

IEEE/PES Transformers Committee

Spring 2024 Meeting Minutes

Vancouver, BC, Canada

March 10-14, 2024

Unapproved

(These minutes are on the agenda to be approved at the next meeting in Fall 2024)

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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
- Annex B. Dielectric Tests SC – Poorvi Patel
- 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 10)
- 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 23, 2023: 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 Fall 2023 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 26, 2023: 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:

Last Name	First Name	Affiliation	Monday 3/11/24	Thursday 3/14/24
Antosz	Stephen	Stephen Antosz & Associates, Inc	X	
Arteaga	Javier	Hitachi Energy	X	X
Ayers	Donald	Ayers Transformer Consulting	X	X
Ballard	Robert	Dupont	X	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	X
Blaszczyk	Piotr	Specialty Transformer Components	X	
Blaydon	Daniel	Baltimore Gas & Electric	X	
Boettger	William	Boettger Transformer Consulting LLC	X	X
Boman	Paul	Hartford Steam Boiler	X	
Brown	Darren	Howard Industries	X	
Callsen	Thomas	Weldy-Lamont Associates	X	X
Castellanos	Juan	Prolec GE	X	X
Cheim	Luiz	Hitachi Energy	X	
Chiang	Solomon	The Gund Company	X	
Chrysler	Rhett	ERMCO	X	X
Colopy	Craig	Retired	X	X
Cruz Valdez	Juan Carlos	Prolec-GE	X	X
Davis	Eric	Consultant	X	X
Debass	Samson	EPRI	X	X
Digby	Scott	Duke Energy	X	X
Dulac	Hakim	Advanced Power Technologies	X	X
Ermakov	Evgenii	Hitachi Energy	X	X

Fausch	Reto	RF Solutions	X	
Ferreira	Marcos	Quanta Technology	X	
Foata	Marc	MR	X	
Foldi	Joseph	Foldi & Associates, Inc.	X	
Forsyth	Bruce	Cargill	X	X
Garcia	Eduardo	Siemens Energy	X	
Gardner	James	Prolec-GE Waukesha	X	X
Gaytan	Carlos	Prolec GE	X	X
Ghosh	Saurabh	GE	X	
Girgis	Ramsis	Hitachi Energy	X	
Griesacker	Bill	W. Griesacker & Associates Inc.	X	X
Gyore	Attila	M&I Materials Ltd	X	
Hampton	Kenneth	BGE	X	X
Harley	John	FirstPower Group LLC	X	X
Heinzig	Peter	Weidmann Electrical Technology AG	X	X
Hernandez	Ronald	Doble Engineering Co.	X	
Hochanh	Thang	BC Hydro	X	
Hoffman	Gary	Advanced Power Technologies	X	
Hopkinson	Philip	HVOLT Inc.	X	
Iman	Mohammad	MGM Transformer Company	X	
John	John	Virginia Transformer Corp.	X	X
Kaineder	Kurt	Siemens Oesterreich AG	X	X
Kennedy	Sheldon	Sheldon P. Kennedy Engineering, PLLC	X	X
Klaponski	Brian	Carte International Inc.	X	X
Kornowski	Marek	Polycast Int'l	X	
Kulasek	Krzysztof	Delta Star Inc.	X	
Levin	Aleksandr	Weidmann Electrical Technology	X	X
Li	Weijun	Braintree Electric Light Department	X	X
Lopez-Fernandez	Xose	Universidade de Vigo	X	
Lovins	Colby	Federal Pacific	X	
Mabrey	Stephanie	Weidmann	X	X
Mai	Tim-Felix	Siemens	X	X
Malde	Jinesh	M&I Materials Ltd	X	X
Mani	Kumar	Duke Energy Inc.	X	
Melle	Thomas	Highvolt	X	
Montpool	Rhea	Schneider Electric	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	
Narawane	Aniruddha	EATON Corporation	X	
Parkinson	Dwight	EATON Corporation	X	X
Patel	Sanjay	Smit Transformer Sales, Inc	X	

Payerle	George	Carte International Inc.	X	X
Perjanik	Nicholas	AVO Diagnostics Services	X	
Ploetner	Christoph	Siemens Energy	X	
Pointner	Klaus	Trench Austria GmbH	X	X
Poulin	Bertrand	Hitachi Energy	X	X
Prevost	Thomas	Weidmann Electrical Technologies Inc.	X	X
Radbrandt	Ulf	Hitachi Energy	X	X
Raymond	Timothy	EPRI	X	X
Reed	Scott	MVA	X	X
Robalino	Diego	Megger	X	
Roussell	Marnie	Entergy	X	X
Saad	Mickel	Hitachi Energy	X	X
Sahin	Hakan	Virginia Transformer Corp.	X	
Sankarakurup	Dinesh	Duke Energy	X	X
Sarkar	Amitabh	Virginia Transformer Corp.	X	X
Sauer	Daniel	EATON Corporation	X	X
Sbravati	Alan	Hitachi Energy	X	
Schwartz	Dan	Quality Switch, Inc.	X	
Schweiger	Ewald	Siemens AG	X	X
Selvaraj	Pugazhenth	Virginia Transformer Corp.	X	
Sen	Cihangir John	Duke Energy	X	
Sewell	Adam	Quality Switch, Inc.	X	
Sewell	Jeremy	Quality Switch, Inc.	X	
Sharp	Michael	Trench Limited	X	X
Sharpless	Samuel	Rimkus Consulting Group	X	X
Shertukde	Hemchandra	University of Hartford	X	
Shull	Stephen	BBC Electrical Service Inc.	X	X
Sizemore	Thomas	ABB Inc.	X	X
Snyder	Steven	Retired	X	
Solano	William	Maschinenfabrik Reinhausen	X	
Som	Sanjib	Pennsylvania Transformer	X	
Spitzer	Thomas	City Transformer Service Co.	X	
Stacy	Fabian	Hitachi Energy	X	
Stank	Markus	MR	X	X
Stechschulte	Kyle	American Electric Power	X	
Sweetser	Charles	OMICRON electronics Corp USA	X	
Swinderman	Craig	Mitsubishi Electric Power Products	X	X
Szczechowski	Janusz	Maschinenfabrik Reinhausen	X	
Tanaka	Troy	Burns & McDonnell	X	X
Tedesco	Joseph	Hitachi Energy	X	X
Tendulkar	Vijay	EATON Corporation	X	
teNyenhuis	Ed	Hitachi Energy	X	X
Thibault	Mike	Pacific Gas & Electric	X	
Thompson	Ryan	Burns & McDonnell	X	

Tillery	Timothy	Howard Industries	X	X
Tostrud	Mark	Dynamic Ratings, Inc.	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	
Vartanian	John	National Grid	X	
Verdell	Joshua	ERMCO	X	X
Verdolin	Rogério	Verdolin Solutions Inc.	X	X
Vir	Dharam	Prolec-GE Waukesha	X	X
Walker	David	MGM Transformer Company	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	X
Webb	Bruce	Knoxville Utilities Board	X	X
Weisensee	Matthew	PacifiCorp	X	X
Welton	Drew	Intellirent	X	X
Wilks	Alan	Wilks Consulting	X	
Williams	Trenton	Advanced Power Technologies	X	X
Wimberly	Barrett	General Electric	X	
Wright	Jeffrey	Duquesne Light Co.	X	X
Yun	Joshua	Virginia Transformer Corp.	X	X
Zhao	Peter	Hydro One	X	
Zibert	Kris	Allgeier, Martin and Associates	X	X
Ziger	Igor	Koncar	X	
Ziomek	Waldemar	PTI Transformers LP	X	

Based upon the above attendance totals:

Quorum was achieved at Monday Opening Session (145/203 = 71%).

Quorum was not achieved at Thursday Closing Session (78/203 = 47%).

2.2 GENERAL ATTENDANCE

The attendance of non-Committee Members who signed the attendance sheet is recorded in the scanned copy of the paper attendance rosters 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 Fall 2023 minutes were posted. The Chair requested any comments or changes. There were no comments made, therefore the Fall 2023 minutes were approved as published.

4 CHAIR’S REPORT – DAVID WALLACH

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

4.1 IEEE PES TECHNICAL COUNCIL

The IEEE 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 .

4.1.1 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	Gayland Bloethe
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	John Prousalidis
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 Kamalasan
Standards Coordination Committee.....	Todd Irwin
Technical Sessions Committee	Jim McBride
Entity Proposal Management Committee	Hong Chen, Dan Sabin

4.1.2 PES Technical Council Activities

Upcoming Technical Council meetings include the following:

- July 21 – 25, 2024 Seattle, WA – PES GM
- Nov TBD, 2024 Location TBD – Joint Technical Council Retreat

4.1.3 memberplanet

IEEE PES awarded a contract in 2021 to *memberplanet* for committee membership management. The new system is close to being ready but unfortunately will not be ready (again) for our March 2024 meeting. Greg Anderson and Jim McBride are involved in the regular update meetings with the contractor and will help ensure the system will have all the tools needed for our committee. 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).

Again, activity leaders are requested to continue to use their own mailing lists and meeting rosters.

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

4.2 TRANSFORMERS COMMITTEE ACTIVITIES

4.2.1 Spring 2023 Milwaukee Meeting

Our Fall 2024 Transformer Committee meeting was a great success with near full attendance and small financial surplus.

4.2.2 Committee Schedule

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

Fall 2024	St Louis, MO	Oct 27 – 31, 2024
Spring 2025	Denver, CO	March 23-27, 2025

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

4.2.3 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.

4.2.4 Meeting App

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

4.2.5 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 for 2023:

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).

4.2.6 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.

4.2.7 IEEE Copyright Policy

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

The Transformers Committee has an obligation 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.

4.2.8 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.

4.2.9 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 No. (if indicated)	Letter Date	Licensing Assurance Received	Date record entered or revised (if known)
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
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
C57.147 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
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. 0, February 18, 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.

2024

- IEEE PES Transmission & Distribution Conference & Exposition (T&D)
May 6-9, 2024, Anaheim, CA
- IEEE PES General Meeting
July 21-25, 2024, Seattle, WA

2025

- IEEE PES Grid Edge Technologies Conference and Exhibition
January 21-23, 2025, San Diego, California
- IEEE PES General Meeting

2026

- IEEE PES Transmission & Distribution Conference & Exposition (T&D)
May 4-7, 2026, Chicago, IL
- IEEE PES General Meeting
July 19-23, 2026, Montreal, Canada

5.2 2023 IEEE PES GENERAL MEETING, JULY 16 - 20, 2023, ORLANDO, FLORIDA

5.2.1 Conference Theme

The weblink for the event is IEEE PES T&D 2024

The theme of the conference is *Accelerate the Grid of Tomorrow*.

5.2.2 Conference Papers

The paper submission period opened to authors on July 10, 2023 and closed on August 20, 2023. Papers were then distributed to various Technical Committees for peer review based upon the paper content. Reviewers of Transformers Committee assigned papers were included in the Fall 2023 vice-chair report. The following tabulation provides information on acceptance rate and list of papers accepted:

Total Submissions 13

Accepted 10

Rejected 3

Below are the conference papers submitted (transaction and conference).

Paper	Title	Type
24TD0184	Installation and Energization of the World's First EHV Rapid Response Multi-Voltage Transformer Lease	Poster Session
24TD0201	Comparative Assessment of Twenty-Years Old Transformers Filled with Mineral Oil and Synthetic Ester Liquid	Poster Session
24TD0203	TVP: the ultimate transient voltage protection benefits	Poster Session
24TD0221	Diagnostic Investigation & Correlation In-Service HV & EHV Current-Transformers Exhibiting High Levels of Hydrogen	Poster Session
24TD0225	Dry-Type Single-Phase Overhead Distribution Transformer	Poster Session
24TD0236	Dry-type transformers with reduced dimensions for photovoltaic generation: benefits of recent developments and CompactCool	Poster Session
24TD0256	New Strategy of Performing Dynamic Resistance Measurement on Resistor and Reactor Load Tap Changers	Poster Session
24TD0257	Digital transformation of power-transformer solid-insulation drying process	Poster Session
24TD0265	Non-Linear Load Harmonics and Their Impact on Transformer Aging	Poster Session
24TD0292	De-Carbonization of Transmission Grids Using Natural Ester Insulating Liquid in Power Transformers	Poster Session

5.3 2024 IEEE PES TRANSMISSION & DISTRIBUTION CONFERENCE & EXPOSITION (T&D)

5.3.1 Conference Theme

The weblink for the event is [IEEE PES General Meeting 2024](#)

The theme of the conference is *The New Electric System: Reinvention and Resilience*

5.3.2 Conference Paper Submittals

The paper submission period opened to authors on October 3, 2023 and closed on November 20, 2023. Papers were then 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 8
Transferred 1
Accepted 4
Rejected 3

Below are the conference papers accepted (transaction and conference).

Paper	Title	Type
24PESGM0916	Transformer Equalization based on Non-linear Adaptive Filtering	Poster Session
24PESGM1443	Design Improvement of Magnetic Wall Shunts in Large Power Transformers	Poster Session
24PESGM1762	Industry 4.0-Compliant Wavelet-Based Power Transformer Fault Classification Method During Data Missing Conditions	Poster Session
24PESGM0587	Research on Oil Pressure Rise and Fluctuation Due to Arcing Faults Inside Transformers	Transactions Paper

5.3.3 Paper Reviewer Recognition (volunteers)

Stephen Antosz	Attila Gyore	Sanjib Som
Juan Castellanos	Vijayan Krishnamurthy	Bruce Webb
Ali Cheema	Ewald Schweiger	Waldemar Ziomek
Eduardo Garcia	Sam Sharpless	
Ramsis Girgis	Hem Shertukde	

Respectfully submitted,

Bill Griesacker

Vice-Chair

March 1, 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 Fall 2023 Administrative Subcommittee meeting, six 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	Wimberly Sponsor #3	Membership Category
Barrett Wimberly	General Electric	Zoltan Roman C57.13.3 4 years	Thomas Sizemore ITSC	David Wallace C57.13 2+ years	Producer
Samson Debass	EPRI	Dan Blaydon C57.163 3 years	Casey Ballard Dry-Type SC 3 years	Poorvi Patel Dielectric Test SC 3 years	Producer
Reto Fausch	RF Solutions LLC	Poorvi Patel Dielectric Test SC 4 years	Thang Hochanh C57.98 4 years	Hakan Sahin C57.138 1 year	General
Dan Schwartz	Quality Switch	George Payerle STNP 5 years	John Vartanian C57.12.40 5 years	Adam Sewell C57.157 1 year	Producer
Evanne Wang	Dupont	Sam Sharpless Insulation Life SC 2 years	Kevin Biggie IEEE 1276 2.5 years	Tom Prevost C57.166 4 years	Producer
Alan Washburn	Burns & McDonnell	Dan Sauer Standards SC 2.5 years	Kumar Mani C57.170 2.5 years	Dan Blaydon C57.163 3 years	Consumer

6.1.2 New Member Applications

Four 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
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

6.1.3 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.

<i>Membership Status</i>	F18	S19	F19	S20	F20	S21	F21*	S22**	F22+	S23+	F23+	S24+
<i>Interested Individual</i>	1551	1582	1632	1579	1563	1611	1581	1596	1596	1596	1596	1596
<i>Interested Individual - IEEE Life Member</i>	12	12	12	11	12	12	12	12	12	12	12	12
<i>Total Interested Individuals</i>	1563	1594	1644	1590	1575	1623	1593	1608	1608	1608	1608	1608

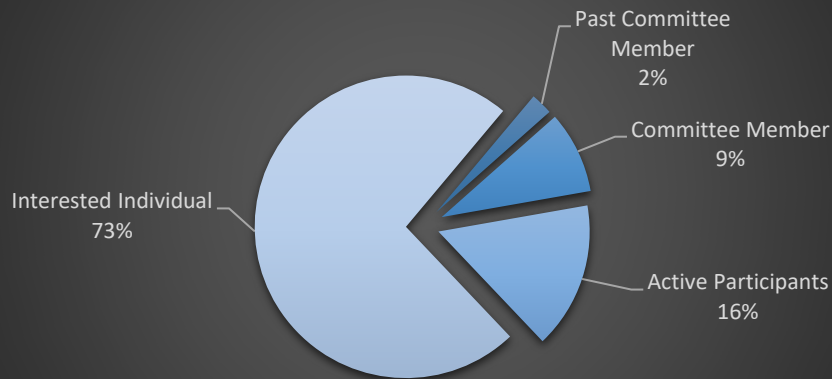
Membership Status	F18	S19	F19	S20	F20	S21	F21*	S22**	F22⁺	S23⁺	F23⁺	S24⁺
<i>Active Participant</i>	324	349	362	365	362	360	350	348	348	348	348	348
<i>Active Participant - IEEE Life Member</i>	5	6	7	6	6	6	6	6	6	6	6	6
Total Active Participants	329	355	369	371	368	366	356	354	354	354	354	354
<i>Committee Member</i>	181	191	182	179	179	173	175	173	183	196	203	186
<i>Committee Member – Emeritus</i>	10	10	10	11	11	11	12	12	13	12	12	12
<i>Committee Member - IEEE Life Member</i>	33	33	32	33	33	32	33	35	29	22	12	12
Total Committee Members	191	201	192	190	190	184	187	185	196	208	215	198
<i>Past Committee Member</i>	38	38	50	48	48	59	56	53	53	53	53	53
<i>Past Committee Member - IEEE Life Member</i>	6	6	8	12	10	12	12	12	12	12	12	12
Total Past Committee Members	44	44	58	60	58	71	68	65	65	65	65	65
TOTAL IN AMS DATABASE	2160	2227	2295	2244	2224	2276	2237	2247	2252	2257	2257	2257

* F21 data as of October 3, 2021

**S22 data as of December 31, 2021

⁺ F22, S23, F23 and S24 - 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 prior to the October 2022 Transformers Committee Meeting. The next scheduled audit for membership requirements in accordance with the Committee P&P will be in 2024 (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 Fall 2023 meeting have been posted to the committee website. Thank you to those who submitted their minutes in a prompt fashion.

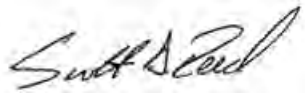
Subcommittee Chairs are asked to submit their respective subcommittee meeting minutes for the Spring 2024 meeting held in Vancouver, BC Canada to the Committee Secretary no later than **April 25, 2024**, which is **6 weeks** after the completion of the meeting. It is strongly recommended that meeting 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
February 5, 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

There was no new business.

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 IFD for hosting the meeting in Vancouver.
- More new attendees and young professionals
 - Women in Power had a luncheon that was well received.
- Exciting time to be in the transformer industry
 - Huge expansion expected in the power grid, major equipment renewal and asset life extension
 - Transformers Committee is responding to fast moving changes to the electricity industry – i.e. new guides planned for CO2 emissions by transformers, reverse power flow
- Transformers and transformer standards are more important / more relevant than ever before

11 MEETINGS PLANNING SC MINUTES & REPORT – TAMMY BEHRENS

See **Appendix 9**.

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)
- New CMS: Bruce Forsyth & Jim McBride
- Photography: George Payerle

-
- Registration Desk, Etc.

Jennifer Quandel, HPN

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

Fall 2024 – October 27-31

St. Louis, Missouri USA

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 (SCOTT DIGBY PRESENTED)

- C57.19.01 – Proceeding to PAR submittal.
- C57.19.04 – Proceeding to PAR submittal.
- C57.19.100 – Close to being ready for Balloting
- IEE 693 - Recommended Practice for Seismic Design of Substations:
 - Current amendment sent back to WG
 - Needing engagement from manuf. for subsequent revision cycle
- Transformer Bushing Seismic Resilience Presentation – WE Gundy / Idaho National Laboratory.

12.2 DIELECTRIC TESTS POORVI PATEL (T HOCHANH PRESENTED)

- Quorum was reached and business could be conducted
- TF Core Ground & Winding Insulation Resistance - resume activities with presentations in experimental work with over 180 transformers
- TF Revision of Low Frequency Test – Two motions were approved during the SC session and motions passed by majority approval. One survey to go out.
- TF Revision of Impulse Test – Motion approved for changes on C57.12.90 (10.2.4)
- C57.161 Guide for DFR Measurements – TF completed its work. Motion made to initiate PAR for document revision. Motion approved.
- C57.127 TF Detection of Acoustic Emissions – Minor modifications required. Work in progress.
- C57.138 Recommended Practice for Routine Impulse Test - C57.160 PD in bushings/PTs/CTs – Document in process of publication

-
- C57.98 Impulse Guide –The WG approved the final revision to be submitted to the SC. PAR requested for 2-year extension.
 - TF Transient Failure Mitigation (WG PC57.142) – CRG working on remaining 20 comments (out of 305)

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; expired
 - All comments resolved; in recirculation & on track to finish
- 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
 - PAR application underway
- C57.12.38 – WG 1-Phase Padmount Transf – Ali Ghafourian; expires 2024
 - In ballot comment resolution; recirculation
- 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 Entity PAR to ballot
- PAR Study Group formed Padmount Step Voltage Regs - Kyle Heiden

12.4 DRY TYPE TRANSFORMERS CASEY BALLARD

- C57.16 Air Core Reactors – Ballot Pool being formed, and draft will be submitted to MEC for review
- C57.12.52 Sealed Dry-Type – On the May 6th RevCom agenda

- C57.12.01 Dry Type General Requirements – corrected Short Circuit temperature calculation, discussed Pass/Fail criteria for Power Factor
- C57.134 Hottest Spot Determination – On the March 20th RevCom agenda
- 259 LV Thermal Aging – WG voted to pursue a PAR extension
- C57.94 Installation and Maintenance – the draft is nearly complete, and plan is to move to ballot after Fall 24
- C57.96 Loading Guide – intention is to complete draft, circulate to WG for ballot via email, get SC approval via email and have first ballot completed before Fall 24
- C57.124 PD Test – Ballot Pool formed and MEC review complete, will open ballot shortly
- C57.12.91 Test Code– added requirement for phase angle metering correction, short circuit requirements for axially stacked windings
- C57.12.59 Through Fault Currents – WG Draft 1 created and shared, found new WG Chair
- ANSI C57.12.55 Enclosures – Created Title and scope which was approved by WG and SC. Next step is to create the PAR.
- C57.12.58 Transient Voltage Analysis – Created Title, Scope, and Purpose which was approved by WG and SC. Next step is to create the PAR.

12.5 TRANSFORMER AND REACTORS FOR HVDC APPLICATIONS ULF RADBRANDT

- IEC/IEEE 60076-57-129, Dual Logo – HVDC Transformers
 - We have applied for a PAR to start revision together with IEC TC14
 - Waldemar Ziomek is our WG chair and Marcos Czernorucki is the nominated IEC Convener
 - The standard expires December 31 2027
- IEEE 1277, Smoothing and Converter Reactors
 - Published 2020, no revision work for some years
- Entity WG, Guide for Vibration Testing of HVDC Transformer (± 160 kV to ± 1100 kV)
 - Nobody from the WG could join this meeting due to Visa issues.
 - The WG Chair, Dr. Jun Deng, sent a presentation of the status of the WG. It was shown during the SC meeting.
 - The WG has had the 2nd meeting January 21, 2024 in Wuhan, China.
 - The third WG meeting is scheduled to be held in August 2024

12.6 INSTRUMENT TRANSFORMERS THOMAS SIZEMORE

- All working groups and task forces met as planned. Of particular note, the WG to revise C57.13 has reviewed all comments in the first draft. Assignments were made to work on existing issues before the Fall meeting.
- C57.13.9 – Standard for Power-line Carrier Coupling Capacitors and Coupling Capacitor Voltage Transformers. Updated the status of the comment resolution from the initial balloting. This standard should be in recirculation soon.
- ITSC – Formed a TF to investigate how we could approach the subject of a high voltage sensor standard.

12.7 INSULATING FLUIDS STEPHANIE MABREY

- WG C57.130-Factory Temperature Rise Test DGA.
 - Did not have quorum. A small amount of data received to add esters into this guide. The chair made a request for more DGA data. Discussion about collaborating with C57.155 due to lack of data. Title, scope, and purpose will need to be changed to add esters.
- WG C57.139-LTC DGA Data.
 - A preliminary review of DGA data was shared with the WG (180,000 records were received). The four Task Forces updated the WG. Classification for In tank and On tank OLTC's were discussed. Timeline for initial draft is mid 2024.
- WG C57.146-Silicone DGA.
 - A motion was passed by the subcommittee for a 2 year par extension. A motion was also passed to go to straw ballot within the WG and the ballot resolution group to have the authority to make changes. Possible LOA patent reported at the meeting. The appropriate steps will be followed with PATCOM.
- WG C57.155- DGA for Ester Fluids.
 - 9500 records were received with the first request for data. A request for additional data is open until June 31 2024. Please submit data to C57data@ieee.org There was discussion of using different methods to reduce false positives in the data.
- WG C57.166- Consolidation of Insulating Fluids.
 - Document in ballot, that ends March 16th. If you are part of the ballot group please respond. If you do not have time to review the document, please abstain. The ballot resolution group will start the review after the ballot closes.
- WG C57.637- Reclamation of Insulating Liquids.
 - Straw Ballot comments have been received. A motion passed to allow the resolution group resolve comments.
- TF C57.104- DGA for Mineral Oil.
 - Project title, scope and purpose were approved by the Subcommittee.
- TF to develop a test method to determine the maximum continuous operating temperature of Insulating liquids.

