t (kV rms)			Induced-voltage test ^{b, t} (phase to ground) (kV rms)	Winding line-end BIL ^{u, t} (kV crest)			Neutral BIL ^{d, c, k} (kV crest)	
		Delta or fully insulated wye	Grounded wye	Impedance grounded wye or grounded wye with higher BIL		Minimum	Alternates		Grounded wye	Impedance grounded wye or grounded wye with higher BIL
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8	Col 9	Col 10	Col 11
Part A - Distribution transformers										
1.5	1.2	10	-	10	1.4	30			30	30
3.5	2.5	15	-	15	2.9	45			45	45
6.9	5	19	-	19	5.8	60			60	60
11	8.7	26	-	26	10	75			75	75
17	15	34	-	34	17	95	110		75	75
26	25	40	-	40	29	125	150		75	95
36	34.5	50	-	50	40	125	150	200	75	125
48	46	95	-	70	53	200	250		95	150
73	69	140	-	95	80	250	350		95	200
Part B - Class I power transformers without partial discharge testing										
1.5	1.2	10	10	10	1.4	30	45		45	45
3.5	2.5	15	15	15	2.9	45	60		60	60
6.9	5	19	19	19	5.8	60	75		75	75
11	8.7	26	26	26	10	75	95		95	95
17	15	34	26	34	17	95	110		95	110
26	25	50	26	40	29	150			95	125
36	34.5	70	26	50	40	200			95	150
48	46	95	34	70	53	200	250		110	200
73	69	140	34	95	80	250	350		110	250

Maximum system voltage (kV rms)	Nominal system voltage ^{a, z} (kV rms)	Applied-voltage test ^t (kV rms)			Induced-voltage test ^{b, t} (phase to ground) (kV rms)		Winding line-end BIL ^{u, t} (kV crest)		Neutral BIL ^{d, c, k} (kV crest)	
		Delta or fully insulated wye	Grounded wye	Impedance grounded wye or grounded wye with higher BIL	Enhanced 7200 cycles	One hour	Minimum	Alternate	Grounded wye	Impedance grounded wye or grounded wye with higher BIL
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8	Col 9	Col 11	Col 12
Part C - Class I power transformers with partial discharge testing specifically requested by purchaser										
1.5	1.2	10	10	10	1.2	1.1	30	45	45	45
3.5	2.5	15	15	15	2.6	2.3	45	60	60	60
6.9	5	19	19	19	5.2	4.6	60	75	75	75
11	8.7	26	26	26	9	7.9	75	95	95	95
17	15	34	34	34	16	14	95	110	95	110
26	25	50	34	40	26	23	150		95	125
36	34.5	70	34	50	36	32	200		95	150
48	46	95	34	70	48	42	200	250	110	200
73	69	140	34	95	72	63	250	350	110	250

^aFor nominal system voltage greater than maximum system voltage, use the next higher voltage class for applied-voltage test levels.

^bInduced-voltage tests shall be conducted at 2.0 × nominal system voltage for 7200 cycles.

^cBold typeface BILs are the most commonly used standard levels.

^dY-Y-connected transformers using a common solidly grounded neutral may use neutral BIL selected in accordance with the low-voltage winding rating.

^eSingle-phase distribution and power transformers and regulating transformers for voltage ratings between terminals of 8.7 kV and below are designed for both Y and Δ connection, and are insulated for the test voltages corresponding to the Y connection so that a single line of transformers serves for the Y and Δ applications. The test voltages for such transformers, when connected and operated, are therefore higher than needed for their voltage rating.

^fFor series windings in transformers, such as regulating transformers, the test values to ground shall be determined by the BIL of the series windings rather than by the rated voltage between terminals.

^gValues listed as nominal system voltage in some cases (particularly voltages 34.5 kV and below) are applicable to other lesser voltages of approximately the same value. For example, 15 kV encompasses nominal system voltages of 14 440 V, 13 800 V, 13 200 V, 13 090 V, 12 600 V, 12 470 V, 12 000 V, and 11 950 V.

^hNeutral BIL shall never exceed winding BIL.

ⁱInduced voltage tests shall be conducted at 1.58 × nominal system voltage for one hour and 1.8 × nominal system voltage for enhanced 7200 cycle test.

Annex B –

Task Force on PD Testing and Limits – Liquid DTR, Wind and Solar Transformer

Meeting notes from 10/28/2024 meeting:

Task Force on Partial Discharge Testing in Distribution, Wind and Solar Transformers

St. Louis, MO

Monday, October 28, 2024

9:30 AM – 10:45 AM CST

Grand Ballroom E

Chairman – Andrew Larison – Hitachi Energy

Vice Chair/Secretary – Nabi Almeida – Prolec GE

1. IEEE Copyright Reminder was presented, no comments from the audience
2. IEEE Patent Claim Reminder was presented, no comments from the audience
3. **Attendance** – For this meeting a QR code is being used to record attendance as well as membership requests, the results will be shared before the end of the meeting. As a task force, quorum is not required.

First Name	Last Name	Position	Email	Roster Fall 2024
Nabi	Almeida	Vice-Chair	nabi.almeida@prolec.energy	Y
Tauhid	Ansari	Member	tauhid.ansari@hitachienergy.com	Y
Onome	Avanoma	Member	o.avanoma@outlook.com	Y
Donald	Ayers	Guest	Donald.ayers@ieee.org	Y
Hugo	Bayona	Guest	hugob@h-j.com	y
Jason	Beaudoin	Guest	Jason.beaudoin@weidmann-group.com	y
Duvier	Bedoya	Member	Duvier.bedoya@hitachienergy.com	y
Orlando	Benitez	Guest	Oblopez98@gmail.com	y
Dominique	Bolliger	Member	d.bolliger@hvtechnologies.com	y
Alain	Bolliger	Member	bolliger@hvtechnologies.com	y
Sudip	Chanda	Member	sudip.chanda2503@yahoo.com	Y
Eric	Davis	Guest	esctdavis@aol.com	y
Luiz	de Oliveira	Guest	batiacabeca@gmail.com	y
Gabriel	Delgado	Member	gdelgado@invenenergy.com	y
Scott	Dennis	Member	scott.dennis@hitachienergy.com	y
Gustavo	do Prado	Guest	gustavo.prado@sirmens-energy.com	y
Jose	Gamboa	Member	joseg@h-j.com	y
Lorne	Gara	Guest	lgara@shermco.com	y
Gilberto	Garza	Member	Gilberto.garza@prolec.energy	y
Carlos	Gaytan	Member	carlos.gaytan@prolec.energy	y
Orlando	Giraldo	Member	orlandog@h-j.com	y
Detlev	Gross	Member	dwg@mailbox.com	y
Grace	Guang Yuan	Member	guang.yuan@hitachienergy.com	y
Brooke	Harvey	Guest	Bharvey@mgpowerassociates.com	y

Miljeno	Hrkac	Guest	Miljenko.hrkac@hitachienergy.com	y
Mihai	Huzmezan	Guest	mihai.huzmezan@megger.com	y
Fawaz	Iqbal	Guest	fawaz.iqbal@omicronenergy.com	y
Akash	Joshi	Member	Akash.d.joshi@ieee.org	y
Yonghui	Kim	Guest	yonghui.kim@iljin.co.kr	y
Nihat	Kosedagi	Member	nihat.kosesagi@hitachienergy.com	y
Mathieu	Lachance	Member	mathieu.lachance@omicronenergy.com	y
Andrew	Larison	Chair	andrew.t.larison@hitachienergy.com	y
Fernando	Leal	Member	ferleal@gmail.com	y
Mario	Locarno	Member	mlocarno@doble.com	y
Kumar	Mani	Member	kumar.mani@duke-energy.com	y
Lee	Matthews	Guest	lmattthews@ieee.org	y
Ali	Naderian	Member	ali.naderian@ieee.org	y
Cuauhtemoc	Ortiz	Guest	cortiz@niagaratransformer.com	y
Poorvi	Patel	Member	Poorvi.patel@hotmail.com	y
Dan	Sauer	Member	dmsauer@mtu.edu	y
Cody	Schott	Member	Codys@h-j.com	y
Mathew	Sze	Member	matthew.sze@omicronenergy.com	y
Andreas	Thiede	Guest	a.thiede@highvolt.com	y
Joe	Watson	Guest	transformerconsulting@gmail.com	y
Zach	Weiss	Member	zweiss@weg.net	y
Trenton	Williams	Guest	trenton.ew@gmail.com	y
Shyzen	Xu	Guest	shuzen.xu@fmglobal.com	y
Joseph	Youn	Guest	joseph.youn@iljin.co.kr	y
Hongzhi	Zhang	Member	alan-hongzhi.zhang@us.abb.com	y

4. Introductions – A round of introductions throughout of the room was performed.

5. Review Record of previous meeting

The records of the previous meeting were reviewed and a quick evaluation of the previously defined targets was mentioned.

Main topics of interest are:

- Accurate voltage levels of the simulation and tests
- Components should also be included on the requirements of tests
- Is there a correlation between PD/Local Corona with a specific component?
- The impact of current limiting fuses on this test.

6. Scope of TF – It was proposed to the task force members the following scope definition:

“ Intended scope to focus on DTR transformers and wind and solar at 35 kV and less, manufactured with DTR components. No inclusion of “large” DTR or Power Transformers”

The TF then reviewed a proposed survey for mfgs using IEEE anonymous survey. A quick review of the PD processes of the existing standards was performed and no comments were made.

7. Collaborate to create a survey for manufacturers on current PD practices for DTR and wind and solar

The Chair started sharing an initial list of questions to be posed to manufacturers with a total of 15 questions. No IP information is included on the list.

John Ayers – Consultant shared his opinion. He referred to the 5-legged transformer requirements. And, he mentioned a proposal for class 1 PTs that has not reached consensus on his TF

Ali Nauderian – Consultant, he mentioned that most components have better performance than the transformer under oil. His proposal is that it should be worth seeing if testing the transformer with the components has an impact. His second point is to also include the lab background PD in the survey.

Dan Sauer – Eaton Corp. – He mentions that is very important to consider that the DT transformers is tested in the production line and several components will create a lot of background noise. What is the problem we are trying to solve? Are these transformers having too many failures in the field that we are trying to prevent? The Chair contested that the current percentage of DT transformers being tested is not high. Dan continued that there are components in the DT transformers have components that naturally generate corona and PD. The chair contested that the intent of the TF is to come back to the WG and propose what should be done on this type of transformers ensuring that there is a compromise between what is feasible for manufacturers and the field conditions. Dan Sauer continued that the time duration on this test is also very important for this type of transformer.

Ali Nauderian came back to the podium to report that some end users are reporting gassing transformers. And that could be the motivation of the request for a general PD testing on DT transformers. He mentions that the challenge is to try and reproduce the load condition during the test and what the end-user thinks about the interaction between the harmonics on the load and the PDs. The Chair added that in his company there are additional tests when PD testing.

Detlev Gross – Consultant. He mentions that he understands that the test on the shop floor is difficult to perform the test, but his experience is that it is possible to execute. The Chair mentioned that there are some special booths that could be used, but this should be a special test. Edel agreed that this should be a design test.

Joe Watson – JD Watson and Assoc. He mentions that his biggest concern with this type of transformers is that throughout the years the requirements for these transformers have changed and the specs and RFQs are not up to the requirements of these transformers. It's unknown if it is the transformer or the site problem. In his opinion, is a mis-usage of the equipment. He believes it needs to be either a Class 1 or defined as a new class of transformers. He asks, do we really need fuses on this type of transformer. PD is important for the right type of transformer and DT is not this type of transformer.

Mathew Sze– Omicron. He does not see an issue in the field. He mentions that it should be a sample (design/special) test.

Akash Joshi – Kimley-horn. He mentions that they also help a lot of users and now that the rating of the transformer is now around 4 MVA and that the users do not know what they are doing. Users should step up and give the data from their installation. The date of installation is also important. The Chair mentioned that in the NEMA meeting a new class of transformers has been discussed to separate the normal DT and Wind and Solar DT.

Carlos Gaytan – Prolec GE – He suggested that the survey questions are good and that we should confirm which test method should be used. Let's not assume that the manufacturers would be testing a certain percentage of units and that the manufacturers do design or routine tests.

Kumar Mani – Duke Energy. He shared that some solar application transformers of his company show gassing. He asked why they are classified as DT transformers since in his opinion they are rectifier transformers. He mentions the importance of core grounding, he mentions that the manufacturers should at least test one unit out of every batch.

Zach Weiss – Weg transformers. He agrees with all the questions. He mentions that his company does all solar units. But they do not follow the IEEE. They ramp up then ramp down and hold for 10s only. With this they have a very high success rate.

Ali came back to the podium to share that maybe due to the differences of current wind/solar/BESS we should request also what is the population that the manufacturers see for each type. The Chair also agreed that BESS is its own niche

Mario Locarno – Doble Energy. He asked Dan Sauer how much work it would be to pull a unit from the line to test in a PD room. Dan answered that their factory does not have the proper room. Marl mentioned that it seems to be a problem in the field, and that they have a crew out doing more and more PD tests. He believes a compromise between the OEMs and the users are necessary. To eliminate PD as a problem.

Dan Sauer – Eaton Corp. Came back to the podium to mention that every DT transformer already goes through the induced test at 200%, if the PD could be done together with that test, it should not add time to the process. He mentions that the test sequence using a 10s seems to be very benign.

Detlev came back to the podium to disagree that you would need to take the transformer out of the line

Joe Watson came back and reported that he had some discussion with manufacturers in the past and they reported that they wanted to energize the transformers from the user inverter instead of the normal test. He also mentions that all the big inverters are exposed to a lot of harmonics that are using the same common ground

Jason Beaudoin - Weidmann. Mentions that the DC component is very important and needs to be taken into consideration.

Akash – C57.159 already defines solar application transformers. And that we should review that.

Mathew came back to the podium and he mentions that the way the transformer is energized is important. Testing under high dv/dt is very complicated. If the OEM is testing around 100 pC already at 60Hz and they want to test under this higher dv/dt will increase the complexity of the test

Dan came back to the podium to share that the inverter is a key component. And that the voltage line to neutral is not clean and that the ground point of the transformer and the inverter is very important. You should ground the midpoint instead of negative or positive bus. The inverter being designed poorly could mis represent the failure

Mihai Huzmezan - Megger – His experience shows that solar farms and they need the tests because their customers have reported many problems. There should be ways to test at the floor. He also wants to state that in the field the background noise is higher but the criteria to pass or fail is also higher.

Alan Hongzhi – Hitachi Energy. Neutral grounded or not during the test. Also, the temperature of the site is important and cannot be reproduced during the test.

8. Collaborate to create a survey for wind and solar developers and end users

The chair shared a list and no comments from the audience were heard.

9. Collaborate to create a survey for DTR component manufacturers.

The chair shared a list of participants recommended, no comments from the audience.

The chair adjourned the meeting, mentioning that the next step is to work on a survey with the manufacturers.

Task Force on Revision of Impulse Tests

Chair: Sylvain Plante

Vice Chair: Daniel Sauer

St-Louis, MO, Fall 2024

Unapproved meeting minutes

The TF met on October 29th, 2024, from 08:00 am to 09:15 am.

Thirty-seven (37) members and ninety-one (91) guests attended the meeting (see attached attendance list). Thirty-three (33) Guests were attending for the first time the Task Force. Seven (7) guests requested membership but only four (4) are eligible to have attended at least 2 of the last 3 meetings. Two (2) members request membership. After this meeting, six (6) members has been moved to guest list, not having attended 2 of the last 3 meetings. The meeting was chaired by Sylvain Plante, Chair of the TF. and Mr. Daniel Sauer was the vice-chair.

The meeting has been called to order by the Chair at 08:10 am. The meeting start late du to the fat that a lot of people were coming in the room. The meeting is after the breakfast.

Attendance has been recorded in the TF's attendance EXCEL spreadsheets and include in the annex.

IEEE Patents and Copyright slides were presented. There were no comments or requests regarding Patents and Copyrights.

Required quorum was met, presence of at least 27 members out of 52 members was required, we had 32 members during Quorum verification. The TF membership roster has been reviewed after last meeting and this one.

The meeting agenda has been approved unanimously. Motion has been made by Sanjib Som and was seconded by John John.

The S24 meeting minutes held in Vancouver have been approved unanimously. Motion has been made by Bertrand Poulin and was seconded by Jim McBride.

The first item of business was related to the modification of clause 10.3.4.1 of C57.12.90 regarding the current detection. After a few discussions, a motion to move the point to the table and send a survey to the member and guests has been made by Dan Saur and seconded by Jim McBride. The motion has been voted unanimity.

The old business has not been discussed du to the fact that the group has not met during the summer.

The meeting adjourned at 09:00 am on October 29th, 2024, proposed by Sanjib Som and seconded by Bertrand Poulin. Voted Unanimity.

The next meeting is planned to be held in Denver, Colorado, March 23-27, 2025.

Minutes wrote by: Sylvain Plante, Eng.

TF Chair

November 12th, 2024

Role	First Name	Last Name	Company
Member	Kayland	Adams	GE Prolec
Guest	Nabi	Almeida	ProlecGE
Member	Stephen	Antosz	Stephen Antosz & Associates, Inc
Guest	Donald	Ayers	Ayers Transformer Consulting
Guest	sean	barker	
Guest	Christopher	Baumgartner	We Energies

Guest	Barry	Beaster	H-J Enterprises, Inc.
Guest	Duvier	Bedoya	Hitachi Energy
Guest	Eolwin	Betancourt	Siemens Energy
Guest	Kevin	Biggie	Weidmann
Member	William	Boettger	Boettger Transformer Consulting LLC
Guest	Alain	Bolliger	HV TECHNOLOGIES, Inc.
Member	Dominique	Bolliger, Ph.D.	HV TECHNOLOGIES, Inc.
Member	Steven	Brzoznowski	Bonneville Power Administration
Member	David	Calitz	Siemens Energy
Member	Juan Alfredo	Carrizales	Prolec GE
Member	camilo	casallas	
Guest	Jaroslaw	Chorzepa	ABB Inc.
Guest	Adriana	Cisco Sullberg	Salt River Project
Guest	Eric	Davis	Consultant
Guest	Luiz	de Oliveira	Hitachi Energy
Member	Gabriel	Delgado	Invenergy
Guest	Nikolaus	Dillon	Dominion Energy
Guest	Jeffrey	Door	The H-J Family of companies
Guest	Iuc	Dorpranns	Royal SMIT Transformers
Guest	Jesse	Duffy	
Member	Janko	Dzodan	Koncar
Guest	Eric	Elson	
Guest	Joe	Foldi	Foldi & Associates, Inc.
Member	Richard	Frye	EATON Corporation
Guest	Robert	Ganser	Transformer Consulting Services, Co.
Guest	Eduardo	Garcia Wild	Siemens Energy
Guest	David	Garcia-Paredes	Virginia Transformer Corp
Guest	Dragana	Gasic	Koncar
Guest	Orlando	Giraldo	THE H-J FAMILY OF COMPANIES
Guest	Jose Antonio	Gonzalez Ceballos	Georgia Transformer
Guest	Kyle	Heiden	Eaton
Member	Sergio	Hernandez Cano	Hammond Power Solutions
Guest	Giovanni	Hernandez Decanini	Virginia Transformer Corp
Guest	Thang	Hochanh	Surplec Inc.
Member	Samma	Hoffman	PPL
Guest	Thomas	Holifield	Howard Industries
Member	saif	Hossain	Trench limited
Guest	Miljenko	Hrkac	Hitachi Energy
Guest	Zinan	Huang	Sieyuan Electric
Guest	Marion	Jarozewski	Delta Star Inc
Guest	Chanho	Jeong	ILJIN Electric
Member	John	John	Virginia Transformer Corp.
Guest	christopher	Johnson	
Member	Qasim	Khan	
Guest	Yonghui	Kim	ILJIN ELECTRIC
Member	Evan	Knapp	Eaton corp
Guest	Nihat	Kosedagi	Hitachi Energ
Guest	Arvind	Kumar	Delta Star Inc
Member	Mark	Lachman	Doble Engineering Co.
Guest	David	Larochelle	Ndb technologies
Member	Fernando	Leal	Prolec GE
Member	Moonhee	Lee	Hammond Power Solutions
Member	Junho	Lee	Hyundai Electric
Guest	Weijun	Li	
Guest	Dongki	Lim	Iljin electric
Guest	Gabriel	Lopes Mamede	Siemens Energy

Member	Xose	Lopez-Fernandez	Universidade de Vigo
Guest	Tim-Felix	Mai	Siemens Energy
Guest	Mbouombouo	Mama	Hitachi Energy
Member	Moses	Manzano	
Guest	Daniel	Martinez	Jfe canada
Guest	Nader	Masoud	Central Moloney
Guest	lee	Mattews	
Guest	Joseph	Mc Bride	
Member	James	McBride	JMX Services, Inc.
Guest	Marta	Munoz	Hitachi Energy
Member	David	Murray	Tennessee Valley Authority
Guest	Nam Tran	Nguyen	TT Electronics
Guest	Boris	Nissle	MGC Poser Glaser
Guest	Cuauhtemoc	Ortiz	Niagara Transformer Corp
Guest	Manan	Pandya	Siemens Energy
Guest	Harry	Pepe	Phenix Technologies, Inc.
Chair	Sylvain	Plante	Hydro-Quebec
Guest	Goran	Plisic	Siemens Energy
Guest	Klaus	Pointner	Trench Austria GmbH
Member	Bertrand	Poulin	Hitachi Energy
Guest	Ulf	Radbrandt	Hitachi Energy
Guest	Ion	Radu	Hitachi Energy
Guest	Juan	Reyes	Hitachi Energy
Guest	Michael	Richardson	Ameren
Member	Rodrigo	Ronchi	WEG Transformers USA Inc.
Member	Hakan	Sahin	Virginia/Georgia Transformer
Guest	Dinesh	sankarakurup	
Vice-Chair	Daniel	Sauer	EATON Corporation
Guest	Eric	Schleisman	Southern Company Services
Guest	Cody	Schott	The H-J Family of Companies
Member	Cihangir	Sen	Duke Energy
Guest	Aron	Sexton	Kinectrics
Member	Mike	Shannon	REA Magnet Wire
Guest	Michael	Sharp	Trench Limited
Member	Hemchandra	Shertukde	University of Hartford
Member	Christopher	Slattery	FirstEnergy Corp.
Guest	William	Solano	Voltyx
Member	Sanjib	Som	Pennsylvania Transformer
Member	Kyle	Stechschulte	American Electric Power
Guest	Hampton	Steele	Tennessee Valley Authority
Guest	Andrew	Steineman	Delta Star Inc.
Guest	Can	Takan	MGC Moser-Glaser INC.
Guest	Jonathan	Tan	
Guest	Troy	Tanaka	
Guest	Samuel	Tekle	
Guest	Andrewa	Thiede	
Member	cole	van dreel	american transmission
Member	Ajith	Varghese	SPX Transformer Solutions, Inc.
Member	Jason	Varnell	Doble Engineering Co.
Guest	Krishnamurthy	Vijayan	PTI Transformers
Guest	John	Wagner	
Member	David	Wallach	Duke Energy
Guest	Luke	Wang	BC hydro
Guest	Alan	Washburn	
Guest	Joe	Watson	Joe Watson & Associates
Member	Matthew	Weisensee	PacifiCorp

Guest	Drew	Welton	Intellirent
Guest	Paul	Weyandt	Schneider Electric
Member	Terry	Wong	
Guest	Fei	Yang	Hitachi energy
Guest	Joseph	Youn	ILJIN Electric
Guest	Shibao	Zhang	PCORE Electric
Guest	JIE	ZHANG	CHINT ELECTRIC CO.,LTD.
Guest	Hongzhi	Zhang	Hitachi Energy
Member	Kris	Zibert	Allgeier, Martin and Associates
Member	Waldemar	Ziomek	PTI Transformers

WG Revision of C57.161 “Guide for Dielectric Frequency Response Measurements”

Chair: Evgenii Ermakov (Hitachi Energy – Sweden)

Vice Chair: Ismail Guner (HydroQuebec – Canada)

Secretary: Diego Robalino (Megger – USA)

Meeting in Grand Ballroom F (4) at the Hyatt Regency, St. Louis, Missouri

Unapproved meeting minutes

This is the very first meeting of this working group. WG Chairman started the session at 13:45 and welcomed all attendees and participants.

The attendees were communicated that this is the first meeting of this WG and all are welcome to become members. Approval of the agenda does not require a quorum today.

1. Introduction of attendees
2. The agenda for this first meeting was presented
 - a. Poorvi Patel moved a motion to approve the agenda
 - b. Mickel Saad seconded the motion
 - c. Agenda approved

Total TF Members: N/A	Members present at the meeting: N/A	Attendance according to sign in sheet: 66
Guests present: N/A	Membership requested: 42	Membership accepted: 42
Members moved to Guest Status: N/A		

- Patent statement from IEEE SA presented to attendees
- IEEE SA Policies presented to attendees
- Chair informed that PAR (project authorization) was received for this WG on May 22nd, 2024.

- C57.161 – 2018 document went through circulation
- PAR items to be considered:
 - Change of Document Title
 - Change of Document Scope with a focus on measurements and analysis
- As suggested by the WG Chair, four (4) Task Forces are required to complete the work on this revision.
 - Task Force 1 – Revision of Chapter 4
 - Task Force 2 – Revision of Chapters 5 & 6
 - Task Force 3 – Revision of Chapter 7
 - Task Force 4 – Revision of Anexess, Literature and Case Studies
- During the discussion, and after describing the scope of each task force, additional comments we addressed including:
 - The document now focuses on mineral oil, the intention is to extend the scope to alternative fluids
 - Extended discussion is considered in the algorithms used to estimate moisture
 - WG Chair presented his observations on each of the chapters for revision. That is to provide clarity to TF working on the revision.
- Open floor to attendees:
 - Peter Werelius – Words supporting the need to extend the scope of the document and modify the title
 - M. Locarno – Confused about what to add, Peter Werelius summarized the experience of the last 10 years.
 - Poorvi Patel – Emphasized the well-understood moisture issue, but additional anomalies have been observed, not all related to dielectrics. So knowledge has to be incorporated as well as the application on reactors.
 - Marcos Ferreira – Discussed some experience in Puerto Rico.
 - Charles Sweetser – Supports the idea of the nomination of leaders to run the TF out of the group of attendees. Also concerned about GST measurements and other failure modes. Considered construction as well.
 - Tom Prevost – Closely involved in the 1st document looking at percentage moisture in solid insulation (%mc). He suggested other items be picked up as informative.
 - Evgenii Ermakov – Mentions the use of UST of inter-winding insulation and the cylindrical model.
 - Tom Prevost – Scared about the application of DFR on reactors and GST measurement.
 - Poorvi Patel – highlighted the use of GST measurements and observed issues such as high core-ground resistance.

- **Task Forces**

TF	Scope	Leader	TF Volunteers
1	Chapter 4	Ron Hernandez	Charles Sweetser Peter Werelius William Herron Samson Debass Evgenii Ermakov
2	Chapters 5 & 6	Peter Werelius	Poorvi Patel Drew Welton Ron Hernandez Mario Locarno Fawaz Iqbal Evgenii Ermakov
3	Chapter 7	Poorvi Patel	Swapnil Marathe Ron Hernandez Peter Werelius

			Sudip Chanda Kumar Mani Alireza Gorzin Marcos Ferreira
4	Annex/Literature / Case Studies	Ismael Guner	Diego Robalino Samson Debass Rakesh Patel Ron Hernandez Evgenii Ermakov

WG Vice Chair requested for case studies any additional measurements using alternative fluids.

- Initial project draft document to be formally requested from IEEE SA (Patrycja Jarosz)
- Patrycja to provide the Word document to initiate revisions
- Poorvi Patel requested to have the case studies during the in-person meetings for knowledge and open discussion with the group.

The meeting adjourned at 2:50 PM.

Attendance Sheet

Role	First Name	Last Name	Company
Member	Onome	Avanoma	MJ Consulting
Member	Edwin	Betancourt	Siemens Energy
Guest	Dominique	Bolliger	HV Technologies
Member	Alain	Bolliger	HV Technologies
Member	Michael	Botti	Hyosung HICO
Guest	Garrett	Bradshaw	Howard Industries
Member	Sudip	Chanda	Delta Star
Member	Sami	Debass	EPRI
Member	Gabriel	Delgado	Invenergy
Guest	Will	Elliott	AEP/SWEPCO
Chair	Evgenii	Ermakov	Hitachi Energy
Member	Marco	Espindola	Hitachi Energy
Member	Marcos	Ferreira	Luma Energy
Guest	Mark	Finn	Hitachi Energy
Guest	Marc	Foata	MR GmbH
Guest	Chris	Franklin	MG Power
Member	Miguel	Garcia	Hitachi Energy
Guest	James	Gardner	Prolec GE Waukesha
Member	Alireza	Gorzin	VTC & GTC
Vice Chair	Ismail	Guner	Hydro-Quebec
Member	Niklas	Gustavsson	Hitachi Energy
Guest	Roger	Hayes	General Electric
Member	Ronald	Hernandez	Doble Engineering Co.
Member	Bill	Herron	MR

Member	Fawaz	Iqbal	OMICRON
Guest	Patrycja	Jarosz	IEEE SA
Guest	Ryan	Jonak	PGE
Guest	Braxton	Jones	SD Myers
Member	Qasim	Khan	
Member	Zan	Kiparizoski	Howard Industries
Guest	Mark	Lachman	Doble Engineering Co.
Guest	David	Larochelle	NDB Technologies
Member	Mario	Locarno	Doble Engineering Co.
Member	Kumar	Mani	Duke Energy
Member	Swapnil	Marathe	Megger
Guest	Mohammed	Megdad	IPS
Member	David	Murray	Tennessee Valley Authority
Member	Ali	Naderian	METSCO Energy Solutions Inc.
Guest	Boris	Nissle	MGC
Member	Poorvi	Patel	Electric Power Research Institute (EPRI)
Member	Rakesh	Patel	Hitachi Energy
Guest	Sylvan	Plante	HQ
Guest	Thomas	Prevost	Weidmann
Guest	Michael	Richardson	Ameren
Secretary	Diego	Robalino	Megger
Member	Rodrigo	Ronchi	WEG-Voltran
Member	Mickel	Saad	Hitachi Energy
Member	Paul	Salvato	Intellirent
Guest	Preston	Simon	ETSI
Member	Andy	Speegl	Entergy
Member	Brad	Staley	LTCE
Member	Gerry	Suman	ETSI
Member	Sunny	Swarna	VTC
Member	Charles	Sweetser	OMICRON electronics Corp USA
Member	Matthew	Sze	Omicron Electronics
Guest	Can	Takan	MGC
Guest	Andreas	Thiede	Highvolt
Guest	Eduardo	Tolcachir	Tubos Trans Electric S.A.
Member	Kannan	Veeran	Georgia Transformer
Member	Luke	Wang	BC Hydro
Member	Drew	Welton	Intellirent
Member	Peter	Werelius	Megger
Guest	Guang	Yuan	Hitachi Energy
Member	Shibao	Zhang	PCORE Electric
Member	Mark	Newbill	Hitachi Energy
Guest	Alexander	Gauen	Coil Innovation

TF C57.127- Revision of IEEE Guide for the Detection, Location and Interpretation of Sources of Acoustic Emissions from Electrical Discharges

Detlev Gross
Unapproved Meeting Minutes
Saint-Louis, October 29th, 2024, Room: Grand Ballroom AB(4)

Meeting Attendance

The working group met at 9:30 AM. 32 participants were in the room including 10 of the 24 members. Quorum was not met. Attendance list is shown at the end of the present minutes.

Discussions

After the call for essential patent claims and showing the copyright policy, the group addressed an external proposal from an entity member, which was mentioned in the opening session on Monday. The proposal suggests a Recommended Practice document covering online substation monitoring using acoustic fingerprint. This is achieved by installing multiple acoustic sensors in a substation to record and process acoustic signals for detecting or locating incipient failure.

Steve Shull explained the context in which an IEEE entity member can suggest the creation of a document. In the present case, it is agreed that although acoustic principles are involved, the proposed method (airborne acoustic in open air) does not fit within the C57.127 scope (solid / liquid propagation path inside transformers). Moreover, the technique is applicable to all equipment within a substation, not only power transformers and reactors. It is then suggested that this analysis be brought to the dielectric subcommittee with the recommendation that PCS handles the new project.

A tutorial on acoustic localization was then presented by Mathieu Lachance. It covered the basic principles of acoustic localization as well as case studies involving different methods and sensors (bushing tap, HFCT, UHF, or TEV) to acquire the electric signal that serves as a reference for time-of-arrival calculations. To answer questions about the sensitivity of the localization process, it was mentioned that although a PD as low as 10 pC can be localized in a laboratory with direct oil propagation path, field constraints involving noise, availability of clean electrical signals and complex propagation path renders every localization case unique.

Two contributions were received since Vancouver meeting. The new merged version of our document will be circulated before the next WG meeting for new comments. Again, the chair called for new localization case studies that could complete the ones already in the annexes.

Adjournment

The meeting was adjourned at 10h30.

David Larochelle

Attendance List

Complete name	Status	Affiliation
Jason Beaudoin	G	Weidmann
Sudip Chandra	G	Delta Star inc.
Marcos Czernorucki	G	Hitachi Energy
Fernando Duarte	G	EPRI
Eric Elson	G	San Diego Gas & Electric
Egui Espitia	G	Reinhausen
Marco Foata	G	Reinhausen
Eloy Gasperin	M	Mistras
Brad Graeaves	G	Weidmann
Detlev Gross	C	Independent
John Harley	VC	FirstPower Group LLC
Gary Hoffman	M	Advanced Power Tech
Patrycja Jarosz	G	IEEE SA
Zhang Jig	G	Chian Electric co
Mathieu Lachance	M	Omicron
David Larochelle	S	NDB Technologies
Jose Lopez-Fernandez	G	Universidad de WGO
Nader Masoud	G	Central Moloney
Omar Mendez	G	Prolec GE
Ali Naderian	G	EnerPars
Daniel Obregon	G	TTE transformers
Klaus Pointner	G	Trench Austria
Yuri Rossini	G	Siemens Energy
Mickel Saad	M	Hitachi Energy
Aron Sexton	M	Kinectrics
Hemchandra Shertukde	G	UHART / DDI
Leena Shimpi	G	MGM Transformers
Matthew Sze	M	Omicron
Eduardo Tolcachir	G	TTE transformers
Mark Tostrud	M	Dynamic Ratings
Karsten Viereck	G	Reinhausen
Guang Yuan	G	Hitachi Energy

WG C57.138 - Recommended Practice for Routine Impulse Tests

Unapproved Meeting Minutes Saint-Louis, October 29th, 2024

Chair:	<u>Hakan Sahin</u>	Vice-Chair	<u>Reto Faush</u>
Secretary	<u>David Wallace</u>	Percent Complete	<u>70%</u>
Current Draft Being Worked On:	<u>Draft not started</u>	Dated:	<u>n/a</u>
PAR Expiration Date:	<u>December 31, 2026</u>		
Meeting Date:	<u>29 October 2024</u>	Time:	<u>3:15pm</u>
Location:	<u>St. Louis, MO, USA</u>		
Attendance:	Members		<u>10</u>
	Guests		<u>23</u>
	Guests Requesting Membership		<u>4</u>
	Total*		<u>34</u>

* Attendance list for this meeting is shown at end of meeting minutes

Meeting Minutes / Significant Issues / Comments:

Meeting was called to order at 3:15pm, October 29, 2024.

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. Introductions of the attendees
 - i. Attendance sheets were passed out.
 - e. Updated membership review and count for quorum
 - i. 34 people were in attendance with 10 out of 15 members present. Quorum was **achieved.**
 - ii. Spring_24 unapproved meeting minutes and Fall_24 agenda were approved with no objections from the members.
 - iii. 0 attendees requested membership.
 - f. Dan Sauer Motioned for approval of agenda and Spring 24 minutes; Jim McBride seconded. No objections noted. Motioned passed

2. Old Business

WG continued to review the document from clause 8.3.2, where we had stopped at the end of Spring_24 meeting, thru clause 8.3.2, which is where we will continue from during the Spring_25 meeting. Proposed changes approved during the meeting. Below is the summary of the review comments.

8.3.2 – Proposed to remove the last sentence of the first paragraph. 7 voted to approve. No abstain. Motion Passed.

Reviewed Figure 26. Leave as is.

Proposed to Remove the first sentence of the fourth paragraph and the following word “However”. After EMI. Add “An off the shelf oscilloscope does not include the software required for the measurement of the peak voltage.”. 7 voted to approve a abstain. Motion passed.

Proposed to remove the 3rd paragraph. 7 approved, Motion passed

Discussed figures 27 and 28. Suggested replacing the waveforms with ones that will clearly demonstrate the problem. Jim McBride recommends three curves to highlight the errors.

Replace figures 29 and 30 with better representing figures.

Look into possibly replacing figures 31 and 32.

Change the last sentence in the paragraph before figures 33 and 34. Update figures 33 and 34.
Stopped on 8.3.2

No objections to adjourning.

WG is well on track to complete the review, revise the document per all approved revisions by the par expiration date of 12/31/2026

3. Next meeting: SPRING 2025 MEETING DENVER, COLORADO, USA March 23 - 27, 2025

4. Close of meeting

- a. Dan Sauer Motioned to adjourn, Jim McBride seconded. No objections
- b. Meeting adjourned at 4:30 pm.

Submitted by: Hakan Sahin Date: 11/15/24

WG C57.138 Members and Guests list

Below membership as of Fall_24 meeting, which will be updated by the Spring-25 meeting

Last Name	First Name	Company	Status	Last Name	First Name	Company	Status
Abdalla	Isaac	Hico America	Guest	Lachman	Mark	Doble	Guest
Alonso	Mario	Georgia Transformers	Guest	Lagos	Fernando	Ge Vernova	Guest
Ansari	Tauhid	Hitachi Energy	Guest	Lambert	Jason	JST Power	Guest
Arnold	Elise	SGB	Guest	Leal	Fernando	Prolec GE	Guest
Avanoma	Onome	MJC	Guest	Lee	Moonhee	Hammond power solutio	Guest
Beaudoin	Jason	Weidmann	Guest	Mani	Balakrishnan	ITEC	Guest
Betancourt	Edwin	Siemens Energy	Guest	McBride	Jim	JMXHV	Member
Binder	Wallace	Consultant	Guest	Masond	Nader	Central Maloney	Guest
Bolliger	Alain	HV Technologies	Member	Meza	Fernando	Ermco	Guest
Bolliger	Dominiques	HV Technologies	Guest	Montanha	Juliano	Siemens Energy	Guest
Britton	Jeffery	Phenix Technology	Guest	Moreno	Andre	Siemens Energy	Guest
Brzoznowski	Steven	BPA	Guest	Morris	Tim	Walton EMC	Guest
Calitz	David	Siemens Energy	Guest	Morrow	Gianetta	Crane Aerospace	Guest
Carr	Deniss	GE	Guest	Murray	David	TVA	Guest
Costa	Florian	Corimpex	Guest	Nissle	Boris	MGC Mozer-Glaser Inc.	Guest
CruzValdes	Juan Carlos	Prolec GE	Guest	ogajanov	Rudolf	Hitachi Energy	Guest
Davis	Eric	Consultant	Guest	Orozco	Polo	GE Grid Solutions	Guest
Derouen	Craig	ERMCO	Guest	Ortiz	Cuauhtemoc	Niagara Transformer Co	Guest
Diaz	Cesar	Eaton	Guest	Owen	John	PowerTech Labs	Guest
Dolloff	Paul	EKPC	Guest	Parrales	Herman	Prolec GE	Guest
Door	Jeffrey	H-J	Guest	Patel	Poorvi	EPRI	Member
Doppemair	Peter	Trench Group	Guest	Pepe	Harry	Phenix Technology	Guest
Elliott	William	Prolec GE	Guest	Plante	Sylvain	Hydro-Quebec	Guest
Eshenroder	Jacob	Burns and McDonnell	Guest	Plisic	Goran	Siemens Energy	Guest
Fausch	Reto	RF Solutions	Member	Posadas	Daniel	CELECO	Guest
Fayad	Fadi	ASD	Guest	Pousset	Baptiste	Transformer Protection C	Guest
Flores	Hugo	Hitachi	Guest	Prince	Jarrold	ERMCO	Guest
Frye	Richard	Eaton	Member	Rhett	Chrysler	ERMCO	Guest
Garcia	Eduardo	Siemens Energy	Guest	Ronchi	Rodrigo	WEG	Guest
Gaytan	Carlos	Prolecge	Guest	Sahin	Hakan	Virginia and Georgia Transformer	Member
Ghosh	Rob		Guest	Salinas	Fernando	Power Partners	Member
Givaldo	Orlando	HJ Family	Guest	Sarkar	Amitabh	VA Transformer	Guest
Hernandez	Giovannie	Virginia Transformers	Member	Sauer	Dan	Eaton	Member
Himow	Monkin	Highvolt	Guest	Schott	Cody	H-J Family	Guest
Hochanh	Thang	PowerTech	Guest	Schrammel	Alfons	Siemens Energy	Guest
Hopkinson	Phil	Hvolt	Member	seluargj	Pugual	VA Transformer	Guest
Hussain	MD Rashid	Mississippi State University	Guest	Sexton	Aron	Kinectrics	Guest
Jarosz	Patrycja	IEEE SA	Guest	Shaikh	Abdul Majid	Delta Star	Guest
Jordan	Steve	TVA	Guest	Shalabi	Jaber	Vantran	Guest
Katz	Nathan	Pacificorp	Guest	Sharp	Michael	Trench, LTD	Guest
Kennedy	Gael	GRKennedy&Associates I	Guest	Slattery	Chris	First Energy	Member
King	Gary	Howard Industry	Guest	Snyder	Steve	Hitachi Energy	Guest
Knapp	Evan	Eaton	Guest				

Last Name	First Name	Company	Status
Som	Sanjib	PTI, LLC	Guest
Steele	Hampton	TVA	Guest
Stretch	Kerwin	Siemens Energy	Guest
Sze	Matthew	Omicron Energy	Guest
Takan	Can	MGC Mozer-Glaser Inc.	Guest
Thibolt	Mike	PG&E	Guest
Thiede	Andreas	Highvolt Dresden	Guest
Thomas	Scott	Hitachi Energy	Guest
Tillery	Tim	Howard Industry	Guest
Traut	Alan	Howard	Member
Verdell	Joshua	ERMCO	Guest
Verdolin	Rogério	Verdolin Solutions	Guest
Waldrop	Mike	MLGW	Guest
Walker	David	MGM Transformers	Guest
Wallace	David	Mississippi State University	Member
Weisensee	Matt	Pacificorp	Guest
Wimbery	Barret	GE	Guest
Winter	Alexandar	Highvolt	Guest
Yun	Joshua	Virgina Transformer Corp	Member
Zaman	Malia	IEEE-SA	Guest
Zanwan	Anand	Siemens Energy	Guest
Zhang	Shibao	PCORE	Guest
Ziger	Igor	Kovear	Guest

WG – Transformer Impulse Test Guide PC57.98

Unapproved Meeting Minutes
Saint-Louis, October 29th, 2024, Room
Chair: Thang Hochanh
Vice Chair: Reto Fausch
Secretary: vacant

- No meeting.
- C57.98 is in process for balloting.

Liaison Report – HVTT

(J. Britton)

Standards Activity:

- IEEE 1122 – IEEE Standard for Digital Recorders for Measurements in HV Impulse Tests
 - Standard is Published (Jeff Britton)
- IEEE 510 – IEEE Guide for Electrical Safety in High-Voltage Testing
 - Draft Development Adding Clearances for Voltages 1kV-50kV (Jeff Hildreth)
- IEEE P4.1 Implementation Guide for IEEE 4
 - Draft Development – Uncertainty Estimation and K-Factor (Bill Larzelere)
- IEEE P454 – Guide for the Detection, Measurement and Interpretation of Partial Discharges
 - Draft Development (Glenn Behrmann)
- IEEE P2426 – Guide for Field Measurement of Fast-Front and Very Fast-Front Overvoltages in Electric Power System
 - Guide is Published (Shijun Xie)
- IEEE 4 – Standard for High-Voltage Testing Techniques
 - PAR for Revision Approved (Jeff Britton)

Meeting Activities:

- All PSIM meetings are hybrid
- JTCM – Annually (All PSIM Groups)
- IEEE GM – Annually (Sensors and Electricity Metering)

Upcoming Meetings:

- IEEE P454 – March 25th, 2024 (Virtual)
- HVTT Groups - IEEE P454 , IEEE 510, and IEEE 4 – November 20th - 21st , 2024, Fayetteville, GA (Hybrid)

WG to Investigate the Interaction between Substation Transients and Transformers in HV and EHV Applications and Revision of C57.142

**St. Louis, Missouri, USA
Tuesday, October 29, 2024
11:00 AM – 12:15 PM
Hyatt Regency - Grand Ballroom D**

**Chairman – Jim McBride
Vice Chair – Xose Lopez-Fernandez
Secretary – Tom Melle**

1. Welcome and Chair's Remarks
2. Circulation of Attendance Sheets. Quorum was achieved with 34 of 43 Members present. Guest attendance was 61 for a total of 95 attendees.
3. IEEE Patent Policy Slides – no patent claims
4. Approval of Agenda and Minutes from Last Meeting: Spring 2024 Minutes (motion by Akash Joshi / 2nd by Rogerio Verdolin) and Fall 2024 Agenda (motion by Phil Hopkinson / 2nd by Akash Joshi) unanimously approved.
5. C57.142 Ballot and Comment Resolution – Jim McBride
 The Chair presented the list of BRG Members. The BRG has reduced the unresolved comment list to just 15 unresolved comments and plans to address at least five per month in online meetings between now and the Spring 2025 meeting.
 Question from Phil Hopkinson: “what is the expected lifetime of MOV’s internal to a transformer?”; Eduardo Garcia commented they are designed to last the lifetime of the transformer. Rogerio Verdolin commented that simulations of these arrestors in the circuit should be a key element of the designed resilience of the transformer. Bertrand Poulin commented that arrestors inside the winding are only required to absorb several hundred amperes at most and that failure of these arrestors is extremely rare. This is totally different from needing to absorb the external line energy (perhaps ~10kA / ~1MV or more).
6. Mitigation Methods Task Force Update – Jim McBride / Phil Hopkinson
 The Chair presented the list of TF Members. A tutorial in the main session is being planned for Fall 2025 (latest Spring 2026).
 Rogerio Verdolin mentioned a paper he presented on the application of surge arrestors which he provided to the WG. The Chair also presented a list of the mitigation methods being considered so far that will be part of the tutorial and possibly added as a future Annex to the Guide. The Chair provided an overview of the few remaining comments (mostly general, but a few would require extensive changes to the organization of the Guide).
 Phil Hopkinson made a comment about older circuit breaker design utilizing “insertion of resistance” or “pre-insertion resistors” having dual sets of contacts (the first step closing on a resistor and the second step shunting the resistor). Phil suggested there should be some review of these designs, as the breakers have increased voltage ratings since the original designs.
 Jesse Duffy commented that newer circuit breakers (vacuum, SF6) typically do not have pre-insertion resistors. This usage has become more specialized (as needed) rather than common. Kumar Mani commented that zero-voltage closing breakers now very common. Bertrand Poulin commented that certain utilities prefer closing at approx. 40° (phase angle), rather than zero-crossing, as this avoids the maximum potential for inrush currents. Phil Hopkinson discussed capacitance grading as an option, but suggested this was a more difficult approach. The Chair mentioned pending changes to vacuum-interrupter designs, as the industry moves away from SF6 breakers, as something to keep in mind.
 Extensive discussions regarding the challenges of high-magnitude, high-frequency transients that the Guide is intended to address ensued. It was noted there are few (if any) factory tests that can simulate these occurrences. It was also mentioned that multi-contact vacuum interrupters rated 145 kV are increasingly common with 230 kV usage growing as well.
7. New Business – no new business
8. Next Meeting (Denver, CO March 23rd – 27th, 2025)
9. Adjournment at 12:05 PM

Meeting Attendance:

Role	Last Name	First Name	Company
Chair	McBride	James	JMX High Voltage
Vice	Lopez-Fernandez	Xose	Universidade de Vigo
Secretary	Melle	Thomas	HIGHVOLT
Member	Betancourt	Enrique	Prolec GE
Member	Boettger	William	Boettger Transformer Consulting LLC
Member	Espindola	Marco	Hitachi Energy
Member	Frazier	Raymond	Ameren
Member	Garcia	Miguel	Hitachi Energy
Member	Garcia Wild	Eduardo	Siemens Energy
Member	Heiden	Kyle	EATON Corporation
Member	Hernandez	JC	Georgia Tech - NEETRAC
Member	Hoffman	Saramma	PPL Electric Utilities
Member	Hopkinson	Philip	HVOLT Inc.
Member	Hossain	Saif	Trench Limited
Member	John	John	Virginia Transformer Corp.
Member	Joshi	Akash	Kimley-Horn
Member	Lee	Moonhee	Hammond Power Solutions
Member	Li	Weijun	Braintree Electric Light Dept.
Member	Pepe	Harry	Phenix Technologies, Inc.
Member	Plisic	Goran	Siemens Energy
Member	Pointner	Klaus	Trench Austria GmbH
Member	Poulin	Bertrand	Hitachi Energy
Member	Ronchi	Rodrigo	WEG-Voltran
Member	Roussell	Marnie	Entergy
Member	Sarkar	Amitabh	Virginia Transformer Corp.
Member	Sen	Cihangir	Duke Energy
Member	Sharp	Michael	Trench Limited
Member	Shertukde	Hemchandra	University of Hartford
Member	Varghese	Ajith	Prolec-GE-Waukesha
Member	Verdolin	Rogério	Verdolin Solutions Inc.
Member	Vir	Dharam	Prolec-GE Waukesha
Member	Yun	Joshua	Virginia Transformer Corp.
Member	Zhang	Shibao	PCORE Electric
Member	Ziomek	Waldemar	PTI Transformers
Guest	Avelino	Pavel	Hitachi Energy Brazil
Guest	Beaster	Barry	H-J Family of Companies
Guest	Bohrn	Josh	Pacificorp
Guest	Botti	Michael	Hyosung HICO
Guest	Calil	Wilerson	Hitachi Energy

Guest	Calitz	David	Siemens Energy
Guest	Carrizales	Juan Alfredo	Prolec GE
Guest	Casallas	Camilo	Trench LTD
Guest	Choksi	Bhaumik	Hitachi Energy
Guest	Czernorucki	Marcos	Hitachi Energy
Guest	de Oliveira	Luiz	Hitachi Energy
Guest	Dolloff	Paul	East Kentucky Power
Guest	Duffy	Jesse	Nashville Electric Service
Guest	Dugan	Roger	RE Dugan
Guest	Elson	Eric	SDGE
Guest	Finn	Mark	Hitachi Energy
Guest	Garcia	David	Virginia Transformer Corp.
Guest	Gardner	James	Prolec-GE-Waukesha
Guest	Harley	John	FirstPower Group LLC
Guest	Hernandez	Giovanni	Virginia Transfomrer Corp.
Guest	Hrkac	Miljenko	Hitachi Energy
Guest	Iman	Mohammad	MGM Transformer Company
Guest	Jaroszewski	Marion	Delta Star Inc.
Guest	Johnson	Christopher	Oncor
Guest	Khan	Qasim	Georgia Tech - NEETRAC
Guest	Kim	Yeounsoo	MEPPI
Guest	Kosedagi	Nihat	Hitachi Energy
Guest	Kumar	Arvind	Delta Star Inc.
Guest	Leal	Fernando	Prolec GE
Guest	Lee	Junho	HD Hyundai Electric
Guest	Leigl	Angela	EATON Corporation
Guest	Mani	Kumar	Duke Energy
Guest	Mantoan	Francis	Siemens Energy
Guest	Mbouombo	Mama	Hitachi Energy
Guest	Nissle	Boris	Moser-Glaser
Guest	Ortiz	Cuauhtemoc	Niagara Transformer
Guest	Pandza	Tihomir	Siemens Energy
Guest	Panetta	Sergio	I-GARD Corp
Guest	Parkinson	Dwight	EATON Corporation
Guest	Ploetner	Christoph	Siemens Energy
Guest	Prado	Gustavo	Siemens Energy
Guest	Radbrandt	Ulf	Hitachi Energy
Guest	Raymond	Tim	Inductive Reasoning
Guest	Rossini	Yuri	Siemens Energy
Guest	Sahin	Hakan	Virginia Transformer Corp.
Guest	Schleismann	Eric	Southern Company Services
Guest	Sharifi	Masoud	Siemens Gamesa Renewable Energy

Guest	Steele	Hampton	Tennessee Valley Authority
Guest	Steineman	Andrew	Delta Star Inc.
Guest	Tolcachir	Eduardo	TTE
Guest	Trujillo	Pedro	Hyundai Power Transformers USA
Guest	Velasquez	Juan	Magnetron
Guest	Vijayan	Krishnamurthy	Pennsylvania Transformer
Guest	Wagner	Jolin	American Electric Power
Guest	Wang	Luke	BC Hydro
Guest	Washburn	Alan	Burns & McDonnell
Guest	Watson	Joshua	Nebraska Public Power District
Guest	Wong	Terry	Trench LTD
Guest	Yang	Fei	Hitachi Energy
Guest	Yuan	Guang	Hitachi Energy
Guest	Zhang	Hongzhi	Hitachi Energy

List of Attendees to the DTSC meeting of October 30, 2024

Role	First Name	Last Name	Company
Member	Kayland	Adams	Prolec-GE Waukesha
Member	Tauhid Haque	Ansari	Hitachi Energy
Member	Donald	Ayers	Ayers Transformer Consulting
Member	Christopher	Baumgartner	We Energies
Guest	Jason	Beaudoin	Weidmann
Guest	Orlando	Benitez	Hyosung HICO
Guest	Edwin	Betancourt	Siemens Energy
Guest	Enrique	Betancourt	Prolec ge
Guest	Naveen	Bhardwaj	Trench Group
Guest	Wallace	Binder	WBBinder Consultant
Member	Daniel	Blaydon	Baltimore Gas and Electric
Member	William	Boettger	Boettger Transformer Consulting LLC
Guest	Joshua	Bohrn	PacifiCorp
Guest	Sanket	Bolar	Oncor Electric Delivery
Guest	Michael	Botti	Hyosung HICO
Guest	Garrett	Bradshaw	Howard Industries
Guest	Samuel	Brodeur	Hitachi Energy
Guest	Steven	Brzoznowski	Bonneville Power Administration
Guest	Wilerson	Calil	Hitachi Energy
Member	David	Calitz	Siemens Energy
Member	Juan Alfredo	Carrizales	Prolec GE
Member	Juan	Castellanos	Prolec GE
Guest	Vivian	Chan	Hitachi energy
Guest	J. Arturo	Del Rio	HSP US LLC

Guest	Bhaumik	Choksi	Hitachi energy
Guest	Adriana	Cisco	Salt River Project
Member	Craig	Colopy	Retired from EATON
Guest	Janet	Crockett	Fayetteville PWC
Member	Juan Carlos	Cruz Valdes	Prolec GE
Guest	Marcos	Czernoruck	
Member	Roberto	Da Silva	Maschinenfabrik Reinhausen
Guest	Caleb	Colby	
Member	Eric	Davis	Consultant
Guest	Pouneh	Davoudi	Delta Star Inc.
Guest	Tim	Dappen	Cargill
Member	Sami	Debass	Electric Power Research Institute (EPRI)
Member	Gabriel	Delgado	Invenergy
Guest	Scott	Digby	Duke Energy
Guest	Nikolaus	Dillon	Dominion Energy
Guest	Paul	Dolloff	East Kentucky Power
Guest	Jeffrey	Door	The H-J Family of Companies
Guest	Fernando	Daurte	
Guest	Luiz	de Oliveira	Hitachi Energy
Guest	Eric	Doak	
Member	Evgenii	Ermakov	Hitachi Energy
Member	Reto	Fausch	RHF Solutions
Guest	Peter	Dopplmair	Trench Group
Member	Raymond	Frazier	Ameren
Member	Richard	Frye	EATON Corporation
Member	Eduardo	Garcia Wild	Siemens Energy
Member	Alireza	Gorzin	Black & Veatch
Member	Detlev	Gross	Power Diagnostix Consult GmbH
Guest	Kenneth	Dugger	Voltyx/NASS
Guest	Attila	Gyore	MIDEL and MIVOLT Fluids Ltd
Guest	Jack	Harley	
Member	Roger	Hayes	GE Vernova
Guest	Kyle	Heiden	EATON Corporation
Guest	Eric	Elson	San Diego Gas & Electric
Member	Ronald	Hernandez	Doble Engineering Co.
Member	Sergio	Hernandez Cano	Hammond Power Solutions
Guest	Mark	Foata	
Vice-Chair	Thang	Hochanh	Bc Hydro
Member	Saramma	Hoffman	PPL Electric Utilities
Guest	Ryan	Hogg	Bureau of Reclamation
Guest	Derek	Hollrah	Burns & McDonnell
Member	Philip	Hopkinson	HVOLT Inc.
Guest	Saif	Hossain	Trench Group
Guest	Miljenko	Hrkac	
Guest	Patrycja	Jarosz	IEEE SA
Guest	Marion	Jaroszelski	Delta Star Inc

Guest	Nicholas	Jensen	Delta Star Inc.
Member	John	John	Virginia Transformer Corp.
Guest	Christopher	Johnson	Oncor
Member	Akash	Joshi	Kinley-horn
Guest	JOSEPH	Foldi	Foldi & Associate
Member	Kurt	Kaineder	Trench
Member	Jerzy	Kazmierczak	Hitachi Energy
Member	Sheldon	Kennedy	Sheldon P Kennedy Engineering PLLC
Guest	Brad	Graves	
Guest	Yeoundoo	Kim	MEPPI
Guest	Ismail	Guner	Hydro-Quebec
Guest	Miljenko	Hekac	Hitachi Energy
Guest	Zan	Kiparizoski	Howard Industries
Member	Egon	Kirchenmayer	Siemens Energy
Member	Evan	Knapp	EATON Corporation
Guest	William	Herron	Reinhausen
Guest	Anton	Koshel	Delta Star Inc.
Guest	Rafal	Kowalski	
Guest	Kevin	Juchem	Hitachi Energy
Guest	Mick	Kasonga	
Guest	Fernando	Lagos	GE Vernova
Guest	Andrew	Larison	Hitachi Energy
Member	David	Larochelle	NDB Technologies
Member	Fernando	Leal	Prolec GE
Member	Moonhee	Lee	Hammond Power Solutions
Guest	Junho	Lee	HD Hyundai Electric
Guest	Dugger	Kenneth	
Member	Weijun	Li	Braintree Electric Light Dept.
Guest	Qasim	Khan	NEETRAC -Georgia Tech
Guest	Seungmo	Kim	Hyosung HICO
Guest	Luc	Loiselle	Tetra tech
Member	Xose	Lopez-Fernandez	Universidade de Vigo
Guest	José Luis	Machain	Prolec GE
Guest	Jinesh	Malde	MIDEL & MIVOLT FLUIDS INC.
Guest	Gabriel	Mamede	Siemens Energy
Guest	Yonghui	Kim	ILJIN ELECTRIC
Guest	Moses	Manzano	Hyosung HICO
Guest	Swapnil	Marathe	Megger
Guest	Nihat	Kosedagi	Hitachi Energy
Member	Brian	McBride	Cargill, Inc.
Member	James	McBride	JMX High Voltage
Member	Thomas	Melle	HIGHVOLT
Guest	Omar	Mendez	
Member	Francis	Mills	POWER Engineers
Member	Emilio	Morales-Cruz	Qualitrol Company LLC
Guest	Arvind	Kumar	Delta Star Inc
Guest	Marta	Muñoz	Hitachi Energy
Guest	Andreas	Kurz	

Member	David	Murray	Tennessee Valley Authority
Guest	Ryan	Musgrove	Oklahoma Gas & Electric
Guest	Mark	Newbill	Hitachi
Guest	Ashwini	Labh	Hitachi Energy
Guest	Jihun	Lee	HD hyundai electric
Guest	Anastasia	O'Malley	Consolidated Edison Co. of NY
Member	Parminder	Panesar	Virginia Transformer Corp.
Member	Dwight	Parkinson	EATON Corporation
Chair	Poorvi	Patel	Electric Power Research Institute (EPRI)
Guest	Rakesh	Patel	Hitachi Energy
Guest	Dongki	Lim	Iljin electric
Guest	Verena	Pellon	
Member	Harry	Pepe	Phenix Technologies, Inc.
Member	Sylvain	Plante	Hydro-Quebec
Member	Klaus	Pointner	Trench Austria GmbH
Member	Bertrand	Poulin	Hitachi Energy
Guest	Rafael	Llamuza	Hitachi Energy
Member	Ion	Radu	Hitachi Energy
Member	Timothy	Raymond	Inductive Reasoning
Member	Scott	Reed	MVA
Guest	Michael	Richardson	Ameren
Secretary	Diego	Robalino	Megger
Member	Rodrigo	Ronchi	WEG Transformers México
Guest	Kumar	Mani	Duke Energy
Member	Mickel	Saad	Hitachi Energy
Member	Hakan	Sahin	Virginia Transformer Corp
Member	Amitabh	Sarkar	Virginia Transformer Corp.
Member	Daniel	Sauer	EATON Corporation
Member	Markus	Schiessl	SGB
Guest	Eric	Schleismann	Southern Company Services
Member	Ewald	Schweiger	Siemens Energy
Member	Cihangir	Sen	Duke Energy
Guest	Nader	Masoud	Central Moloney
Member	Abdulmajid	Shaikh	Delta Star Inc
Member	Hemchandra	Shertukde	University of Hartford
Guest	Mohammed	Megdad	
Guest	Stephen	Shull	BBC Electrical Services, Inc.
Member	Jonathan	Sinclair	Black and Veatch
Member	Christopher	Slattery	FirstEnergy Corp.
Member	Steven	Snyder	Hitachi Energy
Guest	Nader	Mfysous	
Member	Sanjib	Som	Pennsylvania Transformer
Member	Brad	Staley	Salt River Project
Member	Kyle	Stechschulze	American Electric Power
Guest	Hampton	Steele	Tennessee Valley Authority
Member	Andrew	Steineman	Delta Star Inc.
Member	Charles	Sweetser	OMICRON electronics Corp USA

Member	Matthew	Sze	Omicron Electronics
Guest	Jonathan	Tan	Northern Transformer
Member	Troy	Tanaka	Burns & McDonnell
Guest	Marc	Taylor	JFE Shoji Power Canada Inc.
Guest	Shivkumar	Morkhande	Siemens Energy
Guest	Andreas	Thiede	
Guest	Scott	Thomas	Hitachi
Guest	Mark	Tostrud	Dynamic Ratings, Inc.
Guest	Cole	Van Dreel	American Transmission Co.
Guest	Fredy	Murcia	Siemens Energy
Member	Ajith	Varghese	Prolec GE Waukesha
Member	Jason	Varnell	Doble Engineering Co.
Member	Rogério	Verdolin	Verdolin Solutions Inc.
Guest	Krishnamurthy	Vijayan	Pennsylvania Transformer
Member	Dharam	Vir	Prolec GE Waukesha
Member	Pragnesh	Vyas	Sunbelt-Solomon Solutions
Guest	John	Wagner	American electric power
Member	David	Wallace	Mississippi State University
Member	David	Wallach	Duke Energy
Guest	Nam Tran	Nguyen	TT Electronics
Guest	Alan	Washburn	Burns & McDonnell
Guest	Joshua	Watson	NPPD
Member	Bruce	Webb	Knoxville Utilities Board
Member	Matthew	Weisensee	PacifiCorp
Member	Drew	Welton	Intellirent
Member	Peter	Werelius	Megger
Member	Daniel	Weyer	Monolith
Guest	Joe	White	
Member	Barrett	Wimberly	GE Vernova
Guest	Terry	Wong	Trench Limited
Guest	Jeffrey	Wright	Duquesne Light Co.
Guest	Fei	Yang	
Guest	Michael	Nolte	Kiewit
Guest	Joshua	Yun	Virginia Transformer Corp.
Guest	Jesus	Nunez	
Guest	Shibao	Zhang	PCORE
Guest	Sanjay	Patel	SGB-Smit USA
Member	Kris	Zibert	Allgeier, Martin and Associates
Member	Waldemar	Ziomek	PTI Transformers
Guest	Gustavo	Prado	Siemens Energy
Guest	Marnie	Roussell	Entergy
Guest	Aron	Sexton	Kinectrics
Guest	Leena	Shimpi	Mgm Transformers co.
Guest	Jason	Snyder	FirstEnergy
Guest	Samuel	Tekle	WEG Transformers USA
Guest	Alwyn	Vanderwalt	Electrical Consultants Inc
Guest	Luke	Wang	BC hydro
Guest	Koray	Yavuz	Noark Electric US

Guest	Jie	Zhang	CHINT ELECTRIC CO.,LTD.
Guest	Hongzhi	Zhang	Hitachi Energy
Guest	Zhu	ZHIXIANG	Chint

SC Chair requested a motion to adjourn the meeting.

Sanjib Som made a motion, Dan Sauer second.

Meeting Adjourned at 12:15 PM.

Distribution Transformer Subcommittee

Task force / Working Group Report

Annex C Distribution Subcommittee – Chair: Jerry Murphy

October 30, 2024
St. Louis, MO USA

Chair: Jerry Murphy
Vice-Chair: Josh Verdell
Secretary: Martin Rave

C.1 General Opening

Jerry opened the meeting welcoming everyone to the meeting and provided a Standards Report. To establish a quorum, a list of members was displayed, and a count of members was taken. We did have a quorum with 64 members in attendance by count of those identified on a slide presented in the meeting. Recorded attendance gave 167 in attendance and 64 of 92 members. List of attendees and affiliation attached below.

The agenda was reviewed and revised to include a WG report on C57.15, Step-Voltage Regulators. Dan Sauer made a motion and seconded by Jeremy Van Horn to approve the revised agenda. The revised agenda was unanimously approved.

The Spring 2024 meeting minutes were reviewed. A motion was made to approve by John John and seconded by Dan Mulkey to approve the meeting minutes. The meeting minutes were unanimously approved.

At this time, Josh Verdell reviewed the membership changes. A slide was presented welcoming the new member of the subcommittee before proceeding with the working group and task force reports.

C.2 Working Group and Task Force Reports

██████ C57.12.20 – Overhead Distribution Transformers – Al Traut

This working group did not meet.

██████ C57.12.28, .29, .30, .31 & C57.12.32 – Enclosure Integrity – Dan Mulkey

Dan Mulkey presented the following minutes from the working group meeting on October 29, 2024, at 8:00 AM CDT with 84 in attendance.

1. Dan Mulkey called the meeting to order at 8:02 AM CST.
2. Opening remarks and announcements
 - a. Paper rosters were circulated.
3. Dan Mulkey reviewed IEEE SA Copyright Policy and Essential Patent Claims. No issues were raised.
4. Membership changes were noted:
 - a. Added: Jeffrey Brooks, Noah Chesser, Miguel Plascencia, Daniel Posadas

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b. Removed: John Crotty, William Elliott, Brad Kittrell, Maria Lamorey, Juan Ramirez, Jeffrey Schneider

5. Quorum was verified. The working group consisted of **64** members, requiring **33** for quorum. 41 members were counted at the start of the meeting. Attendance records later confirmed **44** members attended.
6. Dan Mulkey requested approval of the Fall 2024 Agenda. Mike Thibault made a motion, second by Jerry Murphy. Agenda was unanimously approved.
7. Dan Mulkey requested approval of the Spring 2024 Minutes. Justin Minikel made a motion, second by Mike Thibault for approval of the minutes. Minutes were unanimously approved.
8. Status of Standards:
 - a. C57.12.28 Standard for Pad-Mounted Equipment – Enclosure Integrity, Approved 2014
 - i. Expires: 12/31/2034
 - ii. Status: **Published May 7, 2024**
 - b. C57.12.29 Standard for Pad-Mounted Equipment – Enclosure Integrity for Coastal Environments, Approved 2014
 - i. Expires: 12/31/2034
 - ii. Status: **Published May 7, 2024**
 - c. C57.12.30 Standard for Pole-Mounted Equipment – Enclosure Integrity for Coastal Environments, Approved 2020
 - i. Expires: 12/31/2030
 - ii. Status: Plan to request PAR Dec 2026
 - d. C57.12.31 Standard for Pole-Mounted Equipment – Enclosure Integrity, Approved 2020
 - i. Expires: 12/31/2030
 - ii. Status: Plan to request PAR Dec 2026
 - e. C57.12.32 Standard for Submersible Equipment – Enclosure Integrity, Approved 2019
 - i. Expires: 12/31/2029
 - ii. Par Expires: 12/31/2027
 - iii. Status: Draft 1.4
9. Old business:
 - a. *C57.12.32 Clause 1.3 Word Usage* – Dan Mulkey presented suggested changes to include Clause 1.3 “Word Usage” as mandated by IEEE.

Jerry Murphy made a **motion** seconded by Steve Shull to adopt the clause 1.3 “Word Usage” as presented by Dan Mulkey. The motion passed unanimously.
 - b. *C57.12.32 Definitions Clause* – Dan Mulkey presented suggested three changes to the clause:
 - i. Swap the order of UL 94 and UL 746V in the Standard so they are in alphabetical order
 - ii. Include the statement “Transformer terminology found in IEEE C57.12.80 shall apply unless modified in this standard.”
 - iii. Add “SCAB – Simulated corrosive atmospheric breakdown” to the definitions and abbreviations clause.

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Jerry Murphy made a **motion** seconded by Steve Shull to approve the language related to references as presented by Dan Mulkey. The motion passed unanimously.

- c. *C57.12.32 Clauses 4.2.1 and 4.2.5* – Dan Mulkey, presented a suggested change to replace the word “what” with “which” in clause 4.2.1. Dan also entertained discussion around clause 4.2.5 around “external sharp corners shall be minimized”. The group discussed the verbiage “using best engineering judgment, external sharp corners shall be minimized.”

Tom Dauzat made a **motion** seconded by Mike Thibault to accept Clause 4.2.1 as proposed and change clause 4.2.5 to “External sharp corners and projections shall be minimized to maintain paint adherence”. During discussion, Carlos Gaytan commented that minimizing sharp corners does not just apply to paint adherence, but also safety, in the case that somebody falls into a pad-mount transformer. The motion was not modified and passed unanimously.

- d. *C57.12.32 Clauses 4.2.8* – Dan Mulkey presented a suggested addition of a new clause 4.2.8 as follows:

“4.2.8 Galling

Steps must be taken in the design and manufacture of the enclosures to prevent galling. Galling is known to occur with threaded fasteners where the mating surfaces are both made of the same stainless-steel alloy, aluminum alloy, or titanium alloy. Two commonly used methods to mitigate galling are listed below but are not specifically required separately or in combination. Alternative methods may be used if proven to be equally effective:

- Use anti-seize compounds or materials in the threaded joints
- Use dissimilar materials in threaded joints (e.g. silicon-bronze with stainless steel, brass with stainless steel,)

Note: Manufacturers and users should be aware that the use of dissimilar metals may lead to galvanic corrosion in some service environments. The use of dielectric unions or physical isolation of the materials is known to mitigate corrosion potential.”

Marty Rave made a **motion** seconded by Tom Dauzat to modify Section 4.2.8 Galling as approved in previous standards. The motion passed unanimously.

- e. *C57.12.32 Clause 4.2.9* – Dan Mulkey presented a suggested addition of a new clause 4.2.9 as follows:

“The enclosure shall be constructed of fire-resistant material. Non-metallic enclosures shall be made from material having a 5V classification per UL 94, or the enclosure shall comply with the 127 mm (5 inch) flame test specified in UL 746C.”

There was prolonged discussion around the definition of UL5V classification. Dan explained in approximate terms how the test functions. Bruce Webb and Fernando Mesa provided further clarification on the test procedure outlined by UL.

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Tom Dauzat made a motion, to accept the changes as presented by Dan. The motion was not seconded.

A **Task Force** was formed, chaired by Bruce Webb, to propose verbiage for a change to the clause. The Task force consists of Bruce Webb, Fernando Mesa, Tom Dauzat and Mike Thibault.

Mike Thibault made a **motion**, seconded by Justin Minikel, to table further discussion on 4.2.9 until the next meeting. The motion was approved unanimously.

- f. *C57.12.32 Clause F* – Dan Mulkey presented a suggested addition to section 5.3 as follows:

“5.3 Enclosure color

The exterior enclosure color shall be as agreed upon. Most commonly, enclosures are black or gray, but a referenced color standard is not specified in this document.”

Dan Mulkey also presented a suggested change to section 5.4 by replacing the word “in” with “during” and replacing “system” with “system(s)”

The group discussed the suggested changes. Jerry Murphy asked if “holiday” is defined anywhere. Justin suggested adding it to the definition sections.

A **task force** was formed chaired by Justin Minikel to propose a definition of “Holiday” for the definitions sections.

Al Traut made a **motion**, seconded by Jerry Murphy, to accept the proposed changes to sections 5.3 and 5.4 as presented by Dan Mulkey. The motion passed unanimously.

- g. *C57.12.32 clause 5.6.1.2* – Dan Mulkey presented suggested changes to 5.6.1.2 and 5.6.2 as follows:

Clause 5.6.1.2:

- i. Change clause to “shall be fabricated in accordance with” after “Three coated panels,”
- ii. Change clause to “to create an approximately 102 mm (4inch) long scribe across the weld,” after “ASTM D1654-05”.

Clause 5.6.2:

- iii. Add “This test requirement shall apply to all coating systems applied to the enclosure.” after the first sentence.

A **motion** was made by Justin Minikel, seconded by Al Traut to accept the changes as presented by Dan. The Motion passed unanimously.

- h. *C57.12.32 Clause 5.6.3 and 5.6.4* – Dan Mulkey presented suggested changes to 5.6.3 and 5.6.4 as follows:

Clause 5.6.3 Soak Test:

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- i. Revise the first sentence to “This test demonstrates proper pretreatment of the substrate and subsequent coating adhesion.”

Clause 5.6.4 Impact Test

- ii. Added “This test requirement shall apply to all coating systems applied to the enclosure.” after the first sentence.

A **motion** was made by Tom Dauzat, seconded by Mike Zarnowski, to accept the changes as presented. The motion passed unanimously.

- i. *C57.12.32 Clause 5.6.5* – Dan Mulkey presented suggested changes to clause 5.6.5 as follows;

Revised the second paragraph to: “This test requirement shall apply only for coated surfaces on the interior of the enclosure and that come into direct contact with insulating fluids.”

A **motion** was made by Tiffany Lukas, seconded by Al Traut, to accept the changes as proposed. The motion passed unanimously.

- j. *C57.12.32 Clause 5.6.7 and 5.6.8* – Dan Mulkey presented suggested changes to clauses 5.6.7 and 5.6.8 as follows:

Clause 5.6.7 Simulated corrosive atmospheric breakdown: added the sentence “This test requirement shall apply only for coated surfaces on the exterior of the enclosure.” as a new paragraph after the current sentence.

Clause 5.6.8 Abrasion resistance: added “This test requirement shall apply only for coated surfaces on the exterior of the enclosure.” as a new paragraph after the first paragraph.

A **motion** was made by Tom Dauzat, seconded by Martin Bachand, to accept the changes as shown. The motion passed unanimously.

- k. *C57.12.32 Clause 5.6.9 Chipping resistance test* – Dan Mulkey presented suggested changes to clause 5.6.9 as follows:

Added “This test requirement shall apply only for coated surfaces on the exterior of the enclosure.” as a separate paragraph after the first paragraph.

A **motion** was made by Tiffany Lukas, seconded by Martin Bachand, to accept the changes as shown. The motion passed unanimously.

- l. *C57.12.32 Annex B* – Dan Mulkey presented suggested changes to formatting throughout the Annex.

Tom Dauzat made a **motion**, seconded by Mike Zarnowski, to accept the changes as presented. The motion passed unanimously.

- m. *C57.12.32 Annex C* – Dan Mulkey presented suggested changes to the document to include a informative new Annex C on Substrate Surface Preparation.

Distribution Transformer Subcommittee

Task force / Working Group Report

The group discussed and a comment was made that the NACE standard which is referenced in the document has been replaced by the AMPP standard and the reference should be updated.

A **motion** was made by Tom Dauzat, seconded by Martin Bachand, to accept the annex as presented with the change of the AMPP standard in place of the NACE standard. The motion passed unanimously.

10. New Business

a. *Impact Testing* –

Justin Minikel reviewed Impact Testing with the group including

- i. The impact test method per ASTM D2794 and example images of failures
- ii. Areas where further clarification could be provided in Section 5.1 and 5.5 and 5.6.4 of the standard

Justin Minikel presented suggested changes to clauses 5.1 and 5.6.4 in a “Draft 1.5” as follows:

Clause 5.1 General

- i. Reword the second sentence in the paragraph to read “Each different combination of substrate(s) and coating(s) shall meet these design tests.”

Clause 5.6.4

- ii. Revised “If cracking is not evident...” to “If wrinkling or cracking is not evident...”

Justin Minikel made a **motion**, seconded by Tom Dauzat, to change the language and update the formatting of section 5.6.4 as presented in “draft 1.5”. There was discussion about the motion. Martin Bachand commented that we should further consider material thickness in this test. Dan Mulkey asked whether it made sense to run the 24h salt spray test on stainless steel material substrates. Justin commented that this test is primarily testing the coatings process more than the material itself. Jerry Murphy asked if we should come back and address crushing at a later date. The motion was not changed and passed unanimously.

- b. *Impact test in C57.12.29* – Justin Minikel commented that C57.12.29 does not have an impact test and asked the group if it should be considered. Conversation was tabled for a future meeting.

11. Next meeting: March 25, 2025, in Denver, Colorado, USA.

- a. The following attendees requested membership and will be added to membership for the Fall 2023 meeting: **Jared Bates, David Rohrer, Tim Menter, Fernando Meza**

12. The meeting was adjourned at 9:15 AM CST.

Submitted by: Jeremy Van Horn

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Date: Oct 29, 2024

List of Members:

<i>Alex Ayala (Power Partners)</i>
<i>Martin Bachand (Cloverdale Paint Inc.)</i>
<i>Jeffrey Brooks (POWER Engineers)</i>
<i>Darren Brown (Howard Industries)</i>
<i>Noah Chesser (Oncor Electric Delivery)</i>
<i>John Chisholm (IFD Technologies)</i>
<i>Douglas Craig (Richards Manufacturing Co.)</i>
<i>Thomas Dauzat (AEP)</i>
<i>Craig Derouen (ERMCO)</i>
<i>James Gardner (Prolec GE)</i>
<i>Carlos Gaytan (Prolec GE)</i>
<i>Ali Ghafourian (H-J Enterprises, Inc.)</i>
<i>Ramadan Issack (American Electric Power)</i>
<i>Gary King (Howard Industries)</i>
<i>Gilbert Kozar (Northeast Transformer Services, LLC)</i>
<i>Patrick Kozar (Northeast Transformer Services, LLC)</i>
<i>Andrew Larison (Hitachi Energy)</i>
<i>Tiffany Lucas (Prolec GE)</i>
<i>Alejandro Macias (CenterPoint Energy)</i>
<i>Justin Minikel (EATON Corporation)</i>
<i>Michael Morgan (Duke Energy)</i>
<i>Daniel Mulkey (Mulkey Engineering Inc.)</i>
<i>Jerry Murphy (Reedy Creek Energy Services)</i>
<i>Dwight Parkinson (EATON Corporation)</i>
<i>Vinay Patel (Consolidated Edison Co. of NY)</i>
<i>Miguel Plascencia (Pacific Gas & Electric)</i>
<i>Ion Radu (Hitachi Energy)</i>
<i>James Ratty (Electronic Technology Inc.)</i>
<i>Martin Rave (IFD Technologies)</i>
<i>Robert Reepe (Georgia Power Co.)</i>
<i>Mason Rush (Central Moloney Inc)</i>
<i>Pedro Salgado (Electronic Technology Inc.)</i>
<i>Stephen Shull (BBC Electrical Services, Inc.)</i>
<i>Igor Simonov (Toronto Hydro)</i>
<i>Edward Smith (H-J Family of Companies)</i>
<i>James Spaulding (Fort Collins Utilities)</i>
<i>Michael Thibault (Pacific Gas & Electric)</i>
<i>Alan Traut (Howard Industries)</i>
<i>Reinaldo Valentin (Duke Energy)</i>

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<i>Jeremy Van Horn (IFD Technologies)</i>
<i>Joshua Verdell (ERMCO)</i>
<i>Shelby Walters (Howard Industries)</i>
<i>Alan Wilks (Consultant)</i>
<i>Michael Zarnowski (Carte International)</i>

List of Guests:

<i>Jared Bates (Oncor Electric Delivery)</i>
<i>Matthew Chisholm (IFD Technologies)</i>
<i>Janet Crockett (Fayetteville PWC)</i>
<i>John Crotty (Ameren)</i>
<i>Rohrer David (First Energy)</i>
<i>Huan Dinh (Hitachi Energy)</i>
<i>Jake Draxton (Sherwin-Williams)</i>
<i>Sanford Fong (Georgia Power Co.)</i>
<i>Kevin Frye (Central Moloney Inc.)</i>
<i>Luke Grandbois (IFD Technologies)</i>
<i>Garza Hector (Orto de Mexico)</i>
<i>Jason Lambert (JST Power)</i>
<i>Nicholas Manske (Oncor Electric Delivery)</i>
<i>Timothy Menter (Lincoln Electric System)</i>
<i>Fernando Meza (Power Partners)</i>
<i>Charles Morgan (Eversource Energy)</i>
<i>Martin Munoz (Orto de Mexico)</i>
<i>Stefan Schindler (Maschinenfabrik Reinhausen)</i>
<i>Fernando Tirado (Prolec)</i>
<i>Bruce Webb (Knoxville Utilities Board)</i>
<i>Kangjin Lee (Cheryong Electric)</i>
<i>Rebecca Kim (Cheryong Electric)</i>
<i>Jim Cai (JSHP Transformers)</i>
<i>Nicholas Post (WEC Energy Group)</i>
<i>Joel Pacas (IFD Technologies)</i>
<i>Brian Conneighton (Cleveland-Cliffs)</i>
<i>Bryan Marquardt (Cleveland-Cliffs)</i>
<i>Fernando Duarte (EPRI)</i>
<i>Pragnesh Vyas (Sunbelt Solomon)</i>
<i>Juan Velasquez (Magnetron SAS)</i>
<i>Hugo Murillo (The H-J Family)</i>
<i>Joel Schumack (Ameren)</i>
<i>Gilberto Garza (Prolec GE)</i>
<i>Miguel Garcia (Hitachi Energy)</i>
<i>Qasim Khan (NEETRAC - Georgia Tech)</i>

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<i>Vedrana Starcevic Prebeg (Koncar-DFST)</i>
<i>David Cordova (Maddox Industrial XFMR)</i>
<i>Robert Mennonna (Maddox Industrial XFMR)</i>
<i>Holly Wassall (JST Power)</i>
<i>Megan Bereswill (JST Power)</i>

C57.12.34 – Three Phase Pad-Mount Transformers – Steve Shull

Steve Shull presented the following minutes from the working group meeting on October 28, 2024, at 3:15 PM CDT with 100 in attendance.