-
- A motion was brought before the subcommittee to disband this TF. The motion was approved by the subcommittee. A motion was brought to for a PAR study group in place of the TF. The motion did not pass.

12.8 INSULATION LIFE SAM SHARPLESS

- C57.91 Loading Guide – Balloting underway, will be completed by next Spring.
- C57.100 Thermal Test – Published 2022. No active PAR
- C57.119 Temp Rise Tests – Expires 2028. Par study group approved.
- C57.154 Hi Temp Guide – Published 2022. No active PAR
- C57.162 Moisture Guide – In Comment Resolution. Photo finish in 2024.
- C57.165 Temp Measurements – In ballot, should be complete this year.
- C57.169 Max Winding Rise – Published June 30, 2023. No Active PAR
- IEEE 1276 Hi Temp Materials – Work on amendment is progressing, ballot ready soon.
- C57.12.90 Clause 11 Temp rise tests – Work continues on four items.
- Study group for Cellulose Degradation Tests will continue in Fall.
- Study group for loading of non-C57-119 insulation systems will start in Fall.

12.9 PERFORMANCE CHARACTERISTICS ROGERIO VERDOLIN

- TF CO2 Emissions in the Construction of Transformers
 - Submitted title and scope to SC for PAR request.
 - Title: IEEE Guide for the Environmental Performance and Life Cycle Assessment of Shunt Reactors, Distribution and Power Transformers.
 - Scope: “This Guide covers the methodology of calculation and reporting the environmental impact and carbon footprint of transformers and shunt reactors over their lifecycle.”
 - A motion to create a PAR study group for this topic was made and approved.
- TF PCS Cont. Rev. to Audible Sound C57.12.90
 - Data presented on the sound level of PAs was presented and discussed. It was suggested that a paper be published with the information.
- TF PCS Cont. Rev. to C57.12.00
 - Approved changes to aux loss definition and to add phasor group designation to nameplate. These were approved by the Subcommittee to forward to WG C57.12.00.
 - Survey regarding DC current injection limits as % of rated current will be sent out.

-
- Tabled discussion of clarification of kVA limits in Table 11 to next meeting for more fact finding.
 - New business for the Fall meeting: Adding heat run duration to test reports. Decided not to pursue changes to ratio tolerance. Aux loss definition discussion ongoing. No time was left for new business.
 - WG C57.159 – Standard for DPV Transformers
 - First working group meeting: presentation on NEMA draft 80042 and soliciting volunteers to work on specific sections of the standard.
 - TF PCS Cont. Rev. to C57.12.90
 - Sent cold resistance temperature to TF Continuous Rev Clause 11 Temp Rise Tests C57.12.90. This TF will continue to review defining type/class of transformers that may be held to a more accurate temperature measurement.
 - C57.142
 - CRG working on remaining comments. Two presentations were made.
 - C57.158 Application Guide for Tertiary Winding and Stabilizing Windings
 - TF groups were formed by the WG to work on specific sections of the document.
 - C57.32
 - TFs on each section gave reports on progress. Will begin to prepare document draft with TF inputs to review for the fall meeting.
 - C57.32.10 Entity
 - Draft 6 completed. Working on MEC review in order to go to ballot.
 - C57.141
 - Resolving comments from pre-ballot. Will be sent to MEC and then sent to SC in around 2-3 months for approval to send to balloting.
 - New Business
 - Discussion on whether to form TF to study issues associated with transformer modeling and stability studies. A motion was made and passed to form a TF.
 - A presentation was given on the Design and Operation of Renewable Energy Collector Transformers (RCTs).

12.10 POWER TRANSFORMERS RYAN MUSGROVE

- WG C57.131 Standard Requirement for Tap Changers – Approved by RevCom Feb 15th, 2024
- WG C57.156 Guide for Tank Rupture Mitigation– no quorum, collecting suggestions for revision, plan to have final draft by Fall 2026. Will meet in St Louis
- WG IEEE 638 Class 1E Transformers for Nuclear Power Gen– 1st meeting, reviewed draft and comparing changes from IEEE/IEC 60980-344-2020, will meet in St Louis.
- WG IEC/IEEE 60076-57-135 Guide for Phase Shifting Transformers– made quorum, reviewed possible revision topics. Ewald Schweiger is seeking volunteers that are experienced with protection/control of Phase Shifting Transformers for assistance. Will meet in St. Louis and virtually btwn meetings.
- WG C57.143 Monitoring Guide– One comment left to resolve out of 676 from ballot, plan to submit final draft and recirculate by end of March.
- TF C57.12.10 Std. req for tr – 1st meeting, agreed to revise document and made motion to SC to submit PAR with the approved Title and Scope.
- TF C57.140 Guide for Evaluation and Reconditioning of TR – 1st meeting, agreed a revision is needed. Working on title and scope for PAR submittal.
- WG C57.125 Failure Investigating and Reporting– achieved quorum. Many modifications discussed and approved. Straw ballot will go to members with attempt to be ready for Ballot by Fall mtg in St. Louis.
- WG C57.170 Condition Assessment Guide– made quorum. Update made on straw ballot comments and resolutions. Motion was made to move to ballot and approved unanimously. Will meet in St. Louis.
- WF C57.157 Guide for the Life Test of Switch Contacts– Made quorum, presentation made on background of guide and discussion made on addition of esters, chair will attempt to coordinate a presentation on synthetic esters for next meeting. Will meet in St. Louis.
- WG C57.150 Transportation Guide– No meeting – final draft approved 9/21/23 and still awaiting publication.
- WF C57.17 Standard Requirements for Arc Furnace Transformers – Made quorum. Made motion to send straw ballot for comments to WG for section volunteers to review. Will meet in St. Louis.
- WG C57.107 Transformer Volts/Hertz – Draft was approved Feb 4th, 2024 and is awaiting Revcom Approval. Will not meet in St. Louis.
- TF 60076-57-1202 Liquid immersed phase-shifting transformers – 1st meeting, agreed on revision with title and scope for PAR approval to SC. Approved unanimously. Will meet as WG in St. Louis.

-
- TF C57.93 Installation and Maintenance Guide– made quorum. Agreed to revise and approved title and scope, motion in SC to submit a PAR with approved wording and passed unanimously. Will meet as WG in St. Louis.
 - Liaison to Entity PAR PC57.93a – no updates since last meeting.
 - WG C57.153 Guide for Paralleling Transformers – 1st WG meeting. Presentations made for recommended updates/changes. Defined reverse power flow based on previous TR mtg presentation. Will meet in St. Louis.
 - Entity PAR C57.145 – Digital Twin for Power Equipment (DTPE) – no update since last meeting.
 - Entity PAR for Low Frequency Power Transmission – No update since last meeting.
 - Old business
 - Discussed IEEE 693 document from Substation Standards Committee regarding an amendment currently being balloted. Appears to have been moved back to WG, and awaiting update.
 - Task force headed by Hemchandra Shertukde for IOT – no updates since last meeting.
 - 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.

12.11 STANDARDS DAN SAUER

- C57.12.00 – During S24 two changes were approved.
 - Aux losses & Vector Group
- C59.12.90 – DiTest SC approved two changes
 - Additional notes to Switching Surge & bushing venting wording
- Expect to close 12.00 & 12.90 following S25 Meeting
- Some discussion on the working of the WG for 12.00 & 12.90
 - Will review during the P&P review this year
- C57.152 – Is through MEC and starting ballot pool formation
- TF IEEE / IEC Cross Reference –TF met and discussed the framework and scope of work to be carried out.

-
- TF Reverse Power Flow Effects –
 - T Motion to go for a WG PAR based on the agreed upon title, scope & purpose
 - TF did not complete the second task and this will be taken up in F24 as old business
 - Motion to go for a WG Document amendment PAR to C57.12.80 to define “Reverse Power Flow”.

12.12 SUBSURFACE TRANSFORMERS & NETWORK PROTECTORS GEORGE PAYERLE

- C57.91 Loading Guide – Balloting underway, will be completed by next Spring.
- C57.100 Thermal Test – Published 2022. No active PAR
- C57.119 Temp Rise Tests – Expires 2028. Par study group approved.
- C57.154 Hi Temp Guide – Published 2022. No active PAR
- C57.162 Moisture Guide – In Comment Resolution. Photo finish in 2024.
- C57.165 Temp Measurements – In ballot, should be complete this year.
- C57.169 Max Winding Rise – Published June 30, 2023. No Active PAR
- IEEE 1276 Hi Temp Materials – Work on amendment is progressing, ballot ready soon.
- C57.12.90 Clause 11 Temp rise tests – Work continues on four items.
- Study group for Cellulose Degradation Tests will continue in Fall.
- Study group for loading of non-C57-119 insulation systems will start in Fall.

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 Spring 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 Committed 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 five 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 Thomas Traub



Thomas Traub passed away at age 85 on June 13, 2022.

Thomas was a Committee Member.

Thomas was Standards Subcommittee Chair from 1996 – 1997 and C57.131 Working Group Chair (also received Outstanding Working Group award in 1997).

Thomas had a successful 40 year career as an electrical engineer with ComEd.

Thomas enjoyed traveling throughout Europe, Australia, New Zealand, and the Western US; he appreciated classical music; he like dining out; and was a long-suffering Cubs fan.

16.2.2 Amitav Mukerji



Amitav Mukerji passed away at age 70 on June 9, 2021

Amitav became a Committee Member in 2009

Amitav worked for ABB Transformers in South Boston, Virginia from 2007 – 2015 as Quality Manager and formerly worked for Siemens and Virginia Transformer.

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:

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

It was approved to also add Claude Beauchemin to this list.

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 March 22, 2022 meeting:

<u>Name</u>	<u>Affiliation</u>
Fabian Stacy	Hitachi Energy
John Vartanian	National Grid
Trenton Williams	Advances Power Technologies
Joshua Yun	Virginia Transformer

16.5 NEW FELLOW MEMBER

The Transformers Committee is very pleased to recognize Tom Prevost who was elevated to IEEE Fellow effective January 1, 2024, “for contributions to life estimation of transformer insulation systems”.

IEEE Fellow is a distinction reserved for select IEEE members whose extraordinary accomplishments in any of the IEEE fields of interest are deemed fitting of this prestigious grade elevation. The other IEEE Fellows in the Transformers Committee are Ramsis Girgis, Jack Harley, Sheldon Kennedy, Gary Hoffman, Peter Balma, and Phil Hopkinson.

16.6 GENERAL SERVICE AWARDS

16.6.1 Certificate of Appreciation – Meeting Host

The Transformers Committee thanks **IFD** for serving as the Host Company for the Spring 2024 meeting. In addition, the Committee thanks **Paul Chisholm** and **Jeremy Van Horn** for their dedicated service as Co-Hosts for the meeting.

16.6.2 Certificate of Appreciation – Bruce Forsyth

The Transformers Committee thanks **Bruce Forsyth** for his service as Officer of the Transformers Committee for 8 Years including Secretary 2016-2017; Vice-Chair 2018-2019; Chair 2020-2021; Past-Chair 2022-2023.

16.6.3 Certificate of Appreciation – Ed teNyenhuis

The Transformers Committee thanks **Ed teNyenhuis** for his service as Chair of the Transformers Committee for 2022-2023.

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 **Jim Dukarm** and **Roger Wicks**:

- Jim Dukarm – for significant contributions to the Transformers Committee for dissolved gas in oil analysis especially for C57.104 and C57.139
- Roger Wicks – for expertise in standards work for insulation system life for all types of transformers including those that have some form of liquid and dry-type

16.8 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.

16.8.1 IEEE Std C57.136™-2023 – *IEEE Guide for Audible Sound of Liquid-Immersed Power Transformers*

WG Chair: Stephen Antosz
WG Vice Chair: Ramsis Girgis
WG Secretary: Mats Bernesjo

16.8.2 IEEE Std C57.167™-2023 – *IEEE Guide for Monitoring Distribution Transformers*

WG Chair: Gary Hoffman

WG Vice Chair: Mike Thibault

Plaques:

Dan Mulkey

Gustavo Leal

Stephen Shull

Jerry Murphy

16.8.3 IEEE Std C57.168™-2023 – *IEEE Guide for Low-Frequency Dielectric Testing for Distribution, Power, and Regulating Transformers*

WG Chair: Daniel Sauer

WG Secretary: Sergio Hernandez

Plaques:

Bertrand Poulin

Hamid Abdelkamel

Certificates of Appreciation:

Ajith Varghese

Kyle Stechschulte

Drew Welton

Jeffrey Britton

John Foschia

16.8.4 IEEE Std C57.12.20™-2023 – *IEEE Standard for Overhead-Type Distribution Transformers 500 kVA and Smaller; High Voltage, 34 500 V and Below; Low Voltage, 7970/13 800V V and Below*

WG Chair: Alan Traut

Vice Chair: James Smith

Secretary: Kendrick Hamilton

Certificates of Appreciation:

Bruce Webb

Carlos Gaytan

Giuseppe Termini

Igor Simonov

Joshua Verdell

Stephen Shull

16.8.5 IEEE Std C57.12.24™-2023 – *IEEE Standard for Submersible, Three-Phase Transformers, 3750 kVA and Smaller: High Voltage, 34 500 GrdY/19 920 V and Below; Low Voltage, 600 V and Below*

WG Chair: Benjamin Garcia

Vice Chair: Thomas Dauzat

Secretary: George Payerle

—

Plaques:

Dan Mulkey

Certificates of Appreciation:

Alejandro Macias

Avijit Shingari

Michael Zarnowski

Nabi Almeida

Jeremy Van Horn

Audrey Siebert-Timmer

16.8.6 IEEE Std C57.12.20™-2023 – IEEE Standard for Overhead-Type Distribution Transformers 500 kVA and Smaller; High Voltage, 34 500 V and Below; Low Voltage, 7970/13 800Y V and Below

WG Chair: Alan Traut

Vice Chair: James Smith

Secretary: Kendrick Hamilton

Certificates of Appreciation:

Bruce Webb Carlos Gaytan Giuseppe Termini

Igor Simonov Joshua Verdell Stephen Shull

16.9 PRESENTATION SLIDES

A brief summary of this Recognition and Awards report was presented at the March 10, 2-24 Administrative Subcommittee meeting. A full presentation was made at the Spring 2024 Awards Luncheon on March 12, 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 – Mar 14, 2024

17 ADMINISTRATIVE SUBCOMMITTEE – DAVID WALLACH

The Administrative Subcommittee met on March 10, 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:

Members and Guests Present:

1. Chair..... David Wallach
2. Vice-Chair..... Bill Griesacker
3. Secretary Scott Reed
4. Treasurer Troy Tanaka
5. Standards Coordinator Steve Shull
6. Awards/Past Chair Ed teNyenhuis
7. Bushings Scott Digby
8. Dielectric Tests Poorvi Patel
9. Distribution Transformers Jerry Murphy
10. Dry Type Transformers Casey Ballard
11. HVDC..... Ulf Radbrandt
12. Instrument Transformers..... Thomas Sizemore
13. Insulation Life Sam Sharpless
14. Insulating Fluids Stephanie Mabrey
15. Performance Characteristics Rogerio Verdolin
16. Power Transformers Ryan Musgrove
17. Standards..... Dan Sauer
18. Underground Transformers & Network Protectors George Payerle
19. Meetings..... **
20. Guests: Malia Zaman, Patricia Jarosz, David Walker, Vice Chair of Dry Type
21. *Scott Digby, Vice Chair of Bushing SC attended meeting for Eric Weatherbee, Chair.
22. ** Thang Hochanh, Vice Chair of Dielectric Tests, attended meeting for Poorvi Patel, Chair
23. *** Tammy Behrens had schedule conflict and was not able to attend, Meeting Planning SC information to be delivered at main Committee meeting in Monday general session.

17.2 APPROVAL OF PREVIOUS MEETING MINUTES

The Chair requested if there were comments on the draft Fall 2023 Administrative Subcommittee meeting minutes. Sam Sharpless made a motion to approve the minutes and George Payerle seconded the motion. Objections to unanimous approval of the minutes was requested. No comments were offered and no objections were voiced, therefore the Fall 2023 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. Stephen Shull 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 Fall 2023 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).....	Malia Zaman	
4. Meeting Planning Report		3:15
4.1. Meeting Planning Report (:05)	Tammy Behrens	
5. Subcommittee Reports (<i>please limit your report to 4 minutes or less</i>).....		3:20
5.1. Bushings.....	Eric Weatherbee	
5.2. Dielectric Test	Poorvi Patel	
5.3. Distribution Transformers	Jerry Murphy	
5.4. Dry Type Transformers	Casey Ballard	
5.5. HVDC.....	Ulf Radbrandt	
5.6. Instrument Transformers.....	Thomas Sizemore	
5.7. Insulating Fluids	Stephanie Mabrey	

5.8.	Insulation Life.....	Sam Sharpless	
5.9.	Performance Characteristics.....	Rogério Verdolin	
5.10.	Power Transformers	Ryan Musgrove	
5.11.	Standards	Dan Sauer	
5.12.	Subsurface Transformers & Network Protectors	George Payerle	
6.	Unfinished Business		4:10
6.1.	Update on memberplanet (:10).....	David Wallach	
6.2.	Other (:05)	All	
7.	New Business (:10)		4:40
7.1.	IEEE Std 1860 co-sponsorship (:05)	David Wallach	
8.	Wrap Up & Adjournment		4:50
8.1.	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.”

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

Name	Affiliation
Fabian Stacy	Hitachi Energy
John Vartanian	National Grid
Trenton Williams	Advances Power Technologies
Joshua Yun	Virginia Transformer

The four 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 – MALIA ZAMAN

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 | Scott Digby
- 17.11.2** Dielectric Test Subcommittee | Thang Hochanh Poorvi Patel
- 17.11.3** Distribution Transformers Subcommittee | Jerry Murphy
- 17.11.4** Dry Type Transformers Subcommittee | Casey Ballard
- 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 An announcement will be made by the chair on Monday in the General Meeting that memberplanet is not ready. Bruce Forsyth will assist Jim McBride in testing.

17.12.2 P&P Revision: this is scheduled to be updated in 2024. Awaiting on the IEEE template.

17.13 NEW BUSINESS

17.13.1 IEC Liaisons: TC 10, TC 14 and TC 15 will be combined and consolidated into one topic of interest. Christoph Ploetner will be the point of contact.

17.13.2 Women in Power: Successful breakfast but requested a time change so it will be a luncheon

17.13.3 P2815 Smart Distribution Transformer: SC21 Entity PAR – PE/TR agreed to be a co-standards committee

17.13.4 IEEE C57.693: A suggestion was made to have more transformers manufactures involved with the revision.

17.13.5 PES Committee Survey: The purpose of this survey is to Investigate Distributed Cyber Physical Assessment for Grid Resilience. Please distribute to determine if there is any interest.

17.13.6 Emeritus Status:

- Claude Beauchemin was accepted by the AdCom to be moved to Emeritus Status.
- Mehesh Sampat was known to be involved but unknown as to what involvement. AdCom will table a decision on him until more information is collected.

17.13.7 PARs that the Transformer committee has agreed to Co-Sponsor; TC lacks the expertise to support and therefore will serve as a co-sponsor. Anyone interested in being involved should reach out and volunteer IEEE Std 1860 co-sponsorship – It is proposed that the Transformers Committee will be a co-sponsor of this standard.

17.14 ADJOURNMENT

The items on the agenda were completed and the meeting was adjourned at about 4:25 PM.

Respectfully submitted by:

Scott Reed,
Secretary, Transformers Committee

March 10, 2023

March 10, 2024 Adcom Meeting Attendance;

Last Name	First Name	Affiliation	Meeting Date 3/10/24
Ballard	R. Casey	DuPont	X
Digy	Scott	Duke Energy	X
Griesacker	Bill	William Griesacker and Associates Inc.	X
Hochanh	Thang	BC Hydro	X
Jarosz	Patricia	IEEE	X
Mabrey	Stephanie	Weidmann	X
Murphy	Jerry	Reedy Creek Energy Services	X
Musgrove	Ryan	Oklahoma Gas & Electric	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
Som	Sanjib	PTTI	X
Tanaka	Troy	Burns & McDonnell	X
teNyenhuis	Ed	Hitachi Energy	X
Verdolin	Rogério	Verdolin Solutions Inc.	X
Wallach	David	Duke Energy	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, MARCH 9

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

TIME	ACTIVITY	TRACK	MTG CHAIR	STATUS	ROOM (FLOOR)
7:30 AM – 7:30 PM	EARLY BIRD TOUR – MAJESTIC VICTORIA FULL DAY TOUR				
	Embark on a full day trip to Victoria on Vancouver Island, famous for its stunning northwest coast scenery and British charm. Sail across the Salish Sea, choose between Butchart Gardens or the Royal BC Museum, enjoy a group lunch, and return to Vancouver in the evening.				
	- See flyer for details				

SUNDAY, MARCH 10

TIME	ACTIVITY	TRACK	MTG CHAIR	STATUS	ROOM (FLOOR)
1:00 PM – 5:30 PM	Meeting Registration				Regency Foyer (3)
2:00 PM – 5:00 PM	Administrative Subcommittee	Admin	D. Wallach	–	Oxford/Prince of Wales (3)
	- Closed meeting, by invitation only				
2:00 PM – 5:00 PM	NEMA Transformers	++	P. Orr	–	Balmoral (3)
	- Closed meeting, by invitation only				
6:00 PM – 8:00 PM	Welcome Reception				Perspectives Level (34)
	Renew old friendships and form new ones! This reception will be held inside the rooms at the top of the Hyatt, so weather will not be an issue. Cash 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.				

MONDAY, MARCH 11 Breaks Sponsored by Siemens Energy*

TIME	ACTIVITY	TRACK	MTG CHAIR	STATUS	ROOM (FLOOR)
7:00 AM – 5:00 PM	Meeting Registration				Regency Foyer (3)
7:00 AM – 7:50 AM	Newcomers Orientation - Arrive early, grab breakfast from Plaza Ballroom and get a good seat - Newcomers and guests are encouraged to attend		B. Griesacker	—	Georgia A/B (2)
7:00 AM – 8:00 AM	Breakfast - Attendees (no spouses/companions please)				Plaza Ballroom (2)
8:00 AM – 9:30 AM	Breakfast - Spouses/Companions (no meeting attendees please)				Seymour (34)
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 C/D (3)
9:30 AM – 3:30 PM	Spouses/Companions Tour: Granville Island Food & Culture Tour - Start the day with a private tour of the Bill Reid Gallery of Northwest Coast Art and a stop in Gastown - Enjoy a progressive meal from at least 12 vendors inside Granville Island market - See website/flyer for details				
9:15 AM – 9:30 AM	Break (beverages only): Siemens Energy				Regency Foyer (3)
9:30 AM – 10:45 AM	TF IEEE-IEC Cross Reference	Stds	A. Washburn	I	Balmoral (3)
9:30 AM – 10:45 AM	TF PAR Study Group Temp Rise Test beyond NP C57.119	Ins Life	E. Schweiger	N	Regency A (3)
9:30 AM – 10:45 AM	WG Guide for Tank Rupture Mitigation C57.156	Power	P. Zhao	I	Regency B (3)
9:30 AM – 10:45 AM	TF Transf Efficiency & Loss Evaluation (DOE Activity)	Distr	P. Hopkinson	I	Regency C/D (3)
9:30 AM – 10:45 AM	TF PD Testing of DTR, Wind & Solar Transf	DiTests	A. Larison	N	Regency E/F (3)
9:30 AM – 10:45 AM	WG Guide DGA in Ester-Immersed Transformers PC57.155	IF	A. Sbravati	I	Oxford/Prince of Wales (3)
10:45 AM – 11:00 AM	Break (beverages only): Siemens Energy				Regency Foyer (3)
11:00 AM – 12:15 PM	TF CO2 Emissions in the Construction of Transformers	PCS	J. Kazmierczak	I	Balmoral (3)
11:00 AM – 12:15 PM	WG Guide for DGA in Silicone PC57.146	IF	P. Boman	I	Regency A (3)
11:00 AM – 12:15 PM	WG Class 1E Transf. for Nuclear Power Gen Std. 638	Power	C. Swinderman	I	Regency B (3)
11:00 AM – 12:15 PM	WG App of High-Temp Insulation Matrs IEEE 1276 Annex B	Ins Life	K. Biggie	I	Regency C/D (3)
11:00 AM – 12:15 PM	TF PAR Study Group Guide for TVA Dry-Type Coil C57.12.58	Dry Type	K. Klein	N	Regency E/F (3)
11:00 AM – 12:15 PM	WG 1ph Submersible Transformers PC57.12.23	STNP	A. Traut	N	Oxford/Prince of Wales (3)
11:00 AM – 12:15 PM	TF Core Ground & Winding Insul. Resistance - Perf & Int.	DiTests	D. Robalino	N	Georgia A/B (2)
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.				Plaza Ballroom (2)
1:45 PM – 3:00 PM	TF - Test Degredation of Cellulose in Liquid Type Transfs	Ins Life	L. Lewand	I	Balmoral (3)
1:45 PM – 3:00 PM	WG Dry Type Gen. Requirements C57.12.01	Dry Type	C. Ballard	I	Regency A (3)
1:45 PM – 3:00 PM	WG Guide for Phase Shifting Transf C57.135	Power	E. Schweiger	I	Regency B (3)
1:45 PM – 3:00 PM	TF Audible Sound Revision to Test Code	PCS	R. Girgis	I	Regency C/D (3)
1:45 PM – 3:00 PM	TF DFR Test Guide C57.161	DiTests	E. Ermakov	I	Regency E/F (3)
1:45 PM – 3:00 PM	WG 1-ph Padmount Dist Transf. C57.12.38	Distr	A. Ghafourian	I	Oxford/Prince of Wales (3)
3:00 PM – 3:15 PM	Break (beverages and treats): Siemens Energy				Regency Foyer (3)
3:15 PM – 4:30 PM	WG Transformer Impulse Test Guide PC57.98	DiTests	T. Hochanh	I	Balmoral (3)
3:15 PM – 4:30 PM	TF Test for Eval of Insulation for Dry-Type Transfs IEEE 259	Dry Type	D. Stankes	I	Regency A (3)
3:15 PM – 4:30 PM	TF Std Reqs for Liquid-Immersed Power Trans C57.12.10	Power	S. Digby	N	Regency B (3)
3:15 PM – 4:30 PM	TF PCS Cont. Revisions to C57.12.00	PCS	T. Ansari	I	Regency C/D (3)
3:15 PM – 4:30 PM	WG Bushing Application Guide C57.19.100	Bush	T. Spitzer	I	Regency E/F (3)
3:15 PM – 4:30 PM	WG 3-ph Padmount Dist Transf. C57.12.34	Distr	S. Shull	I	Oxford/Prince of Wales (3)
3:15 PM – 4:30 PM	TF Guide Eval & Recon of Liquid Immerse Transf C57.12.140	Power	S. Som	N	Georgia A/B (2)
4:30 PM – 4:45 PM	Break (beverages only): Siemens Energy				Regency Foyer (3)
4:45 PM – 6:00 PM	WG Sec. Network Protectors C57.12.44	STNP	M. Faulkner	I	Balmoral (3)
4:45 PM – 6:00 PM	TF PAR Study Group Unit Substation Transf C57.12.55	Dry Type	S. Nunn	N	Regency A (3)
4:45 PM – 6:00 PM	WG Failure Investigation & Reporting PC57.125	Power	H. Sahin	I	Regency B (3)
4:45 PM – 6:00 PM	TF Inverter Transf Precautions on Ground Shields C57.159	PCS	H. Shertukde	I	Regency C/D (3)
4:45 PM – 6:00 PM	SC HVDC Converter Transfs & Smoothing Reactors	HVDC	U. Radbrandt	-	Regency E/F (3)
4:45 PM – 6:00 PM	WG Guide for Field Testing PC57.152	Stds	M. Ferreira	I	Oxford/Prince of Wales (3)
6:30 PM – 9:30 PM	Technical Tour: IFD Technologies Advance registration required—space is limited! Admission confirmed with badge at bus. Start loading bus departs at 6:30PM, 6:45PM arrival at IFD. Bus departure at 9:15PM, 9:30PM arrival at hotel. Catered dinner is provided. See website/flyer for more information.	Tech Tour			

TUESDAY, MARCH 12 Breaks Sponsored by Delta-X Research*

TIME	ACTIVITY	TRACK	MTG CHAIR	STATUS	ROOM (FLOOR)
7:00 AM – 11:30 AM	Meeting Registration				Regency Foyer (3)
7:00 AM – 7:50 AM	EL&P Delegation (End-users only please) - Arrive early and grab breakfast from Plaza Ballroom		J. Murphy	–	Georgia A/B (2)
7:00 AM – 8:00 AM	Breakfast - Attendees (no spouses/companions please)				Plaza Ballroom (2)
8:00 AM – 9:30 AM	Breakfast - Spouses/Companions (no meeting attendees please)				Seymour (34)
9:30 AM – 3:30 PM	Spouses/Companions: Photography Lesson in Stanley Park - Top local photographer will guide you in capturing stunning images using just your smartphone - Enjoy a beautiful lunch in the Stanley Park Tea Room - 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	Balmoral (3)
8:00 AM – 9:15 AM	WG Practice for Install & Operation of Dry Type PC57.94	Dry Type	K. Klein	I	Regency A (3)
8:00 AM – 9:15 AM	WG Power-Line Carrier Coupling Cap & Volt Transf. C57.13.9	Instr TR	Z. Roman	I	Regency B (3)
8:00 AM – 9:15 AM	WG Guide DGA Applied to Factory Temp Rise Test C57.130	IF	B. Forsyth	I	Regency C/D (3)
8:00 AM – 9:15 AM	TF on Revision of Impulse Tests C57.12.00 & C57.12.90	DiTests	S. Plante	I	Regency E/F (3)
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	Oxford/Prince of Wales (3)
9:15 AM – 9:30 AM	<i>Break (beverages only): Delta-X Research</i>				Regency Foyer (3)
9:30 AM – 10:45 AM	TF Detection of Acoustic Emissions from PD C57.127	DiTests	D. Gross	I	Balmoral (3)
9:30 AM – 10:45 AM	TF Std Require for Bushings C57.19.01	Bush	S. Zhang	I	Regency A (3)
9:30 AM – 10:45 AM	TF Instrument Transf. Accuracy	Instr TR	I. Ziger	I	Regency B (3)
9:30 AM – 10:45 AM	WG Condition Assessment Guide PC57.170	Power	K. Mani	I	Regency C/D (3)
9:30 AM – 10:45 AM	TF PCS Cont. Rev. to Test Code C57.12.90	PCS	H. Sahin	I	Regency E/F (3)
9:30 AM – 10:45 AM	WG Distr Substation Transf PC57.12.36	Distr	J. Murphy	I	Oxford/Prince of Wales (3)
10:45 AM – 11:00 AM	<i>Break (beverages only): Delta-X Research</i>				Regency Foyer (3)
11:00 AM – 12:15 PM	WG Sw Transients Ind by TR/Bkr Interaction PC57.142	PCS	J. McBride	I	Balmoral (3)
11:00 AM – 12:15 PM	WG Liquid-immersed Sec. Network TRs C57.12.40	STNP	J. Vartanian	I	Regency A (3)
11:00 AM – 12:15 PM	WG Standard Requirements for Arc Furnace Transf. C57.17	Power	D. Corsi	I	Regency B (3)
11:00 AM – 12:15 PM	WG Requirements for Instrument Transformers PC57.13	Instr TR	D. Wallace	I	Regency C/D (3)
11:00 AM – 12:15 PM	WG Guide for the Reclamation of Mineral Oil C57.637	IF	S. Mabrey	I	Regency E/F (3)
11:00 AM – 12:15 PM	WG Guide for Loading Dry Type Transformers C57.96	Dry Type	A. Narawane	I	Oxford/Prince of Wales (3)
11:00 AM – 12:15 PM	WG Electronic Test Data PC57.12.37	Distr	A. Traut	N	Georgia A/B (2)
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.				Plaza Ballroom (2)
1:45 PM – 3:00 PM	TF Std Require Bushings above 5kA in Bus Encl. C57.19.04	Bush	S. Digby	N	Balmoral (3)
1:45 PM – 3:00 PM	TF Cont. Revision to Low Frequency Tests C57.12.90	DiTests	A. Varghese	I	Regency A (3)
1:45 PM – 3:00 PM	TF Liquid Immersed Phase- Shifting Transf 60076-57-1202	Power	E. Schweiger	N	Regency B (3)
1:45 PM – 3:00 PM	TF PAR Study Group DGA in Mineral Oil Transf C57.104	IF	E. teNyenhuis	N	Regency C/D (3)
1:45 PM – 3:00 PM	TF to Merge C57.13.5 into C57.13	Instr TR	T. Sizemore	N	Regency E/F (3)
1:45 PM – 3:00 PM	WG Bar Coding for Distr Transf. C57.12.35	Distr	R. Chrysler	B	Oxford/Prince of Wales (3)
3:00 PM – 3:15 PM	<i>Break (beverages and pretzels): Delta-X Research</i>				Regency Foyer (3)
3:15 PM – 4:30 PM	WG Recommend Practice Routine Impulse Tests C57.138	DiTests	H. Sahin	I	Balmoral (3)
3:15 PM – 4:30 PM	TF Test Method for Max Cont Temp of Ins Liquids	IF	A. Gamil	N	Regency A (3)
3:15 PM – 4:30 PM	TF Guide for Install & Maintenance of Power Trf C57.93	Power	S. Reed	I	Regency B (3)
3:15 PM – 4:30 PM	TF Continuous Rev Clause 11 Temp Rise Tests C57.12.90	Ins Life	D. Sankarakurup	I	Regency C/D (3)
3:15 PM – 4:30 PM	TF Reverse Power Flow Effects on Trans	Stds	R. Hogg	I	Regency E/F (3)
3:15 PM – 4:30 PM	WG Req for Dist Trf Tank Pressure Coordination C57.12.39	Distr	C. Gayton	N	Oxford/Prince of Wales (3)
4:30 PM – 4:45 PM	<i>Break (beverages only): Delta-X Research</i>				Regency Foyer (3)
4:45 PM – 6:00 PM	Guide for App of Tertiary & Stabilizing Windings C57.158	PCS	E. Bentancourt	I	Balmoral (3)
4:45 PM – 6:00 PM	WG Guide for Mitigating Corrosion on Sub Trfs C57.12.53	STNP	W. Elliott	I	Regency A (3)
4:45 PM – 6:00 PM	WG Guide for DGA in LTCs C57.139	IF	R. Frotscher	I	Regency B (3)
4:45 PM – 6:00 PM	WG Guide for Paralleling Transformers C57.153	Power	M. Tostrud	I	Regency C/D (3)
4:45 PM – 6:00 PM	WG Dry Type Test Code C57.12.91	Dry Type	D. Walker	I	Regency E/F (3)
4:45 PM – 6:00 PM	WG Neutral Grounding Devices C57.32	PCS	S. Kennedy	I	Oxford/Prince of Wales (3)
6:20 PM – 8:30 PM	Technical Tour: Harbor Air E-Plane Advance registration required—space is limited to 25. Admission confirmed with badge at bus. Depart on bus at 6:20 PM, 7:00 PM arrival at Harbour Air ePlane hangar. Depart at 8:00 PM, 8:30 PM arrival at hotel. Box dinner will be provided while boarding bus. See website/flyer for more information	Tech Tour			

IEEE PES TRANSFORMERS COMMITTEE
SPRING 2024 MEETING: MARCH 10 TO MARCH 14
Hyatt Regency Vancouver; Vancouver, British Columbia, Canada

1/25/2024

WEDNESDAY, MARCH 13 Breaks Sponsored by Cargill*

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)				Plaza Ballroom (2)	
7:00 AM – 8:00 AM	SC Meetings Planning - Arrive early and grab breakfast from buffet - All interested individuals welcome	Mtgs	T. Behrens	–	Oxford/Prince of Wales (3)	
7:00 AM – 8:00 AM	IEC TC-14 Technical Advisory Group - Breakfast Meeting - arrive early and grab breakfast from Plaza Ballroom - All interested individuals welcome		T. Prevost	–	Georgia A/B (2)	
8:00 AM – 9:30 AM	Breakfast - Spouses/Companions (no meeting attendees please)				Seymour (34)	
8:00 AM – 9:15 AM	SC Instrument Transformers	Instr TR	T. Sizemore	–	Regency E/F (3)	
8:00 AM – 9:15 AM	SC Insulation Life	Ins Life	S. Sharpless	–	Regency C/D (3)	
9:15 AM – 9:30 AM	Break (beverages only): Cargill				Regency Foyer (3)	
9:30 AM – 10:45 AM	SC Distribution Transformers	Distr	J. Murphy	–	Regency C/D (3)	
9:30 AM – 10:45 AM	SC Bushings	Bush	E. Weatherbee	–	Regency E/F (3)	
10:45 AM – 11:00 AM	Break (beverages only): Cargill				Regency Foyer (3)	
11:00 AM – 12:15 PM	SC Submersible Transf. & Network Protectors	STNP	G. Payerle	–	Regency E/F (3)	
11:00 AM – 12:15 PM	SC Dielectric Test	DiTests	P. Patel	–	Regency C/D (3)	
12:15 PM – 1:30 PM	Lunch Break					
12:15 PM – 1:30 PM	Women in Power Luncheon				Regency A (3)	
1:30 PM – 2:45 PM	SC Dry Type Transformers	Dry Type	C. Ballard	–	Regency E/F (3)	
1:30 PM – 2:45 PM	SC Power Transformers	Power	R. Musgrove	–	Regency C/D (3)	
3:45 PM – 4:00 PM	Break (beverages and treats): Cargill				Regency Foyer (3)	
3:00 PM – 4:15 PM	SC Insulating Fluids	IF	S. Mabrey	–	Regency E/F (3)	
3:00 PM – 4:15 PM	SC Performance Characteristics	PCS	R. Verdolin	-	Regency C/D (3)	
4:15 PM – 4:30 PM	Break (beverages only): Cargill				Regency Foyer (3)	
4:30 PM – 5:45 PM	SC Standards	Stds	D. Sauer	–	Regency E/F (3)	
6:00 PM – 10:00 PM	Dinner Social - Grouse Mountain Chalet - Advance on-line registration required; admission confirmed with name badge at bus loading - Arrive at the bottom of the mountain by shuttle bus and experience a short gondola ride up to the chalet; buses will run between the mountain base and hotel throughout the evening - Admire panoramic views of Vancouver's city lights and snow-capped mountains - Enjoy hors d'oeuvres, buffet dinner, cash bars, a Celtic musical trio, roving comedic Mountie duo, high-definition Theatre in the Sky, and gift shop - See flyer for details	Social				

THURSDAY, MARCH 14

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)				Plaza Ballroom (2)	
8:00 AM – 9:30 AM	Breakfast - Spouses/Companions (no meeting attendees please)				Seymour (34)	
8:00 AM – 9:15 AM	Technical Presentation 1 Tutorial on Revision of IEEE C57.163 GIC Guide & Recommended GIC Specification Requirements by Dan Blaydon and Ramsis Girgis - See flyer on website for details **	Tutorial			Regency C/D (3)	
9:15 AM – 9:30 AM	Break (beverages only)					
9:30 AM – 10:45 AM	Technical Presentation 2 Tutorial on Dry-type pole-mounted transformer. An innovative solution to increase safety in overhead distribution networks by Andre Moreno, Tim-Felix Mai – Siemens Energy & Cassandra Wadsten – Consumers Energy - See flyer on website for details **	Tutorial			Regency C/D (3)	
10:45 AM – 11:00 AM	Break (beverages only)					
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 C/D (3)	
12:00 PM	Lunch (on your own)					
12:15 PM – 5:00 PM	Technical Tour: Powertech Labs Advance registration required. Space is limited to 40 attendees! Admission confirmed with badge at bus. Depart promptly at 12:15 PM. Return at ~5:00 PM. Catered lunch provided on-site at Powertech. 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	N	Oxford/Prince of Wales (3)	
4:15 PM – 7:30 PM	Technical Tour: General Fusion Advance registration required. Space is limited to 35 attendees! Admission confirmed with badge at bus. Depart on bus at 4:15 PM for a 5:00 PM arrival at General Fusion. Return at ~7:30 PM. NO meal provided; however, water and snacks will be available on the bus. See website/flyer for more information.	Tech Tour				

* 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.

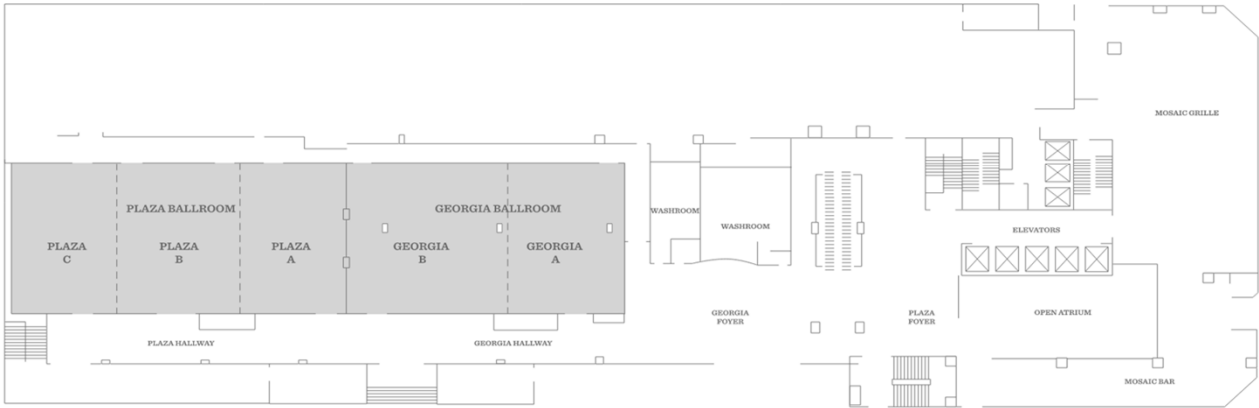
FRIDAY, MARCH 15

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

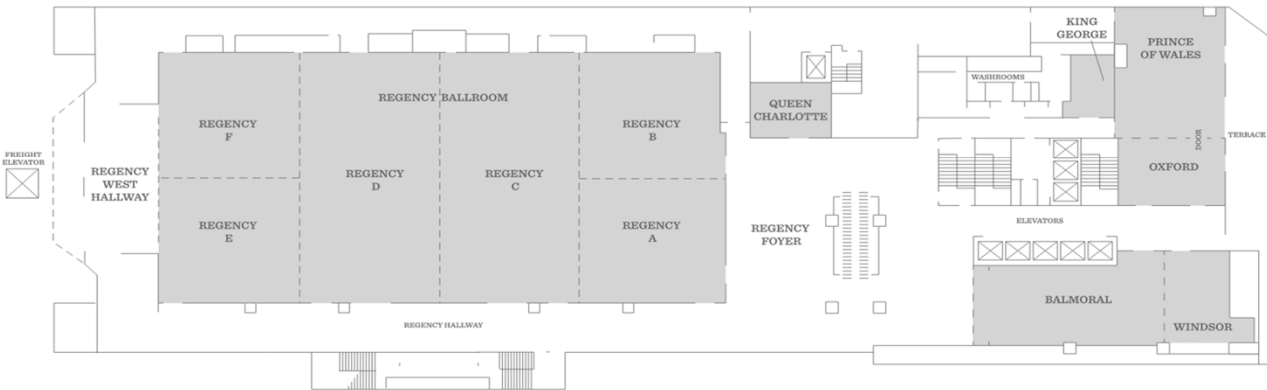
TIME	ACTIVITY	TRACK	MTG CHAIR	STATUS	ROOM (FLOOR)
8:00 AM – 4:00 PM	WG PC57.15 Std Req Terms & Test Code for V Step Regs	Distr	D. Sauer	N	Oxford/Prince of Wales (3)

FUTURE COMMITTEE MEETINGS
Fall 2024: St. Louis, Missouri, October 27 – 31, 2024
Spring 2025: Denver, Colorado USA, March 23 – 27, 2025
Fall 2025: TBD USA, October , 2025
Spring 2026: TBD USA, March , 2026

Plaza Level (Second Floor)



Convention Level (Third Floor)



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SUBCOMMITTEE MEETING LIST

SPRING 2024 MEETING: MARCH 10 TO MARCH 14

Hyatt Regency Vancouver; Vancouver, British Columbia, Canada

Date	Time Start	Time End	Session Title	Track	Chair	Room/Location
3/10/2024	2:00 PM	5:00 PM	Administrative Subcommittee - Closed meeting, by invitation only	Admin	D. Wallach	Oxford/Prince of Wales (3)
3/11/2024	3:15 PM	4:30 PM	WG Bushing Application Guide C57.19.100	Bush	T. Spitzer	Regency E/F (3)
3/12/2024	9:30 AM	10:45 AM	TF Std Require for Bushings C57.19.01	Bush	S. Zhang	Regency A (3)
3/12/2024	1:45 PM	3:00 PM	TF Std Require Bushings above 5kA in Bus Encl. C57.19.04	Bush	S. Digby	Balmoral (3)
3/13/2024	9:30 AM	10:45 AM	SC Bushings	Bush	E. Weatherbee	Regency E/F (3)
3/11/2024	9:30 AM	10:45 AM	TF Transf Efficiency & Loss Evaluation (DOE Activity)	Distr	P. Hopkinson	Regency C/D (3)
3/11/2024	1:45 PM	3:00 PM	WG 1-ph Padmount Dist Transf. C57.12.38	Distr	A. Ghafourian	Oxford/Prince of Wales (3)
3/11/2024	3:15 PM	4:30 PM	WG 3-ph Padmount Dist Transf. C57.12.34	Distr	S. Shull	Oxford/Prince of Wales (3)
3/12/2024	8:00 AM	9:15 AM	WG Encl Int C57.12.28, C57.12.29, C57.12.31, C57.12.32	Distr	D. Mulkey	Oxford/Prince of Wales (3)
3/12/2024	9:30 AM	10:45 AM	WG Distr Substation Transf PC57.12.36	Distr	J. Murphy	Oxford/Prince of Wales (3)
3/12/2024	11:00 AM	12:15 PM	WG Electronic Test Data PC57.12.37	Distr	A. Traut	Georgia A/B (2)
3/12/2024	1:45 PM	3:00 PM	WG Bar Coding for Distr Transf. C57.12.35	Distr	R. Chrysler	Oxford/Prince of Wales (3)
3/12/2024	3:15 PM	4:30 PM	WG Req for Dist Trf Tank Pressure Coordination C57.12.39	Distr	C. Gayton	Oxford/Prince of Wales (3)
3/13/2024	9:30 AM	10:45 AM	SC Distribution Transformers	Distr	J. Murphy	Regency C/D (3)
3/14/2024	1:00 PM	5:00 PM	WG PC57.15 Std Req Terms & Test Code for V Step Regs	Distr	D. Sauer	Oxford/Prince of Wales (3)
3/15/2024	8:00 AM	4:00 PM	WG PC57.15 Std Req Terms & Test Code for V Step Regs	Distr	D. Sauer	Oxford/Prince of Wales (3)
3/11/2024	9:30 AM	10:45 AM	TF PD Testing of DTR, Wind & Solar Transf	DiTests	A. Larison	Regency E/F (3)
3/11/2024	11:00 AM	12:15 PM	TF Core Ground & Winding Insul. Resistance - Perf & Int.	DiTests	D. Robalino	Georgia A/B (2)
3/11/2024	1:45 PM	3:00 PM	TF DFR Test Guide C57.161	DiTests	E. Ermakov	Regency E/F (3)
3/11/2024	3:15 PM	4:30 PM	WG Transformer Impulse Test Guide PC57.98	DiTests	T. Hochanh	Balmoral (3)
3/12/2024	8:00 AM	9:15 AM	TF on Revision of Impulse Tests C57.12.00 & C57.12.90	DiTests	S. Plante	Regency E/F (3)
3/12/2024	9:30 AM	10:45 AM	TF Detection of Acoustic Emissions from PD C57.127	DiTests	D. Gross	Balmoral (3)
3/12/2024	1:45 PM	3:00 PM	TF Cont. Revision to Low Frequency Tests C57.12.90	DiTests	A. Varghese	Regency A (3)
3/12/2024	3:15 PM	4:30 PM	WG Recommend Practice Routine Impulse Tests C57.138	DiTests	H. Sahin	Balmoral (3)
3/13/2024	11:00 AM	12:15 PM	SC Dielectric Test	DiTests	P. Patel	Regency C/D (3)
3/11/2024	11:00 AM	12:15 PM	TF PAR Study Group Guide for TVA Dry-Type Coil C57.12.58	Dry Type	K. Klein	Regency E/F (3)
3/11/2024	1:45 PM	3:00 PM	WG Dry Type Gen. Requirements C57.12.01	Dry Type	C. Ballard	Regency A (3)
3/11/2024	3:15 PM	4:30 PM	TF Test for Eval of Insulation for Dry-Type Transfs IEEE 259	Dry Type	D. Stankes	Regency A (3)
3/11/2024	4:45 PM	6:00 PM	TF PAR Study Group Unit Substation Transf C57.12.55	Dry Type	S. Nunn	Regency A (3)
3/12/2024	8:00 AM	9:15 AM	WG Practice for Install & Operation of Dry Type PC57.94	Dry Type	K. Klein	Regency A (3)
3/12/2024	11:00 AM	12:15 PM	WG Guide for Loading Dry Type Transformers C57.96	Dry Type	A. Narawane	Oxford/Prince of Wales (3)
3/12/2024	4:45 PM	6:00 PM	WG Dry Type Test Code C57.12.91	Dry Type	D. Walker	Regency E/F (3)
3/13/2024	1:30 PM	2:45 PM	SC Dry Type Transformers	Dry Type	C. Ballard	Regency E/F (3)
3/11/2024	4:45 PM	6:00 PM	SC HVDC Converter Transfs & Smoothing Reactors	HVDC	U. Radbrandt	Regency E/F (3)
3/11/2024	9:30 AM	10:45 AM	WG Guide DGA in Ester-Immersed Transformers PC57.155	IF	A. Sbravati	Oxford/Prince of Wales (3)
3/11/2024	11:00 AM	12:15 PM	WG Guide for DGA in Silicone PC57.146	IF	P. Boman	Regency A (3)
3/12/2024	8:00 AM	9:15 AM	WG Guide DGA Applied to Factory Temp Rise Test C57.130	IF	B. Forsyth	Regency C/D (3)
3/12/2024	11:00 AM	12:15 PM	WG Guide for the Reclamation of Mineral Oil C57.637	IF	S. Mabrey	Regency E/F (3)
3/12/2024	1:45 PM	3:00 PM	TF PAR Study Group DGA in Mineral Oil Transf C57.104	IF	E. teNyenhuis	Regency C/D (3)
3/12/2024	3:15 PM	4:30 PM	TF Test Method for Max Cont Temp of Ins Liquids	IF	A. Gamil	Regency A (3)
3/12/2024	4:45 PM	6:00 PM	WG Guide for DGA in LTCs C57.139	IF	R. Frotscher	Regency B (3)
3/13/2024	3:00 PM	4:15 PM	SC Insulating Fluids	IF	S. Mabrey	Regency E/F (3)
3/11/2024	9:30 AM	10:45 AM	TF PAR Study Group Temp Rise Test beyond NP C57.119	Ins Life	E. Schweiger	Regency A (3)
3/11/2024	11:00 AM	12:15 PM	WG App of High-Temp Insulation Mats IEEE 1276 Annex B	Ins Life	K. Biggie	Regency C/D (3)
3/11/2024	1:45 PM	3:00 PM	TF - Test Degredation of Cellulose in Liquid Type Transfs	Ins Life	L. Lewand	Balmoral (3)
3/12/2024	3:15 PM	4:30 PM	TF Continuous Rev Clause 11 Temp Rise Tests C57.12.90	Ins Life	D. Sankarakurup	Regency C/D (3)
3/13/2024	8:00 AM	9:15 AM	SC Insulation Life	Ins Life	S. Sharpless	Regency C/D (3)
3/12/2024	8:00 AM	9:15 AM	WG Power-Line Carrier Coupling Cap & Volt Transf. C57.13.9	Instr TR	Z. Roman	Regency B (3)
3/12/2024	9:30 AM	10:45 AM	TF Instrument Transf. Accuracy	Instr TR	I. Ziger	Regency B (3)
3/12/2024	11:00 AM	12:15 PM	WG Requirements for Instrument Transformers PC57.13	Instr TR	D. Wallace	Regency C/D (3)
3/12/2024	1:45 PM	3:00 PM	TF to Merge C57.13.5 into C57.13	Instr TR	T. Sizemore	Regency E/F (3)
3/13/2024	8:00 AM	9:15 AM	SC Instrument Transformers	Instr TR	T. Sizemore	Regency E/F (3)
3/13/2024	7:00 AM	8:00 AM	SC Meetings Planning - Arrive early and grab breakfast from buffet - All interested individuals welcome	Mtgs	T. Behrens	Oxford/Prince of Wales (3)