The Chair called the meeting to order at 3:15 P.M. CDT on October 28, 2024. Attendees verbally identified themselves by name and affiliation.

1. IEEE Privacy Policy
The Chair verbally stated and explained in detail all the information according to IEEE Privacy Policy.
2. Meeting Quorum
The Chair displayed the members of the WG and a quorum was established.
3. Agenda Approval
The Chair displayed the agenda for this meeting. A motion was made by Tom Dauzat and seconded by Lee Matthews to “Approve the Agenda as displayed”. The Chair asked any opposition to the displayed Agenda to which no opposition was observed. The Agenda was approved as displayed.
4. Minutes Approval
The Chair stated the Last Meeting Minutes were available online. A motion was made by Jerry Murphy and seconded by Mike Thibault to “approve the Last Meeting Minutes as shown online”. The Chair asked any opposition to approved these minutes as posted to which no opposition was observed. The Last Meeting Minutes were approved.
5. Confirmation of IEEE SA Essential Patent Statement
The patent information request was displayed. The chair provided an opportunity for participants to identify patent claim(s)/patent application claim(s) and/or if a participant is personally aware of patent claim(s)/patent application claim(s) that may be essential for the use of this standard. There were no responses to this request so no patent claim(s)/patent application claim(s) were identified.
6. IEEE SA Copyright Policy Statement and Participant Behavior Policy were shown without any discussion or objection.
7. Old Business

Task Force Reports

- TF #2 – The Task Force reported that “Although we are seeing higher kVA units for the voltages listed in Table 3, these requests are tied specifically to projects customized to the site, including the special short circuit current designs to accommodate these requirements.

As such, the TF did not feel it would be appropriate for an IEEE standard to increase the kVA ratings in Table 3.

However, the TF did recommend that the addition of voltages of 416Y/240 and 690Y/398.”

Distribution Transformer Subcommittee

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A motion was made by Igor Simonov and seconded by Gary King to accept these changes. The Chair asked if there was any opposition to approved this motion as presented to which no opposition was observed.

- TF #5 – Update bushing drawings to reference C57.19.02 and make them consistence with a common labeling practice, i.e. X_3 and not $X3$. Since this was editorial, no motion or vote was taken.

This taskforce also made modification to the standard to incorporate the reference to C57.19.02. This resulted in the removal of Figure 19 and 20 since these are reflected in C57.19.02. The tables in these figures were moved to Article 8.7.3 *600 V and below terminals*. This also resulted in modification of this section which is reflected in the current draft.

- TF #4 Test Review – A presentation was made by Michael Zarnowski and Andrew Larison related to Article 7.2 *Dielectric Tests*. The issue that was seen was using an induced test voltage of 3.46X rated + 1000 which at the 125 kV BIL and 150 kV BIL Voltage Test Limits exceeded induced test limits exceed voltage ratings for certain accessories such as dual voltage switches and underoil load break switches and exceeds the interphase insulation levels and under oil lead spacing. This had resulted in advertent failures. The recommendation of the task force was to change the value to 2X rated voltage. After considerable discussion, a motion was made by Gary King to use the 2X rated induced test voltage. The motion was seconded by Rhett Chrysler and the motion passed. The article will eb changed to:

Dielectric test levels shall be in accordance with the distribution transformer test levels in IEEE Std C57.12.00.

Having run out of meeting time, the meeting adjourned at 4:30 P.M. CDT.

Submitted by: Alan Wilks

Date: 10/28/2024

Attendance:

First Name	Last Name	Company	Role
Rehan	Ali	Siemens Energy	Member
Jared	Bates	Oncor Electric Delivery	Member
Noah	Chesser	Oncor Electric Delivery	Member
Rhett	Chrysler	ERMCO	Member
Thomas	Dauzat	AEP-SWEPCO	Member
Miguel	Garcia	Hitachi Energy	Member
Carlos	Gaytan	Prolec GE	Member
Ali	Ghafourian	H-J Enterprises, Inc.	Member
Giovanni	Hernandez	Virginia Transformer Corp.	Member
Ramadan	Issack	American Electric Power	Member
Gary	King	Consultant	Member
Brian	Klaponski	Carte International Inc.	Member
Gilbert	Kozer	Northeast Transformer Services, LLC	Member
Patrick	Kozer	Northeast Transformer Services, LLC	Member

First Name	Last Name	Company	Role
Daniel	Mulkey	Mulkey Engineering Inc.	Member
Jerry	Murphy	Reedy Creek Energy Services-Retired	Member
Dwight	Parkinson	EATON Corporation	Member
Martin	Rave	IFD Technologies	Member
Robert	Reepe	Georgia Power Co.	Member
Mason	Rush	Central Moloney, Inc.	Member
Jaber	Shalabi	VanTran Industries, Inc.	Member
Michael	Shannon	Rea Magnet Wire	Member
Stephen	Shull	BBC Electrical Services, Inc.	Member
Igor	Simonov	Toronto Hydro	Member
James	Spaulding	Fort Collins Utilities	Member
Chris	Talbert	JST Power Equipment	Member
Reinaldo	Valentin	Duke Energy	Member
Jeremy	Van Horn	IFD Technologies Inc.	Member

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Andrew	Larison	Hitachi Energy	Member
Weijun	Li	Braintree Electric Light Dept.	Member
Alejandro	Macias	CenterPoint Energy	Member
Lee	Matthews	Howard Industries	Member
Michael	Morgan	Duke Energy	Member

Pragnesh	Vyas	Sunbelt-Solomon Solutions	Member
Bruce	Webb	Knoxville Utilities Board	Member
Zachery	Weiss	WEG Transformers USA Inc.	Member
Alan	Wilks	Consultant	Member
Joshua	Yun	Virginia Transformer Corp.	Member
Michael	Zarnowski	Carte International	Member

First Name	Last Name	Company	Role
Nabi	Almeida	Prolec GE	Guest
Alejandro	Ayala	Power Partners	Guest
Hugo	Bayong	H-J Family of Companies	Guest
Megan	Bereswill	JST Power Equipment	Guest
Kevin	Biggie	Weidmann Electrical Technology	Guest
Jeffrey	Brooks	Asplunda Engineering Services	Guest
Jim	Cai	JSHP Transformer	Guest
Alonso	Castillo	Kaedi Energy	Guest
Matthew	Chisholm	IFD Corporation	Guest
Brian	Connelghton	Cleveland-Cliffs	Guest
Janet	Crockett	Fayetteville PWC	Guest
John	Crotty	Ameren	Guest
Craig	DeRouen	ERMCO	Guest
Jeff	Door	H-J Family of Companies	Guest
Fernando	Duarte	EPRI	Guest
Roger	Dugan	EPRI Retired	Guest
Qusai	Elnimri	Vantran Transformer	Guest
Kevin	Frye	Central Moloney, Inc.	Guest
Jose	Gamboa	H-J Family of Companies	Guest
Luke	Grandbois	IFD Technologies	Guest
Kyle	Heiden	EATON Corporation	Guest
John	Hipchen	Copper Development ASSN.	Guest
Thomas	Holifield	Howard Industries	Guest
Mohammad	Iman	MGM Transformer Co.	Guest
John	John	Virginia Transformer Corp.	Guest
Braxton	Jones	SD Meyers	Guest
Qasin	Khan	NEETRAC - Georgia Tech	Guest
Rebecca	Kim	Cheryong Electric	Guest
Evan	Knapp	EATON Corporation	Guest
Kang Jin	Lee	Cheryong Electric	Guest
Nicholas	Manske	Oncor Electric Delivery	Guest

First Name	Last Name	Company	Role
Bryan	Marquardt	Cleveland-Cliffs	Guest
Katherine	Marulanda	Magnetron	Guest
Nader	Masoud	Central Moloney, Inc.	Guest
Brian	McBride	Cargill, Inc.	Guest
Johnny	Meng	Alpha Plottex NC Inc	Guest
Tim	Menter	Lincoln Electric System	Guest
Fernando	Meza	Power Partners	Guest
Justin	Minikel	EATON Corporation	Guest
Humberto	Moreno	Siemens Energy	Guest
Charles	Morgan	Eversource Energy	Guest
Fredy	Murcia	Siemens Energy	Guest
Hugo	Murillo	H-J Family of Companies	Guest
Joel	Pacas	IFD Technologies	Guest
Nicholas	Post	WEC Energy Group	Guest
Ion	Radu	Hitachi Energy	Guest
David	Rohrer	First Energy	Guest
Stefano	Schindler	Reinhausen	Guest
Joseph	Schumack	Ameren	Guest
Masoud	Sharifi	SGRE	Guest
Mochande	Shiv	Siemens Energy	Guest
Mohammad	Sohail	Trench Limited	Guest
Vedrana	Starcevicprebeg	Koncar Dfst	Guest
Tim	Tillery	Howard Industries	Guest
Fernando	Tirado	Prolec GE	Guest
Alan	Traut	Howard Industries	Guest
Joshua	Verdell	ERMCO	Guest
David	Walker	MGM Transformer Co.	Guest
Shelby	Walters	Howard Industries	Guest
Koray	Yavuz	Norak Electric	Guest
Malia	Zaman	IEEE SA	Guest
Bryan	Marquardt	Cleveland-Cliffs	Guest

■ C57.12.35 – Bar Coding for Transformers and Regulators– Rhett Chrysler

This working group did not meet.

■ C57.12.36 – Distribution Substation Transformers – Jerry Murphy

Jerry Murphy presented the following minutes from the working group meeting on October 29, 2024, at 9:30 AM CDT in with 65 in attendance.

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Jerry Murphy called the meeting to order at 9:30 AM. Introductions were made. By a show of hands, the quorum was reached by having 16 out of the 29 members present.

A motion for approval of the agenda was made by Mike Shannon and seconded by Dwight Parkinson, and the motion was approved without opposition. A motion for approval of the past meeting minutes in Vancouver, BC was made by Dwight Parkinson, seconded by Mike Shannon, and the motion was approved with no opposition.

Essential patent claims and IEEE SA and participant behavior slides were presented.

In old business, Jerry Murphy raised the topic of thermal identifications (ONAN/KNAN) in the standard. No further comments on this topic were discussed.

Jerry Murphy said that Draft 2 of the standard is published on the website with password protected access.

Jerry Murphy asked the WG about considering moving Draft 2 to ballot as the current standard is two years from expiring. Bruce Webb motioned to go to ballot. Miguel Garcia seconded, and there were no objections.

Al Traut made a motion to form a ballot comment resolution task force with editorial power. Dwight Parkinson seconded, and there was no objection. Conversation on the motion included reviewing and addressing editorial and technical comments and to bring comments back to WG for approval at the Spring 2025 Denver WG meeting.

Comment resolution TF to include Bruce Webb, Noah Chesser, Miguel Garcia, Dwight Parkinson, Hector Garza, Jaber Shalabi, Carlos Gaytan, Jerry Murphy, and Angela Leigl.

Meeting adjourned at 9:46AM.

Submitted by: J. Murphy/C. Gaytan/A. Leigl

Date: 10/29/2024

Attendance:

First Name	Last Name	Company	Member/Guest
Rehan	Ali	Siemens Energy Inc	Guest
Nabi	Almeida	Prolec GE	Guest
Jared	Bates	Oncor Electric Delivery	Guest
Megan	Bereswill	JST Power Transformers	Guest
Noah	Chesser	Oncor Electric Delivery	Member
Matthew	Chisholm	IFD Technologies	Guest
Rhett	Chrysler	ERMCO	Guest
Craig	Colopy	Retired	Member
Brian	Conneighton	Cleveland Cliffs	Guest
Janet	Crockett	Fayetteville PWC	Guest
John	Crotty	Ameren	Guest

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Tim	Dappen	Cargill	Guest
Thomas	Dauzat	AEP SWEPCO	Guest
Sanford	Fong	Georgia Power Co	Guest
Chris	Franklin	MG Power Associates	Guest
Kevin	Frye	Central Moloney Inc	Guest
Miguel	Garcia	Hitachi Energy	Member
Gilberto	Garza	Prolec GE	Guest
Hector	Garza	Orto de Mexico	Guest
Carlos	Gaytan	Prolec GE	Vice-Chair
Luke	Grandbois	IFD Technologies	Guest
Brad	Grooms	NTS	Guest
Jovani	Gutierrez	JST Power Transformers	Guest
Benjamin	Hershberger	Midwest Transformer	Guest
Rebecca	Kim	Cheryong electric	Guest
Gary	King	Consultant	Guest
Andrew	Larison	Hitachi Energy	Member
Kang Jin	Lee	Cheryong Electric	Guest
Angela	Leigl	Eaton Corp	Secretary
Nicholas	Manske	Oncor Electric Delivery	Guest
Lee	Matthews	Howard Industries	Guest
Luis Felipe	Mendez	JST Power Transformers	Guest
Justin	Minikel	Eaton Corp	Guest
Tyler	Morgan	Duke Energy	Guest
Dan	Mulkey	Mulkey Engineering Inc.	Member
Martin	Muñoz	Orto de Mexico	Member
Fredy	Murcia	Siemens Energy Inc	Guest
Jerry	Murphy	Reedy Creek Energy Services	Chair
Nurudeen	Olayiwola	PECO	Guest
Dwight	Parkinson	Eaton Corp	Member
Joel	Pacas	IFD Technologies	Guest
Ion	Radu	Hitachi Energy	Member
Martin	Rave	IFD Technologies	Guest
Perry	Reedee	PA Transformer	Guest

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Robert	Reepe	Georgia Power Co	Guest
David	Rohrer	First Energy	Guest
Mason	Rush	Central Moloney Inc	Guest
Stefan	Schindler	Maschinenfabrik Reinhausen	Member
Joseph	Schumack	Ameren	Guest
Jaber	Shalabi	Vantran Transformers	Member
Mike	Shannon	REA Magnet Wire	Member
Stephen	Shull	BBC Electrical Services Inc.	Member
Ed	Smith	The H-J Family of companies	Guest
Vedrana	Starcevic Prebeg	Koncar D&ST	Guest
Kerwin	Stretch	Siemens Energy Inc	Guest
Chris	Talbert	JST Power Transformers	Guest
Mike	Thibault	Pacific Gas & Electric	Member
Tim	Tillery	Howard Industries	Guest
Fernando	Tirado	Prolec GE	Guest
Alan	Traut	Howard Industries	Member
Reinaldo	Valentin	Duke Energy	Guest
Josh	Verdell	ERMCO	Guest
Holly	Wassall	JST Power Transformers	Guest
Bruce	Webb	Knoxville Utilities Board	Member
Zach	Weiss	WEG Transformers	Guest

C57.12.37 – Electronic Reporting of Dist Tr Test Data – Alan Traut

Alan Traut presented the following minutes from the working group meeting on October 29, 2024, at 1:45 PM CDT with 55 in attendance.

1. Chair called the meeting to order at 1:45pm CDT. Members introduced themselves with their affiliation. Paper rosters were circulated to record attendance.
2. Chair called for identification of essential patents pertaining to the work of this WG. None brought forward. Copyright policy presented. No issues identified.
3. Chair Report
 - a. PAR for revision of C57.12.37 approved on 2/15/2024 with an expiration date of 12/31/2028.
 - b. The current published document C57.12.37-2015 expires 12/31/2025.

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4. Total attendance was 55. 19 of 31 members were present and a quorum was declared. 18 of the 36 guests attending requested membership.
5. Motion to approve the meeting agenda (Rhett Chrysler/Shelby Walters). Meeting agenda was unanimously approved.
6. Motion to approve the meeting minutes from Spring 2024 Vancouver meeting (Dan Mulkey/Shelby Walters). Meeting minutes were unanimously approved.
7. The Chair reviewed the changes made to the document approved at the Spring 2024 meeting. No new comments or issues were identified.
8. Bruce Webb requesting follow-up on Auxiliary document to identify existing and new vendor identifications. The list of manufacturer codes is maintained under IEEE Std C57.12.35. IEEE SA Josh Gay administers the Open Source documents. Rhett Chrysler to contact Josh for further work on the matter. The link to the download is:
https://standards.ieee.org/wp-content/uploads/2024/07/C57.12.35-2024_downloads.zip
9. The Chair will do an editorial scrub of the document in preparation for initiating the ballot process. Dan Mulkey volunteered to help. The Chair will also conduct a straw ballot among the active participants of this working group to identify any potential technical issues.
10. Next meeting – Denver, CO March 23-27 2025.
11. Meeting adjourned at 3:00pm CDT.

Submitted by: Bruce Webb, Acting Secretary

Date: 10/29/2024

Attendance:

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First Name	Last Name	Company or Affiliation	Role	First Name	Last Name	Company or Affiliation	Role
Alex	Ayala	Power Partners	Guest (R)	Jerry	Murphy	Reedy Creek Energy Services	Member
Jared	Bates	Oncor Electric Delivery	Member	Joel	Pacas	IFD Corporation	Guest
Megan	Bercswill	JST Power	Guest (R)	Dwight	Parkinson	Eaton	Guest (R)
Darren	Brown	Howard Industries	Guest (R)	Homer	Portillo	Advanced Power Tech	Guest (R)
Noah	Chesser	Oncor Electric Delivery	Member	Nicholas	Post	WEC Energy Group	Guest
Rhett	Chrysler	ERMCO	Member	Martin	Rave	IFD Technologies	Guest
Janet	Crockett	Fayetteville PWC	Member	Robert	Reepe	Georgia Power Co.	Member
John	Crotty	Ameren	Guest (R)	Kevin	Rusch	Russard Monitoring	Guest
Craig	DeRouen	ERMCO	Guest (R)	Mason	Rush	Central Moloney Inc	Guest (R)
Fernando	Duarte	EPRI	Guest (R)	Paul	Salvato	Intellirent	Guest
Roger	Duran	RCDugan	Guest	Joe	Schumack	Ameren	Guest (R)
Kevin	Frye	Central Moloney Inc	Guest	Mike	Shannon	REA Maget Wire	Guest
Ramadan	Issack	American Electric Power	Member	Stephen	Shull	BBC Electrical Services, Inc.	Member
Jose	Izquierdo	Siemens Energy	Guest (R)	Ed	Smith	H-J Family of Companies	Guest (R)
Gary	King	Consultant	Guest	James	Spaulding	Fort Collins Utilities	Guest
Jason	Lambert	JST Power	Guest	Chris	Talbert	JST Power	Guest
Andrew	Larison	Hitachi ABB Power Grids	Member	Michael	Thibault	Pacific Gas & Electric	Vice Chair
Angela	Leigl	EATON Corporation	Member	Fernando	Tirado	Prolec GE	Guest
Alejandro	Macias	Centerpoint Energy	Guest (R)	Alan	Traut	Howard Industries	Chair
Nicholas	Manske	Oncor Electric Delivery	Guest (R)	Reinaldo	Valentin	Duke Energy	Member
Nader	Masoud	Central Moloney Inc	Guest (R)	Joshua	Verdell	ERMCO	Member
Lee	Matthews	Howard Industries	Guest	Shelby	Walters	Howard Industries	Member
Johnny	Meng	Alpha Plotter NC inc	Guest	Holly	Wassall	JST Power	Guest (R)
Tim	Menter	Lincoln Electric System	Guest (R)	Bruce	Webb	Knoxville Utilities Board	Member
Fernando	Meza	ERMCO	Guest	Paul	Weyandt	Schneider Electric	Guest (R)
Michael (Tyler)	Morgan	Duke Energy	Member	Alan	Wilks	Consultant	Member
Shiv	Morkhanded	Siemens Energy	Guest	Malia	Zaman	IEEE SA	Guest
Daniel	Mulkey	Mulkey Engineering Inc.	Member				

████████ C57.12.38 – Single-Phase Pad-Mounted Transformers – Ali Ghafourian

This working group did not meet.

████████ C57.12.39 – Tank Pressure Coordination – Carlos Gaytan

Carlos Gaytan presented the following minutes from the working group meeting on October 29, 2024, at 3:15 PM CDT with 42 in attendance.

1. Carlos Gaytan called the meeting to order at 3:15 PM PST. Group introductions were made.
2. Carlos Gaytan reviewed IEEE SA Copyright Policy and Essential Patent Claims. No issues were raised.
3. Quorum was verified. The working group consisted of **38** members, requiring **19** for quorum. Attendance records later confirmed **20** members attended.
4. Carlos Gaytan requested approval of the Fall 2024 Agenda. Al Traut made a motion, second by Nabi Almeida. Agenda was unanimously approved.
5. Carlos Gaytan requested approval of the Spring 2024 Minutes. Luke Grandbois made a motion, second by Alex Macias for approval of the minutes. Minutes were unanimously approved.
6. Old Business

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Task force / Working Group Report

a. *Task force report: Negative pressure requirements* – Luke Grandbois

Luke Grandbois presented the findings of the task force, which fit into three categories:

i. Clause 4.1 Liquid Preservation

The Task Force found there is ambiguity in the link between the pressure range in the second paragraph to the operating conditions described in the first paragraph, which may lead to misinterpretation of the clause.

The Task Force recommended modifying Clause 4.1 by adding a footnote with the following text:

“The pressure limits described shall be built into the design of the sealed-tank system (without relying upon pressure regulating devices), which involves manipulating the tank size, oil volume and air space while operating within the conditions described in the first paragraph of Clause 4.1.”

The working group discussed the proposal. Al Traut made the comment that the footnote is phrased using normative verbiage (“shall”) and may be better as part of the clause instead of a footnote.

The **task force** will revise the footnote into the clause for proposal at next meeting.

ii. Clause 4.2.1. Tank Integrity

The Task Force presented a suggested change to Clause 4.2.1:

Replace the following “an internal pressure of 49 kPa (gauge) (7 psig)” with “a range of internal pressures between -35 kPa (gauge) (-5 psig) to 49 kPa (gauge) (7 psig)” in both paragraphs of the clause.

A lengthy discussion followed. Tom Dauzat mentioned many factors influence the pressure differential, for example, elevation. Carlos Gaytan clarified that the standard currently only covers negative pressure for sealing requirements, not mechanical strength. The group discussed the rationale behind the value of -5 psi, and Carlos Gaytan clarified that this is a value seen in the field, and considers a couple of parameters, including ambient temperatures and cyclic loads. The group discussed and agreed there are tools available that could be used for measuring negative pressure in transformers.

Luke Grandbois made a **motion**, seconded by Jerry Murphy, to accept the proposal as presented. Nicholas Manske suggested a friendly amendment to change the word “to” to “and”, which was accepted by Luke and Jerry. The motion as amended passed unanimously.

iii. Term: compromising definition

Distribution Transformer Subcommittee

Task force / Working Group Report

The Task Force presented a suggested change to the term “permanent deformation”, as it relates to the transformer tank, throughout the document. The Task Force suggested that the term “permanent deformation” is problematic because it is hard to measure in the field, could lead to over-designed transformers, and could allow for compromised functionality in some instances.

The Task force proposed replacing the terms “permanent deformation” and “permanent tank deformation” with “compromising deformation” and “compromising tank deformation”, respectively, in 4 instances in the standard: the Abstract (x1), the Purpose (x1), and Clause 4.1 Tank Integrity (x2).

The Task force also proposed adding the following definition of ‘compromising deformation’ to the definitions section:

“compromising deformation: elastic or plastic deformation that interferes with either transformer sealing, cabinet security, mechanical operation of covers and doors, electrical clearances, thermal operation, the tank’s ability to shed water, or creates areas where corrosive elements can accumulate.”

The Task Force clarified that the use of the term “permanent deformation” in clause 4.2.2.3 Pressure relief valve (PRV) is used in relation to the PRV pull ring and not the tank, and should be left as-is.

The group discussed the proposed changes. Jerry Murphy commented that a change to the purpose may require a PAR change. It was later clarified this would not be required since the purpose was not part of the PAR.

Huan Dinh commented that the term “in the field” is ambiguous and may need clarification. It was also agreed that it is important to have more definitive language than “interferes” in the definition. Joe Schumack commented that the language we need may be “precludes normal operation” in the definition. Marty Rave commented that the requirement that a transformer remain effectively sealed to -5C does not align with the minimum temperature requirements defined in C57.12.00 and may not be sufficiently low.

The **Task Force** will revise the language of permanent deformation per the discussion for proposal at the next meeting.

b. *Clarification of applicability of fault current capability test* – Carlos Gaytan

Carlos led a discussion on the fault current capability test and it’s applicability to rectangular tank construction. This is being discussed in another working group. No follow action will be taken by the C57.12.39 Working Group at this time.

c. *Review overall structure of the sections of the document for clarification* – Carlos Gaytan

Carlos presented an alternative structure of the document organized by tank construction geometry (round vs. rectangular). The recommendation was not to change the structure of the document.

Distribution Transformer Subcommittee

Task force / Working Group Report

The group discussed and agreed that no change to the structure would be best. No motion was required.

d. *Scope of transformer fault current capability test* – Jim Cai

Jim Cai asked the group whether the scope of the Transformer Enclosure Fault Current Capability test should be expanded to include rectangular tank transformers. For example, there have been tests performed on 8 and 12 MVA transformers up to 69 kVA and 34.5 kV network transformers.

The group discussed the question. Jeremy Van Horn mentioned he believes the C57.156 standard does not currently address this test. Carlos Gaytan mentioned the C57.12.23 Working Group is currently exploring including rectangular tank construction, and it may make sense to wait until they decide before proceeding.

The group decided not to explore the fault current capability test for rectangular tanks further at this time. No motion was required.

7. New business –

a. *Minimum temperature range for sealing* – Marty Rave

Marty Rave asked whether -5 °C is an appropriate minimum temperature for the temperature range specified in Clause 4.1.

A discussion followed. Nabi Almeida commented that this clause refers to liquid temperature, not ambient temperature, which may need to be considered.

The **Task Force** chaired by Luke Grandbois was assigned to consider this question and bring a proposal to the working group at the next meeting. Marty Rave agreed to join the task force.

8. Next meeting: March 25, 2025 in Denver, CO, USA

- a. No guests requested membership which meet the membership requirement, so no new members will be added for the next meeting.

9. The meeting was adjourned at 4:25 PM CDT.

Submitted by: Jeremy Van Horn

Date: October 29, 2025

List of Members:

Alejandro Ayala (Power Partners)
Darren Brown (Howard Industries)
Jim Cai (JSHP Transformers)
Noah Chesser (Oncor Electric Delivery)

Carlos Gaytan (Prolec GE)
Luke Grandbois (IFD Technologies Inc.)
Didier Hamoir (Transformer Protector Corp)
Ramadan Issack (AEP)

Andrew Larison (Hitachi Energy)
Alejandro Macias (Centerpoint Energy)
Nicholas Manske (Oncor Electric Delivery)
Jerry Murphy (RCES)

Distribution Transformer Subcommittee

Task force / Working Group Report

Ismael Naja (Eaton Corp.)
Dwight Parkinson (Eaton Corp.)
David Rohrer (First Energy)

Fernando Tirado (Prolec GE)
Alan Traut (Howard Industries)
Jeremy Van Horn (IFD Technologies Inc.)

Joshua Verdell (ERMCO)
Alan Wilks (Wilks Consulting)

List of Guests:

Huan Dinh (Hitachi Energy)
Shelby Walters (Howard Industries)
Joe Schumack (Ameren)
John Crotty (Ameren)
Jared Bates (Oncor Electric Delivery)
Marty Rave (IFD Technologies Inc.)
Shiv Morkhande (Siemens Energy)
Gilberto Garza (Prolec GE)

Chris Talbert (JST Power)
Holly Wassall (JST Power)
Kang Jin Lee (Cheryong Electric)
Rebecca Kim (Cheryong Electric)
Craig DeRouen (ERMCO)
Tom Dauzat (AEP)
Tim Menter (Lincoln Electric System)
Brian Conneighton (Cleveland-Cliffs)

Jeremy Hansman (Cleveland-Cliffs)
Bryan Marquardt (Cleveland-Cliffs)
Matthew Chisholm (IFD Technologies Inc.)
Vedrana Starcevic Prebeg (Koncar DST)
William Trenton (Advanced Power Technologies)
David Cordova (Maddox Industrial Transformer)

C57.15 – Step-Voltage Regulators – Dan Sauer

Dan Sauer presented the following minutes from the working group meeting on October 28, 2024, at 4:45 PM CDT with 34 in attendance.

1. Attendance – We have achieved the minimum required attendance for quorum (15 out of 25)
2. Presentation and approval of meeting Agenda – Motion was made by Stephen Shull and seconded by Kile Hayden with unanimous approval.
3. Presentation and approval of of Spring Vancouver Minutes – Motion was made by Stephen Shull and seconded by Kile Hayden with unanimous approval.
4. Presentation and approval of of June Virtual Minutes – Motion was made by Stephen Shull and seconded by Kile Hayden with unanimous approval.
5. WG documentation review – patents & copyrights – No comments from the WG attendance
6. Review of approved IEEE PAR – Dan Sauer
7. Review of IEC Maintenance Team Status – Dan Sauer
 - a) Review of IEC TC14 meeting – Rome
 - b) Review of IEC TC14 meeting - Edinburgh

8. Document Review

a) Known Issues

i) Universal Interface Issues

- a) Touch Safe – Pin orientation
- b) Connection point
- c) Connection method

Discussion: Stephen Shull brought two cabinets and cables to have a show and tell session with the WG regarding the two proposed solutions for the cable connection to the control cabinet. Option A is to use a pass-through connector and use a jam nut inside the cabinet to secure the cable. Option B is to have an external sleeve attached to the cabinet and use other means to secure the cable inside the cabinet. Stephen also reported that he had some difficulties in getting samples for the connector from the current manufacturer (Amphenol) using its SAE denomination.

David from First Energy stated that they prefer the Jam nut for the connection inside of the cabinet, but they have no preference.

Miguel from PG&E shared that need to insure that the inside access to the cabinet is protected.

Tom from AEP-Swepco shared that he was against this since the beginning and asks why we need to add another box to the regulator. Also he asks how is the means to short the CT for cases where the manufacturer do not have an auto-shortening device, using Eaton as an example.

Kile from Eaton explained that the shorting process is mentioned in the main body of the standard, item 11.1 – e.

Stephen from BBC Electrical Services mentioned that the ultimate goal is to protect the lineman.

Tom returned to the podium to request to add the SAE reference to the figures indicated in the standard (Fig 22.)

Stephen explained that the intention is to add a chart and additional figures for the control box side and also for the voltage regulator side.

Robert from Dominion stated that in their case, they will short the CT even when the unit is de-energized.

The WG mentioned that we should add a legend to the Fig. 24, using A and B (i.e.) for the two different figures.

Stephen requested the WG to hold onto a decision on the universal interface until he gets more information, this was accepted by the WG attendants.

ii) Control cable to be fire rated **UL94**? UL1581?

- a) UL94 rated? Manufacturers to check?

Universal cable part number –
Amphenol # ACC06AMI22-14P(003)(M32)(P)(B30)
Amerline # AEC3106PG 22-14P

Control Box Wiring harness –
Amphenol # ACC06A22-14P(003)(B30)(F42)

Voltage Regulator End Wiring Harness –
Amphenol # AMP# ACC070A22-14S(003)(B30)(F42)

Discussion: There was no report about the rating of the cable, the users only reported that in California their requirement is for the cable not to drip when it catches fire.

b) Is a duration specified?

c) When specified?

9. New business – To be reviewed in the Thursday, October 31st

a) Update on section review:

- i) Section 2 - Kyle Heiden/Guang Yuan/Samragui Datta Roy
- ii) Sections 3 & 4 – Dan Sauer
- iii) Section 5 – Lee Matthews
- iv) Section 6 – Miguel Plascencia
- v) Section 7 – Michael Gonzales/Sherif Salem
- vi) Section 9 – Dan Sauer/Rich Frye/Samragui Datta Roy
- vii) Section 10 – Kyle Heiden/Sebastian Rehkopf
- viii) Section 11 – Steve Shull
- ix) Annexes – Craig Colopy/Lee Matthews

10. Future meetings

C57 Meeting – WG Meeting Thursday, October 31, 1:00 – 5:00 PM CDT – Regency A

IEEE C57 Spring 2025 Meeting Denver, same format summary during the week and working meeting before/after – any preference?

Volunteers to host other meetings / times / places?

The WG requested for at least one virtual meeting before the Spring 25 conference.

11. Closing of Meeting – Meeting was adjourned at 18:00, moved by Lee Mathews and seconded by David Rohrer with unanimous approval.

Members in attendance:

First Name	Last Name	Member/Guest
Rehan	Ali	Member
Nabi	Almeida	Secretary
Samragui	Datta Roy	Member
Richard	Frye	Member
Juan	Gonzalo Castellanos Gonzales	Member
Kyle	Heiden	Member
Yeounsoo	Kim	Member
Lee	Matthews	Vice Chair
Miguel	Plascencia	Member
David	Rohrer	Member
Dan	Sauer	Chair
Stephen	Shull	Member
Christopher	Slattery	Member
Jimmy	Smith	Member
John	Tranum	Member

Guests in attendance:

First Name	Last Name	Member/Guest
Robert	Allison	Guest
Noah	Chesser	Guest
Craig	Colopy	Guest
John	Croty	Guest
Thomas	Dauzat	Guest
Scott	Digby	Guest
Ramadan	Issack	Guest
Evan	Knapp	Guest
Alvin	Kopp	Guest
Tim	Menter	Guest
Justin	Minikel	Guest
Tyler	Morgan	Guest
Jerry	Murphy	Guest
Nicholas	Post	Guest
Martin	Rave	Guest
Joe	Schumack	Guest
Andreas	Thiede	Guest
Tim	Tillery	Guest
Reinaldo	Valentin	Guest

Dan Sauer provided the following minutes from the working group meeting on October 31, 2024, at 1:00 PM CDT with 17 in attendance.

The chairman called the meeting to order at 1:00 pm.

The Patent Slides were displayed. No patents claims were brought up from the attendees.

The IEEE Copyright Policy was displayed.

Attendance – We have achieved the minimum required attendance for quorum (13 out of 25).

Motion by Steve Shull, seconded by Miguel Plascencia, to approve the agenda. Motion was approved.

Dan Sauer reviewed Clauses 3 & 4 with no recommended changes at the present time.

Steve Shull made a motion, seconded by Miguel Plascencia, to include the design ratios at each tap on the nameplate. There was considerable discussion on the motion concerning whether ratios or voltages should be used. Also discussed was whether a range should be included or the nominal ratios only.

After the discussion, Kyle Heiden made a motion to table Steve’s motion until the next meeting to allow the manufacturers to review available space on the nameplates or if a secondary nameplate would be required. John Trantum seconded the motion. This motion was approved and Steve’s motion was tabled.

Dan Sauer indicated that he would work with Rich Frye & Sam Datta Roy to review the ratio connections shown in clause 9.4.

Kyle Heiden made a motion, seconded by Miguel Plascencia, to not require the motor to be tested during the control wiring test of section 9.8.3.

There will be a meeting in Denver, CO during the Spring of 2025 Transformers Committee Meetings.

A virtual meeting will be held in January or February 2025 prior to the Transformers Committee Meetings.

Motion to adjourn by Steve Shull, seconded by Miguel Plascencia. The motion was approved.

Lee Matthews, Vice-Chair

Members in attendance:

First Name	Last Name	Member/Guest

Rehan	Ali	Member
Samragui	Datta Roy	Member
Kyle	Heiden	Member
Yeounsoo	Kim	Member
Lee	Matthews	Vice Chair
Miguel	Plascencia	Member
David	Rohrer	Member
Dan	Sauer	Chair
Stephen	Shull	Member
Christopher	Slattery	Member
Jimmy	Smith	Member
John	Tranum	Member
Pawel	Klys	Member

Guests in attendance:

First Name	Last Name	Member/Guest
Ramadan	Issack	Guest
Thomas	Dauzat	Guest
Evan	Knapp	Guest
Reinaldo	Valentin	Guest

Dan Sauer provided the following minutes from the working group virtual meeting on June 25, 2024 at 8:00 AM CDT with 16 in attendance.

- 1) Welcome, Introduction and Chair's Remarks
- 2) Attendance records
 - a. We had a total of 16 people attending the meeting, our WG has 19 members, we had a total of 14 members in attendance
- 3) Approval of meeting minutes from previous meeting (motion by Chris Slattery / Seconded by Jimmy Smith) – approved without opposition.
- 4) Presentation and approval of meeting Agenda (motion by Stephen Shull / Seconded by Kyle Heiden) – approved without opposition.
- 5) Reviewed Patent and Copyrights, no concerns raised by the WG members – Dan Sauer
- 6) Reviewed Approved PAR with WG – Dan Sauer
- 7) Review of IEC Maintenance Team Status
 - a. Review of IEC TC14 meeting – Rome

The Chair commented about his participation on the IEC TC14. The IEC Committee agreed on this WG continuing with the maintenance of the standard but requested that we ensure at least 5 different countries are part of the WG. To which we do not comply now. Nabi Almeida offered to request participation from Mexico and Brazil to support our WG. The members need to be a P member country. Members need to be recognized in the professional association of that country. The Chair gave a detailed explanation on how the voting rights for the IEC works and how the USA manages the work and the recommendations for our representative to vote on these matters.

8) Document Review

a. Known Issues

i. Universal Interface Issues

It was agreed the cable will have pins and a threaded collar, and the regulator will have a socket that the pins will go into. The collar of the cable will be the opposite, where the cable will be the female and the regulator will be the male.

John Trantum Siemens – Reported the result of his survey with his customer base. His customer base is more inclined to have the connection inside the control box, pins on the control end and sockets on the cable end.

Stephen Shull proposed the use of standard cable and use tamper resistance fixture mounted to the cabinet, using an SAE connection standard, this way it would be easier for the user to procure the necessary parts.

Stephen Shull volunteered to bring an example to the next in person meeting.

Dan Sauer will bring an example from Eaton that uses jam nut and a security sleeve example.

Kyle Heiden will provide more information regarding jam nuts and security sleeves.

The WG reserved the right to continue the discussion in the next in person meeting.

ii. Touch Safe – Pin orientation

Not addressed?

iii. Connection point

Not addressed?

9) New business

a. Update on section review:

i. Section 2 - Kyle Heiden/Guang Yuan/Samragui Datta Roy

Not presented

ii. Sections 3 & 4 – Dan Sauer

Not presented

iii. Section 5 – Lee Matthews

IEC C57.15 Clause 5.1.5 Load Current – Comparing the verbiage with C57.12.00, there is additional information referencing non sinusoidal loads (C57.110) and total harmonic distortion. It was proposed to add the information existing on the C57.12.00 as a note in the C57.15.

C57.15 Clause 5.3.4 Other Unusual Service Conditions - It was proposed to add a note to match 12.00 regarding C57.110 as well as adding this standard to the bibliography.

iv. Section 6 – Miguel Plascencia

Not presented

v. Section 7 – Michael Gonzales/Sherif Salem

His review was focused on the comparison between C57.15 and C57.12.20.

Table 14 have different BIL levels between the two standards, the WG.

The WG discussed whether a 125kV BIL was needed for Regulators and the consensus that it was not.

Clause 7.6 Tank construction - The comparison regarding the venting and sealing characteristics. The main point was the differences between the pressure levels. The general agreement withing the WG was that the current limits within the document are acceptable and should remain the same.

Clause 7.6.3 Cover assembly - The WG agreed to keep the current verbiage.

vi. Section 9 – Dan Sauer/Rich Frye/Samragui Datta Roy

Not presented

- vii. Section 10 – Kyle Heiden/Sebastian Rehkopf
Not presented
- viii. Section 11 – Steve Shull
Not presented
- ix. Annexes – Craig Colopy/Lee Matthews
 - 1. Annex A – No comments
 - 2. Annex B – No comments
 - 3. Annex C – The WG commented that the diagrams were a bit overly simplified. The Chair commented that figures C.3 to C.5 could be improved to show that the series winding has more taps (more according to the reality) and the action to improve was assigned to Dan Sauer (Chair).
Several members suggested that we add a note related to the floating circuit on Figure C.5, we requested suggestions on how should we write this note and will compile it for the next meeting. **“Jimmy Smith’s proposal - Note: The closed loop circuit the series transformer of Figure C.5 is shown in is floating. If implementing this circuit in a specific design, manufacturers have various means to remedy this condition.”**
 - 4. Annex D – No comments
 - 5. Annex E – No comments
 - 6. Annex F – No comments
- b. See if we can standardize on 65C AWR ratings.
 - i. The WG agreed that at this time is not ideal to change this since the standard has ways to consider 65C AWR (Item 3 on Table 2)
- c. Control cable to be fire rated UL94? UL1581?
 - i. It was shared by Miguel that Southern California Edison spec UL94. Dan Sauer took an action to investigate if UL94 is possible. Also, it was requested to the WG that the Manufacturers to give feedback whether their current practice complies with UL 94 or if they have that offering at all. Miguel will also share his company’s practice related to this topic.

10) Future meetings

IEC TC14 Plenary (status) meeting – Edinburgh, October, 2024

C57 Meeting – WG Meeting Probably after C57 similar to this meeting due to timing of the TC14

Plenary meeting – Saint Louis, MO, October 2024

Look to have a WG meeting on Monday/Tuesday as well.

Volunteers to host other meetings / times / places?

- 11) Meeting adjourned (Motion by Steve Shull / Second by Jimmy Smith) – Approved without opposition.

Attendance

First Name	Last Name	Member/Guest	Affiliation
Dan	Sauer	Chair	Eaton Corp
Stephen	Shull	Member	BBC Electrical Services Inc.
Nabi	Almeida	Secretary	Prolec GE

Sherif	Salem	Member	Eversource Energy
John	Tranum	Member	Siemens Energy Inc.
Lee	Matthews	Vice Chair	Howard Industries
Elizabeth	Gillian	Guest	Not Stated
Kyle	Heiden	Member	Eaton Corp
Christopher	Slattery	Member	First Energy
Rehan	Ali	Member	Siemens Energy Inc.
Richard	Frye	Member	Eaton Corp
Yeounsoo	Kim	Member	Not Stated
Jimmy	Smith	Member	Howard Industries
Michael	Gonzales	Member	Southern California Energy
Santosh	Pachpund	Guest	Not Stated
Sunilkumar	Singh	Member	Eaton India

Dan Sauer provided the following minutes from the working group meeting March 14, 2024, in Vancouver at 1:00 PM PDT with 20 in attendance.

- 1) Welcome and Chair's Remarks
- 2) Circulation of Attendance Sheets
 - a. A total of 20 attendees were present in person, with one additional attendee joining via Teams. 15 attendees requested membership, which was granted due to this being the first WG meeting. Three individuals requested membership after the meeting had concluded. Therefore, a total count is as follows:
 - i. 18 Members
 - ii. 6 Guests
- 3) Presentation and approval of meeting Agenda (motion by Craig Colopy / Seconded by Kyle Heiden) – approved without opposition.
- 4) Reviewed Approved PAR with WG – Dan Sauer
- 5) Review of topics to be addressed in next revision:
 - a. Universal Interface (UI)

- i. Kyle Heiden stated that the main point of contention is that Section 11 does not explicitly describe the connection type/style between control cable and control enclosure – causing OEMs to make their own interpretations.
 - ii. General agreement that the cable shall:
 - 1. Have male pins on the Regulator end
 - 2. Have female sockets at the Control end
 - iii. Question to address is around mounting style on Control end. What level of cable security do users require?
 - iv. Photos of Eaton’s and Siemens’ solutions were presented for discussion purposes
 - v. **Action** - SAE AS50151, referenced in section 11, latest release is “Version E”. Verify cross references of A31021 and AS31061 remain unchanged – Steve Shull
 - vi. Informal poll was taken amongst users present and 5 of 6 preferred the connection at the control end of the cable be inside the control enclosure
 - vii. **Action** – Steve Shull to take Dan Sauer’s working copy of changes and work on updating section 11.
 - viii. **Action** – OEMs to survey their users to understand their preference on where the connection point between the control cable and control enclosure should be (inside vs. outside cabinet). Feedback due to WG chair by end of May.
- b. IEC Changes in Short Circuit (SC) Testing
- i. Lee Matthews identified that IEC SC requirements changed in 2019 (editorial)
 - 1. Always was a single 2 second test – “2s (+/- 1 10%)”
 - 2. Changed to two 1 second tests – “2 (1s +/- 1 10%)”
 - 3. All agreed to fix error to original wording
- c. Change in Defining Rated Temps
- i. Thermally upgraded Kraft paper – max 110 °C
 - 1. IEEE includes avg. ambient of 30 °C, 65 °C rise, and 15 °C hot spot rise
 - 2. IEC has 110 °C max, but has several pages stating how average winding rise can be determined

- ii. Group discussed and is leaning towards not adopting the IEC language
 - iii. Tabled for now
 - d. Table 12 – K-Factor 6.8.1
 - i. PowerTech requested WG looked at this section
 - ii. If X/R of system is such that the K-factor described in table 12 can't be obtained then the RMS short circuit current shall be raised to obtain the required peak current value.
 - iii. PowerTech wants to know if it is ok that the resulting K-factor is lower than described by Table 12?
 - iv. Group agreed that by definition the K-factor would have to be lower in above scenario
 - e. DGA in Step-Voltage Regulators
 - i. C57.139 is looking for data to include guidance for DGA of Step-Voltage Regulators
 - ii. Action – Dan Sauer to reach out to Insulation Life SC Chair (Scott Reed) to add new business item for addressing DGA in Voltage Regulators
 - f. Equation E1 in Annex E
 - i. Uses I_{r1} in numerator but it is not defined. Change to add a definition of I_{r1}
- 6) Members were assigned sections to review and recommend updates/changes. All chained references shall be checked to make sure they are updated
 - a. Section 2 - Kyle Heiden/Guang Yuan/Samragui Datta Roy
 - b. Sections 3 & 4 – Dan Sauer
 - c. Section 5 – Lee Matthews
 - d. Section 6 – Miguel Plascencia
 - e. Section 7 – Michael Gonzales/Sherif Salem
 - f. Section 9 – Dan Sauer/Rich Frye/Samragui Datta Roy
 - g. Section 10 – Kyle Heiden/Sebastian Rehkopf
 - h. Section 11 – Steve Shull
 - i. Annexes – Craig Colopy/Lee Matthews
- 7) New Business for next WG meeting:
 - a. Can we standardize ratings on 65 °C AWR?
 - b. UL94 – Should we include requirement for jacketed cable – more common standard for wire/jacketed cable is UL 1581

- 8) Action – Dan Sauer to coordinate next WG meeting for July 2024 (virtual)
- 9) Motion to Adjourn (motion by Steve Shull / Seconded by Kyle Heiden) – approved without opposition.

Attendance

First	Last	Member/Guest	Affiliation
Dan	Sauer	Chair	Eaton Corp
Stephen	Shull	Member	BBC Electrical Services Inc.
Kyle	Heiden	Member	Eaton Corp
Janet	Crockett	Guest	Fayetteville PWC
Samragui	Datta Roy	Member	Siemens Energy Inc.
Wilson	Tranum	Member	Siemens Energy Inc.
Rehan	Ali	Member	Siemens Energy Inc.
Patrycja	Jarosz	Guest	IEEE SA
Miguel	Garcia	Guest	Not stated
Yeounsoo	Kim	Member	Not stated
Sherif	Salem	Member	Eversource Energy
Sebastian	Rehkopf	Member	Reinhausen
Jimmy	Smith	Member	Howard Industries
Tim	Tillery	Guest	Howard Industries
Guang	Yuan	Guest	Hitachi Energy
Miguel	Plascencia	Member	PG&E
Dwight	Parkinson	Guest	Eaton Corp
Richard	Frye	Member	Eaton Corp
David	Rohrer	Member	First Energy
Chris	Slattery	Member	First Energy
Michael	Gonzales	Member	Southern California Energy
Lee	Matthews	Vice Chair	Howard Industries
Nabi	Almeida	Secretary	Prolec GE
Ismael	Naja	Member	Eaton Corp
Alex	Macias	Member	CenterPoint Energy

PC57.167 – Guide for Monitoring Distribution Transformers – Gary Hoffman

This working group did not meet.

Task Force on Transformer Efficiency and Loss Evaluation – Phil Hopkinson

Phil presented the following minutes from the task force meeting on October 28, 2024, at 9:30 AM CDT with 156 in attendance.

1. Welcome- Phil Hopkinson.

2. Roster

156 in attendance.

3. Approval of Agenda –
Approved.

4. Approval of the Minutes of the Last Meeting – March 2024, Vancouver, BC
Previous minutes approved.

5. Efficiencies for DOE General Purpose Transformers for 2029 (Hopkinson)

Energy Information Administration (EIA) an office of the DOE, projects a forecast of how energy loading will change. When they did their study, it looked like loading would increase 2% in 2022. This is the data they worked from when they provided information to draft the NOPR. 2 years later EIA said loading growth would be 3.75 % per year. Chair Hopkinson said loading will be much higher.

In the Final Rule for Liquid - Filled they call it “liquid immersed.”

Final Rule effective April 23, 2029

DOE Definition of Distribution Transformer

A transformer that –

- 1) Has an input line voltage of 35kv or less;
- 2 Has an output line voltage of 600 V or less;
- 3 Is rated for operation at a frequency of 60 Hz; and
- 4 Has a capacity of 10 kVa to 5000 kVA for liquid-immersed units and 15 kVA to 5000 kVA for dry-type units.

NOPR anticipates 25% of distribution transformers would need to be Amorphous. A step up transformer from low voltage to MV does not have to meet the DOE requirements. So, wind and solar transformers would be exempt.

It was noted that because loading is going up, DOE should have optimized on Total loss (load) not core loss (no-load). If so, GOES would have won out over Amorphous.

Summary of Designs (from ppt)

Energy picture in 2024

1. **Load growth increasing broadly all across the US**
2. **Three major factors in load growth**
 - a. **EV Charging**
 - b. **AI Data Centers**
 - c. **New cold weather heat pumps replacing natural gas**
3. **Distribution Transformer lead times out to 2+ years**

3-Phase conclusions

3-Phase Growth rate high and increasing

GOES transformers will add 20+ % to weight

Alternative will be Amorphous Cores

An attendee commented that data centers want smaller transformers and complying with the 2029 rule will cause them to get larger also.

Another commenter stated using amorphous increased noise level (single phase).

A transformer manufacturer noted that for data centers the common request is 3000kVA to 4000kVA

6. Strategies for GOES (Bryan M., Cleveland Cliffs)

Bryan Marquardt presented on reducing transformer no-load losses with GOES.

7. Assignments for next meeting

8. Next meeting date Monday, March 24, 2025, and location Denver: CO.

9. Adjourn The meeting was adjourned at 10:46 am.

Meeting Attendance Follows (156 people signed in):

Jerry Allen, Metglas, Inc.

Javier Arteaga, Hitachi Energy

Alex Ayala, Power Partners, Inc.

Donald Ayers, Ayers Transformer Consulting

Cheryl Basel, WEG Transformers USA Inc.

Jared Bates, Oncor Electric Delivery

Andrew Berman, S&C Electric

Edwin Betancourt, Siemens Energy

Kevin Biggie, Weidmann Electrical Technology

David Blew, Retired (PSE&G)

Dominique Bolliger, HV Technologies

Jeffrey Britton, Phenix Technologies, Inc.

Darren Brown, Howard Industries

Thomas Callsen, Weldy-Lamont Associates

Deniss Carr, GE Grid Solutions

Raymond Chapa, WEG Transformers USA Inc.

Paul Chisholm, IFD Technologies
Eunyoung Cho, Hico-America
Stefano Comerio, LTC Group
Brian Conneighton, Cleveland-Cliffs
Noah Cresser, Oncor Electric Delivery
Janet Crockett, Fayetteville PWC
Michael Dahlke, Central Moloney, Inc.
Tim Dappen, Cargill
Craig DeRouen, ERMCO
Antonio Di Biase, Tempel
Jeffrey Door, The H-J Family of Companies
William Elliott, SWEPCO AEP
William Ellis, AMEREN
Fadi Fayad, ASD Inc
Bruce Forsyth, Cargill
Kevin Frye, Central Moloney, Inc.
Renjie Fu, ERMCO/V&F Transformer
Bob Fyrer, Dupont
Jose Gamboa, H-J Family of Companies
Carlos Gaytan, Prolec GE
Ali Ghafourian, The H-J Family of Companies
Rafael Grajeda, EATON Corporation
Richard (Luke) Granbois, IFD Technologies
Kendrick Hamilton,
Michael Hardin, H-J Family of Companies
Sergio Hernaidez, Hammond Power Solutions
Giovanni Hernandez, Virginia Transformer
Jean Hernandez, Georgia Tec NEETRAC
John Herron, Raytech USA
John Hipchen, Copper Development Assn.
Thomas Holifield, Howard Industries
Philip Hopkinson, HVOLT Inc.
Mohammad Iman, MGM Transformer Company
Jose Izquierdo, Siemens-Energy
Karl Jakob, Cargill
Sheldon Kennedy, Sheldon P. Kennedy Engineering LLC
Vladimir Khalin, K V Consulting
Qasim Khan, NEETRAC - Georgia Tech
Brian Klaponski, Carte International Inc.
Ken Klein, Johnson Coil
Gillbert Kozer, Northeast Transformer
Patrick Kozer, Northeast Transformer
Jason Lambert, JST Power
Andrew Larison, Hitachi Energy
Andrew Lawless, Potencia Partners
Moonhee Lee, Hammond Power Solutions
Aleksandr Levin, Weidmann Electrical Technology
Jacky Lin, Fortune Electric
Parry Lively, Tempel
Colby Lovins, Federal Pacific
Mark Lowther, Kruger Products Inc
Marilia Machado Riberio, GE
Alejandro Macias, Center Point Energy
Kushal Mahajan, EATON Corporation
Tim-Felix Mai, Siemens Energy
Jinesh Malde, M & I Materials

Swapnil Marathe, Megger
 Bryan Marquardt, Cleveland-Cliffs
 Daniel Martinez, JFE Shoji Power Canada
 Jim McBride, JMX High Voltage
 Joseph McBride, JMX High Voltage
 Ken McKinney, UL Solutions
 Tim Menter, Lincoln Electric System
 Fernando Meza, Power Partners, Inc.
 Rhea Montpool, Schneider Electric
 Elena Morales, Siemens Energy
 Andre Moreno, Siemens Energy
 Dan Mulkey, Mulkey Engineering Inc
 Hugo Murillo, The H-J Family of Companies
 Ismael Naja, EATON Corporation
 Aniruddha Narawane, EATON Corporation
 Shawn Nun, Hitachi Energy
 Tommy Nunn, JST Power
 Steven Oakes, WEG Transformers USA Inc.
 Austin Ortega, Siemens-Energy
 Dwight Parkinson, EATON Corporation
 George Partyka, PTI Transformers
 George Payerle, Carte International Inc.
 Harry Pepe, Phenix Technologies, Inc.
 Jason Perkins, Moehn Electrical Sales
 Daniel Posadas, Prolec S. A.
 Jarrod Prince, ERMCO
 Ion Radu, Hitachi Energy
 Adnan Rashid, Measurement Canada / ISED
 Martin Rave, COMED
 Tony Roiss, Custom Materials Inc
 Mason Rush, Central Moloney, Inc.
 Fernando Salinas, Power Partners, Inc.
 Alberto Sandoval, EATON Corporation
 Jaber Shalabi, VanTran
 Michael Shannon, Rea Magnet Wire
 Masoud Sharifi, Siemens Gamesa
 Shihey Xras Shen, GE Grid Solutions
 Stephen Shull, BBC Electrical Services, Inc.
 Audrey Siebert-Timmer, IFD Technologies
 Igor Simonov, Toronto Hydro
 Chris Slattery, First Energy
 Jimmy Smith, Howard Industries
 Steven Snyder, Hitachi Energy
 Muhammad Abdullah Sohail, Trench Canada
 Brian Sonnenberg, General Electric
 Jim Spaulding, City of Fort Collins
 Mike Spurlock, Spurlock Engineering Services, LLC
 Stefan Srebert, Brockhaus
 David Stankes, 3M
 Kerwin Streich, Siemens Energy
 Ali Syed, COMED
 Dragan Tabakovic, Hubbell Power
 Chris Talbert, JST Power
 Erik Tarengo, ULSUN Electric
 Val Tatu, Powersmitus
 Joseph Tedesco, Hitachi Energy

Vijay Tendulkar, EATON Corporation
Craig Tennant, The H-J Family of Companies
Michael Thibault, Pacific Gas & Electric
Andreas Thiede, Highvolt
Ryan Thompson, Burns & McDonnell
Tim Tillery, Howard Industries
Fernando Tirado, Prolec GE
Alan Traut, Howard Industries
Lee Tyler, WARCO, Inc
Jeremy Van Horn, IFD Technologies
John Vartanian, National Grid
Pragnesh Vyas, Sunbelt Soloman
David Walker, MGM Transformer Company
David Wallach, Duke Energy
Shelby Walters, Howard Industries
Bruce Webb, Knoxville Utilities Board
Zachery Weiss, WEG Transformers USA Inc.
Michael Wheeler, Hitachi Energy
Joe White, Power Engineers
Devora Wiesel, Con Edison
Alan Wilks, Consultant
Guang Yuan, Hitachi Energy
Michael Zarnowski, Carte International Inc.
Martin Rave, IFD Technologies

■ Task Force Tank Touch Temperature – Bruce Webb

This task force did not meet. Our SA requested White Paper document remains in development. It is expected to be issued to our comment review and resolution Team in late January 2025 with likely issuance to our full TF group prior to our Denver, CO meeting in S25. Our TF will be requesting a Room for an in-person meeting in CO. We intend to make our report to the SC at that time to complete the effort.

Please accept this as our TF request to obtain an in-person room for the upcoming S25 Denver, CO meeting.

We would welcome a room that may accommodate up to the sixty-five (65) plus attendees matching our last meeting.

As for the time, I would welcome a similar Monday 4:45 PM slotting, if available.

C.3 Old Business

No old business was discussed

C.4 New Business

Discussion on TF need for guide or standard for data center OIP transformers.

Dan Sauer brought a motion with a second from Bruce Webb to go to ballot for C57.12.36. This motion was unanimously approved.

Alicia Farag discussed QR codes as part of the SCATE transformer unique ID (C57.12.35).

Kyle Heiden made a motion with a second from Dan Sauer to approve the title and scope of PAR for pad-mounted step-voltage regulators for advancement to NESCOM. This motion received unanimous approval.

Dan Mulkey brought up a topic regarding changing terminology in standards from “liquid-immersed” to “liquid-filled” along with other general English language errors that have been adopted into standards.

C.5 Chairman’s Closing Remarks and Announcements

Jerry had no closing comments to the SC.

C.6 Adjournment

Jerry adjourned the meeting as provided in the meeting agenda at 10:45am.

List of Attendees and Affiliations:

Last Name	First Name	Company / Affiliation	Role/Status
Parkinson	Dwight	Eaton	Member
Whitehead	Bill	H2scan	Requesting Membership
Crotty	John	Ameren	Requesting Membership
Post	Nicholas	WEC Energy Group	Guest
Kim	Rebecca	Cheryong Electric	Guest
Sauer	Dan	Eaton	Member
Schwartz	Danny	Quality Switch	Guest
Shull	Stephen	BBC Electrical Services Inc	Member
Chisholm	Matthew	IFD TECHNOLOGIES	Guest
Naja	Ismael	Eaton	Requesting Membership
Rush	Mason	Central Moloney Inc.	Member
Leigl	Angela	Eaton	Requesting Membership
Shalabi	Jaber	VanTran Industries	Requesting Membership
Li	Weijun	Braintree Electric Light Department	Member
Mendez	Luis Felipe	JST Power	Guest
Verdolin	Rogério	Verdolin Solutions	Member
Morgan	Charles	Eversource Energy	Guest
Knapp	Evan	Eaton	Member
Washburn	Alan	Burns and McDonnell	Guest
Almeida	Nabi	ProlecGE	Member
Hatton	Eric	Tempel	Guest
King	Gary	Consultant	Member
DAPPEN	TIM	Cargill	Requesting Membership
Velasquez	Juan	Magnetron sas	Guest

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Olayiwola	Nurudeen	Exelon/ PECO	Guest
Khan	Qasim	NEETRAC -Georgia Tech	Requesting Membership
Pacas	Joel	IFD Technologies	Guest
Meza	Fernando	ERMCO	Requesting Membership
Webb	Bruce	Knoxville Utilities Board	Member
Greaves	Brad	Weidmann Electrical Technology, Inc	Guest
Farag	Alicia	Locusview	Guest
Verdell	Joshua	ERMCO	Member
Panesar	Parminder	Virginia Transformer Corp	Requesting Membership
Hogg	Ryan	Bureau of Reclamation	Guest
Beaudoin	Jason	Weidmann	Guest
Lee	KangJin	Cheryong Electric	Guest
RONCHI	Rodrigo	WEG Transformers México	Member
Masoud	Nader	Central Moloney	Guest
FOATA	Marc	MR	Guest
Brooks	Jeffrey	Asplundh Engineering Services	Guest
zhang	Hongzhi	Hitachi Energy	Guest
Bennett	Mark	Essex Brownell	Guest
Nolte	Michael	Kiewit	Requesting Membership
Grandbois	Luke	IFD Technologies Inc.	Guest
Heiden	Kyle	Eaton	Member
Blew	David	DS Blew Consulting LLC	Member
Minikel	Justin	Eaton	Member
Yun	Joshua	Virginia Transformer Corp	Member
Larison	Andrew	Hitachi Energy	Member
McBride	Jim	JMX High Voltage	Guest
Xu	shuzhen	Fm	Requesting Membership
Garza	Gilberto	Prolec GE	Requesting Membership
Grooms	Brad	NTS	Guest
Morkhande	Shivkumar	Siemens Energy	Guest
Gyore	Attila	MIDEL and MIVOLT Fluids Ltd	Guest
Marulanda	Katherine	Magnetron	Guest
Vary	Robert	Reinhausen Manufacturing Inc.	Guest
Coughlan	William	Metglas Inc	Guest
Gaytan	Carlos	Prolec GE	Member
Colopy	Craig	Retired from EATON	Member
Hernández Cano	Sergio	Hammond power solutions	Member
Taylor	Marc	JFE Shoji Canada	Guest
John	John	Virginia Transformer Corp.	Member
Hoffman	Saramma	PPL	Requesting Membership

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Van Horn	Jeremy	IFD Technologies	Member
Basel	Cheryl	WEG Transformer	Guest
Blackwell	Zack	TCI	Guest
Cai	Jim	JSHP Transformer	Guest
Spaulding	James	City of Fort Collins Utilities	Member
Weyandt	Paul	Schneider electric	Requesting Membership
Duarte	Fernando	EPRI	Requesting Membership
Radu	Ion	Hitachi Energy	Member
McCullough	Lynn	Essex Brownell	Guest
Kim	Yeounsoo	MEPPI	Requesting Membership
Yavuz	Koray	Noark Electric US	Guest
Tirado	Fernando	Prolec GE	Requesting Membership
Vyas	Pragnesh	Sunbelt Solomon	Member
Hamilton	Kendrick	Badger Magnetics Inc.	Member
Megdad	Mohammed	Integrated Power Services	Requesting Membership
Rohrer	David	FirstEnergy	Guest
Mennonna	Robert	Maddox Industrial Transformer	Guest
DeRouen	Craig	ERMCO	Member
Traut	Alan	Howard industries	Member
Sewell	Jeremy	Quality Switch Inc.	Guest
Schindler	Stefan	Maschinenfabrik Reinhausen	Member
Payerle	George	Carte	Member
Matthews	Lee	Howard industries	Member
Slattery	Christopher	FirstEnergy	Guest
Plascencia	Miguel	PG&E	Requesting Membership
McBride	Brian	Cargill	Member
Thomas	Holifield	Holifield	Guest
Katapalli	Thrinadha	Virginia Transformer Corp	Requesting Membership
Iqbal	Fawax	OMICRON	Guest
Orr	Paul	NEMA	Guest
Wassall	Holly	JST Power	Requesting Membership
Stretch	Kerwin	Siemens Energy	Member
Frye	Richard	Eaton	Member
Crockett	Janet	Fayetteville PWC	Guest
Schumack	Joseph	Ameren	Requesting Membership
Tillery	Timothy	Howard Industries	Member
Mulkey	Dan	Mulkey Engineering Inc.	Member
Shertukde	Hemchandra	University of Hartford/Diagnostic-devices.com	Member
Roussell	Marnie	Entergy	Guest
Garcia	Miguel	Hitachi Energy	Requesting Membership
Macias	Alejandro	CenterPoint Energy	Member

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Chisholm	Paul	IFD Technologies	Member
Murcia	Fredy	Siemens Energy	Guest
Wilks	Alan	Consultant	Member
Reepe	Robert	Georgia Power Company	Member
Ayers	Donald	Ayers Transformer Consulting	Member
Vijayan	Krishnamurthy	Pennsylvania Transformer	Guest
Cordova	David	Maddox Industrial Transformer	Guest
Yuan	Guang	Hitachi Energy	Requesting Membership
Kosedagi	Nihat	Hitachi Energy	Guest
Klaponski	Brian	Carte International Inc	Member
Issack	Ramadan	AEP	Member
Blaszczyk	Piotr	Specialty Transformer Components LLC	Member
Lopez-Fernandez	Xose	Universidade de Vigo	Guest
Weiss	Zachery	WEG transformers	Member
Patel	Vinay	Con Edison	Member
Biggie	Kevin	Weidmann	Member
Manske	Nicholas	Oncor Electric Delivery	Requesting Membership
Hrkac	Miljenko	Hitachi Energy	Guest
Lee	Moonhee	Hammond Power Solutions	Member
Bhardwaj	Naveen	Trench Group	Guest
Ali	Rehan	Siemens Energy, Inc.	Requesting Membership
Da Silva	Roberto	Maschinenfabrik Reinhausen	Guest
Oakes	Stephen	Weg	Member
Hoffman	Gary	Advanced Power Technologies	Member
Tatu	Val	Powersmiths	Member
Fausch	Reto	RF Solutions	Guest
Zarnowski	Michael	Carte	Member
Pepe	Harry	Phenix Technologies	Guest
Gardner	James	Prolec-GE Waukesha	Member
Tostrud	Mark	Dynamic Ratings	Guest
Chesser	Noah	Oncor Electric Delivery	Member
Menter	Tim	Lincoln Electric System	Member
Ayala	Alejandro	Power partners	Member
Hopkinson	Philip	HVOLT Inc.	Member
Chrysler	Rhett	ERMCO	Member
Rave	Martin	IFD Technologies	Member
Chiang	Solomon	The Gund Company	Guest
Dauzat	Tom	AEP	Member
Snyder	Steven	Hitachi Energy	Member

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Sohail	Muhammad Abdullah	Trench Canada	Requesting Membership
Rusch	Kevin	Rugged Monitoring	Guest
Hilbert	Matt	D'Ewart Representatives	Guest
Boettger	William	Boettger Transformer Consulting LLC	Guest
Li	Chao	Eaton	Guest
Smith	Edward	H-J Family of Companies	Member
Thibault	Michael	Pacific Gas & Electric	Member
Thiede	Andreas	Highvolt Dresden	Guest
Zaman	Malia	IEEE	Guest
Murillo	Hugo	H-J Family of Companies	Requesting Membership
Shimpi	Leena	MGM Transformers	Guest
Nunez	Jesus	MGM Transformers	Guest
Holifield	Thomas	Howard Industries	Guest
Fu	Peng	Chint Electric	Guest
Jarosz	Patrycja	IEEE	Guest
Castillo	Alonso	Kaedi Energy	Guest
Obregon	David	TTE Transformers	Guest
Zhu	Zhaxiang	Chint Electric	Guest
Zhang	Jie	Chint Electric	Guest
Portillo	Homer	APT	Guest
Mani	Kumar	Duke Energy	Guest
Nguyen	Nam Tran	TT Electronics	Guest
Debass	Sami	EPRI	Requesting Membership

Annex D Dry Type Transformers Subcommittee

Wednesday October 30, 2024

IEEE Transformer DTSC Fall 2024 St. Louis, Missouri

Chair: Casey Ballard

Vice-Chair: David Walker

Secretary: Dave Stankes

D.1 Introductions, Chairs Remarks

The Dry-type Transformers Subcommittee (DTSC) met in the Grand Ballroom AB room at the Hyatt Regency St. Louis Missouri on October 30, 2024 at 1:30 PM (CST).

The Chair notified the attendees that the meeting would be recorded for the purpose of accurately documenting the minutes, and that recording would be erased once minutes were completed.

Request TF and WG chairs to provide David Walker short, concise summary of what was accomplished this week to be shared at Closing Session on 10/31. Meeting minutes requested to be forwarded to Dave Stankes asap as DTSC Meeting minutes are due by December 5th.

QR code system may be rolled out to at next meeting for the recording of attendance.

Chair offered congratulations to David Walker who will be taking over as Chair of the Dry-type Transformer after the conclusion of the Fall 2024 meeting.

D.2 Attendance and Quorum

The chair presented a slide with the names of all current members. There were 48 attendees. 17 of the 31 members of the DTSC were present, so a quorum was reached.

A roster was circulated, and the Chair requested any member who did not receive an e-mail invitation to this meeting to include it as they sign the roster as the e-mail the DTSC has on file is not accurate.

D.3 Approval of Agenda and Minutes

The chair entertained a motion to approve the planned agenda that was displayed at the meeting.

Motion to Approve – Mike Iman

Seconded – Ken Klein

Agenda was approved unanimously.

The chair entertained a motion to approve the Spring 2024 DTS meeting minutes that were posted on the Transformer Committee website.

Motion to Approve – Colby Lovins

Seconded – Kerwin Stretch

Spring 2024 DTS meeting minutes approved unanimously.

D.4 Working Group/Task Force Reports

Presentation of the reports of the various working groups and task forces. See the following sections for the individual reports:

D.4.1 C57.12.58 Transient Voltage

Ken Klein

The Working Group met and the meeting was called to order at 11:00 AM by Chair Ken Klein.

Meeting Minutes by Chris Powell as Tim-Felix Mai was absent.

Spring 2024 Minutes and agenda approved

Bob Fryer First and Joe Tedesco second,
Motion was approved unanimously.

Patents claim was made

Copyright policy was made

Question was posed to what should be updated on C57.12.58 document

C57.12.98 is open and coincides with C57.12.58

Casey Ballard stated past revision resolved all comments and no further work could be done from last time

C57.12.98 PAR expires in December, and this is a good time to see if anything from that could be used

Chair should get the current draft of C57.12.98 from that working group

Suggested to remove anything that is in C57.12.58 and also in C57.12.98 so items only need to be updated in one document and the other can reference it

Suggested to join C57.12.98 ballot to view their comments

Will get copies of the C57.12.98 and C57.12.58 documents to push them out to the members

Meeting adjourned at 11:43 A.M.

As this was a first WG meeting, a quorum was present.

WG Meeting Agenda

1. Welcome & chair's remarks
2. Introduction of attendees, Creation of WG?/attendance
3. Approval of agenda & Spring study group minutes
4. Call for essential Patents & IEEE SA Copyright Policy review
5. Approved PAR Title and Scope
6. Path forward
7. Meeting Adjournment

WG Attendance:

- 37 total participants

WG plans to meet during the spring 2025 Transformer Committee meeting in Denver.

Chair: Ken Klein

Vice Chair/Acting Secretary: Chris Powell

Participation list:

Last Name	First Name	Company
Fu	Renjie	Ermco/VDF
Walker	David	MGM transformer
deOliveira	Luit	Hitachi Energy
Tedesco	Joe	Hitachi Energy
Nunez	Jesus	MGM transformer

Shimpi	Leena	MGM transformer
Fryer	Bob	Dupont
O'keefe	William Sean	Dupont
Nguyen	Namtran	TT Electronics
Iman	Mohammad	MGM transformer
Washburn	Alan	Burns Mcdonald
Watson	Joshua	NPPD
Lachman	Mark	Doble
Yu	Zhenquan	Sieyuan Toshiba
Huang	Zinan	Sieyuan Toshiba
Lambert	Jason	Jst Power Equiptment
Hoffman	Gary	Advanced Power Tech
Mccullaugh	Lynn	Essex Bromwell
Bennett	Mark	Essex Bromwell
lee	Moonhee	Hammond Power Solutions
Ballard	Cassie	Dupont
Lovins	Colby	Federal Pacific
Tatu	Yaz	Powersmiths
Stretch	Kerwin	siemens energy
Gutierrez	Jolani	Jst Power Equiptment
Menddez	Luis Felipe	Jst Power Equiptment
Mosquera	Emerson	Jst Power Equiptment
Grajeda	Rafaed	Eaton
Sandaval	Alberto	Eaton
Moeelohande	Shivkumar	siemens energy
Izquidero	Jose	siemens energy
Kupp	Alvin	HVTC Inc.
Mennonna	Robert	Maddox Industrial
Cordova	David	Maddox Industrial
Oitega	Anidondo	siemens energy
Naderian	Ali	siemens energy
Heracidez	Cuno Sergio	Enerpars

D.4.2 Revision for IEEE Revision of C57.12.01 Chair Casey Ballard

The WG met on Monday, October 28, 2024; 1:45 PM – 3:00 PM

- The meeting was called to order at 1:45 pm by Chair Casey Ballard.
- The chair made opening comments, and the Working Group leaders (Chair, Vice Chair and Secretary) introduced themselves.

The attendance roster was circulated with instructions to indicate if the attendees would like to become a member of the Working Group.

After circulation, there were 58 participants, 23 Members, 35 guests, and 11 individuals requested membership.

The Chair displayed the current Working group members list. At present, there are 36 Working Group members. 23 were present so the meeting quorum was established. Please see the list of attendees at the end of the report.

The Chair reviewed the agenda for the meeting.

Motion by John John to approve the Agenda.

- Motion seconded by Ryan Hogg
- No discussion
- Chair asked if there was any objection to unanimous approval of the agenda. None of the present members objected so the motion passed unanimously.

The Chair reviewed the previous meeting minutes from the spring 2024 meeting in Vancouver.

Motion by Kerwin Stretch to approve the Spring 24 Meeting Minutes.

- Motion seconded by David Walker
- No discussion
- Chair asked if there was any objection to unanimous approval of the agenda. None of the present members objected so the motion passed unanimously.

The Chair discussed the PAR expiration date of December 2026 and stated the Spring 2025 meeting would be the last meeting to incorporate changes to the document. The desire is to maintain the same timeline as C57.12.91.

The Chair reviewed the copyright and patent slides. No patent claims were stated.

Old Business:

Power Factor Testing Pass/Fail Criteria – Report by Mr. Locarno

- The topic was postponed to later in the meeting in case the individual was delayed. By meetings end, Mr. Locarno was unable to attend so the topic was not discussed.

TF Annex Proposal on Fire Performance – Tim-Felix Mai

- No Task Force updates/reports from the previous two Working Group Meetings. The Chair decided to close the Task Force.

TF Environmental Conditions– Tim-Felix Mai

- No Task Force updates/report from the previous two Working Group Meetings. The Chair decided to close the Task Force.

New Business:

Short Circuit Temperature Calculation – Vijay Tendulkar

- Vijay was unable to attend the meeting so there was nothing to report. There was a group discussion around the IEC and IEEE formulas. Primarily the IEC was preferred but the IEEE was allowed. The Chair asked the group for additional information that may be discussed in the next meeting.

Dry-Type Pole Mounted – Tim-Felix Mai

- Tim-Felix was unable to attend the meeting so there was nothing to report. The Chair asked the group for thoughts / comments. No comments were shared.

BIL of Dry-Type versus Liquid – Phil Hopkinson

- Phil discussed the history of Dry-Type and Liquid-Filled in relation to BIL / Impulse testing levels and why they were different. Also discussed were switching transients and how Vacuum Breaker technology has contributed to a increase in these levels. Much

discussion on whether to align the BIL levels of Dry-Type Transformers with the BIL levels of Liquid-Filled Transformers. Discussion also included the differences between negative and positive polarity in regards to Impulse testing.

- **Motion by Mahajan Kushai:** Change the Dry-Type BIL listed in table 3 to match the distribution section of table 3 of C57.12.00 and maintain the positive polarity.
 - Motion seconded by Joe Tedesco
 - Discussion: Much discussion on having a table to vote on opposed to voting on text and that the proposal was a big change and could significantly affect end users. Also, discussion centering around Vacuum Circuit Breaker interactions / restrikes, shielded windings and Snubbers. Discussion progressed toward the topic of tabling the motion until the next meeting. There was a consensus within the group to table the motion.
 - **Motion by David Walker:** Table the motion until we have a BIL table to review.
 - Motion seconded by Ryan Hogg
 - No additional discussion
 - 19 Approved, 0 Disapproved, 4 Abstained.
 - Chair asked for a Task Force volunteers to report at the Spring meeting. However, if the Task Force fails to present a proposal at the Spring meeting, the tabled motion would die. There were two Task Force volunteers, Phil Hopkinson as Chair and Joe Tedesco as a member.

Class I Transformers / Table 13 – Ryan Hogg

- Ryan gave a presentation centered around Table 13. See below.



241027 C57.12.01
500 kVA History (1).ppt

- Ryan discussed possible ways forward.
 1. Keep the existing table
 2. Update the table: 1Ph and 3Ph values use a 3X relationship
 3. Create a Task Force to investigate further.
- Ryan will also present to the C57.12.00 WG and report back any findings / comments.
- Additional discussions on keeping the existing table (option 1) but writing a clarification note regarding 500KVA. Ryan agreed to draft an explanatory note and present it to the Working Group during the Spring 2025 meeting.

With no further business, the meeting was adjourned.

Chair: Casey Ballard
Vice Chair: Joe Tedesco
Secretary: Colby Lovins

Working Group for C57.12.01 Meeting Attendees – Fall 2024

Robert	Ballard	DuPont	Chair
Mark	Bennett	Essex Brownell	Guest
Megan	Bereswill	JST Power Equipment	Guest
Solomon	Chiang	The Gund Company	M
David	Cordova	Maddox Industrial Transformer	Guest
Renjie	Fu	ERMCO/VF Transformer	M

Bob	Fyrer	DuPont	M
Miguel	Garcia	Hitachi Energy	Guest
Rafael	Grajeda	EATON Corporation	Guest
Detlev	Gross	Power Diagnostix Consult	Guest
Jovani	Gutierrez	JST Power Equipment	Guest
Giovanni	Hernandez	Virginia Transformers Corporation	M
Sergio	Hernandez Cano	Hammond Power Solutions	M
Ryan	Hogg	Bureau of Reclamation	M
Philip	Hopkinson	HVOLT Inc.	Guest
Saif	Hossain	Trench Ltd.	Guest
Mohammad	Iman	MGM Transformer Company	M
Jose	Izquierdo	Siemens Energy	Guest
John	John	Virginia Transformer Corp.	M
Rebecca	Kim	Cheryong Electric	Guest
Ken	Klein	Johnson	M
Mahajan	Kushal	Sungrow	M
Jason	Lambert	JST Power Equipment	Guest
Moonhee	Lee	Hammond Power Solutions	M
Weijun	Li	Braintree Electric Light Dept.	M
Colby	Lovins	Federal Pacific Transformer	Secretary
Alejandro	Macias	Centerpoint Energy	Guest
Lynn	McCullough	Essex Brownell	Guest
Luis Filipe	Mendez	JST Power Equipment	Guest
Robert	Mennonna	Maddox Industrial Transformer	Guest
Humberto	Moreno	Siemens Energy	Guest
Emerson	Mosquera	JST Power Equipment	Guest
Shivkumas	Mozkhande	Siemens Energy	Guest
Namtran	Nguyen	TT Electronics	Guest
Mike	Nolte	Kiewit	Guest
William Sean	O'Keefe	DuPont	Guest
Agustin	Ortega	Siemens Energy	Guest
Harry	Pepe	Phenix Technology, Doble	Guest
Chris	Powell	Intermountain Electronics	M
Ashley	Reagan	Eltek Labs	Guest
Alberto	Sandoval	EATON Corporation	M
Cody	Schott	The HJ Family of Companies	Guest
Mike	Shannon	REA Magnet Wire	Guest
Masoud	Sharifi	Siemens Gamesa	Guest
Hemchandra	Shertukde	UHART	Guest
Muhammad Abdullah	Sohail	Trench Limited	M
Brian	Sonnenberg	Instrument Transformers, LLC	M
David	Stankes	3M	M
Kerwin	Stretch	Siemens Energy	M
Chris	Talbert	JST Power Equipment	Guest
Valeriu	Tatu	Powersmith	M
Joseph	Tedesco	Hitachi Energy	Vice Chair
David	Walker	MGM Transformer Company	M

Evanne	Wang	DuPont	Guest
Paul	Weyandt	Schneider Electric	Guest
Terry	Wong	Trench Ltd	Guest
Guang	Yuan	Hitachi Energy	Guest
Malia	Zaman	IEEE SA	Guest

D.4.3 Revision for IEEE 259**Chair Dave Stankes****The WG met at 3:15 PM CST, Monday, October 28, 2024**

Chair: David Stankes

Vice-Chair/Secretary: Joseph Tedesco

This was the fourteenth meeting of the IEEE 259 Working Group. The meeting was held in the Grand Ballroom C meeting room, and Dave Stankes called the meeting to order at 3:15 PM.

Introductions were made.

There were 40 people present in the meeting, with 10 members and 30 guests. The Working Group had 20 members; therefore, a quorum was reached, and business could proceed. 3 guests requested membership.

Dave S. asked for a motion to approve the agenda. Casey Ballard moved to accept the agenda, with Bob Fryer seconding the motion. There was no discussion, and approval of the agenda was unanimous.

Dave S. had distributed the minutes of the last two meetings, which were held virtually in June and September. He asked for a motion to approve both sets of minutes. Colby Lovins moved to accept the minutes, and Solomon Chiang seconded the motion. There was no discussion, and approval of both sets of minutes was unanimous.

Dave S. showed the patent and copyright slides. He asked if there were any patent or copyright concerns from those in attendance; no one had any concerns or noted any patent/copyright issues.

Old Business:

- Dave S. showed and discussed the flow chart that had been developed for the revised standard, and he discussed the overall approach that has been used in the revision, namely breaking the work up into multiple smaller groups/task forces.
- Dave S. discussed changes that were proposed to the Clause 6 (Test Methods), and Joe Tedesco added details about the rationale behind the proposals.
 - Proposal 1: Reduce the targeted number of cycles for failure from “6 to 10” to “5 to 10.”
 - Casey B. made a motion to accept this change. Solomon C. seconded the motion. There was no discussion, and the approval of the motion was unanimous.

- Proposal 2: Change the separation of aging temperatures from “15 to 35°C” to a minimum of 10°C” and mandate that the range from lowest to highest aging temperature shall be at least 30°C. There was some discussion regarding the proposed wording, with changes being made to the proposed wording.
 - A motion was made by Casey B. to accept those changes, with Solomon Chiang seconding the motion. There was no further discussion, and the approval of the changes was unanimous.
 - Another motion was made by Casey B. to add the proposal to the draft. Solomon C. seconded the motion. There was no discussion, and the motion was unanimously approved.
- Proposal 3: Change when the cycle time may be changed depending on when failures occur. There was a lot of discussion about whether mandating when times be altered is the best policy and whether it would actually lead to faster failures. It was pointed out that if the screening tests were being used to determine more accurate thermal and dielectric limits of the test coils, then the likelihood of test coils lasting for many, many cycles was reduced.
 - Ultimately, the proposal was sent back to the task force for further consideration.
- Proposal 4: Change the description of oven tolerances to vary depending on the temperature range of the oven. There were some minor changes to the wording, but the general consensus was that the tolerances were consistent with other standards and not problematic.
 - A motion was made by Joe Tedesco to add the over temperature tolerance wording, and it was seconded by Evanne Wang. There was no discussion, and the motion was unanimously approved.
- Proposal 5: Change the minimum suggested number of test coils from 10 to 6. There was a discussion about whether, for statistical significance, it would be better to have more test coils. Points were made that a poorly manufactured test coil could have outsized effects if the number of test coils were smaller, and this could end up being more costly in the long run. It was also pointed out that there are a number of standards and test reports that identify the minimum number of samples necessary for statistical significance, and that 6 was in that range. It was also noted that the numbers were merely suggestions for minimum numbers of test coils, and it was questioned whether there should be a requirement.
 - Ultimately, the proposal was sent back to the task force for further consideration.
- Proposal 6: Change the minimum temperature for the cold shock to -30°C. It was asked where this number came from, and it was pointed out that it matched the minimum cold storage temperature in C57.12.01. It was also similar to cold exposure language in C57.12.60. There was a lot of discussion about the purpose of the cold exposure, whether it was designed to hasten mechanical failures, or if it was just to facilitate condensation during subsequent humidification testing. The question was asked why wouldn't the focus be to achieve a stable temperature, like

the current wording in C57.12.60, instead of just specifying a time to hold the test coils at -30°C?

- Ultimately, the proposal was sent back to the task force for further consideration.
- Proposal 7: Change the description of moisture exposure to be similar to C57.12.60 and add wording about accommodating other tests. There was some discussion about the wording, which was changed to the satisfaction of all in attendance.
 - Joe T. made a motion to add the wording, and it was seconded by Bob Fryer. There was a short discussion, and a vote was taken, with 9 for, 1 against, and 0 abstentions. The motion carried.
- Dave S. began discussing Clause 8.4, which called for allowing a company to modify an insulation system by adding a secondary insulation that had the same chemical fingerprint as a material already in the system. Solomon C. explained that this was to streamline the process and would apply to materials that would otherwise undergo chemical compatibility testing, which is why it was unnecessary to have similar mechanical properties. Casey B. pointed out that if this were to be allowed, it should be mandated that only a manufacturer of two chemically identical products could make such a substitution (as opposed to an end user, supplier, etc.). He further pointed out that chemical fingerprinting of materials was well-known to be fraught with potential problems.
 - There was no decision, and the matter would be discussed in further detail at the next meeting.

New Business:

- Dave S. discussed the upcoming revised draft. New text that was added and accepted would be highlighted a different color than text that had been added but not yet accepted. Text that was deleted and text that was moved would also be identified.

There will be two interim meetings before the Spring 2025 meeting. The dates of those meetings have not been set yet. The working group would also meet on March 24, 2025 or March 25, 2025 in Denver, CO.

The meeting was adjourned at 4:27 PM.

Role	First Name	Last Name	Affiliation
Guest	Gavin	Alexander	Coil Innovation
Member	Robert Casey	Ballard	DuPont
Guest	Naveen	Bhardwaj	Trench Group
Guest	Camilo	Casallas	Trench Limited
Member	Solomon	Chiang	The Gund Company
Guest	Luiz	de Oliveira	Hitachi Energy
Guest	Peter	Doppihain	Trench Group
Guest	Marco	Espindola	Hitachi Energy
Guest	Renjie	Fu	ERMCO/V&F Transformer
Member	Bob	Fryer	DuPont
Guest	Rafael	Grajeda	Eaton
Guest	Jovani	Gutierrez	JST Power Equipment
Guest	Gary	Hoffman	Advanced Power Technologies
Guest	Saif	Hossain	Trench Limited
Guest	Ken	Klein	Johnson Electric
Member	Moonhee	Lee	Hammond Power Solutions
Member	Colby	Lovins	Federal Pacific
Member	Kushal	Mahajan	Eaton
Guest	Swapnil	Marathe	Megger
Guest	Emerson	Mosquera	JST Power Equipment
Guest	Nam	Nguyen	TT Electronics
Guest	Jesus	Nunez	MGM Transformer
Guest	William Sean	O'Keefe	Dupont
Guest	Agustin	Ortega	Siemens Energy
Guest	Klaus	Pointer	Trench Austria
Member	Chris	Powell	Intermountain Electronics
Guest	Ashley	Reagan	ELTEK Labs
Guest	Alberto	Sandoval	Eaton
Guest	Michael	Sharp	Trench Limited
Guest	Leena	Shimpi	MGM Transformer
Guest	Brian	Sonnenberg	ITI
Chair	David	Stankes	3M
Guest	Val	Tatu	Powersmiths
Vice Chair	Joseph	Tedesco	Hitachi Energy
Member	Evanne	Wang	DuPont
Guest	Leon	White	Hedrich
Guest	Stefan	Wirth	Coil Innovation
Guest	Terry	Wong	Trench Ltd.
Guest	Guang "Grace"	Yuan	Hitachi Energy
Guest	Malia	Zaman	IEEE SA

VIRTUAL Meeting – WG met 3:00 PM EST, Thursday, September 12, 2024

Chair: David Stankes

Vice-Chair/Secretary: Joseph Tedesco

This was the thirteenth meeting of the IEEE 259 Working Group. The meeting was held virtually, and Dave Stankes called the meeting to order at 3:00 PM.

To save time, quick introductions were skipped.

There were 26 people present in the meeting, with 10 members and 16 guests. No one requested membership. The Working Group had 19 members; therefore, a quorum was reached, and business could proceed.

Dave S. asked for a motion to approve the agenda. Chuck Johnson moved to accept the agenda, with Solomon Chiang seconding the motion. There was no discussion, and approval of the agenda was unanimous.

Dave S. had not distributed the minutes of the last meeting, which was held virtually in June, and planned to distribute those minutes with the minutes of this meeting prior to the Fall Meeting, planning to seek approval for both sets of minutes at that meeting.

Dave S. showed the patent and copyright slides. He asked if there were any patent or copyright concerns from those in attendance; no one had any concerns or noted any patent/copyright issues.

Old Business:

- Solomon C. reviewed the proposal for Clause 7, which would deal with how to modify an insulation system
 - There were extensive discussions about types of primary/major insulations, how they were used in transformers, and what types should be described in this standard.
 - There were extensive discussions about how to add/change primary/major insulations.
 - Three-point vs. single-point thermal aging were presented as options, and Dave S. asked why anyone would perform a three-point thermal aging to simply modify an insulation system.
 - Chemical interchangeability of materials was discussed, and there was a discussion about how to describe different methods for identifying chemical composition of materials for this purpose.
 - The description of single-point thermal aging would come directly from C57.12.60-2020 Clause 8.2, and there was a discussion as to whether that standard should just be referenced or whether the process should appear as text.
 - Joe Tedesco pointed out that some users of this standard would be LV manufacturers who would have no use for C57.12.60.
 - Solomon C. pointed out that the text in C57.12.60 contained a typo, which could be corrected when copied to IEEE 259.
 - It was decided to add the text in full instead of just referencing C57.12.60-2020.
 - The ways to add varnishes and resins was discussed.

Annex D

- There was a discussion about the definitions of varnishes and resins, and whether to use the definitions in IEEE C57.12.80 or other, more technical descriptions of varnishes and resins.
 - The definitions from C57.12.80 would be used.
- Solomon C. mentioned the use of chemical compatibility testing (AKA sealed tube testing) for adding varnishes for open wound transformers, coatings on wires, etc. and single-point thermal aging for resins used for solid-cast transformers.
 - Joe T. pointed out that the C57.12.60 working group had identified that varnishes for open wound transformers occupied a special place and were handled using the enhanced sealed tube test.
- There was extensive discussion about using chemical similarity between two materials to determine whether testing was necessary.
 - Bob Fyrer pointed out that you could have two materials that were chemically identical but could have very different properties depending on how they were structured.
 - Dave S. decided to table the discussion.
- Joe T. reviewed the changes made to Clause 6 involving testing.
 - Most of the changes were minor, with only a few technical changes, and there was little discussion.
 - The range between aging temperatures, how to adjust aging periods depending on sample failure, and oven temperature uniformity, were all clarified.
 - The table of suggested aging temperatures and cycle lengths from C57.12.60 was added.
 - Mechanical stress, thermal exposure shock, and moisture exposure testing on samples was simplified, removing differences depending on expected usage of the transformers (indoor vs. outdoor).

New Business:

- Dave S. provided an update the PAR extension.
 - It is on the agenda for the September 25 NesCom meeting.
- Dave S. showed the new scope and purpose.
 - They will be added to PAR revision, which will be upcoming.

Role	First Name	Last Name	Affiliation
Member	Piotr	Blaszczyk	Specialty Transformer
Guest	Camilo	Casallas	Trench Limited
Member	Solomon	Chiang	The Gund Company
Guest	Renjie	Fu	ERMCO/V&F Transformer
Member	Bob	Fyrer	DuPont
Guest	Rafael	Grajeda	EATON Corporation
Guest	Saif	Hossain	Trench Limited
Member	Charles	Johnson	Hitachi Energy
Member	Moonhee	Lee	Hammond Power Solutions
Member	Aleksandr	Levin	Weidmann Electrical Technology
Guest	Tiffany	Lucas	Prolec GE
Guest	Kenneth	McKinney	UL LLC/UL Solutions
Guest	Christian	Orlando	IEEE SA
Guest	Vinay	Patel	Con Edison
Guest	Caroline	Petersen	Xcel Energy
Guest	Chris	Powell	Intermountain Electronics
Guest	Zoltan	Roman	GE
Guest	Alberto	Sandoval	EATON Corporation
Guest	Sam	Sharpless	Rimkus
Chair	David	Stankes	3M
Guest	Val	Tatu	Powersmiths
Vice Chair	Joseph	Tedesco	Hitachi Energy
Member	Vijay	Tendulkar	EATON Corporation
Member	Evanne	Wang	DuPont
Guest	Terry	Wong	Trench Limited
Guest	Guang "Grace"	Yuan	Hitachi Energy

VIRTUAL METING – WG Met 9:30 AM – 10:30 AM CET, Wednesday, June 12, 2024

The meeting was held virtually over Microsoft Teams and Dave Stankes called the meeting to order at 9:32 AM Chair made opening comments.

In the interest of time, introductions were foregone, and Dave asked that all attendees record their affiliations in the Chat section of Microsoft Teams.

Attendance:

- 25 total participants
- 10 Members
- 15 guests

There were 10 out of 18 members present. A quorum was present.

WG Meeting Agenda

- 1. Introductions / Attendance/Determine Quorum (10minutes)**
- 2. Review action items from Vancouver Spring meeting including:**

Clause 7. Modifications to an existing system (Evanne Wang, Solomon Chiang)
Review proposals for method to add minor insulations and/or

Clause 6: Test procedures

Review of Mechanical stress, thermal exposure, and moisture (Tim-Felix Mai, Joe Tedesco)

3. PAR Extension Update

4. Meeting Adjournment

The chair showed the Participant behavior in IEEE-SA activities, patent, and copyright slides. He asked if there were any patent or copyright concerns from those in attendance; no one had any concerns or noted any patent/copyright issues.

The agenda was approved unanimously without discussion.

Motion: Colby, Second: Rob

The WG Meeting minutes of the Spring 2024 in Vancouver were approved unanimously without discussion.

Motion: Rob, Second: Vijay

Old Business:

Clause 7. Modifications to an existing system

A proposal from Solomon to include UL1446 CCT to include a path for adding minor insulation. This requires on seal tube per varnish type. Mark commented on that proposal and the group discussed if generic material substitution should not be allowed or not.

As UL 1446 has good definitions for modifications to an existing system Evanne proposed to use wording from this standard.

Clause 7 should reference UL1446's supplements SA – Substitution or Modifications to an EIS on modifications to an existing system.

Clause 7 should include example ways to modify an existing system and which test to use.

Evanne has sent in a full proposal for clause 7 which was shown by the chair.

Motion: To incorporate information to change an existing system by using UL1446 as a reference
By Evanne, Second: Joe

The motion was approved unanimously without discussion.

Clause 6: Test procedures

The ask for volunteers to review the section and help Joe and Tim-Felix. Nancy volunteered and Mark will help to review the proposals.

PAR Extension Update

This revision to the PAR will be submitted at a later date as it may change as we continue to work on the document. 2 year extension will be requested. No change to Title, Scope, or Purpose at this time.

New Business:

None

The meeting was adjourned at 10:30 AM.

	Last Name	First Name	Company	
1	Stankes	David	3M	Chai
2	Tedesco	Joseph	Hitachi Energy	Vice Chair
3	Mai	Tim-Felix	Siemens Energy	Secretary
4	Lee	Moonhee	Hammond Power Solution	Member
5	Levin	Alexander	Weidmann	Member
6	Lovins	Colby	Federal Pacific	Member
7	Tendulkar	Vijay	Eaton	Member
8	Wang	Evanne	DuPont	Member
9	Patel	Vinay	Con edision	Guest
10	Yuan	Guang	Hitachi Energy	Guest
11	Jarosz	Patrycja	IEEE SA	Guest
12	Peterson	Caroline	Xcel Energy	Guest
13	Shahsiah	Ahmad	Exponent, Inc.	Guest
14	Caverly	David	Trench Limited	Guest
15	Johnson	Charles	Hitachi Energy	Member
16	Powell	Chris	Intermountain Electronics	Guest
17	Izquierdo	Jose	Siemens Energy	Guest
18	McKinney	Kenneth	UL Solutions	Guest
19	Morales	Elena	Siemens Energy	Guest
20	Forst	Nancy	Frosty's Zap Lab, LLC	Guest
21	Raymond	Mark	UL Solutions	Guest
22	Fu	Renjie	VF Transformer	Guest
23	Ghosh	Rob	GE	Member
24	Lucas	Tiffany	Prolec GE Waukesha	Guest
25	Vrabie	Ivan	UL Solutions	Guest

D.4.4 PAR for ANSI C57.12.55 Enclosures

Colby Lovins

The WG met at 4:45 PM CST, Monday, October 28, 2024.

Secretary (Acting Chair): Colby Lovins

Acting Secretary: Joseph Tedesco

This was the second meeting of the IEEE C57.12.55 Task Force. The meeting was held in the Grand Ballroom C meeting room, and Colby Lovins called the meeting to order at 4:45 PM.

To save time, introductions were skipped.

There were 19 people present in the meeting, with 5 members and 14 guests. 5 guests requested membership. The Task Force had 8 members; therefore, a quorum was reached, and business could proceed.

Colby L. explained that the task force had completed its assigned work of developing the PAR in the last meeting, but the PAR had not been approved yet, so we were unable to do any actual work. For this meeting, we would discuss the direction we wanted to proceed.

Colby L. asked for a motion to approve the agenda. Bob Fryer moved to accept the agenda, with Ken Klein seconding the motion. There was no discussion, and approval of the agenda was unanimous.

Colby L. asked for a motion to approve the minutes. Ken K. moved to accept the minutes, and Bob F. seconded the motion. There was no discussion, and approval of both sets of minutes was unanimous.

Colby L. showed the patent and copyright slides. He asked if there were any patent or copyright concerns from those in attendance; no one had any concerns or noted any patent/copyright issues.

Old Business:

- Colby L. discussed the plan.
 - The PAR will be submitted by the end of the year, so we should be a working group by the Spring 2025 meeting.
 - We would consider removing Annex A, Annex B, clearance tables, and the table of conformance testing.
 - This material has been moved to or included in other standards.
 - We would investigate agreement with other enclosure standards, enclosure categories, and adopting enclosure types from NEMA and UL.
 - We would review the diagrams, drawings, and tooling to match those listed in IEEE C57.12.28.

New Business:

- There was no new business.

There was a question raised regarding if the WG gained approval from the DTSC for submitting a PAR. (Yes, it did.) A question regarding the ANSI designation on the document was raised. This document will not have ANSI designation once it is released.

The working group should meet on March 24, 2025 or March 25, 2025 in Denver, CO.

The meeting was adjourned at 5:06 PM.

ATTENDANCE

Role	First Name	Last Name	Affiliation
Guest	Kayland	Adams	Prolec GE Waukesha
Member	Robert Casey	Ballard	DuPont
Member	Bob	Fryer	DuPont
Guest	Hector	Garza	Orto de Mexico
Member	Ken	Klein	Johnson Electric
Secretary	Colby	Lovins	Federal Pacific
Guest	Shiv	Makhande	Siemens Energy
Guest	Humberto	Moreno	Siemens Energy
Guest	Ali	Naderian	Enerpars
Guest	Jesus	Nunez	MGM Transformer
Guest	William Sean	O'Keefe	Dupont
Guest	Agustin	Ortega	Siemens Energy
Guest	Leena	Shimpi	MGM Transformer
Guest	David	Stankes	3M
Guest	Kerwin	Stretch	Siemens Energy
Guest	Val	Tatu	Powersmiths
Member	Joseph	Tedesco	Hitachi Energy
Guest	Evanne	Wang	DuPont
Guest	Bruce	Webb	KUB

D.4.5 Revision of IEEE C57.94

Chair Ken Klein

- The Working Group met in Grand Ballroom F room. The meeting was called to order at 8:00 AM by Chair Ken Klein.
- Chair made opening comments.
- Introductions were made by all participants. WG Roster has been distributed and signed.

Attendance:

- 34 total participants
- 9 Members
- 25 guests

There were 9 out of 17 members present. A quorum was present.

WG Meeting Agenda

1. Welcome & chair's remarks
2. Introduction of attendees, attendance & determination of quorum
3. Approval of agenda and Spring minutes
4. Call for essential Patents & IEEE SA Copyright Policy review
5. Review of TF sections
 - o Normative references: Ken & Roger
 - o Definitions: Tim-Felix (Complete)
 - o Application: Colby & Chris (Complete Fall 2022)
 - o Installation: Dave (Complete Fall 2022)
 - o Testing: Kerwin & Joe (Complete Spring 2023)
 - o Operation: Casey (Complete Fall 2023)
 - o Maintenance: Ken Klein & Kerwin (New Figure #1 & Comments from Ryan Hogg)
6. Go to ballot? If yes, create resolution group and empower it to resolve comments without the need to come back to the WG
7. Meeting Adjournment

Reviewed agenda. The agenda was approved unanimously without discussion.
Motion: Joe Tedesco, Second: Colby Lovins

The WG Meeting minutes of the Spring 2024 Meeting were approved unanimously without discussion.
Motion: Colby Lovins, Second: Joe Tedesco

The chair presented the information on Code of Conduct, Patent Disclosures, and IEEE SA Copyright Policy. He asked the group to report any relevant patent issues – None were communicated.

Old Business:

Review of TF sections:

Maintenance Clause - New Figure #1 & Comments from Ryan Hogg

Ryan described the addition of new Clause 8.1.4 that described other potential maintenance items that may be considered. A new Maintenance Checklist was also created and added as content in the (Informative) Annex. Ryan stated no new requirements were included in this checklist.

Ken reviewed updated New Figure #1.

A **motion** to add the new Clause 8.1.4 (potential maintenance items), Maintenance Checklist (into Annex), and new Figure #1 was made by Ryan Hogg and seconded by Kerwin Stretch.

Discussion on whether font on figures would need to be fixed before submitting (Colby believes it needs to be fixed). A question regarding whether more information / text was needed explaining the shape of the curve in New Figure #1. It was decided that sufficient text was already present in Clause 3.3.5.2.

Motion was approved unanimously.

Discussion regarding what is the responsibility of the WG to make sure bibliography title and number are correct before submitting for vote. Patrycja J. from IEEE confirmed this information should be correct before submitting.

Patrycja J. reminded the WG that formed Comment Resolution Groups are able to address editorial comments. The CRG's are encouraged to notify the WG on any resolution or recommendations for technical comments although this is under the discretion of the SC.

The WG addressed several needed fixes including:

- correcting names of references and locating these references in correct place in the document (Normative Annex vs. Bibliography).
- Removal of duplicate references.
- Making sure Scope and Purpose in Draft match what is on PAR.

A **motion** was made by Joe Tedesco and seconded by Chris Powell to send the current draft, pending chair to make any other needed editorial corrections to the document, to the SC for a vote to go to ballot. Request formation of a Comment Resolution Group with authority to address editorial and technical comments without having to go back to the WG.

Motion was approved.

Approve: 9

Reject: 0

Abstain: 0

Volunteers for CRG included:

Ryan Hogg

Joe Tedesco

Kerwin Stretch

Colby Lovins

Ken Klein

At the conclusion of the review of the C57.94 meeting highlights

Ken Klein made a motion to the DTSC to take C57.94 to ballot. The motion was seconded by Joe Tedesco. The motion was unanimously approved.

Chair: Ken Klein

Vice-Chair: David Stankes (submitted meeting minutes)

Secretary: Tim-Felix Mai

	First Name	Last Name	Company	
1	David	Stankes	3M	Vice Chair
2	Robert	Ballard	DuPont	Member
4	Ken	Klein	Johnson	Chair
5	Joseph	Tedesco	Hitachi Energy	Member
6	Colby	Lovins	Federal Pacific	Member
7	Solomon	Chiang	TGC	Member
8	Kerwin	Stretch	Siemens Energy	Member
9	Val	Tatu	Powersmiths	Guest
10	Bob	Fyrer	DuPont	Guest
11	Ryan	Hogg	Bureau of Reclamation	Guest
12	Alberto	Sandoval	Eaton	Guest
13	Brian	Sonnenberg	ITI	Guest
14	Yuan	Guang	Hitachi Energy	Guest
15	Evanne	Wang	DuPont	Guest
16	Stefon	Wirth	Coil Innovation	Guest
17	William Sean	O'Keefe	DuPont	Guest
18	Mark	Bennet	Essex Brownell	Guest
19	Humberto	Moreno	Siemens Energy Inc.	Guest
20	Luis Felipe	Mendez	JST Power	Guest
21	Emerson	Mosquera	JST Power	Guest
22	Leena	Shimpi	MGM Transformer	Guest
23	Jesus	Nunez	MGM Transformer	Guest
24	Mihai	Huzemezam	Meggior	Guest
25	Jesse	Theberge	Tempel	Guest
26	Eric	Hatton	Tempel	Guest
27	Hem	Shertuse	UHART/DDI	Guest
28	Verena	Pellon	FPL	Guest
29	Patrycja	Jarosz	IEEE SA	Guest
30	Kushal	Mahajan	Sunrow	Guest
31	Chris	Powell	Intermountain Electronics	Member
32	Jose	Izquierdo	Siemens Energy	Guest
33	Agustin	Ortega	Siemens Energy	Guest
34	Renjie	Fu	Ermco / V&F Transformer	Guest

D.4.6 Revision of C57.12.59 Through Fault Current**Paul Weyandt**

- Chair called meeting to order at 11 am CDT.
- Restart after change of Chair from Derek Foster to Paul Weyandt
- Colby Lovins moved to approve agenda, Ken Kline seconded. Motion passed unanimously
- Chair presented call for patents. No claims presented.
- Chair presented Copyright and behavior policies.
- Chair presented options for proceeding: do nothing, minor changes, revise everything.

- Casey Ballard pointed out that C57.12.01 removed the 25X short circuit current limit. Discussion about options revolved about how the existing curves were generated- where is the data, analysis, etc.. It was suggested that members of the previous working group might have data. Should review liquid guide to see if background information is available.

- Chair proposed interim virtual meetings to address some of these issues before Spring 25 meeting.

- Colby Lovins to proceed on proceeding on path 2. Joe Tedesco seconded. Motion passed unanimously.

- Action Items:
 - David Walker to compare Dry and Liquid (C57.109) guides to look for background information.

 - Look at extending graphs to lower and higher impedance. Leena Shimpi volunteered.

 - Meeting adjourned at 12:15 pm CDT. A virtual working group meeting will be announced when scheduled. Next in-person meeting will take place at the Transformers Committee Spring 2025 Meeting in Denver, CO. March 23-27, 2025.

- Meeting Attendees:

Name	Affiliation	Participation
Ballard, Casey	DuPont	Member
Bereswill, Megan	JST Power	Member
Chiang, Solomon	The Gund Company	Guest
Colby, Caleb	Schneider Electric	Member
Coughlan, Will	MetGlas	Guest
Fu, Peng	Chint Electric	Guest
Fu, Renjie	VF Transformer	Member
Fyrer, Bob	Dupont	Member
Garza, Hector	Orto	Guest
Grajeda, Rafael	Eaton	Member
Gutierrez, Jovani	JST Power	Guest
Izquierdo, Jose	Siemens Energy	Member

Klein, Ken	Johnson Coil	Member
Lambert, Jason	JST Power	Member
Lovins, Colby	Federal Pacific	Member
Mai, Tim-Felix	Siemens Energy	Secretary
Mahajan, Kushal	Sungrow	Member
Makhande, Shiv	Siemens Energy	Member
Mendez, Luis Filipe	JST Power	Guest
Moreno, Humberto	Siemens Energy	Member
Mosquera, Emerson	JST Power	Guest
Munoz, Martin	Orto	Guest
Naderian, Ali		Guest
Nguyen, Nam	TT Electronics	Member
Nunez, Jesus	MGM Transformers	Member
Okeefe, Sean	DuPont	Member
Ortega, Augustin	Siemens Energy	Member
Powell, Chris	Intermountain Electronics	Member
Sandoval, Alberto	Eaton	Member
Shimpi, Leena	MGM Transformers	Member
Stankes, Dave	3M	Guest
Stretch, Kerwin	Siemens Energy	Member
Talbert, Chris	JST Power	Guest
Tatu, Val	Powersmiths	Member
Tedesco, Joe	Hitachi Energy	Member
Walker, David	MGM Transformers	Vice-Chair
Wang, Evanne	DuPont	Member
Wassall, Holly	JST Power	Member
Weyandt, Paul	Schneider Electric	Chair

D.4.7 Revision of IEEE C57.12.91 Test Code David Walker

Chair: David Walker

Acting Secretary: Joseph Tedesco

This was the second meeting of the IEEE C57.12.91 Working Group. The meeting was held in the Grand Ballroom GH meeting room, and David Walker called the meeting to order at 4:45 PM.

To save time, introductions were skipped.

There were 38 people present in the meeting, with 16 members and 22 guests. 0 guests requested membership. The Task Force had 30 members; therefore, a quorum was reached, and business could proceed.

David W. showed the patent, behavior, and copyright slides. He asked if there were any patent concerns from those in attendance; no one had any concerns or noted any issues.

David W. asked for a motion to approve the agenda. Kerwin Stretch moved to accept the agenda, with Dave Stankes seconding the motion. There was no discussion, and approval of the agenda was unanimous.

Old Business:

- David W. reviewed the PAR timeline.
 - The PAR expires on December 31, 2026. To have all work done and the new version published by then, the last meeting where new work will take place is the Spring 2025 meeting.
 - This will also keep the timeline in sync with C57.12.01.
- We reviewed updating the exponents for temperature rise correction factors.
 - This has been tabled several times due to lack of data from multiple manufacturers.
 - There was no new data, so this matter was tabled again and will not be discussed further until new data is received.
- We reviewed whether to keep fans on or turn them off during AF temperature testing.
 - This has been tabled several times due to lack of data from multiple manufacturers.
 - There was no new data, so this matter was tabled again and will not be discussed further until new data is received.
- We reviewed how to add a correction factor for the voltage during the no load loss test.
 - This matter was tabled due to a lack of data. There was also no proposal made for how to handle it because the person who was going to make the proposal was not present.
- We reviewed the tolerance for current during the load loss measurement, and how to handle the situation when test equipment is unable to reach the rated current?
 - Colby Lovins proposed tabling this due to a lack of time to investigate suitable solutions before the working group finishes and goes to ballot.
 - It was brought up that IEC may address this problem, and we should look at what they say about this. Kerwin Stretch found a statement in IEC 60076-1 pertaining to the current tolerance.
 - Casey Ballard pointed out that IEC 60076-1 is currently in revision and many changes are being made, but he was able to find a copy of the current draft under review and reported that it did include a tolerance and a correction method for the current.
 - Kerwin S. volunteered himself and Tim-Felix Mai to summarize the relevant portions of the latest draft of IEC 60076-1 and report the summary with a proposal in the Spring 2025 meeting.

New Business:

- Val Tatu made a proposal for a method that could be used to correct currents when there is an imbalance in the currents measured in each phase of a three-phase transformer.
 - The method of interest, but it was decided to not include it at this time.

The next working group will be on March 25, 2025 in Denver, CO.

The meeting was adjourned at 5:32 PM.

The meeting attendees were:

Ballard, Robert	Klein, Ken	Nunez, Jesus	Stankes, David
de Olivera, Luiz	Lee, Moonhee	O'keefe, Sean	Stretch, Kerwin
Fu, Renjie	Lowther, mark	Ortega, Agustin	Tatu, Valeriu
Fyrer, Robert	Lovins, Colby	Pepe, Harry	Tedesco, Joseph
Gorzin, Alireza	Mahajan, Kushal	Powell, Chris	Walker, David
Grajeda, Rafael	Mendez, Luis	Sandoval, Alberto	Wang, Evanne
Hernandez, Giovanni	Moreno, Humberto	Sharifi, Masoud	Weyandt, Paul
Hernandez-Cano, Sergio	Mosquera, Emerson	Shimpi, Leena	Yuan, Guang
Iman, Mohammad	Naderian, Ali	Shull, Stephen	
Isquierdo, Jose	Nguyen, Nam Tran	Sohail, Muhammad	

D.5 REPORTS FROM WG's THAT DID NOT MEET AT FALL 2024 MEETING

D.5.1 Revision of C57.96 Loading Guide

Mike Iman

Final document has been reviewed and approved

D.5.2 Revision of C57.16 Air Core Reactors

Arturo Del Rio

Draft 7 was balloted and received a 77% response. 73 comments were received and are being resolved. Will submit for recirculation ballot once comments are addressed. PAR expires at the end of 2024 and a PAR extension is being considered now.

D.5.3 Revision of C57.12.52 Sealed Dry-Type

Joe Tedesco

Document is published.

D.5.4 Revision of C57.134 Hottest Spot

Colby Lovins

Document is in the hand of the IEEE editors and waiting for the document to be published.

D.5.4 Revision of C57.124 Partial Discharge

Thomas Prevost

It was planned to send the document for ballot but a delay in response to questions raised during MEC review has delayed balloting. A new Ballot group will need to be formed.

Tom Prevost made a motion to form a ballot group for C57.124

Seconded by Klaus Pointner.

The motion was approved unanimously by the subcommittee.

D.6 Old Business

D.6.1 Status of Dry-Type Transformer Documents

The chair presented slides showing DTSC standards activity and status that are part of the Standards Report found on the Transformer Committee website.

Commented that most of our documents and timing for completing needed revisions are on schedule. Exception is C57.124 but a plan is now in place for having this document completed.

D.7 New Business

D.7.1 Alicia Farag Chair presented information regarding formation of a new WG for development of IEEE P3476. It is referred to as “SCATE” (Supply Chain and Active Traceability for Energy) by the WG. Alicia is the Chair of this WG.

Goal of creating industry standard unique ID’s and smart tags like QR codes for all electric grid equipment. The manufacturers will create this unique ID based on the standard, apply the QR code to their products. Utilities will be able to scan the ID and get all of the attribute data associated with the product in a standardized digital format. All the data that is typically on a nameplate will be in this digital format.

Similar in concept to current C57.1235 (barcode) but will be applicable to all asset types beyond just transformer.

Introduces the concept of industry standard catalog ID with defined attributes associated with it.

Most of the work for this project will be to define what attributes are required for each asset type. Alicia presented examples of this for liquid filled transformer. Will need to list specific domain values. Things that are not easily identified with a specific domain (like special requirements specified by a customer) will be captured with a separate attachment.

Categories for the Energy Transformation Group include transformer asset types:

- Liquid filled
- Dry-Type
- Instrument
- Voltage regulators / network protectors

The above four have been prioritized and are requesting participation by the appropriate Transformer subcommittee.

Jerry Murphy pointed out that this work is being sponsored by the T&D, not the Transformer Committee. Al Trout has already performed a lot of work on this in support of liquid filled transformer and may be able to answer any questions the DTSC may have.

The P3476 is hoping to have all of the attributes defined by the end of March 2024.

This program is designed for newly manufactured assets. There may be a way to address items in stock or newly deployed assets.

Slides shared at this meeting describing the P3476 work will be posted to the IEEE Transformer website.

D.7.2 Review of Dry-type Transformer Terminology

Chair presented information given to him by Dan Mulkey that provided information related to terminology used to describe dry-type transformers.

Information supplied by Dan and presented by the Chair included the Title, Scope, and Purpose of C57.12.52. Dan suggested the wording used to describe the scope in the PAR would not apply to any transformer.

Proposed new definitions that could be used included:

- Cast coil dry type transformer
- Sealed air filled dry type transformer

- Sealed gas filled dry type transformer
- Dry type transformer with ventilated cabinet
- dry type transformer with non-ventilated cabinet

Chair asked the subcommittee members if there was interest in forming a TF to investigate the definitions of dry-type transformers all within the subcommittee scope and review this with what is currently in C57.12.80.

Joe Tedesco made a motion to form a Task Force to explore the concept of dry-type transformer definitions.

No second was made.

As a result, a Task Force will not be formed.

D.7.3 Mistake found in C57.12.60

Solomon Chiang identified a mistake he had found when reviewing the data analysis clause 8.2 in C57.12.60. The mistake included incorrect identification of equation 3.

Solomon Chiang made a motion to initiate a Corrigendum for C57.12.60 in order to fix information in Clause 8.2 Single Point Thermal Aging, one paragraph referring to Equation 3 should be changed to Equation 4.

Joe Tedesco seconded the motion.

Motion was approved unanimously.

Chair will reach out to previous Chair of the revision of C57.12.60 to see if he would like to initiate the project. If not this may be a good opportunity for a new volunteer to become active in the SC.

With no further business, the meeting was adjourned at 2:25 PM.

Chairman: Casey Ballard

Vice Chairman: David Walker

Secretary: David Stankes (prepared meeting minutes)

D.7.4 Changing of the guard

Casey offered his farewell to the SC as his official duty as DTSC Chair was now ended (after 8 years of actively conducting duties as Chair)

Attendees

Role	First Name	Last Name	Company
Vice Chair	David	Walker	MGM Transformer Company
Secretary	David	Stankes	3M
Member	Solomon	Chiang	The Gund Company
Member	J. Arturo	Del Rio	Siemens Energy
Member	Sergio	Hernandez Cano	Hammond Power Solutions
Member	Mohammad	Iman	MGM Transformer Company
Member	John	John	Virginia Transformer Corp.
Member	Ken	Klein	Johnson Coil

Annex D

Member	Moonhee	Lee	Hammond Power Solutions
Member	Colby	Lovins	Federal Pacific Transformer
Member	Klaus	Pointner	Trench Austria GmbH
Member	Chris	Powell	Intermountain Electronics
Member	Thomas	Prevost	Weidmann Electrical Technology
Member	Brian	Sonnenberg	Instrument Transformers, LLC
Member	Kerwin	Stretch	Siemens Energy
Member	Joseph	Tedesco	Hitachi ABB Power Grids
Guest	Renjie	Fu	ERMCO
Guest	Bob	Fyrer	DuPont
Guest	Miguel	Garcia	Hitachi Energy
Guest	Saif	Hossain	Trench Limited
Guest	Patrycja	Jarosz	IEEE
Guest	Alejandro	Macias	CenterPoint Energy
Guest	Jerry	Murphy	Reedy Creek Energy Services
Guest	Nam Tran	Nguyen	TT Electronics
Guest	Thomas	Prevost	Weidmann Electrical Technology
Guest	Ulf	Radbrandt	Hitachi ABB Power Grids
Guest	Valeriu	Tatu	Powersmiths International
Guest	Michael	Thibault	Pacific Gas & Electric
Guest	Evanne	Wang	Dupont
Guest	Terry	Wong	Trench LTD
Guest	Guang	Yuan	Hitachi Energy
Chair	Robert	Ballard	DuPont
Guest	Mark	Bennett	ESSEX Brownell
Guest	Jovani	Civtieriez	JST Power Equipment
Guest	Fenando	Duarte	EPRI
Guest	Alicia	Farag	Locusview
Guest	Brad	Grieves	Weidmann
Guest	Jim	McBride	JMX High Voltage
Guest	Luis Felipe	Mendez	JST Power Equipment

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Guest	Robert	Mennonna	Maddox Industrial Transformer
Guest	Shiv	Mozkhande	Siemens Energy
Guest	Humberto	Moreno	Siemens Energy
Guest	Emerson	Mosqueta	JST Power
Guest	William Sean	O'Keefe	DuPont
Guest	Ashley	Reagan	ELTEK Labs
Guest	Joseph	Schumock	American
Guest	Leena	Shimpi	MGM Transformer Company
Guest	Paul	Weyandt	Schneider Electric

Annex E Transformers and Reactors for HVDC Applications Subcommittee

October 28, 2024, 4.45 pm local time – Hyatt Regency Saint Louis at the Arch, St. Louis, MO, USA

Chair: Ulf Radbrandt (ulf.radbrandt@ieee.org)

Vice Chair: Les Recksiedler (lrecksiedler@mhi.ca) – not present

Secretary: Klaus Pointner (klaus.pointner@ieee.org)

E.1 Introduction / Attendance / Approval of the Agenda / Essential Patent Issues

There was a total of 43 persons in the meeting, 16 members and 27 guests present. 5 new requests for membership were received.

Call for patents (essential patent claim) and IEEE copyright policy have been addressed.

Actual membership prior the Fall 2024 meeting is shown below:

Last Name	First Name	Role
Sean	Barker	Member
Casallas	Camilo	Member
Caverly	David	Member
Chiang	Solomon	Member
Czernorucki	Marcos	Member
Davis	Eric	Member
Ermakov	Evgenii	Member
Gaun	Alexander	Member
Heinzig	Peter	Member
Hernandez	Giovanni	Member
Kaineder	Kurt	Member
Plante	Sylvain	Member
Ploetner	Christoph	Member
Pointner	Klaus	Secretary
Radbrandt	Ulf	Chair
Recksiedler	Leslie	Vice-Chair
Hossain	Saif	Member
Sandsten	Lina	Member
Sharp	Michael	Member
Wong	Terry	Member
Ziomek	Waldemar	Member

16 members out of 21 members were present, thus quorum was met.

The agenda for this meeting, that was distributed via E-mail on Sept 25, 2024, was presented. No comments received. The agenda was unanimously approved.

The list of all attendees of the meeting is shown below:

FIRST Name	LAST Name	AFFILIATION	EMAIL ADDRESS	Request Member ship
Paulo	Avelino	Hitachi Energy	paulo.avelion@hitachienergy.com	
Gilles	Bargone	FISO	gilles.bargone@fiso.com	Yes
Sean	Barker	Hitachi Energy	Sean.barker@hitachienergy.com	
Naveen	Bhardwaj	Trench Group	naveen.bhardwaj@trench-group.com	Yes
Alfredo	Carrizales	Prolec	juanalfredo.carrizales@prolec.energy	
Camilo	Casallas	Trench	Camilo.casallas@trench-group.com	
Antonio	Ceballos	Georgia Transformers	antonio.ceballos@gatransformer.com	Yes
Vivian	Chan	Hitachi Energy	Vivian.chan@hitachienergy.com	
Solomon	Chiang	The Gund Company	Schiang@thegundcompany.com	
Eunyoung	Cho	HICO America	echo@hicoamerica.com	
Domenico	Coris	Doble Engineering Co	dcosi@doble.com	
Juan Carlos	Cruz Valdes	PROLEC GE	juancarlos.cruz@prolec.energy	
Marcos	Czernorucki	Hitachi Energy	marcos.czernorucki@hitachienergy.com	
Eric	Davis	Consultant	Esetdavis@aol.com	
Peter	Dopplmair	Trench Group	Peter.dopplmair@trench-group.com	
Evgenii	Ermakov	Hitachi Energy	evgenii.ermakov@hitachioenergy.com	
Egui	Espita	Reinhausen	e.espita@us.reinhausen.com	
Alexander	Gaun	Coil Innovation	alexander.gaun@coilinnovation.at	
Jack	Harley	First Power Group LLC	jack.harley@firstpowergroupllcc.com	
Saif	Hossain	TRENCH Group	Saif.hossain@trench-group.com	
Patrycja	Jarosz	IEEE SA	P.jarosz@ieee.org	
Kevin	Juchem	Hitachi Energy	kevin.juchem@hitachienergy.com	
Kurt	Kaineder	Trench Austria GmbH	kurt.kaineder@trench-group.com	
Thrinadha	Katapalli	Virgina Transformer	katapalli_thrinadha@vatransformer.com	
Omar	Mendez	Prolec ge	Omar.mendez@prolec.energy	
Frank	Neder	Trench Group	Frank.neder@trench-group.com	
Sylvain	Plante	Hydro-quebec	Plante.sylvain.3@hydroquebec.com	
Christoph	Ploetner	Siemens Energy GmbH	christoph.ploetner@siemens-energy.com	
Klaus	Pointner	Trench Austria GmbH	Klaus.pointner@ieee.org	
Bertrand	Poulin	Hitachi Energy	bertrand.f.poulin@hitachienergy.com	
Thomas	Prevost	Weidmann	Tprevost78@gmail.com	
Ulf	Radbrandt	Hitachi Energy	Ulf.radbrandt@hitachienergy.com	
Michael	Sharp	Trench Limited	Mike.sharp@trench-grpup.com	
Muhammad	Sohail	Trench Limited	muhammad.sohail@trench-group.com	Yes
Karsten	Viereck	Reinhausen	K.viereck@reinhausen.com	
Dharam	Vir	Prolec GE	dharam.vir@prolec.energy	Yes
Peter	Werelius	Megger	peter.werelius@megger.com	

FIRST Name	LAST Name	AFFILIATION	EMAIL ADDRESS	Request Membership
Stefan	Wirth	Coil Innovation GmbH	stefan.wirth@coilinnovation.at	
Terry	Wong	Trench Limited	terry.wong@trench-group.com	
Malia	Zaman	IEEE SA	m.zaman@ieee.org	
Shibao	Zhang	Pure Electric	shibao.zhang@ieee.org	
Gigi	Zhang	HICO America	Jzhang@hicoamerica.com	
Waldemar	Ziomek	PTI Transformers LP	wziomek@ptitransformers.com	

Qualification for membership of the received requests will be checked and the applicants will be notified.

E.2 Approval of the minutes of the Spring 2024 meeting in Kansas City

The minutes of the spring meeting as distributed by E-mail on September 25, 2024 have been presented. No comments were given. The minutes have been unanimously approved.

E.3 Status of the Entity WG for development of the Guide for vibration testing of oil immersed HVDC converter transformer. (Chairman: Dr. Jun Deng)

The SC HVDC is sponsoring this Entity WG. Therefore, future work of this WG is reported to this subcommittee. The actual status of the WG is outlined in the presentation submitted by the WG chair Jun Deng prior to the Fall 24 meeting. Unfortunately, the WG chair could not come to this meeting but is encouraged to do so for the Spring 2025 meeting in Denver (CO). The 3rd WG meeting was held on October 19, 2024 at the Shuixiu Garden Hotel, Nanjing, Jaingsu, China.

Status Report:

IEEE SA
STANDARDS ASSOCIATION

WORKING GROUP STATUS OF IEEE PC57.132
"GUIDE FOR VIBRATION TESTING OF OIL-IMMERSED HIGH-VOLTAGE DIRECT CURRENT (HVDC) CONVERTER TRANSFORMER (± 160 KV DC TO ± 1100 KV DC)"

Jun Deng
Working Group Chair
October 19th 2024

IEEE

CURRENT STATUS OF WORKING GROUP

Date and Location of Last Working Group Meeting:
19th, October 2024, Nanjing, China (Third WG meeting)



IEEE SA
STANDARDS ASSOCIATION

IEEE 2

that a draft proposed by the WG for balloting is in the required shape to start the ballot process.

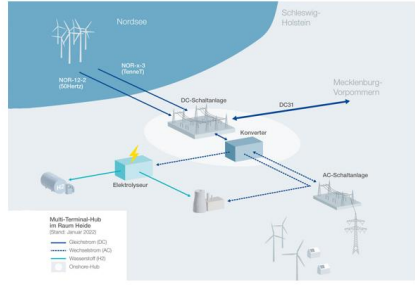
E.4 Dual logo standard IEC/IEEE 60076-57-129 (WG Chair: Waldemar Ziomek)

The WG meeting of this revision work took place in the time slot of the SC meeting, after the SC meeting has adjourned. Details can be found in the annex of these minutes.

- There will be two further WG meetings during this week in this hotel as indicated below:
- Thursday 10/31/2024 1:00pm to 5:00pm Room Mills 7 (4)
- Friday 11/1/2024 8:00am to 12:00pm Room Mills 7 (4)

E.5 CIGRE 2024 – Hot Topics

Klaus Pointner gave a brief report on the CIGRE 2024 meeting held in Paris from August 25, to August 30, 2024. Details of the presentation are summarized as follows:

9 SC HVDC – Fall 2024 • <u>Cigre 2024 Session in Paris – hot topics</u> A short summary of the <u>Cigre Paris 2024 session</u> (August 25 to August 30) with focus on SC B4 - DC systems and power electronics, will be given by Klaus Pointner. • Future work within this Subcommittee Discussion of ideas of coming work within this SC. All ideas are welcome. • New business • Adjournment 12	11 SC HVDC – Fall 2024 <u>Study Committees</u> <u>Group A – Equipment</u> A1 Power generation and electromechanical energy conversion A2 Power transformers and reactors A3 Transmission and distribution equipment <u>Group B – Technologies</u> B1 Insulated cables B2 Overhead lines B3 Substations and electrical installations B4 DC systems and power electronics B5 Protection and automation <u>Group C – Systems</u> C1 Power system development and economics C2 Power system operation and control C3 Power system sustainability and environmental performance C4 Power system technical performance C5 Electricity markets and regulation C6 Active distribution systems and distributed energy resources <u>Group D – New Materials and IT</u> D1 Materials and emerging test techniques D2 Information systems, telecommunications and cybersecurity 13
SC HVDC – Fall 2024 Hot Topics: • Energy Transition / Integration of Renewables • HVDC grid access / HVDC networks • Mitsubishi released the first commercially available DC breaker – enabler for DC grids • Workshop on (planned) HVDC grids held by B4 • China, Germany and UK are planning (HV)DC hubs with multiple infeed • DC current breaking device required Conclusion: HVDC remains booming for the coming years 12	SC HVDC – Fall 2024 Hot Topics:  13

SC HVDC – Fall 2024

- DC switching devices will bring a new reactor application

- DC side current limiting reactors with ratings up to 600mH (depending on topology and selectivity)
- Shall limit di/dt to ensure that S/C current is not harmful for the converters prior fault clearing occurs – speed of fault clearing (and the decision making process behind) is decisive
- Type of reactor may need to be addressed in the next revision of IEEE1277
- <https://www.promotion-offshore.net>

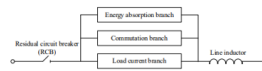
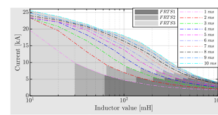
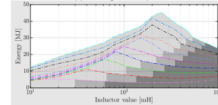


Figure 5-1 A generic representation of a DCCB.



(a) Breaking current requirement



(b) Energy absorption requirement

© Promotion D4.5 Requirements for DC switchgear

**E.6 Future Work of this Sub Committee**

The chairman of the SC encouraged members and guest to propose work items and activities that shall be considered by this SC. Input is welcome – please contact the SC chairman directly.

E.7 Old Business

There was no old business

E.8 New Business

There is no new business

E.9 Adjournment

The meeting was adjourned at 05.15pm and handed over to the WG meeting IEC/IEEE 60076-57-129

Annex: Minutes of Meeting of the WG meeting “Dual logo standard IEC/IEEE 60076-57-129”

Minutes of Meeting

WG Rev. to IEEE Standard 60076-57-129 IEC/IEEE International Standard Power transformers-Part 57-129: Transformers for HVDC applications

October 28, 2024, 5:15 pm local time – Hyatt Regency St. Louis, Missouri

Chair: Waldemar Ziomek (wziomek@ptitransformers.com)

Secretary: Eric Davis (esetdavis@aol.com)

1. Attendance / Approval of the Agenda / Essential Patent Issues

The meeting took place in the course of HVDC SC meeting. Eighteen (18) of twenty-seven (27) members and twenty-two (22) guests for a total of forty (40) people attended. Six (6) guests requested membership. A quorum was in attendance. The list of attendees is shown below:

First Name	Last Name	Email	Company	Member/ Guest
Paulo	Avelino	Paulo.avelino@hitachienergy.com	Hitachi Energy	G
Gilles	Bargone	gilles.bargone@fiso.com	FISO	G
Sean	Barker	sean.barker@hitachienergy.com	Hitachi Energy	M
Naveen	Bhardwaj	naveen.bhardwaj@trench-group.com	Trench Group	G
Alfredo	Carrizales	juanalfredo.carrizales@prolec.energy	Prolec	G
Camilo	Casallas	camilo.casallas@trench-group.com	Trench Limited	M
Antonio	Ceballos	Antonio.ceballos@gatransformer.com	Georgia Transformer	G
Vivian	Chan	vivian.chan@hitachienergy.com	Hitachi Energy	M
Solomon	Chiang	schiang@thegundcompany.com	The Gund Company	M
Domenico	Corsi	dcorsi@doble.com	Doble Engineering	G
Juan Carlos	Cruz Valedz	juan.carlos.cruz@prolec.energy	GE Prolec	G
Marcos	Czernorucki	marcos.czernorucki@hitachienergy.com	Hitachi Energy	M
Eric	Davis	esetdavis@aol.com	Consultant	M
Peter	Dopplmair	peter.dopplmair@trench-group.com	Trench Group	G
Evgenii	Ermakov	evgenii.ermakov@hitachi.energy.com	Hitachi Energy	G-RM
Egui	Espidia	e.espidia@us.reinhausen.com	Reinhausen US	G
Jack	Harley	Jack.harley@firstpowergroupllc.com	First Power Group	G
Saif	Hossain	saif.hossain@trench-group.com	Trench Group	G-RM
Patrycja	Jarosz	p.jarosz@ieee.org	IEEE SA	G
Kevin	Juchem	kevin.juchem@hitachienergy.com	Hitachi Energy	G
Kurt	Kaineder	kurt.kaineder@trench-group.com	Trench Austria GmbH	M
Thrindha	Katapalli	katapalli_thrindha@vatransformer.com	Virginia Transformer	G-RM
Omar	Mendez	omar.mendez@prolec.energy	Prolec GE	M
Ali	Naderian	Ali.naderian@ieee.org	Trench Group	G
Frank	Neder	Frank.neder@trench-group.com	Trench Group	G
Sylvain	Plante	plante.sylvain.3@hydro.qc.ca	Hydro-Quebec	M

First Name	Last Name	Email	Company	Member/ Guest
Christoph	Ploetner	cp.xfmr@gmail.com	Siemens Energy	M
Klaus	Pointner	klaus.pointner@trench-group.com	Trench Austria GmbH	M
Bertrand	Poulin	bertrand.f.poulin@hitachienergy.com	Hitachi Energy	M
Thomas	Prevost	tom.prevost@weidmann-group.com	Weidmann Electrical Technology	M
Ulf	Radbrandt	ulf.radbrandt@ieee.org	Hitachi Energy	M
Sebastian	Rehkopf	s.repkopf@reinhausen.com	Reinhausen	G-RM
Michael	Sharp	sharp.michael@siemens-energy.com	Trench Limited	M
Muhammad Abdullah	Sohail	Muhammad.sohail@trench-group.com	Trench Limited	G-RM
Dharam	Vir	dharam.vir@prolec.energy	Prolec GE	M
Peter	Werelius	Peter.werelius@megger.com	Megger	G-RM
Terry	Wong	terry.wong@trench-group.com	Trench Canada Limited	M
Gigi	Zhang	jzhang@hicoamerica.com	HICO	G
Shibao	Zhang	Shibao.zhang@ieee.org	PCORE Electric	G
Waldemar	Ziomek	wziomek@ptitransformers.com	PTI Transformers	M

G: Guest

G-RM: Guest – Requesting Membership

M: Member

2. Agenda

The agenda for the WG meeting was presented by the WG chair.

3. Status Report as presented by the WG chair

The WG Chair:

- Reviewed the scheduled meetings for this fall
 - WG Meeting – Monday 10/28, 4:45 pm – 6:00 pm
 - WG Meeting/IEC – Thursday, 10/31, 1:00 pm – 5:00 pm
 - WG Meeting/IEC – Friday, 11/1, 8:00 am – 12:00 pm
- Reviewed the approved PAR Scope of Work
- Reviewed the background for the PAR - The existing dual logo standard is valid until 2027.
- Reviewed the initial steps for the revision
 - Add a new clause 5.2.6 Operation of LCC
 - Add a new clause 5.2.7 Operation of VSC
 - Add a new clause 14 Monitoring Devices
- Provided updates from the IEC TC-14
 - Convenor – Frank Trautmann
- Discussed new additions to the revised standard
 - Review IEC Std 61378-3 Convertor Transformers Part 3: Application Guide and incorporate parts identified as useful

- Consider adding a standard for renewable energy collector transformer using a DC link
- Reviewed the proposed timeline
 - First draft – F24
 - First draft review and correction – S25
 - Ballot within SC – F25
 - Ballot Standard – S26
 - Submit to RevCom – F26

The slides shown by the WG Chair will be posted to the website.

4. Old Business

There was no old business

5. New Business

There is no new business

6. Adjournment

The meeting was adjourned at 5:40pm.

Annex F Instrument Transformers Subcommittee

Chair: Thomas Sizemore

Vice Chair: David Wallace

Nothing Submitted

Annex G Insulating Fluids Subcommittee

October 30, 2024 – 3:00PM – 4:15PM

Hyatt Regency, St. Louis MO

Chair: Stephanie Mabrey

Vice-Chair: Jerry Murphy

Secretary: Mike Bonn

1. Call to Order 3:00PM
2. Stephanie Mabrey introduced herself as Chair, Jerry Murphy Vice-Chair, Mike Bonn Secretary
3. Presented IEEE Patent Policy, Copyright Policy and Code of Conduct
4. Opening Remarks
 - i. Reminded that SC minutes are due to Stephanie Mabrey and Mike Bonn by November 15, 2024 and WG and TF minutes are due to Insulating Fluids Subcommittee (IFSC) Secretary Mike Bonn within 15 business days of their meetings and are to include attendance
 - ii. Recommended new officers take SA training on website.
 - iii. DGA Data to be submitted to c57data@ieee.org. A question was asked whether mineral oil data will also go to this address as it has been used for ester-filled transformers. It was confirmed that all users should email data to this address and put the WG number in the subject to differentiate.
 - iv. Reminded of Membership requirements to attend 3 out of last 5 meetings and be a member in good standing of IEEE PES and IEEE SA.
5. Roll Call of SC Members – Quorum requirement -27
 - i. 36 members signed in from of a total of 53 members achieving quorum
 - ii. 89 attendees. 53 Guests. 17 requested memberships.
 - iii. Both a QR code and paper attendance list were used to do roll call. 14 attendees used paper form only.

First Name	Last Name	Role	First Name	Last Name	Role
Adriana	Cisco-Sullberg	Guest	Luiz	Cheim	Member
Alfons	Schrammel	Guest	Luke	Wang	Guest-RM
Alireza	Gorzin	Guest - RM	Malia	Zaman	Guest
Alwyn	VanderWalt	Member	Marcos	Ferreira	Member
Anastasia	O'Malley	Guest	Mark	Tostrud	Member
Andreas	Kurz	Guest-RM	Michael	Bonn	Member
Anthony	Natale	Guest	Mick	Kasonga	Guest
Attila	Gyore	Member	Mickel	Saad	Member
Brian	Klaponiski	Guest	Miguel	Garcia	Guest-RM
Chao	Li	Member	Naveen	Bhardwaj	Guest -RM
Chris	Franklin	Guest-RM	Nick	Perjanik	Guest-RM
Daniel	Obregón	Guest	Niklas	Gustavsson	Guest
David	Calitz	Member	Orlando	Giraldo	Member
David	Córdova	Guest	Paul	Boman	Member
Dean	Park	Guest	Pedro	Trujillo	Guest
Deanna	Woods	Member	Peter	Werelius	Guest
Didier	Hamoir	Guest	Rainer	Frotscher	Member
Diego	Robalino	Member	Rashid	Hussein	Guest

Donald	Lamontagne	Guest-RM	Robert	Mennonna	Guest
Dwight	Parkinson	Member	Roberto	Da Silva	Guest_RM
Ed	Casserly	Member	Roger	Hayes	Member
Fernando	Tirado	Guest	Ronald	Hernandez	Guest
Florin	Faur	Guest-RM	Rudolf	Ogajanov	Guest
Francis Felipe	Mantoan	Guest	Ryan	Thompson	Member
Gabriel	Delgado	Guest-RM	Samuel	Tekle	Guest
Gilles	Barthes	Guest	Scott	Reed	Member
Greg	Steeves	Member	Sean	Barker	Guest
Igor	Simonov	Guest-RM	Sebastien	Rehkopf	Guest
Ismael	Naja	Guest	Shivkumar	Morkhande	Guest
James	Gardner	Guest	Stephanie	Mabrey	Member
James	Beaudoin	Guest	Shuzen	Xu	Guest-RM
Jeremiah	Bradshaw	Member	Swapnil	Marathe	Guest-RM
Jerry	Murphy	Member	Thomas	Holifield	Guest
Jesse	Duffy	Guest	Thomas	Prevost	Member
Jim	Thompson	Guest-RM	Tiffany	Lucas	Member
Jinesh	Malde	Member	Tim	Dappen	Guest-RM
John	John	Member	Tim	Raymond	Member
John	Pruente	Member	Toni	Mellin	Member
Jonathan	Sinclair	Member	Traci	Hopkins	Member
Joshua	Garner	Guest	K	Viereck	Guest
Juan	Castellanos	Member	William	Boettger	Member
Katherine	Marulanda	Guest	William	Solano	Member
Kevin	Biggie	Member	William	Whitehead	Member
Leon	White	Guest	Yuri	Rossini	Guest-RM
Luc	Loiselle	Guest			

RM = Requested Membership

6. The posted agenda and minutes were amended to correct the year on the date from 2023 to 2024. A **Motion** was made by Diego Robalino and 2nd by Markos Ferreira to approve the changes. Motion unanimously approved.
7. A **Motion** to approve both the Spring 2024 Minutes and the Fall 2024 Agenda as amended was made by Jeremiah Bradshaw and 2nd by Traci Hopkins. Motion unanimously approved.
8. The list of open PARS was presented.
9. **WG & TF Reports Presented**
 - i. **WG C57.155 – Guide for Interpretation of Gases Generated in Natural Ester and Synthetic Ester-Immersed Transformers** Chair: Alan Sbravati - Lance Lewand presented
 - i. More than 100,000 records received and anonymized, however new data welcome
 - ii. A preliminary review of the data was presented
 - iii. New structure of annexes was presented
 - iv. New case studies were requested
 See Appendix A for Minutes
10. **Study Group** to assess need for a Guide to Corrosive Sulfur – Lance Lewand
 - i. Held 1st exploratory meeting to determine interest and there were over 80 attendees.
 - ii. A presentation on corrosive sulfur was made, with discussion on possible sections to be included in the guide and discussion from the floor ensued.
 - iii. There was unanimous agreement at meeting to proceed with a PAR Study Group

- iv. A **Motion** was put forward to IFSC by Jinesh Malde and 2nd Michael Saad to Form a study group to do the work to submit a PAR for a Guide to Corrosive Sulfur – Motion unanimously approved.

See Appendix B for Minutes

11. WGC57.130 – Guide for the use of Dissolved Gas Analysis Applied to Factory Temperature Rise Tests for the Evaluation of Mineral Oil Filled Transformers and Reactors Chair: Bruce Forsyth - Jinesh Malde presented

- i. Meeting took place on Oct 29th at 8:00AM
- ii. Quorum met with 20 of 26 members present
- iii. Agenda and minutes (F22-S24) were approved.
- iv. A new DGA form will be sent by Lance Lewand with the IEEE email address to share DGA results anonymously. The new form includes detailed instructions about what data to share and in what format.
- v. Data to be submitted by 1/31/25
- vi. Volunteers requested for a taskforce (TF) to start editorial work on the standard. TF meeting will be virtual.

See Appendix C for minutes

12. WG/TF C57.146 Chair Paul Boman

- i. 10 of 12 members were present with quorum met. 8 Guests.
- ii. PAR extension approved to December 2026.
- iii. Reviewed straw ballot comment resolutions. There was a comment to insert additional wording into PAR Purpose which did not receive a motion to proceed to vote.
- iv. Motion approved to request IFSC to move PC57.146 Draft 2 to a formal ballot.
- v. Motion approved to form a CRG Task Force with authority to resolve ballot comments.
- vi. A **Motion** was put forward to IFSC by Paul Boman 2nd Tom Prevost, to have PC157.146 draft 2 progress to ballot. Motion unanimously approved.

See Appendix D for minutes

13. WG C57.166 – Guide for Acceptance and Maintenance of Insulating Liquids in Transformers and Related Equipment. Chair: Tom Prevost

- i. Did not meet as document is in comment resolution.
- ii. WG would like request a PAR extension. Tom Prevost moved to approve WG to submit request for PAR extension, 2nd Jinesh Malde. Motion unanimously approved.
- iii. Tom Prevost said the WG will resolve ballot comments and expects to have document out for recirculation prior to next meeting in Denver.

14. WG C57.637 – Guide for the Reclamation and Reconditioning of Insulating Liquids

Chair: Stephanie Mabrey

- i. Did not meet.
- ii. Ballot resolution group resolved comments.
- iii. Document is ready for ballot once C57.166 publishes
- iv. Goal at Spring 2025 meeting to request moving forward from Subcommittee to ballot.

15. WG C57.139 - Guide for the Interpretation of Gases Generated in Liquid-Type Load Tap Changers (Expires 12/31/25) Chair: Rainer Frotscher

- i. Data collection completed, data anonymized and cleaned. 130,000 samples ready for further processing.
- ii. First statistical evaluations done, ongoing work on Triangle use, etc.
- iii. All Task Forces active to improve the Guide in manifold ways.
- iv. Presentation by HE on gas emission from welded steel and insulating materials which could impede DGA of vacuum type LTCs.
- v. Rainer asked how to put presentation from the WG meeting on the IEEE website. Email presentation to tcwebmaster@ieee.org.

See Appendix G for minutes

16. WG C57.104 Guide for Interpretation of Gases Generated in Mineral Oil-Immersed (Expires 12/31/2029) Chair: Ed teNyenhuis – Luis Cheim presented on behalf of Ed.

- i. Held guide change presentations for including monitoring data, core overheating gassing, machine learning for monitoring and DGA flowchart change.
- ii. Approved TF to investigate monitoring section in Guide.
- iii. Approved to set up data collection via IEEE anonymization.
- iv. Agreed to hold virtual meeting to continue guide change presentations.

See Appendix H for minutes

17. Old Business – None

18. New Business

- i. Presentation by Ethan Languri from Tennessee Tech University – Functionalized Nanodiamond Fluids for a Significant Improvement in Thermal Rating and Life of Transformers.
- ii. Ethan to send presentation to Scott Reed for posting to IEEE website

19. Next IFSC Meeting: 2025 March 23-27 – Denver Hyatt Regency

20. Adjournment at 4:13PM

Submitted by Mike Bonn, IFSC

Appendix A

Working Group for Guide for the Interpretation of Gases Generated in Natural and Synthetic Ester Liquid Type Transformers

C57.155

Monday, October 28, 2024
09:30 – 10:45, St Louis, MI, USA

Chairman: Alan Sbravati (absent)
Vice Chair: Lance Lewand, acting as chairman
Secretary: Attila Gyore

The meeting was called to order at 09:30 by the Chair.

There were 25 of 38 members present during the meeting. There were 56 guests, 19 membership requests, in sum 81 attendees.

The quorum was achieved.

1. Attendance list:

1	Daniel	Aleksandrowicz*	Guest
2	Robert	Allison	Guest
3	Sean	Barker	Guest
4	Barry	Beaster	Guest
5	Paul	Boman	Member
6	Jeremiah	Bradshaw	Member
7	Edward	Casserly	Member
8	Stuart	Chambers	Member
9	Vivian	Chan	Guest
10	Luiz	Cheim	Member
11	Bhaumik	Choksi	Guest
12	Caleb	Colby	Guest
13	David	Cordova	Guest
14	Roberto	Da Silva	Member
15	Eric	Doak*	Guest
16	Kenneth	Dugger	Guest
17	Will	Elliot	Guest
18	Quasi	Elnimri	Guest
19	Florin	Faur*	Guest
20	Todd	Felton	Member
21	Marcos	Ferreira*	Guest
22	Mark	Finn	Guest
23	Joseph	Foldi	Guest
24	Chris	Franklin	Guest
25	Rainer	Frotscher	Member
26	Peng	Fu	Guest
27	Joshua	Garner	Guest
28	Alireza	Gorzin	Member
29	Bill	Griesacker	Guest
30	Brad	Grooms*	Guest
31	Attila	Gyore	Secretary
32	Roger	Hayes*	Guest
33	Traci	Hopkins	Member
34	Zinan	Huang	Guest
35	Patrycja	Jarosz	IEEE Staff

36	Braxton	Jones	Guest
37	Egon	Kirchenmayer	Member
38	Seungmo	Kim	Guest
39	Rafal	Kowalski*	Guest
40	Andreas	Kurz	Guest
41	Ashwini	Labh	Guest
42	Don	Lamontage	Guest
43	Lance	Lewand	Vice-Chair
44	Mark	Lowther*	Guest
45	Tiffany	Lucas	Member
46	Stephanie	Mabrey	Member
47	Jinesh	Malde	Member
48	Francis	Mantoan	Guest
49	Swapnil	Marathe	Guest
50	Mama	Mbouombouo*	Guest
51	Brian	McBride	Member
52	Toni	Mellin	Member
53	Justin	Minikel	Guest
54	Shankar	Nambi	Guest
55	Dan	Nikelli	Guest
56	Parminder	Panesar*	Guest
57	Tihomir	Pandza	Guest
58	Pedro	Pedro	Guest
59	Nick	Perjanik	Member
60	Thien	Pham*	Guest
61	Goran	Plisic	Guest
62	John	Pruente	Guest
63	Gerard	Puleo	Guest
64	Timothy	Raymond	Member
65	Scott	Reed	Member
66	Yuri	Rossini	Member
67	Mickel	Saad	Member
68	Amitabh	Sarkar	Member
69	Jaber	Shalabi*	Guest
70	Jonathan	Sinclair*	Guest
71	Bradley	Staley*	Guest
72	Greg	Steeves*	Guest
73	Michael	Swiatkowski*	Guest
74	Matthew	Webb*	Guest
75	Drew	Welton	Guest
76	Peter	Werelius	Guest
77	Elliot	White	Guest
78	Bill	Whitehead*	Guest
79	Deanna	Deanna	Member
80	Fei	Yang*	Guest
81	Unknown	Unknown	Guest

2. Agenda for approval

- A. Welcome & Introduction
- B. Attendance and Establishment of Quorum
- C. Call for Patent Disclosure
- D. IEEE Copyright Policy
- E. Approval of Spring 2024 Minutes
- F. Working Group Activities
 - 1. Task Force 4: Task Force 4 – Jinesh Malde – Updates on the Annexes B to F
 - 2. Task Force 3 – Stu Chambers – Updates on the general document
 - 3. Task Force 2 – Alan Sbravati → No updates
 - 4. Task Force 1 – Lance Lewand → Luiz Cheim: 20 min, Toni Melin: 10 min
 - 5. General discussion → 15 min

H. Old Business / New Business

I. Adjournment

3. Chair posted the Patent Claim. No claims were made.
4. Chair presented the copyright policy slides.
5. The agenda of the meeting was presented by the chair.
6. Agenda for Spring 2024 was approved, motion: Scott Reed, second: Timothy Raymond
7. Spring 2024 Minutes was approved, motion: Ed Casserly, second: Brian McBride Traci Hopkins
8. Discussions on Task Forces' work
 - a. TF4 Reviewing Annexes TF Leader: Jinesh Malde, MIDEL & MIVOLT Fluids
New structure of Annexes was presented
Still new case studies are needed
New Annex about retrofilling was introduced
 - b. TF3 Revision of the Document TF Leader: Stuart Chambers, EPRI International
Updates on the main text was carried out based on earlier received comments
 - c. TF2 Normalized Energy Index, TF Leader: Alan Sbravati, Hitachi Energy
There was no progress to report
 - d. TF1 Statistical Analysis of Database, TF Leader: Lance Lewand, Doble
Actual state of the data analysis was shown by the TF leader, Luiz Cheim and Toni Mellin
More than 70000 records from offline measurement and more than 39000 records were received from online measurement.
Results of analysis datasets from natural and synthetic ester filled transformers were presented.
Different criteria and challenges during the data process were shown.
A table about Provisional Comparison was presented which initiated discussion on the findings.
There is still opportunity to submit more dataset, please reach out to Lance Lewand
Toni Millen presented ester DGA monitor data
9. New Business/Other Items for Discussion: No new business.
10. Next meeting at Spring 2025, Denver, Colorado, USA
11. The meeting was adjourned at 10:45, on time, motion: Ed Casserly, second: Traci Hopkins

Attila Gyore, Secretary

Lance Lewand, Acting Chair

Appendix B

Meeting Minutes

Guide to Understanding Corrosive Sulfur Issues in Liquid-Filled Transformers, Reactors and Load Tap Changers

Ballroom F

Hyatt Regency – St, Louis, MO

October 29, 2024

No attendance required for Par Study Group

This was the first exploratory meeting of a task force to determine if there was enough interest to proceed with this project. There was a large attendance of at least 79 people that spilled out into the hallway. The proposed chair introduced the topic to the audience with a brief discussion of what corrosive sulfur is, what types of compounds are present that cause the issue, the role of oxygen and temperature in the process, how the reactions with the material inside the electrical equipment take place and the consequences of these reactions including copper or silver sulfide deposits on conductor and plating that occurs in the paper sometimes resulting in the failure of the apparatus.

The discussion then turned to the development of the guide itself and what sections to include in the guide. The following sections were proposed:

- In-depth discussion on what corrosive is and how it negatively impacts liquid-filled electrical equipment
- What corrosive sulfur compounds are known and descriptions
- The effects of corrosive sulfur compounds on metal surfaces and deposition in the paper
- Tests for corrosive sulfur
- Flowchart on what actions to take when corrosive sulfur is found
- Electrical tests to detect the presence of copper sulfide formation
- Corrosive sulfur formation from oil processing
- Remediation
- Bibliography

When the audience was queried, there was unanimous acceptance that the guide was of significant importance to the group and it should proceed.

Sincerely,

Lance Lewand, Doble Engineering

Appendix C

Working Group for IEEE C57.130: Guide for the Use of Dissolved Gas Analysis to Factory Temperature Rise Test for the Evaluation of Mineral Oil-Immersed Transformers and Reactors

Tuesday, March 29, 2024

8:00 – 9:15 am

Hyatt, Saint Louis, MO, USA

Minutes of Working Group Meeting

Chair: Bruce Forsyth (absent)

Vice Chair/Secretary: Jinesh Malde (JM)

Acting Secretary: Jason Beaudoin (JSB)

Membership list was updated prior to the meeting to ensure that members had either attended 2 consecutive meeting or 3 out of 5 meetings. Quorum requirement for the meeting was 14 out of 26 members. There were 17 members in the meeting and quorum was met.

The Vice Chair showed the behavior expectations, IEEE patent and copyright policies, and asked the participants if there are any claims that should be reported regarding these policies. There were no claims brought up by attendees in the meeting.

The agenda was presented. Emilio Morales-Cruz made a motion to approve the agenda and Zan Kiparizoski seconded; with no objections, the agenda was approved. The Vice Chair requested the members to approve the Fall 2022, Spring 2023, Fall 2023 and Spring 2024 meeting minutes. Scott Reed made a motioned to approve the Minutes and Amitabh Sarkar seconded; with no objections, the meetings minutes were approved.

A PAR extension will need to be requested due to this WG being behind schedule. The Milestones will be updated prior to the next meeting.

The Vice Chair reminded the group that data is needed, and to use the template created by the working group that Lance Lewand (LL) showed in the meeting. The Vice Chair reminded all participants to share the data by 31 January 2025. Data should be sent to c57data@ieee.org and the subject line should state that it is for the IEEE C57.130 guide.

LL showed the template for data submission:

- LL showed the changes requested by IEEE to the template
- IEEE will clean up the data before sending information to WG in order to maintain anonymity. Data will be kept in IEEE database for future revision of the standard.
- Many of the data fields are drop-down lists: LL demonstrated some of the options available and explained that the drop-down options are to avoid confusion when entering data.
- To date there has only been 1 person who has responded with data.
- About 300 data points for each of the liquid types (Mineral, Natural Ester, Synthetic) in order would be needed to perform statistical analyses.

- Jeremiah Bradshaw (JB), Bureau of Reclamation volunteered to provide data to the WG.

The Vice Chair showed a draft version of the Guide.

- It is not yet determined where the data (specifically esters) will be in the Guide; either in the main body or the Annex (if data will be submitted for ester liquids).
- If ester liquids will be added to the standard, the title, scope and purpose will have to be changed from “Mineral Oil” to “Liquid Immersed”.
- Vice Chair requested volunteers for the revision. 4 people volunteered:
 - o Ed Casserly
 - o William Herron
 - o Mama Mbouombouo
 - o Juan Castellanos

Participants discussions:

- Jim Thompson mentioned that he has the anonymous data from the original study and can share.
- Juan Castellanos asked for clarification regarding the “insulation” option as it could be interpreted as paper and spacers, or only paper. LL said “paper only” and will clarify this in the spreadsheet.
- Fran Topol asked which Temperature Rise test is to be detailed before DGA is taken (ONAN, ONAF/etc).
 - o LL explained that the details are in the spreadsheet.
- JB asked if all of the fields of information were not available, does the WG still want the data?
 - o Yes.
- JB asked if manual testing values or online monitoring data is requested and whether this will be clarified in the template?
 - o LL needs to add a field for this data as there will be multiple data points from the same unit.
- JSB asked if a value should be presented as a whole number, or if the data from the sampling company is shown as a “Less Than” value should the number be shared or not?
 - o LL asked for only numbers. The template will have instruction on this.
- Joe Nims noted that in C57.12.00 meeting there was discussion to add details about the duration of the Heat Run and whether this standard would have guidelines on duration.
 - o JM: this Guide doesn’t detail how to perform the test, it only says to follow the test procedures in other Standards and compare the results from the test to the limits in the guide.
- JB asked if the WG was looking for defects found during FAT? Specifically, how to note if the unit failed during the Heat Run.

- LL mentioned that there is a field to state whether the unit failed FAT.
- Nick Jensen asked if they should detail after which portion of heat run tests the samples were taken from.
 - LL said “final DGA” only.

There was no other old or new business to discuss.

Meeting adjourned at 8:43 am.

Respectfully submitted,

Jason Beaudoin, Acting Secretary

Date of Submission: Nov 4th, 2024

Meeting Attendees

Last Name	First Name	Status
Malde	Jinesh	Vice-Chair
Boettger	William	Member
Castellanos	Juan	Member
Debass	Samson	Member
Felton	Todd	Member
Kiparizoski	Zan	Member
Kirchenmayer	Egon	Member
Lewand	Lance	Member
Li	Chao	Member
Morales-Cruz	Emilio	Member
Perjanik	Nick	Member
Reed	Scott	Member
Sarkar	Amitabh	Member
Staley	Brad	Member
Thompson	Ryan	Member
Vir	Dharam	Member
Yun	Joshua	Member
Beaudoin	Jason	Guest
Blaydon	Daniel	Guest
Bonn	Mike	Guest
Botti	Michael	Guest
Bradshaw	Jeremiah	Guest
Cassery	Edward	Guest
chanda	sudip	Guest
Cuauhtemoc	Ortiz	Guest
Da Silva	Roberto	Guest
Digby	Scott	Guest

Last Name	First Name	Status
Ferreira	Marcos	Guest
Foldi	Joseph	Guest
Frotscher	Rainer	Guest
Garcia	Eduardo	Guest
Garcia-Paredes	David	Guest
Garner	Joshua	Guest
Gorzin	Ali	Guest
Griesacker	Bill	Guest
Hernandez	Ronald	Guest
Hollrah	Derek	Guest
Jensen	Nick	Guest
John	John	Guest
Jones	Braxton	Guest
Juchem	Kevin	Guest
Kennedy	Sheldon	Guest
Kurz	Andreas	Guest
Lamontagne	Donald	Guest
Lamontagne	Donald	Guest
Loiselle	Luc	Guest
Mabrey	Stephanie	Guest
Mbouombouo	Mama	Guest
Mcbride	Brian	Guest
Mellin	Toni	Guest
Mendez	Omar	Guest
Natale	Anthony	Guest
Nims	Joe	Guest
Panesar	Parminder	Guest

Last Name	First Name	Status
Park	Dean	Guest
Patel	Sanjay	Guest
Pedro	Pedro	Guest
Saad	Mickel	Guest
Sanchez rodriguez	Jesus	Guest
schweiger	ewald	Guest
Shaikh	Abdul Majid	Guest
Simon	Preston	Guest
Sinclair	Jonathan	Guest
Som	Sanjib	Guest
Thompson	Jim	Guest
Tolcachir	Eduardo	Guest
Topol	Fran	Guest
Vanderwalt	Alwin	Guest
von Gemmingen	Richard	Guest
Watson	Joshua	Guest
Weiss	Zachory	Guest
Weyandt	Paul	Guest
Weyer	Daniel	Guest
White	Joe	Guest
White	Elliot	Guest
Whitehead	Bill	Guest
Wright	Jeffrey	Guest
YU	ZHENQUAN	Guest
do Prado	Gustavo	Guest
Hernandez Decanini	Giovanni	Guest

Appendix D

PC 47.146 – Guide for Interpretation for Gasses Generate in Silicone Immersed Transformers

Unapproved

Monday, October 28, 2024, St. Louis, MO

Chair: Paul Boman

Vice Chair: Lance Lewand

Secretary: Tiffany Lucas

The meeting was called to order by chairman at 11am CST. Twelve of 12 members were present, quorum was achieved.