SUBCOMMITTEE MEETING LIST

SPRING 2024 MEETING: MARCH 10 TO MARCH 14

Hyatt Regency Vancouver; Vancouver, British Columbia, Canada

Date	Time Start	Time End	Session Title	Track	Chair	Room/Location
3/11/2024	11:00 AM	12:15 PM	TF CO2 Emissions in the Construction of Transformers	PCS	J. Kazmierczak	Balmoral (3)
3/11/2024	1:45 PM	3:00 PM	TF Audible Sound Revision to Test Code	PCS	R. Girgis	Regency C/D (3)
3/11/2024	3:15 PM	4:30 PM	TF PCS Cont. Revisions to C57.12.00	PCS	T. Ansari	Regency C/D (3)
3/11/2024	4:45 PM	6:00 PM	TF Inverter Transf Precautions on Ground Shields C57.159	PCS	H. Shertukde	Regency C/D (3)
3/12/2024	9:30 AM	10:45 AM	TF PCS Cont. Rev. to Test Code C57.12.90	PCS	H. Sahin	Regency E/F (3)
3/12/2024	11:00 AM	12:15 PM	WG Sw Transients Ind by TR/Bkr Interaction PC57.142	PCS	J. McBride	Balmoral (3)
3/12/2024	4:45 PM	6:00 PM	Guide for App of Tertiary & Stabilizing Windings C57.158	PCS	E. Bentancourt	Balmoral (3)
3/12/2024	4:45 PM	6:00 PM	WG Neutral Grounding Devices C57.32	PCS	S. Kennedy	Oxford/Prince of Wales (3)
3/11/2024	9:30 AM	10:45 AM	WG Guide for Tank Rupture Mitigation C57.156	Power	P. Zhao	Regency B (3)
3/11/2024	11:00 AM	12:15 PM	WG Class 1E Transf.for Nuclear Power Gen Std. 638	Power	C. Swinderman	Regency B (3)
3/11/2024	1:45 PM	3:00 PM	WG Guide for Phase Shifting Transf C57.135	Power	E. Schweiger	Regency B (3)
3/11/2024	3:15 PM	4:30 PM	TF Guide Eval & Recon of Liquid Immerse Transf C57.12.140	Power	S. Som	Georgia A/B (2)
3/11/2024	3:15 PM	4:30 PM	TF Std Reqs for Liquid-imerse Power Trans C57.12.10	Power	S. Digby	Regency B (3)
3/11/2024	4:45 PM	6:00 PM	WG Failure Investigation & Reporting PC57.125	Power	H. Sahin	Regency B (3)
3/12/2024	8:00 AM	9:15 AM	WG Guide for Life Tests of Switch Contacts C57.157	Power	A. Sewell	Balmoral (3)
3/12/2024	9:30 AM	10:45 AM	WG Condition Assessment Guide PC57.170	Power	K. Mani	Regency C/D (3)
3/12/2024	11:00 AM	12:15 PM	WG Standard Requirements for Arc Furnace Transf. C57.17	Power	D. Corsi	Regency B (3)
3/12/2024	1:45 PM	3:00 PM	TF Liquid Immersed Phase- Shifting Transf 60076-57-1202	Power	E. Schweiger	Regency B (3)
3/12/2024	3:15 PM	4:30 PM	TF Guide for Install & Maintenance of Power Trf C57.93	Power	S. Reed	Regency B (3)
3/12/2024	4:45 PM	6:00 PM	WG Guide for Paralleling Transformers C57.153	Power	M. Tostrud	Regency C/D (3)
3/13/2024	1:30 PM	2:45 PM	SC Power Transformers	Power	R. Musgrove	Regency C/D (3)
3/11/2024	9:30 AM	10:45 AM	TF IEEE-IEC Cross Reference	Stds	A. Washburn	Balmoral (3)
3/11/2024	4:45 PM	6:00 PM	WG Guide for Field Testing PC57.152	Stds	M. Ferreira	Oxford/Prince of Wales (3)
3/12/2024	3:15 PM	4:30 PM	TF Reverse Power Flow Effects on Trans	Stds	R. Hogg	Regency E/F (3)
3/13/2024	4:30 PM	5:45 PM	SC Standards	Stds	D. Sauer	Regency E/F (3)
3/11/2024	11:00 AM	12:15 PM	WG 1ph Submersible Transformers PC57.12.23	STNP	A. Traut	Oxford/Prince of Wales (3)
3/11/2024	4:45 PM	6:00 PM	WG Sec. Network Protectors C57.12.44	STNP	M. Faulkner	Balmoral (3)
3/12/2024	11:00 AM	12:15 PM	WG Liquid-immersed Sec. Network TRs C57.12.40	STNP	J. Vartanian	Regency A (3)
3/12/2024	4:45 PM	6:00 PM	WG Guide for Mitigating Corrosion on Sub Trfs C57.12.53	STNP	W. Elliott	Regency A (3)
3/13/2024	11:00 AM	12:15 PM	SC Submersible Transf. & Network Protectors	STNP	G. Payerle	Regency E/F (3)

APPENDIX 2

Semi-Annual Standards Report

Standards Report

**March 11, 2024 – Spring Meeting
Vancouver, BC
Stephen Shull**

PES Transformers Committee

[HOME](#)[Scope](#)[Leaders](#)[Subcommittees ▾](#)[Meetings ▾](#)[Information ▾](#)

HOME

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.



PES Transformers Committee



HOME Scope Leaders Subcommittees Meetings Information

HOME

WELCOME TO THE TRANSFORMERS COMMITTEE WE

The Transformers Committee is one of the largest and Committee is comprised of technical and managerial components. The continuing scope of the Committee is and maintenance of transformers, reactors and associa

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.

Requests to tc-webmaster@ieee.org.

Meetings

Meeting Calendar

2024 Spring-Vancouver

Latest Mtg Minutes

Break Sponsors

Path to Standards
Report

Latest Mtg Minutes

LATEST COMMITTEE MINUTES – SPRING 2024 VANCOUVER, BC, CANADA MEETING

[Minutes of previous meetings](#)

NOTE: Meeting minutes are considered unapproved until they are approved by the committee.

Executive Reports:

Main Minutes, Attendance .

Chair's Report .

Vice Chair's Report .

Secretary's Report .

Standards Status [Report](#) 23Feb2024

IEEE Standards Association Report .

Treasurer's Report .

Recognition and Awards: Report / Presentation: PDF .



Current Standards
Report

The next date for submission to NesCom ends on

March 26 2024.

There are 22 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

60076-57-1202	IEC/IEEE International Standard Power transformers --Part 57-1202: Liquid immersed phase-shifting transformers	31 Dec 2026
C57.12.10	IEEE Standard Requirements for Liquid-Immersed Power Transformers	31 Dec 2027
C57.12.58	IEEE Guide for Conducting a Transient Voltage Analysis of a Dry-Type Transformer Coil	31 Dec 2027
C57.120	IEEE Guide for Loss Evaluation of Distribution and Power Transformers and Reactors	31 Dec 2027
C57.140	IEEE Guide for Evaluation and Reconditioning of Liquid Immersed Power Transformers	31 Dec 2027
C57.19.01	IEEE Standard for Performance Characteristics and Dimensions for Power Transformer and Reactor Bushings	31 Dec 2027

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

Some Comments from the Standards Coordinator

- Comment resolution of a document should normally be completed within a 6 month time period.

Some Comments from the Standards Coordinator

- Comment resolution of a document should normally be completed within a 6 month time period.
- When the Working Group moves the document to Ballot, the Comment Resolution Group (CRG) should be formed in the same meeting. This would be accomplished by a motion with the volunteer members listed. In that same motion, the CRG should be *“given the authority to resolve editorial issues and comments where consensus is reached by the CRG. If any of the comments cannot be resolved to a consensus point, they will be brought back to the Working Group for resolution.”*

Task Force (Subgroup)

5.0 Subgroups of the Working Group

*The Working Group may, from time to time, form subgroups for the conduct of its business. Voting Membership in the subgroup is granted to any participant of the Working Group. Such formation shall be explicitly noted in the meeting minutes. At the time of formation, **the Working Group shall determine the scope and duties delegated to the subgroup**, and may decide to allow participation of persons who are not Working Group members and specify the terms and conditions under which they participate in the subgroup. Any changes to its scope and duties will require the approval of the Working Group. Any resolution of a subgroup shall be subject to confirmation by the Working Group.*

The Chair of the Working Group shall appoint, and may dismiss, the Chair of the subgroup.

Formation of a Task Force (Subgroup)

7.1.1 Actions Requiring Approval by a Majority Vote

The following actions require approval by a majority vote:

- a) ***Formation or modification of a subgroup including its procedures, scope, and duties***
- b) *Disbandment of subgroups*
- c) *Approval of minutes*
- d) *Approval of subgroup results and/or recommendations.*

5.0 Subgroups Created by the Sponsor

*The formation and disbandment of subgroups (e.g., Responsible Subcommittees, Executive committees (ExCom), Administrative committees (AdCom), ad hocs, **PAR study groups**, **Working Groups**, and other subgroups, such as writing groups) **requires approval by a majority vote of the Sponsor** as described in clause 7.1. Sponsor subgroups, other than Working Groups and their subgroups, operate under these Sponsor P&P.*

The Sponsor is either the Transformer Committee or a Subcommittee that has been delegated this authority.

7.1.1 Actions Requiring Approval by a Majority Vote

The following actions require approval by a majority vote:

- a) **Formation or modification of a subgroup, including its procedures, scope, and duties***
- b) Disbandment of subgroups*
- c) Approval of minutes*
- d) Delegation to a subgroup for Authorization for submittal of a PAR, modification of a PAR, withdrawal of a PAR, or Sponsor balloting*
- e) **Approval to co-sponsor a project (PAR).***

5.5.2 Criteria for Consideration of a PAR by the Sponsor

The Sponsor should consider, and the PAR Study Group or Working group should therefore address, the following issues when evaluating a project proposal:

- a) Potential market acceptance of the standards project, including technical feasibility*
- b) Relationship to related standards, if known, including its distinct identity from other projects*
- c) Viable volunteer leadership and participation*
- d) Realistic scope and objectives*

PAR Study Group Report

5.5.4 Submission of a PAR to the Sponsor:

The PAR Study Group or Working Group shall report its recommendations on the formation of the project to the Sponsor. The deliverable from the PAR Study Group or Working Group to the Sponsor should be a report addressing the criteria for consideration and, if appropriate, a draft PAR. The report should include a roster of participants and minutes.

The PAR study group's task is to investigate the topic and determine one of the following:

1. Determine that the topic has no merit and should not be pursued;
2. Determine if the subject could or should be a part of an existing Guide, Recommend Practice or Standard and thus be referred to that Working Group; or
3. Develop the Title, Scope of the PAR.

(Side Note: A Purpose can be provided but is not required.)

External Proposal Management (EPM) Committee Report

Proposal ID Number	Project Type	Title of Proposal/Project	Proposal Description	Status / TCR
P0060r1	ENTITY	Recommended Practice on Digital Twin Modeling and Analysis based on Spatial-temporal Data of Switch Cabinet and Transformer with 110kV and Below	This recommended practice applies to digital twin modeling and analysis based on spatial-temporal data of switch cabinet and transformer in substations (110kV or lower). It covers deployment, management, architecture, data processing, and application services about switch cabinet and transformer in DT system, with a focus on 1) the spatial-temporal data structure, 2) the unified characterization of virtual entities, 3) the extraction of high-dimensional/deep features, and 4) the construction of DT-SA index systems.	ACCEPTED BY POWER XFMR SUBCOMMITTEE TCR: Brian Sparling
P0103	ENTITY	Guide for vibration test of Direct-Current(DC) converter transformer	This guide specifies the principle, safety precautions, requirements of test instrument, test method, test procedures, and data analysis of vibration test in the type test, factory test, or on-site test of DC converter transformer. This guide is applicable to vibration test, data analysis and evaluation of DC converter transformers for high-voltage direct-current transmission systems with voltage levels up to 500kV and above.	ACCEPTED BY HVDC SUBCOMMITTEE TCR: Ulf Radbrandt
P0106	ENTITY	Guide for General Technical Requirements and Test Methods for Converter Valve Anode Saturation Reactor in High Voltage Direct Current(HVDC, ± 500 kV) Transmission System	This guide provides technical requirements and test methods for converter valve anode saturation reactor in HVDC transmission system, and specifies the use conditions, rating values, allowable deviation, insulation level, test, nameplate, packaging, storage, transportation and installation of anode saturation reactor. This guide is applicable to converter valve anode saturation reactor in HVDC transmission system with voltage level of ± 500 kV. Reactors with other voltage levels could be implemented with reference to this guide.	ACCEPTED BY HVDC SUBCOMMITTEE TCR: Ulf Radbrandt

External Proposal Management (EPM) Committee Report

Proposal ID Number	Project Type	Title of Proposal/Project	Proposal Description	Status / TCR
P0120	ENTITY	Guide for Power Transformers for Low-frequency (20Hz) Power Transmission	This guide provides technical guidance for the design and application of power transformers for low-frequency (20Hz) power transmission. It includes general requirements, design concepts, electrical, physical and mechanical characteristics, as well as test items and methods of low-frequency power transformers.	ACCEPTED BY POWER XFMR SUBCOMMITTEE TCR: Ryan Musgrove
P0137	ENTITY	Guide for composite current switching test of vacuum-type on load tap changer for converter transformer	This guide describes the test principle, general requirements, test samples, test circuits and test instruments, test process, test result evaluation and test report of the composite current switching test of vacuum on load tap changer for converter transformer. This guide is applicable to vacuum on load tap changer for High Voltage Direct Current(HVDC) transmission or back-to-back HVDC converter transformer with voltage level of $\pm 800\text{kV}$ and below.	ACCEPTED BY HVDC SUBCOMMITTEE TCR: Ulf Radbrandt
P0148	ENTITY	Guide for arc test of liquid-Immersed High-Voltage Direct-Current (HVDC) converter transformers	This guide specifies the principle of testing, test site, test specimen, test instrumentation, testing methods and procedures of internal arc test. The applicable tests are outlined for type testing or special testing of a tank, and an oil chamber of on-load tap-changer(OLTC) for liquid-immersed HVDC converter transformer with voltage levels up to $\pm 160\text{kV}$ and above. Test results are outlined to determine pass or failure of the test specimen.	ACCEPTED BY HVDC SUBCOMMITTEE TCR: Ulf Radbrandt

External Proposal Management (EPM) Committee Report

Proposal ID Number	Project Type	Title of Proposal/Project	Proposal Description	Status / TCR
P0163	INDIVIDUAL	Unique IDs and Smart Tags for Supply Chain and Asset Traceability for the Electric Grid	The scope of this standard is 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.	PENDING CONSIDERATION DISTRIBUTION SUBCOMMITTEE AS CO-SPONSOR

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

C57.19.00
Gen. Requirements
Bushings
Peter Zhao

C57.19.01
Perform Characteristics
Outdoor Bushings
Shibao Zhang

C57.19.02
Perform Characteristics
Dist Xfmr Bushings
Stephen Shull

65700-19-03
Requirements & Testing
DC Bushings
Eric Weatherbee

C57.19.04
Perform Characteristics
GSU Bushings
Scott Digby

C57.19.100
Bushing
Application Guide
Thomas Spitzer

Dielectric Tests Chair - Dr. Poorvi Patel

C57.98
Impulse Tests Guide
Thang Hochanh

C57.113
PD Measurement
Ali Naderian

C57.127
Acoustic PD Guide
Detlev Gross

C57.138
Dist Xfmr Impulse Test
Hakan Sahin

C57.160
PD Measurement
Bushings & Instr Xfmr
Thang Hochanh

C57.161
DFR Test Guide
Evgenil Ermakov

C57.168
Low Freq Test Guide
Daniel Sauer

C57.12.200 (Entity)
Freq Domain
Spectroscopy
- Bushings
Jun Deng
TCR: Poori Patel

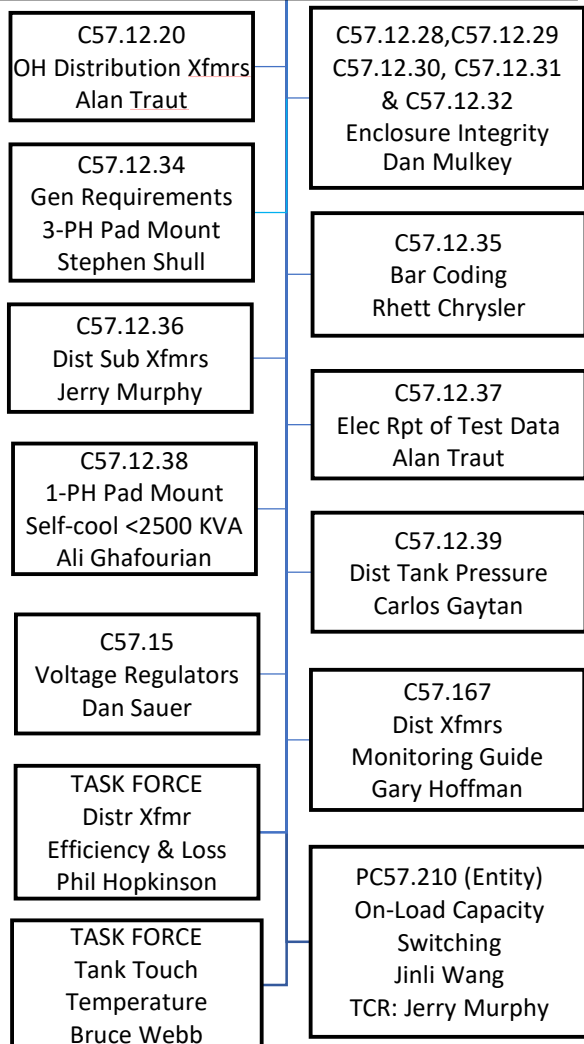
TASK FORCE
Low Freq Tests
Cont Revision C57.12.90
Ajith Varghese

TASK FORCE
Impulse Tests
Cont Revision C57.12.90
Sylvain Plante

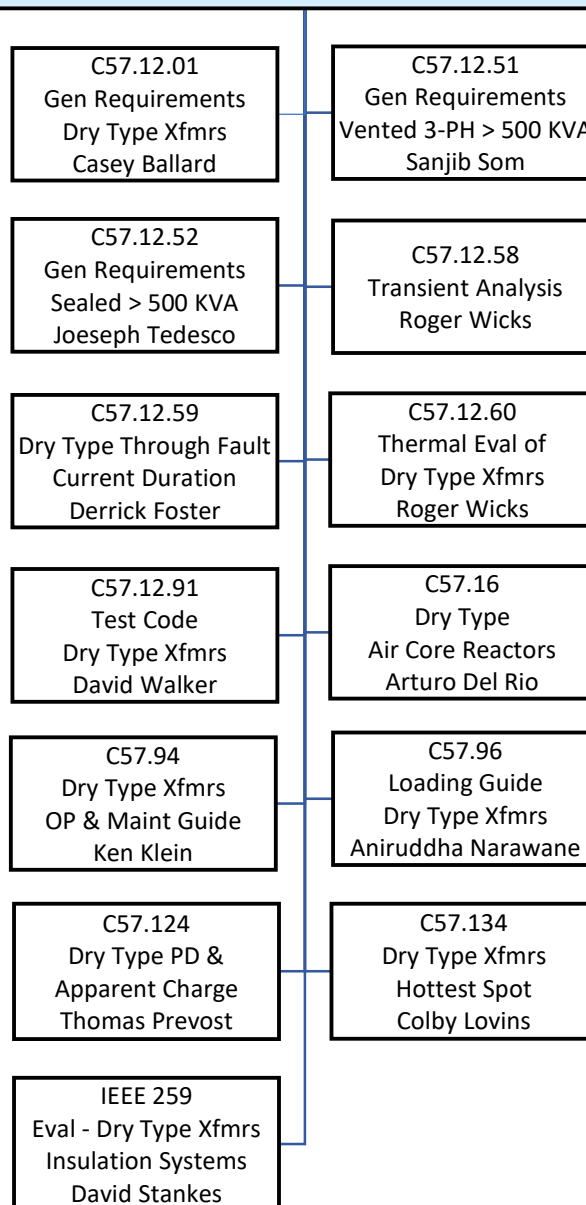
TASK FORCE
Transient Failure Mitigation
(WG PC57.142)
Jim McBride

TASK FORCE
Winding Insulation
Power Factor & Winding
Insulation Resistance
Limits
Diego Robalino

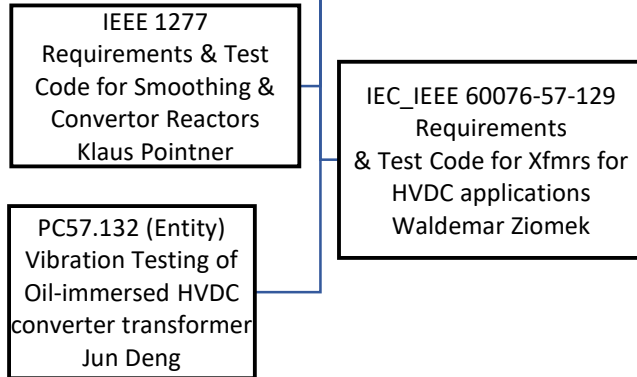
Distribution Transformers Chair - Jerry Murphy