Scott	Reed	Member	MVA
Eunyoung	Cho	Guest	Hico America
Peter	Werelius	Guest	Megger sweden
Paul	Boman	Member	Hsb
Traci	Hopkins	Member	H2scan
Lance	Lewand	Member	Doble Engineering
Caleb	Colby	Member	Schneider Electric
Rainer	Frotscher	Guest	Maschinenfabrik Reinhausen GmbH
Mickr	Saad	Guest	Hitachi Energy
Florin	Faur	Member	Prolec-GE Waukesha
Todd	Felton	Member	MVA Diagnostics
Nick	Perjanik	Member	AVO Diagnostic Services
Stephanie	Mabrey	Member	Avo Diagnostics
Tiffany	Lucas	Member	Prolec-GE Waukesha
Joshua	Garner	Guest	Independent Dielectrics
John	Pruente	Member	APC Construction
Cuauhtemoc	Ortiz	Guest	Niagara Power
Roberto	Da Silva	Guest	MR Reinhausen
Andreas		Guest	Maschinenfabrik Reinhausen

Bill	Whitehead	Member	H2scan

The agenda was presented:

Agenda

- Welcome
- Approval of Agenda
- Membership / Quorum
- Call for Patent Claims / IEEE SA Copyright Policy
- Approval of Meeting Minutes S24
- Straw Ballot comments
- New Business
 - Ballot
 - Ballot Resolution Committee
- Adjourn Meeting

Tracy Hopkins made a motion to accept the agenda, Stephanie Mabrey – 2nd to approve Agenda Vote: 11 to approve, 0 opposed, 0 abstain

Chairman reviewed the venue safety information and IEEE patent and copyright slides.

There were no patent statements made by attendees.

Review of 2024 Vancouver meeting minutes by WG.

Lance Lewand motion to approve after no corrections to meeting minutes

Scott Reed 2nd the motion to approve the meeting minutes

In absence of objection, meeting minutes were approved by unanimous consent.

Straw ballot resolution committee comments reviewed by Working Group.

Chairman reviewed the straw ballot comments that were used specifically as provided, there were 18 comments that were modified in some way.

- Working group reviewed the suggestions of the modified purpose from the straw ballot. Changes made by Lance and Toni to proposed Guide Purpose Statement. No motion was made to change to the proposed purpose. Some felt that the original purpose was preferred and more concise.

Surveillance samples and periodic samples were noted in the straw ballot comments (line 9 in the spreadsheet), specific to the incremental magnitude statement. Incremental magnitudes are similar to the rate of change, adding that language would be repetitive. Incremental is a step change, vs a ratio per Florin Fauer.

- we want the incremental change, not the rate of change - Don
- Lance Lewand, maybe instead of saying "incremental" or "rate", we just say "increasing gassing" or "change in gassing".
- The magnitude of change and the rate of change are the important things to monitor. – Toni
- Lance Lewand – "degree of deterioration from increasing gas concentrations".
- Don, Toni, Traci, Lance, John, many head nods in the group. Paul (chair)said based on head nods we will accept the modification to the straw ballot comment.

John Prunte – makes a motion to accept the modification to the proposed change "degree of deterioration from increasing gas concentrations"

Lance Lewand – 2nd the motion

No further discussion, 11 approved, 0 opposed, 0 abstain

The Duval Triangle had an incorrect boundary point. Lance Lewand will provide appropriate boundary point to chairman Boman.

Last WG meeting Stephanie Mabrey brought up a change in the chart in Figure 2, the committee provided a resolution and it was accepted by the WG.

Industry recommended sampling suggestions was questioned in the straw ballot – NFPA 70B, C57.104 give annual sampling recommendations. The WG, with nods, felt that the sampling criteria should be left in the guide.

Andy Keels – insurance company may dictate the sampling requirements.

Upon completion of straw ballot comment review, chairman proposed moving the document to ballot in Standards Committee Meeting.

Scott Reed made a motion to move the document to ballot. Lance Lewand 2nd the motion. Discussion – none. Unanimous approval to move the document to ballot via WG vote. 0 opposed, 0 abstain

Lance Lewand made a motion to form a ballot resolution committee.

Scott Reed made a motion to amend Lance's motion to form a ballot resolution committee with the empowerment to make changes to the document based on the decisions of the committee.

Lance Lewand rescinded his previous motion in agreement with Scott's proposal for empowerment of the committee.

Scott's motion with the empowerment of the committee to rectify ballot comments was 2nd by John Prunte. There was no discussion. Unanimous approval by WG members, 0 opposed, 0 abstain.

A ballot resolution group was formed and will include: Lance Lewand

Todd Felton Nick Perjanik

Stephanie Mabrey Paul Boman

Tiffany Lucas

Approval of the Balloting group – 11 approve, 0 opposed, 0 abstain

The adjournment of the meeting was on the agenda and the WG agreed to adjourn at approximately 12:05pm CST.

Appendix E

Working Group for Acceptance and Maintenance of Insulating Liquids PC57.166

No meeting minutes.

Appendix F

Working Group for Acceptance and Maintenance of Insulating Liquids PC57.637

No meeting minutes.

Appendix G

WG C57.139 Guide for the Interpretation of Gases generated in Liquid-Type Load Tap Changers

Fall 2024 Meeting Minutes Unapproved

Chair Rainer Frotscher

Vice Chair John Prunte

Secretary Paul Boman

Meeting: St. Louis MO USA Tue October 29, 2024 3:15 – 4:30 PM

Attendance record: Total: 55, Members: 24, Guests: 31, with 14 requesting membership.
Attendees list: see end of these Minutes.

Agenda

- Welcome
- Membership / Quorum
- Approval of Agenda
- Call for Patent Claims / IEEE SA Copyright Policy
- Approval of Meeting Minutes S24
- 5-letter Classification
- Revision of C57.139 – Report of Task Forces TF1 - TF4
- Presentation by Niklas Gustavsson (HE) on “Gas generation in vacuum on-load tap-changers”
- New Business
- Closing Remarks / Adjourn Meeting

Minutes

1. The WG met Tue, Oct 29, 3:15 pm. Chair asked for approval of the agenda; motion by Mark Newbill, 2nd by Ed Casserly => agenda was unanimously approved.
2. Chair showed membership list containing 39 members, with an initial count of 24 members attending => Quorum was achieved.
3. Chair asked for Essential Patent Claims => none stated.
4. Slides for Participant Behaviour and IEEE Copyright Policy were shown.
5. Spring 2024 Meeting Minutes: motion to approve by Marcos Ferreira, 2nd by Deanna Woods.
6. Chair then explained the 5-letter classification, as agreed in the previous meeting. All attendees should get familiar with this classification, as this is now, after the anonymization of data, the only descriptor to identify an LTC design.

I	In-tank (LTC mounted inside transformer tank)
O	On-tank (LTC mounted at the side wall of the transformer)
	A Arcing (arcing contacts with switching arcs occurring in oil)
	V Vacuum (arcing contacts with switching arcs occurring in vacuum interrupters)

		R	Resistor type (transition through resistors)
		X	Reactor type (bridging through a reactance)
		S	Selector compartment only
		C	Combined compartment (selector and diverter in same compartment)
		D	Diverter compartment only
		S	Sealed tank (with or without pressure relief device)
		B	Non-sealed (breathing)

Craig Colopy mentioned that, in LTC Standard C57.131, on-tank type LTCs are named “compartment types”. Chair answered that this definition is confusing and therefore will be re-defined. In C57.139, the word “compartment” describes the different oil compartments from which DGA samples are analyzed.

Craig further recommends using “OLTC” instead of “LTC”, to comply with C57.131.

Chair will check if “OLTC” is going to be defined as alternative to “LTC” in future editions of C57.12.80 (Terminology Standard).

Jesus Sanchez...? asked how DGAs from selector tanks which communicate with the transformer main tank shall be handled. Chair said that they fall under transformer DGA.

7. Task Force Reports

7.1. TF1 LTC Data Collection and Evaluation

- TF leader Zach Draper was not present, so results were presented by Chair.
- Data collection has been completed, data were anonymized and cleaned, so ~130'000 samples are ready for further processing.
- Basic Statistics and Calculation of Ratios were performed on important LTC classes (OAX*B, OAR*B, OVX**, IAR*B, IVR**, with “*” = wildcard for existing variants to be compared).
- Box Plots showing the data distribution of single gases and ratios of some of these LTC classes were presented. They clearly show if it is possible to derive limit or 90/95% values for the respective class – or not. The evaluation is ongoing.
- ROC curves could help to identify meaningful gases which allow a failure detection. Examples were shown for increments and rates of the OAXCB class.

7.2. TF2 Revision of General Section (Chapters 1-4) – Florin Faur reports:

- Edits on Scope, Purpose, Normative References and Definitions (chapters 1-3) are completed.
- Draft 4 was distributed Sep 2024 and discussed within TF2.
- Chapter 4 (Nature, purpose and basis for LTC DGA) needs further revision, e.g. on LTC faults; edits will be done by John Prunte.

7.3. TF3 Revision of Basic Rules for LTC DGA interpretation (Chapter 5) – presented by Deanna Woods:

- Chapter 5 contains the 5-letter classification.
- The classification is supplemented by Annex A, which is a list with elementary LTC model names and their classification.
- Text and graphics were added to explain the most meaningful gases/ratios, and how to identify a worsening condition.
- The value of additional data (old data, frequency of operation, ...) are explained.
- Chapter 5 will hold the Tables with limit values and 90/95% values, based on the data analysis from TF1.
They are meant to give initial orientation, when no individual statistics of a specific LTC population exists.
- Discussion about meaningful ratios. Ratios in the current version of the Guide were revised.
- Bill Whitehead stated that hydrogen is unfavorable in ratios as well as in absolute values, as it is so volatile. It is not helpful to be used in laboratory DGA but gives good information in online DGA diagnostics.

7.4. TF4 Revision of Chapter 6: Interpretation of LTC DGA Data – William Solano reports:

- The existing Result Code was supplemented by a 4th stage “Alarm” – to specify imminent faults. Recommendations for actions should be added.

- Further revisions in Chapter 6 and Annexes C (Case Studies) and D (use of Duval Triangle) to be done.
 - Luis Cheim stated that Duval Triangle #2 must be used with caution, as different LTC classes may show their normal gassing outside of the standard "N" zone.
 - Toni Mellin presented an example of contour plots, showing the density distribution of data in the Duval Triangle. This could be used to identify the "Normal" area for LTC classes which do not match with the standard "N" zone of Triangle 2. Further work on this is to be done.
8. Presentation by Niklas Gustavsson (Hitachi Energy) on "Gas generation in vacuum on-load tap-changers"
- Questions from customers asking about low levels of hydrogen or acetylene in vacuum tap-changers with very few operations led to investigations to understand the origin of these gases.
 - For normal (fault-free) LTC operation, three gas sources were identified:
 - a) Generation of low amounts of sparking or arcing gases, caused by internal by-pass or change-over selector contacts.
 - b) Retrofit installations where residual, gas-contaminated oil from the traditional arcing-in-oil diverter remains in the tap-changer compartment, pipes and conservator.
 - c) Materials used in OLTCs may release or generate gases.
 - Laboratory investigations were performed which revealed that polyester laminates, SMC materials and varnishes can emit significant amounts of hydrogen and methane, with values going beyond 100ppm. Additionally, welded steel structures can emit acetylene, resulting from the welding process (~40ppm).
 - Brian Sparling added that galvanized steel surfaces may lead to catalytic reactions in combination with dissolved water, producing hydrogen.
 - There was a common understanding of the WG to address these gas sources in the Guide.
 - Paul Boman stated that, similar to C57.104, a baseline sample prior to energizing the equipment would help to identify such sources. Additional DGA samples during the first year of operation will give additional information.
9. Chairman will retire Nov 30, 2024, but stays under contract with MR until July 2026. Currently examining legal requirements under which sponsoring by MR is possible to continue work in IEEE. From now on, email address rainer.f@ieee.org should be used.
10. Meeting was adjourned at 4:30 pm.

Attendees list:

First Name	Name	Affiliation	Status/ Membership Request
Anthony	Alexander	Hitachi Energy	Guest ^{*)}
Robert	Allison	Dominian Energy	Guest
Piotr	Blaszezyk	STC	Guest ^{*)}
Paul	Boman	The Hartford Steam Boiler	Secretary
Jones	Braxton	SD Myers	Guest
Edward	Casserly	Ergon	Member
Marcelo	Catugas	Neil Service Inc.	Member
Luiz	Cheim	Hitachi Energy	Member
Craig	Colopy	Retired from Eaton	Guest
Roberto	da Silva	MR	Guest ^{*)}
Sami	Debass	EPRI	Member
Marco	Espindola	Hitachi Energy	Member
Egui	Espitia	Reinhausen Mfg.	Guest
Florin	Faur	Prolec SPX Waukesha	Member
Zlatan	Fazlic	Camlin Energy	Member
Todd	Felton	MVA Diagnostics	Member
Marcos	Ferreira	Quanta Technology	Member
Marc	Foata	MR	Guest ^{*)}
Rainer	Frotscher	MR	Chair
Joshua	Garner	Independant Dielectrics	Guest
Alireza	Gorzin	Black and Veatech	Guest ^{*)}
Niklas	Gustavsson	Hitachi Energy	Member
Attila	Gyore	MIDEL	Member
Thang	Hochanh	BC Hydro	Guest ^{*)}
Traci	Hopkins	H2Scan	Member
Patrycja	Jarosz	IEEE SA	Guest
Kurt	Kaineder	Trench Austria	Guest
Andreas	Kurz	MR	Guest
Ashwini	Labh	Hitachi Energy	Guest ^{*)}
Stefan	Lembacher	Siemens Energy	Guest
Tiffany	Lucas	Prolec SPX Waukesha	Member
Stephanie	Mabrey	AVO Diagnostics	Member
Francis	Mantoan	Siemens Energy	Guest
Lee	Matthews	Howard Ind.	Guest
Mama	Mbouombono	Hitachi Energy	Guest ^{*)}
Toni	Mellin	Vaisala	Member
Mark	Newbill	Hitachi Energy	Member
Nick	Perjanik	AVO Diagnostics	Member
John	Pruente	Prolec SPX Waukesha	Vice Chair

Sebastian	Rehkopf	MR	Member
Mickel	Saad	Hitachi Energy	Member
Jesus	Sanchez ...?	Voltyx	Guest
Alfons	Schrammel	Siemens Energy	Guest
Jonathan	Sinclair	Black and Veatch	Member
William	Solano	Voltyx	Member
Brian	Sparling	Kinetrics	Guest ^{*)}
Daniel	Weyer	Monolith	Member
Leon	White	Hedrich	Guest
Bill	Whitehead	H2Scan	Member
Kayla	Whitesel	DeltaX Research	Guest ^{*)}
Christopher	Whitten	Hitachi Energy	Member
Deanna	Woods	Prolec GE Waukesha	Member
Shuzhen	Xu	FM Global	Guest
Joshua	Yun	Virginia Transformer Corp.	Member
Peter	Zhao	Hydro One	Guest

^{*)}: requesting membership

Appendix H

Minutes of Meeting C57.104 Guide for the Interpretation of Gases Generated in Mineral Oil- Immersed Transformers – Working Group St Louis MO – Oct 29, 2024

- This was the first working group for the revision of C57.104
- The Chair, Ed teNyenhuis, led the meeting. The Chair introduced the Vice-Chair, Luiz Cheim, and the Secretary, Sami Debass who recorded the attendance and meeting minutes.
- There were 134 persons in attendance (see list below). There were 8 persons requesting membership and 37 guests. Since this was the first meeting, quorum was reached.
- The Meeting Agenda was reviewed. A motion to approve the agenda was made by Mickel Saad and seconded by Marko Teofanovic. The agenda was unanimously approved.
- The TF Spring 2024 Meeting Minutes were reviewed. Toni Mellin moved to approve the agenda, which was seconded by Mario Alonso. The minutes were unanimously approved.
- A call for patents was made with no response.
- The Chair earlier invited members to present suggested changes to the guide using a presentation template. The working group had 4 presentations discussed below.
- Presentation # 1 – Luiz Cheim - Section 6.1 & 6.2 - What to do with online monitoring data versus laboratory data.
 - There are differences in results between different monitoring technologies and the lab technology
 - A motion was made by Emilio Morales-Cruz and seconded by Matt Chu to create a task force to investigate this matter to potentially include in this guide, create a new guide, or publish a white paper. The motion was approved.
- Presentation # 2 – Ramsis Girgis - Create a new section in the guide about 6-8:1 H₂ to CH₄ ratio generation caused by moderate overheating of thin oil film between laminations of core
 - Based on publications by Ramsis Girgis and Ed teNyenhuis in 2009 (already cited in the guide)
 - It may be included in the Annex E Case Studies Section
 - Ramsis Girgis made a motion (seconded by Evgenii Ermakov) to write and submit text to the WG for inclusion in the guide. The motion was approved.
- Presentation # 3 - Don LaMontagne - Discussion on Section A.3 Future Work
 - It was proposed to use Artificial Neural Networks in the guide as a new clause (for online and offline DGA)
 - Don LaMontagne suggested creating an online repository of a failure database with pre-failure DGA and RCA results that can be used to train future classification algos
 - Lance Leward made a motion (seconded by Stuart Chambers) that this should be rolled into the earlier approved TF about online monitoring. This motion was approved.
- Presentation # 4 - Rainer Frotscher- Flowchart in 6.1.1: should be AND instead OR in the second decision diamond

- This would significantly reduce the number of transformers that end up as Status 3, moving those other results to Status 2.
 - The data set that was used in Annex A was “destroyed” so we cannot run the change in the flow chart algorithm to perform any statistics.
 - Sami Debass requested that we create an anonymous data repository.
 - IEEE is doing this for esters to collect and anonymize the data and pass it to the transformer committee.
 - Patrycja Jarosz from IEEE SA gave information about how the existing esters database works if we wanted to go forward with a similar process for the creation of an IEEE database.
 - Tim Raymond made a motion (Adrina S Cisco seconded) for the WG chair to begin a discussion with IEEE for the creation of an anonymized DGA mineral oil database. This motion was approved.
- There was insufficient time for the other 2 presentations prepared but these will be discussed in a virtual working group meeting in Jan / Feb 2025.
 - There was no new business to discuss.
 - The meeting was adjourned at 15.00.

Attendance List

NO.	Last Name	First Name	Company Name	Members Attending (Y/N) & Guests
1.	Alonso	Mario	Georgia Transformer	Y
2.	Aleksander	Owicz	Hitachi Energy	G
3.	Attaullah	Ahmad G	Sabic	Guest
4.	Baser	Levent	Hitachi Energy	N
5.	Betancourt	Edwin	Siemens Energy	Guest
6.	Bradshaw	Garrett	Howard Industries	
7.	Brett	John	Delta-X Research	N
8.	Boettiger	William	Boettiger Transformers Consulting LLC	Guest
9.	Boman	Paul	HSB	Y
10.	Bonn	Mike	SOLTEX	N
11.	Brodeur	Samuel	Hitachi Energy	Guest
12.	Burk	Griffin	Ergon	Guest
13.	Casserly	Edward	Ergon	Y
14.	Castellanos	Juan	Prolec GE	Y
15.	Castello	Alonso	Kaedi Energy Solution	Guest
16.	Chanda	Sudip	Delta Star Inc	Y
17.	Chambers	Stuart	EPRI International	Y
18.	Cheatham	Mark	GE	Y
19.	Cheim	Luis	Hitachi Energy	Y
20.	Chen	Kezmen	IFD Technologies	N
21.	Chu	Matt	Shihlin Electric	Guest
22.	S. Cisco sullberg	Adriana	Salt River Project	Guest
23.	Colby	Caleb	Schneider Electric	Guest
24.	Cordova	David	Maddox Industrial	Guest
25.	Cox	Randy	GE	Y
26.	Debass	Sami	EPRI	Y
27.	Delgado	Gabriel	Invenergy	Y
28.	Dillon	Nikolaus	Dominion Energy	Guest
29.	Doak	Eric	D4 Energy solutions	Guest
30.	Doyle	Lee	Vaisala	Y

31.	Draper	Zachary	Delta-X Research	Y
32.	DA Siliva	Roberto	Maschinefabrik Reinhausen	Y
33.	Duffy	Jesse	Nashville Electric Service	Y
34.	Dukarm	James	Delta-X Research	Y
35.	Dulac	Hakim	APT	
36.	Edward	Tolcagir	TTR	Guest
37.	Emilio	Morales - Cruz	Qualitrol	Y
38.	Ellitt	Will	AEP SWEPCO	Y
39.	Espindola	Marco	Hitachi Energy	Y
40.	Fazlic	Zlatan	Camlin Energy	Y
41.	Faur	Florin	Prolec GE WAUKESHA	Y
42.	Felton	Todd	MVA Diagnostics	Y
43.	Fernandez	Miguel	Braintree Electric Light Dept.	Y
44.	Ferreira	Marcos	Quanta Technology	Y
45.	Finn	Mark	Hitachi Energy	Guest
46.	Forsyth	Bruce	Cargill	Y
47.	Franklin	Chris	MG Power Associates	N
48.	Frotscher	Rainer	Reinhausen Germany	Y
49.	Gagne	Zach	IFD Technologies	N
50.	Gamer	Joshua	Independent Dielectrics	Guest
51.	Gara	Lorne	Shermco	Guest
52.	Garcia	Miguel	Hitachi Energy	Y
53.	Gardner	James	Prolec-GE WAUKESHA	Y
54.	Gasparini	Eloy	Mistras	Guest
55.	Garza	Hector	Ovto De Mexico	N
56.	Girgis	Ramsis	Hitachi Energy	Y
57.	Gonzalez	Luis	Conduct Industries	Y
58.	Gorzin	Alireza	Black and Veatch	Y
59.	Gyore	Attila	Midel & Mivolt Fluids LTD	Guest
60.	Guner	Ishmael	Hydro -Quebec	N
61.	Hamoir	Didier	Transformer Protector Corp.	Guest
62.	Hernandez	Giovanni	Virginia Transf. Corp	Y
63.	Hernandez	Ronald	Doble Engineering	N
64.	Hernandez-Mejia	Jean Carlos	Georgia Tech Neetrac	N
65.	Herron	William	MR	N
66.	Holden	Andy	Ergon	Y
67.	Hollrah	Dereck	Burns & McDonnel	N
68.	Hopkins	Traci	H2Scan	Y
69.	Foata	Marc	MR	Guest
70.	Jakob	Karl	Cargill	Guest
71.	Jarosewski	Marion	Delta Star Inc	Guest
72.	Jarosz	Patrycja	IEEE SA	N/A
73.	John	John	Virginia Transformer Corp.	Y
74.	Jones	Braxton	SD Myers	Guest
75.	Jonak	Ryan	PGE	Guest
76.	Kasonga	Mick	Oncor Elec	N
77.	Khan	Qasim	NEETRAC- Georgia Tech	Guest
78.	Kirchenmayer	Egon	Siemens Energy	Y
79.	Klempner	Dmitriy	SCE	Y
80.	Kowackl	Rafal	Hitachi Energy	Guest
81.	Kurz	Adreas	MR	N
82.	Lamontagne	Donald	Arizona Public Service	Y
83.	Lewand	Lance	Doble Engineering	Y
84.	Li	Chao	Eaton	N
85.	LI	Jinming	BC Hydro	Y
86.	Li	Weijun	Braintree Electric Light Dept.	Y
87.	Lin	David	IFD Technologies	N
88.	Lizcand	Cesar	SHELL USA INC.	N

89.	Loiselle	Luc	Tetra Tech	Y
90.	Lucas	Tiffany	Prolec GE	N
91.	Luke	Wang	BC Hydro	N
92.	Mabrey	Stephanie	Weidmann	Y
93.	Malde	Jinesh	MIDEL & MIVOLT Fluids Ltd	Guest
94.	Mani	Kumar	Duke Energy	Y
95.	Mani	Balacrshnan	Delta Star Inc	Guest
96.	Mahajan	Kushal	Sungrow	Y
97.	Mantoan	Francis	Siemens Energy	Guest
98.	Mbouombouo	Mama	Hitachi Energy	N
99.	Megdad	Mohammed	IPS	N
100.	Mellin	Toni	VAISALA	Y
101.	Mannannam	Robert	Maddox Industrial Transf.	N
102.	Miller	Philip	MLGW	N
103.	Morgan	Charles	Eversource Energy	Guest
104.	Munnoz	Molina	Orto	Guest
105.	Murkowski	Emma	Delta-X Research	Y
106.	Murray	David	TVA	Y
107.	Naja	Ismael	Eaton	Guess
108.	Nambi	Shankar	Bechtel Energy	Guest
109.	Newbill	Mark	Hitachi Energy	Y
110.	Nims	Joe	Allen & Hoshall	N
111.	Nolte	Mike	kiewit	Guest
112.	O'Malley	Anastasia	Con Edison NY	N
113.	Pacas	Joel	IFD Technologies	Guest
114.	Panesar	Parminder	Virginia Transformer	Y
115.	Patel	Vinay	Con Edison	Y
116.	Patel	Rakesh	Hitachi Energy	Y
117.	Pedro	Pedro	EFACEC-TRANSFORMERS	N
118.	Perjanik	Nick	Avo Diagnostic Services	Guest
119.	Plisic	Goran	Siemens Energy KPT	N
120.	Pruente	John	APC Construction	Y
121.	Radu	Ion	Hitachi Energy	Y
122.	Raymond	Tim	Inductive Reasoning	Y
123.	Reed	Scott	MVA	Y
124.	Reeder	Perry	GE	N
125.	Reimer	Jonathan	Fortis BC	Guest
126.	Razvan	Arash	Delta Star Inc	Y
127.	Rossini	Yuri	Siemens Energy	Y
128.	Saad	Mickel	Hitachi Energy	Y
129.	Schott	Cody	The J-J Family of Camp	N
130.	Schmitt	Wolfgang	Schneider Electric	Guest
131.	Sinclair	John	Black and Veatch	Y
132.	Smith	Jimmy	Howard Industries	Guest
133.	Soeller	Markus	Power Diagnostix System	N
134.	SOHN	Yong Tue	HYOSONG HICO	Y
135.	Soto	Mauricio	Hitachi Energy	Y
136.	Sparling	Brian	KINECTRICS	Y
137.	Staley	Brad	Leeward Renewable Energy	Y
138.	Steeves	Greg	Baron USA	Y
139.	Sweetser	Charles	Omicron	Guest
140.	Witkowski	Michal	Hitachi Energy	Guest
141.	Tanaka	Troy	Burns and McDonnell	Y
142.	teNyenhuis	Ed	Hitachi Energy	Y
143.	Teofanovic	Marko	Ontario Power Generation	Guest
144.	Thierry	Juan Luis	Doble Engineering	Guest
145.	Thomas	Prevost	Weidman	N
146.	Thompson	Ryan	Burns and McDonnell	Y

147.	Tillery	Tim	Howard Industries	Guest
148.	Tostrud	Mark	Dynamic Ratings	Y
149.	teNyenhuis	Ed	Hitachi Energy	Y
150.	Van Drell	Cole	American Transmission Co	Y
151.	Vanderwalt	Alwyn	ECI	Y
152.	Verdolin	Rogério	VERDOLIN Solutions	Y
153.	Vir	Dharam	Prolec GE	Y
154.	Volodymyr	Prykhodko	ZTZSETVECES	N
155.	Vu	Nguyen	IFD Technologies	Guest
156.	Wager	John	AEP	Guest
157.	Washburn	Alan	Burns & McDonnell	Guest
158.	Welton	Drew	Intellirent	Y
159.	Watson	Joshua	NPPD	N
160.	Weyer	Daniel	Monolith	Y
161.	White	Elliot	SD Myers	N
162.	Whitehead	Bill	H2Scan	Y
163.	Whitesell	Kayla	Delta-X Research	Guest
164.	Woods	Deanna	ATC	Y
165.	Wess	Zacan	Weg Trains	Guest
166.	Xu	Shuzhen	FM Global	Y
167.	Zhn	zhinwring	Chint	Guest
168.	Zuiderveen	Thomas	IFD Technologies	Guest

Annex H Insulation Life Subcommittee

October 30, 2024
St. Louis, Missouri

Chair: Sam Sharpless
Vice-Chair: Jinesh Malde
Secretary: Anastasia O'Malley

The Insulation Life Subcommittee (ILSC) was called to order by the Chair on October 30, 2024, at 8:00 am CDT. The Chair reviewed the agenda and then introduced the subcommittee officers. Due to the size of the group, general introductions were not made. The Chair requested that each person state their name and affiliation when addressing the subcommittee. The list of subcommittee members was displayed, and attendees scanned a QR code to record their attendance. One attendance roster was also used for attendees who were not able to scan the QR code.

H.1 Chair's Report/Remarks

The Chair emphasized the timely completion, technical accuracy, and usefulness of quality projects through the participation of working group leaders, subject matter experts and the general membership.

The Chair reviewed the requirement for activity leaders to maintain updated documents on the subcommittee webpage. He also reviewed administrative requirements for task force and working group chairs. The Chair showed the essential patent claim notice and requested that any person with knowledge of an essential patent that meets the requirements of any subcommittee standard to bring the issue forward for discussion. No essential patent claims were raised.

The Chair reviewed guidelines for IEEE working group meetings reminding compliance with all applicable laws, including antitrust and competition laws.

The Chair displayed the copyright policy and advised the subcommittee that permission would be required from the authors or organizations for use of information.

The Chair discussed the membership requirements, welcomed new members:

Sami Debass	YongTae Sohn
Gabriel Delgado Zamora	Mauricio Soto
Jeffrey Door	Fabian Stacy
Alireza Gorzin	Kyle Stechshulte
Philip Hopkinson	Matthew Sze
Jose Luis Manchain	Scott Thomas
Ismael Naja	Alwyn Vanderwalt
Parminder Panesar	Richard VonGemmingem
Miguel Plascencia	Mike Waldrop
Dominic Pollaro	Matt Weisensee
Rodrigo Ronchi	Guang Yuan
Jaber Shalabi	

And reviewed members moved to guest status:

Arup Chakraborty
Carlos Gaytan
Stephen Jordan
Gael Kennedy
Mario Locarno

Markus Schiessel
Jeffrey Schneider
Pugal Selvaraj
Krishnamurthy Vijayan

H.2 Secretary's Report

For the Fall 2024 St. Louis meeting a QR scan code was used for attendance polling and recording. The QR code was supplemented with an attendance roster. The QR scan code indicated that a quorum had been achieved with 92 out of 133 members in attendance. The attendance roster added 3 additional members for a total of 95 out of 133 members present in the meeting together with 90 guests. A quorum had been achieved. Participants requesting membership for the subcommittee were advised to reach out to the Chair, Vice-Chair or Secretary at the conference, through email or to note it on the paper roster. Nineteen guests requested membership. A list of attendees is provided at the end of this report.

The Spring 2024 subcommittee meeting minutes had been provided to participants in advance of the meeting for review.

Sanjib Som made a motion to approve the minutes. Amitabh Sarkar seconded the motion. After hearing no objection from the attendees, the Spring 2024 meeting minutes were approved by unanimous consent.

The agenda for the meeting had been provided to participants in advance of the meeting for review. An updated agenda with one change highlighted was displayed. Rogerio Verdolin moved for approval of the agenda as shown. Eduardo Garcia seconded the approval of the agenda. After hearing no objection from the attendees, the meeting agenda was approved by unanimous consent.

H.3 Taskforce Reports

H.3.1 Task Force C57.12.90 Clause 11, Temperature Rise Tests – Dinesh

Sankarakurup, TF Chair presented the meeting minutes

ILFC TF Continuous Revisions to IEEE C57.12.90 Clause 11

Temperature-rise Tests

October 29th, 2024, St Louis, MO

TF - Temperature-rise Tests		
Chair: Dinesh Sankarakurup	Vice-Chair: Ajith M. Varghese	Secretary: Cihangir John Sen
Room: Grand Ballroom E	Date: October 29 th , 2024	Time: 3:15 pm to 4:30 pm
Total TF Members: 27	Members present at the Quorum: 17	Attendance Per Roster: 54
Guests present: 31 (Table-2)	Membership requested: 15	Granted membership: 6
Status changed to Guest: 3		Final TF Members: 30 (Table-1)

Chair's Remarks

The meeting was called to order at 3:15 PM on October 29, 2024. The Chair welcomed members and guests to the Fall 2024 meeting.

Annex H

Attendance rosters were circulated. There were 54 participants present (including the Chair, Vice Chair, and the Secretary) and 15 participants requested voting membership. Six (6) of the 15 requests were granted according to their participation records. 3 members' statuses have changed to guest.

Per the Working Group Policies and Procedures, voting membership status will be effective as of the start of the next meeting in Spring 2025. Table 1 is the final list of the **30 members** of this TF. Table 2 lists the 31 guests present at the Fall 2024 meeting.

Table-1: Final Membership List (after F24 Meeting)

	First Name	Last Name		First Name	Last Name
1	Steve	Antosz (P)	16	Bertrand	Poulin (P)
2	Gilles	Bargone	17	Jarrold	Prince
3	William	Boettger	18	Juan	Reyes Perez (New) (P)
4	Juan	Castellanos (P)	19	Dinesh	Sankarakurup (P)
5	Luc	Dorpmanns (New) (P)	20	Ewald	Schweiger
6	Samraghi	Dutta Roy	21	Cihangir John	Sen (P)
7	Renjie	Fu (New) (P)	22	Abdulmajid	Shaikh (P)
8	Saramma	Hoffman	23	Michael	Shannon (P)
9	Qasim	Khan (P)	24	Sam	Sharpless (P)
10	Zan	Kiparizoski (P)	25	Sanjib	Som (P)
11	Egon	Kirchenmayer (P)	26	Valeriu	Tatu (P)
12	Fernando	Leal (P)	27	Ryan	Thomson (New) (P)
13	Gabriel	Mamede	28	Ajith	Varghese (P)
14	Francis	Mills (New) (P)	29	Jason	Varnell (P)
15	Marta	Munoz (New) (P)	30	David	Wallach (P)

(P) Members Present, (N) New Member

Table-2: Guests present during F24 WG Meeting

	First Name	Last Name		First Name	Last Name
1	Donald	Ayers	17	Moses	Manzano
2	Hugo	Bayena	18	Joe	Nims
3	Duvier	Bedoya	19	Anastasia	O'Malley
4	Edwin	Betancourt	20	Manan	Pandya
5	Josh	Bohrn	21	Dean	Park
6	Michael	Botti	22	Sylvain	Plante
7	Mark	Finn	23	Ulf	Radbrandt
8	Joseph	Foldi	24	Garret	Sarkinen
9	Sergio	Hernández Cano	25	Samuel	Tekle
10	Thomas	Holifield	26	Scott	Thomas
11	Fawaz	Iqbal	27	John	Wagner
12	Marion	Jarosewski	28	Luke	Wang
13	Sheldon	Kennedy	29	Matthew	Weisensee
14	Evan	Knapp	30	Paul	Weyandt

15	Arvind	Kumar	31	Joseph	Youn
16	Luc	Loisellez			

Quorum, Approval of Minutes and Agenda

At the time of quorum 17 of the 27 members were present so quorum was achieved short after the meeting start. The Unapproved minutes from the Spring 2024 in Vancouver meeting was presented by Chair and approved by the WG. Chair clarified that the online meeting minutes are not included upon a question by Sam Sharpless.

The agenda for Fall 2024 meeting with the Spring 2024 meeting minutes were unanimously approved.

Patents and Copyrights

Chair made the call for the patent and shared the IEEE SA slides on patent policy and copyright. The attendees were asked if there were any Patents and Copyrights relevant to the scope that the TF should be aware of. None were reported

TF started to discuss about the old businesses since quorum was achieved.

Old/ Unfinished Businesses:

1) Hot spot rise calculation for OFAF /OFWF cooler transformer

TF continued to discuss the proposed changes by Bertrand Poulin and the comments from the circulation of these changes within the TF. Below comments were received after the last circulation of the proposed section 11.3.2.

1.a - Addition of natural convection cooling methods with natural esters that have higher flash points that was proposed by Jason Varnell.

As per David Wallach's suggestion, it was agreed to modify the paragraph as

“For transformers with natural convection of liquid flow through the cooling equipment and in windings (e.g., ONAN, KNAN, LNaN etc.), the following simplified oil flow pattern is assumed.”

Also, “ONAN/ONAF transformers” is changed to “transformers with natural convection” under Figure 1.

1.b – TF agreed to include the below sentence under Figure-1 that shows the oil flow pattern for transformers with natural convection:

“The liquid flow pattern described above for natural convection transformers (Figure 1) is applicable to both guided and non-guided liquid flow.”

1.c - ODAF and ODWF is changed to “transformers with forced circulation through cooling equipment and directed from the cooling equipment into at least the main windings (directed flow)” in the paragraph.

Also, Figure-2 definition is changed to “Oil flow pattern for transformers with directed flow (OD)”

1.d – The paragraph that describes the Figure-2 is changed as below to make it clear and more accurate according to the operating principal of the directed oil flow:

“A pump is used to force the oil through the heat exchangers (radiators or coolers) and directed into the windings with only a small portion going to the core.”

1.e - In accordance with the above changes, ONAN/ONAF, ODAF and ODWF in Figure-3 definition is changed to “transformers with natural convection and directed oil flow”.

Also, the “OFAF/OFWF transformers” that are represented in Figure-4 are revised as “transformers with forced circulation through the cooling equipment and natural convection flow in the windings (non-directed flow)”

1.f - In 11.3.5.3, the cooling methods ONAN/ONAF, ODAF and ODWF excludes the other fluid types such as KNAN/KNAF, etc. It will be revised to take into consideration of the different fluid types.

Addition to the above changes, there were several editorial changes that were implemented in the section with the agreement of the TF attendees.

Chair suggested to survey the revised clause 11.3.2 within the Task Force after implementing the all the changes discussed during the Fall 2024.

2) Negative Altitude Correction (Transformers tested at factories located > 1000 m)

The revised section 11.4.3 regarding the altitude correction was surveyed one time and received a 90% approval rate already.

Steve Antosz provided an update and informed the TF that the section is now final and ready for sending out for a survey within the Task Force. He made a motion to survey the final clean version. Jason Varnell seconded. It will be sent for the final survey before the Spring 2025 meeting. No further discussion.

3) Tap Selection for Temp Rise Test:

TF didn't have time to discuss on this item, however Joseph Foldi wanted to present his thoughts about the tap selection during the temperature rise test and requested to be considered as a new business. His comments were about the below item 4 under clause 11.4. He proposed to change the requirement of testing on a bridging position to an extreme non-bridging position (16L/16R).

4. Transformers with preventive autotransformers (PA) - The tap-changer shall be in a bridging position (not applicable when the preventive autotransformer is energized only during transition), with all or a significant portion of the LTC circuit carrying current. (Example: Test on LTC Tap 15R/15L instead of Tap N, 1R/1L or 16R/16L).

TF did not have time to discuss the proposed change so it was requested from Joseph Foldi to provide an email for the TF to include the discussion in the next meeting's agenda.

No new business was identified.

Meeting was adjourned at 4:33pm.

Minutes respectfully submitted by,

Cihangir John Sen
Secretary

H.4 Technical Activity Reports:

H.4.1 WG IEEE 1276a IEEE Guide for the Application of High-Temperature Insulation Materials in Liquid Immersed Distribution, Power and Regulating Transformers, Amend Annex B and D – Kevin Biggie WG Chair presented meeting minutes

WG IEEE 1276a, Amend Annexes B&D – Meeting Minutes

IEEE 1276 IEEE Guide for the Application of High-Temperature Insulation Materials in Liquid-Immersed Distribution, Power, and Regulating Transformers

Monday, 28 October 2024, 11:00 am – 12:15 pm CDT – Fall 2024 (in-person meeting)

- Chairman: Kevin Biggie (Weidmann)
- Vice-chair: George Frimpong (retired – not present)
- Secretary: Evanne Wang (DuPont)

The Chair called the meeting to order at 11:03 am CDT and welcomed attendees to the meeting. A quorum was achieved. The breakdown of attendees is shown below:

- Attendees present: Eighty-nine (89)
- Members present: Nineteen (19) (19 required for quorum)
- Guests requesting membership: Not applicable
- Guests granted membership: Not applicable

Meeting guidelines, essential patent claims information, and copyright information were reviewed. No patent claims or copyright issues were brought to attention.

The Chair reviewed the purpose of the Working Group, which is to amend annexes B & D of IEEE 1276.

The minutes from the last meeting on March 11th, 2024 were reviewed and unanimously approved. This was motioned by Ed Casserly (Ergon) and seconded by Mike Shannon (REA Magnet Wire). The Chair presented the proposed agenda for this meeting, which was unanimously approved. This was motioned by Phil Hopkinson (HVolt) and seconded by Chao Li (Eaton). Both unapproved minutes from the last meeting and the proposed agenda were sent prior to the in-person meeting to the members and guests of this Working Group.

The Chair reviewed the progress made since the last WG meeting, including changes to develop Draft D.6 of the document, and the results of the emailed straw ballot results for Draft D.6, which was 28 counts for “approve” and 1 count for “abstain.” The 28 approvals of the 37 voting members (75%) met the two-thirds super majority required for Draft D.6 to be presented for approval to proceed to IEEE SA Sponsor Ballot at the upcoming Insulation Life Subcommittee meeting. The Chair asked for any further comments and none were received.

The Chair noted that he will be making a motion at the ILSC to move Draft D.6 to ballot, and seeks members for a comment resolution group (CRG). The volunteers for the CRG are as follows:

1. Jinesh Malde (M&I Materials)
2. Chao Li (Eaton)
3. Ed Casserly (Ergon)
4. Tim Raymond (Inductive Reasoning)
5. Stu Chambers (EPRI)
6. Pragnesh Vyas (Sunbelt Solomon)

7. Bruce Forsyth (Cargill)
8. Kevin Biggie (Weidmann)
9. Evanne Wang (DuPont)

The WG voted and approved that the CRG would have the authority to make changes to Draft D.6 and subsequent drafts based on the IEEE-SA balloting process. This was motioned by Jinesh Malde (M&I Materials) and seconded by Phil Hopkinson (HVolt).

The Chair noted that changes to Draft D.6 from the balloting process will be documented and communicated to the balloting pool after the CRG finishes a draft, and that the balloting pool will have access to the drafts to vote. Additionally, it was noted that one does not need to be a member of the CRG to view the most current draft. The Chair announced that those interested in joining the balloting pool should do so through the IEEE MyProject website.

The Chair thanked everyone for their participation as this is the last in-person meeting for the WG to amend 1276. Phil Hopkinson (HVolt) makes a motion to adjourn the meeting, which was seconded by Sam Sharpless (Rimkus Consulting).

During adjournment, Sam Sharpless (Rimkus Consulting) noted that AdCom is looking to re-number IEEE 1276 standard to be a part of the C57 series of standards.

No additional input or comments were received, and the meeting was adjourned at 11:48 pm PT.

Respectfully submitted,

Kevin Biggie, Chair
George Frimpong, Vice-Chair
Evanne Wang, Secretary

Attendance WG IEEE 1276a Annex B & D Meeting (10/28/2024):

- Attendees present: Eighty-nine (89)
- Members present: Nineteen (19) (19 required for quorum)
- Guests requesting membership: Not applicable
- Guests granted membership: Not applicable

The following attendees were present:

Last/Family/ Surname	First/Given Name	Affiliation / Company Name	Status / Role
Avanoma	Onome	MJ Consulting	Guest
Beaster	Barry		Guest
Benitez	Orlando	Hyosung HICO	Guest
Biggie	Kevin	Weidmann Electrical Technology	Chair
Bradshaw	Jeremiah	Bureau of Reclamation	Guest
Bradshaw	Garrett	Howard Industries	Guest
Brzoznowski	Steven	BPA	Guest
Calitz	David	Siemens Energy	Guest
Casallas	Camilo	Trench	Guest
Casserly	Edward	Ergon	Member
Castellanos	Juan	Prolec GE	Member
Castillo	Alonso	Kaedi Energy Solutions	Guest

Annex H

Chambers	Stuart	EPRI	Member
Chiang	Solomon	The Gund Company	Guest
Cisco Sollberg	Adriana	Salt River Project	Guest
Crochett	Daniel	Ameren	Guest
Cruz Valdes	Juan Carlos	Prolec GE Mty	Guest
Davoudi	Pouney	Delta Star Inc.	Guest
Dolloff	Paul	East Kentucky Power	Guest
Door	Jeffrey	The H-J Family of Companies	Member
Duarte	Fernando	EPRI	Guest
Elson	Eric	San Diego Gas & Electric	Guest
Espindola	Marco	Hitachi Energy	Guest
Garcia	Eduardo	Siemens Energy	Guest
Garcia-Paredes	David	Virginia Transformer Corp.	Guest
Gorzin	Alireza	Black & Veatch	Guest
Hampton	Kevin	Siemens Energy	Guest
Hernandez	Giovanni	Virginia Transformer	Guest
Hoffman	Saramma	PPL	Member
Holifield	Thomas	Howard Industries	Guest
Hopkinson	Philip	HVolt	Member
Hrkar	Miljenko	Hitachi Energy	Guest
Hussain	Mo Rashi	Mississippi State University	Guest
Jensen	Nick	Delta Star	Guest
John	John	Virginia Transformer Corp.	Guest
Johnson	Christopher	Oncor	Guest
Jonay	Ryan	Portland General Electric	Guest
Joseph	Foldi	FEA	Guest
Kennedy	Sheldon	Sheldon P. Kennedy Engineering PLLC	Guest
Kim	Seungmo	Hyosung HICO	Guest
Kiparizoski	Zan	Howard Industries	Member
Kosedagi	Nihat	Hitachi Energy	Guest
Koshel	Anton	Delta Star Inc.	Guest
Lee	Junho	HD Hyundai Electric	Guest
Lee	Jihun	HD Hyundai Electric	Guest
Li	Chao	Eaton	Member
Loiselle	Luc	Tetra Tech	Guest
Malde	Jinesh	M&I Materials	Member
Manzano	Moses	Hyosung HICO	Guest
Martinez	Alberto	WEG Transformers	Guest
Martinez	Daniel	JFE Canada	Guest
McBride	Brian	Cargill	Member
Minikel	Justin	Eaton	Guest
Morales-Cruz	Emilio	Qualitrol	Member
Murciq	Fredy	Siemens Energy	Guest
Nissle	Boris	MGC moser-Glaser	Guest
Oakes	Stephen	WEG Transformers	Member
Panesar	Parminder	Virginia Transformer	Member
Park	Dean	Hyosung HICO	Guest
Raymond	Tim	Inductive Reasoning	Member
Reyes	David	Oncor	Guest

Reyes Perez	Juan	Hitachi Energy	Guest
Sabin	Hakan	Virginia Transformer	Guest
Salvato	Paul	Intellirent	Guest
Sarkar	Amitabh	Virginia Transformer	Guest
Sarkinen	Garret	Xcel Energy	Guest
Shaikh	Abdul Majid	Delta Star Inc.	Guest
Shannon	Michael	REA Magnet Wire	Member
Sharpless	Samuel	Rimkus Consulting	Member
Snyder	Jason	First Energy	Guest
Stankes	Dave	3M	Guest
Starcevic Prebeg	Verdana	KONCAR D&ST	Guest
Stechsulte	Kyle	AEP	Guest
Steineman	Andrew	Delta Star	Guest
Swarna	Sunny	Virginia Transformer Corp.	Guest
Takan	Can	MGC Moser Glaser Inc.	Guest
Tekle	Samuel	WEG Transformers USA	Guest
Veeran	Kannan	Virginia/Georgia Transformer	Guest
Viereck	Karsten	Reinhausen	Guest
Vyas	Pragnesh	Sunbelt Solomon	Guest
Wagner	John	AEP	Guest
Wang	Evanne	DuPont	Secretary
Wang	Luke	BC Hydro	Guest
Weisensee	Matt	Pacificorp	Guest
Weiss	Zachery	WEG Transformers	Member
Welton	Drew	Intellirent	Guest
Yavuz	Koray	Noark Electric	Guest
Young	Fei	Hitachi Energy	Guest
Zhang	Hongzhi	Hitachi Energy	Guest

Kevin Biggie made a motion to approve the draft amendment of IEEE 1276 Annex B and D for balloting. Eduardo Garcia seconded the motion. There was no objection to the unanimous consent of the motion to proceed to ballot.

H.4.2 WG PC57.91 Guide for Loading Mineral-Oil-Immersed Transformers –

David Wallach, WG Chair presented the update

Chair: David Wallach

Vice-Chair: Javier Arteaga

Secretary: Kumar Mani

No meeting was held in St. Louis. The ballot successfully closed on February 15, 2024. A comment resolution group was formed and has met seventeen times since the Spring meeting. There are a total of 448 comments comprised of 228 editorial, 149 general and 71 technical comments. One hundred and sixty-two comments were identified by the comment resolution group for discussion. One hundred and forty-five of those comments have been resolved. The group plans to recirculate the ballot by the end of this year. The PAR expires on December 31, 2025.

H.4.3 PC57.162 Guide for the Interpretation of Moisture Related Parameters in Liquid Immersed Transformers and Reactors – Tom Prevost, WG Chair presented the update

Chair: Tom Prevost
Secretary: Deanna Woods

No meeting was held in St. Louis. The comment resolution group conducted weekly virtual meetings to resolve 834 comments. A recirculation ballot will be sent next week. The PAR expires on December 31, 2024.

Tom Prevost made a motion to approve a PAR extension request. Ewald Schweiger seconded the motion. There was no objection to the unanimous consent of the motion for a PAR extension request.

H.4.4 PC57.165 IEEE Guide for Temperature Measurements for Liquid Immersed Transformers and Reactors – Mark Tostrud WG Chair presented the update

Chair: Mark Tostrud
Vice Chair/Secretary: Zan Kiparizoski

No meeting was held in St. Louis. The guide passed during the second recirculation ballot in July and has been submitted to the Standards Review Committee (Revcom) and is in the final stages with Standards Association Standards Board review.

H.4.5 C57.119 Study Group - Recommended Practice for Performing Temperature Rise Tests on Liquid-Immersed Power Transformers at Loads Beyond Nameplate Ratings – Ewald Schweiger Chair presented the update

Recommended Practice for Performing Temperature Rise Tests on Liquid-Immersed Power Transformers at Loads Beyond Nameplate Ratings

- 1) Meeting took place at 9:30 AM (CDT) on Monday October 28th, 2024
- 2) After the virtual meeting on September 29th, 2024, this was the second in person meeting after Vancouver S24. In our today's in person meeting 81 attended our second in person meeting.
 - o Attendance: 81
 - o Members: 7
 - o Guests: 74
- 3) A brief overview about the previous meetings of C57.119 was presented:
 - o F23 - Kansas City: Start Study Group for C57.119
 - o S24 – Vancouver: Recommendation to ILSC “Document needs revision” and received task to work on title / scope.
 - o Sept 24 - Virtual: Voted on wording of title and scope
 - o F24 – St Louis: Seek ILSC’s approval to create a PAR to revise the document. Make motion on Wednesday

- o Purpose of this meeting is to work on the purpose with the objective to complete the content needed for the PAR
- 4) 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.
- a) 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.
- 5) Establish quorum
- o A quorum was achieved
Total number of members is 11 requiring 6= members for quorum.
7 members have been present in the meeting
- 6) Approval of agenda
- a) No comments from the group
 - b) The agenda was unanimously approved (1st motion by Juan Castellanos and 2nd Bertrand Poulin)
- 7) Approval of meeting minutes of the previous virtual meeting from September 29th, 2024
- a) No comments from the group
 - b) The meeting minutes were unanimously approved (1st motion by Bertrand Poulin and 2nd Juan Castellanos)
- 8) Discussion based on feedback from review of C57.119 and next steps needed for the new PAR
- The main purpose of this meeting is to work on the purpose of C57.119 and continue to identify needs for improvements / changes
- a) The discussions which took place, covered topics, like need to cover DGA, test procedure and overlapping with C57.12.90 and C57.12.91
 - b) Based on the discussions and decision from the previous meeting the following wording was presented:
Title (for PAR 2024):
IEEE Recommended Practice for determining the thermal parameters of liquid immersed power transformers
Scope (for PAR 2024):
This recommended practice covers test procedures for determining the thermal parameters of liquid immersed power transformers needed to appraise the transformer's load carrying capabilities.
Need (for PAR 2024):
This revision is needed to maintain and provide necessary updates and corrections to this recommended practice in order to reflect today's technology.
 - c) Per the decisions made in the last virtual meeting the SG chair will seek approval from the ILSC on Wednesday, October 30th, 2024 at the F24 meeting in St. Louis, MO to use the above mentioned (8b) wording of the title and scope for creation of the PAR to revise C57.119.
 - d) In regards to the question from the last virtual meeting about the a purpose statement in the document, it was recommended by IEEE to include in the purpose statement in the PAR in order to be included in the "standard document". Otherwise a PAR modification needs to be applied for.
Therefore the group decided to move forward to discuss the wording of the purpose statement

- e) The current wording of the “purpose” in the PAR from 2014 were presented

Purpose (Old PAR 2014):

These recommended test procedures for performing temperature rise tests on power transformers are for the purpose of the following:

- a) *Determining the thermal characteristics of a transformer needed to appraise the thermal performance of a transformer at loads other than nameplate rating*
- b) *Verifying that a transformer can be loaded with a specified load profile without exceeding specified temperature rise*
- c) *Assessing a transformer’s performance during transient loading, simulating a load cycle that includes loads in excess of nameplate rating*

Tests performed in accordance with Clause 9 are for the purpose of determining transformer thermal characteristics in a consistent manner. Data may then be accumulated from a large number of transformers and used to evaluate the accuracy of the equations and the empirical constants used in the loading guides.

Tests performed in accordance with Clause 10 are for the purpose of demonstrating the thermal effects of loading a transformer with a specified sequence of loads, including loads beyond nameplate rating.

Tests performed in accordance with Clause 11 are for the combined purposes of determining the thermal characteristics of a transformer and demonstrating the thermal effects of loading with a designated load cycle. This is accomplished by performing temperature rise tests at three loads, similar to Clause 9, except the three loads are selected to simulate the thermal effects of a specific load cycle.

It is not intended that all of these procedures be performed on a transformer design. It is intended that only one of the following combinations of test procedures be specified:

- *Clause 9 only, when thermal characteristics are to be determined*
- *Clause 10 only, when only verification of complying with temperature limits when loaded to a specific load profile is needed*
- *Clause 9 plus Clause 10, when both thermal characteristics and verification of compliance with temperature limits when loaded to a specific load profile are needed*
- *Clause 11 when both thermal characteristics and verification of compliance with temperature limits when loaded to a specific load profile are required, and the load profile can be represented with three steady state loads*

The user should specify which of the test procedures are required at the time of specification.

A further purpose of these procedures is to obtain information with respect to possible loading limitations imposed on the transformer by liquid levels and ancillary equipment when the transformer is operated at loads beyond nameplate rating.

- f) Extensive discussions for the wording of the purpose took place, like the content and the details needed and how possible changes in the numbering within the new document will impact the wording.
- g) The final conclusion was to keep the wording simple and more general. With all further details then put into other sections, like introduction and others
- h) Ryan Hogg suggested to shorten the wording and keep just the beginning and the delete the rest.

The proposal of the wording read as follows and was shown on the screen:

Purpose (for PAR 2024):

These recommended test procedures for performing temperature rise tests on power transformers are for the purpose of the following:

- a) Determining the thermal characteristics of a transformer needed to appraise the thermal performance of a transformer at loads other than nameplate rating
 - b) Verifying that a transformer can be loaded with a specified load profile without exceeding specified temperature rise
 - c) Assessing a transformer's performance during transient loading, simulating a load cycle that includes loads in excess of nameplate rating
 - i) Bertrand Poulin made the motion to use this wording as stated above in e) and which was shown on the screen to use for the purpose statement for the application of the PAR if the ILSC will approve the creation of the PAR in SC meeting on the following Wednesday. Juan Castellanos provided second.
 - o Motion was carried unanimously with no objections or abstentions.
 - j) The ILSC Chair Samuel Sharpless took the opportunity to express his appreciation to the group to take this task forward and thanked for the established results.
- 9) Based on this, we will seek approval from the ILSC on Wednesday, October 30th, 2024 at the F24 meeting in St. Louis, MO to request a PAR to revise C57.119
- 10) The meeting was adjourned at 10:30 AM (CDT)
- 11) Next meetings (planned):
- o Virtual meeting – might be scheduled before March 2025
 - o In-person meeting S25 – March 23-27, 2025 in Denver, CO

Respectfully submitted,
 Ewald Schweiger
 Study Group Chair

List of attendees for this meeting:

Last name	Given name	Affiliation	Status
Adams	Kayland	Prolec Ge Waukesha	G
Arnold	Elise	SGB	G
Bargone	Gilles	FISO	G
Blaydon	Daniel	Baltimore Gas and Electric	G
Bohrn	Josh	PacifiCorp	G
Bradshaw	Garrett	Howard Industries	G
Calil	Wilerson	Hitachi Energy	G
Carrizales	Alfredo	PROLEC	G
Castellanos	Juan	Prolec GE	M
Cisco Sullberg	Adriana	Salt River Project	G
Craven	Michael	Qualus	G
Crockett	Dan	Ameren	G
Dappen	Tim	CARGILL	G
Davoudi	Ponneh	Delta Star	G
Digby	Scott	Duke Energy	G
Dillon	Nikolaus	Dominion Energy	G
Dolloff	Paul	East Kentucky Power Cooperative	G
Dorpmanns	Luc	Royal SMIT Transformers	G
Dzodan	Janko	Končar D&ST	G
Eduardo	Tolcachir	TTE Transformers	G

Annex H

Elson	Eric	San Diego Gas and Electric	G
Frazier	Raymond	Ameren	G
Frye	Richard	Eaton	G
Gasic	Dragana	KONCAR D&ST	G
Greaves	Brad	WEIDMANN Electrical Technology	G
Hoffman	Saramma	PPL	M
Hogg	Ryan	Bureau of Reclamation	G
Holifield	Thomas	Howard Industries	G
Hussain	MD Rashid	Mississippi State University	G
Jensen	Nick	Delta Star	G
Kaineder	Kurt	Trench Austria	G
Katapalli	Thrinadha	Virginia transformer corporation	G
Khan	clasim	NEETRAC - Georgia Tech	G
Kim	Yeounsoo	Meppi	G
Kiparizoski	Zan	Howard Industries	G
Kumar	Arvind	Delta Star Inc	G
Lachman	Mark	Foble	G
Lembacher	Stefan	Siemens Energy	G
Mamede	Gabriel	Siemens Energy	M
Martinez Mares	Alberto	WEG Transformers USA	G
McBride	Brian	Cargill	G
Munoz	Marta	Hitachi Energy	G
Natale	Anthony	HICO America	G
Newbill	Mark	Hitachi	G
Omalley	Anastasia	Con Edison NY	G
Orozco	Eduardo	GE Grid Solutions	G
Park	Dean	Hyosung Hico	G
Patel	Sanjay	SGB-Smit USA	G
Pavicic	Tomislav	Koncar Power Transformers Ltd	G
Poulin	Bertrand	Hitachi Energy	M
Reyes perez	Juan	Hitachi Energy	G
Richardson	Michael	Ameren	G
Ronchi	Rodrigo	WEG Transformer Mexico	G
Sahin	Hakan	Virginia transformer corp	G
Sankarakurup	Dinesh	Duke Energy	G
Sarkinen	Garret	Xcel Energy	G
Schiessl	Markus	SGB	G
Schrammel	Alfons	Siemens Energy	M
Schweiger	Ewald	Siemens Energy	M / Chair
Sen	Cihangir	Duke Energy	G
Shaikh	AbdulMajid	Delta Star Inc.	G
Sharpless	Samuel	Rimkus	M / Chair ILSC
Stechschulte	Kyle	American Electric Power	G
Steineman	Andrew	Delta Star, Inc.	G
Tan	Jonathan	Northern Transformer	G
Tanaka	Troy	Burns & McDonnell	G

Tekle	Samuel	WEG Transformers USA	G
Thomas	Scott	Hitachi Energy	G
Topol	Fran	Koncar Power Transformers Ltd.	G
Tostrud	Mark	Dynamic Ratings	G
Vanderwalt	Alwyn	Electrical Consultants Inc	G
Varghese	Ajith	Prolec Ge Waukesha	G
Varnell	Jason	Doble Engineering	G
Varnell	Jason	Doble Engineering	G
Viy	Dharam	Prolec Ge Waukesha	G
Wagner	John	American Electric Power	G
Watson	Joshua	NPPD	G
White	Joe	Power Engineers	G
ZHENQUAN	YU	Sieyuan Toshiba	G
Zibert	Kris	Allgeier Martin & Associates	G
Ziger	Igor	Končar - Instrument Transformers	G

Approved minutes from the virtual meeting on September 24, 2024:

Recommended Practice for Performing Temperature Rise Tests on Liquid-Immersed Power Transformers at Loads Beyond Nameplate Ratings

- 1) Meeting took place at 10:000 AM (EDT) on Tuesday September 24th, 2024
- 2) After the virtual meeting on January 31st, 2024, the first in person meeting in Vancouver on March 11th, 2024 – in our todays virtual meeting 29 attended our second virtual meeting.
Attendance: 29 Members: 6 Guests: 23
- 3) In Kansas City F23 meeting, it was decided to start a Study Group for C57.119
Recommended Practice for Performing Temperature Rise Tests on Liquid-Immersed Power Transformers at Loads Beyond Nameplate Ratings.

In Vancouver we provided the Insulation Life Subcommittee (ILSC) with a recommendation that the document needs revision and the ILSC gave us the task to work on the PAR.

Purpose of this virtual meeting is to work on the title and scope with the objective to present the title and scope during the meeting of the ILSC in St Louis

- 4) Call for patents & Copyright statement
 - a) 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.
 - b) 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.
- 5) Establish quorum

- A quorum was achieved
Total number of members is 8 requiring 6= members for quorum.
5 members have been present in the meeting
- 6) Approval of agenda
 - a) No comments from the group
 - b) The agenda was unanimously approved (1st motion by Steve Antosz and 2nd Bertrand Poulin)
- 7) Approval of meeting minutes of the previous in person meeting I Vancouver, CAN on March 11th, 2024
 - a) The minutes were displayed on the screen and presented
 - a) No comments from the group
 - b) The meeting minutes were unanimously approved (1st motion by Steve Antosz and 2nd Bertrand Poulin)
- 8) Discussion based on feedback from review of C57.119 and next steps needed for the new PAR
 - a) Collected feedback about the need for revision were presented (like Errors, clarifications, improvements, updates, new technology and clarification needed for the title, scope etc)
 - b) The current wording of the “title” and “scope” in the PAR from 2014 were presented
Title (Old PAR 2014):
IEEE Recommended Practice for Performing Temperature Rise Tests on Liquid-Immersed Power Transformers at Loads Beyond Nameplate Ratings
Scope (Old PAR 2014):
This recommended practice covers temperature rise test procedures for determining those thermal characteristics of power transformers needed to appraise the transformer’s load carrying capabilities at specific loading conditions other than rated load.
 - c) Extensive discussions for the title took place, like procedure of temperature rise tests in C57.12.90 vs. C57.119, brief title, evaluation of the test results vs. procedure to get to the test results
 - d) Discussion took place about “Recommended practice” vs. “Guide”
The definition from the IEEE SA Guide was shown:
- Recommended practices: *Documents in which procedures and positions preferred by IEEE are presented.*
- Guides: *Documents in which alternative approaches to good practice are suggested but no clear-cut recommendations are made.*
The conclusion of the group was that the already used “Recommended practice” is the best fit
 - e) Extensive discussions for the scope took place, like parameters vs characteristics
→ The group recognized the necessity of aligning the terminology for parameters and characteristics in the document with the wording used in the title and scope.
 - f) Based on the discussions the following wording was worked out:
Title (for PAR 2024):

IEEE Recommended Practice for determining the thermal parameters of liquid immersed power transformers

Scope (for PAR 2024):

This recommended practice covers test procedures for determining the thermal parameters of liquid immersed power transformers needed to appraise the transformer's load carrying capabilities.

- 9) Bertrand Poulin made the motion to recommend to the ILSC to use the above mentioned (8f) wording for the new PAR. Juan Castellanos provided second.
 - Motion was carried unanimously with no objections or abstentions.
- 10) Steve Antosz raised the issue of including a purpose statement in the document, despite it not being mandatory for the PAR. After discussion, the group reached the consensus that the purpose should indeed be included in the document.
 - Ewald Schweiger will get in contact with IEEE SA to get clarification about the best way to move forward.
- 11) The group continued to work on the wording of the “need” in the PAR
 - a) The current wording of the “need” in the PAR from 2014 were presented

Need (Old PAR 2014):

IEEE Recommended Practice C57.119 is nearing its end of life. It is still needed and is technically valid as it is currently written. However, the Nomenclatures used to note reference Standards are not consistent with the current IEEE-SA format and need to be updated to meet the existing IEEE-SA Standards Formatting
 - b) Discussions were held and based on the wording of the new title and scope resulting in the following wording for the “Need”:

Need (for PAR 2024):

This revision is needed to maintain and provide necessary updates and corrections to this recommended practice in order to reflect today's technology.
- 12) Bertrand Poulin made the motion to use the above mentioned (11b) wording for the new PAR. Steve Antosz provided second.
 - Motion was carried unanimously with no objections or abstentions.
- 13) Based on this, we will seek approval from the ILSC on Wednesday, October 30th, 2024 at the F24 meeting in St. Louis, MO to request a PAR to revise C57.119
- 14) The meeting was adjourned at 11:35 AM (EDT)
- 15) Next in person meeting – October 2024 in St Louis, MO

Respectfully submitted,
Ewald Schweiger
Study Group Chair

List of attendees for this meeting:

Last name	Given name	Affiliation	Status
Adams	Kayland	Prolec GE Waukesha	G
Antosz	Steve	Stephen Antosz & Associated	M
Bargone	Gilles	FISO	G
Berube	Jean-Noel	Rugged Monitoring Quebec Inc	G
Blaszczyk	Piotr	Specialty Transformer Components LLC.	G

Carrizales	Juan Alfredo	PROLEC	G
Castellanos	Juan G.	Prolec	M
Dillon	Nikolaus	Dominion Energy	G
Ghosh	Saurabh	GE	G
Gonzalez	Luis	Conduct Industries	G
Grandbois	Luke	IFD Technologies	G
Hogg	Ryan	Bureau of Reclamation	G
Jensen	Nick	Delta Star	G
Katapalli	Thrinadha	VA Transformer	G
Kennedy	Gael R	GR Kennedy & Associates LLC	M
Kim	Yeounsoo	Mitsubishi Electric Power Products	G
Mamede	Gabriel	Siemens Energy	G
Martinez Mares	Alberto	WEG Transformers USA	G
McBride	Brian	Cargill	G
O'Malley	Anastasia	Consolidated Edison Co. of NY	G
Peterson	Caroline	Xcel Energy	G
Poulin	Bertrand	Hitachi Energy	M
Ronchi	Rodrigo	WEG Transformers	G
Schrammel	Alfons	Siemens Energy	M
Schweiger	Ewald	Siemens Energy	M
Sohail	Muhammad Abdullah	Trench Limited	G
Stechschulte	Kyle	American Electric Power	G
Welton	Drew	Intellirent	G
Zibert	Kris	Allgeier Martin & Associates	G

Ewald Schweiger made a motion to approve a PAR for revision of C57.119 with the following title and scope:

Title: IEEE Recommended practice for determining the thermal parameters of liquid immersed power transformers

Scope: This recommended practice covers test procedures for determining the thermal parameters of liquid immersed power transformers needed to appraise the transformer's load carrying capabilities.

Eduardo Garcia seconded the motion. There was no objection to the unanimous consent of a PAR.

H.4.6 Study Group – Proposed Guide to Interpretation of Direct and Indirect Tests for the Degradation of Cellulosic Materials in Oil Immersed Transformers – Lance Lewand, Chair, presented the meeting minutes

Chair: Lance Lewand

Vice Chair/Acting Secretary: Stuart Chambers

Degradation of Cellulose in Liquid-Filled Transformers

Ballroom C

Hyatt Regency – St, Louis, MO

October 28, 2024

This was the 2nd meeting of this study group on proposal for the degradation of cellulose in liquid-filled transformers. There was a large attendance of at least 80+ people that spilled out into the hallway. The

interest in this subject was demonstrated at the last meeting in Vancouver when the participants decided to go forward in developing this subject matter.

At the last meeting, the amount of material proposed was considered to be too ambitious and so this meeting was to pare down the amount of material and the main focus. In the end, a number of sections were combined and others were tabled through discussion with the meeting participants. The sections approved were:

1. Discussion of cellulosic materials found in liquid-filled transformers and reactors
2. Discussion of cellulosic degradation pathways and the byproducts produced
3. Tests or analyses to determine the condition of the cellulosic insulation and analysis in mineral oil and non-mineral oil liquids. Partitioning of liquid soluble aging markers
4. Frequency of testing, how to sample, and special considerations for new and in-service transformers
5. The impact of transformer preservation systems
6. Interpretation of results
7. Impact of oil processing activities on cellulose degradation byproducts
8. Minimizing cellulosic insulation degradation in transformers and reactors (have to review C57.140 to determine if this section is necessary)
9. Bibliography

In all, the number of sections was reduced from 15 to 9.

The last discussion centered on producing a title, scope and purpose so that a PAR could be issued.

Sincerely,

Lance Lewand, Doble Engineering

H.4.7 Study Group – Non-C57.91 Loading Characteristics – Tim Raymond, Chair, presented update

Chair: Tim Raymond

No meeting was held in St. Louis. A study group has been formed to consider loading characteristics for insulation systems that are not covered by C57.91. There are transformers in operation with materials that do not fall under the scope of C57.91. The study group will review existing guides and identify the gaps to propose either a revision of existing documents or the development of a new document. Interested participants should contact Tim Raymond. The group will meet during the Spring 2025 committee meeting.

H.5 Old Business

None.

H.6 New Business

The Chair presented two proposals that have come to the Insulation Life Subcommittee from the Entity Proposal Management Committee (EPMC). EPMC projects are proposals from outside organizations that are available for sponsorship by the Transformer Committee. These projects are Entity PARs and will be developed outside of our regular meetings. Anyone can participate, but only Registered IEEE Entities may vote. If sponsored, the Subcommittee will appoint a representative to assist with the development of the PAR and document. Once completed, the document will be under Subcommittee supervision for

future enhancement and revision. If rejected, the document will proceed without Transformer Committee supervision.

The first project is EPMC P0184, “Guide for measurement of the polymerization degree of insulating paper-paperboard for power transformers based on terahertz time domain spectroscopy”. The Chair reviewed the information shared by the entity affiliate, The State Grid Shanxi Electric Power Research Institute.

Title: Guide for measurement of the polymerization degree of insulating paper/paperboard for power transformers based on terahertz time domain spectroscopy

Scope: This guide describes a method for measuring the degree of polymerization of insulating paper/paperboard for power transformers based on terahertz time-domain spectroscopy.

This guide applies to equipment such as oil immersed transformers, reactors, current transformer, potential transformer, and bushings.

Purpose: The purpose of this guide is to propose a new non-destructive method for measuring the degree of polymerization of insulating paper/paperboard, in order to solve the problems of difficult sampling and complex testing processes in the past, and to accurately perceive and timely detect the deterioration of oil-paper insulation system during the operation and maintenance of oil-filled equipment.

Attendees discussed the proposed project. **Tom Prevost made a motion to accept sponsorship of EPMC 0184 “Guide for measurement of the polymerization degree of insulating paper-paperboard for power transformers based on terahertz time domain spectroscopy”. Poorvi Patel seconded the motion. A vote was conducted with 51 members supporting the motion, 17 members against the motion and 2 abstentions. The motion carried and the Chair will assign a liaison representative.**

The second project is EPMC P0197, “Guide for Inversion Detection of Hot-Spot Temperature and Loading Capacity in Oil-Immersed Transformers”. The Chair reviewed the information shared by the entity affiliate, State Grid Anhui Electric Power Co. LTD Research Institute.

Title: Guide for Inversion Detection of Hot-spot Temperature and Loading Capacity in Oil-immersed Transformer

Scope: This guide provides the methodology and parameters for numerical modeling of oil-immersed power transformers, input/output characteristic quantities of winding hot-spot temperature inversion detection, setup of training and test datasets for artificial intelligence (AI) algorithm, error analysis, and evaluation of dynamic loading capacity. This guide applies to the oil-immersed power transformer winding hot-spot temperature inversion monitoring and dynamic loading capacity evaluation, particularly under complex operational scenarios.

Purpose: The method mentioned in this document combines numerical computation and AI technology in the calculation of hot-spot temperature in oil-immersed power transformer windings and can serve as a good alternative approach to conventional methods based on empirical formulas or other mathematic models. It can be promoted as an advanced technology that needs improvement without mandatory requirements.

Attendees discussed the proposed project. **Dave Wallach made a motion to accept sponsorship of EPMC 0197 “Guide for Inversion Detection of Hot-Spot Temperature and Loading Capacity in Oil-Immersed Transformers”. Eduardo Garcia seconded the motion. A voice vote was conducted for those in favor and those opposed. There were no voiced abstentions. The motion carried and the Chair will assign a liaison representative.**

The meeting adjourned at 9:20am CDT.

Attendance:
95 Members
90 Guests

Status	Last	First	Company
Member	Adams	Kayland	Prolec-GE Waukesha
Member	Almeida	Nabi	ProlecGE
Guest	AVELINO	PAULO	Hitachi Energy
Member	Ayers	Donald	Ayers Transformer Consulting
Member	Ballard	Casey	DuPont
Member	Bargone	Gilles	FISO
Guest	Baumgartner	Christopher	We Energies
Member	Beaster	Barry	H-J Enterprises, Inc.
Guest	Beaudoin	Jason	Weidmann
Guest	Benitez	Orlando	Hyosung HICO
Member	Biggie	Kevin	Weidmann
Guest	Blackwell	Zack	TCI
Guest	Blaszczyk	Piotr	SPECIALTY TRANSFORMER COMPONENTS LLC
Member	Boettger	William	Boettger Transformer Consulting LLC
Guest	Bonn	Mike	Soltex Inc.
Member	Botti	Michael	Hyosung HICO
Guest	Bradshaw	Garrett	Howard Industries
Member	Bruce	Webb	Knoxville Utilities Board
Member	Calitz	David	Siemens Energy Inc
Guest	Carrizales	Alfredo	PROLEC
Member	Casallas	Camilo	Trench
Member	Casserly	Edward	Ergon
Member	Castellanos	Juan	Prolec GE
Member	Cheim	Luiz	Hitachi Energy
Member	Chiang	Solomon	The Gund Company
Guest	Cho	Eunyoung	HICO AMERICA
Guest	Choksi	Bhaumik	Hitachi energy
Guest	Colopy	Craig	Retired from EATON
Guest	Cordova	David	Maddox Industrial Transformer
Guest	Crotty	John	Ameren
Member	Da Silva	Roberto	Maschinenfabrik Reinhausen
Member	Delgado Zamora	Gabriel	Invenergy
Member	Digby	Scott	Duke Energy
Guest	Dillon	Nikolaus	Dominion Energy
Guest	Dolloff	Paul	EKPC
Member	Door	Jeff	The H-J Family of Companies
Guest	Duffy	Jesse	Nashville Electric Service

Annex H

Guest	Elson	Eric	San Diego Gas & Electric
Member	Ermakov	Evgenii	Hitachi Energy
Member	Ferreira	Marcos	Quanta Technology, LLC
Guest	Franklin	Chris	MG Power Associates
Member	Frotscher	Rainer	Maschinenfabrik Reinhausen GmbH
Guest	Gamboa	Jose	
Guest	Garcia	Miguel	Hitachi Energy
Member	García	Eduardo	Siemens Energy
Guest	Garcia-Paredes	David	Virginia Transformers Corp
Member	Gardner	James	Prolec-GE Waukesha
Guest	Garner	Joshua	Independent Dielectrics
Guest	Garza	Gilberto	Prolec GE
Guest	Gaytan	Carlos	Prolec GE
Member	Giraldo	Orlando	THE H-J FAMILY OF COMPANIES
Member	Gorzin	Alireza	Black & Veatch
Guest	Greaves	Brad	Weidmann Electrical Technology
Member	Gyore	Attila	MIDEL and MIVOLT Fluids Ltd
Guest	Hampton	Kevin	Siemens Energy
Member	Hayes	Roger	GE Vernova
Member	Hernández cano	Sergio	Hammond power solutions
Guest	Herron	William	Reinhausen
Member	Hoffman	Saramma	PPL
Guest	Holifield	Thomas	Howard Industries
Guest	Hollrah	Derek	Burns & McDonnell
Member	Hopkins	Traci	H2scan
Member	Hopkinson	Philip	Hvolt.com
Member	Hossain	Saif	Trench Group
Guest	Hrkac	Miljenko	Hitachi Energy
Member	Issack	Ramadan	
Guest	Jarosz	Patrycja	IEEE SA
Guest	Jaroszewski	Marion	Delta Star Inc
Guest	Jensen	Nick	Delta Star
Guest	Jeong	Chanho	ILJIN ELECTRIC
Member	John	John	Virginia Transformer Corp.
Member	Johnson	Christopher	Oncor
Member	Joshi	Akash	Kimley-horn
Guest	Katapalli	Thrinadha	Virginia transformer corp
Member	Kennedy	Sheldon	Sheldon P Kennedy Engineering PLLC
Member	Khan	Qasim	NEETRAC- Georgia Tech
Guest	Kim	Yeounsoo	MEPPI
Guest	Kim	Yonghui	ILJIN ELECTRIC
Member	King	Gary	Consultant
Member	kiparizoski	zan	howard industries

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Member	Kirchenmayer	Egon	Siemens Energy
Guest	Kosedagi	Nihat	Hitachi Energy
Guest	Kumar	Arvind	Delta Star Inc
Guest	Labh	Ashwini	Hitachi Energy
Guest	Lamontagne	Donald	Arizona Public Service Co.
Guest	Leal	Fernando	PROLEC GE
Guest	Lee	Jihun	HD HYUNDAI ELETRIC
Guest	Lee	KangJin	Cheryong Electric
Guest	Lee	Junho	
Member	Lee	Moonhee	Hammond Power Solutions
Guest	Leigl	Angela	Eaton
Guest	Lembacher	Stefan	Siemens Energy
Member	Li	Weijun	Braintree Electric Light Department
Guest	Lim	Dongki	Iljin electric
Guest	Loiselle	Luc	Tetra tech
Member	Lucas	Tiffany	Prolec GE - Waukesha
Member	Mabrey	Stephanie	AVO Diagnostics
Member	Malde	Jinesh	MIDEL & MIVOLTS FLUIDS INC.
Guest	Mamede	Gabriel	Siemens Energy
Member	Mani	Kumar	Duke Energy
Guest	Manzano	Moses	Hyosung HICO
Guest	Marathe	Swapnil	Megger
Guest	Marulanda	Katherine	Magnetron
Guest	Mennonna	Robert	Maddox Industrial Transformer
Member	Mills	Francis	POWER Engineers
Member	Morales-Cruz	Emilio	QUALITROL
Guest	Moreno	Humberto	Siemens Energy
Guest	Morgan	Charles	Eversource Energy
Guest	Murillo	Hugo	The H-J Family
Member	Murray	DAVID	TVA
Guest	Natale	Anthony	HICO America
Guest	Nolte	Mike	Kiewit
Member	OMalley	Anastasia	Con Edison
Member	Panesar	Parminder	Virginia Transformer Corp
Member	Parkinson	Dwight	Eaton
Member	Patel	Poorvi	EPRI
Member	Patel	Rakesh	Hitachi Energy
Guest	Pham	Thien	Siemens Energy
Member	Plascencia	Miguel	PG&E
Member	Pointner	Klaus	Trench Austria GmbH
Member	Pollaro	Dominic	NASS
Guest	Post	Nicholas	WEC Energy Group
Guest	Prado	Gustavo	Siemens Energy

Annex H

Member	Radu	Ion	Hitachi Energy
Member	Raymond	Timothy	Inductive Reasoning
Member	Reed	Scott	MVA
Member	Richardson	Michael	Ameren
Member	Ronchi	Rodrigo	WEG Transformers México
Member	Saad	Mickel	Hitachi Energy
Member	Sahin	Hakan	Virginia Transformer
Guest	Sanchez Rodriguez	Jesus	Voltyx
Member	Sankarakurup	Dinesh	Duke Energy
Member	Sarkar	Amitabh	Virginia Transformer Corporation
Guest	Schrammel	Alfons	Siemens Energy
Guest	Schumack	Joseph	Ameren
Member	Schweiger	Ewald	Siemens Energy
Member	Sen	Cihangir	Duke Energy
Member	Sharpless	Samuel	Rimkus
Member	Sherrukde	Hemchandra	University of Hartford
Guest	Shull	Stephen	BBC Electrical Services Inc
Member	Sinclair	Jonathan	Black and Veatch
Member	Som	Sanjib	PTT, LLC
Member	Steckschulte	Kyle	AEP
Guest	Steele	H. Allen	TVA
Guest	Steineman	Andrew	Delta Star, Inc.
Guest	Sweetser	Charles	OMICRON electronics Corp. USA
Member	Sze	Matthew	Omicron electronics Canada Corp
Guest	Tan	Jonathan	Northern Transformer
Member	Tanaka	Troy	Burns & McDonnell
Guest	Taylor	Marc	JFE Shoji Canada
Guest	Tekle	Samuel	WEG Transformers USA
Guest	Thiede	Andreas	HIGHVOLT Dresden
Member	Thomas	Scott	Hitachi Energy
Guest	Tillery	Timothy	Howard Industries
Guest	Tirado	Fernando	Prolec GE
Guest	Tolcachir	Eduardo	TTE Transformers
Member	Tostrud	Mark	Dynamic Ratings
Guest	Vaagensmith	Bjorn	Idaho National Laboratory
Guest	Van Dreel	Cole	American Transmission Company
Member	Vanderwalt	Alwyn	Electrical Consultants Inc
Member	Varghese	Ajith	Prolec GE Waukesha
Member	Varnell	Jason	Doble Engineering
Guest	Vary	Robert	Reinhausen Manufacturing Inc.
Guest	Vijayan	Krishnamurthy	Pennsylvania Transformers
Member	Verdolin	Rogerio	Verdolin Solutions

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Member	Vir	Dharam	Prolec GE Waukesha
Member	von Gemmingen	Richard	Dominion Energy
Member	Vyas	Pragnesh	Sunbelt Solomon
Guest	Wagner	John	American electric power
Member	Wallach	David	Duke Energy
Guest	Wang	Luke	BC hydro
Guest	Watson	Joshua	NPPD
Member	Weisensee	Matt	PacifiCorp
Member	Weiss	Zachery	WEG transformers
Member	Welton	Drew	Intellirent
Member	White	Joe	POWER Engineers
Guest	Wong	Terry	Trench Limited
Guest	Yang	Fei	Hitachi Energy
Guest	Youn	Joseph	ILJIN Electric
Member	Yuan	Guang	Hitachi energy
Member	Yun	Joshua	Virginia Transformer Corp
Guest	Xu	Shuzhen	FM Global
Guest	Zhang	Jie	Chint electric co.,LTD.
Guest	Zhang	Hongzhi	Hitachi Energy
Member	Ziomek	Waldemar	PTI Transformers LP

19 Guests requested membership:

Status	Last	First	Company
Guest	Blaszczyk	Piotr	SPECIALTY TRANSFORMER COMPONENTS LLC
Guest	Carrizales	Alfredo	PROLEC
Guest	Garcia	Miguel	Hitachi Energy
Guest	Garza	Gilberto	Prolec GE
Guest	Gaytan	Carlos	Prolec GE
Guest	Hrkac	Miljenko	Hitachi Energy
Guest	Jensen	Nick	Delta Star
Guest	Kim	Yeounsoo	MEPPI
Guest	Labh	Ashwini	Hitachi Energy
Guest	Lee	Junho	
Guest	Mamede	Gabriel	Siemens Energy
Guest	Marulanda	Katherine	Magnetron
Guest	Moreno	Humberto	Siemens Energy
Guest	Nolte	Mike	Kiewit
Guest	Schumack	Joseph	Ameren
Guest	Van Dreel	Cole	American Transmission Company
Guest	Wong	Terry	Trench Limited
Guest	Yang	Fei	Hitachi Energy
Guest	Zhang	Hongzhi	Hitachi Energy

Respectfully submitted,

Anastasia O'Malley
Secretary, Insulation Life Subcommittee

Annex J Performance Characteristics Subcommittee (PCS)

October 30th, 2024, Hyatt Regency, St. Louis, MO

UNAPPROVED MINUTES

Chair: Rogerio Verdolin

Vice Chair: Sanjib Som

Secretary: Kris Zibert

J.1 Introduction / Attendance

Quorum was achieved with 70 members present (64.8% in attendance). In addition, 67 guests were present at the meeting. The total attendance at the meeting was 137. Guests should contact the Vice Chair to request membership. Their requests for membership and past attendance will be reviewed. If they meet the membership requirements, they will be granted membership before the next meeting in Denver, Colorado, March 24-27, 2025.

J.2 Chairman's Remarks

The Chair gave the Chairman's Remarks.

The Chair introduced himself, the Vice Chair and secretary and provided the below updates and comments.

The Chair discussed that the meeting would be recorded for minutes purposes and then deleted.

The Chair asked anyone with new business to submit said business in writing prior to the meeting.

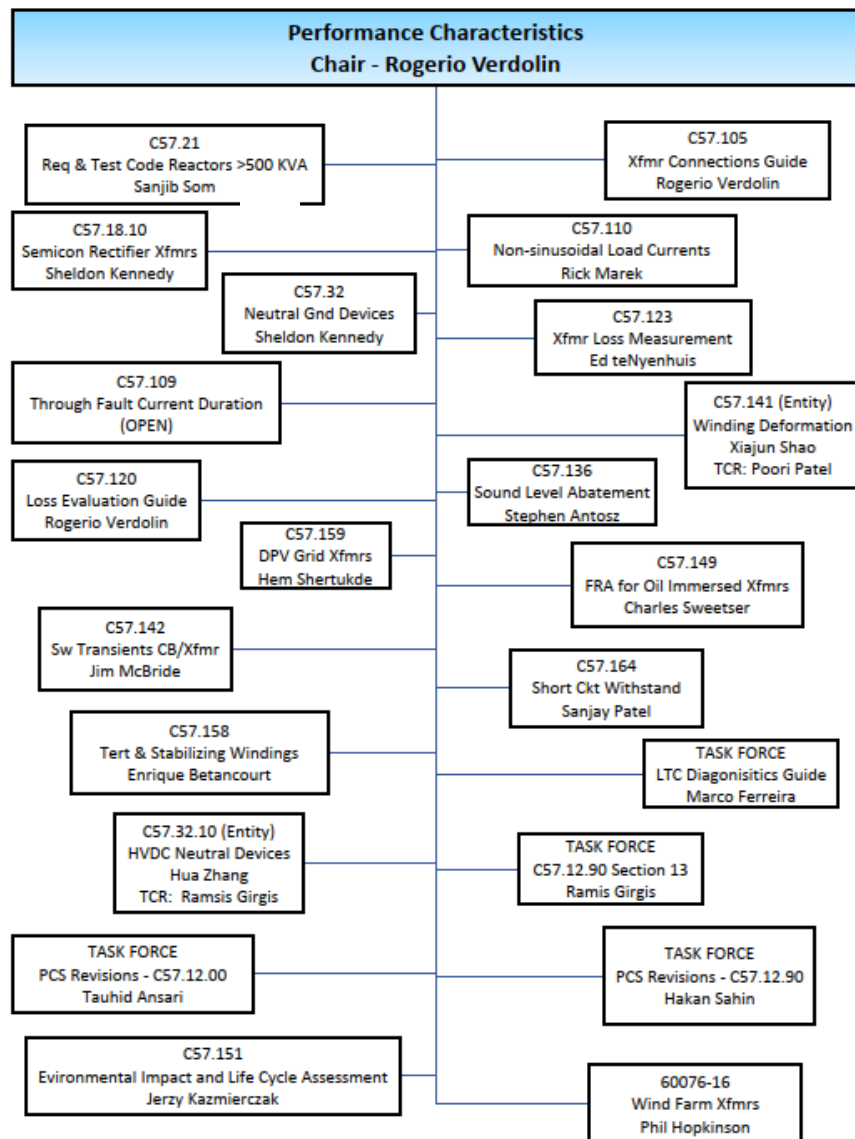
The Chair gave a reminder regarding affiliation data as a requirement and to continue updating attendance manually.

PCS Responsibilities: Defined by the Transformers Committee Organization and Procedures Manual.

The Performance Characteristics Subcommittee shall be responsible for the following:

- Studying and reviewing the treatment of loss, impedance, exciting current, inrush current audible sound and vibration, and other performance characteristics and their methods of application, measurement, or test for liquid filled transformers and liquid filled and dry type reactors.
- Studying and reviewing the treatment of the performance characteristics of other special use transformers e.g. photovoltaic, wind, and rectifier transformers.
- Developing and maintaining related standards, recommended practices, and guides for such criteria
- Coordinating with other technical committees, groups, societies, and associations as required

Standards Supported by PCS:



- C57.12.00 – TF to provide PCS revisions – T. Ansari
- C57.12.90 – TF to provide PCS revisions – H. Sahin (test code) & R. Girgis (audible sound)
- C57.18.10 – Semiconductor rectifier transformers – S. Kennedy
- C57.21 – Requirements & Test Code For Shunt Reactors >500kVA – S. Som
- C57.32-2015 – Neutral Grounding Devices (2025) – S. Kennedy
- C57.32.10 – Entity WG Neutral Grounding Reactors Guide for HVDC Converter Transformers – H. Zhang (TCR: R. Girgis)
- C57.105 – Transformer connections guide – R. Verdolin
- C57.109 – Through Fault Current Duration – OPEN
- C57.110 – Xfmr Capability when Supplying Nonsinusoidal Load Currents – R. Marek
- C57.120 – Guide for loss evaluation – R. Verdolin

- C57.123 – Transformer Loss Measurement – E. teNyenhuis
- C57.136 – Sound Abatement Guide – S. Antosz
- C57.141 - Entity - Winding Deformation – X. Shao (TCR: P. Patel)
- C57.142 – Switching Transients Circuit breaker/Transformer – J. McBride
- C57.149 – FRA for Oil Immersed Transformers – C. Sweetser
- C57.158 – Tertiary & Stabilizing Windings (2027) – E. Betancourt
- C57.159 – DPV Transformers (2026) – H. Shertukde
- C57.164 – Short Circuit Withstand – S. Patel
- TF for Insulating Fluid for Factory Testing – E. teNyenhuis
- TF for LTC Diagnostics Guide – M. Ferreira
- 60076-16 – Wind Turbine Generator Transformers – P. Hopkinson
- C57.151 Eval Guide Environmental Impact of Transformers & Reactors – J. Kazmierczak

Status of Active PAR's:

- 2024 PAR's
 - C57.32.10 Entity WG Guide for the Selection of Neutral-Grounding Devices for HVDC Converter Transformers (Recirc Ballot Complete)
- 2025 PAR's
 - C57.142 Transient Guide (Comment Resolution)
 - C57.141 Entity WG Guide for Detection, Monitoring and Evaluation of Winding Deformation
- 2027 PAR's
 - C57.32 Neutral Grounding Devices
 - C57.158 Application of Tertiary and Stabilizing Wdgs Guide
- 2028 PAR's
 - C57.159 DPV Transformers Guide
 - C57.151 Enviro & Life Cycle Assessment (New WG)

Status of Standards without active PARs

- C57.120-2017 – Loss Evaluation Guide (2027)
- 60076-16-2018 – Wind Turbine Generator Transformers (2028)
- C57.109-2018 – Through Fault Current Duration (2028)
- C57.110-2018 – Transf. Capability when Supplying Nonsinusoidal Loads (2028)
- C57.105-2019 – Transformer connections guide (2029)
- C57.123-2019 – Loss Measurement Guide (2029)
- C57.164-2021 – Short Circuit Withstand Guide (2031)
- C57.21-2021 – Shunt Reactors over 500kVA (2031)
- C57.18.10-2021 – Semiconductor Rectifier Transformers (2031)
- C57.136-2023 – Sound Level Abatement Guide (2033)
- C57.149 – FRA Guide (2034)

Performance Characteristics Subcommittee Membership Requirements

- Voting membership may be requested and granted after attending three of the last five meetings.
- If a voting member misses two consecutive meetings, his or her voting privileges may be revoked. Notification will be sent if voting privileges are revoked.
- Refer to TC P&P 4.3.1 for more information.

Performance Characteristics Subcommittee WG / TF Leaders

- Issue agenda at least 30 days ahead of time
- Minutes are due in 15 days; please get a rough draft of them to us today in MS Word (not PDF) format
- Please keep your webpages up to date – review regularly and send any content/files to tc-webmaster@ieee.org.
- A patent and copyright call must occur at every WG/TF meeting
- Please send to Patrycja Jarosz (p.jarosz@ieee.org) your WG roster by November 13th, 2024, including last name, first name, email address, and voting status.

Performance Characteristics Subcommittee Meeting Minutes

- Name of the group, time, date, and location of meeting
- Officers' names, meeting participants, member status, and affiliations
- Chair's remarks and reminders of IEEE policies (Patent and Copyright)
- Approval of minutes of previous meeting and agenda
- Technical topics: Brief summary (discussions and conclusions, motions exactly as they are stated, including the names of mover and seconder, and the outcome of each motion)
- Action items, items reported out of executive session
- Recesses and time of final adjournment
- Next meeting—date, time, and location

WG / TF Balloting Reminder

- Working Groups must achieve a 2/3 majority to submit a document for Sponsor Ballot.
- The Subcommittee must achieve a simple majority to submit a document for Sponsor Ballot.

Attendance / Membership – moved to Guest status

The following 2 Members missed more than 2 consecutive meetings and have been moved to “Guest” status:

Steven Brzonowski	David Caverly	Everton De Oliveira
Scott Dennis	Shawn Gossett	Stephen Jordan
Akash Joshi	Samuel Sharpless	Krishnamurthy Vijayan
Marcos Ferreira	Joseph Foldi	Anthony Franchitti
Sanjay Patel	Kiran Vedante	Baitun Yang

Please contact Sanjib by sending him a message or see him after the meeting if you believe your membership status is not accurate and/or you would like to become a member.

Attendance / Membership – New Members

The following Guests requested membership at the Spring 2024 meeting and have attended 3 of the past 5 meetings:

Alex Ayala	Juan Alfredo Carrizales
Ravi Gupta	Jean Hernandez-Myia
Saif Hossain	Jose Luis Machain
Rodrigo Ronchi	Abdul Majid Shaikh
Cole Van Dreel	Guang Yuan

Attendance / Membership – Quorum determination

- Current breakdown of the Subcommittee:
 - 108 Members
 - 55 are needed for a quorum
- Quorum was established with 70 members in attendance.

J.3 Approval of Agenda

The Chair presented the agenda and entertained a motion to approve. The agenda had been sent to the members by email several weeks prior to the meeting. The motion was made by M. Roussel and seconded by W. Binder. The motion passed by unanimous consent.

J.4 Approval of Last Meeting Minutes

The Chair presented the minutes of meeting held in March 2024 and entertained a motion to approve. The minutes had been sent to the members by email several weeks prior to the meeting. The motion was made by R. Musgrove and seconded by D. Wallach. The motion passed by unanimous consent.

J.5 Minutes from Working Groups and Task Force

The following WG and Task Force reports were received (the reports are appended later).

• WG Eval Guide Environ Impact of Trans & Reactors PC57.151	J. Kazmierczak
• TF Audible Sound Rev to Test Code	R. Girgis
• TF Transformer Data Required for System Studies	J. Watson
• TF Continuous Revisions to C57.12.00	T. Ansari
• WG Standard for DPVTs C57.159	H. Shertukde
• TF Continuous Revisions to Test Code C57.12.90	H. Sahin
• WG Sw Transients Ind by Xfmr/Bkr Interaction PC57.142	J. McBride
• WG C57.158 App. Guide for Tertiary and Stabilizing Windings	E. Betancourt
• WG IEEE Neutral Grounding Devices PC57.32	S. Kennedy
• WG PC57.32.10 Entity HVDC Neutral Grounding Device Guide	Z. Hua
• WG PC57.141 Entity Winding Deformation Guide	X. Shao

Below are highlights that were discussed at the PCS meeting:

1) WG Eval Guide Environ Impact of Trans & Reactors PC57.151 J. Kazmierczak

- This is the first meeting of the guide after receiving PAR.
- A call to order was made at 11:00 AM CST
- The Agenda was presented
- The patent & copyright policy was reviewed. A call for any patents was made. There were two patents declared.
- Introduction of officers was made.
- Introduction of attendees was made, with a total of one hundred six attendees present, plus three officers
- Membership was offered. Sixty four attendees requested membership.
- Information & updates on IEC & CIGRE progress were reviewed
- The goal of the standard that is to be developed was discussed.
- A proposed outline was presented.
- Poorvi Patel, EPRI, requested that the outline be reviewed prior to the goal review.
- Jim Thompson, T&R Service Co., made a motion to delete the bullet points put forth in the goal statement & amend the PAR to include the purpose. This motion was withdrawn.
- There was further discussion surrounding including a purpose, or just clarifying a goal statement that will not be included in the guide but will serve to help the group develop an outline.
- Luiz Chem, Hitachi, made a motion to change section 3 to “Life Cycle Assessment” to define the LCA, methodologies & the potential issues surrounding the methods. Mani Kumar, Duke Energy, seconded the motion.
- A vote was made for the motion. 37 for, 0 opposed, 1 abstention. The motion passed.
- Mike Nolte, Kiewit, moved to take the outline and divide into task forces. This was seconded by Jim Thompson, T&R Service Co.
- The motion was voted on 38 for, 0 opposed, 1 Abstention. The motion passed.
- Hugo Avila, Hitachi, volunteered for leading task force for outline point 4: Product specific rules for the life cycle assessment (LCA)
- Michael Nolte, Kiewit, volunteered to lead task force on outline point 3: Environmentally conscious design and life cycle assessment
- Jim Thompson, volunteered to lead task force on outline point 5: Further environmental performance considerations
- Outline point 6: Reporting on environmental performance and life cycle assessment results, still needs to have a task force leader volunteer.
- Relevant industry documents need to be requested to share among the task forces as references.
- A motion was made to adjourn the meeting. It was adjourned at 12:09 PM CST.
- The next meeting will take place in Denver, CO. during IEEE Transformer Committee Meeting scheduled for March 23-27, 2025.

2) TF Audible Sound Code Revision R. Girgis

- Attendance: 39 out of 56 members + 48 guests, 87 Total, 17 requested membership

- Chairman presented measured Sound level data collected from four Manufacturers for several transformers with the objective to determine the difference between sound level of PAs in air vs in oil.
- Based on the data, a conservative difference of 5 dB is proposed.
- Chairman then presented methodology to determine sound level of PAs such that PA noise does not impact the sound level of the main Transformer by more than 1 dB
- Finally, the Chairman presented a proposed methodology for measuring sound level of PAs in air
- The chairman announced that he will put together proposed text to be added to the IEEE Noise Guide that will include:
 - Methodology to determine sound level of PAs such that PA noise does not impact the sound level of the main Transformer by more than 1 dB
 - Proposed methodology for measuring sound level of PAs in air
 - The proposed text will be shared with attendees of the TF meeting well before the Spring meeting of the TF and comments will be reviewed and then discussed at the Spring meeting of the TF.

3) TF Transformer Data Required for System Studies

J. Watson

- The TF met for the first time at 1:45PM on Monday, 10/28/24 with 43 attendees, with 17 members.
- Patent and Copyright requirements were covered. No motions or other official business were covered, and only general discussions were held on the purpose of the TF. Alwyn Vanderwalt volunteered to serve as Secretary.
- The general goals of the TF are to survey the industry to identify the commonly-used programs used by system operators and engineering firms for system studies for various conditions such as fault studies, load flows and transient overvoltage conditions, and to identify the transformer parameters required as inputs for those programs.
- Once the parameters are identified, the TF should prepare a report for the SC recommending whether or not a WG should be established to define and prescribe the methods for calculating or determining their values.
- Some of the programs that were identified are: PSCad, EMTP, CYME, OPAL-RT, and ETAP. We also learned that CIGRE published 2 Technical Bulletins in 2023, TB900 and TB901 on transformer models for network studies, and these will be reviewed.
- The attendees were requested to survey their organizations that use system studies programs to identify the more commonly-used programs for discussion in a remote meeting tentatively scheduled for 4-6 weeks from now.
- The TF will meet in Denver, and will need a permanent time slot.

4) TF Continuous Revisions to C57.12.00

T. Ansari

- Meeting Date/Time: October 28, 2024, 4:30 PM
- 91 total attendees, consisting of 31 members and 60 guests. The TF achieved a quorum (30 members required). 29 guests requested membership.
- Old Business
 - Update of KVA levels in table 11
 - The motion passed to prepare the note below the table 11. Prepare the verbiage and present in Spring 2025 meeting.
 - Add duration of the heat run test to the test report.

- The subject matter will be surveyed in task force and result will be discussed in Spring 2025 meeting.
- New Business
 - Clarification on clearance between live part
 - Belongs to dielectric subcommittee.

5) WG Standard for DPV Transformers C57.159

H. Shertukde

- The C57.159 WG met in Spring 2024 and virtual meeting on 9/13/24 and 10/11/24. A quorum was not achieved in any of those meetings and official work could not be conducted.
- The Fall 2024 meeting the C57.159 WG achieved a quorum. Previous minutes were approved, and business was conducted as usual.
- The business of the Fall 2024 meeting primarily revolved around discussion of the contents and wording of the PAR Scope and Purpose. Many changes to the wording were discussed at length and approved. In addition, there was a lengthy discussion of the PAR scope. The key issues were what should be considered a photovoltaic transformer-the general agreement was that anything that was in a solar installation would count as a PVT.
- However, the primary concern of this standard is the transformers connected to the inverters on the output of solar panels or Battery Energy Storage due to the problems installations are having with these type of transformers.
- There was an open question of whether these transformers belonged in their own standard or if they should be in C57.18.10 (Power Rectifier Transformers). They were not included in the current revision because of revision publication timing but could be included in a future revision depending on schedule. This question was left open for further discussion.
- The next meeting will be Spring 2025 with a possibility of virtual meeting before that meeting.

6) TF on PCS Continuous Revisions to Test Code C57.12.90

H. Sahin

- Meeting started on time. Quorum was met
- Continued discussions on section 5.1 – Determination of cold temperature. TF agreed on the following wording to be surveyed; “The cold temperature of the windings for class II transformers shall be determined by temperature sensor(s) directly immersed in the liquid, or thermowell”
- A new business was submitted during the meeting to discuss possibility of adding tolerances on the current to be applied during load loss and impedance tests, which will be reviewed during the next meeting
- Meeting was adjourned on time.

6) WG Switching Transients Ind by Xfmr/Bkr Interaction PC57.142

J. McBride

- Welcome and Chair’s Remarks
- Circulation of Attendance Sheets (34 of 43 Members were present - quorum was achieved. 64 guests, Total 98 Attendees)
- IEEE Patent Policy Slides (no patent claims)

- Approval of Agenda and Minutes from Spring 2024 Meeting
- C57.142 Ballot status and Comment Resolution – Jim McBride
 - Total Comments – 306 (Editorial Required – 107; Editorial Not Required - 109)
 - Technical Required – 67; Technical Not Required – 22)
 - Addressed Comments: 291; Need Resolution for Remaining Comments: 15
 - Draft 12 has been completed and incorporates all the 291 addressed comments.
- CRG is reviewing all comments remaining. Plan is to send out proposed resolutions from the WG officers to the CRG and seek to finish comment resolution of the remaining 15 comments for a recirculation in early 2025. The CRG has members from both the Transformers and Switchgear Committees.
- Mitigation Methods Task Force Update – Those present agreed to proceed with the Transformers Committee panel session to present the summary of the full list of mitigation methods that has been compiled. This update will be a tutorial during the Fall 2025 Meeting.
- There was an open discussion on the reliability of surge arresters used internally in transformers.
- Meeting adjourned at 12:05 PM

7) WG Guide for Application of Tertiary & Stabilizing Windings C57.158 E. Betancourt

- Meeting Date/Time: Oct 29, 2024; 4:45 PM
- 73 total attendees, consisting of 22 Members and 51 Guests. The TF achieved a quorum (19 members required). 11 guests requested membership.
- Highlights:
- Old Business
 - Report on TF 1 “General Editorial/Technical Review”
 - The Guide plus 8 Documents reviewed for identification of cross-references; 90+ items listed.
 - Report of TF 2 “Transformers Without a TW or SW”
 - New proposed text based on recent technical publications.
 - Report of TF 3 “Extension of Special Topics Currently in the Guide”
 - New material proposed with example for loading of multi-winding transformers.
 - Report of TF 4 “New Technical Topics”
 - Discussed considerations for design of Y-y-y renewables collector transformers
- No New Business

8) WG IEEE Neutral Grounding Devices PC57.32 S. Kennedy

- Task Force Assigned work is almost complete (Clause 4 Grounding Reactors has only new Annex remaining, Clause 5 Ground Fault Neutralizers is complete, Clause 6 Grounding Transformers is complete, Clause 7 Grounding Resistors is complete, Clause 8 Combination Devices is being surveyed by the TF and to be complete by December)
- Plan to have WG straw ballot done of completed draft 1 before the Spring Meeting
- Target to have draft ready for ballot by Dec 2025

9) WG Entity HVDC Neutral Grounding Devices PC57.32.10 Z. Hua

- MEC review comments was done in December 2023, new draft was created: D6.1 version.
- SA ballot was opened on April 26, 2024, and was closed successfully on May 26, 2024. 12 members joined the Ballot Group, and 11 members completed the voting, with 10 votes in favor and 1 vote against.
- The WG responded each of the 20 comments received in SA Ballot and revised the draft content, which resulted in draft version D6.2.
- The WG initiated the first Recirculation on September 19, 2024, and was closed successfully on September 29, 2024.
- Currently, the WG is preparing to initiate the second Recirculation.
- The latest draft version D6.3 and the response to SA Ballot and the first Recirculation Comments were uploaded under PCS webpage.

10) WG Entity Winding Deformation Guide PC57.141

X. Shao

- TCR: Poorvi Patel
- Anticipated completion date of Pre-MEC Editorial Review: End of November or beginning of December.
- 80% Complete- remaining 20% is for modifying Figures and Charts;
- WG needs to submit modified PAR to Nescom before December 20th Deadline.
- Modified PAR approval by SA: Beginning of 29th of January 2025.
- February 2024 for SC Approval to initiate SA ballot.
- SA ballot initialization date: Mid-February 2025
- Need SC approval for modified PAR
- Reason:
 - The reason for revising the scope is: At present, vibration test is rarely used in transformers with voltage levels of 66kV and below, meanwhile the data statistical basis and application cases of this guide only include transformers above 66kV. Therefore, the WG considered that it was appropriate to modify the use range of vibration test from “above 35kV” to “above 66kV”. Besides, the revised description about main contents of this guide is consistent with the text and annexes of the final draft (approved by the WG).
- Original
 - Purpose:
 - This guide provides the guidance for detection, monitoring and evaluation off transformer winding deformation based on vibration test, including its mechanism, influencing factors, equipment requirements, sensor placement and evaluation methods in normative text, as well as related calculation procedures, operation flows, and application cases in annexes. This guide applies to the vibration test of oil-immersed power transformers rated above 35kV.
- Modified
 - Purpose:
 - Scope of proposed standard: This guide provides guidance for the detection, monitoring, and evaluation of winding deformation in liquid-immersed power transformers based on the vibration test. This guide applies to the vibration test of

oil-immersed power transformers rated above 66 kV. The theoretical basis, instrument configuration, safety precautions, sensor arrangement, operating condition indexes, vibration characteristic quantities, and evaluation method are included in this guide. Additional materials related to the vibration test, such as typical vibration spectrums, optimal arrangement method, vibration test cases, research on winding condition threshold, and bibliography, are described in annexes

- P. Patel made a motion to modify the PAR's purpose per the request of the entity group. Second made by J. McBride. P. Jarosz explained that entity groups and individual groups have the same procedural requirements when their document belongs to a subcommittee. The motion passed by unanimous consent.

J.6 Unfinished (Old) Business

There was no unfinished business.

J.7 New Business

- IEC/IEEE 60076-16
 - IEC has decided to not renew this document.
 - E. teNyenhuis made a motion to form a PAR study group to determine if a PAR should be developed. Seconded by E. Schweiger. Motion was approved by unanimous consent.
- IEEE C57.120
 - Guide expires in 2027. D. Sauer made a motion to establish a PAR study group and W. Binder seconded. The motion passed by unanimous consent.
- The Chair announced that this is his last meeting as his term has expired. S. Som will be the Chair going forward.

J.8 Adjournment

- The meeting was adjourned at 3:51PM.

J.9 Minutes of Meetings of Working Group (WG) and Task Force (TF) Reports (all unapproved)

J.9.1 WG Eval Guide Environ Impact of Trans & Reactors PC57.151

Meeting Date/Time: Monday, October 28, 2024, 11:00 AM to 12:15 PM PT

Meeting Location: St. Louis, Missouri, USA

Chairman: J. Kazmierczak (Hitachi Energy)

Vice Chair: Ismail Guner (Hydro Quebec)

Secretary: Elise Arnold (SGB SMIT)

- This is the first meeting of the guide after receiving PAR.
- A call to order was made at 11:00 AM CST
- The Agenda was presented
- The patent & copyright policy was reviewed. A call for any patents was made. There were two patents that were declared by Luiz Chiem.
- Introduction of officers was made.

- Introduction of attendees was made, with a total of one hundred five attendees present, plus three officers
- Membership was offered. Sixty-nine attendees requested membership.
- Information & updates on IEC & CIGRE progress were reviewed
- The goal of the standard that is to be developed was discussed.
- A proposed outline was presented.
- Poorvi Patel, Epri, requested that the outline be reviewed prior to the goal review.
- Jim Thompson, T&R Service Co., made a motion to delete the bullet points put forth in the goal statement & amend the PAR to include the purpose. This motion was withdrawn.
- There was further discussion surrounding including a purpose, or just clarifying a goal statement that will not be included in the guide, but will serve to help the group develop an outline.
- Luiz Chem, Hitachi, made a motion to change section 3 to “Life Cycle Assessment” to define the LCA, methodologies & the potential issues surrounding the methods. Mani Kumar, Duke Energy, seconded the motion.
- A vote was made for the motion. 37 for, 0 opposed, 1 abstention. The motion passed.
- Mike Nolte, Kiewit, moved to take the outline and divide into task forces. This was seconded by Jim Thompson, T&R Service Co.
- The motion was voted on 38 for, 0 opposed, 1 Abstention. The motion passed.
- Hugo Avila, Hitachi, volunteered for leading task force for outline point 4: Product specific rules for the life cycle assessment (LCA)
- Michael Nolte, Kiewit, volunteered to lead task force on outline point 3: Environmentally conscious design and life cycle assessment
- Jim Thompson, volunteered to lead task force on outline point 5: Further environmental performance considerations
- Outline point 6: Reporting on environmental performance and life cycle assessment results, still needs to have a task force leader volunteer.
- Relevant industry documents need to be requested to share among the task forces as references.
- A motion was made to adjourn the meeting. It was adjourned at 12:09 PM CST.
- The next meeting will take place in Denver, CO. during IEEE Transformer Committee Meeting scheduled for March 23-27, 2025.

List of Meeting Attendees from Spring 2024 meeting (including affiliation & member status).

Giraldo	Orlando	The HJ Family of Companies	Member
Verdolin	Rogério	Verdolin Solutions	Member
Shull	Stephen	BBC Electrical Services Inc.	Guest
Bohrn	Joshua	Pacificorp	Member
Vanderwalt	Alwyn	ECI	Member
Munoz	Marta	Hitachi energy	Member
Tenyenhuus	Ed	Hitachi Energy	Member
Matthews	Lee	Howard Industries	Member
Machain	Jose Luis	Prolec GE	Member
Sohail	Muhammad Abdullah	Trench Limited	Member
Ziger	Igor	Koncar	Member
Tan	Jonathan	Northern Transformer	Member
Tanaka	Troy	Burns & McDonnell	Guest
Greaves	Brad	Weidmann Electrical Technology	Member
Hossain	Saif	Trench Canada	Member
Tolcachir	Eduardo	TTE Transformers	Member
Doak	Eric	D4 Energy Solutions	Member

Sweetser	Charles	Omicron	Guest
Parkinson	Dwight	Eaton	Member
Rehkopf	Sebastian	Reinhausen Germany	Member
Plotner	Chris	Siemens Energy	Guest
Foata	Marc	MR	Guest
Wallach	David	Duke Energy	Guest
Boettger	William	Boettger Transformer Consulting LLC	Member
Chelgi	Bhaumile	Hitachi Energy	Guest
Masathe	Swapnil	Megger	Guest
Mahajan	Kushal	Sungrow	Member
Bolar	Sanket	Oncor	Member
Schiessl	Markus	SGB	Member
Dillon	Nikolaus	Dominion Energy	Member
Sharp	Michael	Trench Limited	Member
Bhardwaj	Naveen	Trench Group	Member
Wong	Terry	Trench Limited	Member
Calil	Wilerson	Hitachi Energy	Member
Natale	Anthony	HICO America	Guest
Khan	Hasim	NEETRAC – Georgia Tech	Member
Kapka	Serivoz	Hitachi Energy	Guest
Kiwathahshin	Matenz	Hitachi Energy	Guest
Aleksandrowicz	Danieal	Hitachi Energy	Member
Kowalski	Rafal	Hitachi Energy	Member
Casallas	Camilo	Trench	Member
Mbovombolo	Mama	Hitachi Energy	Member
Herron	Bill	Reinhausen	Member
Sen	John	Duke Energy	Member
Hogg	Ryan	Bureau of Reclamation	Guest
Thompson	Jim	T&R Service Co.	Member
Patel	Sanjay	SGB-SMIT USA	Guest
Joshi	Akash	Kimley-Hoorn	Member
Garcia	Miguel	Hitachi Energy	Member
Hugo	Avila	Hitachi Energy	Member
Mani	Kumar	Duke Energy	Member
Trifunoski	Risto	Trench Canada	Member
Delgado	Gabrial	Invernergy	Member
Nolte	Michael	Kiewit	Member
Gyore	Attila	Midel	Member
Dorpmanns	Luc	Royal SMIT Transformers	Member
Schrammel	Alfons	Siemens Energy	Member
Kaineder	Kurt	Trench Austria	Member
Ansari	Tauhid	Hitachi Energy	Member
Thomas	Scott	Hitachi Energy	Guest
Swatkowski	Michael	Hitachi Energy	Member
Patel	Yakesh	Hitachi Energy	Member
Dragana	Gasic	Koncar Dist.	Guest
Diodan	Janko	Koncar Dist	Guest
Weyandt	Paul	Schneider Electric	Member
Neder	Frank	Trench Germany	Member
Patel	Poorvi	EPRI	Member

Gustavsson	Niklas	Hitachi Energy	Member
Labh	Ashwini	Hitachi Energy	Member
Cheim	Luiz	Hitachi Energy	Member
Fu	Peng	Chint	Guest
Mills	Francis	Power Engineers Inc.	Member
Luka	Kovacic	Koncar Instrument Transformers	Member
Crown	Alexander	Coil Innovation	Guest
Wirth	Stefan	Coil Innovation	Guest
McBride	Jim	JMX High Voltage	Guest
Gamboa	Jose	The H-J Family of Companies	Guest
Bayena	Hugo	The H-J Family of Companies	Guest
Schott	Cody	The H-J Family of Companies	Guest
Richardson	Michael	Ameren	Guest
Frazier	Raymond	Ameren	Guest
Radbrandt	Vif	Hitachi Energy	Guest
Schleismann	Eric	Southern Company	Guest
Furlanetto	Carlo	Siemens Energy	Guest
Hanson	Corey	Flex-Core	Member
Orozco	Eduardo	GE Grid Solutions	Member
Post	Nicholas	WEC Energy Group	Guest
Vir	Dharam	Prolec GE Waukesha	Member
Varghese	Ajith	Prolec GE Waukesha	Member
Steele	Hampton (Allen)	TVA	Member
Saad	Mickel	Hitachi Energy	Member
Dopplmair	Peter	Trench Group	Guest
Mendez	Omar	Prolec GE	Member
Avelino	Paulo	Hitachi Energy	Guest
Megdad	Mohammed	IPS	Member
Betancourt	Edwin	Siemens Energy	Member
Bernesjo	Mats	Hitachi Energy	Guest
Kirchenmayer	Egon	Siemens Energy	Member
Do Prado	Gustavo	Siemens Energy	Guest
Rossini	Yuri	Siemens Energy	Guest
Mamede	Gabriel	Siemens Energy	Guest
Mantoan	Francis	Siemens Energy	Guest
Taylor	Marc	JFE Shoji Canada	Member
Leal	Fernando	Prolec GE	Member
Som	Sanjib	PTT, LLC	Member
Arnold	Elise	SGB SMIT	Officer -Secretary
Guner	Ismail	Hydro Quebec	Officer - Vice Chair
Kazmierczak	Jerzy	Hitachi Energy	Officer -

J.9.2 TF “Audible Sound Revision to Test Code”

The TF met at 1:45 PM, on Monday, October 28, 2024. Dr. Ramsis Girgis, Chairman of the TF, presided over

the meeting, with Mats Bernesjo being the Secretary.

The Chairman & Secretary welcomed the audience to this meeting and reviewed the proposed agenda. The agenda was unanimously approved as was the unapproved minutes of the Spring 2024 TF meeting in Vancouver (Sanjib Som 1st, David Wallach 2nd).

The TF meeting was attended by 39 out of 56 members and a total meeting attendance of 87. A quorum was established. 17 attendees requested membership at this meeting (listed below) **.

The chairman presented Sound Pressure level data of several power transformers where the sound level of the PA was first measured in air and then compared with the Sound Level of the PA in oil determined from the difference between the measured sound pressure levels of these transformer in the bridging position versus the non-bridging position. These measurements showed that the sound level of the PA in oil was mostly in the range of 4 – 6 dB lower than that measured in air. The Chairman suggested using a conservative average value of 5 dB for that difference. The Sound Pressure level data used in this analysis was received for 9 different Transformers from four different manufacturers: Hitachi Energy, Prolec GE, SGB-SMIT, and WEG USA.

The Chairman then presented the methodology of determining the Sound pressure level of the PA in oil such that the PA noise does not increase the Sound Pressure Level of the main Transformer by more than 1 dB at the bridging Tap Position. Adding 5 dB to this value determines the sound Pressure level of the PA in air to be specified by power transformer manufacturers. A numerical example of this process was also presented. The chairman then presented a suggested methodology to measure the Sound Pressure level of PAs in air.

Two main questions were asked, and the following answers were given by the chairman:

1. In determining the limit for the Sound Pressure Level of the PA in air, a value of 1 dB was chosen as a conservative, but reasonable, limit for the impact of the PA noise on the sound pressure level of the main transformer.
2. In cases of power transformers, where the difference of the measured sound level of the transformer at the bridging tap position is in the 0.1- 0.2 dB range higher than that at the non-bridging tap position, caused by either the PA noise is:
 - Too low to impact the sound level of the main transformer, or
 - Too high such that it dominates the noise of the main transformer

The logarithmic difference between the measured sound power of the main transformer in the bridging tap position versus the non-bridging tap position results in a value for the PA sound power level that is not reliable. Therefore, this data could not be used to accurately determine the sound level of the PA in oil.

As agreed upon before, the Chairman suggested that a section would be added to the IEEE Noise Guide C57.136 to provide guidance to power Transformer manufacturers on how to determine the required “Sound Pressure Level of the PA in air” such that the PA noise would not cause an increase of more than 1 dB to the sound pressure level of the main transformer. This section would also include proposed method of measuring sound pressure level of PA in air. Manufacturers could choose to not use this information in specify the Sound levels of their PAs.

Since the IEEE noise Guide would not be slated for a revision for a number of years yet, Steve Antosz suggested that, in the meantime, an IEEE paper that includes the above information, could be published. The chairman agreed and informed that indeed an IEEE paper on this subject is planned to be submitted for next year’s PES Conference.

Finally, the chairman stated that the presentation given at the TF meeting will be shared with the attendees of this meeting along with the unapproved minutes of the meeting.

With no new additional business raised, the meeting was adjourned upon unanimous approval (Dan Sauer 1st, Eduardo Garcia 2nd).

Respectfully submitted,

Mats Bernesjo, TF Secretary

**** Attendees requested membership**

Duvier Bedoya (Hitachi Energy), Steven Brzoznowski (BPA), Camilo Casallas (Trench Ltd), Akash Joshi (Kimley-Horn), Arvind Kumar (Delta Star Inc), Xose Lopez-Fernandez (Universidad de Vigo), Moses Manzano (Hyosung HICO), Daniel Martinez (JFE Canada), Ortiz Cuanhtemoc (Niagara Transformers), Dominic Pollaro (NASS), Davoudi Pouneh (Delta Star Inc.), Amitabh Sarkar (Virginia Transformer Corp.), Abdulmajid Shaikh (Delta Star Inc.), Igor Simonow (Toronto Hydro), Krishnamurthy Vijayan (PTI Transformers), Fei Yang (Hitachi Energy), and Kim Yeounsoo (MEPPI).

2024 Fall Meeting Attendance and Affiliation is as follows:

First name	Last name	Company Name	Status
Kayland	Adams	Prolec GE Waukesha	Member
Daniel	Aleksanderowicz	Hitachi Energy	Member
Stephen	Antosz	Stephen Antosz & Associates, Inc	Member
Elise	Arnold	SGB-SMIT	Member
Onome	Avanoma	MJ Consulting	Member
Donald	Ayers	Ayers Transformer Consultants	Guest
Duvier	Bedoya	Hitachi Energy	Guest
Mats	Bernesjo	Hitachi Energy	Member
Enrique	Betancourt	Prolec GE	Member
William	Boettger	Boettger Transformer Consulting LLC	Member
Michael	Botti	Hyosung HICO	Guest
Darren	Brown	Howard Industries	Member
Samuel	Brodeur	Hitachi Energy	Guest
Steven	Brzoznowski	Bonneville Power Administration	Guest
Camilo	Casallas	Trench ltd	Guest
Jeong	Chanho	Iljin Electric	Guest
Eunyoung	Cho	HICO America	Guest
Adriana	Cisco Sullberg	Salt River Project	Guest
Juan Carlos	Cruz Valdes	Prolec GE	Member
Ortiz	Cuauhtemoc	Niagara Transformer	Guest
Mateusz	Czernorucki	Hitachi Energy	Guest
Scott	Dennis	Hitachi Energy	Guest
Scott	Digby	Duke Energy	Member

Lim	Donyki	Iljin Electric	Guest
Peter	Dopplmair	Trench Group	Guest
Kenneth	Dugger	NASS	Guest
Joe	Foldi	Foldi & Associates	Guest
Richard	Frye	Eaton Corporation	Guest
Eduardo	Garcia Wild	Siemens Energy	Member
Ramsis	Girgis	Hitachi Energy	Member
Nicholas	Jensen	Delta Star Inc.	Member
Akash	Joshi	Kimley-Horn	Guest
Sergiusz	Kapka	Hitachi Energy	Guest
Alvin	Kopp	HVTC Inc.	Guest
Rafal	Kowalski	Hitachi Energy	Member
Fernando	Leal	Prolec	Guest
Arvind	Kumar	Delta Star Inc.	Guest
Jihun	Lee	HD Hyundai Electric	Guest
Junho	Lee	Hyundai Electric	Member
Xose	Lopez-Fernandez	Universidad de Vigo	Guest
Jose	Machain	Prolec GE	Member
Moses	Manzano	Hyosung HICO	Guest
Daniel	Martinez	JFE Canada	Guest
Mama	Mbouombouo	Hitachi Energy	Member
Francis	Mills	Power Engineers Inc	Member
Bhardwaj	Naveen	Trench Group	Guest
Marta	Munoz	Hitachi Energy	Guest
Joe	Nims	Allen & Hoshall	Member
Besjan	Pajatidi	Brockhaus	Guest
Chris	Ploetner	Siemens	Guest
Klaus	Pointner	Trench Austria GmbH	Member
Dominic	Pollaro	NASS	Guest
Davoudi	Pounch	Delta Star Inc.	Guest
Hakan	Sahin	Virginia/Georgia Transformer	Member
Jesus	Sanchez Rodriguez	Voltyx	Guest
Dinesh	Sankarakarup	Duke Energy	Member
Amitabh	Sarkar	Virginia Transformer Corp.	Guest

Daniel	Sauer	Eaton Corporation	Member
Markus	Schiessl	SGB-SMIT	Member
John	Sen	Duke Energy	Member
Abdulmajid	Shaikh	Delta Star	Guest
Michael	Sharp	Trench Ltd. Canada	Member
Stefan	Siebert	Brockhaus	Guest
Igor	Simonov	Toronto Hydro	Guest
Christopher	Slattery	FirstEnergy Corporation	Member
Jason	Snyder	FirstEnergy Corporation	Guest
Sanjib	Som	Pennsylvania Transformer	Member
H. Allen	Steele	TVA	Guest
Andy	Steineman	Delta Star Inc.	Member
Michal	Swiatkowski	Hitachi Energy	Member
Troy	Tanaka	Burns & McDonnell	Member
Marc	Taylor	JFE Shoji Power Canada Inc.	Member
Samuel	Tekle	WEG Transformers USA	Guest
Ryan	Thompson	Burns & McDonnell	Member
Ajith	Varghese	Prolec-GE Waukesha	Member
Jason	Varnell	Doble Engineering Co.	Member
Krishnamurthy	Vijayan	PTI Transformers	Guest
David	Wallach	Duke Energy	Member
Trenton	Williams	Advance Power Technologies	Guest
Stefan	Wirth	Coil Innovation	Guest
Jeffrey	Wright	Duquesne Light	Member
Fei	Yang	Hitachi Energy	Guest
Koray	Yavuz	Noark Electric	Guest
Kim	Yeounsoo	MEPPI	Guest
Kim	Yonghui	Iljin Electric	Guest
Yu	Zhenquan	Sieyuan Toshiba	Guest
Kris	Zibert	Allgeier Martin	Member

J.9.3 TF PCS Continuous Revisions to C57.12.00

PCS Task Force on General Requirements C57.12.00

Performance Characteristics Subcommittee
IEEE / PES Transformers Committee

October 28, 2024
Saint Louis, MO (Saint Louis)

UNAPPROVED MINUTES

The PCS Task Force on General Requirements for C57.12.00 met at 3:15 PM on Monday, October 28, 2024. Chairman Tauhid Ansari presided over the meeting together with Vice Chair Enrique Betancourt and Mats Bernesjo being the secretary. The meeting was called to order and the Chairman reminded the group of the purpose and scope of this Task Force. The copyright and patent statements from IEEE were presented to the group; none of the members and guests present were aware of any issues related to this TF's activities.

The meeting was attended by 42 members (out of 59), 65 guests, for a total meeting attendance of 107 people, including 29 requests for membership at this meeting. A quorum was established with $42 / 59 = 71\%$ attendance.

The agenda was unanimously approved (1st Amitabh Sarkar, 2nd Marnie Rousell). The unapproved minutes from the previous meeting (Spring meeting, Vancouver, 2024) was unanimously approved (1st Phil Hopkinson, 2nd Hakan Sahin).

The following 29 guests requested membership:

Duvier	Bedoya	Hitachi Energy		Josh	Bohrn	PacifiCorp
Steven	Brzoznowski	BPA		Gilles	Bargune	FISO
Sudip	Chanda	Delta Star		Mama	Mbouombouo	Hitachi Energy
Pouneh	Davoudi	Delta Star		Paul	Dolloff	EKPC
Scott	Dennis	Hitachi Energy		Miguel	Plascencia	PG&E
Nick	Jensen	Delta Star		Francis J	Mills	Power Eng. Inc
Fernando	Leal	Prolec		Dominique	Bolliger	HV Techn.
Mike	Nolte	Kiewit		Nihat	Kosedagi	Hitachi Energy
Edward	Orozco	GE Grid Sol.		Miljenko	Hrkac	Hitachi Energy
AbdulMajid	Shaikh	Delta Star		Hongzhi	Zhang	Hitachi Energy
Michal	Swiatkowski	Hitachi Energy		Ismael	Naja	Eaton
Cole	Van Dreel	ATC		Risto	Trikundski	Trench group
Fei	Yang	Hitachi Energy		Garrett	Bradshaw	Howard Ind.
Richard	Frye	Eaton		Onome	Avanoma	MJ Consult.
Arvind	Kumar	Delta Star				

Next, the Chair briefly provided background and relevance of each item brought up for Group's discussion in the agenda. The Chair started Group's regular business.

WG Item 115, Adding Sec 4.1.10 on DC current injection limits

Andrew Larison was unfortunately not able to attend. The item was passed on but will be discussed in upcoming TF meetings.

WG Item 116, Update of KVA levels in table 11

Ryan Hogg gave the TF an excellent presentation on this topic and how these levels (Table 11) have been consistent throughout the revisions, 15 – 500 KVA category I. It was suspected that it could have been a typo in this table, but it appeared not to be!

Dan Sauer 1st and Ryan Hogg 2nd proposed to table this matter and work together putting together proposed wording to follow the table following the recommendation by Ryan Hogg (Item 1.1 in his

presentation). It was unanimously approved to go ahead with this table but add the note. The motion was carried (1 abstain) to discontinue the discussion for now, but to be continued in future TF meetings.

WG Item 117, C57.12.00 Short Circuit Table – Table 11

Ryan Hogg had a new business item: adding zero sequence impedance to the nameplate and adding nameplate A, B, and C. Ryan Hogg requested to withdraw the new business he proposed.

WG Item 118, add duration of the heat run test to the test report

Jason Varnell presented a proposal for the TF on why he suggested to add the duration of the heat run to the test report. It is mainly to be able to correlate the DGA results (per C57.30) with time the transformer is tested thermally. A great discussion involving a large number of the TF participants followed. It was proposed by the attendees to Jason Varnell to put together a write-up for the TF Chair. Tauhid will then send it out for survey. A motion to survey the verbiage was held (Steve Antosz 1st, Dan Sauer 2nd). It was unanimously approved (1 abstain) and hence, passed.

A few final discussions were held on live parts of power transformers but this discussion was asked to be moved to another workgroup on dielectrics where this subject matter belong.

With a quiet floor, the Chairman asked for the meeting to be adjourned (1st Dan Sauer, 2nd by Marnie Rousell)

Meeting was adjourned at 4:15 PM.

Respectfully submitted,

	Tauhid Ansari	Enrique
Betancourt	Mats Bernesjo	
	Chair	Vice-
Chair		Secretary

Attendance Fall 2024 Meeting – PCS TF to Revision C57.12.00

First Name	Last Name	Affiliation	Status
Tauhid	Ansari	Hitachi Energy	Member
Stephen	Antosz	Stephen Antosz & Associates, Inc.	Member
Elise	Arnold	SGB-SMIT	Member
Onome	Avanoma	MJ Consulting	RM
Donald	Ayers	Ayers Transformer Consultants	Member
Gilles	Bargune	FISO	RM
Christopher	Baumgartner	WE Energies	Member
Duvier	Bedoya	Hitachi Energy	RM
Orlando	Benitez	Hyosung HICO	Guest
Mats	Bernesjo	Hitachi Energy	Member
Edwin	Betancourt	Siemens-Energy	Guest
Enrique	Betancourt	Prolec GE	Member
Chokso	Bhaumik	Hitachi Energy	Guest
Dan	Blaydon	BG&E	Member
William	Boettger	Boettger Transformer Consulting LLC	Member
Josh	Bohrn	Pacificorp	RM
Sanket	Bolar	Oncor	Guest
Dominique	Bolliger	HV Technologies	RM

Michael	Botti	Hyosung HICO	Guest
Garrett	Bradshaw	Howard Industries	RM
Darren	Brown	Howard Industries	Member
Steven	Brzoznowski	BPA	RM
Alfredo	Carrizales	Prolec Energy	Guest
Sudip	Chanda	Delta Star	RM
Eric	Davis	Consultant	Member
Pounch	Davoudi	Delta Star	RM
Scott	Dennis	Hitachi Energy	RM
Nikolaus	Dillon	Dominion Energy	Member
Paul	Dolloff	EKPC	RM
Luc	Dorpmanns	SMIT	Guest
Eric	Elson	SDG&E	Guest
Reto	Fausch	RF Solutions	Guest
Joe	Foldi	Foldi & Associates	Guest
Richard	Frye	Eaton	RM
Eduardo	Garcia Wild	Siemens Energy	Member
Ramsis	Girgis	Hitachi Energy	Member
Bill	Griesacker	Duquesne Light	Member
Detlev	Gross	Power Diagnostics consult	Guest
Shertukde	Hemchandra	University of Hartford	Member
First Name	Last Name	Affiliation	Status
Sergio	Hernandez Cano	Hammond Power Solutions	Guest
Ryan	Hogg	USBR	Member
Philip	Hopkinson	HVOLT Inc	Member
Miljenko	Hrkac	Hitachi Energy	RM
Patrycia	Jarosz	IEEE SA	Guest
Nick	Jensen	Delta Star	RM
Akash	Joshi	Kimley-Horn	Guest
Sheldon	Kennedy	Sheldon Kennedy Engineering, PLLC	Member
Zan	Kiparizoski	Howard Industries	Member
Nihat	Kosedagi	Hitachi Energy	RM
Anton	Koshel	Delta Star	Guest
Arvind	Kumar	Delta Star	RM
Mark	Lachman	Doble	Member
Fernando	Leal	Prolec	RM
Jihun	Lee	HD Hyundai Electric	Guest
Junho	Lee	HD Hyundai Electric	Guest
Gabriel	Mamede	Siemens Energy	Guest
Mama	Mbouombouo	Hitachi Energy	RM
Doug	McCullough	Maxima - Hyundai	Guest

Omar	Mendez	Prolec GE	Guest
Francis J	Mills	Power Engineer Inc	RM
Ismael	Naja	Eaton	RM
Joe	Nims	Allen & Hoshall	Member
Mike	Nolte	Kiewit	RM
Edward	Orozco	GR Grid Solutions	RM
Sanjay	Patel	Royal SMIT	Member
Tomiscav	Pavicic	Siemens Energy	Guest
Harry	Pepe	Phenix Technologies Inc.	Guest
Sylvain	Plante	HQ	Guest
Miguel	Plascencia	PG&E	RM
Bertrand	Poulin	Hitachi Energy	Member
Ulf	Radbrandt	Hitachi Energy	Member
Juan	Reyes Perez	Hitachi Energy	Guest
Rodrigo	Ronchi	WEG Transformers USA	Guest
Marnie	Rousell	Entergy	Member
Hakan	Sahin	Virginia / Georgia Transformers	Member
Dinesh	Sankarakurup	Duke Energy	Member
Amitabh	Sarkar	Virginia Transformers	Member
Daniel	Sauer	Eaton	Member
Markus	Schiessl	SGB-SMIT	Member
Eric	Schleismann	Southern Company	Guest
Cihangir	Sen	Duke Energy	Member
AbdulMajid	Shaikh	Delta Star	RM
Jaber	Shalabi	Van Tran Industries	Guest
Christopher	Slattery	FirstEnergy	Member
Steven	Snyder	Hitachi Energy - Retired	Member
H. Allen	Steele	TVA	Guest
Charles	Sweetser	Omicron Electronics Corp	Guest
Michal	Swiatkowski	Hitachi Energy	Member
Jonathan	Tan	Northern Transformer	RM
Andreas	Thiede	Highvolt Dresden	Guest
Fran	Topol	Koncar Power Transformers	Guest
Mark	Tostrud	Dynamic Ratings	Guest
Risto	Trikundski	Trench Group	RM
Cole	Van Dreel	ATC	RM
Ajith	Varghese	Prolec-GE	Member
Jason	Varnell	Doble Engineering	Member
Juan David	Velasquez	Magnetron SAS	Guest
Krishnamurthy	Vijayan	Quanta Services	Member
Dharam	Vir	Prolec-GE Waukesha	Member
John	Wagner	AEP	Guest

David	Wallach	Duke Energy	Member
Paul	Weyandt	Schneider Electric	Guest
Fei	Yang	Hitachi Energy	RM
Hongzhi	Zhang	Hitachi Energy	RM
Zhixiang	Zhu	Chint	Guest
Kris	Zibert	Allgeier Martin & Associates	Member

RM = Request membership

J.9.4 WG Standard for DPVTs C57.159

Working Group C57.159: Standard for Distributed Photo-Voltaic Transformers (DPVTs)

Unapproved Meeting Minutes

Spring 2024 Meeting

October 28, 2024, 4:45pm

Hyatt Regency at the Arch Grand Ballroom D

St. Louis, Missouri

The meeting was called to order at 4:45PM CDT by Chair, Dr. Hemchandra Shertukde.

25 Members attended and a quorum was achieved; official business was conducted.

Joe White moved to approve the agenda as written, Kumar Mani seconded. Approval of Agenda unanimously passed.

Ed teNyenhuis moved to approve minutes from the Spring 2024 and virtual meetings on 9/13/24 and 10/11/24 as written. Joe White seconded. The minutes were unanimously approved.

Phil Hopkinson shared the history and need for a standard for transformers attached to inverters. Paul Orr from NEMA attended. NEMA has a new guide for inverter transformers from which we hope to use material. NEMA has given us a copyright permission form to allow us to use the NEMA information. Patrycja from IEEE needs to be notified on the IEEE side.

Call for patents was issued and none were mentioned.

Copyright and Behavior slides were presented.

The Chair recognized the contributors to the current document.

New Business:

Most of the new business was discussion of the Scope and Purpose of the PAR. Joe Watson suggested that the WG would hold off on a revision to the PAR until the draft more finished to avoid needing multiple revisions to the PAR. Chair agreed.

Discussion on PAR Scope:

Much discussion of the grammar and wording of the Scope ensued. Kumar Mani proposed modifying the scope to include battery energy storage transformers. Joe White questioned in the word “practice”

should be in line 10 of the scope. He suggested that “Practical” would be better. Kuman Mani suggested that “or cast resin transformers” should be deleted from the scope since they fall under dry-type. Don Ayers and Joe Watson suggested changes in wording. Akash Joshi felt that these are power transformers but that the IEEE is considering a new class of transformer between power and distribution. Don Ayers suggested separating the application from the electrical specifications and configuration (like padmount).

Joe Watson suggested that Photo-Voltaic could be expanded to inverter transformers. David Walker also suggested that maybe the scope should be transformers connected to inverters. Phil Hopkinson felt that inverter transformers were the key reason to update this standard. Chair felt that restricting the standard to inverter transformers might leave out some applications. Joe Watson noted that there is consideration in the Committee of eliminating Class 1 as a designation. Jason Beaudoin mentioned the same and that in C57.135 in Dielectric Tests there was a Task Force considering testing of wind and solar transformers for partial discharge creating what would create a different category. Phil Hopkinson that if Class I power was eliminated then we might need two types- one per the DOE scope (Class 1 Distribution) and another for at least to 1.2kV Class and 10MVA (Class II Distribution). Akash Joshi proposed to keep the PAR scope as it stands. Sheldon Kennedy noted that C57.18.10 covers inverter transformers. The difference is IGBT-based inverters are what is causing the problems compared to earlier units. Phil Hopkinson felt that this could have fit into C57.18.10 except from timing of revisions. Maybe BESS transformers belong there. Xoze Lopez-Fernandez suggested that the scope be left alone. Andrew Larison felt that the Scope is different than one for distribution transformers and maybe needs a different name. More suggestions of wording from many people.

Patrycja Jarosz IEEE) asked- Do changes broaden the PAR scope? Chair replied- we don’t know yet. If needed, we will do a PAR revision later.

Akash Joshi- Moved to accept changes to scope wording as displayed on screen. Joe Watson seconded. Passed unanimously.

Discussion on PAR Purpose:

Discussion on editing the wording for clarity. Because of time the WG agree to finish the discussion of the PAR Purpose in next meeting.

The attendees of the meeting were as follows:

Full Name	Affiliation	Participation
Ayers, Donald	Ayers Transformer Consulting	Member
Bayena, Hugo	H-J Industries	Guest
Beaudoin, Jason	Weidmann Group	Member
Biggie, Kevin	Weidmann Group	Member
Boettger, William	Boettger Transformer Consulting	Guest
Chrysler, Rhett	Ermco	Guest
Conneighton, Brian	Cleveland Cliffs	Guest

Cordova, David	Maddox	Guest
Crockett, Janet	Fayetteville PWC	Guest
Delgado Zamora, Gabriel	Invenergy	Member
de Olivera, Luiz	Hitachi Energy	Guest
Dinh, Huan	Hitachi Energy	Member
Door, Jeff	H-J Industries	Member
Dugan, Roger	EPRI (Retired)	Guest
Fu, Peng	Chint Electric	Guest
Gamboa, Jose	H-J Industries	Member
Garcia, Miguel	Hitachi Energy	Member
Garza, Gilberto	Prolec	Guest
Gaytan, Carlos	Prolec	Member
Grajeda, Rafael	Eaton	Member
Griesacker, Bill	Verizon	Member
Hansman, Jeremy	Cleveland Cliffs	Guest
Hipchen, John	Copper Development Assn	Guest
Hopkinson, Phil	Hvolt, Inc	Vice-Chair
Kennedy, Sheldon	Sheldon P Kennedy Engineering	Member
Larison, Andrew	Hitachi Energy	Member
Leigl, Angela	Eaton	Member
Lopez-Fernandez, Xose	Universidade de Vigo	Member
Mani, Kumar	Duke Energy	Member
Marquardt, Bryan	Cleveland Cliffs	Guest
Marulonda, Katherine	Magnetron SAS	Guest
Mennonna, Robert	Maddox	Guest
Murcia, Fredy	Siemens Energy	Guest
Murillo, Hugo	H-J Industries	Guest
Oakes, Stephen	WEG	Member
Orr, Paul	NEMA	Member
Patel, Sanjay	SMIT USA	Guest
Patel, Vinay	Commonwealth Edison	Guest
Joshi, Akash		Guest
Radu, Ion	Hitachi Energy	Guest
Ronchi, Rodrigo	WEG	Guest
Salvato, Paul	IntelliRent	Guest
Sandoval, Alberto	Eaton	Member
Schindler, Stefan	Reinhausen	Guest
Sharifi, Masoud	Siemens Gamesa	Guest
Shertukde, Hemchandra	University of Hartford	Chair
Simon, Preston	Electrical Technologies	Guest

Sinclair, John	Black and Veatch	Guest
Sparling, Brian	Kinectrics	Guest
Spaulding, Jim	Fort Collins	Guest
Staley, Brad	Leeward Energy	Member
Stockton, David	Stockton Consulting	Member
Suman, Gerry	Electrical Technologies	Guest
teNyenhuis, Ed	Hitachi Energy	Member
Velasquez, Juan David	Magnetron SAS	Guest
Walker, David	MGM Transformers	Secretary
Watson, Joe	JD Watson and Associates	Member
Weisensee, Matt	PacificCorp	Guest
Weyandt, Paul	Schneider Electric	Member
White, Joe	Power Engineers	Member
Yavuz, Koray	Noark Electric	Guest
Yuan, Guang	Hitachi Energy	Member

The meeting was adjourned at 5:53 CDT.

The next meeting will be at the Transformers Committee Spring 2024 Meeting in Denver, Colorado. If additional virtual meetings are scheduled before the Spring 2024 meeting all Working Group members and non-member attendees will be notified.

Respectfully submitted

Hemchandra Shertukde, Chair, C.57.159 Standard

J.9.5 PCS Task Force Continuous Revision to Test Code C57.12.90

Vancouver, BC, Canada

March 12, 2024

9:30 AM – 10:45 AM

Chair – Hakan Sahin

Vice Chair – Pugal Selvaraj

Secretary – Adam Sewell

Meeting Minutes / Significant Issues / Comments:

Meeting was called to order at 9:30am, October 29, 2024 at Hyatt Regency St. Louis at The Arch.

1. Administrative

- a. IEEE Patent Policy and Call for Patents and IEEE SA Copyright Policy
 - i. No comments from group
- b. Review of Fall 2024 agenda
 - i. No comments from group
- c. Introductions of the attendees

- i. Attendance sheets were passed out. Due to time constraints, chair did not have each attendee announce their name/affiliation. Name/affiliation was announced as attendees spoke during the meeting.
 - ii. Secretary asked all who wanted on email distribution for the C57.12.90 PCS Task Force to send him an email at: adamsewell@ieee.org
 - d. Updated membership review and count for quorum
 - i. 47 members were listed and 29 were counted as present by hand count. Based on the hand count, the chair announced there was QUORUM for this meeting.
 - ii. Attendance sheets after meeting completed showed 33 members attended.
 - iii. **Members are expected to attend and stay in the meeting so business can be conducted.**
 - iv. **Member requests should be sent to secretary – adamsewell@ieee.org**
 - e. Approval of Spring 2024 unapproved minutes and Fall 2024 agenda
 - i. Motion-S.Som, 2nd-J.John
 - 1. No opposition to unanimous approval – minutes/agenda approved
 - 2. Old Business
 - a. Review of the recommended revision to Clause 5.1: Determination of cold temperature, under Clause 5: Resistance measurements
- 5.1 Determination of cold temperature**
- The cold temperature of the windings shall be determined as accurately as possible when measuring the cold Resistance *by using top liquid (What to do for conservator units?), top and bottom temperature probes or sensors, to determine top liquid and average liquid temperatures. If a temperature rise test is required on the subject transformer, same temperature probes shall be used to determine the liquid temperatures.* The precautions in 5.1.1, 5.1.2, and 5.1.3 shall be observed.
- 5.1.1 General**
- Cold-resistance measurements shall be made on a transformer only when the liquid or winding temperature is stable. The temperature is considered stable if the ~~top~~ *average* liquid temperature does not vary more than 2 °C in a 1 h period. *Define average??*
- 5.1.2 Transformer windings immersed in insulating liquid**
- The temperature of the windings shall be assumed to be the same as the average temperature of the insulating liquid, provided the following occurs:
- a) The windings have been under insulating liquid with no excitation and with no current in the windings for a minimum of 3 h for a transformer without pumps and for 1 h for transformer with pumps running before the cold resistance is measured.
 - b) The temperature of the insulating liquid has stabilized, and the difference between top and bottom temperature does not exceed 5 °C.
 - b. J.Varnell proposed suggested wording for the TF discussion on the winding resistance:
 - i. The cold temperature of the windings for class II transformers shall be determined by a thermocouple or suitable thermometer immersed directly in oil.
 - c. Discussions were had about wording of cold temperature measurement and will be continued at next meeting
3. New Business
 - a. No new business, just review of Clause 5.1: Determination of cold temperature
4. Membership changes
 - a. Officers will look at attendance and change TF membership status before next meeting.
5. Next meeting: March 25, 2025 at Spring 2025 Transformers Committee Meeting scheduled for March 23-27, 2025, Denver, CO, USA
6. Close of meeting
 - a. Meeting adjourned at 10:45am – Motion-D.Sauer, 2nd-J.John
 - i. No opposition to unanimous approval – MOTION APPROVED

Submitted by: Hakan Sahin

Date: 11/15/24_____

October 29, 2024 Meeting Attendance: (RM = Request Membership)

Last Name	First Name	Company (Affiliation)	Role
Adams	Kayland	Prolec GE Waukesha	Member
Aikens	Tom	Delta Star Inc.	Guest
Antosz	Stephen	Stephen Antosz & Associates, Inc	Member
Arnold	Elise	SGB	Member
Ayers	Donald	Ayers Transformer Consulting	Member
Baumgartner	Chris	We Energies	Member
Beaster	Barry	H-J Family	Guest
Bedoya	Duvier	Hitachi Energy	Member
Bernesjo	Mats	Hitachi Energy	Member
Betancourt	Edwin	Siemens Energy	Guest
Blaszczk	Piotr	Specialty Transformer Components LLC	Guest
Blaydon	Daniel	Baltimore Gas & Electric	Member
Boettger	William	Boettger Transformer Consulting LLC	Member
Bohrn	Joshua	PacifiCorp	Guest
Bolliger	Alain	HV TECHNOLOGIES, Inc.	Guest-RM1
Bolliger	Dominique	HV TECHNOLOGIES, Inc.	Guest-RM3
Botti	Michael	Hyosung HICO	Guest-RM1
Bradshaw	Garrett	Howard Industries	Guest
Brown	Darren	Howard Industries	Guest
Brzozowski	Steven	Bonneville Power Administration	Guest-RM1
Calitz	David	Siemens Energy	Guest
Cantu	Jorge	Alliant Energy	Guest
Carrizales	Juan Alfredo	Prolec GE	Guest-RM2
Choksi	Bhaumilc	Hitachi Energy	Guest
Davis	Eric	Consultant	Guest
Dennis	Scott	Hitachi Energy	Member
Dillon	Nikolaus	Dominion Energy	Guest
Dorpmanns	Luc	SGB SMIT	Guest
Dzodan	Janko	Koncar DIST	Guest
Fausch	Reto	RF Solutions	Guest
Foldi	Joseph	Foldi & Associates, Inc.	Guest
Forsyth	Bruce	Bruce Forsyth and Associates PLLC	Guest-RM1
Frazier	Raymond	Ameren	Member
Frye	Richard	EATON Corporation	Guest-RM2
Garcia Wild	Eduardo	Siemens Energy	Guest
Gasic	Dragana	Koncar DIST	Guest
Girgis	Ramsis	Hitachi Energy	Member
Gorzin	Alireza	Black & Vcatch	Guest-RM3
Griesacker	Bill	Duquesne Light Co.	Member
Hernandez Cano	Sergio	Hammond Power Solutions	Guest
Hernandez	Giovanni	Virginia Transformer Corp.	Member
Holifield	Thomas	Howard Industries	Guest
Hopkinson	Phil	HVOLT Inc.	Guest
Hrkac	Miljenko	Hitachi Energy	Guest
Issack	Ramadan	AEP	Guest-RM4
Jaroszewski	Marion	Delta Star Inc.	Guest
Jarosz	Patrycja	IEEE SA	Guest
Jensen	Nick	Delta Star Inc.	Guest-RM2
Jeong	Chanho	Iljin Electric	Guest
John	John	Virginia Transformer Corp.	Member
Kapka	Sergiun	Hitachi Energy	Guest
Kennedy	Sheldon	Sheldon P. Kennedy Engineering, LLC	Guest
Khan	Qasim	NEETRAC - Georgia Tech	Guest
Kim	Yeounsoo	MEPPI	Guest-RM2
Kiparizoski	Zan	Howard Industries	Guest
Kircheumayer	Egon	Siemens Energy	Guest
Kosedagi	Nihat	Hitachi Energy	Guest
Kumar	Arvind	Delta Star Inc.	Guest
Kwiatkowski	Mateusz	Hitachi Energy	Guest
Lachman	Mark	Doble Engineering Co.	Member
Leal	Fernando	Prolec GE	Member
Lee	Moonhee	Hammond Power Solutions	Guest-RM1

Last Name	First Name	Company (Affiliation)	Role
Lim	Donggi	Iljin Electric	Guest
Mahajan	Kushal	Sunarow	Guest
Mamede	Gabriel	Siemens Energy	Guest
Marathe	Swapnil	Megger	Guest-RM1
Mbouombouo	Mama	Hitachi Energy	Guest
McBride	Brian	Cargill	Guest-RM1
McBride	James	JMX Services, Inc.	Guest
Mills	Francis	Power Engineers	Guest-RM3
Munoz	Marta	Hitachi Energy	Guest
Murray	David	TVA	Member
Naja	Ismael	Eaton	Guest-RM3
Nambi	Shankar	Bechtel Energy	Guest
Nims	Joe	Allen & Hoshall	Guest
Ortiz	Cuauhtemoc	Niagara Power	Guest
Pandya	Manan	Siemens Energy	Guest
Panesar	Parminder	Virginia Transformer Corp.	Guest
Patel	Sanjay	Smit Transformer	Member
Pepe	Harry	Doble Engineering Co.	Member
Plante	Sylvain	Hydro-Quebec	Guest
Plascencia	Miguel	PG&E	Guest-RM1
Poulin	Bertrand	Hitachi Energy	Guest
Prado	Gustavo	Siemens Energy	Guest
Reyes Perez	Juan	Hitachi Energy	Guest
Roussell	Marnie	Entergy	Guest
Sahin	Hakan	Virginia/Georgia Transformer	Member-Chair
Sankarakurup	Dinesh	Duke Energy	Guest
Sarkar	Amitabh	Virginia Transformer Corp.	Guest-RM1
Sarkinen	Garrett	Xcel Energy	Guest
Sauer	Daniel	EATON Corporation	Member
Schiessl	Markus	SGB	Member
Schwartz	Dan	Quality Switch, Inc.	Guest
Sewell	Adam	Quality Switch, Inc.	Member-Secretary
Sewell	Jeremy	Quality Switch, Inc.	Guest
Shaikh	Abdul Majid	Delta Star Inc.	Guest-RM1
Slattery	Christopher	FirstEnergy Corp.	Member
Som	Sanjib	Pennsylvania Transformer	Member
Stechschulte	Kyle	AEP	Guest
Steele	H. Allen	TVA	Guest
Steineman	Andrew	Delta Star Inc.	Guest
Swarna	Sunny	Virginia Transformer Corp.	Guest
Tan	Jonathan	Northern Transformer	Guest
Tekle	Samuel	WEG Transformers	Guest
teNyenhuish	Ed	Hitachi Energy	Member
Thiede	Andreas	HIGHVOLT	Guest-RM1
Van Dreel	Cole	American Transmission Company	Member
Varghese	Ajith	Prolec GE Waukesha	Member
Varnell	Jason	Doble Engineering Co.	Member
Veeran	Kannan	Virginia/Georgia Transformer	Guest
Velasquez	Juan	Magetron	Guest
Vijayan	Krishnamurthy	Quanta Services	Member
Vyas	Pragnesh	Sunbelt Solomon	Member
Walker	David	MGM Transformer Company	Guest
Wallach	David	Duke Energy	Guest-RM1
Walters	Shelby	Howard Industries	Guest
Wang	Luke	BC Hydro	Guest
Weyandt	Paul	Schneider Electric	Guest-RM1
Yang	Fei	Hitachi Energy	Guest
Youn	Joseph	Iljin Electric	Guest
Zaman	Malia	IEEE SA	Guest
Zhang	Hongzhi	Hitachi Energy	Guest
Zibert	Kris	Allgeier, Martin and Associates	Guest-RM1
Ziomek	Waldemar	PTI Transformers	Member

J.9.6 WG HV & EHV Breaker & Transformer Sw. Transients C57.142

IEEE / PES Transformers Committee Performance Characteristics Subcommittee WG to Investigate the Interaction between Substation Transients And Transformers in HV and EHV Applications and Revision of C57.142

St. Louis, Missouri, USA Tuesday, October 29, 2024

11:00 AM – 12:15 PM

Hyatt Regency - Grand Ballroom D

**Chairman – Jim McBride
Vice Chair – Xose Lopez-Fernandez
Secretary – Tom Melle**

- 1) Welcome and Chair's Remarks
 - 2) Circulation of Attendance Sheets. Quorum was achieved with 34/43 Members present. Guest attendance was 64 for a total of 98 attendees.
 - 3) IEEE Patent Policy Slides – no patent claims
 - 4) Approval of Agenda and Minutes from Last Meeting: Spring 2024 Minutes (motion by Akash Joshi / 2nd by Rogerio Verdolin) and Fall 2024 Agenda (motion by Phil Hopkinson / 2nd by Akash Joshi) unanimously approved.
 - 5) C57.142 Ballot and Comment Resolution – Jim McBride
- The Chair presented the list of BRG Members. The BRG has reduced the unresolved comment list to just 15 unresolved comments and plans to address at least five per month in online meetings between now and the Spring 2025 meeting.
- Question from Phil Hopkinson: “what is the expected lifetime of MOV's internal to a transformer?”. Eduardo Garcia commented they are designed to

last the lifetime of the transformer. Rogerio Verdolin commented that simulations of these arrestors in the circuit should be a key element of the designed resilience of the transformer. Bertrand Poulin commented that arrestors inside the winding are only required to absorb several hundred amperes at most and that failure of these arrestors is extremely rare. This is totally different from needing to absorb the external line energy (perhaps ~10kA / ~1MV or more).

- 6) Mitigation Methods Task Force Update – Jim McBride / Phil Hopkinson
- The Chair presented the list of TF Members. A tutorial in the main session is being planned for Fall 2025 (latest Spring 2026).
- Rogerio Verdolin mentioned a paper he presented on the application of surge arrestors which he provided to the WG. The Chair also presented a list of the mitigation methods being considered so far that will be part of the tutorial and possibly added as a future Annex to the Guide. The Chair provided an overview of the few remaining comments (mostly general, but a few would require extensive changes to the organization of the Guide).
- Phil Hopkinson made a comment about older circuit breaker design utilizing “insertion of resistance” or “pre-insertion resistors” having dual sets of

contacts (the first step closing on a resistor and the second step shunting the resistor). Phil suggested there should be some review of these designs, as the breakers have increased voltage ratings since the original designs. Jesse Duffy commented that newer circuit breakers (vacuum, SF6) typically do not have pre-insertion resistors. This usage has become more specialized (as needed) rather than common. Kumar Mani commented that zero-voltage closing breakers now very common. Bertrand Poulin commented that certain utilities prefer closing at approx. 40° (phase angle), rather than zero-crossing, as this avoids the maximum potential for inrush currents. Phil Hopkinson discussed capacitance grading as an option, but suggested this was a more difficult approach. The Chair mentioned pending changes to vacuum-interrupter designs, as the industry moves away from SF6 breakers, as something to keep in mind.

Extensive discussions regarding the challenges of high-magnitude, high-frequency transients that the Guide is intended to address ensued. It was noted there are few (if any) factory tests that can simulate these occurrences. It was also mentioned that multi-contact vacuum interrupters rated 145 kV are increasingly common with 230 kV usage growing as well.

7) New Business – no new business

8) Next Meeting (Denver, CO March 23rd – 27th, 2025)

9) Adjournment at 12:05 PM

J.9.7 WG C57.158 Application Guide for Tertiary and Stabilizing Windings

PCS Working Group Revision of Application Guide for Tertiary and Stabilizing Windings C57.158

*Performance Characteristics Subcommittee
IEEE / PES Transformers Committee*

*October 29, 2024
St. Louis, Missouri, US*

UNAPPROVED MINUTES

This group met on Tuesday October 29, 2024 at 4:45 PM in St. Louis, MO, US. The attendance record showed 73 people attended the meeting with 24 out of the 37 Members present; a quorum to conduct business was established.

Following 11 Guests requested Membership (to be awarded after consecutive attendance to two WG meetings):

Alfredo Carrizales	Prolec GE
Eduardo Orozco (*)	GE Grid Solutions
Fei Yang	Hitachi Energy
Jerzy Kazmierzak (*)	Hitachi Energy
Jose Antonio Gonzalez	Georgia Transformer
Junho Lee (*)	HD Hyundai

Kim Yeounsoo	MEPPI
Manan Pandya	Siemens Energy
Marnie Rousell (*)	Entergy
Michael Botti	Hyosung HICO
Pedro Trujillo	HD Hyundai

(*) To become WG Members after this meeting.

The officers were introduced as Enrique Betancourt Chair, Xose Lope-Fernandez Vice Chair, and Kayland Adams Secretary.

IEEE Patent slides were covered, no issues were brought up.
IEEE Copyright Policy slides were discussed, no issues were brought up.

Attendance was conducted and quorum was achieved. Agenda was presented. Motion unanimously passed to approve agenda (Joe White, Sanjib Som). The Minutes from the last meeting were also unanimously approved (John John, Amitabh Sarkar).

1. OLD BUSINESS

Updates by each Task Force were presented.

1.1 Task Force 1: General editorial overview

Emilio Morales-Cruz, TF Leader, presented the findings. 92 comments were assembled, some editorial, some technical and some may require changes to other standards.

Sanjib Som made discussion to bring terminal labeling conflicts to C57.12.00 for resolving. Emilio will review the subject with his Group.