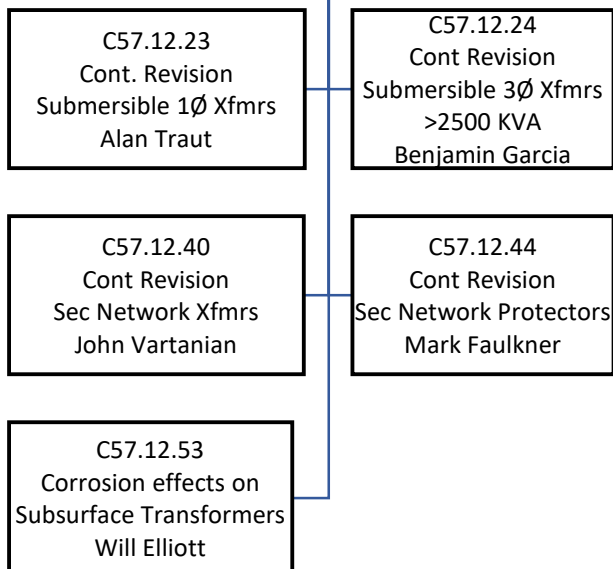
Dry Type Transformers Chair - Casey Ballard



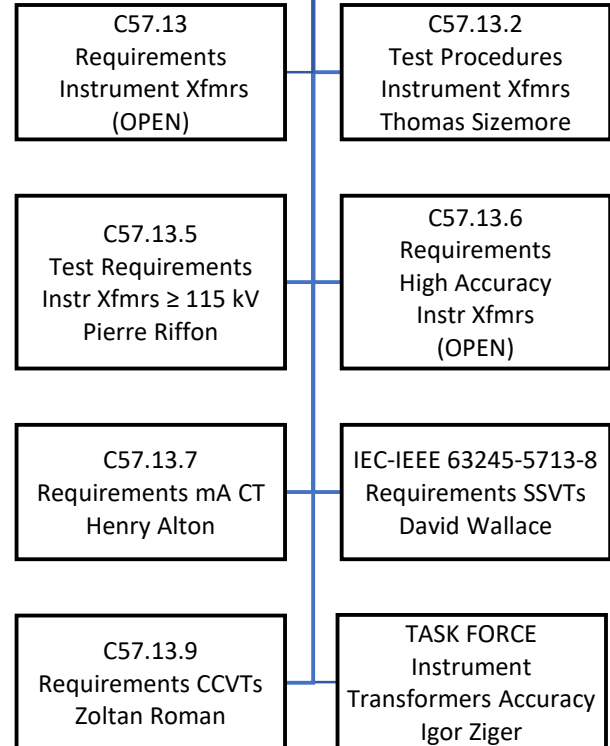
Transformers & Reactors for HVDC Applications Chair - Ulf Radbrandt

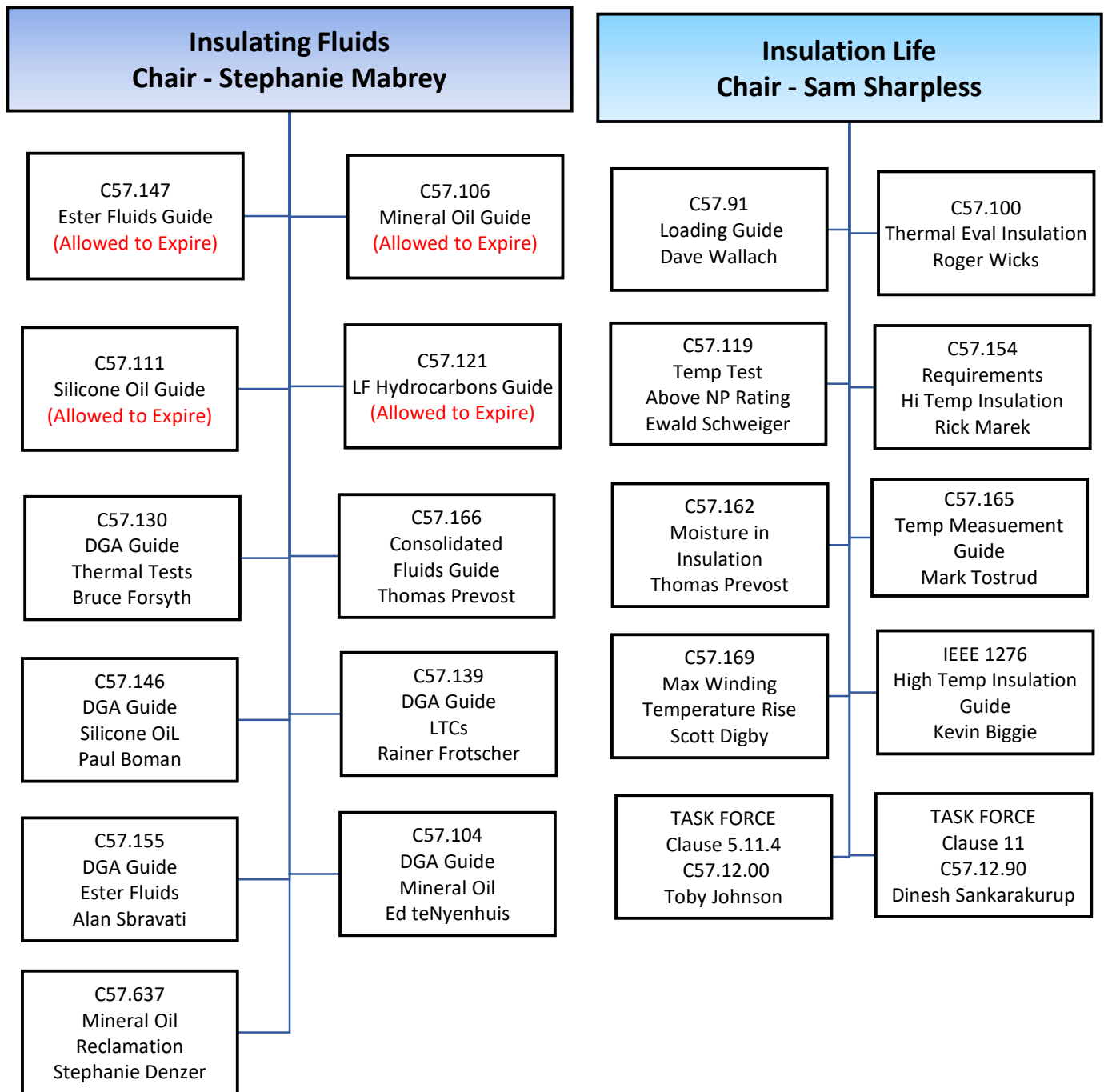


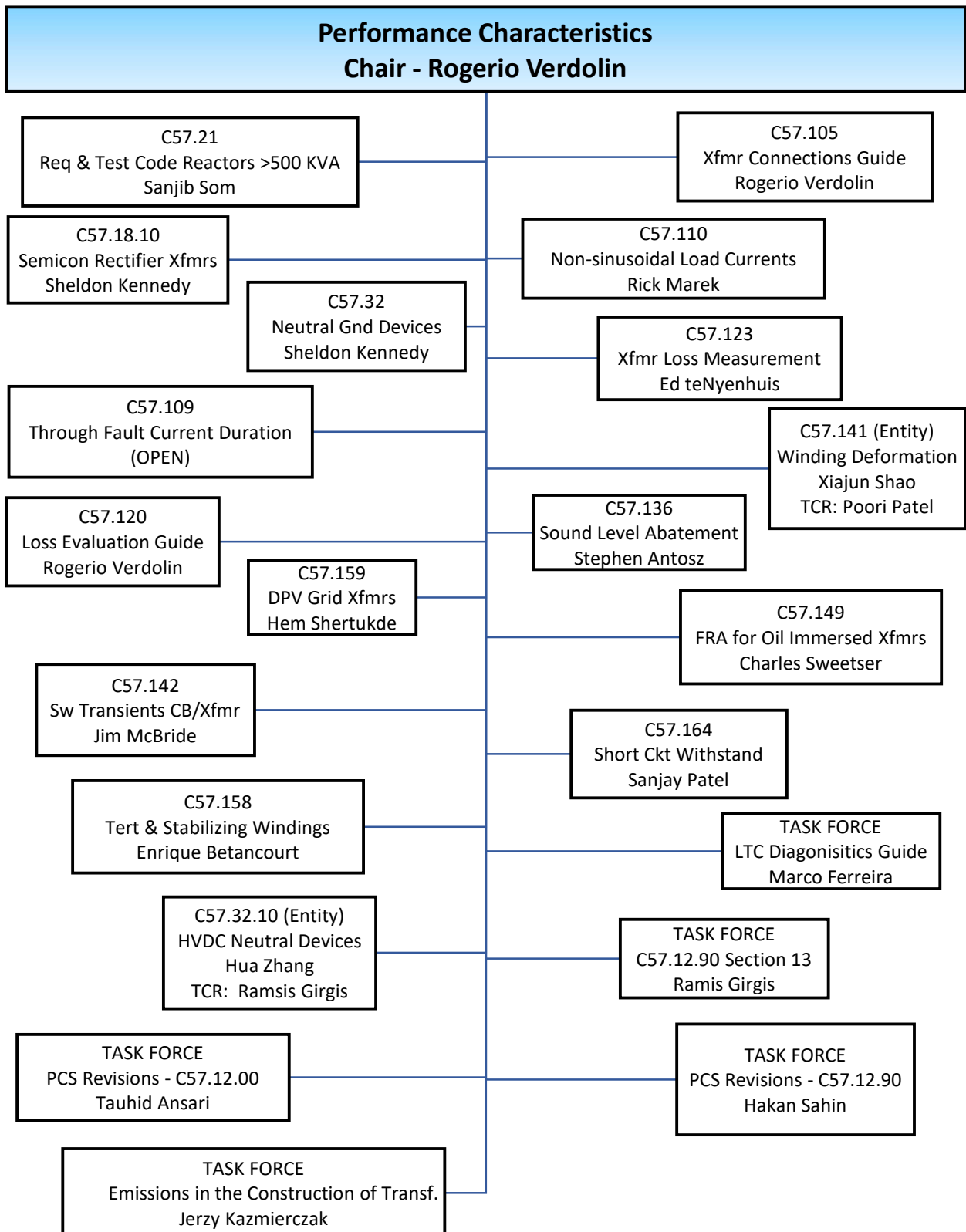
Subsurface Transformers & Network Protectors Chair - George Payerle

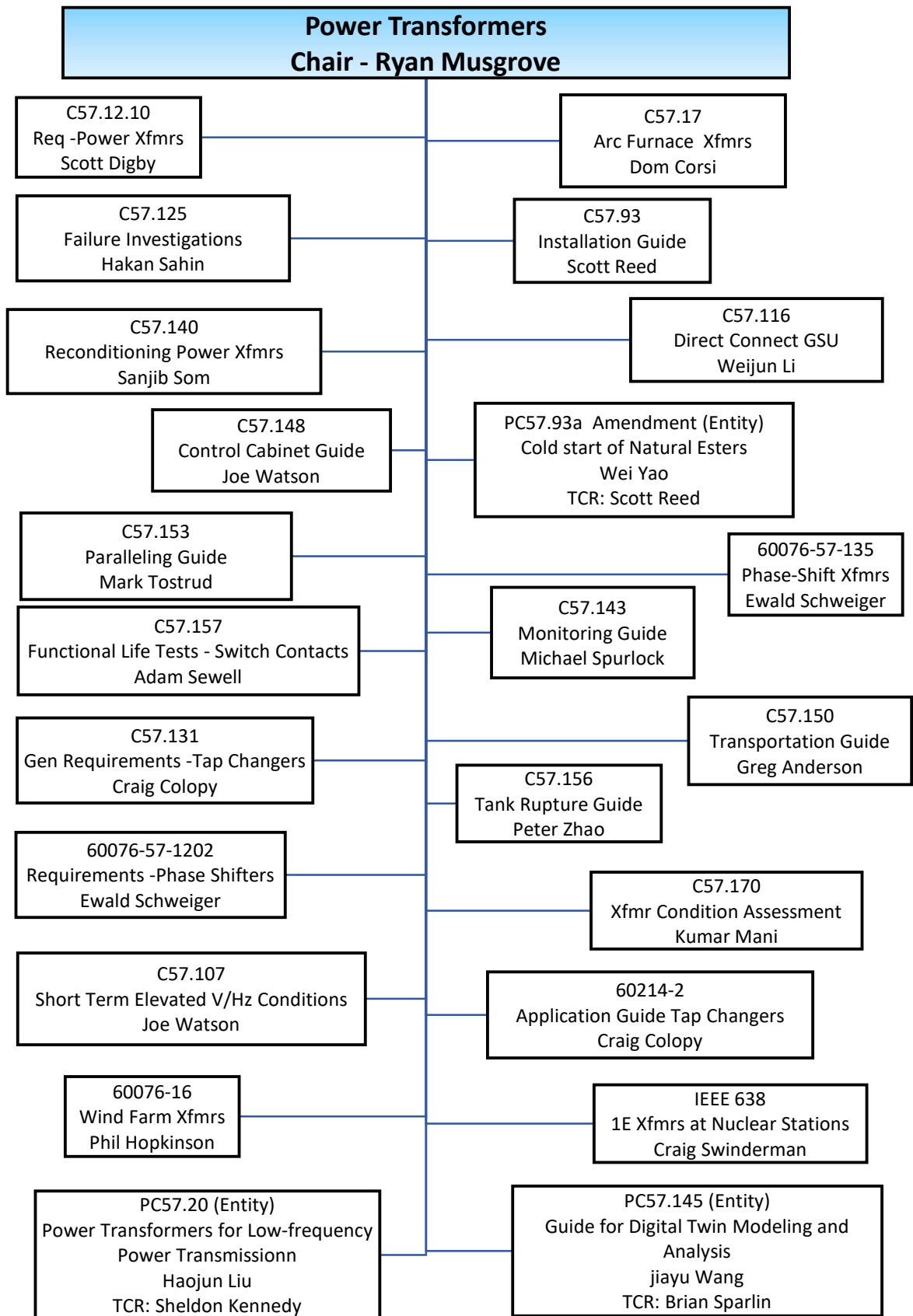


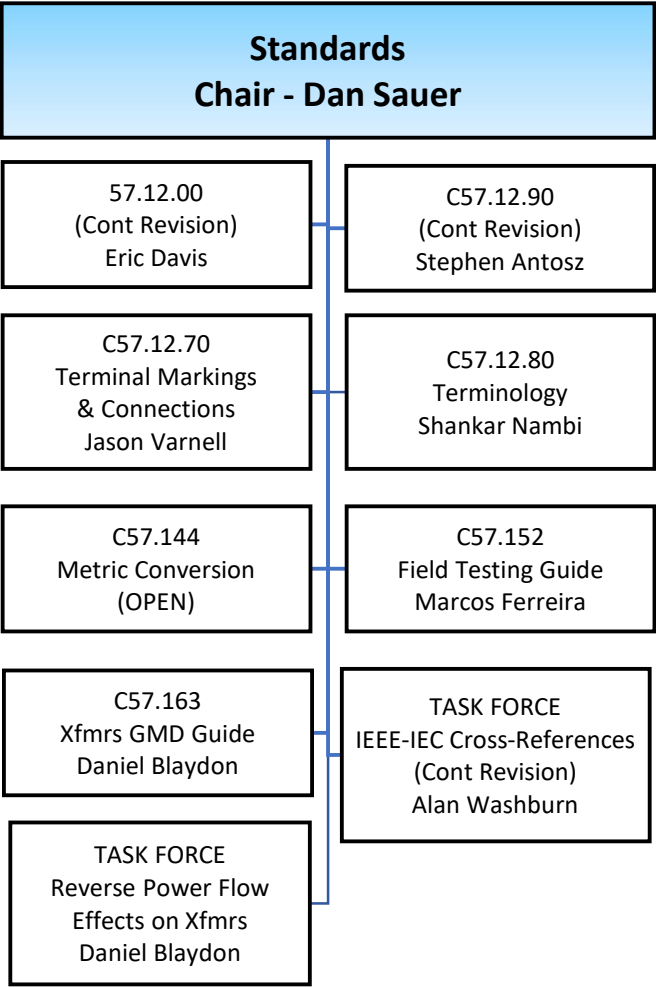
Instrument Transformers Chair - Thomas Sizemore











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: Closed 8/11/2023 with 29 comments to resolve. Currently in Comment Resolution
P65700-19-03		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		2017		ACTIVE
Individual			12/31/2027		
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		2018		ACTIVE
Individual			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		2018		ACTIVE
Individual			12/31/2028		
C57.168	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	
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		
Entity PC57.12.210	Draft Recommended Practice for On-load Capacity Switching Distribution Transformers	Jinli Wang		2/10/2021	Active PAR
		 wangjinli@epri.sgcc.com.cn		12/31/2025	TCR: Jerry Murphy
C57.12.20 Individual	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 12/31/2033		ACTIVE
C57.12.28 Individual	IEEE Standard for Pad Mounted Equipment - Enclosure Integrity		2023 12/31/2033		ACTIVE
C57.12.29 Individual	IEEE Standard for Pad Mounted Equipment - Enclosure Integrity for Coastal Environments		2023 12/31/2033		ACTIVE CO-STD-COM – Switchgear
C57.12.30 Individual	IEEE Standard for Pole-Mounted Equipment - Enclosures for Coastal Environment		2020 12/31/2030		ACTIVE CO-STD-COM – Switchgear
C57.12.31 Individual	IEEE Standard for Pole Mounted Equipment - Enclosure Integrity		2020 12/31/2030		ACTIVE CO-STD-COM – Switchgear
C57.12.32 Individual PC57.12.32	IEEE Standard for Submersible Equipment - Enclosure Integrity	Daniel Mulkey (707) 776 - 7346 dhmulkey@ieee.org	2019 12/31/2029	12/6/2023 12/31/2027	ACTIVE + PAR for Revision
C57.12.34 Individual PC57.12.34	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 (417) 206 - 4047 sdshull@ieee.org	2022 12/31/2032	2/15/2023 12/31/2027	ACTIVE + PAR for Revision

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		
C57.12.35	IEEE Standard Bar Coding for Distribution Transformers and Step-Voltage Regulators	Rhett Chrysler	2013	6/13/2019	ACTIVE + PAR for Revision + 1 PAR Extension
Individual		(731) 288 - 2831	12/31/2023		SA Ballot: Closed on 9/19/23 with 42 comments to resolve. Currently in comment resolution.
PC57.12.35		rhettchrysler@ieee.org		12/31/2025	
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		

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 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 12/31/2024	INACTIVE-RESERVED+ PAR for Revision 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	Joseph Tedesco (276) 688-1675 joseph.l.tedesco@hitachi-pow	2012 12/31/2022	3/5/2020 12/31/2024	INACTIVE-RESERVED + PAR for Revision (Scope Changed and Approved 2/23/2022) SA BALLOT: Recirculation 2 closed 2/25/24
Individual					
PC57.12.52					
C57.12.58	IEEE Guide for Conducting a Transient Voltage Analysis of a Dry-Type Transformer Coil		2017 12/31/2027		ACTIVE
Individual					
C57.12.59	IEEE Guide for Dry-Type Transformer Through-Fault Current Duration	Derek Foster (815) 529 - 1907 drfoster@ieee.org	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					

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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		
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	Colby Lovins colby.lovins@ieee.org	2013 12/31/2023	5/21/2021 12/31/2025	ACTIVE + PAR for Revision SUBMITTED TO REVCOM FOR APPROVAL: Currently on the March 20, 2024 agenda
Individual					
PC57.134					
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
Individual					
PC57.16					
C57.94	IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers	Kevin Kline ken00klein@gmail.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
Individual					
PC57.96					

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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		
Individual P63253-5713-8	Draft Standard Requirements for Station Service Voltage Transformers	David Wallace (662) 325 - 2009 daweleceng@aol.com		3/21/2019 12/31/2025	Active PAR + 1 PAR Extension SA BALLOT: Recirculation-1 to Close on 3/7/24
Entity PC57.13.10	Draft Guide for Calibration of Energized Current Transformers for 34.5 kV and Below	Yunguo Yang 77766711@qq.com		3/22/2022 12/31/2026	Active PAR TCR: Thomas Sizemore
Individual PC57.13.9	Draft Standard for Power-Line Carrier Coupling Capacitors and Coupling Capacitor Voltage Transformers	Zoltan Roman (706) 360 - 4964 zoltan.roman@ge.com		3/23/2017 12/31/2024	Active PAR + 2 PAR Extension SA BALLOT: Closed 10/21/2022 with 662 comments to resolve. Currently in Comment Resolution. CO-STD-COM – PSCC
C57.13 Individual PC57.13	IEEE Standard Requirements for Instrument Transformers	David Wallace (662) 325 - 2009 daweleceng@aol.com	2016 12/31/2026	3/24/2022 12/31/2026	ACTIVE + PAR for Revision
C57.13.2 Individual	IEEE Conformance Test Procedure for Instrument Transformers		2005 12/31/2020		INACTIVE-RESERVED
C57.13.5 Individual	IEEE Standard of Performance and Test Requirements for Instrument Transformers of a Nominal System Voltage of 115 kV and Above		2019 12/31/2029		ACTIVE
C57.13.6 Individual	IEEE Standard for High Accuracy Instrument Transformers		2005 12/31/2020		INACTIVE-RESERVED
C57.13.7 Individual	IEEE Standard for Current Transformers with Maximum Milliampere Secondary Current of 250 mA		2018 12/31/2028		ACTIVE

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STANDARD		Working Group Chair	Approved Year	PAR Issue Date	Standard Status
BALLOT TYPE		Phone		Rev Due Date	Remark
PROJECT		Email		PAR Expiration	
SubCommittee INSULATING FLUIDS					
CHAIR: Stephaney Mabrey		Stephanie.mabrey@weidmann-grou (802) 397 - 4113			
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: Intial Ballot to Close 3/16/2024
C57.104 Individual	IEEE Guide for the Interpretation of Gases Generated in Mineral Oil-Immersed Transformers		2019 12/31/2029		ACTIVE
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 12/31/2024	INACTIVE-RESERVED + PAR for Revision

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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@weidmann-grou (802) 397 - 4113			
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 Denzer	2015	9/23/2021	ACTIVE + PAR for Revision
Individual		(330) 581 - 4103	12/31/2025		
PC57.637		stephaniedenzer@alliantenerg		12/31/2025	

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STANDARD		Working Group Chair	Approved Year	PAR Issue Date	Standard Status
BALLOT TYPE		Phone		Rev Due Date	Remark
PROJECT		Email		PAR Expiration	
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.
Individual PC57.165	Draft Guide for Temperature Measurements for Liquid Immersed Transformers and Reactors	Mark Tostrud (262) 746 - 1230 mark.tostrud@dynamicratings.		2/17/2017 12/31/2024	Active PAR + 2 PAR Extension SA BALLOT: Closed on 5/3/2023 with 119 comment to resolve. Currently in comment resolution.
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	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
C57.169 Individual	IEEE Guide for Determination of Maximum Winding Temperature Rise in Liquid-Immersed Transformers		2023 12/31/2033		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	
C57.91	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.c		12/31/2025	

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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		
Entity C57.32.10	Draft Guide for the Selection of Neutral-Grounding Devices for High Voltage Direct Current (HVDC) Converter Transformers	Zhang Hua		10/30/2018	Active PAR
		zhanghua002@163.com		12/31/2024	PREBALLOT: Invitation closed 12/29/2023 TCR: Rogério Verdolin
Entity PC57.141	Draft Guide for Detection, Monitoring, and Evaluation of Winding Deformation in Liquid-Immersed Power Transformers	Xianjun Shao		9/23/2021	Active PAR
		shaioxianjun0575@163.com		12/31/2025	TCR: Poori Patel
C57.105 Individual	IEEE Guide for Application of Transformer Connections in Three-Phase Distribution Systems		2023		ACTIVE
			12/31/2033		
C57.109 Individual	IEEE Guide for Liquid-Immersed Transformers Through-Fault-Current Duration		2018		ACTIVE
			12/31/2028		
C57.110 Individual	IEEE Recommended Practice for Establishing Liquid Immersed and Dry-Type Power and Distribution Transformer Capability when Supplying Nonsinusoidal Load Currents		2018		ACTIVE
			12/31/2028		
C57.120 Individual	IEEE Guide for Loss Evaluation of Distribution and Power Transformers and Reactors		2017		ACTIVE
			12/31/2027		
C57.123 Individual	IEEE Guide for Transformer Loss Measurement		2019		ACTIVE
			12/31/2029		
C57.136 Individual	IEEE Guide for Sound Level Abatement and Determination for Liquid- Immersed Power Transformers and Shunt Reactors Rated Over 500 kVA		2023		ACTIVE
			12/31/2033		