1.2 Task Force 2: Recommendations for Y-connected transformers without a delta connected winding.

Xose Lope-Fernandez, TF Leader, presented work in this section. Additional text was proposed to be added to clauses 4.3, 5.2, and 8.3 that refer to the following two papers that propose monitoring techniques that will allow Y-Y transformer without a tertiary to operate with a certain level of unbalance load:

[Alvarez-Gomez Part I 2024]

L. A. Alvarez-Gomez, X. M. Lopez-Fernandez, F. de Leon and A. Ramos, "Three-Phase Three-Legged Wye-Wye Transformers With Only One Neutral Grounded and No Stabilizing Winding—Part I: Zero-Sequence Performance," in *IEEE Transactions on Power Delivery*, vol. 39, no. 3, pp. 1451-1461, June 2024, doi: 10.1109/TPWRD.2024.3365857

[Alvarez-Gomez Part II 2024]

L. A. Alvarez-Gomez, X. M. Lopez-Fernandez, F. de Leon and A. Ramos, "Three-Phase Three-Legged Wye-Wye Transformers With Only One Neutral Grounded and no SW – Part II: Zero-

Sequence Permissible Temperature," in IEEE Transactions on Power Delivery, vol. 39, no. 3, pp. 1462-1473, June 2024, doi: 10.1109/TPWRD.2024.3365861.

Sanjib Som made a discussion that the guide should be standalone and not require the papers. Whatever methods recommended should be included in the guide and not require the review of other documents. Xose will discuss the subject within his Group.

One important question identified as part of the TF2 work is whether any tests could be recommended in the Guide, to validate the expected operational performance.

1.3 Task Force 3: Improvement and, or simplification of concepts in the Guide

Krzysztof Kulasek accepted the Leadership of this Task Force between the Spring 2024 meeting and Fall 2024 meeting. Work by Task Force 3 was presented by the WG Chair, as Krzysztof could not attend the meeting this time. Additions to clauses 5.4 and 8.1.2 were discussed, which explain "Loading of Multi-winding Transformers" and "Transfer of High Voltage to Low Voltage Windings".

1.4 Task Force 4: New recommendations for TW or SW

The WG Chair is currently leading this Task Force but has asked for other WG Member to volunteer to take the lead in future. Material was presented showing separate delta connected tertiary windings for axial split dual LV winding configurations. Additional text was proposed to be added to clause 4.1 to cover this topic.

A short presentation was given by the Chair to just introduce the topic of "Zero sequence flux and its effects on transformers/systems". A circuit model was also presented. Tutorial material will be supplemented by next WG's meeting, to cover the fundamentals necessary to understand the Guide's advanced concepts.

1.5 Next steps

Task Forces will continue working with the objective of recommending proposed text improvements, based on their findings and discussions, with the objective to incorporate them to Draft 2 version of the Guide.

2. NEW BUSINESS

No new business was brought up.

3. ADJOURN

Motion passed to adjourn. Rodrigo Ronchi made the motion, Emilio Morales-Cruz seconded. The meeting was adjourned at 6:00 PM.

Respectfully submitted,

Enrique Betancourt
Chairman

Dr. Xose Lopez-Fernandez
Co-Chair

Kayland Adams
Secretary

Next Page: Attendance List (RM = Request membership):

Last Name	First Name	Affiliation	Status
Adams	Kayland	Prolec GE	Member
Antosz	Stephen	Consultant	Member
Barker	Sean	Hitachi Energy	Guest
Betancourt	Edwin	Siemens Energy	Guest
Betancourt	Enrique	Prolec GE	Member
Boettger	William	Boettger Transformer Consulting LLC	Member
Botti	Michael	Hyosung HICO	RM
Calil	Wilerson	Hitachi Energy	Guest
Calitz	David	Siemens Energy Inc	Guest
Carrizales	Alfredo	PROLEC	RM
Chan	Vivian	Hitachi Energy	Guest
Chanda	sudip	Delta Star Inc	Guest
Choksi	Bhamile	Hitachi Energy	Guest
Dolloff	Paul	EKPC	Guest
do Prado	Gustavo	Siemens Energy	Guest
Dugan	Roger	RC Dugan	Guest
Dzodan	Janko	Koncar D&ST	Guest
Finn	Mark	Hitachi Energy	Guest
Frazier	Raymond	Ameren	Member
Garcia	Eduardo	Siemens Energy	Member
Garcia-Paredes	David	Virginia Transformers Corp	Guest
Garza	Hector	Orto de Mexico	Guest
Gasic	Dragana	Koncar D&ST	Guest
Gonzalez Ceballos	Jose Amtonio	Virginia/Georgia Transformers	RM
Griesacker	William	WGA	Guest
Hernandez	Carlos	Delta Star	Guest
Holifield	Thomas	Howard Industries	Guest
Jaroszewski	Marion	Delta Star Inc	Guest
Jensen	Nick	Delta Star	Guest
John	John	Virginia Transformer Corp.	Member
Juchem	Kevin	Hitachi Energy	Guest
Kazmierczak	Jerzy	Hitachi Energy	RM
Kim	Yeounsoo	MEPPI	RM

Kirchenmayer	Egon	Siemens-Energy	Member
Lee	Junho	HD Hyundai Electric	RM
Lopez-Fernandez	Xose M.	Universidad de Vigo	Member
Manzano	Moses	Hyosung HICO	Member
Morales-Cruz	Emilio	QUALITROL	Member
Munoz	Marta	Hitachi Energy	Member
Munoz	Martin	Orto de Mexico	Guest
Nambi	Shankar	Bechtel Energy, Inc.	Member
Nims	Joe	Allen & Hoshall	Guest
OMalley	Anastasia	Con Edison Co. NY	Guest
Orozco	Eduardo	GE Grid Solutions	RM
Pandya	Manan	Siemens Energy	RM
Pandza	Tihomir	Siemens Energy KPT	Guest
Patel	Sanjay	SGB-Smit USA	Member
Pavicic	Tomislav	Koncar Power Transformers Ltd	Guest
Plisic	Goran	Siemens Energy KPT	Guest
Prado	Gustavo	Siemens Energy	Guest
Reyes Perez	Juan	Hitachi Energy	Guest
Ronchi	Rodrigo	WEG Transformers Mexico	Member
Roussell	Marnie	Entergy	RM
Sankarakurup	Dinesh	Duke Energy	Member
Sarkar	Amitabh	Virginia Transformer Corporation	Member
Schiesl	Markus	SGB	Member
Snyder	Jason	FirstEnergy	Member
Som	Sanjib	PTT, LLC	Member
Speegle	Andy	Entergy	Member
Steineman	Andrew	Delta Star, Inc.	Guest
Tekle	Samuel	WEG Transformers USA	Guest
Tolcachir	Eduardo	TTE Transformers	Guest
Topol	Fran	Koncar Power Transformers	Guest
Trujillo	Pedro	HD Hyundai	RM
Varnell	Jason	Doble Engineering	Member
Vijayan	Krishnamurthy	Pennsylvania Transformers	Member
Wagner	John	American electric power	Guest
Wallach	David	Duke Energy	Guest
Washburn	Alan	Burns and McDonnell	Guest
Webb	Bruce	Knoxville Utilities Board	Guest
White	Joe	Power Engineers	Member
White	Leon	Hedrich	Guest
Woods	Deana	Prolec GE Waukesha	Guest

Yang	Fei	Hitachi Energy	RM
Yavuz	Koray	NOARK Electric	Guest
Zaman	Malia	IEEE SA	Guest
Zhang	Jie	CHINT Electric	Guest

J.9.8 WG PC57.32 Neutral Grounding Devices

IEEE Neutral Grounding Devices Working Group Meeting Hyatt Regency Hotel Vancouver, BC, Canada

**Tuesday, Oct 29, 2024
4:45 PM – 6:00 PM**

**Chair – Sheldon P. Kennedy
Vice-Chair – Thomas Melle
Secretary – Ed teNyenhuis**

- 1. Welcome and Chair's Remarks**
- 2. Circulation of Attendance Sheets**
(Quorum achieved – 17 of 26 Members; 18 Guests present)
- 3. Approval of Agenda**
(Motion to approve by Don Ayers, second by Sergio Panetta – motion passed without objection)
- 4. Patent Call - none**
- 5. Copyright and IEEE Ethics Policies**
- 6. Approval of Minutes from previous Meeting**
(Motion to approve by Don Ayers, second by Mike Sharp – motion passed without objection)
- 7. Reports from TF Leader Assignments**
 - a. Clause 4 - Neutral Grounding Reactors – Camilo Casallas**
All main body section draft work is complete. Will provide new Annex section on SPAR by December.
It was agreed to change the 92kV values in Table 3 to 115kV.
 - b. Clause 5 - Neutral Ground Fault Neutralizers – Klaus Pointner**
All work is complete including two new Annex's on "Failed Phase Grounding" and "Residual Current Compensator".

c. Clause 6 - Neutral Grounding Transformers – Don Ayers
All work is complete.

d. Clause 7 - Neutral Grounding Resistors – Ryan Hogg, Sergio Panetta
The TF held 18 meetings. All work is complete.

e. Clause 8 - Combination Devices - Sergio Panetta
The draft is being surveyed by the TF and will be complete by December.

8. Working Group Survey

It is planned that all the remaining TF draft work is completed by the end of the year. An overall draft will be prepared that will be sent for straw ballot to the WG by Feb 2025. It is hoped the comments can be reviewed at the Spring 2025 meeting in Denver.

9. Old Business

None

10. New Business

None

11. Next in-person meeting – Spring 2025 Meeting (IEEE TC – Denver USA, March 23 – 27, 2025)

12. Adjournment at 5.51PM local time

List of Meeting Attendees (including affiliation & member status).

Kennedy	Sheldon	Sheldon P. Kennedy Engineering	Chair
Melle	Thomas	HIGHVOLT	Vice-Chair
teNyenhuis	Ed	Hitachi Energy	Secretary
Casallas	Camilo	Trench Ltd.	Member
Dinh	Huan	Hitachi Energy	Member
Hossain	Saif	Trench Ltd.	Member
Sharp	Mike	Trench Ltd.	Member
Ayers	Donald	Ayers Consulting	Member
Bolar	Sankey	ONCOR	Member
Cruz Valdes	Juan Carlos	Prolec GE	Member
Hogg	Ryan	Bureau of Reclamation	Member
Panetta	Sergio	I-Gard Corp.	Member
Pointner	Klaus	Trench Austria	Member
Radbrandt	Ulf	Hitachi Energy	Member
Steckschulte	Kyle	AEP	Member
Thomas	Scott	Hitachi Energy	Member

Wong	Terry	Trench	Member
Allison	Robert	Dominion Energy	Guest
Beaudain	Jason	Wiedmann	Guest
Benitez	Orlando	Hyosung HICO	Guest
Bhardwaj	Naveen	Trench Group	Guest
Biggie	Kevin	Weidmann	Guest
Brooks	Jeffrey	Asplundh Engineering	Guest
Brzaznowski	Steven	BPA	Guest
Dom	Corsi	Doble	Guest
Dopplmair	Peter	Trench Group	Guest
Jesus	Rodriguiz	Voltyx	Guest
Kaineder	Kurt	Trench Austria	Guest
Keels	Thomas	KEElectric Engineering PLLC	Guest
Machain	Jose Luis	Prolec GE	Guest
Nolte	Michael	Kiewit	Guest
Parkinson	Dwight	Eaton Corp	Guest
Starcevic	Vedrana	Koncar	Guest
Vyas	Pragnesh	Sunbelt Soloman	Guest
Watson	Joshua	NPPD	Guest

J.9.9 TF Transformer Data Required for System Studies

J. Watson

Performance Characteristics Subcommittee Task Force Meeting Minutes
Transformer Data Required for System Studies
Hyatt Regency Hotel St. Louis at the Arch, St. Louis, MO
Grand Ballroom E(4)
Monday, October 28, 2024, 1:45 – 3:00PM

Chair: Joe Watson
Vice Chair: Rogerio Verdolin
Secretary: Alwyn Vanderwalt

The Task Force met for the first time at 1:45PM on Monday, 10/28/24 with 43 attendees. 17 attendees chose to become members. Patent and Copyright requirements were covered.

No motions or other official business were covered, and only general discussions were held on the purpose of the Task Force, which is to identify the system studies programs that are commonly used in the US by utilities and engineering firms and identify the transformer parameters that are required inputs to those programs. Once these programs and data inputs are identified, the Task Force will report or recommend

- Whether or not all parameters used in these programs are commonly available from design or test data
- If any commonly used parameters need to be defined to ensure consistent data
- Whether or not an IEEE document should be created or expanded to cover these transformer parameters

The Task Force discussed some of the programs that the attendees were familiar with such as

PSCAD, EMTP, CYME, OPAL-RT, and ETAP. We also learned that CIGRE published 2 Technical Bulletins in 2023, TB900 and TB901 on transformer models for network studies, and these will be reviewed.

In general, fault study and load flow studies appear to only require tap voltages, impedances and other data that are commonly available from transformer designers. Some stability programs, however, require data inputs that are not commonly available such as air core reactances, transformer core saturation curves, winding saturation locations and others.

The Task Force will meet in the Spring 2025 Denver meetings. The time slot for this first meeting was only available because a WG meeting had been cancelled. The Task Force will need another time slot.

The attendees were requested to survey their organizations that use system studies programs to identify the more commonly-used programs for discussion in a remote meeting tentatively scheduled for 4-6 weeks from now. The meeting adjourned at 3:00.

Meeting Attendees

First Name	Last Name	Affiliation	Status
Nabi	Almeida	Prolec GE	Member
Bhaumik	Choksi	Hitachi Energy	Guest
Mike	Craven	Qualus Power Services	Guest
Janet	Crockett	Fayetteville PWC	Guest
Luiz	de Oliveira	Hitachi Energy	Guest
Fernando	Duarte	EPRI	Guest
Roger	Dugan	EPRI (Retired)	Guest
Carlos	Gaytan	Prolec GE	Member
John	Hipchen	Copper Development Assn.	Guest
Miljenko	Hruac	Hitachi Energy	Guest
Zinan	Huang	Sieyum Toshiba	Guest
Basim	Khan	NEETRAC - Georgia Tech.	Guest
Egon	Kirchenmayer	Siemens Energy	Member
Evan	Knapp	Eaton	Guest
Nihat	Kosedagi	Hitachi Energy	Member
Anton	Koshel	Delta Star, Inc.	Guest
Andrew	Larison	Hitachi Energy	Guest
Lee	Matthews	Howard Industries	Guest
Tim	Menter	Lincoln Electric System	Member
Tyler	Morgan	Duke Energy	Guest
Dan	Mulkey	Mulkey Engineering Inc.	Guest
Jerry	Murphy	Retired - RCES	Member
Shankar	Nambi	Bechtel Energy, Inc.	Member
Verena	Pellon	NextEra/FPL	Guest

Goran	Plisic	Siemens Energy KPT	Member
Homer	Portillo	Advanced Power Technology	Guest
Bertrand	Poulin	Hitachi Energy	Guest
Ulf	Radbrandt	Hitachi Energy	Member
Marnie	Roussell	Entergy	Member
Eric	Schleismann	Southern Company	Guest
Stephen	Shull	BBC Electric Services Inc.	Member
Mike	Thibault	Pacific Gas and Electric	Guest
Fran	Topol	Koncar Power Transformers	Guest
Oliver	Uhlmann	Reinhausen Canada	Guest
Reinaldo	Valentin	Duke Energy	Guest
Alwyn	Vanderwalt	ECI	Secretary
Rogério	Verdolin	Verdolin Solutions	Vice-Chair
Alan	Washburn	Burns and McConnell	Member
Joshua	Watson	Nebraska Public Power District	Member
Joe	Watson	JD Watson and Associates, Inc.	Chair
Bruce	Webb	KUB	Guest
Hongzhi	Zhang	Hitachi Energy	Member
Zhixsang	Zhu	Chint	Guest

J.10 Performance Characteristics Subcommittee Attendance List

<u>First Name</u>	<u>Last Name</u>	<u>Affiliation</u>	<u>Status</u>
Rogério	Verdolin	Verdolin Solutions Inc.	Chair
Sanjib	Som	Pennsylvania Transformer	Vice-Chair
Kris	Zibert	Allgeier, Martin and Associates	Secretary
Kayland	Adams	Prolec-GE	Member
Tauhid Haque	Ansari	Hitachi Energy	Member
Donald	Ayers	Ayers Transformer Consulting	Member
Robert	Ballard	DuPont	Member
Christopher	Baumgartner	We Energies	Member
Wallace	Binder	WBBinder Consultant	Member
Daniel	Blaydon	Baltimore Gas & Electric	Member
William	Boettger	Boettger Transformer Consulting LLC	Member
Sanket	Bolar	Oncor Electric Delivery	Member
Juan Alfredo	Carrizales	Prolec GE	Member
Camilo	Casallas	TRENCH	Member
Craig	Colopy	Retired - EATON Corporation	Member
Juan Carlos	Cruz Valdes	Prolec GE	Member
J. Arturo	Del Rio	Siemens Energy	Member

Nikolaus	Dillon	Dominion Energy	Member
Evgenii	Ermakov	Hitachi Energy	Member
Reto	Fausch	RF Solutions	Member
Raymond	Frazier	Ameren	Member
Jose	Gamboa	H-J Family of Companies	Member
Eduardo	Garcia Wild	Siemens Energy	Member
Ramsis	Girgis	Hitachi Energy	Member
Sergio	Hernandez Cano	Hammond Power Solutions	Member
Saramma	Hoffman	PPL Electric Utilities	Member
Saif	Hossain	Trench Limited	Member
Ramadan	Issack	American Electric Power	Member
John	John	Virginia Transformer Corp.	Member
Jerzy	Kazmierczak	Hitachi Energy	Member
Sheldon	Kennedy	Sheldon P. Kennedy Engineering, PLLC	Member
Stacey	Kessler	Ulteig Engineers	Member
Egon	Kirchenmayer	Siemens Energy	Member
Moonhee	Lee	Hammond Power Solutions	Member
Weijun	Li	Braintree Electric Light Dept.	Member
James	McBride	JMX Services, Inc.	Member
Francis	Mills	Power Engineers	Member
Emilio	Morales-Cruz	Qualitrol Company LLC	Member
David	Murray	Tennessee Valley Authority	Member
Ryan	Musgrove	Oklahoma Gas & Electric	Member
Poorvi	Patel	Electric Power Research Institute (EPRI)	Member
Harry	Pepe	Phenix Technologies, Inc.	Member
Sylvain	Plante	Hydro-Quebec	Member
Klaus	Pointner	Trench Austria GmbH	Member
Ion	Radu	Hitachi Energy	Member
Rodrigo	Ronchi	WEG-Voltran	Member
Marnie	Roussell	Entergy	Member
Hakan	Sahin	Virginia/Georgia Transformer	Member
Amitabh	Sarkar	Virginia Transformer Corp.	Member
Daniel	Sauer	EATON Corporation	Member
Markus	Schiessl	SGB	Member
Ewald	Schweiger	Siemens Energy	Member
Abdul Majid	Shaikh	Delta Star, Inc.	Member
Hemchandra	Shertukde	University of Hartford	Member
Christopher	Slattery	FirstEnergy Corp.	Member
Steven	Snyder	Hitachi Energy	Member
Kyle	Stechschulte	American Electric Power	Member
Charles	Sweetser	OMICRON electronics Corp USA	Member
Ed	teNyenhuis	Hitachi Energy	Member

Ajith	Varghese	Prolec GE-Waukesha	Member
Jason	Varnell	Doble Engineering Co.	Member
Dharam	Vir	Prolec-GE	Member
Richard	vonGemmingen	Dominion Energy	Member
Pragnesh	Vyas	Sunbelt-Solomon	Member
David	Wallach	Duke Energy	Member
Drew	Welton	Intellirent	Member
Guang	Yuan	Hitachi Energy	Member
Joshua	Yun	Virginia Transformer Corp.	Member
Peter	Zhao	Hydro One	Member
Waldemar	Ziomek	PTI Transformers	Member
Akash	Joshi	Mott MacDonald	GuestNew
Sanjay	Patel	Smit Transformer	GuestNew
Krishnamurthy	Vijayan	Pennsylvania Transformers	GuestNew
Nabi	Almeida	Prolec GE	Guest
Elise	Arnold	SGB	Guest
Vivian	Chan	Hitachi Energy	Guest
Michael	Craven	Qualus Power Services	Guest
Thomas	Dauzat	AEP-SWEP CO	Guest
Pouneh	Davoudi	Delta Star Inc.	Guest
Luc	Dorpmanns	Royal Smit Transformers	Guest
William	Elliott	AEP-SWEP CO	Guest
Gary	Hoffman	Advanced Power Technologies	Guest
Ryan	Hogg	Bureau of Reclamation	Guest
Derek	Hollrah	Burns & McDonnell	Guest
Christopher	Johnson	Oncor Electric Delivery	Guest
Anton	Koshel	Delta Star Inc.	Guest
Fernando	Leal		Guest
Junho	Lee	Hyundai Electric	Guest
Yaquan (Bill)	Li	BC Hydro	Guest
Xose	Lopez-Fernandez	Universidade de Vigo	Guest
Kumar	Mani	Duke Energy	Guest
Alberto	Martinez	WEG Transformers USA Inc.	Guest
Omar	Mendez	Prolec-GE	Guest
Marta	Munoz	Hitachi Energy	Guest
Hugo	Murillo	H-J Family of Companies	Guest
Bertrand	Poulin	Hitachi Energy	Guest
Michael	Richardson	Ameren	Guest
Dinesh	Sankarakurup	Duke Energy	Guest
Eric	Schleismann	Southern Company	Guest
Avijit	Shingari	Pepco Holdings Inc.	Guest
Jason	Snyder	First Energy	Guest
Hampton	Steele	Tennessee Valley Authority	Guest

Andrew	Steineman	Delta Star Inc.	Guest
Joe	White	Power Engineers	Guest
Terry	Wong	Trench Limited	Guest
Fei	Yang	Hitachi Energy	Guest
Janet	Crockett	Fayetteville PWC	Guest
Eric	Elson	SDGE	Guest
Yeounsoo	Kim		Guest
David	Rohrer	First Energy	Guest
Brad	Staley	Leenard Renewable Energy	Guest
Sachin	Tade		Guest
John	Wagner	American electric power	Guest
Orlando	Benitez	Hyosung Hico	Guest
Sudip	Chanda	Delta Star Inc.	Guest
Peng	Fu	Chint Electric	Guest
Carlos	Hernandez	Delta Star	Guest
Miglenko	Hrvac	hitachi energy	Guest
Fawaz	Iqbal	Omicron	Guest
Marion	Jaroszewski	Delta Star Inc.	Guest
Dasim	Khan	Neetrac - Georgia Tech	Guest
Nihot	Kosedagi	Hatachi Energy	Guest
Arvind	Kumaria	Delta Star Inc.	Guest
Moses	Manzano	Hyosung Hico	Guest
Mark	Newbill	Hitachi Energy	Guest
Stephen	Oakes	WEG	Guest
Ednardo	Orozco	GE Grid Solutions	Guest
Pedro	Pedro	Efacec Energy	Guest
Gustavo	Prado	Siemens Energy	Guest
Thomas	Prevogt	Weidmann	Guest
Garret	SarKinen	Xcel Energy	Guest
Sunny	Swarha	Virginia Trf Corp	Guest
Juan	Velasquez	Magnetron	Guest
Koray	Yavuz	Noark Electric (US)	Guest
Jie	Zhang	Chint Electric	Guest
Hongzhi	Zhang	Hitachi Energy	Guest
Zhinizang	Zhm	Chint Electric	Guest

Annex K Power Transformers Subcommittee

October 30, 2024

St. Louis, Missouri, 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, October 30 at 1:30 p.m. The attendance record indicates that 87 out of 109 members of the subcommittee were in attendance; a quorum at the meeting was achieved. A total of 247 individuals attended the meeting. PTSC Chair Ryan Musgrove (Oklahoma Gas & Electric), Vice Chair Alwyn VanderWalt (Electrical Consultants, Inc.), and Secretary Weijun Li (Braintree Electric Light Department) were present.

Nine individuals requested membership by speaking with or emailing PTSC officers after the meeting. Eight attended at least 3 out of the last 5 meetings and therefore qualified for “Member” status. The 9th has not been recorded in attendance in 3 out of the last 5 meetings, and therefore not yet qualified for membership.

A total of 55 individuals were added as “Guests” to the subcommittee. Ten 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 115 members after the Fall 2024 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 and mentioned that a typo was corrected in the previously circulated Spring 2024 meeting minutes. Stephen Shull (BBC Electrical Services, Inc.) made a motion to approve the agenda as presented, which was seconded by Juan Carlos Cruz-Valdes (Prolec GE). The agenda was approved without objection. The approved agenda can be found in Attachment K.2. Sanjib Som (Pennsylvania Transformer) made a motion to approve the Spring 2024 meeting minutes with correction, which was seconded by Stephen Shull (BBC Electrical Services, Inc.). The Spring 2024 meeting minutes were approved without objection.

K.3 Chair’s Remarks

The Chair provided an update on the PTSC roster. One member had been moved to Guest status due to not having attended at least 3 out of the last 5 meetings. Attendees were reminded to verify their email address and update as necessary. 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. Membership requests on paper roster will not be accepted.

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 the scheduling of meetings, submission of minutes, and other administrative tasks. 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. Paper roster will continue to be used until the new system is ready and data migration is complete.

The Chair reminded the working groups of patent calls and copyright & participant behavior review at each meeting and note in the 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 a 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 Malia Zaman is transitioning away from the Transformers Committee. Patrycja Jarosz will be the IEEE staff point of contact for PTSC going forward.

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

The Chair introduced 3 new members that were added to the PTSC membership list since the Spring 2024 meeting. The new members are listed below:

Jose Machain (Prolec GE)
Ed teNyenhuis (Hitachi Energy)
Dharam Vir (Prolec GE)

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.

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 St. Louis. The final draft (D1.3) was approved as a revised standard by IEEE SA Standards Board Standards Review Committee (RevCom) on February 15, 2024.

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) reported that Marc Foata (Maschinenfabrik Reinhausen) gave a presentation on rupture proof OLTC solutions. The group reviewed the proposed modifications to sections 4.2.2 & 4.2.3 that were prepared by a task force formed by Samuel Brodeur (Hitachi Energy) and Enrique Betancourt (Prolec GE). The group also reviewed some of the proposed modifications to Section 5.2 that were prepared by another task force formed by Marc Foata (Maschinenfabrik Reinhausen), Chris Johnson (Oncor), Ryan Musgrove (Oklahoma Gas & Electric), Samson Debass (EPRI), and Didier Hamoir (Transformer Protector Corp). Discussion of these technical topics will continue at the next meeting.

The complete meeting minutes can be found in Attachment K.4.2. The next in-person meeting is planned for Spring 2025 in Denver, Colorado.

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 6 members and 27 guests present. 2 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 2 of the document. The WG Chair indicated that further updating of IEEE 638 will be based on changes to another standard IEEE/IEC 60980-344-2020. The group will also review Annex A for update.

The complete meeting minutes can be found in Attachment K.4.4. The next in-person meeting is planned for Spring 2025 in Denver, Colorado.

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 48 attendees and achieved a quorum. WG Chair Ewald Schweiger (Siemens Energy) provided an update on document review since the Vancouver meeting. Kevin Juchem (Hitachi Energy) and Luc Dorpmanns (Royal SMIT Transformers) presented ideas about harmonization and redistribution of contents in Guide C57.135 and Standard 60076-57-1202. 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 is looking 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 Spring 2025 in Denver, Colorado.

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 St. Louis due to the new draft guide being in the final ballot resolution stage. WG Chair Mike Spurlock (Spurlock Engineering Services, LLC) was not in attendance. WG Vice Chair Poorvi Patel (EPRI) reported that Draft 1.7 completed the 3rd recirculation on October 12, 2024 with a 98% approval rate and an 89% response rate. No comments were received. The final review by RevCom is expected to take place on December 10, 2024.

K.4.7 WG C57.12.10, Standard Requirements for Liquid-Immersed Power Transformers – Scott Digby

This working group met on Monday with 93 attendees. 38 individuals requested membership. 24 members from the task force carried over as new working group members. The new working has a total of 62 members. The current document expires at the end of 2027.

WG Chair Scott Digby (Duke Energy) discussed the revising plan with the group. The document will be circulated to the WG membership in "straw ballot" type format to gather comments for discussion and revision consideration. The group will then determine the next steps based on return/response from document circulation.

The complete meeting minutes can be found in Attachment K.4.7. The next in-person meeting is planned for Spring 2025 in Denver, Colorado.

K.4.8 TF C57.140, Guide for Evaluation and Reconditioning of Liquid-Immersed Power Transformers – Sanjib Som

This task force had their second in-person meeting on Monday with 64 attendees and achieved a quorum. After much discussion, the task force approved the following new Title and Scope (not including Purpose):

Title: IEEE 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.

Being mindful of the definitions of Reconditioning and Refurbishment, the task force noted that the Chairs of C57.140, C57.637, and C57.170 should coordinate and make sure that there is clear understanding that this document (C57.140) would not encroach on the scope of C57.637 or C57.170.

TF Chair Sanjib Som (Pennsylvania Transformer) made a motion to create a PAR to revise C57.140, Guide for Evaluation and Reconditioning of Liquid-Immersed Power Transformers. Ewald Schweiger (Siemens Energy) seconded the motion. The motion passed with unanimous approval.

The complete meeting minutes can be found in Attachment K.4.8. Marcos Ferreira (Quanta Technology) is now the group's new chair.

The next in-person meeting is planned for Spring 2025 in Denver, Colorado.

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) reminded the group of the tight timeline for completing a draft guide. The current document expires on December 31, 2025.

The group reviewed and approved the proposed modifications to Section 4.2 (Flowchart) and Table 8. With this, the WG completed the review of the existing document with appropriate revisions approved by the WG. The plan is to complete a draft document with all proposed revisions before the Spring 2025 meeting and proceed with ballot. The WG may request a PAR extension at the next meeting as needed.

The complete meeting minutes can be found in Attachment K.4.9. The next in-person meeting is planned for Spring 2025 in Denver, Colorado.

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 37 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. Attila Gyore (Midel) presented at the meeting on topic of synthetic esters.

The complete meeting minutes can be found in Attachment K.4.10. The next in-person meeting is planned for Spring 2025 in Denver, Colorado.

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 an initial ballot was completed with 80% response rate and 91% approval rate. A total of 172 comments were received including 37 technical and 135 editorial/general comments. The group plans to resolve all comments by the end of this year and go for recirculation in the first quarter of 2025.

The complete meeting minutes can be found in Attachment K.4.11. The next in-person meeting is planned for Spring 2025 in Denver, Colorado.

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 St. Louis. The revised guide was approved in 2023. According to the standards report, this document was marked as being published in 2023, with next revision due December 2033.

K.4.13 WG PC57.17, Standard Requirements for Arc Furnace Transformers – Dom Corsi

This working group met on Tuesday with a total of 34 attendees. 13 of 21 members were present; therefore, a quorum was achieved. This was the third meeting as a working group. With one member removal and two newly added members, the WG now has 22 members.

The group reviewed the current working draft and the comments from the 1st straw ballot. The group agreed to go for 2nd straw ballot for additional comments.

The WG Chair Dom Corsi (Doble Engineering) transitioned chair position to Secretary (Jason Varnell, Doble Engineering) who will preside as WG chair going forward. Trenton Williams (Advanced Power Tech.) will be the new secretary.

The complete meeting minutes can be found in Attachment K.4.13. The next in-person meeting is planned for Spring 2025 in Denver, Colorado.

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 St. Louis. 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 50 attendees and achieved a quorum. WG Chair Ewald Schweiger (Siemens Energy) provided an update on document review since the Vancouver meeting.

Kevin Juchem (Hitachi Energy) and Luc Dorpmanns (Royal SMIT Transformers) presented ideas about harmonization and redistribution of contents in Guide C57.135 and Standard 60076-57-1202 and the input from IEC Polish NC for the separate measurements of the impedances of the HV/LV (series/exciter unit). 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 is seeking 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 Spring 2025 in Denver, Colorado.

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 1st official working group meeting.

WG Chair Scott Reed (MVA) presented the project timeline and an overview of the existing document.

The WG formed 7 task forces:

- 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 report back to the WG at the Spring 2025 meeting with recommendations on how to revise the existing document.

The complete meeting minutes can be found in Attachment K.4.16. The next in-person meeting is planned for Spring 2025 in Denver, Colorado.

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 and are resolving comments. Because it was an entity PAR, individuals were not permitted to vote on the guide amendment.

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.

A modification to bibliography was discussed and approved. Proposed revisions to Annex C – Apparent Circulating Current were presented. The draft document will be updated with the proposed revisions and distributed to the WG. The definition of Reverse Power Flow was discussed. The WG decided there isn't a need to define it at this point and will proceed with work. The WG will wait to see how C57.12.80 and C57.133 define Reverse Power Flow. The group requested volunteers to draft a section on acceptable actions during reverse power flow conditions.

The group also discussed the impact IEEE P3400 may have on the language in the guide.

The complete meeting minutes can be found in Attachment K.4.18. The next in-person meeting is planned for Spring 2025 in Denver, Colorado.

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. Liaison Brian Sparling (Kinectrics) provided the following progress report:

Draft 3.0 still under development
November 1, 2024 – Draft 3.0 completion

December 26, 2024 – Draft 4.0 completion
February 2, 2025 – Submit to Pre-MEC and MEC
April 2, 2025 – Submit draft to PE/TR for approval
June 1, 2025 – Initiate ballot invitation

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:

Draft 1 still under development
November 27, 2024 – Draft 1.0 Completion
December 12, 2024 – The Second WG Meeting and Approval of Draft 1.0
February 17., 2025 – The Third WG Meeting and Approval of Draft 2.0
April 22, 2025 – The Fourth WG Meeting and Approval of Draft 3.0 (Ballot Ready Draft)
June 18, 2025 – The Fifth WG Meeting (If needed)
July 16, 2025 – Submit to Mandatory Editorial Coordination (MEC)
September 3, 2025 – Update draft based on MEC Report
November 19, 2025 – Initiate SA Ballot

There were no meeting minutes for this liaison activity.

K.5 Old Business

Discussion on Creation of a New IoT Document – Hemchandra Shertukde and Sanjib Som

Study group chair Hemchandra Shertukde (University of Hartford) said that he contacted an engineer with IoT experience and talked about the possibility of putting together a short article on this topic. Dan Sauer (Eaton Corporation) made a motion to table the topic until further solid update becomes available. Stephen Shull (BBC Electrical Services, Inc.) seconded the motion. The motion passed with unanimous approval.

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

PTSC Chair Ryan Musgrove (Oklahoma Gas & Electric) provided an update on the so-called IEEE 693 Amendment “P693a” and Bushings Subcommittee Chair Eric Weatherbee’s efforts appealing IEEE SA’s approval of the “Amendment”. Note that Eric Weatherbee is affiliated with PCORE Electric. Transformers Committee Chair David Wallach (Duke Energy) confirmed that the “Amendment” was approved and Eric Weatherbee’s appeal was turned down. 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. Standards Coordinator Stephen Shull (BBC Electrical Services,

Inc.) echoed the Chair's comments and urged participation from bushing and transformer experts. Anyone who is interested in getting involved is encouraged to contact the PTSC Chair at ryan.musgrove@ieee.org. The Chair plans on emailing all PTSC members and guests when further information about the next revision becomes available.

K.6 New Business

60076-16 Power Transformers – Part 16: Transformers for Wind Turbine Applications – Revision due 2028

The revision of this document is due in 2028. The Chair will appoint a volunteer to lead a study group to review the document and suggest next steps. The Chair has noted that PAR study group will be postponed until work is completed on at least two of the ongoing PTSC standards to help try to prevent future meeting scheduling conflicts. This will fall under old business to be reviewed at the next subcommittee meeting.

It should be noted that after the Performance Characteristics Subcommittee meeting and further conversation with the standards coordinator, it appears that IEC/IEEE 60076-16 was improperly marked as belonging to the Power Transformers Subcommittee and it actually belongs to the Performance Characteristics Subcommittee

60214-2 Draft 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. The Chair has noted that PAR study group will be postponed until work is completed on at least two of the ongoing PTSC standards to help try to prevent future meeting scheduling conflicts. This will fall under old business to be reviewed at the next subcommittee meeting.

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

The revision of this document is due in 2030. The Chair will appoint a volunteer to lead a study group to review the document and suggest next steps. The Chair has noted that PAR study group will be postponed until work is completed on at least two of the ongoing PTSC standards to help try to prevent future meeting scheduling conflicts. This will fall under old business to be reviewed at the next subcommittee meeting.

SCATE P3476 – Standard for Unique IDs and Smart Tags for Supply Chain and Asset Traceability for the Electric Grid – Alicia Farag

P3476 Work Group Chair Alicia Farag (LocusView) gave a presentation titled Supply Chain and Asset Traceability for Energy (SCATE) on industry standard unique IDs and smart tags (QR codes) for power equipment. This standard addresses unique identification numbers for electric grid assets including generation, transmission, substation, distribution, storage, and electric vehicle charging stations. The unique identifiers include a universal catalog identifier, manufacturer identifier, and traceability identifier.

Existing IEEE standard C57.12.35 (IEEE Standard Bar Coding for Distribution Transformers and Step-Voltage Regulators) covers manufacturer, serial number, manufacture date, customer

catalog ID, etc. but such information may not include all critical attribute data. SCATA P3476 covers industry standard catalog IDs with all critical attributes that are embedded directly into a smart tag that does not require look-up in another system and is consistent across all asset types (not just transformers).

The scope of the IEEE P3476 WG is to convert the SCATE specification into a standard and develop unique ID data models for each asset type.

The presentation touched on use cases and success stories from the natural gas industry. The presentation also illustrated various asset types and associated data model.

P3476 Work Group Chair Alicia Farag (LocusView) mentioned that the following asset types will likely be prioritized for Version 1 of the document and the WG will need Subject Matter Experts (SMEs) for each of these in the work group:

- Liquid-filled power and distribution transformers, C57.12.00
- Dry-type power and distribution transformers, C57.12.01
- Instrument transformers, C57.13.5
- Voltage regulators, C57.15

Extensive discussions were carried out during the Q&A session following the presentation. Topics included approximate project timeline (raised by Timothy Raymond, Consultant), optional attributes such as customer purchase order number (raised by Ewald Schweiger of Siemens Energy), advantages of interchangeability & mutual aid assistance (raised by Francis Mills of Power Engineers), potential impact on OEM's existing inventory/tracking systems (raised by Joshua Yun of Virginia Transformer Corp.), whether serial number being part of the new ID and a potentially challenging decoding process as time changes (raised by Trenton Williams of Advanced Power Technologies), and similar activities on the IEC side (raised by Brian Sparling of Kinectrics).

Gary Hoffman (Advanced Power Technologies) pointed out that the Transmission & Distribution Committee is the sponsor committee of P3476.

The presentation given was a condensed version. Once available, a copy of the full presentation provide by Alicia Farag will be posted on the PTSC website:
<https://www.transformerscommittee.org/subcommittees/powertransf/>

Power System Relaying and Control Committee Seeking Liaison – Michael Thompson

Power System Relaying and Control Committee (PSRC) Chair Michael Thompson (SEL Engineering Services, Inc.) introduced himself and shared his view of mutual benefits of having a liaison from the Transformers Committee participate in PSRC's activities. Participation from PTSC would be especially important due to PSRC's involvement in protection and control of power transformers and reactors. The PSRC group meets 3 times a year. A liaison attending PSRC meetings at least once a year would be beneficial. The goal is to share updates/reports between the two committees. Anyone who is interested in being the liaison is encouraged to contact Michael Thompson at michael.thompson@ieee.org and/or the PTSC Chair at ryan.musgrove@ieee.org.

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 (No Meeting Minutes)

Attendance Record

Role	First Name	Last Name	Company
Member	Kayland	Adams	Prolec GE Waukesha
Guest	Anthony	Alexander	Hitachi Energy
Guest	Rehan	Ali	Siemens Energy
Guest	Rehan	Ali	Siemens Energy, Inc.
Guest	Robert	Allison	Dominion Energy
Member	Tauhid Haque	Ansari	Hitachi Energy
Guest	Elise	Arnold	SGB
Member	Onome	Avanoma	MJ Consulting
Guest	Paulo	Avelino	Hitachi Energy BR
Member	Donald	Ayers	Ayers Transformer Consulting
Member	Gilles	Bargone	FISO Technologies Inc.
Guest	Gilles	Barthes	Hitachi Energy
Member	Christopher	Baumgartner	We Energies
Guest	Hugo	Bayona	H-J Family of Companies
Guest	Jason	Beaudoin	Weidmann Electrical Technology
Guest	Orlando	Benitez	Hyosung HICO
Member	Enrique	Betancourt	Prolec GE
Guest	Edwin	Betancourt	Siemens Energy
Guest	Naveen	Bhardwaj	Trench Group
Guest	Kevin	Biggie	Weidmann Electrical Technology
Member	Wallace	Binder	WBBinder Consultant
Guest	Piotr	Blaszczyk	Specialty Transformer Components LLC
Member	Daniel	Blaydon	Baltimore Gas & Electric
Member	William	Boettger	Boettger Transformer Consulting LLC
Guest	Sanket	Bolar	Oncor Electric Delivery
Member	Paul	Boman	Hartford Steam Boiler
Member	Jeremiah	Bradshaw	Bureau of Reclamation
Guest	Garrett	Bradshaw	Howard Industries
Guest	Samuel	Brodeur	Hitachi ABB Power Grids
Guest	Steven	Brzoznowski	Bonneville Power Administration
Member	David	Calitz	Siemens Energy
Guest	Juan Alfredo	Carrizales	Prolec GE
Member	Juan	Castellanos	Prolec GE
Guest	Vivian	Chan	Hitachi Energy
Guest	Luiz	Cheim	Hitachi Energy
Guest	Caleb	Colby	Schneider Electric
Member	Craig	Colopy	Retired - General Interest

Guest	Michael	Craven	Qualus Corp.
Guest	Janet	Crockett	Fayetteville PWC
Member	Juan Carlos	Cruz Valdes	Prolec GE
Guest	Marcos	Czernorucki	Hitachi Energy
Guest	Roberto	Da Silva	Maschinenfabrik Reinhausen
Guest	Tim	Dappen	Cargill
Guest	Thomas	Dauzat	AEP-SWEPCO
Member	Eric	Davis	Consultant
Guest	Pouneh	Davoudi	Delta Star Inc.
Guest	Gabriel	Delgado	Invenergy
Member	Scott	Digby	Duke Energy
Guest	Nikolaus	Dillon	Dominion Energy
Guest	Paul	Dolloff	East Kentucky Power
Guest	Jeffrey	Door	H-J Family of Companies
Guest	Peter	Dopplmair	Trench Group
Guest	Luc	Dorpmanns	Royal SMIT Transformers
Guest	Jesse	Duffy	Nashville Electric Service
Guest	Kenneth	Dugger	Voltyx/NASS
Guest	Janko	Dzodan	Koncar D&ST
Guest	William	Elliott	AEP-SWEPCO
Guest	Eric	Elson	SDGE
Member	Evgenii	Ermakov	Hitachi Energy
Guest	Egui	Espitia	Reinhausen Mfg
Member	Reto	Fausch	RF Solutions
Member	Marcos	Ferreira	Quanta Technology
Guest	Joseph	Foldi	Foldi & Associates, Inc.
Guest	Raymond	Frazier	Ameren
Guest	Jose	Gamboa	H-J Family of Companies
Member	Eduardo	Garcia Wild	Siemens Energy
Guest	Miguel	Garcia Wild	Hitachi Energy
Guest	James	Gardner	Prolec GE Waukesha
Guest	Joshua	Garner	Independent Dielectrics
Guest	Dragana	Gasic	Koncar D&ST
Guest	Orlando	Giraldo	H-J Family of Companies
Member	Ramsis	Girgis	Hitachi Energy
Guest	Alireza	Gorzin	Black & Veatch
Guest	Brad	Grooms	NTS
Member	Ismail	Guner	Hydro-Quebec
Member	Niklas	Gustavsson	Hitachi Energy
Member	Attila	Gyore	MIDEL

Guest	Jesse	Hall	Virginia Transformer Corp.
Guest	Didier	Hamoir	Transformer Protector Corp
Guest	Kevin	Hampton	Siemens Energy
Guest	Eric	Hatton	Tempel
Guest	Ronald	Hernandez	Doble Engineering Co.
Guest	William	Herron	Reinhausen
Member	Gary	Hoffman	Advanced Power Technologies
Member	Saramma	Hoffman	PPL Electric Utilities
Member	Ryan	Hogg	Bureau of Reclamation
Guest	Thomas	Holifield	Howard Industries
Guest	Traci	Hopkins	H2Scan
Member	Philip	Hopkinson	HVOLT Inc.
Guest	Zinan	Huang	Sieyuan
Guest	Marion	Jaroszewski	Delta Star Inc.
Guest	Nicholas	Jensen	Delta Star Inc.
Member	John	John	Virginia Transformer Corp.
Guest	Christopher	Johnson	Oncor Electric Delivery
Member	Akash	Joshi	Kimley-Horn
Member	Kurt	Kaineder	Trench Austria
Guest	Sergiusz	Kapka	Hitachi Energy
Guest	Mick	Kasonga	ONCOR Electric
Guest	Jerzy	Kazmierczak	Hitachi Energy
Guest	Thomas	Keels	kEElectric Engineering PLLC
Member	Sheldon	Kennedy	Sheldon P. Kennedy Engineering, PLLC
Guest	Qasim	Khan	Neetrac Georgia Tech
Guest	Yeounsoo	Kim	MEPPI
Guest	Seungmo	Kim	Hyosung HICO
Guest	Yonghui	Kim	ILJIN Electric
Member	Zan	Kiparizoski	Howard Industries
Member	Egon	Kirchenmayer	Siemens Energy
Guest	Anton	Koshel	Delta Star Inc.
Guest	Andreas	Kurz	MR
Guest	Mateusz	Kwiatkowski	Hitachi Energy
Guest	Ashwini	Labh	Hitachi Energy
Guest	Donald	Lamontagne	Arizona Public Service Co.
Guest	Fernando	Leal	Prolec GE
Guest	Jihun	Lee	HD HYUNDAI electric
Guest	Junho	Lee	Hyundai Electric
Guest	Stefan	Lembacher	Siemens Energy
Secretary	Weijun	Li	Braintree Electric Light Dept.

Guest	Luc	Loiselle	Tetra Tech
Guest	Xose	Lopez-Fernandez	Universidade de Vigo
Member	Jose	Machain	Prolec GE
Guest	Jinesh	Malde	M&I Materials Inc.
Member	Kumar	Mani	Duke Energy
Guest	Francis	Mantoan	Siemens Energy
Guest	Moses	Manzano	Hyosung HICO
Guest	Daniel	Martinez	Lamination Specialties Inc.
Guest	Daniel	Martinez	
Guest	Katherine	Marulanda	Magnetron
Member	Thomas	Melle	HIGHVOLT
Guest	Toni	Mellin	Vaisala
Guest	Omar	Mendez Zamora	Prolec GE
Guest	Philip	Miller	Memphis Light, Gas & Water
Member	Francis	Mills	Power Engineers, Inc.
Member	Emilio	Morales-Cruz	Qualitrol Company LLC
Guest	Marta	Munoz	Hitachi Energy
Guest	Fredy	Murcia	Siemens Energy
Guest	Hugo	Murillo	H-J Family of Companies
Member	David	Murray	Tennessee Valley Authority
Chair	Ryan	Musgrove	Oklahoma Gas & Electric
Guest	Anthony	Natale	HICO America
Guest	Mark	Newbill	Hitachi Energy
Guest	Rudolf	Ogajanov	Hitachi Energy
Member	Anastasia	O'Malley	Consolidated Edison Co. of NY
Guest	Eduardo	Orozco	GE Grid Solutions
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	Jason	Perkins	Moehn Electrical
Guest	Goran	Plisic	Siemens Energy KPT
Guest	Christoph	Ploetner	Siemens Energy
Guest	Dominic	Pollaro	NASS
Guest	Homero	Portillo	Advanced Power Technologies
Guest	Nicholas	Post	WEC Energy Group

Guest	Gustavo	Prado	Siemens Energy
Member	Ion	Radu	Hitachi Energy
Guest	Timothy	Raymond	Electric Power Research Institute (EPRI)
Member	Scott	Reed	MVA
Guest	Perry	Reeder	PA Transformer
Guest	Sebastian	Rehkopf	Maschinenfabrik Reinhausen
Guest	David	Reyes	ONCOR
Guest	Michael	Richardson	Ameren
Guest	Diego	Robalino	Megger
Guest	Rodrigo	Ronchi	WEG-Voltran
Guest	Yuri	Rossini	Siemens Energy
Member	Marnie	Roussell	Entergy
Member	Mickel	Saad	Hitachi Energy
Member	Hakan	Sahin	Virginia/Georgia Transformer
Member	Dinesh	Sankarakurup	Duke Energy
Guest	Amitabh	Sarkar	Virginia Transformer Corp.
Member	Daniel	Sauer	EATON Corporation
Member	Markus	Schiessl	SGB
Guest	Eric	Schleismann	Southern Company Services
Guest	Alfons	Schrammel	Siemens Energy
Member	Dan	Schwartz	Quality Switch, Inc.
Member	Ewald	Schweiger	Siemens Energy
Member	Cihangir	Sen	Duke Energy
Member	Adam	Sewell	Quality Switch, Inc.
Guest	Jeremy	Sewell	Quality Switch, Inc.
Member	Abdul Majid	Shaikh	Delta Star Inc.
Member	Hemchandra	Shertukde	University of Hartford
Member	Stephen	Shull	BBC Electrical Services, Inc.
Guest	Stefan	Siebert	BROCKHAUS Measurements
Guest	Jonathan	Sinclair	Black & Veatch
Guest	Christopher	Slattery	FirstEnergy Corp.
Guest	Jason	Snyder	FirstEnergy Corp.
Guest	Muhammad Abdullah	Sohail	Trench
Member	William	Solano	Reinhausen Manufacturing Inc.
Member	Sanjib	Som	Pennsylvania Transformer
Guest	Jonathan	Sonclair	Black and Veatch
Guest	Brian	Sparling	Kinectrics
Member	Brad	Staley	Leeward Energy
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
Guest	Jonathan	Tan	Northern Transformer
Member	Troy	Tanaka	Burns & McDonnell
Guest	Samuel	Tekle	WEG Transformers USA
Guest	Jesse	Theberge	Tempel
Guest	Andreas	Thiede	Highvolt
Guest	Scott	Thomas	Hitachi Energy
Member	Ryan	Thompson	Burns & McDonnell
Guest	Michael	Thompson	SEL Engineering Services, Inc.
Guest	James	Thompson	T & R Service Company
Guest	Timothy	Tillery	Howard Industries
Guest	Francis	Topol	Siemens Energy KPT
Member	Mark	Tostrud	Dynamic Ratings, Inc.
Vice-Chair	Alwyn	Van Der Walt	Electrical Consultants, Inc.
Member	Ajith	Varghese	Prolec Energy
Member	Jason	Varnell	Doble Engineering Co.
Guest	Juan	Velasquez	Magnetron
Member	Rogério	Verdolin	Verdolin Solutions Inc.
Guest	Karsten	Viereck	Maschinenfabrik Reinhausen
Guest	Krishnamurthy	Vijayan	Pennsylvania Transformers
Member	Dharam	Vir	Prolec GE
Member	Richard	vonGemmingen	Dominion Energy
Member	Pragnesh	Vyas	Sunbelt-Solomon
Guest	John	Wagner	AEP
Member	David	Wallach	Duke Energy
Guest	Alan	Washburn	Burns & McDonnell
Guest	Joshua	Watson	NPPD
Member	Bruce	Webb	Knoxville Utilities Board
Guest	Matthew	Webb	GE Vernova
Guest	Drew	Welton	Intellirent
Guest	Peter	Werelius	Megger
Member	Daniel	Weyer	Monolith
Guest	Joe	White	Power Engineers
Guest	Leon	White	Hedrich
Member	William	Whitehead	H2scan Corporation
Member	Trenton	Williams	Advanced Power Technologies
Member	Jeffrey	Wright	Duquesne Light Co.

Guest	Fei	Yang	Hitachi Energy
Guest	Tim	Young	Hitachi Energy
Guest	Zhenguan	Yu	Sieyuan Toshiba
Member	Joshua	Yun	Virginia Transformer Corp.
Guest	Malia	Zaman	IEEE
Guest	Jie	Zhang	Chint ELECTRIC CO.,LTD
Member	Peter	Zhao	Hydro One
Guest	Zhu	Zhixiang	Chint ELECTRIC CO.,LTD
Member	Kris	Zibert	Allgeier, Martin and Associates
Member	Waldemar	Ziomek	PTI Transformers

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
 - i. Monday Oct 28th, 9:30-10:45 – Grand Ballroom GH (4)
 - 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
 - i. Monday Oct 28th, 11:00-12:15 – Grand Ballroom F (4)
 - e. WG C57.135, Guide for Phase shifting Transformers.....Ewald Schweiger
 - i. Monday Oct 28th, 1:45-3:00 – Grand Ballroom GH (4)
 - f. WG Revision of C57.143, Monitoring Guide (no meeting) Mike Spurlock
 - g. WG Requirement for Liquid-Immersed Power TR – C57.12.10..... Scott Digby
 - i. Monday Oct 28th, 3:15-4:30 – Grand Ballroom D (4) **First meeting**
 - h. TF Guide for Evaluation & Reconditioning of Liquid Immersed TR C57.140..... Sanjib Som
 - i. Monday Oct 28th, 3:15-4:30 – Grand Ballroom E (4)
 - i. WG Revision of C57.125, Failure Investigating and Reporting Hakan Sahin
 - i. Monday Oct 28th, 4:45-6:00 – Grand Ballroom GH (4)
 - j. WG C57.157, Guide for Life test of Switch Contacts..... Adam Sewell
 - i. Tuesday Oct 29th, 8:00-9:15 – Grand Ballroom C (4)
 - k. WG C57.170, Condition Assessment Guide Kumar Mani
 - i. Tuesday Oct 29th, 9:30-10:45 – Grand Ballroom D (4)
 - l. WG Revision of C57.150, Transportation Guide (No meeting)..... Greg Anderson
 - m. WG C57.17, Standard Requirements for Arc Furnace Transformers..... Dom Corsi
 - i. Tuesday Oct 29th, 11:00-12:15 – Grand Ballroom C (4)
 - n. WG C57.107, Transformer Volts per Hertz (No meeting)..... Joe Watson
 - o. WG Liquid Immersed Phase-Shifting Transformers 60076-57-1202 Ewald Schweiger
 - i. Tuesday Oct 29th, 1:45-3:00 – Grand Ballroom C (4) **First meeting**
 - p. WG C57.93, Installation and Maintenance Guide Scott Reed
 - i. Tuesday Oct 29th, 3:15-4:30 – Grand Ballroom D (4) **First meeting**
 - q. Liaison to PC57.93a – Installation and Maintenance Guide Scott Reed
 - r. WG C57.153, Guide for Paralleling Transformers Mark Tostrud
 - i. Tuesday Oct 29th, 4:45-6:00 – Grand Ballroom C (4)
 - 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. Discussion on the creation of a new IOT Document – Sanjib Som/Hemchandra Shertukde
 - b. IEEE 693 Recommended Practice for Seismic Design of Substations – Substations Standards Committee – Need volunteers, especially users and transformer manufacturers.
9. New business
10. Adjournment

Title: WG Guide for Tank Rupture Mitigation PC57.156

Time: 9:30 AM- 10:45 AM, Monday, October 28, 2024

Place: Hyatt Regency St. Louis at the Arch, St Louis, MO, 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
25	13	16	63	Yes

2. Approval of Meeting Minutes

- a. Motion to accept minutes of the spring 2024 meeting (Vancouver).
 - i. Moved: Kevin Juchem
 - ii. Seconded: Eduardo Garcia
 - iii. The Spring 2024 meeting minutes were unanimously approved.

3. Technical Topics

- i. Presentation of a Rupture proof OLTC solutions by Marc Foata.
- ii. Reviewed and discussed of the proposal for Sections 4.2.2 & 4.2.3 by task force (Samuel Brodeur & Enrique Betancourt). The updated proposal from the discussions will be presented next week for further review and approval.
- iii. Partially reviewed and discussed of the proposal for Section 5.2 by task force (Marc Foata, Chris Johnson, Ryan Musgrove, Samson Debass and Didier Hamoir) due to time limit, and will continue into next meeting.

4. Action Items

- a. None

5. Unfinished Business

- a. None

6. New Business

- a. None

7. Next Meeting

- a. Next Meeting date and location Denver Colorado, March 23-27 2025

Reported by:

Samuel Brodeur, P.Eng.

WG Vice-Chair

Attendance:

Name	Affiliation	Member (yes, no or requested)
Alex Zeigher	Hitachi Energy	no
Alireza Gorzin	Black & Veatch	yes
Andy Speegle	ENTERGY	no
Ashwin Padmanaban Iyer	Transformer protector Corp	requested
Avila Hugo	Hitachi Energy	requested
Chao Li	Eaton	requested
Christop Ploetner	Siemens Energy	no
Christopher Johnson	Oncor	Yes
David Calitz	Siemens Energy	yes
David Murray	TVA	yes
David Reyes	Oncor	no
Derek Hollrah	Burns&McDonnell	yes
Didier Hamoir	Transformer Protector CORP.	requested
Eduardo Garcia	Siemens Energy	yes
Egui Espitia	MR	no
Emilio Morales Cruz	Qualitrol	requested
Enrique Betancourt	Prolec-GE	no
Eric Schleismann	Southern Company	no
Francis Mills	Power Engineers	requested
Hector Garza	Orto de Mexico	no
Hugo Avila	Hitachi Energy	no
Ismael Guner	Hydro Quebec	no
James Gardner	Prolec-GE Waukesha	no
Jason Snyder	FirstEnergy	no
Jerzy Kazmierczak	Hitachi Energy	requested
Jihun Lee	HD HYUNDAI ELECTRIC	no

Joe Nims	Allen& Hoshall	no
Jose Luis Machain	Prolec GE	yes
Joshua Yun	Virginia Transformer	yes
Junho Lee	Hyundai Electric	yes
Kannan Veeran	Virginia Transformer	requested
Kevin Hampton	Siemens Energy	no
Kevin Juchem	Hitachi Energy	no
Luc Loiselle	Tetra Tech	yes
Luke Wang	BC hydro	requested
Malia Zaman	IEEE SA	no
Manan Pandya	Siemens energy	requested
Marc Foata	MR	yes
Martin Munoz	Orto de Mexico	requested
Michael Botti	Hyosung HICO	yes
Michael Nolte	Kiewit	requested
Moses Manzano	Hyosung HICO	yes
Niklas Gustavsson	Hitachi Energy	no
Olivier David Uhlmann	Reinhausen Canada Inc.	no
Omar Mendez	Prolec	no
Oscar Mendiola	Transformer Protector Corp.	no
Paul Dolloff	EKPC	no
Peter Zhao	Hydro One	yes
Rehan Ali	Siemens Energy, Inc.	no
Richard Vongemminen	Dominion Energy	no
Rogério Verdolin	Verdolin Solutions	requested
Ryan Musgrove	Oklahoma Gas & Electric	no
Samson Debass	EPRI	yes
Samuel Brodeur	Hitachi Energy	yes
Sanjib Som	PTT, LLC	yes
Sebastian Rehkopf	MR	requested
Sergiusz Kapka	Hitachi Energy	no
Stephen Antosz	Consultant	no
Steven Brzoznowski	BPA	no
Sunny Swarna	Virginia Transformer Corporation	requested
Verena Pellon	NEXTERA	yes
Waldemar Ziomek	PTI Transformers	requested
William Solano	Voltyx	requested

Document #: **638**

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

Chair: Craig Swinderman Vice Chair Robert Allison* new
Secretary: Dominic Pollaro Percent Complete: 25%

Meeting Date: Monday, October 28, 2024 Time: 11:00 am to 12:15 pm.
Location: Hyatt Regency; St. Louis Missouri – Grand Ballroom F.

Current draft being worked on: 2.0 Dated: October 6, 2024
PAR Expiration date: December 31, 2027

Attendance: Members:	6 of 11
Guests:	27
Guests requesting membership:	2
Total*:	<u>33</u>

* 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 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. 6 out of 11 members were in attendance of the meeting so quorum was achieved.

6. Approval of the Meeting Minutes from Vancouver Spring 2024 and Agenda for Fall 2024:

- a. Approval of the Spring 2024 meeting unapproved minutes
 - i. Ryan Musgrove motioned to approve.
 - ii. Robert Allison seconded.
 - iii. Motion was carried unanimously with no objections or abstentions. – Approved.
- b. Approval of the Fall 2024 agenda
 - i. Robert Allison motioned to approve.
 - ii. Ryan Musgrove seconded.
 - iii. Motion was carried unanimously with no objections or abstentions. – Approved.

7. Chair announcements:

The PAR for revision of 638 was recently 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.

Robert Allison of Dominion Energy volunteered to be the working group's Vice Chair during this meeting.

8. Old work:

Discussed scope and purpose to IEEE 638, closely linked standards from IEEE/IEC 60780-323 and IEEE/IEC 60980-344. These dual logo standards are targeted to all safety related nuclear equipment, of which transformers are a subset. Both documents have been updated since IEEE 638 was published in 2013, and reviews have been done to target changes that have been made by these revisions.

Several changes reviewed from IEEE 323 2003 document to the 2016 revision. Much of the wording matched the previous

version but needed to have further detailed reviews of specific sections. These reviews are in progress. Chair called for other volunteers to assist with reviews. IEEE/IEC 60780-323 2016 will be due for re-publication by December 2026, so we need to be aware of those potential changes as well.

Initial review topics of IEEE/IEC 60980-344 2020 was reviewed. Shared notes and comments from Robert Allison.

Chair continued with review of new chapters and additions to the IEEE/IEC 60980-344 standards for the 2020 version, noting that there appear to be some significant changes included in the 2020 version, which the corresponding material will require updating in 638.

Chair noted Sections 5 (Approaches to Transformer Qualifications) and 6 (Design Qualification Procedure) need to be reviewed for updating based on changes to IEEE/IEC 60780-323 and IEEE/IEC 60980-344.

Chair discussed request for deeper review and shared access to draft document.

9. New Work:

Robert Allison of Dominion Energy agreed to review and update Section 6 of the Draft 2.

Craig Swinderman presented Draft 2 to the working group and indicated specifically the areas where we are looking for help.

Craig reviewed the highlights.

Grace Guang Yuan of Hitachi Energy volunteered to assist with the ANNEX A review.

Jason Beaudoin of Weidmann volunteered to assist with the ANNEX A review with respect to solid insulation aging for oil immersed transformers.

10. Next meeting: Denver Colorado, Spring 2025_ March 23-27, 2025
11. Close of meeting:
The meeting adjourned at 12:00 pm

Submitted by: Craig Swinderman Date: October 30, 2024

List of Meeting Attendees at Fall '24 Meeting, including affiliation & voting member status.

NAME	COMPANY	ROLE
WEIJU LI	BRAINTREE ELECTRIC	GUEST
GERALD SUMAN	ETSI	GUEST
PRESTON SIMON	ETSI	GUEST
CHERYL BASEL	WEG TRANSFORMERS	GUEST
JASON PERKINS	MOELEVE ELECTRIC	GUEST
MARK NEWBILL	HITACHI ENERGY	GUEST
ARVIND KUMAR	DELTA STAR	GUEST
ANDREW LUGGE	HITACHI ENERGY	GUEST
CHRIS WHITTEN	HITACHI ENERGY	GUEST
MARNIE ROUSSELL	ENTERGY	GUEST
ANDREAS THIEDO	HIGH VOLT DRESDEN	GUEST
GILLIS BARGONE	FISCO	GUEST
ZHINGANG ZHU	CHINT	GUEST
SUDIP CHANDRA	DELTA STAR	GUEST
CHENY CAI	SIEYUAN ELECTRIC	GUEST
ALEX ZEIGHER	HITACHI ENERGY	GUEST
JASON BEAUDOIN	WEIDMANN	GUEST
DAVID MURRAY	TVA	GUEST
DOMINIC POLLARO	NASS	MEM
DAN SAUER	EATON	GUEST
KEYLAND ADAMS	PROLEC GE	GUEST
ANDY SPEEGLE	ENTERGY	GUEST
SAMMEL GRUSHIEWTZ	GE VERONA	GUEST
WILLIAM SOLANO	VOLTYX	GUEST
JOSE ANTONIO GONZALEZ	VIRGINIA TRANSFORMER	GUEST

EGUI ESPITIA	REINHAUSEN	GUEST
MARIA ZAMAN	IEEE SA	GUEST
YEONUNSOO KIM	MITSUBISHI ELECTRIC	MEM
CRAIG SWINDERMAN	MITSUBISHI ELECTRIC	MEM
RYAN MUSGROVE	OGE	MEM
ROBERT ALLISON	DOMINION ENERGY	MEM
ALFREDO CARRIZALES	PROLEC GE	GUEST
GRACE YUAN	HITACHI ENERGY	GUEST

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 (CDT) on Tuesday October 28th, 2024 with Welcome & Chair's remarks
2. Details about attendance:
 - a) Attendance: 48
 - b) Members: 15
 - c) Guests: 33
3. Call for essential patents
 - d) 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.
4. Copyright policy
 - e) 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.
→ No issues were reported.
5. Quorum check
 - f) Total number of members is 26 requiring 14 members for quorum.
First member couple had only 12 in attendance. Decision was to continue with status update on IEC / IEEE 60076-57-135 and re-check attendance later.
6. IEC Decisions Taken in Rome, April 18, 2024
 - g) Kevin Juchem and Ewald Schweiger presented information from Rome meeting
 - h) IEC TC 14 decides to participate in revision of IEC/IEEE 600076-57-1202
 - i) Further decided to transfer both aspects, phase-shifting standard (60076-57-1202) and technical guideline standard (60076-57-135), into one new MT (Maintenance Team)
 - j) Kevin Juchem is appointed as convenor for the new established MT 60076-57-PST.
 - k) Members nominated by the IEC NC (National Committee) of 60076-57-PST were displayed
7. Presentation of proposals for content redistribution IEEE/IEC 60076-57-135 and IEEE/IEC 60076-57-1202
 - l) Kevin Juchem and Luc Dorpmanns presented many observations from reviews and suggestions for updates of the documents.
 - m) Topics included Definitions, Control Systems, Testing, Power flow, GIC, PST Load flows and more
 - n) Note was made of the fact that IEC does not allow work GUIDE to be used and title will likely have to be changed to GUIDANCE or other term for IEEE/IEC 60076-57-135
 - o) Particular note and discussion were on ARS (Advance Retard Switch) a technology that is mentioned in the standard but is a unique manufacture technology and it was challenged if this should belong in the document.
 - p) The significant complexities of design, protection, reliability etc were discussed at length
 - q) Suggestion was made that ARS should possibly be moved from the Standard to the Guide
8. Quorum recount was made at 2:10 and 14 members were present
 9. →establishing quorum.
10. Approval of agenda
 - a) Motion to approve agenda was made by Eric Davis and seconded by Luc Dorpmanns.
No discussion or objections were made.

- b) Motion was carried unanimously with no objections or abstentions.
- 11. Approval of meeting minutes of the previous Spring 2024 meeting
 - a) Motion to approve agenda was made by Eric Davis and seconded by Luc Dorpmanns. No discussion or objections were made.
 - b) Motion was carried unanimously with no objections or abstentions.
- 11) Status and Next steps were discussed for PAR update now with dual logo.
 - a) The information from Michael Thompson was shared that the Power System Relaying and Control Committee (PSRC) will establish a Study group for C37.345 (IEEE Guide for the Application of Protective Relaying for Phase-Shifting Transformers) in the next PSRC meeting in January
 - b) Guide will need to be aligned with IEEE C37.245 (IEEE Guide for the Application of Protective Relaying for Phase-Shifting Transformers) for consistency of definitions etc.
 - c) Noted on the task list are the needs of a PAR modification:
Title: Technical guideline for the Application, Specification, and Testing of Phase-Shifting Transformers
Document number: IEC/IEEE 60076-57-135
- 12) Review of needed work on Clauses 1-6 and 4-12 were discussed and call for volunteers was put out.
- 13) Old Business
 - o None
- 14) New Business
 - a) Sanjay Patel commented on a need to clean up ARS
 - b) Patrycja Jarosz with IEEE/SA commented on need to modify PAR though it is not an urgent need now.
 - c) No other Discussions were presented
- 15) The meeting was adjourned at 2:32 PM (CST)
- 16) Next meetings (planned):
 - o Virtual meeting – might be scheduled before March 2025
 - o In-person meeting S25 – March 23-27, 2025 in Denver, CO

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
Barker	Sean	Hitachi Energy	G
Beaudoin	Jason	Weidmann Electrical Technology	G
Calitz	David	Siemens Energy	G
Chan	Vivian	Hitachi Energy	G
Colopy	Craig	Retired	G
Corsi	Domenico	Doble Engineering Co.	G
Davis	Eric	Consultant	M
Dorpmanns	Luc	Royal SMIT Transformers B.V.	M
Espitia	Egui	Reinhausen Manufacturing Inc.	G

Garza	Hector	Orto de Mexico	G
Gonzalez Ceballos	Jose Antonio	Georgia Transformer	G
Grushiewrz	Samuel	GE Vernova	G
Hampton	Kevin	Siemens Energy	G
Heiden	Kyle	EATON Corporation	G
Hoffman	Saramma	PPL	M
Jarosz	Patrycia	IEEE SA	G
Juchem	Kevin	Hitachi Energy	M
Katapalli	Thrinadha	Virginia Transformer Corporation	M
Labh	Ashwini	Hitachi Energy	G
Lembacher	Stefan	Siemens Energy	G
McCullough	Douglas	Maxima / Hyundai	M
Mendez Zamora	Omar	Prolec GE	M
Munoz	Martin	Orto de Mexico	G
Musgrove	Ryan	OG+E	M
Orozco	Eduardo	GE Grid Solutions	G
Pandza	Thiomir	Siemens Energy	G
Patel	Sanjay	TD-Smit Transformers	M
Pavicic	Tomislav	Siemens Energy	G
Rashide	Adnan	Measurement Canada	G
Rehkopf	Sebastian	Maschinenfabrik Reinhausen GmbH	M
Reyes	David	Oncor	G
Sarkar	Amitabh	Virginia Transformer Corporation	G
Schindler	Stefan	Maschinenfabrik Reinhausen GmbH	G
Schrammel	Alfons	Siemens Energy	M
Schweiger	Ewald	Siemens Energy	M
Scott	Thomas	Hitachi Energy	G
Shimpi	Leena	MGM Transformer Co.	G
Solano	William	Voltyx	G
Stechschulte	Kyle D	AEP	M
Thompson	Michael	SEL Engineering Services, Inc.	M
Viereck	Karsten	Maschinenfabrik Reinhausen	G
Vir	Dharam	Prolec GE Waukesha	G
von Gemmingen	Richard	Dominion Energy	M
Weisensee	Matthew	Pacificorp	G
White	Joe	Power Engineers	G
Zeigher	Alex	Hitachi Energy	G
Zhangh	Jie	CHINT	G

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, October 28, 2024

Hyatt Regency St. Louis, St. Louis, Missouri, USA

Unapproved Meeting Minutes

WG Chair Scott Digby called the meeting to order at 3:19 p.m., Monday, October 28, 2024. As this was the first meeting of this new WG, the vice-chair role has not yet been established or filled. WG Secretary is Juan Castellanos.

Total Attendance was:	93
Members from previous TF	10 (total members from TF carried over to WG = 24)
Guests requesting Membership:	38 (membership granted thus quorum achieved)
Guests not requesting membership:	45

The total new WG membership stands now at 62. The meeting attendance list is included at the end of these minutes.

The WG Chair reviewed with the group the revision plan. The PAR was approved at the September 25, 2024 NESCOM meeting with an expiration date of 12/31/2028. It was noted that the active document was published in 2017, so it expires 12/31/2027 (~3.0 years from now). So the chair looks forward to finish the revision by the end of year 2026 and allows the entire 2027 for the SA sponsor balloting process.

A proposed meeting agenda was presented by the WG Chair, with there being no comments so the meeting proceeded accordingly. Attendance rosters were circulated, with attendees being advised that as this is the first meeting of this group, that those requesting membership on the roster would be granted membership. The WG Chair made the requisite Call for Patents and there was none noted by those present. The WG Chair presented the IEEE SA Copyright Policy slides as well as the IEEE-SA activity participant behavior slides. There were no minutes approved because it was the first meeting of this WG.

During the meeting it was discussed how to proceed with the revision. The idea of creating task forces (TFs) was recognized as a more efficient way to get the work done. The possible TFs may be:

Section 2	Normative References
Section 3	Definitions and Acronyms
Section 4	Rating Data
Section 5	Construction

Section 6 OLTC

Annex A OLTC considerations

Ryan Musgrove, chair of the Power Transformers Subcommittee, recommended to create the Task Forces, and in parallel circulate the document among members of the WG calling for comments to get the best input for the next spring meeting. Regarding the last rounds of recirculation during the previous sponsor ballot in 2017, Patrycja Jarosz (IEEE-SA) to double check how to gather comments from previous revision.

Adriana Cisco (Salt River Project) commented there are conflicts between C57.12.00 and C57.12.10, minor wording issues, inconsistencies that should be resolved in this revision. Craig Colopy suggested having virtual work sessions between face-to-face meetings and splitting the task in sub-groups because the document is too large to be revised by the entire WG. The time slot for this WG is scheduled at the same time as the C57.12.00 TF for continuous revision, the chairman would look for a solution of this overlap. Two persons volunteered for the position of vice-chairman, Rogerio Verdolin (Verdolin Solutions) and Thomas Keels (Keelectric Engineering), the chairman to decide who would get the position.

The document to be circulated to WG membership in “straw ballot” type format to gather comments for discussion and revision consideration.

There being no new business, the meeting was adjourned.

The next in-person meeting will be at the Spring 2025 Transformers Committee Meeting in Denver, CO that is scheduled for March 23-27, 2025.

Respectfully Submitted,

Juan Castellanos, WG Secretary

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
Scott	Digby	Duke Energy	Chair
Garret	Bradshaw	Howard industries	Y
Daniel	Martinez	IFE Canada	Y

Sami	Debass	EPRI	Y
Sunny	Swarna	Virginia Transformer	Y
Tim	Dappen	Cargill	Y
Scott	Thomas	Hitachi Energy	Y
Gustavo	Do Prado	Siemens Energy	Y
Ashwini	Labh	Hitachi Energy	Y
Piotr	Blaszezyk	Specialty Transformer Components	Y
Alireza	Gorzin	Black and Veatch	Y
Brad	Stacey	Leeward Renewable Energy	Y
Will	Elliot	ACP/SWEPCO	Y
Kaman	Neeran	VTC/GTC	Y
Yeun Soo	Kim	MEPPI	Y
Caleb	Colby	Schneider Electric	Y
Bill	Whitehead	H2 Scan	Y
Thomas	Keels	Keelectric Engineering	Y
Dominic	Polard	NASS	Y
Kayland	Adams	Prolec GE - Waukesha	Y
Shankar	Nambi	Bechtel Energy	Y
Matt	Weisensse	Pacificorp	Y
Florin	Faur	Prolec GE - Waukesha	Y
Luke	Wang	BC Hydro	Y
Rashid	Hussain	Mississippi State University	Y
Jason	Snyder	First Energy	Y
Kyle	Stechschulte	AEP	Y
Egui	Espitia	Reinhausen Manufacturing	Y
Martín	Muñoz	Orto de Mexico	Y
Garret	Sarkinen	Xcel Energy	Y
Rogério	Verdolin	Verdolin Solutions	Y
Jason	Beaudoin	Weidmann	Y
Eduardo	García	Siemens Energy	Y
Luc	Loiselle	Tetra Tech	Y
Adriana	Cisco Sullberg	SRP	Y
Sebastian	Renhopf	Machinenfabrik Reinhausen	Y
Richard	Von Gemingen	Dominion Energy	Y
David	García Perales	Virginia Transformers	Y
Manen	Panelya	Siemens Energy	Y
Craig	Colopy	Retired from Eaton	N
Angela	Leigi	Eaton	N
Dan	Crockett	Ameren	N
David	Calitz	Siemens Energy	N
Roberto	Da Silva	Machinenfabrik Reinhausen	N
Tihomir	Pandza	Siemens Energy	N
Ponggki	Kim	Iljin Electric	N
Yonghui	Kim	Iljin Electric	N

Patrycja	Jarosz	IEEE SA	N
Besja	Pajaziti	Brochhaus Measurements	N
Chris	Franklin	MG Power Association	N
Gilberto	Garza	Prolec GE	N
Dragana	Gasic	Koncar	N
Janko	Pzodan	Koncar	N
Pedro	Pedro	Efacec	N
Mike	Craven	Qualus Power Service	N
Olivier	Uhlmann	RM Canada	N
Gerey	Suman	Electrical Technologies	N
Ali	Naderian	Enerparts	N
Kevin	Hampton	Siemens Energy	N
Stefan	Lembacher	Siemens Energy	N
Anton	Kashel	Delta Star	N
Ewald	Schweiger	Siemens Energy	N
Attila	Gyore	Midel & Midel Fluids	N
Park	Dean	Hyosung - HICO	N
Christopher	Johnson	Oncor	N
Andrew	Lugge	Hitachi Energy	N
Daniel	Obregon	TTE Transformers	N
Samuel	Brodeur	Hitachi Energy	N
Andrew	Steineman	Delta Star	N
Gerard	Paleo	Midel	N
Dan	Schwartz	Quality Switch	N
Paulo	Avelino	Hitachi Energy	N
Oscar	Mendiola	Transformer Protector Corporation	N
Drew	Welton	Intellirent	N
Paul	Salvato	intellirent	N
Samuel	Gruskicwitz	GE Vernova	N
Ronald	Hernandez	Doble	N
Samuel	Tekle	Weg Transformers USA	N
Alex	Zugher	Hitachi Energy	N
Jie	Zhang	CHINT	N
Mark	Tostrud	Dynamics Ratings	N
Pedro	Trujillo	Hyundai	N
Carlos	Hernandez	Delta Star	N



Task Force C57.140 Meeting

Fall 2024 Meeting

Grand Ballroom E, St. Louis, MO

Monday, October 28th, 2024

3:15PM – 4:30 PM Central Time Zone

Chair: Sanjib Som

Vice-Chair: Marcos Ferreira

Secretary: Traci Hopkins

TFC57.140 IEEE Guide for Evaluation and Reconditioning of Liquid Immersed Power Transformers

Fall 2024 IEEE Transformers Committee Meeting

St. Louis, MO, USA

28 October 2024

UNAPPROVED MINUTES

Chair: Sanjib Som – PTT

Vice-chair: Marcos Ferreira – Quanta Technology

Secretary: Traci Hopkins – H2scan

Meeting Start Time: 1515

SUMMARY:

At 1515 on the afternoon of Monday 28 October 2024, the chair opened the meeting with an introduction and attendance. The sign-in sheet was distributed by the Secretary. The chair then reviewed the required IEEE policies and reviewed the Agenda and Minutes from the Spring 2024 meeting.

There was a Motion to Approve the Minutes from previous Spring 2024 meeting by Jeremiah Bradshaw and it was seconded by Joe White – **UNANIMOUS approval of minutes**. Then there was a review of the Agenda, there was a motion to approve the agenda by Ed teNyenhuus and it was seconded by Mickel Saad. This was passed unanimously.

There were 64 attendees in total. 13 of the 22 members were present, Quorum was Achieved. Member List is provided below.

Role	First Name	Last Name	Company
Chair	Sanjib	Som	PTT
Vice-chair	Marcos	Ferreira	Quanta Technologies
Secretary	Traci	Hopkins	H2scan
Member	Jeff	Benach	Megger
Member	Sanket	Bolar	Oncor
Member	Jeremiah	Bradshaw	Bureau of Reclamation

Member	Luiz	Cheim	Hitachi Energy
Member	Jesse	Duffy	Nashville Electric Service
Member	Zan	Kiparizoski	Howard Industries
Member	Emilio	Morales Cruz	Qualitrol
Member	Ryan	Musgrove	Oklahoma Gas and Electric
Member	Timothy C.	Raymond	Inductive Reasoning
Member	Scott	Reed	MVA
Member	Mickel	Saad	Hitachi Energy
Member	Brian	Sparling	Kinectrics
Member	Brad	Staley	Leeward Energy
Member	Shankar	Subramany	KEMA, Netherland
Member	Ed	teNyenhuis	Hitachi Energy
Member	Pragnesh	Vyas	Sunbelt Solomon
Member	Joe	White	Power Engineers
Member	Guang	Yuan	Hitachi Energy
Member	Kris	Zibert	ALLGEIER, MARTIN and ASSOCIATES, INC.

The chair then opened discussions by reviewing Title, Scope and Purpose. Discussion began regarding the Scope and if it needed to be changed. There was discussion around the use of the words reconditioning and refurbishing. Jeremiah Bradshaw – USBR, noted that in C12.80 the word reconditioning was defined for the liquid insulation only. However, the word Refurbished was not. It was decided that “Refurbishing” would be defined in the revised C57.140 document and that part of the definition would include terminology such as “upgrades.”

After extensive discussion, there was a suggestion to change the Title and scope to:

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

1. Overview

1.1 Scope

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

A Motion to approve new Title & Scope and not to include Purpose by proposed by Mickel Saad and seconded by Tim Raymond. A vote was taken, and the approval was unanimous.

It was noted by **Marc Foata – Reinhausen** there is a CIGRE Document with the same Title and the new approved title. He also shared that CIGRE spent a lot of time discussing and defining “end of life.” And suggested we look at what they have already done and mentioned that CIGRE End of Life definitions are broken down into three categories:

1. Functional life
2. Economic life
3. Technical life

A final concern was presented by **Jeremiah Bradshaw USBR** to ensure that C57.140, C57.170 & C57.637 chairs coordinate with each other to clearly understand the purpose of each document. **Sanjib Com, Chair**, will raise this with Subcommittee Chair.

The meeting was adjourned at 1615. Below is a list of attendees for the St. Louis meeting. The task forced achieved the task assigned in two meetings.

Attendee List for Fall 2024 Meeting:

Role	First Name	Last Name	Company
Guest	Paul	Boman	HSB
Member	Jeremiah	Bradshaw	Bureau of Reclamation
Guest	Wilerson	Calil	Hitachi Energy
Guest	Edward	Casserly	Ergon
Member	Luiz	Cheim	Hitachi Energy
Guest	David	Cordova	Maddox Industrial Transformer
Guest	Eric	Doak	DY Energy Solutions
Member	Jesse	Duffy	Nashville Electric Service
Guest	Evgenii	Ermakov	Hitachi Energy
Guest	Zlatan	Fazlic	Camlin Energy
Vice-chair	Marcos	Ferreira	Quanta Technologies
Guest	Mark	Finn	Hitachi Energy
Guest	Marc	Foata	Reinhausen
Guest	Peng	Fu	Chint Global
Guest	Eduardo	Garcia	Siemens
Guest	James	Gardner	Prolec-GE Waukesha
Guest	Jose Antonio	Gonzalez Ceballos	GA Transformers
Guest	Brad	Greaves	Weidmann Group
Guest	Brad	Grooms	NTS
Guest	Ismail	Guner	Hydro Quebec
Guest	Niklas	Gustavsson	Hitachi Energy
Guest	Roger	Hayes	GE
Guest	William	Herron	US Reinhausen
Guest	Thang	Ho	BC Hydro
Guest	Derek	Hollrah	Burns & McDonnell
Secretary	Traci	Hopkins	H2scan
Guest	Ryan	Jonak	PGE
Guest	Braxton	Jones	SD Myers

Guest	Kurt	Kaineder	Trench Group
Guest	Thrinadha	Katapalli	VA Transformers
Guest	Mathieu	Lachance	Omicron Energy
Guest	Don	Lamontague	Arizona Public Service
Guest	Tiffany	Lucas	PROLEC
Guest	Jose Luis	Machain	Prolec GE
Guest	Jinesh	Malde	MIDEL
Guest	Kumar	Mani	Duke Energy
Guest	Balakrishnan	Mani	Delta Star FS
Guest	Moses	Manzano	Hyosung Hico
Guest	Mohammed	Megdad	IPS
Guest	Toni	Mellin	Vaisala
Guest	Robert	Mennonna	Maddox Industrial Transformer
Member	Emilio	Morales Cruz	Qualitrol
Guest	Anastasia	O'Malley	Con Edison NY
Guest	Cuauhtemur	Ortiz	Niagara Power
Guest	Parminder	Panesar	VA Transformers
Guest	John	Pruente	APC Construction
Member	Timothy C.	Raymond	Inductive Reasoning
Member	Scott	Reed	MVA
Guest	Patrick	Rock	ATC
Member	Mickel	Saad	Hitachi Energy
Guest	Alfonso	Schrammel	Siemens-Energy
Guest*	John	Sinclair	Black & Veatch
Chair	Sanjib	Som	PTT
Member	Brian	Sparling	Kinectrics
Guest	Greg	Steeves	Baron USA
Guest	Marc	Taylor	JFESHOJI Power
Member	Ed	teNyenhuis	Hitachi Energy
Guest	Jim	Thompson	T&R Service Company
Guest	Alvyn	Vanderwalt	ECI
Guest	Joshua	Watson	NPPD
Member	Joe	White	Power Engineers
Guest	Elliot	White	SD Myers
Guest	Deanna	Woods	Prolec GE Waukesha
Guest	Jeffrey	Wright	Duquesne Light

Minutes:

1515 called to order

Reviewed: patents, Participant behavior, Copy-wright policy

Reviewed Member list

Quorum: 13 of 21 members Quorum **achieved**

Review of minutes sent from last meeting:

Motion To Approve Minutes from previous Spring 2024 meeting: Jeremiah Bradshaw, seconded Joe White – **UNANIMOUS approval of minutes**

Review of Agenda:

Motion to approve agenda: Ed teNyenhuis, seconded Mickel Saad

Review & Discussion of Title, Scope & Purpose:

Brian Sparling – Kinectrics – Scope: Is this truly for Mineral Oil only or should we be talking about other insulating liquid types?

Suggests: changing scope to align with title

Scott Reed-MVA: is reclaiming part of this it is already in 637...need clear delineation of this guide and 637. Suggest keep scope broad to “liquid maintenance & diagnostics”

Ed teNyenhuis – Hitachi Energy: include cooling in the scope

Jim Thompson-T&R Service Company: C57.637 is detailed on methods and tied into c57.106 – previous C57.140 references C57.637 & C57.106.

Marcos Ferreira – Luma: 637 covers alternate liquids.

Thrinadha Katapalli – VA Transformer: loss of life – are we talking about returning to nameplate rating

Sanjib Som - Chair: loss of life – not listed

Jerimiah Bradshaw USBR – tech editor of 637 is for all liquid items – remove all liquid items and point to 637, 140 should be for xfmr's remove all liquid and diagnostics from here and point to 637 for appropriate reclamation

Kumar Mani – Duke Energy: say insulation life or condition

Jeff Thompson: another guide that combines all liquids is this just for mineral oil?

Sanjib Som- Chair: hearing from the TF this doc should be expanded to include alternate liquids

Tim Raymond – Inductive Reasoning: biggest challenge with Scope & Purpose of this doc is a lot of this material has been cannibalized by other documents. What can we strike as parts are

covered elsewhere...focus is the reconditioning (Life extension). Reword scope to focus on the reconditioning component.

Jeremiah Bradshaw - USBR: 170 condition assessment of liquid xfmrs. 140 should focus on the extension of life.

Suggests the Scope should read:

This document provides guidelines to assist the user in extending the useful life of a transformer.

Mickel Saad: add through reconditioning and refurbishing to scope

Jeremiah: reconditioning and refurbishing are in the purpose. What about upgrading?

Kumar: also include repair.

Jeff T.: thinks this should be enough:

This document provides guidelines to assist the user in extending the useful life of a transformer through repairing, reconditioning, or refurbishment.

Tim: are we limiting this to Field activities?

Jeremiah: refurbishment includes repair. To bring to “like new” need to include upgrades.

Sanjib: Is refurbishment defined in C12.80, if not then we need to add to the definitions.

Decision made to define the word refurbishment in revision of C57.140.

The word refurbishment to be defined to include “upgrades.”

Marcos F.: assess the xfmr is it beyond repair in the field? Need guide to address should we repair or put out of service?

Brian S: Getting into economics...cannot do this.

Jeremiah: reconditioning is in 12.80 – definitely in 637 need different name...suggestion is Refurbishment

UNKNOWN: clarifying the 12.80 definition of reconditioning

Jinesh: retrofilling – refurbishing

TIM: need to be careful with 12.80

KURT: Likes broad definition of SCOPE. Add reactors too.

Mickel S.: Evaluation includes Risk Assessment which is in another guide...170...GUIDE FOR REFURBISHMENT

Ed T.: Suggested title read:

IEEE GUIDE FOR LIFE EXTENSION OF LIQUID IMMERSED POWER TRANSFORMERS AND REACTORS

KUMAR: Scope – need to add word, **suggested:**

This document provides guidelines to assist the user in extending the useful life of a liquid-immersed Power transformer and Reactors.

Marc Foata – Reinhausen: Observed new proposed Title is same as CIGRE Document: advised that CIGRE spent a lot of time discussing and defining “end of life.” Suggested we take a look at

what they have already don... CIGRE End of Life broken down into three categories:

4. Functional life
5. Economic life
6. Technical life

Proposal of New Title and Scope to:

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

2. Overview

2.1 Scope

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

Motion to approve new Title & Scope and not to include Purpose: Mickel Saad, seconded Tim Raymond...unanimous.

Approved New Title & Scope and decided to not include Purpose

Final Note:

Jeremiah Bradshaw USBR: make sure C57.140, C57.170 & C57.637 chairs coordinate with each other to clearly understand the purpose of each document...needs coordinated. Sanjib to raise this with Subcommittee Chair.

Meeting Adjourned: 1615

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:	<u>Hakan Sahin</u>	Vice-Chair	<u>Thomas Melle</u>
Secretary	<u>Adam Sewell</u>	Percent Complete	<u>75%</u>

Current Draft Being Worked On: 1.0 Dated: n/a

PAR Expiration Date: December 31, 2025

Meeting Date: 10/28/2024 Time: 4:45pm – 6:00pm

Location: St. Louis, MO, USA

Attendance:	Members	26 of 41
	Guests	71
	Guests Requesting Membership	13
	Total*	97

* Attendance list for this meeting is shown at end of meeting minutes

Meeting Minutes / Significant Issues / Comments:

Meeting was called to order at 4:45pm, October 28, 2024 at Hyatt Regency St. Louis at The Arch.

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 2024
 - e. Introductions of the attendees

- i. Attendance sheets were passed out. Name/affiliation was announced as attendees spoke during the meeting.
 - ii. Secretary asked all who wanted on email distribution for the C57.125 Working Group to send him an email at: adamsewell@ieee.org
 - f. Updated membership review and count for quorum
 - i. 41 members and 24 were counted as present via hand count.
 - 1. QUORUM ACHIEVED
 - ii. *Attendance sheets after meeting completed showed 26 members attended.*
 - iii. Members are expected to attend and stay in the meeting so business can be conducted.
 - g. Approvals of previous minutes and agenda:
 - i. Approval of the agenda for Fall 2024
 - ii. Approval of the Spring 2024 unapproved meeting minutes
 - iii. MOTION to approve agenda/minutes – R.Verdolin, 2nd – S.Chambers
 - 1. No objection to unanimous approval – ALL APPROVED
- 2. Old Business
 - a. Review of the online voting results and comments on Section 4.2 – Flowchart, and re-vote.
 - i. 19/41 members responded, with all approved, or approved with comments. Below are the comments with approval votes:
 - 1. Hakim Dulac: I would keep the DP testing before scraping. Or at least suggest or make it optional.
 - 2. Zachary Draper: I kind of wish there was a box right before "SCRAP", that said "Consider performing a methodical tear-down investigation." Then a transformer owner doesn't immediately send for scrap, but considers trying to learn from the experience by having a slower tear-down process (before the Jawas get their hands on it), where they take photographs of key internal components, things perhaps not visible from an internal inspection when it is still in its tank. Something optional of course, but it gives the hint that something can still be learned from it. Especially when you performed all the tests leading up to that point, it would be nice to have the "smoking gun" photograph, or even to find nothing.
 - ii. MOTION to approve changes to Section 4.2-Flowchart as presented – S.Chambers, 2nd – S. Som
 - 1. After some discussion, a vote was called
 - 2. 23 – APPROVE, 1 – Abstain – MOTION PASSES
 - b. Review of the online voting results and comments on Table-8 – Internal inspection of the main tank, and re-vote
 - i. 19/41 members responded, 18 approved or approved with comments, 1 abstain. We need to vote again during this meeting (Pending quorum). Below is the only comment with approval vote:
 - 1. Hakim Dulac: I would keep "Evidence of low insulating liquid level inside tank" in the Condition of Core section.
 - ii. MOTION to approve changes to Table 8 as shown – W.Binder, 2nd – R.Musgrove

1. After some discussion an amended MOTION was made to approve changes to Table 8 as shown but keep the words “Lead clamping” – T.Raymond, 2nd – S.Chambers
 2. Vote on the Amended MOTION to approve changes to Table 8 as shown but keep the words “Lead clamping” was taken
 - a. 21 APPROVE, 4 Abstain – MOTION PASSES
 3. New Business
 - a. Officers will work on getting Draft 1 created using all the approved changes from previous meetings and will send out to the Working Group.
 - b. From Enrique Betancourt – warning related to stakeholders
 - i. I wanted to look at the Draft document because I think there is a paragraph missing with some warning related to stakeholders who must approve and even witness the investigation process. When the transformer is under warranty from the manufacturer, and or there is an insurance company to be claimed about the event, they may also request some preliminary steps, before starting with the technical part of the investigation process recommended in the Guide.
 - ii. MOTION to review the stakeholders in the document – E.Betancourt, 2nd- E.Garcia Wild
 1. After some discussion, E.Betancourt WITHDREW this MOTION.
 4. Membership changes
 - a. Officers will look at attendance of members and member requests to make changes to WG membership list before the Spring 2025 meeting.
 5. Next meeting: March 2025 in Denver, CO, USA.
 6. Close of meeting
 - a. Meeting adjourned at 6:00pm
- Submitted by: Hakan Sahin Date: 11/15/24

October 28, 2024 Meeting Attendance (RM = Request Membership):

Last Name	First Name	Company (Affiliation)	Role	Last Name	First Name	Company (Affiliation)	Role
Bedoya	Duvier	Hitachi Energy	Guest	Schwartz	Dan	Quality Switch, Inc.	Guest-RM1
Betancourt	Enrique	Prolec GE	Member	Sewell	Adam	Quality Switch, Inc.	Member-Secretary
Binder	Wallace	WBBinder Consultant	Member	Sewell	Russ	Quality Switch, Inc.	Guest
Boettger	William	Boettger Transformer Consulting LLC	Member	Snyder	Jason	First Energy	Guest
Bolar	Sanket	Oncor	Member	Som	Sanjib	Pennsylvania Transformer	Member
Bradshaw	Jeremiah	Bureau of Reclamation	Guest	Steele	Hampton	TVA	Guest
Brodeur	Samuel	Hitachi Energy	Guest	Tanaka	Troy	Burns & McDonnell	Member
Chambers	Stuart	EPRI	Member	Thompson	Ryan	Burns & McDonnell	Guest
Craven	Michael	Qualus Power Serv.	Guest	Uhlmann	Olivier	Reinhausen Canada	Guest
Crockett	Daniel	Ameren	Guest-RM3	Vanderwalt	Alwyn	ECI	Guest
DaSilva	Roberto	Maschinenfabrik Reinhausen	Guest	Veeran	Kannan	Georgia Transformer	Guest-RM1
Debass	Samson	EPRI	Guest-RM3	Verdolin	Rogelio	Verdolin Solutions Inc.	Member
Dillon	Nikolaus	Dominion Energy	Member	vonGemmingen	Richard	Dominion Energy	Member
Doloff	Paul	East Kentucky Power	Guest	Washburn	Alan	Burns & McDonnell	Member
Foata	Marc	Maschinenfabrik Reinhausen	Guest	Weyer	Daniel	Monolith	Guest-RM2
Garcia Wild	Eduardo	Siemens Energy	Member	Wright	Jeffrey	Duquesne Light Co.	Guest
Gardner	James	Prolec GE Waukesha	Guest	Yang	Fei	Hitachi Energy	Guest-RM1
Gorzin	Alireza	Black & Veatch	Guest-RM2	Yuan	Guang	Hitachi Energy	Guest-RM2
Greaves	Brad	Weidmann Electrical Technology	Guest	Yun	Joshua	Virginia Transformer Corp.	Member
Hamoir	Didier	Transformer Protector Grp	Guest	Kim	Seungmo	Hyosung HICO	Guest
Hernandez	Ronald	Doble Engineering Co.	Member	Li	Chao	EATON Corporation	Guest
Hollrah	Derek	Burns & McDonnell	Guest	Lim	Donggi	Iljin Electric	Guest
Johnson	Christopher	Oncor	Guest-RM2	Kim	Yonghui	Iljin Electric	Guest
Lamontagne	Donald	Ariz Public Svc	Guest	Pandya	Manan	Siemens Energy	Guest
Li	Weijun	Braintree Electric Light Dept.	Member	Chanda	Sudip	Delta Star Inc	Guest-RM1
Lopes Mamede	Gabriel	Siemens Energy	Guest	Zhu	Zhixiang	Chimt	Guest
Lucas, P.E.	Tiffany	Prolec GE Waukesha	Guest	Bailey	Anne	A-Line E.D.S.	Guest
Machain	Jose Luis	Prolec GE	Guest-RM2	Labh	Ashwini	Hitachi Energy	Guest
Mani	Balakrishnan	Delta Star Inc	Guest	Tekle	Samuel	WEG TX USA	Guest
Manzano	Moses	Hyosung HICO	Guest	Sexton	Aron	Kinectrics	Guest
McBride	Jim	JMX High Voltage	Guest	Sanchez Rodriguez	Jesus	Volyto	Guest
Melle	Tom	Highvolt	Member-ViceChair	Trujillo	Pedro	Hyundai Electric	Guest
Mills	Francis	Power Engineers	Guest-RM3	Park	Dean	Hyosung HICO	Guest
Morales-Cruz	Emilio	Qualitrol	Member	Keels	Andy	kEElectric Engineering PLLC	Guest
Munoz	Marta	Hitachi Energy	Guest	Munoz	Martin	Orto de Mexico	Guest
Murray	David	TVA	Member	Garza	Hector	Orto de Mexico	Guest
Musgrove	Ryan	Oklahoma Gas & Electric	Member	Kesedogi	Nihat	Hitachi Energy	Guest
O'Malley	Anastasia	Consolidated Edison Co. of NY	Member	Zhang	Hongzhi	Hitachi Energy	Guest
Panesar	Parinder	Virginia Transformer Corp.	Member	White	Elliot	SD Myers	Guest
Pedro	Pedro	EFFACEC Energia	Guest	Janes	Braxton	SD Myers	Guest
Pellon	Verena	FPL	Guest	Hruac	Miljenko	Hitachi Energy	Guest
Plisic	Goran	Siemens Energy	Guest	Garner	Joshua	Independent Dielectrics	Guest
Raymond	Timothy	Inductive Reasoning	Member	Cheksi	Bhaumilc	Hitachi Energy	Guest
Reyes Perez	Juan	Hitachi Energy	Guest	Finn	Mark	Hitachi Energy	Guest
Saad	Mickel	Hitachi Energy	Member	Kurz	Andreas	Maschinenfabrik Reinhausen	Guest
Sahin	Hakan	Virginia Transformer Corp.	Member-Chair	Herron	Bill	Reinhausen	Guest
Sarkar	Amitabh	Virginia Transformer Corp.	Member	Pavicic	Tomislav	Siemens Energy	Guest
Scardazzi	Alaor	Siemens Energy	Guest	Swarna	Sunny	Virginia Transformer Corp.	Guest
Schleismann	Eric	Southern Compnay	Guest-RM1				

Power Transformers Subcommittee Working Group Report

Document #:	<u>C57.157</u>
Document Title:	<u>Guide for Conducting Functional Life Tests on Switch Contacts Used in Insulating Liquid-Immersed Transformers</u>
Chair:	<u>Adam M. Sewell</u>
Vice-Chair	<u>N/A</u>
Secretary	<u>Piotr Blaszczyk</u>
Percent Complete	<u>N/A</u>
Current Draft Being Worked On:	<u>N/A</u>
Dated:	<u>N/A</u>
	<u>PAR expires 12/31/2027</u>
PAR Expiration Date:	<u>Std expires 12/31/2025</u>
Meeting Date:	<u>29 March 2024</u>
Time:	<u>8:00am-9:15am</u>
Location:	<u>St. Louis, MO, USA</u>
Attendance:	
Members	<u>10 of 18</u>
Guests	<u>27</u>
Guests Requesting Membership	<u>1</u>
Total*	<u>37</u>

* 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, October 29, 2024 at Hyatt Regency St. Louis at The Arch- Grand Ballroom C (4th 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. 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. 10 out of 18 members were in attendance of the meeting so quorum was achieved.
6. Approval of the Meeting Minutes from Spring 2024 and Fall 2024 Agenda.

- a. MOTION was made by D.Schwartz and 2nd by J.Sewell to approve Meeting Minutes from Spring 2024 and Fall 2024 Agenda.
 - b. No opposition to unanimous approval of the MOTION - APPROVED
- 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 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 2024 meeting and make suggestions as to what recommendations they have for this guide
 - c. Presentation was made by F. Faur of his observations of the current guide:

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. T. Tillery and P. Hopkinson brought up looking at synthetic esters for use in this guide in Kansas City Fall 2023 meeting.
 - i. Chair has requested a presenter/presentation to give at a future meeting from a synthetic ester producer. No presentation was ready for Vancouver meeting so plan on having a presenter/presentation for Fall 2024 St. Louis meeting.

- b. Attila Gyore (Midel) presented at the meeting 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
 - 10. Next meeting: March 25, 2025 at Spring 2025 Transformers Committee Meeting scheduled for March 23-27, Denver, CO, USA.
 - 11. Close of meeting
 - a. Meeting adjourned at 8:55am
- Submitted by: Adam Sewell Date: November 5, 2024

Meeting Attendance October 29, 2024 (RM = Request Membership):

Last Name	First Name	Company (Affiliation)	Role
Allison	Robert	Dominion Energy	Guest
Almeida	Nabi	PROLEC GE	Guest
Bayern	Hugo	H-J Family of Companies	Guest
Blaszczyk	Piotr	Specialty Transformer Components LLC	Member-Secretary
Colopy	Craig	Retired from EATON	Guest
Corsi	Domenico	Doble Engineering Co.	Guest
Cruz Valdes	Juan Carlos	Prolec GE	Member
Faur	Florin	Prolec GE Waukesha	Member
Gamboa	Jose	H-J Family of Companies	Guest
Greaves	Brad	Weidmann	Guest
Gustavsson	Niklas	Hitachi Energy	Guest
Gyore	Attila	MIDEL	Guest
Harley	Jack	First Power Group LLC	Guest
Hopkinson	Phil	Hvolt Inc	Guest
Labh	Ashwini	Hitachi Energy	Guest
Leigl	Angela	EATON	Guest
Machain	Jose Luis	Prolec GE	Guest
Mani	Balakrishnan	Delta Star Inc.	Guest
Matthews	Lee	Howard Industries	Guest
Miller	Philip	Memphis Light, Gas and Water Division	Guest
Musgrove	Ryan	Oklahoma Gas + Electric	Guest
Newbill	Mark	Hitachi Energy	Member
Paleo	Gerard	Midel	Guest
Pruente	John	Prolec GE Waukesha	Guest-RM1
Rehkopf	Sebastian	Maschinenfabrik Reinhausen	Member
Rossini	Yuri	Siemens Energy	Guest
Schwartz	Dan	Quality Switch, Inc.	Member
Sewell	Adam	Quality Switch, Inc.	Member-Chair
Sewell	Jeremy	Quality Switch, Inc.	Member
Sewell	Russ	Quality Switch, Inc.	Guest
Tillery	Timothy	Howard Industries	Member
Uhlmann	Olivier	Reinhausen Canada	Guest
Verdolin	Rogério	Verdolin S	Guest
Whitten	Christopher	Hitachi Energy	Member
Yavuz	Koray	Noark Electric	Guest
Zaman	Maria	IEEE SA	Guest
Zeigher	Alex	Hitachi Energy	Guest

IEEE TC MEETING Minutes

Working Group PC57.170

Condition Assessment Guide

October 29, 2024

9:30 AM – 10:45 AM (CST)

Hyatt Regency, St. Louis, Missouri, Conference Room: Grand Ballroom D (4)

Chair: Kumar Mani

Vice-Chair: James Cross (Not Present)

Secretary: Akash Joshi

1. Call to Order
 - a. Chair's Remarks
 - b. IEEE-SA Policies, including Essential Patent Policy Reviewed
 - c. Copyright Policy Reviewed
 - d. A quorum was established with 35 of 62 members being present. There was a total of 95 attendees.
2. Fall 2024 Meeting Agenda Review and Approval. Reviewed and approved without any objections or abstentions.
 - a. Motion Moved by Marcos Ferreira.
 - b. Seconded by Scott Reed.
 - c. Motion was approved unanimously.
3. Approval of Spring 2024 Vancouver Meeting Minutes of the Previous meeting, No objections, or abstentions.
 - a. Motion Moved by William Whitehead.
 - b. Seconded by Jeremiah Bradshaw.
 - c. Motion was approved unanimously.
4. PC57.170 Guide Progress
 - a. The chair provided an update on the initial ballot circulation- we received an 80% response and 91% approval rate with 171 comments.
 - b. Saramma Hoffman, the CRG Team Lead provided an update on comment resolution - a total of 172 Comments were received with 37 being of technical nature and the remaining 135 editorial. The Team met twice after the ballot and has resolved 17 technical comments so far. It is planned to resolve the remaining comments by Dec 31, 2024.
 - c. The Chair remarked that the guide will be sent out for a recirculation ballot after the comment resolution process is completed. The PAR for the guide expires on Dec 31, 2025.

- d. Marcus Ferreira suggested collaboration with the C57.140 guide PAR Team to avoid the duplicating details about OLTC maintenance between that guide and the C57.170 guide. Jeremiah suggested we discuss overlap topics between the two guides at the next meeting. Weijun Li and Ryan Musgrove then clarified that as per current rules, no new topic can be introduced now that the guide is in ballot stage while the CRG is resolving it and that new topics can now be added only in the next revision cycle.

The Chair and Brian Sparling remarked that chapters in the guide draft were written after mapping out the contents of other existing guides like C57.140 and C57.93 and there should be overlap.

- e. Thomas A Keels requested a draft copy of the guide. Since he is not a member of the working group currently, he cannot be provided with a copy of it.

5. Next meeting will be held at Denver, Colorado between March 23-27, 2025.

6. Meeting was adjourned after no new items were discussed.

Attendee List:

PC57.170 Condition Assessment Fall-2024 Attendance			
First Name	Last Name	Company	WG Member/Guest
Daniel	Aleusandrowicz	Hitachi Energy	G
Robert	Allison	Dominion Energy	G
Orlando	Benitez	Hyosung HICO	G
Enrique	Betancourt	Prolec GE	M
William	Boettger	Boettger Transformer Consulting LLC	M
Sanket	Bolar	Oncor Electric Delivery	M
Paul	Boman	Hartford Steam Boiler	G
Mike	Bonn	Soltex	G
Jeremiah	Bradshaw	Bureau of Reclamation	M
Samuel	Brodeur	Hitachi Energy	G
Wilerson	Calil	Hitachi energy	G
Alonso	Castilo	Kaedi energy	G
Stuart	Chambers	EPRI	G
Luiz	Cheim	Hitachi Energy	M
Roberto	Da Silva	MR Reinhausen	G
Thomas	Dauzat	AEP-SEPCO	G
Eric	Doak	D4EnergySolutions LLC	G
Jesse	Duffy	Nashville Electric Service	M
William	Elliott	AEP	G
Evgenii	Ermakov	Hitachi Energy	M
Marco	Espindola	Hitachi Energy	M
Florin	Faur	Prolec GE Waukesha	G
Zlatan	Fazlic	Camlin Power	G
Todd	Felton	Not Availble	G
Marcos	Ferreira	Quanta Techno	M
Mark	Finn	Hitachi energy	G
Jose Antonio	G	Georgia Transformer	G
Eduardo	Garcia Wild	Siemens Energy	M
James	Gardner	Prolec GE Waukesha	G
Joshua	Garner	Independent Dielectrics	G
Ismail	Guner	Hydro-Quebec	M
Attila	Gyore	Midel M&I	M
Roger	Hayes	General Electric	G
Kyle	Heiden	EATON Corporation	G
Jean	Hernandez	Georgia tech	G
Ronald	Hernondez	Doble Engineering Co.	G

Bill	Herron	Reinhausen	G
Thang	Hochanh	BC Hydro	G
Saramma	Hoffman	PPL Electric Utilities	M
Derek	Hollrah	Burns & McDonnell	G
Traci	Hopkins	h2Scan	G
Christopher	Jhonson	Oncor Electric Delivery	G
Ryan	Jonak	PG&E	G
Braxton	Jones	SD Myers	G
Akash	Joshi	Black & Veatch	M
Jerzy	Kaznierezah	Hitachi Energy	G
Thomas	Keels	KE Electric Engineering PLLC	G
Bob	Kelley	Nass	G
Rafal	Kowlaski	Hitachi Energy	G
Donald	Lamontagne	Arizona Public Service Co.	G
Weijun	Li	Braintree Electric Light Dept.	M
Andrew	Logge	Hitachi Energy	G
Luc	Loiselle	Tetra Tech	G
Tiffany	Lucas	Prolec GE Waukesha	G
Stephanie	Mabrey	AVO Diagnostics	M
Balakrishnan	Mani	Delta start	G
Kumar	Mani	Duke Energy	M
Toni	Mellin	Vaisala	G
Emilio	Morales-Cruz	Qualitrol Company LLC	M
Ryan	Musgrove	OG&E	G
Mark	Newbill	Hitachi Energy	G
Mike	Nolte	Kiewit	G
Shane	Oakley	NASS	G
Poorvi	Patel	Electric Power Research Institute (EPRI)	M
Timothy	Raymond	Inductive Reasoning	M
Scott	Reed	MVA	M
Diego	Robalino	Megger	G
Mickel	Saad	Hitachi Energy	M
Amitabh	Sarkar	Virginia Transformer Corp.	M
Alaor	Scardozzi	Siemens Energy	G
Hemchandra	Shertukde	University of Hartford	M
Jonathan	Sinclair	Black & Veatch	M
Brian	Sparling	Dynamic Ratings, Inc.	M
Andy	Speegle	Entergy	G
Brad	Staley	Leeward renewable energy	M
Charles	Sweetser	OMICRON electronics Corp USA	M

Ed	TeNyenhuis	Hitachi energy	M
Olivier	Uhlmann	Reinhausen Canada Inc.	G
Alwin	Van Der Walt	Electrical Consultants, Inc.	G
Rogerio	Verdolin	Verdolin Solutions Inc.	G
Dharam	Vir	GE Prolec	M
Alan	Washburn	Burns & McDonnell	M
Joshua	Watson	NPPD	G
Matthew	Webb	GE Prolec	G
Drew	Welton	Intellirent	G
Elliot	White	SD Myers	G
Joe	White	Power engineers	G
William	Whitehead	H2scan Corporation	M
Trenton	Williams	Advanced Power Technologies	M
Jeffrey	Wright	Duquesne Light Co.	M
Shazhan	Xu	FM global	G
Koray	Yavuz	Noark Electric	G
Guang	Yuan	Hitachi Energy	G
Joshua	Yun	Virginia Transformer	M
Zhu	Zhinoiang	Chint Transformers	G

Working Group Meeting for IEEE Standard PC57.17

St. Louis, Missouri, USA Meeting – October 29, 2024 11:00-12:15 pm CST

Chair: Dom Corsi

Secretary: Jason Varnell

1. The meeting was called to order at 11:00 AM CST.
2. There were 34 active participants present, which consisted of 13 of the 21 members. Quorum was achieved.
3. Two (2) participants requested membership and both were granted membership due to attendance. One member requested to be moved to guest. Therefore, the new membership total after the F24 meeting is 22.
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 Jason Beaudoin (Weidmann) and seconded by Trenton Williams (Advanced Power Technologies) to approve the Fall 2024 meeting agenda. There were no objections to unanimous approval of the agenda. A motion was made by Jason Beaudoin (Weidmann) and seconded by Trenton Williams (Advanced Power Technologies) to approve the Spring 2024 Vancouver, BC Working group meeting minutes. There were no objections to unanimous approval of the Spring 2024 Vancouver, BC working group meeting minutes.
7. **Old Business:** The chair reviewed changes that were incorporated into the D1.1 draft after the S24 meeting.
8. **Old Business:** May 31, 2024 straw ballot:
 - a. Only two sub-groups submitted comments to the straw ballot, it was agreed by the working group to resubmit the straw ballot with increased focus to obtain responses prior to the S25 meeting.
 - b. One comment requested to increase the insulation levels in clause 5 to include 115kV; however, it was decided by the WG to not include 115kV in clause 5 but it was noted that the scope of the standard was previously revised to remove restrictions to limit the standard to 69kV class. This will be old business in the S25 WG meeting.
 - c. One comment requested to increase the kVA rating from 100,000 kVA to 300,000 kVA in Subclause 4.2. The commenter was not at the WG meeting and the WG wanted more information before agreeing to make the change. This will be old business in the S25 WG meeting.
 - d. One comment requested to increase the typical impedance range from 4.0 % – 5.5 % to 8.0 % - 10.0 % in subclause 6.1. The commenter was not at the WG meeting and the WG wanted more information before agreeing to make the change. This will be old business in the S25 WG meeting.
 - e. The straw ballot comments were reviewed and the following changes were agreed to be incorporated in Draft D1.2
 - i. Editorial change to Annex A to add the word “transformer.”
 - ii. Add a note to subclause 4.4.
 1. “Note: This is to protect the LV windings from over current if the wye connected HV windings were operated at design current levels.”
 - iii. Add text to subclause 8.1 to state that additional losses may be generated in and from the shorting bars and risers during load loss measurement and an allowance for a loss correction method should be agreed upon between manufacturer and purchaser at the bid stage. Additionally, agreement should be made if less than rated current will be used for loss measurement.
 - iv. Add text to subclause 8.2 to state that fiber optic probes may be used to determine winding temperature rise when agreed upon between the manufacturer and purchaser at the bid stage.
 - v. Add requirement to subclause 8.6 that arc furnace transformers with series reactors built in the same tank as the main transformer should be tested for linearity up to 200 % rated current.
 - f. Draft D1.2 will be sent out for straw ballot prior to the S25 WG meeting.
9. **New Business:** The chair, Dom Corsi, announced that he is stepping down from the chair position and that Jason Varnell (Doble Engineering) will transition from secretary to chair. William Herron (Reinhausen) will be vice-chair and Trenton Williams (Advanced Power Technologies) will be secretary.
10. The next working group meeting will be in Denver, Colorado, USA during the Spring 2025 Transformers Committee Meeting.
11. The meeting adjourned at 12:00 PM CST.

Attendance Record:**Status as of
10/30/2024****(After F24
Meeting)**

	Last Name	First Name	Affiliation
Member	BARGONE	GILLES	FISO
Guest	BETANCOURT	EDWIN	SIEMENS ENERGY
Member	BEAUDOIN	JASON	WEIDMANN
Member	BOETTGER	WILLIAM	BOETTGER TRANSFORMER CONSULTING LLC
Guest	COLOPY	CRAIG	CONSULTANT
Guest	CORSI	DOMENICO	Doble Engineering Co.
Guest	DOAK	ERIC	D4ENERGY SOLUTIONS
Member	GORZIN	ALIREZA	BLACK & VEATCH
Guest	GRIESACKER	BILL	WILLIAM GRIESACKER AND ASSOC.
VICE-CHAIR	HERRON	WILLIAM	REINHAUSEN
Guest	JIE	ZHANG	CHINT HEEVIE CO. LTD
Guest	JUNG	FRANCISCO	REINHAUSEN
Guest	KELLEY	BOB	NASS
Member	KENNEDY	SHELDON	SHELDON KENNEDY ENGINEERING PLLC
Guest	LABH	ASHWINI	HITACHI ENERGY
Guest	LUGGE	ANDREW	HITACHI ENERGY
Guest	MARTINEZ	DANIEL	JFE CANADA
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
Guest	PREVOST	THOMAS	WEIDMANN
Member	SAUER	DAN	EATON
Member	SOM	SANJIB	PTTI
Guest	SPARLING	BRIAN	KINETRICS
Guest	SWARNA	SUNNY	VIRIGINA TRANSFORMER
Guest	TENYENHAUS	EDWIN	HITACHI ENERGY
CHAIR	VARNELL	JASON	Doble Engineering Co.
SECRETARY	WILLIAMS	TRENTON	ADVANCED POWER TECHNOLOGY
Member	WHITTEN	CHRISTOPHER	HITACHI ENERGY
Guest	YAVUZ	KORAY	NOARK ELECTRIC
Member	XU	SHUSHEN	FM GLOBAL
Guest	ZEIGHER	ALEX	HITACHI ENERGY

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 October 29th.
2. This was the first meeting as WG (Working Group).
 - Attendance: 48
 - Members: 11
 - Guests: 37
3. A brief overview about the previous meetings of 60067-57-1202 was presented:
 - Kansas City F23: Started a Study Group for the 60076-57-1202 IEC/IEEE Standard of Liquid immersed Phase-Shifting Transformers.
 - The objective: To provide the Power Transformers Subcommittee (PTSC) with a recommendation whether the document needs revision.
 - Vancouver S24: PTSC approved the title & scope of PAR.
 - Virtual 07/24: Finalized wording for PAR (Need for the project)
 - PAR approved on September 26th by IEEE SA Standard Board
 - → 1st meeting as **Working Group** here in St Louis
4. Call for patents & Copyright statement
 - r) 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.
 - s) 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.
5. Establish quorum
 - A quorum was achieved.
 - Total number of members is 14 requiring 8 members for quorum.
 - 11 members were present establishing quorum.
6. Approval of agenda
 - a) Motion to approve agenda was made by Joe Watson and seconded by Alfons Schrammel. No discussion or objections were made.
 - b) Motion was carried unanimously with no objections or abstentions.
7. Approval of meeting minutes of the previous Virtual meeting on July 24th, 2024 via Webex
 - a) The Meeting Minutes were posted on the [PTRC website](#).
 - b) Motion to approve agenda was made by Luc Dorpmanns and seconded by Sanjay Patel. No further discussion or objections were made.
 - c) Motion was carried unanimously with no objections or abstentions.

8. Discussion on status of the PAR, structured review of the standard and guide, collaboration with IEC
 - a. It was reported that the PAR was approved on Sept 25, 2024 and will expire Dec 31, 2028.
 - b. Collaboration with IEC
Kevin Juchem, the convener at IEC TC 14 MT "Phase-Shifting Transformers," presented the list of IEC experts nominated by the national committees. He also mentioned that this group will be involved in the development of 60076-57-135, the "Guide for the Application, Specification, and Testing of Phase-Shifting Transformers."
 - c. Michael Thompson shared that the Power System Relaying and Control Committee (PSRC) will establish a Study group for C37.345 (IEEE Guide for the Application of Protective Relaying for Phase-Shifting Transformers) in the next PSRC meeting in January.
 - d. The discussions indicate that alignments with PCRS will bring benefit to the development of all three documents C57.135 (60076-57-135), 60076-57-1202 and C37.345.
Like duplications should be avoided and the best place where to move needs serious considerations.
 - e. Kevin Juchem presented a presentation created together with Luc Dormmanns about ideas about "Content redistribution at IEEE/IEC 60076-57-135 and IEEE/IEC 60076-57-1202"
 - f. Kevin Juchem presented the feedback received by the IEC Polish National Committee on Clause 13.7 in IEEE/IEC 60076-57-1202". During the EN adaption the request was received to separate testing of short circuit impedance and losses off the excitation unit (to add a clause at 13.7.2)
An extensive discussion about the request took place and the purpose of such a request was challenged. Since no one from the polish NC was present
--> Kevin Juchem will go back to the Polish NC and will request clarification and more information
9. Planned next steps
 - a. *Continue to review* (Standard posted – PTSC)
Volunteers are requested to reach out to the ones who took over tasks and / or officers
 - b. Collection of feedback (via email)
Outcome of Rev 60076-1 if impact to PST – Paul Jarman
 - c. In-person S25 Meeting in Denver, CO - Present the status and next steps
March 23-27, 2025
10. The meeting was adjourned at 14:30 PM (CDT)
11. Next meetings (planned):
 - Virtual meeting – might be scheduled before March 2025
 - In-person meeting S25 – March 23-27, 2025 in Denver, CO

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
Barker	Sean	Hitachi Energy	G
Beaudoin	Jason	Weidmann	G
Bhardwaj	Naveen	Trench Group	G
Biggie	Kevin	Weidmann	G
Brodeur	Samuel	Hitachi energy	G
Chan	Vivian	Hitachi Energy	G
Colopy	Craig	Retired from EATON	G
Czernorucki	Marcos	Hitachi Energy	G
Dorpmanns	Luc	Royal SMIT Transformers	M
Espitia	Egui	Reinhausen Mfg	G
Fu	Renjie	ERMCO	G
Hossain	Saif	Trench Group	G
Jarosz	Patrycja	IEEE SA	G
Juchem	Kevin	Hitachi Energy	M
Kaineder	Kurt	Trench	G
Katapalli	Thrinadha	Virginia Transformer Corp	G
Lee	Junho	HD Hyundai Electric	G
Lee	Jihun	HD Hyundai Electric	G
Lembacher	Stefan	Siemens Energy	G
Lugge	Andrew	Hitachi Energy	G
Martinez	Daniel	JFE Shoji Power Canada	G
McCullough	Douglas	Maxima - Hyundai	G
Murcia	Fredy	Siemens Energy	G
Musgrove	Ryan	Oklahoma Gas & Electric	M / Chair PTSC
Naderian	Ali	Consultant	G
Patel	Sanjay	SGB-Smit USA	M
Ploetner	Christoph	Siemens Energy	M
Rehkopf	Sebastian	Reinhausen Germany	M
Schrammel	Alfons	Siemens Energy	M
Schweiger	Ewald	Siemens Energy	M / Chair
Shannon	Mike	Rea Magnet Wire	G
Shertukde	Hemchandra	University of Hartford	G
Siebert	Stefan	Brockhaus Measurements	G
Simon	Preston	ETSI	G
Suman	Gerry	Electrical Technologies	G
Thompson	Michael	SEL Engineering Services	M / Chair PCRS
Van Dreel	Cole	American Transmission Co.	G
Velasquez	Juan	Magnetron sas	G
Viereck	Karsten	Reinhausen Germany	G
Watson	Joe	JD Watson and Associates	M

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

Tuesday, October 29th, 2024

3:15 – 4:30 PM

Hyatt Regency, Grand Ballroom D

St. Louis, MO

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 first 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.

Because this was the first Working Group meeting, there was no members or guests. 58 people were in attendance with 50 requesting membership to the WG with all requests granted.

The chair shared the title and scope as approved for the PAR. The chair suggested to form 7 study groups to target specific sections of the document as follows:

TF1 Shipping and Assembly—Ryan Musgrove

TF2 Vacuum Processing Methods—Kyle Stechschulte

TF3 Final Testing and Energization—Elizabeth Bray

TF4 Relocation and Field Repair—Alwyn VanderWalt

TF5 Maintenance—Weijun Li

TF6 Storage—Pat Rock

TF7 Editorial and Definitions—Jesse Duffy

Each TF leader presented a brief overview of their intensions and made a call for volunteers to be part of the task force groups. The Chair called on the task force leaders to report back progress for the spring meeting.

The chair called for new business: Wallace Binder asked about on incorporating C57.93a into the guide. The chair confirmed that after C57.93a is approved the WG will incorporate this amendment into our new guide. The WG will have the opportunity to review and approve/comment on what is incorporated into C57.93 after C57.93a is completed.

The meeting was adjourned at 4:30 p.m.

First name	Last Name	Affiliation	Your Email	Member/ Guest
Elise	ArGuestId	SGB	Elise.arGuestId@sgb-smit.group	Member

Jason	Beaudoin	Weidmann	Jason.beaudoin@weidmann-group.com	Guest
Wallace	Binder	wbbinder consultant	wbbinder@ieee.org	Member
Sanket	Bolar	Oncor Electric Delivery	sanket.bolar@oncor.com	Member
Jeremiah	Bradshaw	Bureau of Reclamation	jeremiah.l.bradshaw@ieee.org	Member
Stuart	Chambers	EPRI International	schambers@epri.com	Member
sudip	chanda	Delta Star Inc	sudip.chanda2503@yahoo.com	Member
Eunyoung	Cho	HICO AMERICA	echo@hicoamerica.com	Member
Juan Carlos	Cruz Valdes	PROLEC GE	juancarlos.cruz@prolec.energy	Guest
Tim	Dappen	Cargill	Tim_dappen@cargill.com	Member
Sami	Debass	EPRI	Sdebass@epri.com	Member
Gabriel	Delgado	Invenergy	gdelgado@invenergy.com	Member
Eric	Doak	D4EnergySolutions	Ericdoak@d4energysolutions.com	Member
Jesse	Duffy	Nashville Electric Service	jduffy@nespower.com	Member
Evgenii	Ermakov	Hitachi Energy	evgenii.ermakov@hitachienergy.com	Member
Lorne	Gara	Shermco	lgara@telus.net	Member
Brad	Grooms	NTS	B.grooms@atsllcwi.com	Member
Samuel	Gruskiewicz	Ge verGuestva	Samuel.gruskiewicz@ge.com	Guest
Ismail	Guner	Hydro-Quebec	ismailguner@ieee.org	Member
Roger	HaMember	GE VerGuestva	Roger.haMember1@ge.com	Member
William	Herron	Reinhausen	W.herron@us.reinhausen.com	Member
Ryan	Jonak	Portland General Electric	Ryan.Jonak@pgn.com	Guest
Thomas A.	Keels	kEElectric Engineering PLLC	thomasakeels@ieee.org	Member
Yeounsoo	Kim	MEPPI	Yeounsoo.kim@meppi.com	Member
Weijun	Li	Braintree Electric Light Department	wli@beld.com	Member
Mario	LocarGuest	Doble Engineering	mlocarGuest@doble.com	Member
Jose	Machain	Prolec Ge	joseluis.machain@prolec.energy	Member
Balakrishnan	Mani	Delta star field service	Balakrishnan_mani@ieee.org	Member
Kumar	Mani	Duke Energy	kumar.mani@duke-energy.com	Member
Douglas	McCullough	Maxima Hyundai	Doug@maxima-sales.com	Guest
David	Murray	TVA	Dbmurray@tva.gov	Member
Ryan	Musgrove	Oklahoma Gas & Electric	Ryan.musgrove@ieee.org	Member
Anthony	Natale	HICO America	anatale@hicoamerica.com	Member
Mike	Guestlte	Kiewit	Guestlte@ieee.org	Member
Parminder	Panesar	Virginia Transformer Corp	parminder_panesar@vatransformer.com	Member
Rakesh	Patel	Hitachi energy	rakesh.patel@hitachienergy.com	Member
Pedro	Pedro	Efacec Energia	pedropedro@efacec.com	Member
Homer	Portillo	Advanced Power TechGuestlogies	hportillo@advpowertech.com	Member

Scott	Reed	Mva	sreed@mvadiagGueststics.com	Member
Perry	Reeder	PA Transformer	Perry.reeder@patransformer.com	Member
Diego	RobaliGuest	Megger	Diego_robaliGuest@ieee.org	Member
Patrick	Rock	American Transmission Company	patrock@ieee.org	Member
Alaor	Scardazzi	Siemens Energy	alaor.scardazzi@siemens-energy.com	Member
Stefan	Schindler	Maschinenfabrik Reinhausen GmbH	s.schindler@reinhausen.com	Guest
Ewald	Schweiger	Siemens Energy	ewald.schweiger@ieee.org	Member
Thomas	Spitzer	City Transformer Service Co	t.spitzer@sbcglobal.net	Member
Kyle	Stechschulte	AEP	Kdstechschulte@aep.com	Member
H. Allen	Steele	TVA	hasteele@tva.gov	Member
David	Stockton	SBC	david@stockton-consulting.com	Member
Jonathan	Tan	Guestrthern Transformer	jtan@Guestrtherntransformer.com	Member
Troy	Tanaka	Burns & McDonnell	ttanaka@burnsmcd.com	Member
Jim	Thompson	T & R Service Company	jim@svtv.com	Member
Eduardo	Tolcachir	TTE Transformers	etolcachir@tte.com.ar	Member
Alwyn	Vanderwalt	ECI	A.vanderWalt.us@eciusa.com	Member
Alan	Washburn	Burns and McDonnell	awashburn@burnsmcd.com	Member
Matthew	Webb	GE VerGuestva	Matthew.webb@ge.com	Guest
Elliot	White	SD Myers	Elliot.white@sdmyers.com	Guest
Kris	Zibert	Allgeier, Martin & Associates	Kris.zibert@amce.com	Member

Unapproved Meeting Minutes

PC57.153 WG Guide for Paralleling Regulating Transformers

Minutes from October 29, 2024 – St. Louis 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 October 29, 2024

2. Chairs Remarks

After the officer’s introduction, several changes to the previously sent agenda were noted. These changes include the addition of a draft for Annex C of the document, detailing aspects related to circulating current, and a new topic addressing issues with inclusive language, particularly terminology such as “master/follower.

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 43 attendees in the meeting
 - 17 members were present
 - 7 guests requested membership
- Quorum check
 - Quorum was achieved, 17 of 20 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 to the emailed agenda were made.

- 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
- Quorum Check
- Review and approval of the meeting agenda
- Review and approval of the minutes from the Spring 2024 meeting
- Review and discussion of reverse power flow definition
 - Request for volunteers to draft a section on "Recommended actions during reverse power flow"
- Review draft of Annex C – Concept of Apparent Circulating Current - Dr Karsten Viereck
- Old Business –
 - Resolution of Bibliography Reference B.1 - CEMA Std L10-1 CEMA Standard for Load Tap Changing Paralleling Schemes
- 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
- Next Meeting(s)

- Virtual - TBD
- In Person – March 25, 2025 – Denver, CO
- Adjourn

Motion to approve the agenda

- Motion by Dan Sauer
- Seconded by Dharam Vir
- Unanimous approval

4.2 Approval of the minutes from the last working group meeting in spring , 2024

No objection to unanimous approval of the meeting minutes from spring 2024 working group meeting.

5. Review and discussion of reverse power flow definition and document section

Discussion began with a review of the reverse power flow definition agreed upon in the last meeting. It was brought to attention that WG for C57.133 is forming a task force for further review of the reverse power flow definition. It was proposed to retain the current definition in our document unless there are objections.

A question was raised about whether C57.133 had already defined reverse power flow. It was clarified that the group would create its own definition instead.

A suggestion to reference C57.133 in the documentation was discussed, but concerns were raised about the number of external references already included.

Ultimately, it was decided to table the definition final text decision for future discussion.

Volunteers were asked to write the section related to the reverse power flow of the transformers.

- Francis Mill and
- Mark Tostrud

Volunteered to work on this section

6. Old Business

6.1 Resolution of Bibliography Reference B.1 - CEMA Std L10-1 CEMA Standard for Load Tap Changing Paralleling Schemes

A review of the references in the old document revealed that a CEMA L10-1 standard, , was used . However, further investigation confirmed that the CEMA organization no longer exists, and this standard is now unavailable. Given the lack of access to this document, the working group discussed whether to retain any excerpts or images from it. Due to availability and copyright concerns, it was agreed that the reference to the CEMA Standard should be removed from the updated draft.

A motion to eliminate the B.1 reference from the document was made:

- Motion by Dharam Vir
- Seconded by Francis Mills
- Unanimous approval

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

Presentation detailing the concept of the apparent circulating currents was presented by Dr. Karsten Viereck. Presentation will be distributed among the WG members.

6.3 Use of Inclusive Language in Technical Terminology and Communications (IEEE P3400)

During the approval PAR process, concerns were raised regarding terminology in the guide, specifically with terms like "master/follower related to the specific control scheme. This terminology was questioned for potentially non-inclusive language. IEEE attempted to address this by suggesting guidelines for more neutral terminology. Initially, the terms were removed temporarily from the guide's purpose to facilitate PAR approval, deferring the issue for later resolution.

The proposed change is to replace "master/follower" with terms like "primary/secondary" or "leader/follower." This change would standardize terminology within the guide, although it would not address terminology inconsistencies in field use.

During the discussion it was noted that manufacturers commonly use "master/follower," and it was suggested including an informative note acknowledging that alternate terminology exists in the industry. This would help readers understand the broader industry context.

It was also discussed that the IEEE P3400 document, which might provide additional guidance, has not yet been approved.

At the end of discussion, a motion was made to: suspend further discussion related to the "master/follower" terminology until formal guidance is received from IEEE.

- Motion by Weijun Li
- Seconded by Ryan Musgrove
- Unanimous approval

7. New Business

No new business was identified.

8.Next Meeting

The next scheduled meeting will be at the spring meeting, 2025.

9.The meeting adjourned at 5:45 PM

10.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
Avelino	Paulo		Guest
Bargone	Gilles	FISO	Member
Berancourt	Edwing	Siemens Energy	Guest
Blaydon	Daniel	Baltimor Electric	Member
Crockett	Janet	Fayetteville PWC	Guest
Elson	Eric	San Diego G&E	Guest
Eopitla	Equi	MR	Guest
Fong	Satford	Georgia Power	Guest
Gambco	Jose	H-J fammily of Companies	Guest
Garnder	James	Prolec GE	Guest
Heiden	Kyle	Eaton	Member

Hoffman	Saramma	PPL	Member
Hollrah	Derek	Burnes&McDonnell	Guest
Joshi	Akash	Kimley-Hash/Kleev USA	Guest
Jung	Francisco	MR	Guest
Katapalli	Thrinadhia	Virginia Transformers	Guest
Kiparizoski	Zan	Howard Industries	Secretary
Knapp	Evan	Eaton	Member
Li	Weijun	Braintree Electric Light Dept.	Member
Marulanda	Katherine	Magnetron	Guest
Mendez	Omar	Prolec GE	Guest
Mills	Francis	Power Engineers	Member
Murcia	Fredy	Siemens Energy	Guest
Musgrove	Ryan	Oklahoma Gas&Electric	Member
Obcegan	Daniel	TTE Transformers	Guest
Park	Den	Hico	Guest
Radu	Ion	Hitachi Energy	Member
Rock	Pat	American Transmission	Guest
Rossini	Yuri	Siemens Energy	Guest
Sauer	Dan	Eaton	Member
Schindler	Stefan	MR	Guest
Schleismann	Eric	Southern Company	Member
Sen	Cihangir	Duke Energy	Vice-chair
Shalbi	Jaber	Vantran Transfomrers	Guest
Sherturde	Heinchora	Uhart/Ddi	Guest
Thompson	Michael	SEL Engineering Services	Guest
Tostrud	Mark	Dynamic Ratings	Chair
Vaagensmith	Bjorn	Idaho National Lab	Guest
Last Name	First Name	Affiliation	Role
Viereck	Karsten	Reinhausen	Member
Vir	Dharam	Prolec GE	Member
Young	Tim	Hitachi Energy	Guest
Zaman	Malia	IEEE SA	Guest
Zhang	Shibao	Pcore Electric	Member

Standards Subcommittee

October 30, 2024, St. Louis, MO.

Standards Subcommittee		
Chair: Daniel Sauer	Vice-Chair: Marcos Ferreira	Secretary: Ajith Varghese
Standards Coordinator: Steve Shull		
Room: Grand Ballroom E	Date: October 30, 2024	Time: 4:30 PM to 05:15 pm
Total Members: 84	Present at time of quorum check: 43	Attended per Record: 49
Guests present: 67	Membership requested: 21	Membership accepted: 12

L.1 Meeting Attendance

The Standards Subcommittee met on Wednesday; Oct 30th, 2024, at 4:31 PM (CST).

43 members were in attendance at the beginning of the meeting, which met the quorum requirement.

Based on attendance roster and after correction to membership, it was confirmed that **49 of 84** members were present. 66 guests were also present of which **21** guests requested membership of which **12** met attendance requirement and will be granted membership.

L.2 Chair's Remarks

The Chair welcomed members and guests to the F24 meeting. Chair briefly highlighted the requirement that while introducing one need to state their affiliation.

The agenda was moved by Tom Prevost and seconded by Sanjib Som. The motion was carried with unanimous consent. The Minutes for Spring 2024 was moved by Eric Davis and seconded by Francis Mills. The motion was carried with unanimous consent.

Chair presented the IEEE requirement for patent and copyrights. The Chair reminded WGs that call of the patent is required during every WG meetings including on-line/Teleconference meeting. If there are any patent claim, it shall be noted but not discussed at the working group meetings. The chair reminded members of their membership duties to respond to surveys and ballots to maintain.

The Chair reminded the WG and TF leaders to submit their minutes from the meetings within **15 days** to the SC secretary. The SC Secretary then must submit the SC minutes within 45 days of the SC meeting.

WG on C57.12.00, C57.12.90, C57.152 and C57.133 and TF on IEEE/IEC and Reverse Power flow provided an update on status of their standards/TF.

- **WG C57.12.00:** Two business items are approved during this week to add to next revision of C57.12.00. These are related to modification to Induce Over Voltage Factor and new section for Class I PD Testing, approved by TF of low frequency test and Dielectric Test SC.
- **WG C57.12.90 Test Code:** The six Task Forces that are working on material for continuous revision of C57.12.90-2021 all met in St Louis on Monday and Tuesday. There are two business that were approved in a Task Force meeting this.

Both C57.12.00 and C57.12.90 are tentatively planning to launch the next IEEE-SA ballot by the end of 2025 or early 2026, therefore, will consider closing off any pending work soon after the Spring 2025 meeting

Sanjib Som raised questions on functioning of WG C57.12.00 and C57.12.90 as these WG don't have meeting and there is no formal WG approval for addition/modification to standards. The chair clarified that all changes to these standards are discussed and approved in respective TF and approved by respective subcommittee. David Wallach added that transformer ADCOM is in process of revising manuals and at some point, in future this will be discussed

- **WG C57.152 Field guide:** Ballot is in progress and had to be extended to get the required 75% response. WG approved a motion to confirm the comment resolution board and volunteers were identified to be part of CRG.
- **WG C57.133 Reverse Power flow:** WG had their first meeting. Three presentations were made and initial work/outlined were discussed. WG plan to meet virtually before S25 to get an initial working definition and refine the framework
- **TF IEEE/IEC Cross Reference:** TF did not have quorum. TF started work to develop an index document to compare IEC and IEEE and have some volunteers confirmed their availability to work with chair to develop further.
- **WG C57.12.80 Terminology Guide:** Did not meet. Recirculation is completed and currently hoping to have the document published in early 2025.
- **WG C57.12.70 Terminal Markings:** Currently not active and did not meet.
- **WG C57.163 Guide for Establishing Power Transformer Capability while under Geomagnetic Disturbances:** WG is not active and did not meet.

Detailed WG/TF reports are included as part of this report (pages 4 to 35).

L.4 Old Business

Under the old Business, Dan Blaydon made a presentation explaining the basic concept of reverse flow and references to Step Up/ Step down and service conditions currently found in various transformer standards.

Follow up discussion on next step on where to go with definition of the Reverse flow and modifying the service condition, some member wanted to have WG of C57.133 to take initial lead but some suggested creating another Task force or extend the scope of PAR study group created for the defining of reverse flow to add as addendum to C57.12.80. After more discussion, a motion was passed to Table (1) PAR study group on defining Reverse flow definition and (2) further discussion/action of changes to service condition till WG C57.133 make progress and can give recommendation to SC on these items. Motion was passed with 30 in favor, 5 against and 5 abstaining.

L.5 New Business

No new item was discussed.

L.6 Attendance

Included as last two pages of this minutes.

L.7 Adjournment

The meeting was adjourned at 5:25 PM CST.

Subcommittee New business and SC attendees list are included at end of this minutes after WG/TF reports (pages 36-37).

Respectfully submitted,
Ajith M. Varghese
Standards SC Secretary
04/06/2024

L.3 Working Group and Task Force Reports

L.3.1 Standards Working Group on the Continuous Revision of C57.12.00

Standards Working Group on the Continuous Revision of C57.12.00

Standards Subcommittee
IEEE/PES Transformers Committee
WG Chair: Eric Davis
Fall 2024 St. Louis, MO; October 30, 2024

INTRODUCTION

This is a working group by committee of task forces, for continuous revision of C57.12.00. The purpose of this WG is to compile all the work being done in various TF/WG/SC's for inclusion in the continuous revision of C57.12.00 in a consistent manner. The WG exists administratively in the Standards Subcommittee, and the technical work is done in other subcommittees, based on expertise and scope. This WG coordinates efforts with the companion standard C57.12.90 so that they publish together.

SUMMARY

C57.12.00-2021 was approved by IEEE SA Standards Board on November 9, 2021. and published January 2022. A Project Authorization Request (PAR) for Revision of PC57.12.00 was approved May 13, 2022. It expires December 31, 2026.

Changes approved by the appropriate subcommittees by the end of the Spring 2025 meeting will be included in the next revision of C57.12.00. This will allow sufficient time to ballot and resolve any comments prior to the expiration of the existing PAR.

FUTURE REVISIONS AND PENDING WORK

Any new material provided by the various Task Forces to this WG for inclusion in the next revision, will first be approved by the responsible technical subcommittee (Dielectric Test, PCS, Distribution, IL, etc.) and then presented to the Standards Subcommittee for the "official" vote of approval to go to ballot.

The following groups are reviewing proposed changes that may impact this standard.

- TF PCS Continuous Revisions to C57.12.00 (PCS)
 - The TF discussed the following items. Please refer to the TF and SC meeting minutes for additional details.
 - Item 116: Update KVA levels in Table 11.
 - Item 117: Withdrawn
 - Item 118: Add Heat Run Test Time in the Test Report
- TF Revision of Impulse Tests C57.12.00 & C57.12.90 (DiTest)

- Please refer to the TF and SC meeting minutes for details.
- TF Continuous Revisions of Low Frequency Tests (DiTest)
 - Partial Discharge for Class I Transformers: Approved by TF and SC.

Table 4—Dielectric insulation levels for all windings of Class II power transformers, voltages in kV

Maximum system voltage (kV rms)	Nominal system voltage ^a (kV rms)	Applied-voltage test ^a (kV rms)			Induced-voltage test ^{b,c} (phase to ground) (kV rms)		Winding line-end BIL ^d (kV crest)				Neutral BIL ^{e,f} (kV crest)	
		Delta and fully insulated wye	Grounded wye	Impedance grounded wye or grounded wye with higher BIL	Enhanced 7200 cycle	One hour	Minimum	Alternates			Grounded wye	Impedance grounded wye or grounded wye with higher BIL
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8	Col 9	Col 10	Col 11	Col 12	Col 13
≤ 17	≤ 15	34	34	34	16	14	110				110	110
26	25	50	34	40	26	23	150				110	125
36	34.5	70	34	50	36	32	200				110	150
48	46	95	34	70	48	42	200	250			110	200
73	69	140	34	95	72	63	250	350			110	250
121	115	173	34	95	120	105	350	450	550		110	250
145	138	207	34	95	145	125	450	550	650		110	250
169	161	242	34	140	170	145	550	650	750	825	110	350
242	230	345	34	140	240	210	650	750	825	900	110	350
362	345	518	34	140	360	315	900	1050	1175		110	350
550	500	N/A	34	140	550 ^g	475 ^g	1425	1550	1675		110	350
765	735	N/A	34	140	880 ^g	750 ^g	1950 ^g	2050			110	350
800	765	N/A	34	140	885 ^g	795 ^g	1950 ^g	2050			110	350

^aFor nominal system voltage greater than maximum system voltage, use the next higher voltage class for applied-voltage test levels.

^b~~The induced-voltage tests shall be conducted at voltages in the table above are based on an overvoltage factor of approximately 1.58 × nominal system voltage for the one hour test and 1.80 × nominal system voltage for the enhanced 7200 cycle test.~~

5.10.5.5 Induced-voltage test for Class II power transformers

With the transformer connected and excited as it will be in service, an induced-voltage test shall be performed as indicated in Figure 2, at voltage levels indicated in Columns 6 and 7 of Table 4. ~~Minimum line-to-ground induced test levels for Class II power transformers shall be a multiple of corresponding line-to-ground nominal system voltage as follows: 1.58 times for one-hour tests and 1.8 times for 7200 cycles enhancement level tests.~~

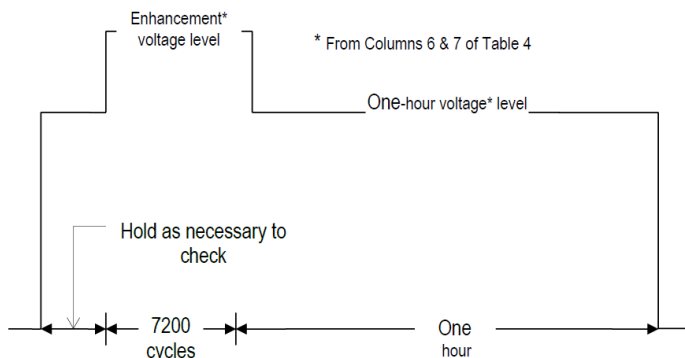


Figure 2—Induced-voltage test for Class II power transformers

- Induced Overvoltage – Nominal versus Maximum operating voltage: Approved by TF and SC

Table 3—Dielectric insulation levels for distribution and Class I power transformers, voltages in kV

Maximum system voltage (kV rms)	Nominal system voltage ^{a, c} (kV rms)	Applied-voltage test ^d (kV rms)			Induced-voltage test ^{b, e} (phase to ground) (kV rms)	Winding line-end BIL ^{h, f} (kV crest)			Neutral BIL ^{g, c, h} (kV crest)	
		Delta or fully insulated wye	Grounded wye	Impedance grounded wye or grounded wye with higher BIL		Minimum	Alternates		Grounded wye	Impedance grounded wye or grounded wye with higher BIL
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8	Col 9	Col 10	Col 11
Part A - Distribution transformers										
1.5	1.2	10	-	10	1.4	30			30	30
3.5	2.5	15	-	15	2.9	45			45	45
6.9	5	19	-	19	5.8	60			60	60
11	8.7	26	-	26	10	75			75	75
17	15	34	-	34	17	95	110		75	75
26	25	40	-	40	29	125	150		75	95
36	34.5	50	-	50	40	125	150	200	75	125
48	46	95	-	70	53	200	250		95	150
73	69	140	-	95	80	250	350		95	200
Part B - Class I power transformers without partial discharge testing										
1.5	1.2	10	10	10	1.4	30	45		45	45
3.5	2.5	15	15	15	2.9	45	60		60	60
6.9	5	19	19	19	5.8	60	75		75	75
11	8.7	26	26	26	10	75	95		95	95
17	15	34	26	34	17	95	110		95	110
26	25	50	26	40	29	150			95	125
36	34.5	70	26	50	40	200			95	150
48	46	95	34	70	53	200	250		110	200
73	69	140	34	95	80	250	350		110	250
Maximum system voltage (kV rms)	Nominal system voltage ^{a, c} (kV rms)	Applied-voltage test ^d (kV rms)			Induced-voltage test ^{b, e} (phase to ground) (kV rms)		Winding line-end BIL ^{h, f} (kV crest)		Neutral BIL ^{g, c, h} (kV crest)	
		Delta or fully insulated wye	Grounded wye	Impedance grounded wye or grounded wye with higher BIL	Enhanced 7200 cycles	One hour	Minimum	Alternate	Grounded wye	Impedance grounded wye or grounded wye with higher BIL
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8	Col 9	Col 11	Col 12
Part C - Class I power transformers with partial discharge testing specifically requested by purchaser										
1.5	1.2	10	10	10	1.2	1.1	30	45	45	45
3.5	2.5	15	15	15	2.6	2.3	45	60	60	60
6.9	5	19	19	19	5.2	4.6	60	75	75	75
11	8.7	26	26	26	9	7.9	75	95	95	95
17	15	34	34	34	16	14	95	110	95	110
26	25	50	34	40	26	23	150		95	125
36	34.5	70	34	50	36	32	200		95	150
48	46	95	34	70	48	42	200	250	110	200
73	69	140	34	95	72	63	250	350	110	250

^aFor nominal system voltage greater than maximum system voltage, use the next higher voltage class for applied-voltage test levels.

^bInduced-voltage tests shall be conducted at 2.0 × nominal system voltage for 7200 cycles.

^cBold typeface BILs are the most commonly used standard levels.

^dY-Y-connected transformers using a common solidly grounded neutral may use neutral BIL selected in accordance with the low-voltage winding rating.

^eSingle-phase distribution and power transformers and regulating transformers for voltage ratings between terminals of 8.7 kV and below are designed for both Y and Δ connection, and are insulated for the test voltages corresponding to the Y connection so that a single line of transformers serves for the Y and Δ applications. The test voltages for such transformers, when connected and operated, are therefore higher than needed for their voltage rating.

^fFor series windings in transformers, such as regulating transformers, the test values to ground shall be determined by the BIL of the series windings rather than by the rated voltage between terminals.

^gValues listed as nominal system voltage in some cases (particularly voltages 34.5 kV and below) are applicable to other lesser voltages of approximately the same value. For example, 15 kV encompasses nominal system voltages of 14 440 V, 13 800 V, 13 200 V, 13 090 V, 12 600 V, 12 470 V, 12 000 V, and 11 950 V.

^hNeutral BIL shall never exceed winding BIL.

ⁱInduced voltage tests shall be conducted at 1.58 × nominal system voltage for one hour and 1.8 × nominal system voltage for enhanced 7200 cycle test.

Three changes have already been approved by the respective SC for the next revision. These approved changes are:

1. Changes to Low Frequency Tests from Ajith Varghese's RLFT TF in the Dielectric Test SC. The final survey approved by TF and SC in the Spring 2023 meeting is shown below. Text in black is existing, red is revised, blue is added.

5.10.5.5 Induced-voltage test for Class II power transformers

With the transformer connected and excited as it will be in service, an induced-voltage test shall be performed as indicated in Figure 2, at voltage levels indicated in Columns 6 and 7 and 1.05 times the line to ground voltage per column 2 of Table 4. Minimum line-to-ground induced test levels for Class II power transformers shall be a multiple of corresponding line-to-ground nominal system voltage as follows: 1.58 times for one-hour tests and 1.8 times for 7200 cycles enhancement level tests.

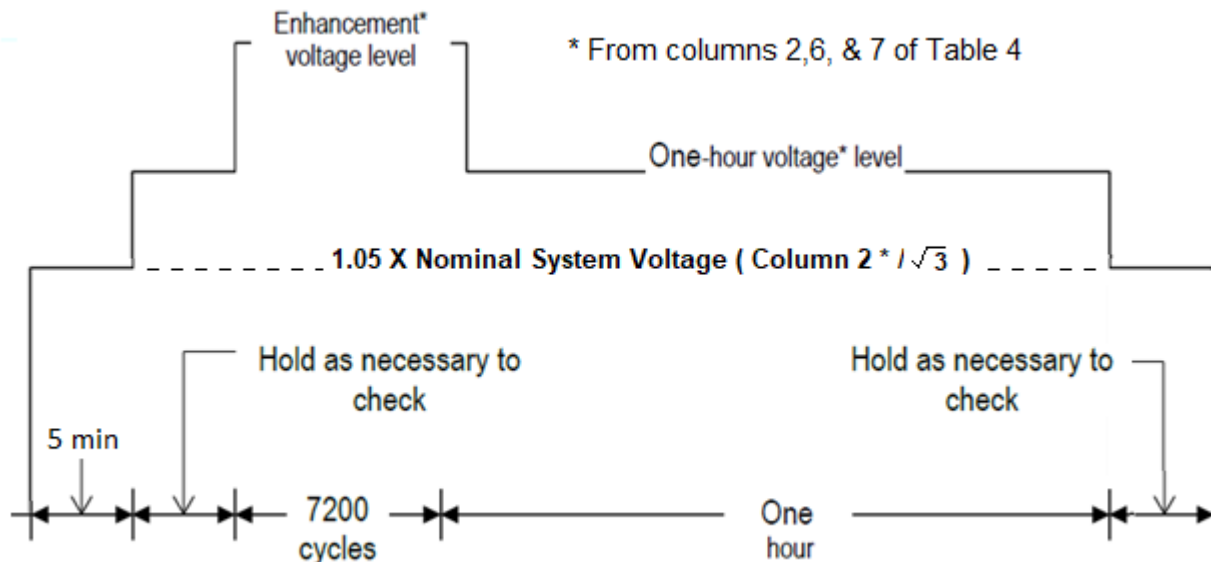


Figure 2 —Induced-voltage test for Class II power transformers

2. Changes to Measurements of Auxiliary Losses from T. Ansari's Continuous Revisions to C57.12.00 in the Performance Characteristics SC. The motion approved by the TF and SC in the Spring 2024 meeting are shown below. The actual text from C57.12.00 is shown after the motion. Text in black is existing, red is revised, blue is added.

1. WG Item 113, Measurement of Auxiliary Losses/Ajith Varghese (Prolec GE). To clarify what component's losses would be included as "control losses", to avoid different interpretation of "integral parts of the transformer", a new proposed text was presented to the Group and approved:

- *For Class II transformers (see 5.10), **auxiliary cooling equipment** losses shall be measured and recorded. All stages of cooling, and all associated cooling control equipment shall be energized, **provided these components are integral parts of the transformer to meet guaranteed thermal performance.***

Note:

*The auxiliary losses **do not include control cabinet components** including but are not limited to cabinet heaters, online DGA or ancillary devices such as dehydrate breathers, nitrogen cabinet heaters, etc.*

5.9 Total losses

The total losses of a transformer shall be the sum of the no-load losses and the load losses. The losses of cooling fans, insulating liquid pumps, space heaters, and other ancillary equipment are not included in the total losses. When specified, power loss data on such ancillary equipment shall be furnished.

The standard reference temperature for the load losses of power and distribution transformers shall be defined as 20 °C plus the rated average winding rise. The standard reference temperature for the no-load losses of power and distribution transformers shall be 20 °C.

For Class II transformers (see 5.10), ~~control/auxiliary (cooling)~~ **auxiliary cooling equipment** losses shall be measured and recorded. All stages of cooling, ~~pumps, heaters,~~ and all associated **cooling** control equipment shall be energized, provided these components are integral parts of the transformer **to meet guaranteed thermal performance.**

Note: The auxiliary losses do not include control cabinet components including but are not limited to cabinet heaters, online DGA or ancillary devices such as dehydrate breathers, nitrogen cabinet heaters, etc.

3. Changes to Phasor Diagrams from T. Ansari's Continuous Revisions to C57.12.00 in the Performance Characteristics SC. The motion approved by the TF and SC in the Spring 2024 meeting are shown below. The actual text from C57.12.00 is shown after the motion. Text in black is existing, red is revised, blue is added.

2. WG Item 114, Modification of Sec 5.7.2/Steve Antosz (Prolec GE)

- Proposal to add the phasor-group designation as required nomenclature for identifying the angular displacement between windings for three-phase power and distribution transformers. Std. C57.12.70 “Standard Terminal Markings and Connections” was recently revised and updated with that concept. As both standards are linked through mutual references, the proposal includes the phasor group designation be shown on the transformer’s nameplate. The nomenclature is detailed in 12.70. This proposal also harmonized with IEC Stds.
- Three motions passed:
 - Motion #1: Add the following sentence at the end of the second paragraph in Subclause 5.7.2: “The phasor group designation (vector group) shall be shown on the transformer’s nameplate, near the phasor diagram.”
 - Motion #2: Revise existing Figure 1 to describe the phasor group designation for the four example connections given, as: Dd0, Yd1, Yy0, Dyl
 - Motion #3: Revise Table 6, Row 11 for Nameplates A, B, and C. Change “Phasor Diagram” to “Phasor Diagram and Phasor Group Designation”

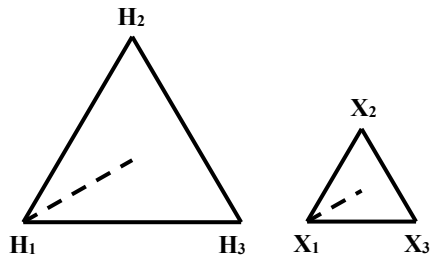
5.7.2 Angular displacement (nominal) between voltages of windings for three-phase transformers

The angular displacement of a polyphase transformer is the time angle expressed in degrees between the line-to-neutral voltage of the reference identified high-voltage terminal H₁ and the line-to-neutral voltage of the corresponding identified low-voltage terminal X₁.

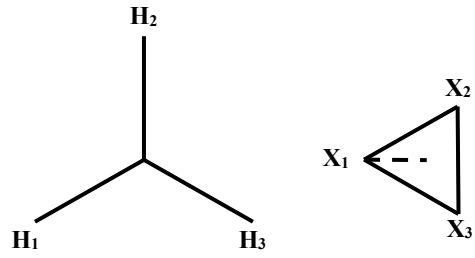
Unless specified otherwise and identified on the nameplate, the angular displacement between high-voltage and low-voltage phase voltages of three-phase transformers with Δ-Δ or Y-Y connections shall be zero degrees. The phasor group designation (vector group) shall be shown on the transformer’s nameplate, near the phasor diagram.

The angular displacement between high-voltage and low-voltage phase voltages of three-phase transformers with Y-Δ or Δ-Y connections shall be 30°, with the low voltage lagging the high voltage as shown in Figure 1.

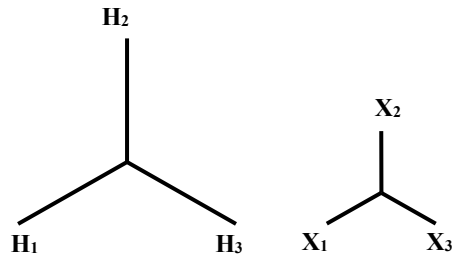
Additional phasor diagrams are described in IEEE Std C57.12.70.



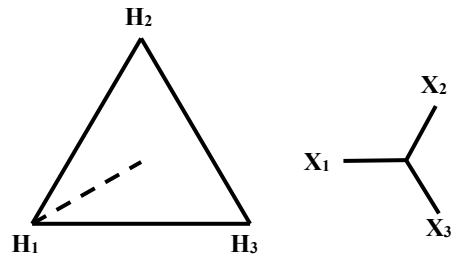
$\Delta - \Delta$ CONNECTION (Dd0)



Y - Δ CONNECTION (Yd1)



Y - Y CONNECTION



Δ - Y CONNECTION

Figure 1 —Phase relation of terminal designation for three-phase transformers

Table 6—Nameplate information

Row	Nameplate A	Nameplate B	Nameplate C
1	Serial number ^a	Serial number ^a	Serial number ^a
2	Month/year of manufacture	Month/year of manufacture	Month/year of manufacture
3	Class (ONAN, ONAF, etc.) ^b	Class (ONAN, ONAF, etc.) ^b	Class (ONAN, ONAF, etc.) ^b
4	Number of phases	Number of phases	Number of phases
5	Frequency	Frequency	Frequency
6	kVA rating ^{a, b}	kVA rating ^{a, b}	kVA (or MVA) rating ^{a, b}
7	Voltage ratings ^{a, c}	Voltage ratings ^{a, c}	Voltage ratings ^{a, c}
8	Tap voltages ^d	Tap voltages ^d	Tap voltages ^d
9	Temperature rise, °C	Temperature rise, °C	Temperature rise, °C
10	Polarity (single-phase transformers)	Polarity (single-phase transformers)	Polarity (single-phase transformers)
11	Phasor diagram and phasor group designation (polyphase transformers)	Phasor diagram and phasor group designation (polyphase transformers)	Phasor diagram and phasor group designation (polyphase transformers)
12	Percent impedance ^e	Percent impedance ^e	Percent impedance ^e
13	—	Basic lightning impulse insulation levels (BIL) ^f	Basic lightning impulse insulation levels (BIL) ^f
14	Approximate total mass in kg or weight in lb ^g	Approximate total mass in kg or weight in lb ^h	Approximate total mass in kg or weight in lb ^h
15	Connection diagram ⁱ	Connection diagram ⁱ	Connection diagram ⁱ
16	Name and location (country) of manufacturer	Name and location (country) of manufacture	Name and location (country) of manufacture
17	Installation and operating instructions reference	Installation and operating instructions reference	Installation and operating instructions reference
18	The word <i>transformer</i> or <i>autotransformer</i>	The word <i>transformer</i> or <i>autotransformer</i>	The word <i>transformer</i> or <i>autotransformer</i>
19	Type of insulating liquid (generic name preferred) ^j	Type of insulating liquid (generic name preferred) ^j	Type of insulating liquid (generic name preferred) ^j
20	Conductor material (of each winding)	Conductor material (of each winding)	Conductor material (of each winding)
21	Liquid volume	—	Step-up operation suitability ^k
22	—	—	Maximum value of primary voltage ^l
23	—	—	Tank, pressure, and liquid data ^m
24	Department of Energy (DOE) compliant ⁿ	DOE compliant ⁿ	DOE compliant ⁿ
25	---	---	Core Design – Core or Shell form
26	---	---	Core Type - Number of limbs (wound), Shell Type - D type , 7 limbs, or others

Respectfully submitted,
Eric Davis, WG Chair
November 6, 2024

L.3.4 WG Standards Transformer on Continuous Revision for C57.12.90

Standards Working Group on the Continuous Revision of C57.12.90

Standards Subcommittee

IEEE/PES Transformers Committee

WG Chair: Stephen Antosz

Vice-Chair/Secretary: Jason Varnell

Fall 2024 St. Louis; October 30, 2024 (new text is highlighted)

INTRODUCTION

This is a working group by committee of task forces, for continuous revision of C57.12.90. The purpose of the WG is to keep track of the work being done in various TF/WG/SC's for inclusion in the continuous revision of C57.12.90 in a consistent manner. The WG exists administratively in the Standards Subcommittee and has no live meetings. The technical work is done in other subcommittees based on expertise and scope. WG membership consists of the people actively working on revisions. These people are the TF Chairs, SC Chairs, and other significant contributors to the current version. WG Members are:

Hakan Sahin
Ramsis Girgis
Sylvain Plante
Ajith Varghese
Diego Robalino
Dinesh Sankarakurup
Daniel Sauer
Rogerio Verdolin
Poorvi Patel
Sam Sharpless
Bertrand Poulin guest
John Sen guest
Polo Rodriguez guest
Zan Kiparizoski guest

Currently there are six Task Forces in three different Subcommittees, as follows:

1. PCS – Cont Rev to Test Code C57.12.90 Clauses 5-9, & 12, TF Chair: Hakan Sahin
2. PCS – Audible Sound Revision Clause 13, TF Chair: Ramsis Girgis
3. Dielectric Test – Cont Rev to Impulse Tests in Clause 10, TF Chair: Sylvain Plante
4. Dielectric Test – Cont Rev to LowFrequency Tests Clause 10, TF Chair: Ajith Varghese
5. Dielectric Test –Insulation Power Factor and Resistance, 10.10 and 10.11, TF Chair: Diego Robalino
6. Insulation Life – Cont Rev to Temperature Test Clause 11 and Resistance Clause 5, TF Chair: Dinesh Sankarakurup

SUMMARY

C57.12.90-2021 was approved as a revised standard by the IEEE-SA Standards Board on Nov 9, 2021. It was published on Feb 4, 2022. The WG Chair took out a new PAR on Feb 28, 2022, which was approved by the IEEE-SA Standards Board on May 13, 2022. The PAR expires on December 31, 2026.