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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		
C57.142	IEEE Guide To Describe The Occurrence And Mitigation Of Switching Transients Induced By Transformer-Breaker Interaction	Jim McBride	2010	3/23/2017	INACTIVE-RESERVED+PAR Revision+2 PAR Extensions
Individual		(770) 460-6626	12/31/2020		SA BALLOT: Closed on 4/27/22 with 305 comments to resolve. Currently in Comment Resolution.
PC57.142		jim@jmxhv.com		12/31/2025	CO-STD-COM – Switchgear
C57.149	IEEE Guide for the Application and Interpretation of Frequency Response Analysis for Oil Immersed Transformers	Charles Sweetser	2012	6/14/2018	INACTIVE-RESERVED+PAR Revision+1 PAR Extension
Individual		(617) 901 - 6180	12/31/2022		SA BALLOT: Closed on 5/30/2023 with 77 comments to resolve. Currently in Comment Resolution.
PC57.149		charles.sweetser@omiconene		12/31/2024	
C57.158	IEEE Guide for the Application of Tertiary and Stabilizing Windings in Power Transformers	Enrique Betancourt	2017	6/29/2023	ACTIVE + PAR for Revision
Individual		52 818 030 - 2135	12/31/2027		
PC57.158		ebetanco@ieee.org		12/31/2027	
C57.159	IEEE Guide on Transformers for Application in Distributed Photovoltaic (DPV) Power Generation Systems	Hemchandra Shertukde	2016	2/15/2024	ACTIVE + PAR for Revision
Individual		(860) 768 - 4847	12/31/2026		
PC57.159		shertukde@hartford.edu		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		
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		12/31/2027	

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BALLOT TYPE	Phone	Rev Due Date	PAR Expiration	Remark
PROJECT	Email			
SubCommittee PERFORMANCE CHARACTERISTICS				
CHAIR: Rogerio Verdolin	roger.verdolin@ieee.org		(403) 850 - 4304	
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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BALLOT TYPE		Phone			
PROJECT		Email	Rev Due Date	PAR Expiration	Remark
SubCommittee POWER TRANSFORMERS					
CHAIR: Ryan Musgrove		ryan.musgrove@ieee.org	(405) 747 - 7960		
Individual PC57.107	Draft 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	Joe Watson (561) 371 - 9138 joe_watson@ieee.org		9/23/2021 12/31/2025	Active PAR SUBMITTED TO REVCOM FOR APPROVAL: Currently on the March 20, 2024 agenda
Entity PC57.145	IEEE Guide for Digital Twin Modeling and Analysis of Power Transformers with High Voltages 69 kV up to 161 kV	Jiayu Wang wjy911106@163.com		6/5/2023 12/31/2027	ACTIVE PAR TCR: Brian Sparlin
Individual PC57.170	Draft Guide for the Condition Assessment of Liquid Immersed Transformers, Reactors and Their Components	Kumar Mani (919) 546 - 2791 kumar.mani@duke-energy.co		9/5/2019 12/31/2025	ACTIVE - PAR Revision + 1 PAR Extension
Entity PC57.93a	Draft Guide for Installation and Maintenance of Liquid-Immersed Power Transformers Amendment: Cold Start of Power Transformers filled with Natural Ester Fluids	Wei Yao yaoweidky@163.com		3/5/2020 12/31/2024	Active PAR for Amendment TCR: Scott Reed
60076-16 Individual	IEC/IEEE International Standard - Power transformers - Part 16: Transformers for wind turbine applications		2018 12/31/2028	ACTIVE	
60076-57-1202 Individual	IEC/IEEE International Standard Power transformers --Part 57-1202: Liquid immersed phase-shifting transformers		2016 12/31/2026	ACTIVE	
60214-2 Individual	IEEE Draft Standard for Tap-Changers - Part 2: Application Guide		2019 12/31/2029	ACTIVE	
638 Individual P638	IEEE Standard for Qualification of Class 1E Transformers for Nuclear Power Generating Stations	Craig Swinderman (724) 816 - 4476 craig.swinderman@meppi.com	2013 12/31/2023	12/6/2023 12/31/2027	ACTIVE + PAR for Revision

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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 POWER TRANSFORMERS					
CHAIR: Ryan Musgrove		ryan.musgrove@ieee.org	(405) 747 - 7960		
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		ACTIVE
Individual			12/31/2027		
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	
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		

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BALLOT TYPE		Phone	Rev Due Date	PAR Expiration	Remark
PROJECT		Email			
SubCommittee POWER TRANSFORMERS					
CHAIR: Ryan Musgrove		ryan.musgrove@ieee.org	(405) 747 - 7960		
C57.153	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.		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.co		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		2019		ACTIVE
Individual			12/31/2029		

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	
C57.12.00	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		SA BALLOT: Closed on 7/8/23 with 134 comments to resolve. Currently in Comment Resolution. Recirculation Requested
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		santosz@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		
PC57.152		mdferreira@comcast.net		12/31/2025	
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)	John Varatanian john.vartinian@nationalgrid.co	2017	5/21/2019	ACTIVE + PAR Revision + 1 PAR Extension
Individual				12/31/2027	SA BALLOT: Closed on 6/3/23 with 50 comments to resolve. Currently in Comment Resolution.
PC57.12.40				12/31/2025	
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 closed 10/13/21 with 69 comments to resolve.
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	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
PC57.132		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	12/31/2027		
PC60076-57-129		wziomek@ptitransformers.com		12/31/2028	

APPENDIX 3

CIGRE Liaison Report

CIGRÉ International Council on Large Electric Systems

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

- March 11, 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

- **Brochures 900-904: High-Frequency Transformer and Reactor Models for Network Studies**
 - From Working Group A2/C4.52
 - Brochures published Q2 2023
 - TB 900: Part A White-box models
 - TB 901: Part B, Black-box models
 - TB 902: Part C, Grey-box models
 - TB 903: Part D, Model interfacing and specifications
 - TB 904: Part E, Measurements and transformer design details

SC A2 WG Activities

No.	Working Group	Topic	Status
1	A2.54	Audible Sound Requirements	Active
2	A2.56	Transformer Efficiency	Active
3	A2.57	Effects of DC Bias	Active
4	A2.58	Site Installation and Pre-commissioning of Power Transformers and Shunt Reactors	Active
5	A2.60	Dynamic Thermal Performance of Power Transformers	Active
6	A2.62	Analysis of AC Transformer Reliability	Active
7	A2.63	Transformer Impulse Testing	Active
8	A2.64	Condition of Cellulose Insulation in Oil Immersed Transformers After Factory Acceptance Tests	Active
9	A2/D2.65	Transformer Digital Twin- concept and future perspectives	Active
10	A2/D1.66	Breathing systems of liquid filled transformers and reactors	Active
11	A2.67	Guideline for Online Dissolved Gas Analysis Monitoring	Active

SC A2 WG Activities

No.	Working Group	Topic	Status
12	A2.68	Failure Survey of Lower Voltage Generator Step Up Transformers installed in Wind farms and Photovoltaic Parks	Active
13	A2.69	Guide for Transformer Maintenance	Active
14	A2.70	Life Cycle Assessment (LCA) of Transformers	Active
15	A2/D1.71	Modern Insulating Liquids Qualification for OLTC, Bushings and other accessories.	Active
16	A2/D1.72	Retrofill of mineral oil in transformers - Motivations, Considerations and Guidance	Starting
17	D1/A2.77	Improved understanding of dynamic behavior of winding insulating materials in liquid insulated power transformers	Active
18	D1/A2.79	Improved understanding of dynamic behavior of winding insulating materials in liquid insulated power transformers	Starting
19	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** This WG aims to evaluate current substation decarbonization practices and establish a simplified carbon footprint assessment methodology applicable to the full life cycle of all types of existing substations and new greenfield substation solutions, taking into account all substation components (incl. transformers). Target completion Q2 2026.

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

TF and AG activities

- Task Force (TF): Power Transformer Tank Specification for Passive Protection Against Internal Arc
- Task Force (TF): Power Transformers Sound Levels on Site

Upcoming Events

- **CIGRÉ Paris Session 2024**
 - Paris, France, August 25-30, 2024
 - Palais des Congrès
 - Paper authors to receive final notifications by May 6, 2024
- **CIGRÉ USNC Grid of the Future**
 - Raleigh, NC, Nov. 11-14, 2024
 - Hosted by Quanta Technology
 - Sheraton Raleigh Hotel
 - Paper manuscripts submitted for review by Aug. 5, 2024
 - Additional details at www.cigre-usnc.org
- **CIGRÉ Symposium**
 - Spring 2025
 - Date and location to be announced soon
- **CIGRÉ A2/D1 Study Committee Colloquium**
 - Seoul, S. Korea, Oct. 19-24, 2025
 - COEX Intercontinental Hotel
 - 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: Massimo Pompili, IT

TC 15 Solid electrical insulating materials

Chair: Bernhard Klaussner, DE / Secretary: Solomon Chiang, US

IEEE Transformers Committee Meeting
2024 March, Vancouver, BC, CA



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

- 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 (3 out of 6 in revision)
- No document published since last report
- Next Plenary Meetings
 - 2024, April 18th in Rome, Italy – full meeting week together with TC 10
 - 2024, October 2nd in Edinburgh, Scotland – within IEC General Meeting week



Revision of TC 14 documents in progress (12)

1. IEC 60076-1 General
2. IEC 60076-2 Temperature rise test
3. IEC 60076-4 Guide to the LI and SI testing
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 Loss Measurements
9. IEC 62032 / IEEE C57.135 Phase Shifter Guide –
to become after revision IEC/IEEE 60076-57-135
10. IEC/IEEE 60076-57-129 HVDC Converter Transformers
11. IEC 60076-21 / IEEE C57.15 Step-voltage regulators
12. 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 / tbd

D. Sauer / Sauer



TC 10 General Information – Ed Casserly

- 42 Member countries; 12 Active MT, PT, WG, AG; 225 Experts
- 64 Documents under supervision; 12 Documents in revision / development
- 2 Documents published since last report:
 - IEC 60867 ED 3.0: Insulating liquids - Specifications for unused liquids based on synthetic aromatic hydrocarbons; 2022-10
 - IEC 60567 ED 5: Oil-filled electrical equipment – Sampling of gases and analysis of free and dissolved gases – Guidance; 2023-12
- Last plenary meeting, June 2022 Bled (SLO) – jointly with TC 14
 - Hybrid meeting – 73 participants (~25 in-person) - 3 USNC TAG represent.
- Next plenary meeting, 2024 April 18/19 Rome (IT) – jointly with TC 14
 - Hybrid meeting



TC 10 Standards Currently Under Revision (10)

For details see TC 10 webpage

- MT22 (David Walker, GB)
 - FDIS - 60422 ED5: Mineral oils - Supervision and maintenance guidance
- MT30 (Massimo Pompili, IT)
 - CDV - 60156 ED4: Insulating liquids - Determination of the breakdown voltage - Test method
 - CD - TR 61294 ED2: Insulating liquids - Determination of the PD inception (PDIV) - Test procedure
- MT36 (Russel Martin, GB)
 - 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
- MT42 (Lance Lewand, US)
 - CD - 60465 ED3: Specification for unused insulating mineral oils for cables with oil ducts
- MT43 (Patrik Ågren, FI)
 - CD - 60666 ED3: Detection and determination of specified additives in mineral insulating oils
- WG41 (Yannick Kieffel, FR)
 - CD - 63359 ED1: Specifications for the re-use of mixtures of gases alternative to SF₆
 - FDIS - 63360 ED1: Mixtures of gases alternative to SF₆



New TC 10 Standards in Development (2)

- WG45 (Ivanka Höhlelein-Atanasova, DE)
 - Interpretation of DGA analysis in natural and synthetic esters
- 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; 91 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; 18 active projects (revision/development)
- 5 Documents published in 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 plenary meeting, November 2024-11-(11-14), Vienna (AT)
 - Hybrid meeting



TC 15 Project of interest to the IEEE Transformers Committee

TC15/MT15 to revise definition of TUP to be more flexible and technological neutral

60554-1 definition of thermally upgraded paper or presspaper

- Kraft insulating paper or presspaper which contains Nitrogen, as dicyandiamide only*, and compliant with the requirements of Part 3 or which has min 50% tensile retention after ageing test as described in the IEEE C57.100 2022 D1 part.

*other industry proven material containing a mixture of dicyandiamide, melamine and polyacrylamide can be used if they are compliant with local environmental regulations.

APPENDIX 5

Standards Coordinating Committee No. 4

Standards Coordination Committee (SCC) 4 Electrical Insulation Liaison Report IEEE PES Transformer Committee

**March 11, 2024– Spring Meeting,
Vancouver, BC**

Evanne Wang

Standards Coordinating Committee on Electrical Insulation – SCC 04

- 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 Coordinating Committee on Electrical Insulation – SCC 04

– 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

Standards Coordinating Committee on Electrical Insulation – SCC 04

– Current Activities

- IEEE 1 – Standard expired 12/31/2021, and current PAR expires 12/31/2024. The Chair will decide whether to allow the current PAR to expire at the end of this year and file a new PAR or file a PAR extension request.
- All work for this document is being conducted virtually. Working group has met twice since September 2023, and the next meeting will take place in April 2024.
- Join us: IEEE 1 Chair – Brad Greaves (brad.greaves@weidmann-group.com)

Standards Coordinating Committee on Electrical Insulation – SCC 04

– Interested in participating? Contact:

- SCC04 Chair – Evanne Wang (evanne.wang@dupont.com)
- IEEE 1 Chair – Brad Greaves (brad.greaves@weidmann-group.com)

APPENDIX 6

ASTM

ASTM Liaison Report

IEEE PES Transformer Committee

March 11, 2024– Spring Meeting,
Vancouver, BC

Ed Casserly

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: Dec 6 – 7, 2023
Washington, DC.

Next Meeting: July 10-11, 2024
Philadelphia, PA

D27 Committee Membership

Classification	Official	Non-Official	Total
Producer	20	13	33
User	10	3	13
Consumer	0	0	0
General Interest	44	26	70
Total	74	42	116

- 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

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 D3487-16 – Specification for Mineral Insulating Oil Used in Electrical Apparatus
 - **Currently under revision, WK83455; subcommittee vote.**

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 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 – Tom Prevost
4. Relative Saturation of Water in Insulating Liquids – Lance Lewand

APPENDIX 7

Transactions Power Delivery

Transactions on Power and Delivery (TPWRD) Editor Liaison Report IEEE PES Transformer Committee

**March 11, 2024– Spring Meeting,
Vancouver, BC**

Xose Lopez-Fernandez

Transactions on Power and Delivery (TPWRD) Editor Liaison

- During 2023 until March 4, 2024, a total of 100 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 13
 - Revise & Resubmit 1
 - Under review 24
 - Reject 55
 - Editorial / Administrative Reject 7
 - **TOTAL (During 2023 until March 4, 2024) 100**
 - The above numbers include reviews managed by all editors.

Transactions on Power and Delivery (TPWRD)

Editor Liaison

[10.1109/TPWRD.2024.3365857](#) [Three-phase Three-legged Wye-Wye Transformers with Only One Neutral Grounded and no Stabilizing Winding –](#)

Part I: Zero-sequence Performance

[10.1109/TPWRD.2024.3365861](#) [Three-phase Three-legged Wye-Wye Transformers with Only One Neutral Grounded and no SW –Part II: Zero-](#)

sequence Permissible Temperature

[10.1109/TPWRD.2023.3303106](#) [Thermal Analysis of Power Transformers Under Geomagnetically Induced Current](#)

[10.1109/TPWRD.2023.3314027](#) [Independent Fast Phase Shifting Transformer: A Flexible and High-precision Power Flow Controller](#)

[10.1109/TPWRD.2023.3334102](#) [Saturation Curve Estimation of Three-Legged Three-Phase Transformers Using Inrush Current Waveforms](#)

[10.1109/TPWRD.2023.3245123](#) [Dynamic Model of a Virtual Air Gap Reactor](#)

[10.1109/TPWRD.2023.3264972](#) [Measurement and Analysis of Switching Transient in 500](#)

Accepted for
Publication

Transactions on Power and Delivery (TPWRD)

Editor Liaison

Accepted for
Publication

kV Pumped Storage Power Plants

[10.1109/TPWRD.2023.3255212](#) [A Compact Saturated Core Fault Current Limiter](#)

Magnetically Integrated with Decoupling Windings

[10.1109/TPWRD.2023.3305732](#) [Residual Lifetime Evaluation of Power Transformers](#)

Based on Data Fusion and Wiener Model

[10.1109/TPWRD.2023.3242266](#) [A Mechanical-Electromagnetic Coupling Model of Transformer Windings and its Application in the](#)

Vibration-based Condition Monitoring

[10.1109/TPWRD.2023.3292569](#) [PEV Charging Optimization Considering a Dynamic Rating](#)

of Primary Distribution Transformers

[10.1109/TPWRD.2023.3243887](#) [DC Impedance Modeling of Push-Pull DC Auto-](#)

transformer for MMC and LCC HVDC Interconnections

[10.1109/TPWRD.2023.3265671](#) [Distribution Transformer Remaining Useful Life](#)

Estimation Considering Electric Vehicle Penetration

Transactions on Power and Delivery (TPWRD)

Editor Liaison

- Thank you to the reviewers:

- Barry Beaster
- Enrique Betancourt
- Gary Hoffman
- Jerry R. Murphy
- Jim Graham
- Jim McBride
- Ramsis Girgis
- Rick Marek
- Tauhid Ansari

Transactions on Power and Delivery (TPWRD)

Editor Liaison

- Please 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

PE/TRANSFORMERS COMMITTEE SPRING MEETING

PE/ TRANSFORMERS ADMINISTRATIVE SUBCOMMITTEE
SPRING 2024

MALIA ZAMAN
M.ZAMAN@IEEE.ORG

PATRYCJA JAROSZ
P.JAROSZ@IEEE.ORG

VANCOUVER, CA
MARCH 2024
IEEE SA

IEEE SA UPDATES

- ☐ Summary of Updates
 - ☐ Staff Updates
 - ☐ PAR/Standards Status Update
 - ☐ Policy Updates/Reminders
 - ☐ IEEE/IEC Dual Logo Status
-
- ☐ Annex : Past policy updates

SUMMARY OF UPDATES FROM IEEE SA

- ❑ **Officers to complete: Understanding IEEE SA's Antitrust, Competition, and Commercial Terms Policies**
 - ❑ Training has moved to the volunteer [ILN site](#).
- ❑ **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)
- ❑ **WG Awards are now submitted in myProject, a WG roster is necessary to complete the awards submission.**
 - ❑ Phone numbers for the recipients is now required
- ❑ **Request for IEC standards (New Process)**
 - ❑ Need to utilize the IEC [Products & Services Portal \(iec.ch\)](#) website.
 - ❑ 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).
- ❑ **[IEEE SA Editorial Hub](#) - NEW** - Normative Reference Training**
 - ❑ Standards developers and working group participants receive a concise overview of the most important and broadly applicable facets of incorporating a normative reference clause and a bibliography into an IEEE standard
- ❑ **NOTE: All approved updates to IEEE SA policies and procedures are expected to be published early 2024, your PMs will provide details once they are available**

STAFF UPDATES

Malia	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 - 13 PARS are expiring

- ❑ 7 are in ballot stage/comment resolution stage
- ❑ 5 in WG Development stage
- ❑ 1 on RevCom (May) – C57.12.52

2025 – 21 PARS are expiring

- ❑ 10 PARs in SA Ballot stage
- ❑ 9 in WG development stage
- ❑ 2 on RevCom (March 2024) - 2 PARS on RevCom, C57.107, and C57.134

Expiring Standards in 2024

- ❑ 4 Stds. will become inactive* (65700-19-03, C57.155, C57.12.38 and C57.12.44)

Expiring Standards in 2025

- ❑ 11 Stds. will become inactive (C57.106 does not have an active PAR)

PE/TR STDS COMM. P&PS DUE 2024

For Standards Committee

- ☐ [IEEE SA Baseline Policies and Procedures for Standards Development – Standards Committee \(DOC\)](#)
- ☐ [Standards Committee Baseline Instructions Template \(DOC\)](#)

For Individual Working Groups

- ☐ [IEEE SA Baseline Policies & Procedures – IEEE Standards WGs – Individual Method \(DOC\)](#)
- ☐ [WGs – Individual Method Baseline Instructions Template \(DOC\)](#)

AudCom Review Checklists (2020)

- ☐ [Standards Committee \(DOC\)](#)

AudCom Baselines URL

Steps to upload the P&Ps to AudCom

ADDING PES EXTERNAL PROPOSAL MANAGEMENT (EPM) COORDINATION IN SC POLICIES

- ☐ When your Standards Committee (SC) policies and procedures come up for revision, the statement below should be added to ensure that coordination is needed between the SC and EPM for PES Committees Policies and Procedures.
- ☐ For consistency purposes please add the following statement to clause 2.1 under Specific Responsibilities :
- ☐ **"Reviewing, accepting, and/or rejecting proposals assigned to the XXXXXX Standards Committee from the IEEE PES External Proposal Management (EPM) Committee "**

MYPROJECT – MANAGE GROUPS AREA

For the benefit of tracking; Membership, Officer Roles, Officer Training compliance and WG awards submission process;

- ☐ **IEEE SA is strongly encouraging the Standards Committee and its WGs to utilize the IEEE SA myProject Manage Groups area**
 - ☐ myProject Roster area to record Membership involvement
 - ☐ Convenient for WG chair during the submission of the WG awards process when project is approved by SASB.
 - ☐ For PES committee to add Subcommittee information
 - Helps Track the officer roles for compliance of the Officer Training
 - ☐ Staff will add the subcommittee levels in the myProject system
 - ☐ The transition will not affect the work, staff will add the Subcommittee levels to the myProject system

MYPROJECT – MANAGE ROSTER/SUBCOMMITTEE LEVELS

Here is a screenshot of what the Subcommittee Levels will look like.

At least 2 characters must be entered to Search

Filter By Type

☐ See my Groups ☒ See All Groups

Group Name	Committee	Group Type	Group Status	
 Administrative Subcommittee ⓘ	PE/T&D/ADMIN	Subcommittee	Active	 
 Project Administration ⓘ	PE/T&D/ADMIN	Working Group	Active	 
 acoustic imaging Working Group ⓘ	PE/T&D/AIWG-190609	Entity Working Group	Active	 
 Capacitor Subcommittee ⓘ	PE/T&D/CAP	Subcommittee	Active	 
 Series Capacitor - P824 Working Group ⓘ	PE/T&D/Capacitor - P824_WG	Working Group	Active	 
 Working Group for the Application of Shunt Power Capacitors ⓘ	PE/T&D/Capacitor-1036_WG	Working Group	Active	 
 IEEE Guide for Application and Specification of Harmonic Filters ⓘ	PE/T&D/Capacitor-1531_WG	Working Group	Active	 
 Capacitors Committee ⓘ	PE/T&D/Capacitor-1726_WG	Working Group	Active	 

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 for the recipients is 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](#)

ADDITIONAL RESOURCES – IEEE SA EDITORIAL GUIDANCE HUB

- ❑ The IEEE SA Content Production and Management Team has developed an Interactive resource to assist with draft development and editorial process in the [IEEE SA Editorial Guidance Hub](#).
- ❑ **NEW** - Normative Reference Training**
 - ❑ Standards developers and working group participants receive a concise overview of the most important and broadly applicable facets of incorporating a normative reference clause and a bibliography into an IEEE standard.
- ❑ The IEEE SA Interactive Draft Standard
 - ❑ Drawing on the IEEE SA Standards Style Manual and the IEEE SA MS Word® Standards template, this tool walks you through a sample draft, explaining how to approach each section

Access to [IEEE SA Editorial Guidance Hub](#)

Use your IEEE Member sign in



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.

IEEE/IEC DUAL LOGO UPDATE (ACTIVE PROJECTS)

Joint Development of standards with IEC Published Standards

- ❑ IEC/IEEE 65700-19-03:2014, Standard Requirements, Terminology, and Test Code for Bushings for DC Applications Rated 110 kV BIL and Above
- ❑ IEC/IEEE 60076-57-1202:2016, Standard Requirements for Liquid Immersed Phase-Shifting Transformers
- ❑ IEC/IEEE 60076-57-129:2017, Converter Transformers for HVDC Applications
- ❑ IEC/IEEE 60076-16-2018, Standard Requirements for Wind Turbine Generator Transformers
- ❑ IEEE PC57.15/IEC 60076-21, Guide for the Application, Specification and Testing of Phase-Shifting Transformers

Standards Under Development

- ❑ IEEE/IEC P63253-5713-8, Standard Requirements for Station Service Voltage Transformers
 - ❑ PAR has been extended until 31 December 2023
 - ❑ IEC COMPLETED CDV is open and closes 9 December 2022
 - ❑ IEEE SA Ballot Group is formed, SA Ballot can open utilizing the CDV as the initial ballot draft
- ❑ IEEE/IEC P65700-19-03, Standard - Bushings for DC Application
 - ❑ PAR for the revision was approved September 2021
 - ❑ Draft development

QUESTIONS?



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.

CONTACT US!

Malia Zaman

Senior Program Manager

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Patrycja Jarosz

Program Coordinator

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(732) 465-7804

PE/TR, PE/PSIM

APPENDIX 9

Meeting Planning

SC Meetings Planning

Spring 2024 Meeting

Vancouver, BC

General Session

March 12, 2024

Tammy Behrens

Prolec GE

Meetings Subcommittee Chair

THANK YOU TO OUR MEETING HOSTS!



Paul Chisholm, Jeremy Van Horn & Team

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

Meeting Attendance

	2022 Spring Denver	2022 Fall Charlotte	2023 Spring Milwaukee	2023 Fall Kansas City	2024 Spring Vancouver
Attendees	385 (393 – 8)	535 (544 – 9)	513 (521 – 8)	569 (576 – 7)	540*
Spouses/ Companions/ Guests	24 (24 – 0)	37 (38 – 1)	24 (24 – 0)	34 (34 – 0)	53*

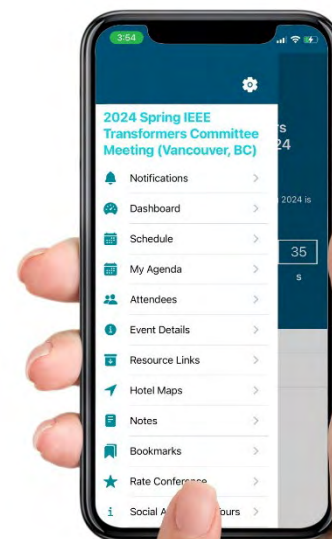
*Registrations
as of 3/11/24

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

Georgia AB

(bring breakfast from Plaza Ballroom)

Miscellaneous Announcements

Check the posted schedule or Event Hub app for current departure times for all tours.

Buses for all technical tours and Wednesday night social at Grouse Mountain will load across from the main entrance of the hotel on Melville Street.

Wednesday night: The first bus will leave at 5:30PM, with the last bus leaving the Hyatt around 6:15PM. Buses will start returning at 8:30PM, with the last bus leaving Grouse at 9:45PM.

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

Future Meetings



FALL 2024 — October 27-31

St. Louis, MO

Hyatt Regency at the Arch

Room Block Open!

SPRING 2025 — March 23-27

Denver, CO

Hyatt Regency at Colorado
Convention Center

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 Spring 2024 Meeting Vancouver, BC Closing Session March 14, 2024

Tammy Behrens

Prolec GE

Meetings Subcommittee Chair

Meeting Attendance

	2022 Spring Denver	2022 Fall Charlotte	2023 Spring Milwaukee	2023 Fall Kansas City	2024 Spring Vancouver
Attendees	385 (393 – 8)	535 (544 – 9)	513 (521 – 8)	569 (576 – 7)	533 (551 – 18)
Spouses/ Companions/ Guests	24 (24 – 0)	37 (38 – 1)	24 (24 – 0)	34 (34 – 0)	54 (54 – 0)

THANK YOU TO OUR MEETING HOSTS!



Paul Chisholm, Jeremy Van Horn & Team

**AND TO
H-J ENTERPRISES
FOR HOSTING OUR
NEXT MEETING IN
ST. LOUIS!**

*St. Louis meeting
hosted by*

Future Meetings



FALL 2024 — October 27-31

St. Louis, MO

Hyatt Regency at the Arch

SPRING 2025 — March 23-27

Denver, CO

Hyatt Regency at Colorado
Convention Center

Room Block Open!



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)

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

As you're leaving...

**DROP YOUR PLASTIC
NAME BADGE HOLDER
AND CLIP ON TABLES
THROUGHOUT THIS FLOOR**

Thank you and travel home safely!

APPENDIX 10

Treasurer's Report

MEMORANDUM

February 19, 2024

To: David Wallach, Chair
IEEE PES Transformers Committee

RE: IEEE PES Transformers Committee Treasurer's Report
Spring 2024 Meeting
(Reporting period 09/01/2023 to 01/31/2024)

Dear David,

The finances of the Committee are in sound financial condition. As of January 31st (end of this reporting period), the checking account balance was \$361,559.34.

FYI: January 31st is a "snapshot in time" after the final income/expenses for the Spring 2023 Milwaukee meeting were finalized and most income/expenses are resolved from the Fall 2023 Kansas City meeting.

It is important to note that the current checking account balance includes \$79,922.23 in early revenues/expenses towards the upcoming Spring 2024 Vancouver Meeting. These additional funds are the result of opening registration early to offset expenses that are caused by holding a meeting outside the United States. These funds are NOT included in the assessment of the Committee's financial condition as they are not a true reflection of the total revenues/expenses expected for the upcoming meeting.

Report period notes:

- The Spring 2023 Milwaukee Meeting reports a profit of \$72,291.25.
- The Fall 2023 Kansas City Meeting reports a preliminary profit of \$114,827.97.
- A financial audit for 2023 is required as the committee's revenues/expenses have met minimum financial thresholds. Documentation is being prepared to send to IEEE auditors.

Based on budgetary projections, the committee's financial condition has stabilized, and registration fees are expected to remain constant for the foreseeable future.

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 - Spring 2024
(for reporting period 09/01/2023 to 01/31/2024)

S24

A	Ledger Balance at Period Opening; 9/01/2023	\$ 172,371.26
	<u>Misc Income, not related to a specific meeting</u>	
B1	interest, approx 6 months	\$ 5,515.94
B2	misc income; shirt sales, CD-ROM sales, book sales, etc.	\$ 0.00
B	Total Misc Income, not meeting related	\$ 5,515.94
	<u>Misc Expenses, not related to a specific meeting</u>	
c1	Authorized.Net	\$ (275.00)
c3	equipment purchases; projectors & cases, etc.	\$ (4,091.85)
c4	technology; RFID tech, meeting app, WiFi equip, printers & ink, cables, etc	\$ 0.00
c5	conferences, JTCM, PES GM, remote meetings, etc.	\$ (1,568.17)
c6	other misc. expenses; shirts, audit, books, office supplies, name badges, etc.	\$ (2,937.10)
c7	memorial	\$ 0.00
C	Total Misc. Expenses, not meeting related	(\$8,872.12)
	<u>Spring 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	\$ (147.94)
D	Total Late Income/(expenses), Spring 2023 Meeting	(\$147.94)
	Previous Revenue/Expenses	\$72,439.19
	Gain/(Loss) Spring 2023 Meeting	\$72,291.25
	<u>Fall 2023 Meeting</u>	
E1	Revenue, meeting registrations	\$ 352,454.56
E2	Revenue, coffee break sponsors	\$ 9,000.00
E3	Meeting expenses	\$ (246,184.59)
E	Profit/Loss between 09/01/2023 to 1/31/2024	\$115,269.97
	Meeting income (expenses) Prior to 9/01/2023	(\$442.00)
	Profit/(Loss), Fall 2023 Meeting	\$114,827.97
	<u>Spring 2024 Meeting</u>	
	Revenue, meeting registration	\$129,475.00
	Revenue, coffee break sponsors	\$7,000.00
	Meeting Expenses	(\$59,052.77)
	Profit/Loss between 09/01/2023 to 1/31/2024	\$77,422.23
	Meeting income (expenses) Prior to 9/01/2023 (**)	\$2,500.00
	Profit/(Loss), Spring 2024 Meeting	\$79,922.23
	<u>Expenses, Future Meetings (deposits paid, etc)</u>	
	Future Meeting Revenue between 09/01/2023 to 01/31/2024	\$0.00
	Future Meeting Expenses between 09/01/2023 to 01/31/2024	
F	Total Meeting Revenue/(Expenses) for Future Meetings between 09/01/2023 to 02/31/2024	\$0.00
G	Net Income (loss), between Spring 2023, Fall 2023 and Spring 2024 meetings (B+C+D+E+F)	\$ 189,188.08
	Ledger/Bank Balance at Period Closing, 01/31/2024 (A + G)	\$ 361,559.34

** Break Sponsor paid in advance during 2022

Spring 2023 - Milwaukee Expenses/Revenue

Reporting Through 1/31/24

	EXPENSES	REVENUE
<u>Meeting Revenue</u>		
Revenue from Registrations		\$ 269,725.00
Break Sponsors		\$ 9,000.00
Hotel Credits		\$ 30,041.95
<u>Meeting Expenses</u>		
Food and Beverage	\$ (148,821.67)	
Hotel Deposit - Used for Food and Beverage	\$ (10,000.00)	
Audio Visual	\$ (22,973.95)	
Internet	\$ -	
Sunday Night Social	\$ (600.00)	
Wednesday Night Social	\$ (17,299.03)	
Spouse Socials	\$ (4,749.39)	
Event Hub	\$ -	
Cvent	\$ (9,636.98)	
Awards	\$ (147.94)	
Quandel Hospitality LLC	\$ (9,491.46)	
Transportation	\$ (4,540.61)	
Shipping Costs	-	
Credit Card Fees associated with Registration	\$ (8,079.30)	
Miscellaneous	\$ (135.37)	
<u>Total Revenue/Expenses</u>	\$ (236,475.70)	\$ 308,766.95

<u>S23 Gain/Losses</u>	\$ 72,291.25

Fall 2023 - KC Expenses/Revenue Reporting Through 1/31/24

	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 1/31/24

	EXPENSES	REVENUE
<u>Meeting Revenue</u>		
Revenue from Registrations		\$ 129,475.00
Break Sponsors		\$ 9,500.00
Hotel Credits		-
<u>Meeting Expenses</u>		
Food and Beverage	-	
Hotel Deposit - Used for Food and Beverage	-	
Audio Visual	-	
Internet	-	
Sunday Night Social	-	
Wednesday Night Social	\$ (32,761.05)	
Spouse Socials	\$ (22,151.88)	
Event Hub	-	
Cvent	-	
Awards	-	
Quandel Hospitality LLC	-	
Transportation	-	
Shipping Costs	-	
Credit Card Fees associated with Registration	\$ (3,884.25)	
Miscellaneous	\$ (255.59)	
<u>Total Revenue/Expenses</u>	\$ (59,052.77)	\$ 138,975.00

<u>S24 Gain/Losses</u>	\$ 79,922.23

ANNEX A Bushings Subcommittee

Vancouver, BC Canada
March 13, 2024, 09:30 AM Central

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

The Vice-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 SG Members and Participants along with the meeting agenda prior to this meeting.

A.1.3 New Members

It was reported that 0 new members had been accepted into the Subcommittee.

A.1.4 Attendance

Participant rosters were circulated during the meeting for recording the meeting attendance. The Vice-Chair presented a list of the 71 current voting members to perform a quorum check. Quorum was achieved. Per subsequent review of the rosters the meeting had 127 attendees, of which 50 were members and 77 guests, with 14 guests requesting Membership. Refer to [Appendix A](#) for meeting participants, their affiliation, and voting member status.

Table 1 – Meeting Attendance

Total	127
Members – Quorum Achieved	50
Guests	77
Guests Requesting Membership*	14

*Review of the historical attendance records indicates that of the 14 guests requesting Membership, 5 meet the eligibility requirements (Gabriel Delgado, Derek Hollrah, Francis Mills, Richard vonGemmingen, Matthew Weisensee) and will be added to the membership roster effective at the next SC meeting.

A.1.5 Agenda Approval

As 50 of the 71 members were in attendance, a quorum was achieved. There were no comments to the proposed agenda. A motion was made by Sebastien Riopel and seconded by Hugo Flores 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 to the minutes that had been posted. A motion was made by Hugo Flores and seconded by Robert Middleton to approve the minutes as posted. This motion carried by unanimous consent.

A.1.7 Status of Bushing Standards

The Vice-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 C57.19.01-2017 – Dr. Shibao Zhang, Chair; **VACANT, Vice-Chair; Dominic Pollaro, Secretary**

The task force has voted to request permission to submit a PAR to start as a working group. Out of the 32 members, they received 26 votes, all of which were Yes. Chair Shibao Zhang made a motion to move to form a WG, and Hugo Flores seconded the motion with unanimous approval to move to WG. The formation of the WG is dependent on the approval of the PAR that was submitted to NesCom which should be granted before the next meeting.

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 Secretary reported that WG did not meet. Art Del Rio reported they had a meeting online on December 5-6 from 8:00 to 10:00 AM Eastern time on both days. All of the work for the TF has been completed, and all the comments are resolved. The recommendation is to move to the CDC (comment draft committee) for voting. No additional meetings are scheduled at this time.

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

The TF had 34 attendees, with 23 requesting Membership. The TF had voted, and it was unanimously approved to request the SC approval to submit a PAR. As the acting SC chair, Scott Digby requested that a motion to submit the PAR that had been unanimously approved by the TF for approval. This motion was made by Sebastien Riopel and seconded by Hugo Flores. The motion was unanimously approved.

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 had asked for and did receive a PAR extension. We had 43 attendees, 32 guests, and 11 members present, so a quorum was achieved. At the beginning of the meeting, there were 7 open comments outstanding. Of which the group was able to resolve 4 of them during the meeting. The plan is to address the remaining 3 by email with the plan to go to balloting by this fall.

A.3 External Liaison Reports

A.3.1 IEC Bushing Standards Activity – Bruno Mansuy, IEEE/IEC Liaison

Mr. Kurt Kaineder presented. This summary report is included in [Appendix E](#) of this report. They are also looking for more volunteers to work on the application guide TC 14. Peter Zhao suggested that we have a liaison from the bushing SC to the IEC activity for the dimensional discussion.

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

Mr. Stacy reported that, according to the IEEE 693 working group chair, a complaint had been filed with REVCOM. The current expectation is that the document will be sent back to the WG to resolve this complaint, but at this time, it has not been sent back, so the document is no longer moving forward. It is also not back at the WG. Ryan Musgrove informed the SC that the substation standards committee is seeking the interest of the transformer committee to co-sponsorship this document, and they are encouraging any bushing or transformer manufacturers to become active participants in the WG. Malia Zaman stated it is no longer at REVCOM and it is in the appeals process.

A.4 Unfinished Business

A.4.1 Venting/PD in OIP Bushings during FAT

Ajith Varghese reported that RFLT agreed upon the text displayed, [Appendix F](#), to submit to the DTSC to forward for insertion into the next revision of C57.12.90. Additional details can be found in the minutes of the DTSC meeting minutes.

A.5 New Business

A presentation on Transformer Bushing Seismic Resilience was made by Jon Binder

A.6 Adjournment

A.7 Next Meeting: Fall 2024, St Louis, Missouri – October 27 – 31, 2024

Last Name	First Name	Role	Employer or Affiliations	eMail Address
Abbas	Mubarak	M	Siemens Energy	mubarak.abbas@siemens-energy.com
Adams	Kayland	M	Prolec-GE Waukesha	kayland.adams@prolec.energy
Allison	Rebert	G	Dominion Energy	Robert.L.Allison@Dominionenergy.com
Arnold	Elise	G	SGB	elise.arnold@sgb-smit.group
Avanoma	Onome	M	MJ Consulting	o.avanoma@outlook.com
Beaster	Barry	M	H-J Family of Companies	blbeaster@ieee.org
Betancourt	Enrique	G	Prolec GE	ebetanco@ieee.org
Boettger	William	M	Boettger Transformer Consulting LLC	weboettger@aol.com
Bolar	Sanket	G	Oncor Electric Delivery	sanket.bolar@oncor.com
Carr	Deniss	G	GE Grid Solutions	deniss.carr@ge.com
Castellanos	Juan	M	Prolec GE	juangonzalo.castellanos@prolecge.com
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S24 Unofficial Standards Status Report

Standard <u>Project</u>	Title	WG Chair	Pub Year <u>Rev. Due Date</u>	PAR Issue <u>Par Expiration</u>	Comments
C57.19.00	IEEE Standard General Requirements and Test Procedure for Power Apparatus Bushings	P. Zhao	2023 2033		Not Active
C57.19.01	IEEE Standard Performance Characteristics and Dimensions for Outdoor Apparatus Bushings	S. Zhang	2017 12/2027		Held TF 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
<u>P65700-19-03</u>	IEC/IEEE International Standard -- Bushings for DC application	Eric Weatherbee	2014 12/2024	2021 12/2025	Comment Resolution Process Recirculation in March/April
C57.19.04	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		Held TF meeting
<u>PC57.19.100</u>	IEEE Guide for Application of Power Apparatus Bushings	T. Spitzer	2012 12/2022	2019 12/2025	WG Draft Development PAR Ext. Granted

IEEE PES TRANSFORMER COMMITTEE
SPRING 2024 MEETING MARCH 10 TO MARCH 14

HYATT REGENCY VANCOURVER; VANCOUVER, BRITISH COLUMBIA, CANADA

S24 IEEE TF REQUIREMENTS FOR BUSHING C57.19.01

Chair: Shibao Zhang

Secretary: Dominic Pollaro

MEETING MINUTES

3/12/24, 9:30 AM – 10:45 AM

Attendees	Member Status	Attendees	Member Status
Shibao Zhang	Y	Bjorn Vaegensmith	N
J. Arturo Del Rio	Y	Eric Euvrard	N
Scott Digby	Y	Bryan Deb	N
Mario Locarno	Y	Levent Baser	N
Anthony Natale	Y	Monil Patel	N
Dominic Pollaro	Y	Patrick Foster	N
Eric Schleismann	Y	Fei Yang	N
Cihangir Sen	Y	Bob Middleton	N
Tommy Spitzer	Y	David Stockton	N
Durand Stacy	Y	Kurt Kaineder	N
Juan Carlos Cruz Valdez	Y	Chris Whitten	N
Gabriel Delgado	Y	Mike Waldrop	N
Jeffrey Door	Y	Filip Mikulelky	N
Hugo Flores	Y	Alex Doutrelepont	N
Orlando Giraldo	Y	Stefan Lembacker	N
Daniel Posadas	Y	Saif Hossain	N
Sebastien Riopel	Y	Terry Wong	N
Troy Tanaka	Y	Eric Elgon	N
Yves Vermette	Y	Michael Sharp	N
Eunyoung Cho	N	Camilo Casallas	N
Junho Lee	N	Douglas Craig	N
Jon Bender	N	Sanford Fong	N
Alfons Schrammel	N	John Fraiser	N
Florian Hermann	N	Craig Tennant	N
Sami Debass	N	Ronald Hernandez	N
Jose Gamboa	N	Issac Abdoulls	N
William Solano	N	Jose Zambrano	N
Vinjay Patel	N	Mubark Abbas	N
Joshua Watson	N	Nathan Lange	N
Mama Mbouombous	N	Samuel Lewis	N

1. Introducton & Opening Statements

- a. Shibao Zhang (Chair) started the meetng 0930.
- b. Sign – In Sheets Passed Out
- c. Noted: If your name is printed on the Sign – In Sheet, you are a member
- d. Chair: We stll have a Task Force C57.19.01 to review and we need to get bushing subcommittee approval to submit a PAR.

2. Establishment of Quorum

- a. 31 Members listed on Sign- In Sheet
- b. 19 Members Present
- c. Quorum Reached
- d. Total Attendance = 60

3. Agenda

- a. Zhang (Chair) presented Agenda to Group
- b. Motion to Approve_ Hugo Flores
- c. Second_ Durand Stacy
- d. Agenda Approved

4. Copyright Reach Out No Report of Copyright

5. Professionalism Reminder

- a. Chair reminded the group that all correspondence be Professional.

6. Approval of Previous Minutes

- a. Chair presented minutes of TF meeting of Oct 2024 in Kansas City, Missouri
- b. Chair presented minutes of our Online Meetng of January 9, 2024, 12 PM EST.
- c. Motion to Approve_ Hugo Flores
- d. Second_ Sebastian Riopel
- e. Minutes Approved

7. Current Status Opening Statements

- a. Chair opened with start of discussion of “Real Situation”, namely the TF responsibility to begin to revise the C57.19.01 Standard (shown to group). He indicated the FIRST STEP is to submit a PAR to the bushing subcommittee.
- b. Current Status: We have submitted a PAR to NASCOM, and this has been circulated through all members on January 12th & January 19th.

- c. OPEN Question is in regard the description of bushings as “Liquid Immersed” @ “Liquid Type”. There seems to have been some confusion and Chair opened this question to the group.
- d. Scot Digby indicated that “it looks like we need to use Liquid Immersed” – we will revise the PAR and tomorrow bring this subject up in the Bushing Sub Committee to obtain NASCOM approval before St. Louis meeting. This will be the first request of the WG.

8. Timeline (As discussed by Chair)

- a. The Chair presented the Timeline to the Group.
- b. “Our PAR will end in 2027.”
- c. When we form the WG we can further discuss & vote.
- d. Plan is to have DRAFT completed for Ballot & Review before 2026.
- e. In the beginning of 2027, we are going to circulate the ballot
- f. Spring 2027: Form Resolution Group to resolve problems.
- g. Mid-Year 2027 will be the last meeting to finalize documents
- h. End 2027 WG will be completed.
- i. Any Issues with Timeline?
- j. None

Mike Sharp: “When is the last date to Submit?”

Chair: “December 2027 in PAR- last meeting is usually in OCT”.

9. Task Force Discussion Chair: Should we Continue?

- a. Because we are not in the first working group meeting, we remain in Task Force only. Although we cannot begin discussions of WG until one is established, we have a choice to STOP, or begin some discussion on general ideas.

Mario Locarno: “I am hearing important changes in this Revision”. “What do we think will be the biggest challenges to getting this revision completed?”

Dry Type Bushing Discussion:

Cihangir Sen: John indicated he thought of a couple big challenges, namely RIS Technology for Dry Types and subsequent Data Collection Challenges , “especially for PD.”

Chair: “OK”

Sami Debass EPRI: “.... challenges right now are regarding Dry Type Bushings.”

Chair: Acknowledged

Standardized Test Taps Discussion:

Duran Stacy: Duran introduced the challenge in standardization of TEST TAPS. As several different variations exist among manufacturers, to standardize dimensions on test taps “would be huge”.

Chair requested Duran Stacy take the lead and reach out to bushing manufacturing companies to obtain bushing test tap dimensional information such that we can “reveal what is considered Standard

Dimensions”.

Noted was the importance of bushing manufacturers to work together.

Sebastian Riopel: Sebastian asked for a more specific understanding of what test tap dimensions we are considering. Are we simply talking about external dimensions for interchangeability of bushing monitors or “ground shield access to pin, or internal dimensions?”.

J. Auturo Del Rio: He suggested the purpose for this information is to move bushing adapters from one bushing to another. The suggested dimensions needed are as follows; Thread size, Stem Size, Depth, Cap Dims – to help monitoring companies to have an adapter ready for installation.

Sebastian Riopel: “...we are talking about interchangeability....”

Durand Stacy: “We have a mixed Bag” in the Industry...

J. Auturo Del Rio: “...all the reason to have standard dimensions..”

Further discussions between multiple members continued with the basic goal of developing a plan of action which encompasses all shareholders within the community of bushings as it relates to Test Tap Inquiry. Much was discussed regarding the legacy population of bushings currently either in use or in stock, and how potential changes to a universal test tap design could affect both style number of these legacy styles and overall interchangeability of bushing monitors going forward.

Affect on Style Number was discussed and the potential of “new model” of bushings would need to be created to accommodate changes in Test Taps.

In general comment, it was discussed that it would be the intent of the working group to determine if manufacturers can agree on the same interface to the bushing monitors with no change to the bushing internals.

Eric Nelson: Emphasized the importance of standardization, stating standardization was accomplished previously - what’s the problem now?

Others provided some insight into this challenge, stating that there are simply more stakeholders/suppliers in the industry today, namely more bushing manufacturers with various dimensional differences - as compared to years past, historical IEEE discussions regarding Test Tap Standardization when only three or four bushing manufacturers were available in the industry.

Further insight was provided as to the which apparatus is in the lead – in other words, are we to change a bushing to fit a bushing monitor or vice versa?

A comparative discussion was provided by Chair; suggesting driver for past standardization was to bring Potential Device to bushings taps; similarly, bushing monitoring connections could be the driver for standardization in future. We initially had Type A and Type B and eventually eliminated Type B.

Eric Nelson: If you begin in the Standards, there will be a trickle effect into the industry.

Chair: Yes, this is the purpose of this discussion and formation of a WG. One-dimension fits all will be a challenge especially with existing bushings & retrofit solutions.

Eric Nelson: You can make 10 different types but then the user can specify and force that we are only going to accept certain types.

The Chair posed this as a “possible solution “ but it will be up to the Working Group.

Hugo Flores reminded the members that if existing designs are changed, this could cause a new style formation (or Revision) adding new part numbers to the utility interchangeability systems.

Final discussion related to this topic; one member (Cihangir Sen) stated that he has under his responsibility over 2000 transformers with standardized bushings (specifically selected for interchangeability) ; if one manufacturer indicates due to test tap design revision - these styles become “ obsolete” this could cause a lot of problems with existing fleet - he suggested that “ looks like a favor to the bushing manufacturers if we simply allow the bushing monitor companies to find an adapter to fit - this may be the simplest solution.”