We are looking to launch the next ballot by the end of 2025 or early 2026. Therefore, would close off pending work at the Spring 2025 meeting, for mid 2025 completion. This might be adjusted later.

FUTURE REVISIONS AND PENDING WORK

Any new material provided by the various Task Forces to this WG for inclusion in the next revision, will first be approved by the responsible technical subcommittee (Diel Test, PCS, Dist, IL, etc.) and then presented to the Standards Subcommittee for the “official” vote of approval to go to ballot.

Changes **ALREADY APPROVED** for the next revision:

1. Hakan Sahin’s PCS TF for Revision of C57.12.90.

- a. Changes to subclause 7.3, Ratio test methods to “modernize” it. Final survey approved in the Spring 2021 virtual meeting.

Insert a new subclause 7.3.1 as follows:

7.3.1 Electronic ratio and phase measurement meters

An electronic meter that determines the transformer turns ratio, polarity and phase angle may be used for the measurement of these parameters.

The existing 7.3.1 Voltmeter method should be renumbered to be 7.3.2, are no changes to the text.

The existing 7.3.2 Comparison method should be renumbered to be 7.3.3, no changes to the text or figures 10 & 11.

The existing 7.3.3 Ratio meter clause and figure 12 is to be deleted.

- b. Ratio test voltage and frequency under subclause 7.1.2. Request to change frequency bandwidth. TF and SC approved in Spring 2022.

7.0 Ratio test

Current Version:

7.1.2 Voltage and frequency

The ratio test shall be made at rated or lower voltage and rated or higher frequency.

Revised Version

7.1.2 Voltage and frequency

The ratio test shall be made at rated or lower voltage and be such that the ratio of test voltage to test frequency is less than or equal to the ratio of rated voltage to rated frequency.

- c. Number of short-circuit tests under subclause 12.3.4. TF and SC approved in Spring 2022.

Current Version:

12.3.4 Number of tests

Each phase of the transformer shall be subjected to a total of six tests satisfying the symmetrical current requirement specified in 12.3.1 or 12.3.2, as applicable. Two of these tests on each phase shall also satisfy the asymmetrical current requirements specified in 12.3.3.

Revised Version

12.3.4 Number of tests

- When a three-phase transformer is tested in a three-phase test circuit or in a single-phase test circuit as given in Annex C, each phase of the transformer shall be subjected to three tests satisfying the asymmetrical current requirements specified in 12.3.3. The tests shall be performed on one of the outer phases with the tap-changer in the maximum position, on the other outer phase with the tap-changer in the minimum position and on the middle phase with the tap-changer in the principal position
 - When a single-phase transformer is tested in a single-phase test circuit the transformer shall be subjected to three tests satisfying the asymmetrical current requirements specified in 12.3.3. The three tests shall be performed one each, with the tap-changer in the maximum, minimum and principal position.
- d. Load Tap Changer performance test with rated voltage. New subclause 8.7. TF and SC approved in Spring 2022. It was re-discussed in Fall 2022 but no changes were made so still considered to be approved.

8.7 Load Tap Changer Voltage Test

8.7.1 General

In order to verify the performance of a transformer that has a load tap changer (LTC), the LTC shall be operated through one end-to-end-to-end sequence (from one tap extreme to the other tap extreme and back again) with the transformer energized at rated voltage.

8.7.2 Control voltage

Control voltage for the LTC motor during the test shall be as near to rated voltage as possible, with a minimum of 85%.

8.7.3 Preparation for the test

The LTC shall be fitted with all included equipment. It shall be connected as it will be in service, including protective devices.

8.7.4 Procedure

Either the high or low voltage winding of the transformer under test shall be energized at rated voltage and frequency, unless otherwise specified. The LTC shall be operated using the motor drive but not manual rotation. The LTC shall be operated through all tap positions twice, starting at one tap extreme and progressing to the other tap extreme, and then return back again to the original tap position. The test may be performed at intervals, if necessary, such as to adjust the test circuit for the applied voltage to be adjusted to the rated voltage of the tap position, but it is a requirement that the transformer be energized at no less than rated voltage corresponding to each tap to be changed.

8.7.5 Observations and Analysis

8.7.5.1 Audible Sound

The transformer shall be observed during this test and the operator shall identify that the sound during the tap changing operations was either normal or abnormal. With some types of tap changers, there will be abnormally loud sounds if components are not assembled properly. Note that during operation of the change-over selector (reversing switch or coarse-tap selector) the sound can be slightly different.

8.7.5.2 Supply Test Circuit

The test control system shall be monitored for any trip of the test circuit that automatically stops the circuit from keeping the transformer energized.

8.7.5.3 Dissolved Gas-in-Oil Analysis

Oil samples shall be taken from the LTC compartment of vacuum type tap-changers before and after the test and analyzed for dissolved gasses. Results of the analysis may show some increase of dissolved gases due to current commutation, resistor heating and / or stray-gassing of the oil.

8.7.6 Failure Detection and Acceptance Criteria

The transformer will have passed this LTC Voltage test if:

- The tap changer operates normally with no abnormal sound
- The transformer stays energized without a trip in the supply test circuit
- For mineral oil filled vacuum LTCs, the increase of the sum of H₂, CH₄, C₂H₆, C₂H₄ and C₂H₂ should not exceed 12 ppm for in-tank type LTCs and 6 ppm for compartment type LTCs.
- For non-vacuum type LTCs, or LTCs filled with a liquid other than mineral oil, the determination of acceptance criteria is through sound only and there is not a limit for increase in gases.

- e. Load Tap Changer performance test with rated current. New subclause 9.6. TF and SC approved in Spring 2022. It was re-discussed in Fall 2022 but no changes were made so still considered to be approved.

9.6 Load Tap Changer Current Test

9.6.1 General

In order to verify the performance of a transformer that has a load tap changer (LTC), the LTC shall be operated through one end-to-end-to-end sequence (from one tap extreme to the other tap extreme and back again) with the transformer current flowing through the windings, corresponding to the top nameplate MVA rating.

9.6.2 Control voltage

Control voltage for the LTC motor during the test shall be as near to rated voltage as possible, with a minimum of 85%.

9.6.3 Preparation for the test

The LTC shall be fitted with all included equipment. It shall be connected as it will be in service, including protective devices.

9.6.4 Procedure

The test shall be performed by applying a short circuit either the high-voltage winding or the low-voltage winding and applying sufficient voltage across the other winding to cause a specific current to flow in the windings. The LTC shall be operated using the motor drive but not manual rotation. The LTC shall be operated through all tap positions twice, starting at one tap extreme and progressing to the other tap extreme, and then return back again to the original tap position. The test may be performed at intervals, if necessary, such as to adjust the test circuit for the applied voltage to be adjusted to the required current of the tap position, but it is a requirement that the transformer be energized at no less than 80% of the top MVA nameplate current value for each tap change.

9.6.5 Observations and Analysis

9.6.5.1 Audible Sound

The transformer shall be observed during this test and the operator shall identify that the sound during the tap changing operations was either normal or abnormal. With some types of tap changers, there will be abnormally loud sounds if components are not assembled properly. Note that during operation of the change-over selector (reversing switch or coarse-tap selector) the sound can be slightly different.

9.6.5.2 Supply Test Circuit

The test control system shall be monitored for any trip of the test circuit that automatically stops the circuit from keeping the transformer energized.

9.6.5.3 Dissolved Gas-in-Oil Analysis

Oil samples shall be taken from the LTC compartment of vacuum type tap-changers before and after the test and analyzed for dissolved gasses. Results of the analysis may show some increase of dissolved gases due to current commutation, resistor heating and / or stray-gassing of the oil.

9.6.6 Failure Detection and Acceptance Criteria

The transformer will have passed this LTC Voltage test if:

- The tap changer operates normally with no abnormal sound
- The transformer stays energized without a trip in the supply test circuit
- For mineral oil filled vacuum LTCs, the increase of the sum of H₂, CH₄, C₂H₆, C₂H₄ and C₂H₂ should not exceed 12 ppm for in-tank type LTCs and 6 ppm for compartment type LTCs.
- For non-vacuum type LTCs, or LTCs filled with a liquid other than mineral oil, the determination of acceptance criteria is through sound only and there is not a limit for increase in gases.

2. Changes to Insulation Power Factor test, from Diego Robalino's Diel Test SC TF for Winding Insulation Power Factor. Final survey approved in the Fall 2021 virtual meeting and by DielTest SC Jan 2022. Specifically with regards to Subclause 10.10.2 revising the accuracy requirements of instrumentation.

The existing text is:

10.10.2 Instrumentation

The insulation power factor may be measured by special bridge circuits or by the voltampere-watt method. The accuracy of measurement should be within $\pm 0.25\%$ insulation power factor, and the measurement should be made at or near a frequency of 60 Hz.

The revised text to replace it will be:

10.10.2 Instrumentation

The insulation line-frequency power factor or dissipation factor may be measured by special bridge circuits or by the voltampere-watt method. The accuracy of the measurement instrumentation at or near rated frequency should be:

- for Insulation Power Factor Below 1%: $\pm 2\%$ of reading $\pm 0.05\%$ absolute

- for Insulation Power Factor Above 1%: +/-5% of reading +/-0.05% absolute

3. Changes to Clause 11 Temperature Test, from Dinesh Sankarakurup's TF in the Insulation Life SC.

- a. Changes to subclause 11.3.2, Liquid Temp Rise Determination. Final survey approved by TF and SC in the Spring 2023 meeting. In the first paragraph change the word "ultimate" to "stabilized", and add a sentence that the top oil rise shall not be averaged over time. Text in black is existing, red is revised, blue is deleted.

Liquid temperature rise is the difference between liquid temperature and ambient temperature. The ~~ultimate~~ **stabilized** temperature rise above ambient shall be considered to be reached when the top liquid temperature rise does not vary more than 2.5% or 1 °C, whichever is greater, during a consecutive 3 h period. **The stabilized liquid temperature rise determined at the end of the total loss run shall not be averaged over time.**

4. Changes to Audible Sound from Ramsis Girgis' TF in the Perf Char SC. These changes were approved by the TF at Spring 2023. The Perf Char SC approved in-person at the Kansas City meeting. Text in black is existing, red is revised, blue is deleted.

- a. Changes to 13.3.3.1 No-load audible sound level.

When a transformer is equipped with a tap changer, the transformer may, on certain tap changer positions, produce sound levels that are higher than the audible sound level at the rated tap position. For these transformers, the measurements ~~shall may, upon purchaser request, and as agreed upon,~~ be made with the transformer on the highest sound producing tap position.

Also, other excitation conditions may occur in service leading to lower, or higher, **core noise**. For example, transformers designed to operate with variable flux the core audible sound level is strongly impacted by the tapping position. **The same is true for SVC transformers when connected to a capacitive load;** Again, for these transformers, the measurements ~~shall may, upon purchaser request, and as agreed upon,~~ be made with the transformer operating at the highest sound producing condition.

- b. Changes to 13.5.5.1 Measuring ambient sound pressure level.

~~The ambient sound pressure level shall be established by averaging the ambient sound pressure levels measured immediately preceding and immediately following the sound measurements with the transformer energized. The ambient sound shall be measured at a minimum of four locations, and the instruments shall be in conformance with 13.2.~~ **The ambient sound pressure level shall be measured at a minimum of four locations around the transformer immediately preceding and immediately following the sound measurements with the transformer energized. The ambient sound pressure level shall be established by calculating the logarithmic average of measured values of the ambient sound pressure levels. The measuring instruments shall be in conformance with 13.2.** However, additional measurements may be made if agreed to by the manufacturer and purchaser or if the ambient measurements vary by more than 3 dB around the transformer. ...

- c. Changes to 13.3.3.2 Load audible sound level.

Since load audible sound becomes a contributor to the total audible sound of the transformer at higher loads, the load audible sound level shall be measured at the ONAF measuring contour. For transformers with only an ONAN rating, load noise is to be measured at the ONAN sound measuring contour.

5. Changes to Low Frequency Tests from Ajith Varghese's RLFT TF in the Diel Test SC. Final survey approved by TF and SC in the Spring 2023 meeting. Text in black is existing, red is revised, blue is deleted.

a. Changes to Induced Test for Class II, Clause 10.8.2 PD Test Procedure

10.8.2 Test procedure

The voltage shall first be raised from zero to the 1.05 X line to ground value of the nominal system voltage (column 2, C57.12.00 Table 4) and held long enough to attain a stable partial discharge level and then record the level of partial discharge. The voltage shall then be raised to the one-hour level and held for a minimum of 5 min or until a stable partial discharge level is obtained to verify that there are no partial discharge problems. The partial discharge level shall be measured at the end of the 5 min period. If the 5 min. period at the 1 h voltage level is extended to obtain a stable partial discharge level the partial discharge shall be measured at the end of this period so that the level of partial discharges are recorded just before raising the voltage to the enhancement level. The voltage shall then be raised to the enhancement level and held for 7200 cycles. The voltage shall then be reduced directly to the one-hour level and held for 1 h.

During this 1 h period, partial discharge measurements shall be made at 5 min intervals. Partial discharge acceptance criteria shall be based on each line terminal rated 69 kV and above. These measurements shall be made in accordance with 10.9.

Immediately following the 1 h period, the voltage shall then be reduced to 1.05 X line to ground value of the nominal system voltage (column 2, C57.12.00 Table 4) and held until a stable partial discharge level is obtained and the partial discharge level measured.

b. Changes to Induced Test for Class II, Clause 10.8.5 PD Failure Detection.

10.8.5 Failure detection

Failure may be indicated by the presence of smoke and bubbles rising in the insulating liquid, an audible sound such as a thump, or a sudden increase in the test current. Any such indication shall be carefully investigated by observation, by repeating the test, and by other diagnostic tests to determine whether a failure has occurred. In terms of interpretation of partial discharge measurements, the results shall be considered acceptable and no further partial discharge tests required under the following conditions:

- a) The magnitude of the partial discharge level does not exceed 250 pC during the 1 h test period.
- b) The increase in partial discharge levels during the 1 h period does not exceed 50 pC.
- c) The partial discharge levels during the 1 h period do not exhibit any steadily rising trend, and no sudden sustained increase in the levels occurs during the last 20 min of the test.
- d) The magnitude of partial discharge level at 1.05 X Nominal System Voltage following the 1 h test period does not exceed 100 pC.

c. Addition of text regarding venting of bushings during PD test. In Vancouver S24, the Dielectric Tests SC approved the following text to be added to the end of Subclause 10.8.5.

If the partial discharge is measured during the Induced-voltage testing of the transformer and is suspected to be generated within an OIP (oil-impregnated-paper) bushing(s), it is permissible to "vent" the bushing(s) exhibiting partial discharge to the atmosphere using the bushing manufacturer's instructions.

Unless agreed between manufacturer & purchaser, bushings shall not be vented proactively prior to dielectric testing. The Induced-voltage test shall be entirely repeated after venting the bushing and a note shall be added to the certified test report indicating bushing(s) were vented during the induced-voltage test.

Notes:

- 1) Partial discharge intended to be addressed by venting the bushing, is a low energy discharge arising from partial vacuum (pressure below atmosphere) created in the expansion chamber and/or gas bubbles generated during the Temperature Rise test and the cooling down afterwards. Partial vacuum is created in the expansion chamber due to absorption of nitrogen or air into oil, and gas bubbles are formed due to saturation of nitrogen or air. Partial discharges from these cases may be resolved by venting the bushing. If continuous gas bubble generation or elevated partial discharge remains after the venting, additional investigations are required.
- 2) If there are concerns of gas generation from the temperature rise test causing bushing failure during impulse or applied voltage test, an induced-voltage test can be performed before impulse testing for diagnostic purposes. A complete induced-voltage test shall be performed as the last dielectric test, as specified in subclause 10.1.5.1 for dielectric test sequence.
- 3) Not all OIP bushings exhibit these conditions, so bushing design can be a factor.
- 4) The same condition of gas bubble formation or partial vacuum may occur in service during normal operation of load and overload cycles.
- 5) Re-establishment of the bushing gas space blanket and resealing of the bushing must also be performed in accordance with the bushing manufacturer's instructions. The internal integrity of the bushing may be compromised by venting, by allowing in oxygen and moisture or by not reestablishing proper conditions.

- d. A revision to add clarification to the overvoltage factor for Induced Test in 10.8.1. In St Louis F24, the Dielectric Tests SC approved the following revisions to Subclause 10.8 Induced-voltage test for Class II power transformers. Text in black is existing, red is revised, blue is deleted.

10.8.1 General

Each Class II power transformer shall receive an induced-voltage test with the required test **voltage** levels **from IEEE Std C57.12.00-2021 Table 4 columns 6 and 7 based on the HV voltage class corresponding to the maximum system voltage. The required test voltage levels shall be** induced in the high-voltage winding. The tap connections shall be chosen, when possible, so that test levels developed in the other windings during the one-hour test are x times their **nominal system** ~~maximum operating~~ voltages, as specified in Table 4 of IEEE Std C57.12.00-2021, where x (also referred to as the “overvoltage factor” in the text that follows) is the ratio of the **line-to-line** test voltage on the high-voltage winding to the **nominal system** ~~maximum operating~~ voltage.

- e. Class I PD test. Revision to the test procedure by Don Ayer's sub Task Force. In St Louis F24, the Dielectric Tests SC approved revisions to Subclause 10.7 to insert a new category of test for Class I power transformers when PD measurements are specifically requested by the purchaser. What follows in red text is all new.

Induced-voltage tests for Class I power transformers with partial discharge measurements specifically requested by the purchaser

General

Each Class I power transformer shall receive an induced-voltage test with the required test levels induced in the high-voltage winding. The tap connections shall be chosen, when possible, so that test levels developed in the other windings during the one-hour test are x times their maximum operating voltages, as specified in Table 3, Part C of IEEE Std C57.12.00-2021, where x (also referred to as the "overvoltage factor" in the text that follows) is the ratio of the test voltage on the high-voltage winding to the maximum operating voltage.

For a transformer built with a single magnetic core holding all windings, all windings are excited at a unique induction level, often referred to as "volts-per-turn." During an induced-voltage test, with the transformer connected and excited as in service, all windings are excited at the same overvoltage factor, regardless of what tap is selected. Each winding turn receives the same voltage. The tap connections shall be chosen, when possible, such that voltages developed across other windings meet or exceed the required overvoltage factor.

The situation is quite different when transformers are equipped with auxiliary devices with separate magnetic cores, such as preventive autotransformer (reactor), series (booster) transformer, or series regulator. Different magnetic cores can be excited at different levels during operation or testing. In certain tap positions, these auxiliary devices do not have their core excited at all and no voltage appears across their windings. For such cases, the selection of the tap-changer position shall be guided by the principles described below. One exception is when such auxiliary devices are not excited on a permanent basis but used only as transitional devices. If equalizing windings are used, the highest voltage impressed across the preventive autotransformer will occur in either the bridging or non-bridging positions. This is because the preventive autotransformer is energized in all tap positions (bridging and non-bridging).

NOTE 1—Equalizing windings are described in IEEE Std C57.131 and IEC 60214-1.

For transformers equipped with a series (booster) transformer, preventive autotransformer (reactor), or any other device, the selected tap position of the load tap-changer (LTC) shall be the one that produces the highest voltage across the windings of the series transformer, preventive autotransformer, and other auxiliary devices as applicable. There can be a conflict of choosing such a tap position when more than one such device is present. In such a case, the selected tap position of the LTC should be the best compromise so that all devices are tested with overvoltage. One common example is the case where a series transformer and preventive autotransformer are both present. In this case, the tap selected shall be the one that is closest to the position that produces the highest voltage across the windings of the series transformer and simultaneously excites the preventive autotransformer, which is typically a bridging position (not applicable when the preventive autotransformer is energized only during transition).

In order to test the series (booster) transformer, preventive autotransformer, and other devices, at the required minimum overvoltage factor, the voltage developed on the terminals of other windings may exceed the one-hour level mentioned in Table 3, Part C of IEEE Std C57.12.00-2021. In such cases, an alternative tap position may be selected by agreement between the manufacturer and the purchaser to avoid overstressing components such as bushings. Annex D shows examples that can serve as a guide to select the LTC tap position for transformers having series (booster) transformer and/or preventive autotransformers.

For certain types of devices such as series reactors used as current limiting devices, there is no voltage developed across their windings during the induced voltage test as these devices are only excited when current flows in their windings. There is no option available to apply any overvoltage for these devices during the induced test.

NOTE 2—The selection of the tap-changer position for induced test should be agreed upon between manufacturer and purchaser prior to design to avoid conflicts during final acceptance tests.

Test procedure

The voltage shall first be raised to the one-hour level and held for a minimum of 1 min or until a stable partial discharge level is obtained to verify that there are no partial discharge problems. The level of partial discharges shall be recorded just before raising

the voltage to the enhancement level. The voltage shall then be raised to the enhancement level and held for 7200 cycles. The voltage shall then be reduced directly to the one-hour level and held for 1 h.

During this 1 h period, partial discharge measurements shall be made at 5 min intervals. Partial discharge acceptance criteria shall be per subclause 10.7.2.5 and these measurements shall be made in accordance with 10.9.

The pressure inside the transformer tank during the induced test shall not be increased by artificial means for the purpose of reducing the PD level. The liquid level and pressure inside of the transformer tank and/or conservator tank shall be configured such that the oil head pressure during the induced test does not exceed the pressure under usual service conditions. Any exceptions that increase tank pressure by more than 3.5 kPa (0.5 psi) over normal operating pressure, such as the use of an elevated test facility conservator tank, requires customer approval prior to test. A note shall be added to the certified test report confirming this approval.

NOTE—Increasing the pressure for diagnostic purposes, such as to identify and possibly reduce suspected bubbles in the liquid, may be done as a remedial step to diagnose a source of high PD. To be considered valid, the test needs to be repeated with no added pressure as stated previously.

Connections

The transformer shall be excited exactly as it will be in service. The voltage may be induced from any winding or from special windings or taps provided for test purposes. Single-phase transformers shall be excited from single-phase sources. Three-phase transformers shall be excited from three-phase sources. The neutral terminals and other terminals that are normally grounded in service shall be solidly grounded. This will stress all of the insulation at the same per unit of overstress.

Frequency

The test frequency shall be increased, relative to operating frequency, as required to avoid core saturation. The requirements in 10.7.2 are also applicable in the case of this induced test.

Failure detection

Failure may be indicated by the presence of smoke and bubbles rising in the insulating liquid, an audible sound such as a thump, or a sudden increase in the test current. Any such indication shall be carefully investigated by observation, by repeating the test, and by other diagnostic tests to determine whether a failure has occurred. In terms of interpretation of partial discharge measurements, the results shall be considered acceptable and no further partial discharge tests required under the following conditions:

- a) For transformers with nominal system voltage (NSV) of 34.5KV and above, the magnitude of the partial discharge level does not exceed 250 pC during the 1 h test period. For transformers below 34.5 kV NSV, the magnitude of the partial discharge level shall be set by agreement between the purchaser and the manufacturer.
- b) For transformers with nominal system voltage (NSV) of 34.5 kV and above the increase in partial discharge levels during the 1 h period does not exceed 50 pC. For transformers rated below 34.5 kV NSV, the increase of the partial discharge level shall be set by agreement between the purchaser and the manufacturer.
- c) The partial discharge levels during the 1 h period do not exhibit any steadily rising trend, and no sudden sustained increase in the levels occurs during the last 20 min of the test.

Judgment should be used on the 5 min readings so that momentary excursions of the partial discharge readings caused by cranes or other ambient sources are not recorded. Also, the test may be extended or repeated until acceptable results are obtained.

A failure to meet the partial discharge acceptance criterion shall not warrant immediate rejection, but it shall lead to consultation between purchaser and manufacturer about further investigations.

6. Changes to Impulse Tests from Sylvain Plante's TF in the Diel Test SC. Final survey approved by TF and SC in the Spring 2023 meeting.

- a. Changes to 10.3.2.2, 10.3.2.3, 10.4.4, 10.4.5 impulse tests on transformers with series-multiple and delta-wye connections. The following final wording was approved by the Dielectric Test SC during the S23 Milwaukee SC meeting

10.3.2.2 Windings for series, parallel or multiple connections. The windings shall be tested for all series, parallel and multiple connections. The test voltage for these conditions shall correspond to the BIL of the winding for that connection.

10.3.2.3 Windings for delta or wye connections. The three-phase transformer shall be tested on both delta and wye connections. The test voltage for each connection shall correspond to the BIL of the winding for that connection.

10.4.4 Windings for series, parallel or multiple connections. For high-voltage windings with series, parallel or multiple connections above 15 kV, the routine impulse test shall be conducted on each connection at its assigned BIL. For nominal system voltages of 15 kV and below, only the series connections shall be tested, unless tests on all connections are specified.

10.4.5 Windings for delta or wye connections. For high-voltage windings of three-phase transformers with delta or wye connection above 15 kV, the routine impulse test shall be conducted on each connection at its assigned BIL. For nominal system voltages of 15 kV and below, only the wye connection shall be tested, unless tests on all connections are specified.

- b. Establishing guidelines about use of +/-3% tolerance on voltage peak for SI and LI. The following final wording was approved by the Dielectric Test SC during the F23 Kansas City SC meeting

Add as second paragraph to Subclause 10.2.2.2 The basic rule for application of the tolerance on voltage crest value is that testing laboratories shall aim for the test value specified. For any of the impulses of a test series, if the actual measured voltage is lower than the required voltage crest value but within the allowable tolerance of $\pm 3\%$, the impulse crest shall be accepted as valid. For any required subsequent impulse on the same terminal, adjustments shall be made to aim for the specified test value

Add as second paragraph to Subclause 10.3.1.1 The basic rule for application of the tolerance on voltage crest value is that testing laboratories shall aim for the test value specified. For any of the impulses of a test series, if the actual measured voltage is lower than the required voltage crest value but within the allowable tolerance of $\pm 3\%$, the impulse crest shall be accepted as valid. For any required subsequent impulse on the same terminal, adjustments shall be made to aim for the specified test value.

- c. Tap position for switching impulse. The S24 Vancouver Dielectric Tests SC approved a motion to add the following at the end of Subclause 10.2.4:

While selecting the tap connection complying to above requirements, the phase-to-phase voltage withstand capability of the transformer active part including LTC, bushings and all accessories shall be reviewed.

Testing on a non-compliant tap connection shall be discussed and agreed between manufacturer and purchaser.”

PENDING WORK

Since this is a continuous revision document, there is ongoing work in Task Forces.

1. Possible revisions from Hakan Sahin’s PCS TF for Revision of C57.12.90. In Fall 2024 there was discussion related to Clause 5 and determining the temperature used for measuring cold resistance. This item is ongoing, but at this time there are no decisions made and nothing to change in 12.90. Will survey TF on text proposed by Jason Varnell for temperature sensors in liquid for class II transformers while determining winding cold resistance temperature.
2. Possible changes to Clause 13 sound test from Ramsis’ TF. Measuring sound level of Preventive Autotransformers (PA) in air as a Quality Control check was again presented and discussed. Possibly a Task Force Paper will be written. In Fall 2024 there was continued discussion. This item is ongoing, but at this time there are no decisions made and nothing to change in 12.90.
3. Possible changes to Subclause 10.2 or 10.3 from Sylvain Plante’s TF regarding switching and lightning impulse tests. No SC motions. Will survey TF for voltage and current waveform overlay requirements.
4. Other possible revisions to subclauses 10.5 to 10.10 from Ajith Varghese’s TF for revision of low frequency tests.
5. Possible changes to subclause 10.11 from Diego Robalino’s TF regarding insulation resistance. This work is ongoing, the TF met in St. Louis, there was no quorum. Nothing to do yet. Possible future changes to insulation resistance measurement procedures are being considered, as compared to conflicting procedures in other documents such as C57.152. Also, possible future addition of core megger and clamp megger procedures since none currently exist in 12.90.
6. Changes to Clause 11 Temperature Test from Dinesh Sankarakurup’s TF
 - 11.4.3 Add text that reverse correction for altitude is also allowed; i.e., when factory is located above 1000 m and transformer rating is based on <1000m. This work is almost complete. A final survey will be sent after the St. Louis meeting.
 - Request for clarification for temp test of 3-winding transformers, injecting maximum losses, and correcting for maximum common winding current in

autos. Prior to Kansas City a small sub group developed some wording, it was briefly discussed in Kansas City. It was not discussed in St. Louis F24.

- Proposal by Bertrand Poulin OFAF Cooling and Top Duct Oil temperature and diagram in C57.119. The draft was circulated to the Task Force for comments. This was further discussed at TF meeting in St Louis F24, and more work will be done. . Another survey will be sent after the St. Louis meeting
- Clarification to Hottest spot Rise calculation using Fiber Optics. Egon and Ewald Schweiger of Siemens advanced their proposal to add as an alternate method an option to measure hot spot temperature using direct measurement with fiber optic probes. A small sub task force will be formed to develop wording. This was further discussed at TF meeting in Vancouver S24, and more work will be done. It was not discussed in St. Louis F24.
- Standardize Method for Hot resistance extrapolation not covered in Kansas City, but Bertrand Poulin submitted some info that should be circulated to the TF. It was not discussed in St. Louis F24.

Respectfully submitted,
Stephen Antosz, WG Chair
Jason Varnell, WG Vice-Chair
November 7, 2024

L.3.5 WG Standards Transformer on Revision for C57.152, Guide of Field Tests

*Standards Subcommittee,
WG – C57.152 Revision
IEEE / PES Transformers Committee*

*October 29, 2024, 4:45PM – 6:00PM
UNAPPROVED MINUTES*

Welcome

The chair of the working group, Marcos Ferreira, and the secretary, Goran Milojevic, opened the meeting at 04:45PM.

1. Attendance and Attendance for Quorum

At the time of the meeting there were 38 Members, including Chair and Secretary. A total of 20 members were counted as present at the meeting. 75 members and guests signed into the circulating paper roster.

20 members present of 38 mean requirements for quorum were fulfilled. The list of attendees who signed into the paper roster is shown below:

Name	Affiliation	Status
Ferreira, Marcos	Quanta Technology	Chair
Milojevic, Goran	DV Power	Secretary
Binder, Wallace	WBBinder Consultant	Member
Bradshaw, Jeremiah	US Bureau of Reclamation	Member
Colopy, Craig	Consultant	Member
Ermakov, Evgenii	Hitachi Energy	Member
Gara, Lorne	Shermco	Member
Guner, Ismail	Hydro Quebec	Member
Gustavsson, Niklas	Hitachi Energy	Member
Hayes, Roger	GE Vernova	Member
Heiden, Kyle	EATON Corporation	Member
Hernandez, Ronald	Doble Engineering Company	Member
Locarno, Mario	Doble Engineering Company	Member
Murray, David	TVA	Member
Poorvi, Patel	EPRI	Member
Robalino, Diego	Megger	Member
Saad, Mickel	Hitachi ABB Power Grids	Member
Sweetser, Charles	OMICRON Electronics Corp USA	Member
Tanaka, Troy	Burns & McDonnell	Member
Verdolin, Rogerio	Verdolin Solutions	Member

Welton, Drew	Intellirent	Member
Ansari, Tauhid	Hitachi Energy	Guest
Balakrishnan, Mani	Delta Star	Guest
Castellanos, Juan	Prolec GE	Guest
Cheksi, Bhaumik	Hitachi Energy	Guest
Da Silva, Roberto	Maschinenfabrik Reinhausen	Guest
Delgado, Gabriel	Invenergy	Guest
Doak, Eric	D4 Energy Solutions	Guest
Dongki, Lim	ILJIN Electric	Guest
Duffy, Jesse	Nashville Electric Service	Guest
Eun Young Cho	HICO America	Guest
Faur, Florin	Prolec GE	Guest
Garner, Joshua	Independent Dielectrics	Guest
Gyore, Attila	MIDEL	Guest
Hall, Jesse	Virginia Transformer	Guest
Herron, William	Reinhausen USA	Guest
Hrkac, Miljenko	Hitachi Energy	Guest
Huzmezan, Mihai	Megger	Guest
Iqbal, Fawaz	Omicron Energy	Guest
Jarosz, Patrycja	IEEE SA	Guest
Johnson, Christopher	Oncor	Guest
Jonak, Ryan	Portland General Electric	Guest
Jones, Brexton	SD Myers	Guest
Knapp, Evan	Eaton	Guest
Kosedagi, Nihat	Hitachi Energy	Guest
Kumir, Arvind	Delta Star	Guest
Lagos, Fernando	GE Vernova	Guest
Lamontagne, Don	Arizona Public Service	Guest
Leal, Fernando	Prolec GE	Guest
Loiselk, Luc	Tetrattech	Guest
Malde, Jinesh	MIDEL	Guest
Mamede, Gabriel	Siemens Energy	Guest
Maratha, Swapnil	Megger	Guest
Menter, Tim	Lincoln Electric System	Guest
Newbill, Mark	Hitachi Energy	Guest
Ogajanov, Rudolf	Hitachi Energy	Guest
Raymond, Tim	Inductive Reasoning	Guest
Salvatto, Paul	Intellirent	Guest
Sami, Debass	EPRI	Guest
Sar Kinen, Garret	Xcel Energy	Guest
Seungmo, Kim	Hyosung HICO	Guest
Sinclair, John	Black & Veatch	Guest
Solano, William	Voltyx	Guest
Stacey, Brad	Leeward Renewable Energy	Guest
Steele, H. Allen	TVA	Guest
Sze, Matthew	Omicron Energy	Guest

Tan, Jonathan	Northern Transformer	Guest
Thiede, Andreas	HIGHVOLT Prueftechnik Dresden	Guest
Vanderwalt, Alwyn	ECI	Guest
Varghese, Ajith	Prolec GE	Guest
Yonghui, Kim	ILJIN Electric	Guest
White, Elliot	SD Myers	Guest
Whitten, Christopher	Hitachi Energy	Guest
Wright, Jeffrey	Duquesne Light	Guest
Zhang, Hongshi	Hitachi Energy	Guest

2. Approval of the Agenda

The motion to approve the agenda was made by Rogerio Verdolin, and seconded by Drew Welton. The motion was approved unanimously.

3. Approval of Minutes of Spring 2024 Meeting

The motion to approve the Minutes of Spring 2024 Meeting was made by Evgenii Ermakov, and seconded by Jeremiah Bradshaw. The motion was approved unanimously.

4. Call for Patents

The chair presented slide 1-4, dated January 2, 2018 informing of the IEEE patent policy and participants duty to inform. There were no issues related to patent assurance brought up by attendees in the meeting.

5. IEEE Copyright Policy

The chair presented IEEE-SA Copyright Policy slides 1-2 informing the audience of the policy.

6. Chair's Remarks

The chair, Marcos Ferreira, gave the following remarks.

“Since Spring 2023, the full text of the draft of the proposed revision of the Guide was submitted to the members by email.

“The Ballot has closed without meeting the 75% response rate requirement as of 04 Oct 2024. The response rate received was 58%.”

Goran and I need your support to vote as soon we're able to get an extension so we can reach the minimum required response of 75%. We count on you members of this working group..”

7. New Business

The secretary, Goran Milojevic, informed the meeting about the updated ballot response for the initial ballot, which was at 72% response rate. The gathered participants who had not already voted were invited to cast their ballot until the extended deadline of November 21st, 2024. At the time of the meeting, five votes were still needed to meet the 75% response rate. Since the

ballot is in the extension period, it will automatically close once the required response rate has been achieved.

The secretary, Goran Milojevic, brought up another item of new business regarding the comment resolution board. Patrycja Jaros, IEEE program coordinator, suggested that the previously accepted comment resolution board should be re-confirmed and its authority clarified. A slide was brought up with the comment resolution board members who accepted their role during the Fall 2023 meeting, and the additional working group members who volunteered to join the comment resolution board.

During the discussion, Charles Sweetser asked that the comment resolution board is divided into subgroups that will each work with a different group of comments, based on the part of the text that was commented, and according to each member's field of expertise. Mario Locarno and Poorvi Patel requested that the plan for addressing the comments is prepared in more detail. During the discussion, it was agreed that the comment resolution board will meet online once per week once all comments are received and sorted. The meetings will include the working group officers, the people who were members of the task force which worked on the commented part of the text, and any other interested comment resolution board members. Once all comments have been addressed, a full list of proposed responses to the comments will be circulated to the comment resolution board members. Once consensus within the comment resolution board has been achieved, it will make the editorial changes and propose the responses to any technical comments to the rest of the working group, which will vote on them during the Spring 2025 meeting of the group.

The following working group members have volunteered to participate in the comment resolution board activities:

- Evgenii Ermakov
- Niklas Gustavsson
- Attila Gyore
- Marcos Ferreira
- Marc Foata
- Ronald Hernandez
- Goran Milojevic
- Diego Robalino
- Charles Sweetser

The motion to confirm the comment resolution board and authorize it to make editorial changes and to make recommendations for technical changes between meetings was made by Diego Robalino, and seconded by Evgenii Ermakov. The motion was approved unanimously.

8. Meeting Adjournment

The motion to adjourn the meeting was made by Evgenii Ermakov, and seconded by Diego Robalino. The meeting was adjourned at 05:20PM.

Respectfully submitted,

Marcos Ferreira – Chair

Goran Milojevic – Secretary

L.3.6 WG C57.133 Reverse Power Flow

First PAR Approved Meeting: WG PC57.133

“Guide for Evaluating Transformer Performance under Reverse Power Flow”

3:15-4:30 PM CDT | October 29, 2024

Grand Ballroom AB (Floor 4) | Hyatt Regency St. Louis at the Arch | St. Louis, MO

Chair:	Ryan Hogg	Bureau of Reclamation	rhogg@ieee.org
Vice Chair:	Bruce Webb	Knoxville Utilities Board	bruce.webb@kub.org
Secretary:	Drew Welton	Intellirent	dwelton@intellirentco.com

Attendees:

Working Group_membership was established at the meeting. Those who requested membership were granted membership. Guests are welcome to join after attending the next two out of three meetings.

Attendees: 121
Members: 89
Guests: 33
Non-Attendee Requesting Membership: 1

First Name	Last Name	Affiliation	Membership
Kayland	Adams	Prolec-GE Waukesha	Member
Gilles	Bargone	FISO	Member
Mats	Bernesjo	Hitachi Energy	Member
Daniel	Blaydon	Baltimore Gas and Electric	Member
William	Boettger	Boettger Transformer Consulting LLC	Member
Garrett	Bradshaw	Howard Industries	Member
Jeffrey	Brooks	Asplundh Engineering Services	Member
Alfredo	Carrizales	PROLEC	Member
Thomas	Dauzat	AEP-SWEPCO	Member
Nikolaus	Dillon	Dominion Energy	Member
Fernando	Duarte	EPRI	Member
Roger	Dugan	RC Dugan	Member
Eric	Elson	San Diego Gas & Electric	Member
Miguel	Garcia	Hitachi Energy	Member
Eduardo	Garcia	Siemens Energy	Member
David	Garcia-Paredes	Virginia Transformers Corp	Member
James	Gardner	Prolec-GE Waukesha	Member
Jose Antonio	Gonzalez Ceballos	Virginia/Georgia Transformers	Member
William	Griesacker	WGA	Member
Jesse	Hall	Virginia Transformer Corp.	Member
Corey	Hanson	Flex-Core	Member
U	Hernandez Decanini	Virginia Transformers Corp	Member
Saramma	Hoffman	PPL	Member
Ryan	Hogg	Bureau of Reclamation	Member
Derek	Hollrah	Burns & McDonnell	Member
Saif	Hossain	Trench Group	Member
Miljenko	Hrkac	Hitachi Energy	Member
Jose	Izquierdo	Siemens energy	Member
Nick	Jensen	Delta Star	Member
John	John	Virginia Transformer Corp	Member
Christopher	Johnson	Oncor	Member
Akash	Joshi	Kimley-Horn	Member
Thrinadha	Katapalli	Virginia Transformer Corp	Member
Anton	Koshel	Delta Star, Inc.	Member
Mark	Lachman	Doble	Member
Jihun	Lee	HD HYUNDAI ELECTRIC	Member
Junho	Lee	HD Hyundai Electric	Member
Kushal	Mahajan	Sungrow	Member
Swapnil	Marathe	Megger	Member
Daniel	Martinez	Jfe guest	Member
Katherine	Marulanda	Magnetron	Member
Brian	McCarrick	Virginia Transformer Corp	Member
Omar	Mendez	Prolec	Member
Emilio	Morales-Cruz	QUALITROL	Member
Tyler	Morgan	Duke Energy	Member
Dan	Mulkey	Mulkey Engineering Inc	Member
Ali	Naderian	EnerPars	Member
Shankar	Nambi	Bechtel Energy, Inc.	Member
Eduardo	Orozco	GE Grid Solutions	Member
Sanjay	Patel	SGB-Smit USA	Member
Vinay	Patel	Con Edison	Member
Gustavo	Prado	Siemens Energy	Member
Tim	Raymond	Inductive Reasoning	Member
Yuri	Rossini	Siemens Energy	Member
Marnie	Roussell	Entergy	Member
Paul	Salvato	Intellirent	Member
Amitabh	Sarkar	Virginia Transformer Corporation	Member
Markus	Schiessl	SGB	Member
Eric	Schleismann	Southern Company	Member
Leena	Shimpi	Mgm transformer	Member
Stephen	Shull	BBC Electrical Services Inv	Member
Igor	Simonov	Toronto Hydro	Member
James	Spaulding	City of Fort Collins Utilities	Member
Andy	Speegle	Entergy	Member
Brad	Staley	Leeward Renewable Energy	Member
Sunny	Swarna	Virginia Transformer Corp	Member
Marc	Taylor	JFE Shoji Canada	Member
Joseph	Tedesco	Hitachi Energy	Member

Ed	teNyenhuis	Hitachi Energy	Member
Mark	Tostrud	Dynamic Ratings	Member
Kannan	Veeran	Virginia/Georgia Transformer Corp	Member
Juan	Velasquez	Magnetron SAS	Member
Karsten	Viereck	Reinhausen Germany	Member
Krishnamurthy	Vijayan	Pennsylvania transformers	Member
Dharam	Vir	Prolec GE	Member
Pragnesh	Vyas	Sunbelt Solomon	Member
Savid	Walker	MGM Transformers	Member
Joe	Watson	JD Watson and Associates	Member
Bruce	Webb	Knoxville Utilities Board	Member
Drew	Welton	Intellirent	Member
Joe	White	POWER Engineers	Member
Jeffrey	Wright	Duquesne Light	Member
Fei	Yang	Hitachi Energy	Member
Tim	Young	Hitachi Energy	Member
Guang	Yuan	Hitachi Energy	Member
Michael	Zarnowski	Carte International	Member
Hongzhi	Zhang	Hitachi Energy	Member
Shibao	Zhang	PCORE Electric	Member
Waldemar	Ziomek	PTI Transformers LP	Member
Edwin	Betancourt	Siemens Energy	Guest
Naveen	Bhardwaj	Trench Group	Guest
Kevin	Biggie	Weidmann	Guest
Bhaumik	Choksi	Engineer	Guest
Rhett	Chrysler	ERMCO	Guest
Adriana	Cisco Sullberg	Salt River Project	Guest
Luiz	de Oliveira	Hitachi Energy	Guest
Paul	Dolloff	EKPC and University of Kentucky	Guest
Janko	Dzodan	Koncar D&ST	Guest
Sanford	Fong	Georgia Power	Guest
Raymond	Frazier	Ameren	Guest
Jose	Gamboa	The H-J Family of Companies	Guest
Dragana	Gasic	Koncar D&ST	Guest
Kevin	Hampton	Siemens Energy	Guest
Jean Carlos	Hernandez-Mejia	Georgia Tech NEETRAC	Guest
Kenneth	Klein	Johnson	Guest
Nihat	Kosedagi	Hitachi Energy	Guest
Angela	Leigl	Eaton	Guest
Xose	Lopez-Fernandez	Universidade de Vigo	Guest
Charles	Morgan	Eversource Energy	Guest
Fredy	Murcia	Siemens Energy	Guest
Higo	Murillo	Guest	Guest
Adnan	Rashid	Measurement Canada	Guest
Robert	Reepe	Georgia Power Co	Guest
Masoud	Sharifi	Siemens Gamesa Renewable Energy	Guest
Hemchandra	Shertukde	University of Hartford	Guest
Andrew	Steineman	Delta Star, Inc.	Guest
Michael	Thompson	SEL Engineering Services	Guest
Timothy	Tillery	Howard Industries	Guest
Reinaldo	Valentin	Duke Energy	Guest
Terry	Wong	Trench Limited	Guest
Koray	Yavuz	Noark Electric US	Guest
Jason	Snyder	First Energy Corp	Interested

Minutes:

1. [Behavior](#), [Copyright](#), and [Patent Slides Displayed](#)
2. PAR, Working Group's goal, and draft schedule (PAR expires 12/31/2028) - Reviewed by Ryan Hogg
3. Established Working Group membership, Established via QR Code System, Paper Roster
4. Agenda approval
 - a. Motion to approve the agenda by Joe White
 - b. Seconded by Dan Mulkey
 - c. Approved unanimously
5. R. Hogg – "Reverse Power and Base C57 Standards"
6. Presentations:
 - a. E. teNyenhuis – "Effect of Reverse Power Flow on Transformers"
 - b. D. Mulkey – "Fundamental differences between power and distribution transformers"
 - c. Slides from the presentations available on the IEEE Transformers Committee web page
 - d. Discussion regarding Ed's presentation that contained illustrations of four power quadrants that may help to define reverse power
7. Definition of "Reverse Power Flow"
 - a. Status of "...addendum to C57.12.80 for defining Reverse Power Flow"
 - b. Our WG to hold interim meetings before Denver meeting on this topic
8. Working outline
 - a. Discuss rough draft outline – Too many items? Missing items?
 - b. Plan = at a future meeting, delegate drafting to task forces
9. Discussions:
 - a. Ramsis Girgis - Discussed the impacts of day vs. night time on power flow, and the differences between step up and step-down transformers, and the effects on OLTC's, and the impacts of voltage regulation should be addressed. Advised he is presenting a paper on reverse power flow at next year's Doble Client Conference.
 - b. Ali Gorzin - Raised the question regarding 3-winding transformers, suggested a review of outside publications, such as published papers, and seek utility guidance.
 - c. Steve Shull recommended referencing a paper published in 1983 as an electric metering source – "Power Flow Direction Definitions for Metering of Bidirectional Power" by Raymond Stevens, IEEE PSIM, for presentation at the IEEE/PES 1983 Winter Meeting in New York, New York.
 - d. Eric Elsum and others were in favor of the quadrant approach would be most beneficial for defining reverse power.
 - e. David Walker stated that unexpected losses can occur during reverse power conditions
10. Old Business – none
11. New Business – none
12. Next meetings – Chair will send out a Doodle Poll to meet regarding:
 - a. Virtual:
 - i. Define "reverse power flow"
 - ii. Outline development
 - b. In person: Denver, CO in Spring 2025
13. Adjourn

L.3.7 TF - IEEE / IEC Continuous Cross Reference

F24 Unapproved Meeting Minutes

**Standards
Subcommittee Task
Force IEEE / IEC
Cross Reference**

Monday, October 28, 2024, 9:30am

to 10:45am Chair: Alan

Washburn

1. Welcome
 - a. Meeting came to order at 9:35am
2. Introduction of participants
 - a. 16 attendees:
Jaroslav Chorzepa, Juan Carlos Cruz Valdes, Kyle Heiden, Anton Koshel, Boris Nissle, Nirav Patel, Peng Fu, Marnie Roussell, Masoud Sharifi, Vedrana Starcevic Prebeg, H. Allen Steele, Can Takan, Ryan Thompson, Ajith Varghese, Dharam Vir, Alan Washburn
3. IEEE SA patent policy and call for patents
4. IEEE SA copyright policy
5. Membership review
 - a. 6 of 14 members, quorum not achieved
6. Review agenda
7. Review S24 meeting minutes
8. Old business
 - a. Scope of TF
 - i. Continued discussion on index scope, format
 - ii. Look for opportunities to make recommendations to IEEE or IEC organizations
 - b. Creation of index document
 - i. Involvement of other stakeholders/subcommittees, may help to collect information more quickly
 1. Start with TC-14 and TC-10
 - ii. List of documents has been created
 - iii. Continuing to use Collabratec for a shared file area and working document tool
9. New business
 - a. Work assignments
 - i. Several people volunteered to start index work:
Ajith Varghese, Allen Steele, Alan Washburn
 - b. Intermediate meetings

- i. Virtual meeting to be scheduled midway between F24 and S25 meetings, primarily to review progress on index work

10. Adjourn

Standards SC S24 Attendance List

Role	First Name	Last Name	2024 OCT
Secretary	Ajith	Varghese	X
Member	Akash	Joshi	X
Member	Alan	Washburn	X
Guest	Alireza	Gorzin	X
Member	Alwyn	Van Der Walt	X
Member	Amitabh	Sarkar	X
Guest	Ashwini	Labh	X
Member	Brad	Staley	X
Member	Carlos	Gaytan	X
Guest	Charles	Sweetser	X
Guest	Christopher	Whitten	X
Guest	Craig	Colopy	X
Member	Daniel	Blaydon	X
Chair	Daniel	Sauer	X
Member	David	Wallach	X
Guest	Deen	Park	X
Guest	Derek	Hollrah	X
Member	Dharam	Vir	X
Guest	Didier	Hamoir	X
Member	Drew	Welton	X
Member	Dwight	Parkinson	X
Member	Ed	teNyenhuis	X
Member	Eduardo	Garcia Wild	X
Guest	Edwin	Betancourt	X
Guest	Egui	Espitia	X
Member	Emilio	Morales-Cruz	X
Member	Eric	Davis	X
Guest	Eric	Elson	X
Member	Evan	Knapp	X
Guest	Eunyoung	Cho	X
Member	Evgenii	Ermakov	X
Guest	Fawaz	Iqbal	X
Guest	Fei	Yang	X
Guest	Eduardo	Orozco	X
Guest	Fernando	Tirado	X
Member	Florin	Faur	X
Member	Francis	Mills	X
Guest	Gabriel	Delgado	X
Guest	Garrett	Bradshaw	X
Member	Grace	Guang Yuan	X
Guest	Hongzhi	Zhang	X
Guest	Hugo	Bayona	X
Guest	Ismael	Naja	X
Guest	Janet	Crockett	X
Member	Jeffrey	Wright	X
Guest	Jeremiah	Bradshaw	X
Member	Jerry	Murphy	X
Guest	Jerzy	Kazmierczak	X
Guest	Jesse	Duffy	X
Guest	Jihun	Lee	X
Guest	Jie	Zhang	X
Member	Joe	White	X
Member	John	John	X
Guest	John	Wagner	X
Guest	Jonathan	Tan	X
Guest	Jose	Izquierdo	X
Member	Joseph	Tedesco	X
Guest	Joshua	Watson	X
Member	Joshua	Yun	X

Role	First Name	Last Name	2024 OCT
Guest	Junho	Lee	X
Member	Kayland	Adams	X
Guest	Koray	Yavuz	X
Guest	Krish	Vijayan	X
Guest	Kyle	Stechschulte	X
Guest	Luc	Loiselle	X
Vice-Chair	Marcos	Ferreira	X
Guest	Mark	Newbill	X
Guest	Mark	Tostrud	X
Guest	Michael	Richardson	X
Guest	Mickel	Saad	X
Member	Miguel	Garcia	X
Member	Miguel	Plascencia	X
Guest	Nabi	Almeida	X
Guest	Nick	Jensen	X
Guest	Nihat	Kosedegi	X
Member	Onome	Avanoma	X
Guest	Paul	Dolloff	X
Guest	Paul	Weyandt	X
Guest	Paulo	Avelino	X
Guest	Pedro	Truhlio	X
Guest	Peng	Fu	X
Member	Poorvi	Patel	X
Guest	Qasim	Khan	X
Member	Ramadin	Issack	X
Member	Ramsis	Girgis	X
Member	Raymond	Frazier	X
Guest	Rehan	Ali	X
Member	Robert	Ballard	X
Guest	Roberto Ignacio	Da Silva	X
Guest	Ryan	Musgrove	X
Member	Ryan	Hogg	X
Guest	Samuel	Tekle	X
Guest	Sanjay	Patel	X
Member	Sanjib	Som	X
Member	Saramma	Hoffman	X
Member	Scott	Digby	X
Member	Sergio	Hernandez Cano	X
Guest	Seugmo	Kim	X
Member	Stephen	Shull	X
Member	Steven	Snyder	X
Guest	Sylvain	Plante	X
Member	Tauhid Haque	Ansari	X
Member	Thomas	Dauzat	X
Member	Thomas	Prevost	X
Guest	Tim	Raymond	X
Guest	Troy	Tanaka	X
Guest	Traci	Hopkinson	X
Guest	Vivian	Chan	X
Guest	William	Boettger	X
Guest	Will	Elliott	X
Guest	William	Solano	X
Member	William	Whitehead	X
Guest	Wilerson	Calil	X
Guest	Yeounsoo	Kim	X
Guest	Zhing-Zang	Zhuo	X

Subsurface Transformers and Network Protectors Subcommittee

Meeting Minutes Fall 2024 St Louis, MO

Chairman: George Payerle

Vice-Chair: Tony Reiss

Meeting Date: October 30, 2024 **Location:** St. Louis, MO **Time:** 11:00 – 12:15

Meeting Administration:

Meeting Opened at 11:00 CST, Nabi Almeida, acting secretary

- Sign In - 2 attendance rosters distributed
- Chairman's Comments - small enough group so introductions were made
- Quorum Determination, member list
 - 34 members, 18 needed for quorum - 19 in attendance
- Present agenda for approval
 - Motion to approve – Tom Dauzat, 2nd – Will Elliott - Unanimous approval
- Approval of the Spring 2024 minutes
 - Motion to approve – Will Elliott, 2nd – Brian Klaponski - Unanimous approval
- Announce new members:
 - New members were recognized by the Chair and welcomed by those in attendance
- WG chairs be sure to note specifically which previous meeting minutes you are approving when you approve minutes of previous meeting.
 - Chairman clarified – in your WG minutes, be specific when identifying the meeting they are from including Fall or Spring and year.
- Does anyone request SC membership? Indicate on roster.
 - Stated at start of roster circulation

Meeting attendees

Members Present

Nabi	Almeida	Prolec GE
Alex	Ayala	Power Partners, Inc.
Jared	Bates	Oncor Electric Delivery
Piotr	Blaszczyk	Specialty Transformer Comp.
David	Blew	Retired (PSE&G)

Jeffrey	Brooks	Asplundh Engineering
Thomas	Dauzat	AEP-SWEPCO
William	Elliott	AEP-SWEPCO
Carlos	Gaytan	Prolec GE
Ramadan	Issack	American Electric Power
Brian	Klaponski	Carte International Inc.
Alejandro	Macias	CenterPoint Energy
Fernando	Meza	Power Partners, Inc.
Vinay	Patel	Consolidated Edison Co. of NY
George	Payerle	Carte International Inc.
Pedro	Salgado	Electronic Technology Inc.
Dan	Schwartz	Quality Switch, Inc.
Adam	Sewell	Quality Switch, Inc.
Jeremy	Sewell	Quality Switch, Inc.
Igor	Simonov	Toronto Hydro
James	Spaulding	Fort Collins Utilities
Alan	Traut	Howard Industries
Jeremy	Van Horn	IFD Corporation
Joshua	Verdell	ERMCO
William	Whitehead	H2scan Corporation
Michael	Zarnowski	Carte International

Guests Present

Kevin	Biggie	Weidmann Electrical Tech.
Jim	Cai	JSHP
Noah	Chesser	Oncor Electric Delivery
Douglas	Craig	Richards Manufacturing Co.
John	Crotty	Ameren
Alicia	Farag	LocusView Solutions
Sanford	Fong	Georgia Power Co.
Gilberto	Garza	Prolec
Orlando	Giraldo	H-J Family of Companies
Rebecca	Kim	Chenyong Electric
Kang Jin	Lee	Chenyong Electric
Angela	Leigl	EATON Corporation
Tiffany	Lucas	Prolec GE
Katherine	M	Magnetron
Nicholas	Manske	Oncor Electric Delivery
Luis Felipe	Mendez	JST Power
Tim	Menter	Lincoln Electric Systems
Justin	Minikel	EATON Corporation

Charles	Morgan	Eversource Energy
Hugo	Murillo	H-J Family of Companies
David	Rorher	FirstEnergy
Garret	Sarkinen	Xcel Energy
Stefan	Schindler	Maschinenfabrik Reinhausen
Joe	Schumack	Ameren
Russell	Sewell	Quality Switch, Inc.
Michael	Thibault	Pacific Gas & Electric
Michael	Thomson	SEL Engineering Services
Timothy	Tillery	Howard Industries
Fernando	Tirado	Prolec GE
Juan	Velasquez	Magnetron
Holly	Wassall	JST Power
Guang	Yuan	Hitachi Energy
Malia	Zaman	IEEE

Working Groups Report:

PC57.12.23 – Single Phase Submersible Transformers

Monday, October 28, 2024

11:00 AM

St. Louis, Missouri USA

Chair: Alan Traut, Howard Industries

Vice-Chair: Noah Chesser, Oncor Electric Delivery

Secretary: Noah Chesser, Oncor Electric Delivery (acting)

Call to Order

The meeting was called to order by the Chair at 11:00AM CDT on Monday, October 28, 2024.

Essential patent statement and copyright slides

There was a call for essential patent claims by the Chair. There were none brought forward. The Chair announced if there was one to inform the Chair. The IEEE copyright slides were shown to the WG. No copyright issues were identified in the material presented at the meeting.

Chair Report

Chair is seeking new volunteer for secretary. See chair if interested. C57.12.23 was published in 2018 and will expire in 2028. The present PAR was approved 2-15-2024 and expires 12-31-2028 so there are 7 in-person meetings available to work on the revision. This being the second in-person meeting. The chair is targeting to vote to send the document to ballot in Fall of 2027.

Membership & Quorum

Total attendance was 70, with 28 of 44 members, 42 guests with 16 of those guests requesting membership. Quorum was met. The attendees are listed below.

First Name	Last Name	Company or Affiliation	Role	First Name	Last Name	Company or Affiliation	Role
Nabi	Almeida	Prolec GE	Member	Fernando	Meza	Power Partners	Member
Alex	Ayala	Power Partners	Guest (R)	Charles	Morgan	Eversource Energy	Guest
Jared	Bates	Oncor Electric Delivery	Secretary	Tyler	Morgan	Duke Energy	Member
Piotr	Blaszczyk	Specialty Transformer Components	Member	Daniel	Mulkey	Mulkey Engineering Inc.	Member
Jeffrey	Brooks	Aselundt Eng	Member	Martin	Munoz	Orto	Member
Jim	Cai	JSMP Transformer	Member	Hugo	Murillo	HJ Family of Companies	Guest (R)
Noah	Chesser	Oncor Electric Delivery	Vice Chair	Ismael	Naja	Eaton Corp	Guest (R)
Matthew	Chisholm	IFD Technologies	Guest	Nurudeen	Olayiwola	PECO Excelon	Guest (R)
Paul	Chisholm	IFD Technologies	Guest	Joel	Pacas	IFD Technologies	Guest
Craig	Colopy	Eaton Corp (Retired)	Guest	Tihomir	Pandza	Siemens Energy	Guest
Douglas	Craig	Richards Mfg	Guest	Vinay	Patel	Con Edison of NY	Member
Janet	Crockett	Fayetteville PWC	Guest	George	Payerle	Carte International Inc.	Guest
John	Crotty	Ameren Services	Guest (R)	Goran	Plisic	Siemens Energy	Guest
Tim	Dappen	Cargill	Guest (R)	Ion	Radu	Hitachi Energy	Guest (R)
Thomas	Dauzat	AEP - SWEPCO	Guest (R)	Martin	Rave	IFD Technologies	Guest
Qusai	Elnimri	Vantran Transformer	Guest	Robert	Reepe	Georgia Power Co.	Guest
Sanford	Fong	Georgia Power	Member	David	Rohrer	First Energy	Member
Chris	Franklin	MG Power Associates	Guest	Mason	Rush	Central Moloney	Member
Gilberto	Garza	Prolec GE	Guest	Stefan	Schindler	Mashinenfabrik Reinhausen	Guest
Hector	Garza	Orto	Guest	Joseph	Schumack	Ameren Services	Guest
Carlos	Gaytan	Prolec GE	Member	Jeremy	Sewell	Quality Switch	Guest
Luke	Grandbois	IFD Technologies	Guest	Jaber	Shalabi	Vantran Transformer	Guest (R)
Michael	Hardin	HJ Family of Companies	Guest (R)	Igor	Simonov	Toronto Hydro	Member
Ramadan	Issack	American Electric Power	Member	Chris	Slattery	First Energy	Guest
Rebecca	Kim	Cheryong Electric	Guest (R)	Steve	Snyder	Hitachi Energy	Guest
Brian	Klaponski	Carte International Inc.	Member	Jim	Spaulding	City of Fort Collins	Guest (R)
Gilbert	Kozer	Northeast Transformer	Member	Tim	Tillery	Howard Industries	Member
Patrick	Kozer	Northeast Transformer	Member	Fernando	Tirado	Prolec GE	Guest
Kang	Lee	Chenyong Electric	Guest	Alan	Traut	Howard Industries	Chair
Angela	Leigl	EATON Corporation	Guest	Reinaldo	Valentin	Duke Energy	Member
Alejandro	Macias	CenterPoint Energy	Member	Jeremy	Van Horn	IFD Technologies	Member
Katherine	Marvlanda	Magnetron	Guest	Joshua	Verdell	ERMCO	Guest (R)
Nader	Masoud	Central Moloney	Guest (R)	Shelby	Walters	Howard Industries	Member
Mohammed	Megdad	IPS	Guest (R)	Bruce	Webb	Knoxville Utilities Board	Member
Tim	Menter	Lincoln Electric System	Guest (R)	Michael	Zarnowski	Carte International Inc.	Member

Approval of Agenda

The Chair sent out the agenda prior to the meeting for review. A motion was made to approve the agenda (Brian Klaponski/Nabi Almedia). Agenda was unanimously approved.

Approval of previous meeting minutes

The Chair presented minutes from that last meeting in Spring 2024. A motion was made to approve the previous meeting minutes (Brain Klaponski/Mason Rush). The motion passed unanimously.

Old Business

- **Task Force #1 Report – Dan Mulkey**

Task force #1 was charged with comparing the recently published C57.12.24 (3ph Submersibles) to C57.12.23 and recommend changes to C57.12.23 to keep these two standards aligned. Dan presented the slides from Task Force 1. The slides are posted on the Transformer Committee website.

- **Task Force #2 Report – Carlos Gaytan**

Task force #2 was charged with comparing the recently published C57.12.39 (Tank Pressur Coordination) to C57.12.23 and recommend changes to C57.12.23 to keep these two standards

aligned. Carlos presented the slides from Task Force 2. The slides are posted on the Transformer Committee website.

- **Clause 6.1 Dielectric Tests**

This item is tabled to the next meeting due to lack of time in this meeting.

- **Clause 7.2.2 low-voltage terminals**

This item is tabled to the next meeting due to lack of time in this meeting.

- **Rectangular Tank Design – Dan Mulkey**

Dan presented slides on the PG&E experience with rectangular tank designs (aka horizontals) compared to round tank designs. In the PG&E case, new construction uses the horizontal design. Round tank designs are only used for replacements where the vault size does not permit installation of a horizontal. The slides for this presentation are available on the Transformer Committee website.

The Chair will incorporate the recommendations from Task Force 1 & 2 into the next draft for approval by the WG.

New Business

- **Proposal to change scope to 500kVA and Below**

A motion was made to change the scope of the standard to 500kVA and Below (Alex Macias/Jared Bates). The motion failed with 6 members for, 18 opposed, and 7 abstentions. CenterPoint Energy and Oncor Electric Delivery were among the only two utilities present who currently purchase 1PH submersible transformers greater than 250kVA. Both utilities only buy them for replacements, not new installations.

- Thomas Dauzat made a proposal recommending to use stainless fittings to reduce the effects of galvanic corrosion between the fitting and enclosure as stated below.

Not sure which underground xfmr standard to start with, but would like to introduce new business with regards to if a user decides to go with the option of copper bearing steel or 304 stainless instead of 316L stainless enclosure to do the following:

- Externally screwed on fittings such as bolts, nuts, valves, pressure relief devices, samplers-scharader valves, thermometers, etc. need not to be made of copper alloy, but preferably made of stainless or molded material (environmentally suited) to reduce the effects of galvanic corrosion between the mating surfaces.
- If there's no alternative stainless version of the silicon bronze fitting, user may use with 'extreme caution' assuming the entire fitting is coated/painted after assembly to the enclosure. As for as a 316L stainless enclosure, still it's best to use stainless fittings utilizing anti-seize thread coating to prevent thread galling.
- Reference C57.12.53 corrosion guide for subsurface xfmr and protector applications, material compatibility, water chemistry, and material validation testing.

We ran out of time in this meeting so this item is tabled to the next meeting.

Next Meeting Announcement

March 23 - 27, 2025 in Denver, Colorado USA

Adjourn

The meeting adjourned at 12:25PM CDT

C57.12.24 Three-Phase Submersible Transformers working group –
Ben Garcia, Chairman; Tom Dauzat, Vice Chair; George Payerle, Secretary

- Published: 2023
- Revision Due Date: 12/31/2033
- PAR Approval Date:
- PAR Expiration Date:

On break. Not meeting at this time

C57.12.40 Secondary Network Transformer working Group –
John Vartanian, Chairman, Dan Schwartz, Secretary

- Published 2024
- Revision due date: 12/31/2034
- PAR Approval Date:
- PAR Expiration Date:

Stage: Standard recently published.

Fall 2024 St. Louis Meeting Minutes

Hyatt Regency, St. Louis, MO USA

Grand Ballroom AB(4)

11:00 AM CST October 29, 2024

Members Present Company

Dan Schwartz (Secretary) Quality Switch

Nabi Almeida Prolec GE

Piotr Blaszczyk Specialty Transformer Components LLC

Dave Blew Retired (Former PSE&G)

Douglas Craig Richards Manufacturing Co.

Tom Dauzat AEP-SWEPCO

Will Elliott AEP-SWEPCO

Brian Klaponski Carte International Inc

Gilbert Kozer Northeast Transformer Services

Patrick Kozer Northeast Transformer Services

Alex Macias CenterPoint Energy

Dan Mulkey Mulkey Engineering

Vinay Patel Consolidated Edison of NY

George Payerle Carte International Inc.

James RattyRichards Manufacturing Co.

Pedro Salgado Richards Manufacturing Co.

Adam Sewell Quality Switch

Jeremy Sewell Quality Switch

Russell Sewell Quality Switch

Igor Siminov Toronto Hydro

William Whitehead H2scan Corporation

Mike Zarnowski Carte International Inc

<u>Guests Present</u>	<u>Company</u>

Alex Ayala	Power Partners

Kevin Biggie	Weidmann Electrical Technology

*Jeffrey Brooks	Asplundh Engineering

*Jim Cai	JSHP Transformers

Fernando Duarte	EPRI

Gilberto Garza	Prolec Waukesha GE

Orlando Giraldo	H-J Enterprises

Didier Hamoir	Transformer Protector Corp

Jeremy Hansman	Cleveland Cliffs

Ramadan Issack	AEP

Rebecca Kim	Cheryong Electric

Andrew Larison	Hitachi Energy

Kang Jen Lee	Cheryong Electric

*Nicholas Manske	Oncor Electric Delivery

Bryan Marguardt	Cleveland Cliffs

Katherine Marvlanda	Magnetron

Nader Masoud	Central Maloney
Brian McBride	Cargill, Inc.
*Cory Morgan	Eversource Energy
*Tyler Morgan	Duke Energy
*Hugo Murillo	H-J Family of Companies
Ion Radu	Hitachi Energy
David Rohrer	First Energy
Joseph Schumack	Ameren
Fernando Tirado	Prolec Waukesha GE
Reinaldo Valetine	Duke Energy
Bruce Webb	Knoxville Utilities Board
*Requested Membership	

- 1) The group met on Tuesday, October 29, 2024 at 11:00 AM CST with 21 members and 27 guests. Six (6) guests requested membership. Quorum was achieved with 22/30 (73%) of members present.
- 2) A call for patents was made; none were mentioned.
- 3) Copyright requirements were reviewed by the Chair.
- 4) Introductions were made by all attendees.
- 5) The agenda was presented for approval. Motion to approve was made by William Whitehead and seconded by Alex Macias. The agenda was approved unanimously.
- 6) The previous minutes from March 12, 2024, were presented for approval. Motion to approve was made by Dave Blew and seconded by Brian Klaponski. The minutes were approved unanimously.
- 7) Old Business
 - a. C57.12.40-2024 was published in May
- 8) New Business
 - a. Presentation for the follow-up on the medium voltage bushing investigation was made by Vinay Patel (Consolidated Edison of New York) and Fernando Duarte (EPRI).

- b. A call was made for potential new presentations to be made at the next meeting in Denver.

- 9) The meeting was adjourned at 11:57 AM CST with the next meeting set for Denver, CO on March 25, 2025.

Respectfully submitted,

D. Schwartz, Secretary

C57.12.44 Secondary Network Protectors working group –
Mark Faulkner, Chairman, Alex Macias, Secretary

- Revision due date: **12/31/2024**
- PAR Approval Date: **3/26/2015**
- PAR Expiration Date:

Stage: Submitted to Revcom. Did not meet at this time.

C57.167 Guide for Monitoring Distribution Transformers working group –
Gary Hoffman, Chairman, Mike Thibault, Secretary

- Revision due date: **N/A – new standard**
- PAR Approval Date: **6/14/2018**
- PAR Expiration Date: **12/31/2022**

Stage: Just published. No report this meeting

PC 57.12.53 Guide for mitigating corrosion on subsurface transformers
Will Elliott, Chair; Michael Zarnowski, Vice-chair; Audrey Siebert-Timmer, secretary

- PAR Approval Date: **2/23/2022**
- PAR Expiration Date: **12/31/2026**

Doc-
u-
ment
#: PC57.12.53

Doc-
u-
ment
Title: C57.12.53 Guide on Mitigating Corrosion on Subsurface Transformers and Network Protectors

Chair:	<u>Will El- liott</u>	Vice- Chair	<u>Micheal Zarnowski</u>
Secre- tary	<u>Audrey Siebert- Timmer</u>	Percent Complete	<u>90%</u>
Acting Secre- tary	<u>Tiffany Lucas</u>		

Current Draft Be-
ing Worked On: Draft 4 Dated: Sep-
tem-
ber
2024

Meet-
ing
Date: October
29, 2024 Time: 4:45 PM CST

At- tend- ance:	Mem- bers	19	
	Guests	24	
	Total*	43	

Attending Members:
Nabi Almeida, Prolec GE
Dave Blew, Consultant
Thomas Dauzat, AEP -
SWEPCO
Will Elliott, AEP - SWEPCO
John Harley, First Power
Group LLC
Brian Klaponski, Carte Inter-
national Inc.

Tiffany Lucas, Prolec GE
Tyler Morgan, Duke Energy
Daniel Mulkey, Mulkey Engi-
neering Inc.
Vinay Patel, Consolidated Edi-
son Co. of NY
George Payerle, Carte Interna-
tional Inc.

**Pedro Salgado, Electronic
Technology Inc.
Dan Schwartz, Quality Switch,
Inc.
Adam Sewell, Quality Switch,
Inc.
Jeremy Sewell, Quality Switch,
Inc.**

Attending Guests:

**Samuel Brodeur, Hitachi Energy
Stuart Chambers, EPRI
John Crotty, Ameren
Jeffrey Door, The H-J Family of
Companies
Gilberto Garza, Prolec GE
Luke Grandbois, IFD Corporation
Didier Hamoir, Transformer Protec-
tor Corp
Javier Hernandez, Orto de Mexico
Ramadan Issack, American Electric
Power
Rebecca Kim, Cheryong Electric
Kang Jin Lee, Cheryong Electric
Alejandro Macias, Centerpoint En-
ergy**

**Igor Simonov, Toronto Hydro
James Spaulding, City of Fort
Collins
Reinaldo Valentin, Duke En-
ergy
Michael Zarnowski, Carte In-
ternational Inc.**

**Nicholas Manske, Oncor Electric De-
livery
Justin Minikel, Eaton
Ali Naderian, EnerPars
Ismael Naja, Eaton
Joel Pacas, IFD Corporation
Nicholas Post, WEC Energy Group
Joseph Shumack, Ameren
Timothy Tillery, Howard Industries
Fernando Tirado, Prolec GE
Jeremy VanHorn, IFD Corporation
Juan Velasquez, Magnetron SAS
Shelby Walters, Howard Industries**

Subsurface Transformers and Network Protectors Subcommittee Meeting Minutes

Meeting Minutes:

- 1. Will Elliott called the meeting to order at 4:45 PM CST.**
- 2. Opening remarks and introductions were made.**
 - i. AMS system has been discontinued. Attendance was taken electronically using a QR code. Paper rosters were circulated to supplement electronic attendance records.**
- 3. Will Elliott reviewed IEEE SA Copyright Policy, Essential Patent Claims, and Code of Ethics & Conduct. No issues were raised.**
- 4. Membership changes were noted:**
 - i. Added: Javier Arteaga, Jeffrey Brooks, Vinay Patel, Igor Simonov, and Reinaldo Valentin**
 - ii. Changed to Guest: None**
- 5. Quorum was verified. The working group consisted of 29 members, requiring 15 for quorum. 16 members were counted at the start of the meeting. Attendance records later confirmed 19 members attended.**
- 6. Will Elliott requested approval of the Spring 2024 Minutes. Nabi Almeida made a motion to approve the Spring 2024 Minutes. Second by Dan Schwartz. Motion was unanimously approved.**
- 7. Will Elliott requested approval of the Fall 2024 Agenda. Dave Blew made a motion to approve the Fall 2024 Agenda. Second by Tom Dauzat. Motion was unanimously approved.**
- 8. Old Business:**
 - i. Will Elliott presented the taskforce's recommended improvements to the draft document.**
 - a. Taskforce members included: Tiffany Lucas (chair), Nabi Almeida, Will Elliott, Audrey Siebert-Timmer, Glenn Stark, John Vartanian, and Michael Zarnowski.**
 - b. The proposed changes to the draft were reviewed until comments were raised.**
 - c. Dan Mulkey made a motion to remove the word "typically" from the definition for low-alloy steel. Second by Tom Dauzat. Motion was unanimously approved. The definition was revised:**
 - 1. Low-alloy Steel: A specially designed metal alloy with iron as the principal alloying element with total other alloying elements $\leq 5\%$ mass percent.**
 - d. Dan Mulkey made a motion to remove the parenthesis from the definition for stagnant. Second by Tom Dauzat. Motion was unanimously approved. The definition was revised:**

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1. **Stagnant:** Is a descriptor of the velocity of a flowing liquid. Stagnant means there is little to no flow.
- e. Will Elliott noted that C57.12.80 has some definitions that use common words, but it does not define the same words in this guide. He also noted that this guide has a statement referencing C57.12.80 and ASTM G193 for definitions. This definitions in the draft defines the language particular to this guide.
- f. Dan Mulkey suggested giving the order of priority as first ASTM G193, then IEEE C57.12.80 and then the standards definitions online if necessary. Will Elliott edited section 3.1 definitions line 12 based on “then if necessary” as suggested by Dan Mulkey for the group to review the suggestion. Tom Dauzat made a motion to accept the change to section 3.1. Second by Igor Simonov. Motion was unanimously approved.
- g. The taskforce recommended an updated Venn diagram for vault submersion (Figure 1). The discussions resulted in multiple motions:
 1. Tom Dauzat made a motion to remove “typically” from the Cyclic area of the Venn diagram. Second by Dan Mulkey. Motion was unanimously approved.
 2. James Spaulding suggested finding a way to align the Venn diagram to Table 3 – Time of Wetness for Corrosion, because the detail in the table should correspond to the Venn diagram. Dan Mulkey suggested the regions should be labelled: Dry Vault with “none to little corrosion”, Cyclic with “some corrosion”, and Immersion with “aggressive corrosion”. James Spaulding made a motion to revise the Venn Diagram to add the corrosion descriptions. Second by Tom Dauzat. Motion was approved unanimously.
- h. Nabi Almeida made a motion to make “environment” plural (change to “environments”) in section 5.6.3. Second by Tom Dauzat. Motion was approved unanimously.
- i. Dan Mulkey made a motion to replace “microbiologically influenced corrosion” with the abbreviation MIC in the last sentence in section 5.6.3. Second by Tom Dauzat. Motion was approved unanimously.
- j. Dan Mulkey made a motion to replace “continuous submersion” with “immersion service” in the whole document and strike the plural “coatings” (revise to “coating”) at the end of section 6.2.1. Second by Tom Dauzat. Motion was approved unanimously.
- k. Nabi Almeida made a motion to approve all changes proposed by the taskforce to the document up to section 6.2.1, which were not already modified and approved by the working group. Second by Igor Simonov. Motion was approved unanimously.
- l. Will Elliott stated that he will update the draft to reflect all changes in the meeting and send out the latest version to the working group for review. He stated that the working group will review the remainder of the document in the Spring 2025 meeting.

9. New Business:

- i. No new business was discussed.

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10. The meeting was adjourned at 5:59 PM CST.
 11. Next meeting: March 25, 2025 in Denver, Colorado, USA.
 - i. The following attendees requested membership and will be added to membership for the Spring 2025 meeting:
 - a. Jeffrey Door, The H-J Family of Companies
 - b. Ramadan Issack, American Electric Power
 - c. Alejandro Macias, Centerpoint Energy
 - ii. The following members will have their membership revised to guest for the Spring 2025 meeting, due to not meeting attendance requirements:
 - a. Hertton De Oliveira Filo, PSE&G
 - b. Liz Sullivan, Dominion Energy
- Submitted by: Will Elliott
Date: 11/9/2024

Old Business:

- No old business

New Business:

- Leadership change – George is leaving his Chair position, which will be filled by Tony Reiss and Nabi Almeida will be the Vice-chair/Secretary for the SC
- George mentioned that he encourages the use of Collabratec

External presentation:

Alicia Farag – Presentation on SCATE P3476. The intention is to have a quick way to identify critical equipment on the network.

Contact information: Alicia.farag@locusview.com 847.387.9412

Initial discussion:

Brian asked for a quick clarification on the motivation for this work. Alicia provide an explanation. Tom Dauzat asked how the information is being kept safe from a national security perspective. Where is the regulation for who creates the code. Alicia answered that the approach they are taking is to create a “VIN” number for the equipment, so this way all the data is encoded in the QR code uID. There is no separate database. There was a question on the audience about wiring diagrams. Alicia explained that in case some additional data is needed you can embed links to additional data. Nabi Almeida asked about any IP risk to the manufacturers and Alicia responded

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that there will only be public information no IP should be exposed. She explained that the information that will be exposed will be validated by IEEE. Al Traut came to share that from his participation on this WG there will be no IP exposition.

Alicia then went through her presentation. Alicia requested participation in the energy transformation WG. There were questions about refurbished units which are included. There was a question on the audience about where the information should be, whether it would be in the nameplate or a label, both options are acceptable according to the presenter.

Nabi Almeida asked where the information for unit specific comes from and Alicia will be controlled by the manufacturer.

Tom asked how we ensure that there is no backdoor approach to getting information of the Utilities company. Alicia mentions that the data is only related to the unit. And the utility information is being protected. There was a mention about the way to ensure the life cycle of this QR code.

Main work group meets bi-weekly and the subgroups meet bi-weekly.

Next meeting:

Wed March 26, 2025 at 11 AM in Denver, CO

Meeting was adjourned at 11:50 Tom Dauzat Moved and it was seconded by Dann Schwartz. Unanimously approved.

Respectfully submitted Nov 20, 2024

George Payerle, Chair STNP subcommittee