Chris Whiten: This would give the bushing monitoring manufacturers the ability to make adapters.

Duran Stacy: This is the process today; we provide outline drawings to the interested parties, and they design an adapter to fit – in advance. What you negotiate with end user is up to you.

Chair: This is what we (HUBBEL) do as well.

One member, a representative from TRENCH, indicated “similar like you” we have legacy spare bushings residing at utilities and its very difficult at times to keep the right bushings in stock.

Sami Debass: Requested we circle back and close the loop. “...on the dimensions we are talking about – so basically we are going to collected dimensions from manufacturers?” and end users? And make recommendations?

Duran Stacy: Manufacturers only, we only have so much time (3 years).

Chair:

Step 1: get the existing dimensions to see how many we have (10,5,3) – to know where we are. Step 2: to see if we can come up with a compromise throughout manufacturers.

A general discussion regarding path going forward was presented; with the understanding that the path is not yet defined – but the fundamental point at this time is to simply obtain the information.

Duran Stacy indicated that he would provide his email such that parties included in these minutes could reach directly to him regarding test tap dimensions. With Subject Line.

Scot Digby asked if there was someone from the bushing monitoring market segment (a manufacturer) as part of this TF.

Mario Locarno indicated that he has taken notes and will bring this up for discussion back at Doble.

Looking for information on existing on how a monitor will plug into a bushing? Or one particular provider has for adapters, or both?

Scot Digby: Not 100% certain, just wanted to make sure we had representation.

10. Moving 25 kV out of the ANNEX Discussion

David Stockton: David wanted to make sure “ All (voltages)are back in the body of the ANNEX” including the upper (voltage) ranges. “Are we updating the upper ranges as well.”

Durand Stacy: “I think they are back” in lieu of the 25 kV question.

Chair: “Yes, 25 kV is already there. It might be 15 kV you are thinking about”. And – “ we do not have the dimensions for 765 kV, dimension wise only up to 500 kV – we will probably go back to the MFG

Scot Digby asked that the scope be reviewed. Chair posted the Scope to all members.

11. 46 kV Bushing Discussion

The standing question is “how do we dimension.”

To do Lists:

- a. Duran Stacy; Accumulation of Bushing Test Tap dimensions from Bushing Manufacturers**
- b. Mario Locarno: Provide information regarding Bushing Monitoring Test Tap Connections & Adapters**

Chair: Motion to Adjourn?

Motion to Adjourn: Hugo Flores

Second: Duran Stacy Chair:

Any Objections?

None

Adjourned 10:16 am PST

Task Force C57.19.04
Standard Requirements for Bushings
above 5000A in Bus Enclosures
March 12, 2024 1:45-3:00 PM
Vancouver, BC Canada
 UNAPPROVED MINUTES

1. Welcome

Meeting was called to order at 1:46PM by Chair Scott Digby. Minutes recorded by Secretary Anthony Natale. Vice Chair is Rich von Gemmingen.

2. Membership

As this is the first meeting of this TF, no prior membership list exists. 34 people attended, of which 23 requested membership.

Last Name	First Name	Company Name	Member
Abbas	Mubarak	Siemens Energy - HSP	
Abdalla	Isaac	HICO America	
Bautista	Paulo	Enmax	
Beaster	Barry	H-J Family of Companies	Yes
Bradshaw	Jeremiah	Bureau of Reclamation	
Brown	Duane	Measurements International	
Cruz Valdes	Juan Carlos	Prolec GE Internacional	Yes
DelRio	Arturo	Siemens Energy	Yes
Digby	Scott	Duke Energy	Chair
Door	Jeffrey	H-J Family of Companies	Yes
Flores	Hugo	Hitachi Energy	Yes
Fu	Yao	BC Hydro	
Gamboa	Jose	H-J Family of Companies	Yes
Ghafourian	Ali	H-J Enterprises	
Hermann	Florian	Trench France	Yes
Kaineder	Kurt	Trench Austria	Yes
Lange	Nathan	Siemens Energy - HSP	
Locarno	Mario	Doble Engineering Co	Yes
Mani	Kumar	Duke Energy	Yes
Mikulecky	Filip	Koncar Power Transformers - Siemens	Yes
Natale	Anthony	HICO America	Secretary
Pollaro	Dominic	NASS	Yes
Posadas	Daniel	Prolec GE	
Riopel	Sebastien	Electro Composites Inc.	Yes
Spitzer	Tommy	City Transformer Service Co	Yes
Stacy	Fabian	Hitachi Energy	Yes
Stockton	David	Stockton Business Consulting	Yes
Thomas	Scott	Hitachi Energy	Yes

Vermette	Yves	Electro Composites Inc.	Yes
vonGemmingen	Richard	Dominion Energy	Vice-Chair
Webb	Matthew	GE Vernova	Yes
Whitten	Christopher	Hitachi Energy	Yes
Zambrano	Jose	Siemens Energy - HSP	
Zhang	Gigi	HICO America	

3. Agenda

Agenda was presented.

4. Approval of Minutes

There are no prior meeting minutes to approve.

5. Call for Patents, IEEE Copyright Policy, Member Behavior

Slides were shown. No essential patents were identified.

6. Document History

The Chair reviewed the history of the document.

7. Title, Scope, and Purpose Discussion

- The Chair noted that the previous working group had agreed on a request to change “in” to “located within” in the document title but it the change was never made so should be made now.
- Sebastien Riopel asked whether the title needed a reference to “liquid-immersed” power transformers. Ultimately it was deemed unnecessary since it’s included in the Scope
- “Liquid-filled” will be changed to “liquid-immersed” in the Scope
- Sebastien Riopel recommended that “thermal” be added to the list of electrical, dimensional, and related requirements since that’s one of the main reasons the documents was created.
- Hugo Flores recommended it be placed second in the list between electrical and dimensional.
- The document does not currently have a Purpose and was deemed unnecessary.
- A motion was made by Hugo Flores to use the revised Title and Scope wording to request permission from the Bushing Subcommittee to submit a PAR.

Motion: That the Bushing SC approve the work of the TF and provide the TF Chair consent to proceed with submittal of the PAR with the Title and Scope as unanimously approved by the TF and as stated below:

Title:

IEEE Standard for Performance Characteristics and Dimensions for High Current Power Transformer Bushings with Rated Continuous Current in Excess of 5000 A located within Bus Enclosures

Scope:

This standard covers the electrical, thermal, dimensional, and related special requirements for high current rating power transformer bushings located within bus enclosures that have rated continuous current in excess of 5000 A. Bushings covered by this standard are intended for use as components of liquid-immersed transformers including, but not limited to, generator step-up (GSU) transformers.

- Seconded by Kumar Mani.
- Motion carries with unanimous approval.

8. General Discussion

- Question was asked by Art DelRio whether any reference to new technology bushings like RIF or RIS needs to be included. The Chair stated that 19.04 does not address bushing technologies and the question should be referred to 19.00

9. Next Steps

- Develop Agenda for Fall 2024 in St. Louis
- Feedback from bushing manufacturers or their purchasers and utilities specifying the standard are needed.

- The TF Chair indicated that he would facilitate the requisite motion at the upcoming Bushing SC meeting to obtain approval of the SC to proceed with PAR submittal as recommended by the TF.

10. Adjournment

- Meeting was adjourned at 2:33 pm.

IEEE C57.19.100

Guide for Application of Power Apparatus Bushing WG

Minutes of the 2024 Spring Meeting

Monday, March 11, 2023- 3:15-4:30 PM

Hyatt Regency; Vancouver, BC Canada Regency E/F (BR)

Tommy Spitzer– Chair

Durand Stacy – Secretary

The WG met on Monday, March 11, 2023, at 3:15 PM in the Regency E/F (BR)

1. Welcoming and Call for Patents, Copyrights

- The meeting was called to order at 3:15 PM by the WG Chair.
- The call for potentially essential patents and copyright issues was made, and none were reported.

2. Quorum

- A total of 44 participants: 11 members and 33 guests.
- 11 Members of the 21 WG Members were present, and a quorum was reached.

3. Call for approval of agenda.

- 3.1. The motion was made by Sebastien Riopel Electro Composites ULC and seconded by Brad Staley.

3.2.

4. Call for approval of the Fall Kansas City MO meeting minutes

- 4.1. The motion was made by Brad Staley and seconded by Mario Locarno Doble Engineering Co.

5. Reconsolidation document

- Document “CommentProposalForm Spr 2024 - R1.xls”
 - 4 of the 7 comments were accepted
 - 3 of the 7 comments will need additional information. Please see “CommentProposalForm Spr 2024 - R3”

6. New business:

- 6.1. Mathew Weisensee PacifiCorp raised the concern that the guide does not address the rise in temperature of the cover/ turret and other objects attached to the bushing during overload conditions. He stated that he observed the cover/ turret area around the bushing reaching temperatures as high as 135°C during the overload test. It was suggested to add a list of areas to consider when evaluating overload conditions as they relate to bushing selection and transformer design. Tommy Spitzer has agreed to put together some thoughts and to circulate them with the group.

7. Call to Adjourn the meeting.

7.1. The motion was made by Sebastien Riopel Electro Composites ULC and seconded by Shibao Zhang PCORE Electric.

8. The meeting was adjourned at 4:30 PM.

Next IEEE WG Meeting

Fall 2024 – ST LOUIS, MISSOURI, USA, OCTOBER 27 – 31, 2024

Respectfully submitted,

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

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

First Name	Last Name	Company	Member
Mubarak	Abbas	Siemens Energy	
Robert	Allison	Dominion	
Barry	Beaster	H-J Family of Companies	
Jon	Bender	W.E. Gundy	
Juan Carlos	Cruz Valdes	Prolec GE	
Pouneh	Davoudi	Delta Star	
Sami	Dubass	EPRI	
J. Arturo	Del Rio	Siemens Energy	X
Jeffrey	Door	H-J Family of Companies	
Jesse	Duffy	Nashville Electric	
Eric	Euvrard	RHM International	X
Patrick	Foster	Siemens Energy	
John	Fragor	IFD Technologies	
Orlando	Giraldo	H-J Family of Companies	
Jose	Gamboa	H-J Family of Companies	
Ismail	Guner	Hydro-Quebec	
Kevin	Hampton	Siemens Energy	
Florieu	Herman	Trench	
Kurt	Kaineder	Siemens Energy	
Egon	Kirchenmayer	Siemens Energy	X
Mavel	Kovnaoski	Polycast	
Nathan	Lange	Siemens Energy	
Mario	Locarno	Doble Engineering Co.	X
Robert	Middleton	RHM International	X
Kelly	Naunton	BC Hydro	
Ivan	Novno	Konear	
David	Olan	BC Hydro	
Giraldo	Orlando	H-J Family of Companies	

Attendance and status:

Annex A, Appendix D

First Name	Last Name	Company	Status
Murarak	Abbas	Siemens Energy	Guest
Alex	Alahmed	Evergy	Guest
Barry	Beaster	H-J Family of Companies	Guest
Edwin	Betancourt	Siemens Energy	Guest
Vivek	Bhatt	Prolec GE	Guest
Juan Carlos	Cruz Valdes	Prolec GE	Guest
Samson	Debass	EPRI	Guest
Yasiu	Demip	Prolec GE	Guest
J. Arturo	Del Rio	Siemens Energy	Member
Scott	Digby	Duke Energy	Member
Huan	Dinh	Hitachi Energy	Guest
Jeffrey	Door	H-J Family of Companies	Guest
Jesse	Duffy	Nashville Electric	Guest
Salih	Durmus	Siemens Energy	Guest
Hassum	Elkussem	Siemens Energy	Guest
Eric	Euvrard	RHM International	Member
Essedoik	Ferdjallah	Siemens Energy	Guest
Jose	Gamboa	H-J Family of Companies	Guest
Andrew	Gregory	ITEC	Guest
Jean	Hernandez-Mejia	GT-NEETRAC	Guest
Kurt	Kaineder	Siemens Energy	Guest
Chrisloph	Kerschamboer	Siemens Energy	Guest
Nathan	Lange	Siemens Energy	Guest
Junho	Lee	Hyundai	Guest
Soyoung	Lee	Hyundai	Guest
Mario	Locarno	Doble Engineering Co.	Member
Tiffany	LUCAS	Prolec GE	Guest

BUSHING SC MEETING

IEC Liaison Report - Spring 2024

IEEE PES TRANSFORMERS COMMITTEE

Location: VANCOUVER

Kurt Kaineder



TC 36A Team and Working Groups

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

Type	Label	Description	Scope	Creation Date
Joint Maintenance Teams	JMT 9	DLMT: HVDC Bushings	To jointly revise the document IEC/IEEE 65700-19-03 "Bushings for DC application" with IEEE
 &nbsp;	2021-12-15
Joint Working Groups	JWG 7	Dimensional bushing standardization	To prepare the working draft of a Technical Report with the title LV-MV and HV Transformer bushings dimensional standardization.	2019-03-01
Joint ad-Hoc Groups	JAHG 8	Bushing Application Guide	To define a table of contents (or outlines) to be used as a starting point of a NP for an International standard document.
 &nbsp;	2021-10-05
Working Group	JWG 10	Bushing application guide	To develop an International Standard on bushing application guide	2024-01-11
Maintenance Teams	MT 5	MT for the revision of IEC 60137: Insulated bushings for alternating voltages above 1kV.	Revision of the standard IEC 60137 with review of the contents and extension of tables to cover new market technical requirements where necessary and possible.
 &nbsp;	2008-07-25
Maintenance Teams	MT 6	Bushings seismic qualification	IEC TS 61463:2016	2012-03-26

It was decided during the last Plenary Meeting that both **MT5** and **MT6** will submit a **call for expert late 2024** and start revision of the concerned documents during 2025



Work Program

Std.	Init.	Fcst. Publ. Date	Next Stage	Comment
IEC TS 63493-1 ED1 Transformer bushings dimensional standardization - Part 1: Medium voltage and low voltage bushings	2024-01	2025-12	CD	Changed from TR to TS
IEC TS 63493-2 ED1 Transformer bushings dimensional standardization - Part 2: High voltage bushings.	2024-01	2025-12	CD	Changed from TR to TS
IEC 63548 ED1 Bushings application guide Part 1: Bushing selection and installation	2024-01	2027-12	CD	Details on next slides New JWG 10
IEC/IEEE 65700-19-03 ED2 Bushings for DC application	2022-07	2025-06	2CD	See on next slides

A **Technical Specification (TS)** approaches an international standard in terms of detail and completeness but has not yet passed through all approval stages, either because consensus has not been reached or because standardization is seen to be premature.

Technical Reports (TR) focus on a particular subject and contain for example data, measurement techniques, test approaches, case studies, methodologies and



IEC 63548 ED1

Bushing application guide Part 1: Bushing selection and installation

- Questionnaire sent out: Establishment of new joint working group JWG10 - Bushing application guide with TC 14, and nomination of convenor

Result:

- Established **JWG 10** with TC 14 with an agreed title and task. The existing member of JAHG 8 will be transferred to JWG 10.
- The nomination of **Mr. Jean Christophe Riboud** as a convenor of SC 36A/JWG10 for the period of 2024-02-26 to 2027-02-25 has been approved by a simple majority of the P-Members voting.



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

- CD was sent out last Summer and comments collected in IEC and IEEE.
- CD resulted in 180 highly appreciated comments which since then has been dealt with by the working group and incorporated in the CDV document

Result:

- The CDV as well as the revised compilation of comments (CC) was submitted to the IEC central office last week and will subsequently be officially submitted to all IEC National Committees as well as IEEE for voting shortly. I.e. the working group has done its part for now and will wait for the results.

Appreciation from Lars Johnson - Please forward my sincere thanks for the valuable contribution to IEEE!



Revision to Low Frequency Tests (RLFT) – Ajith M. Varghese

Quorum: Achieved

MOM: Approved Agenda: Approved

1 PD in bushing & Venting during Induce test

- Revised text (addition to C57.12.90 Section 10.8.5) permitting venting of bushing when PD is suspected during induce was surveyed within Dielectric Test SC and RLFT during Q4'2023.
- Survey returned with 82 % approval rate.
- Comments were reviewed, voted and surveyed text was modified.
 - ❖ Minor changes to note 1
 - ❖ Moved note 3 to main body
 - ❖ Retained note 4, 5 and 6.
 - ❖ Deleted note 7
- TF approved modified text to move to Dielectric Test SC for addition to next revision of C57.12.90.



Motion

- The motion is for Dielectric Test SC approval for addition of text related to venting of bushing to next revision of C57.12.90 (Section 10.8.5)

Text approved by TF -RLFT 3/12/2024

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 and 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.

Cont'd



..Contd.

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.



IEEE PES TRANSFORMERS COMMITTEE

DIELECTRIC TEST SUBCOMMITTEE

The meeting was held at the Hyatt Regency, Vancouver, BC, Canada

Dielectric Tests Subcommittee		
Chair: Poorvi Patel	Vice-Chair: Thang Hochanh	Secretary: Diego Robalino
Room: Regency C/D	Date: Wednesday, March 13, 2024	Time: 11:00 am to 12:15 pm
Total DTSC Members: 154	Members present at the meeting: 96	Attendance according to sign in sheet: 196
Guests present: 100	Membership requested: 7	Membership accepted: 6
Members moved to Guest Status: 0		

Chair's Remarks

The SC Secretary welcomed members and guests to the spring 2024 meeting in Vancouver, BC. In absence of SC Chair, SC Vice-Chair leads the session briefly introducing the agenda for today's meeting. Explanation about the roster sheet provided to review e-mail address and provide any corrections to update the attendance list.

First, SC Secretary reviewed policies and procedures according to IEEE SA. 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 to approach the microphone for questions and comments during the meeting stating name and affiliation.

Future events:

2024 IEEE PES- T&D	May 6-9, Anaheim, CA
IEEE PES General Meeting	July 21-25, Seattle, WA
IEEE DEIS EIC 2024	June 2 – 6, Minneapolis, MN
IEEE PES Transformer Committee Meeting Fall 2024	October 27-31, St Louis, MO
IEEE PES Transformer Committee Meeting Spring 2025	March 23-27, Denver, CO

Next, SC Vice-Chair requested all TF and WG leaders to submit minutes on or before March 27th, 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 April 15, 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 - Standards Program Coordinator for the DTSC is looking after any questions related to PAR generation or extensions. Her contact information was provided for guests and members if questions arise.

Regarding WG and SC officer Training, it has become optional but highly recommended. IEEE SA's Antitrust, Competition, and Commercial Terms Policies remain mandatory. 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**

Regarding 'Memberplanet' – No update and we continue manually recording attendance in our meetings.

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**.

There is a new process for WGs to request an IEC standard using the IEC website and the link IEC [Products & Services Portal \(iec.ch\)](https://www.iec.ch) website.

- **Status of Active Standards**

Project	Title	Valid until	PAR Status
C57.127	Guide for the Detection of Acoustic Emissions from Partial Discharges	2028	WG Active (as stated during the meeting by Detlev Gross)
C57.160	Guide for the Elec. Measurement of PD in HV bushings and Instrument Transformers	2020	PAR 2023 Publishing process
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 2026
C57.161	Guide for DFR Measurements	2028	WG Inactive. TF Initiated
C57.168	Low-Frequency Test Guide	2034	WG inactive. Published
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
19 th – 20 th of March 2024	09 th of February 2024
06 th May of 2024	16th of April 2024
05 th of June 2024	

SC Secretary's Report

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).

- Total Attendees to DTSC F23 meeting: **220**
 - o Total Members attended: **109** (out of 175)
- Requested Membership: **18**
 - o Rejected Membership: **8**
 - o Approved Membership: **10**

FIRST NAME	LAST NAME
Camilo	Casallas
Marco	Espindola
Miguel	Garcia
Fernando	Leal
Juliano	Montanha
Khan	Qasim
Rodrigo	Ronchi

Kushal	Singh
Matthew	Sze
Barrett	Wimberly

- Change Status Member to Guest due to no compliance with membership attendance requirements:
35
 - o Membership to DTSC was reviewed 2 out of 3 or 3 out of 5. The same applies to keep member status in the SC.
- **Total Members for Fall 2023 meeting: 154**

A list of members was presented to the audience to establish a quorum during this meeting. Looking at the list of members, we requested to stand up for headcount.

The headcount was completed with over **90** members attending the meeting. **Therefore, the quorum was achieved.** The final review will be carried out against roster signatures.

Secretary addressed a previous question from Sanjib Som requesting clarification on the SC membership. For clarity of the SC guests and members the link to the Technical Committee Policies and Procedures was provided:

<https://grouper.ieee.org/groups/transformers/info/TC-PP-2-11-2019.pdf>

4.3.1 Requirements for Voting Members

These requirements do not apply to ex-officio voting members.

A voting member of the Sponsor, or a Responsible Subcommittee is required to attend 3 of the last 5 meetings.

Requirements for attaining and continuing membership include the following:

- a) Being a member in good standing of the IEEE Power & Energy Society (IEEE-PES) and IEEE Standards Association (IEEE-SA).
- b) Contributing regularly as a member of a Responsible Subcommittee and Working Group(s) during a two-year period.
- c) Being willing to devote time and effort to contribute to the advance of the art by:
 1. For Sponsor membership, regular attendance at Sponsor meetings and participation at the Subcommittee and Working Group level.
 2. For Responsible Subcommittee membership, regular attendance at Responsible Subcommittee meetings and participation at the Working Group level.
 3. Continued participation in Sponsor functions such as serving as an officer, liaison representative, Responsible Subcommittee member, or Working Group member.
 4. Membership in the IEEE Standards Association (IEEE-SA).
- d) When a voting member is absent for more than two consecutive scheduled regular meetings and fails to participate by correspondence, the voting member may be removed from Sponsor or Responsible Subcommittee membership, subject to a review of the circumstances by the respective committee officers

o Quorum, Approval of Minutes, and Agenda

Once quorum was established, SC Vice-Chair requested a motion to approve the agenda:

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

Chairperson requested a motion to approve the Fall 2023 minutes from Kansas City meeting:

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

Attendance Summary

	By Roster
Total Attendees	196
Total # Of Members	154
Members Present	96
Quorum Present	YES (62.3%)

SC Discussions and Motion passed.

New Business: No New business discussed

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

Secretary: Aniruddha Narawane

**Monday, March 11, 2024. Hyatt Regency, Vancouver, BC – Georgia A/B
(2) 11:00am – 12:15pm**

Minutes prepared by Aniruddha Narawane, Secretary

- Meeting called to order by the chair at 11:00
- Patent claims and copyright shown – no issues or questions were raised.
- No Quorum
- Eduardo Tolcachir presented the data. A question was asked about the duration of test for the data presented.
- There were discussions around the data shared, significance of consistency in test voltage and connections. Chair explained the necessity of consistency in connection type during testing and test voltage with reference to data examples.
- A question was asked if there is value in doing both IR and PF test- at Factory.
- Various sections containing parameters impacting the Insulation resistance were formed and chair requested for volunteers to provide data with reference to the parameters and perform analysis on the data.
- Volunteers:
- Section I
 - Marcos Ferreira
 - Zach Weiss
- Section II
 - Mario Alonso
 - Zach Weiss
 - Jesse Duffy
- Section III
 - Ali Nadarien
- Section IV
 - Ajith Varghese
 - Sanjib Som
 - Fernando Miguel Leal Ramirez
 - Jean Carlos Hernandez

- Jesse Duffy
- Meeting was adjourned at 12.15.
- Roaster Attendance Record
 - Total Guests & Members attendance = 81
 - Total Members = 51
 - Total attending members = 19
 - Requested Membership = 10

Sr. No.	Last Name	First Name	Email	S22 - Denver	F22- Charlott
3	Aikons	Tom	tom-aikons@vantransformer.com		
33	Delgado	Gabriel	gdelgado@invenergy.com		
38	Duffy	Jesse	jduffy@nespower.com		
42	Ermakov	Evgenii	evgeniiermakov@hitachienergy.com		
77	Leal	Fernando	ferleal@gmail.com		
113	Patel	Dipeshkumar	27dipesh@gmail.com		
137	Shaikh	Abdulmajid	ashaikh@deltastar.com		
150	Staley	Brad	brad.staley@leewardenergy.com		
168	Van Dreel	Cole	cvandreel@atclk.com		
175	Vyas	Pragnesh	pragnesh.vyas@sunbeltsolomon.com		

Last Name	First Name	Email	S24- Vancouver	Member(M)/Guest (G)
Abdalla	Isaac	iabdalla@hicoamerica.com	1	G
Aikons	Tom	tom-aikons@vantransformer.com	1	MR
Alonso	Mario	alonso.mario.ma@gmail.com	1	G
Avanoma	Onome	o.avanoma@outlook.com	1	M
Blaydon	Daniel	dblaydon@ieee.org	1	G
Bouty	George	gbouty@deltastart.com	1	G
Bradshaw	Jeremiah	jeremiah.l.bradshaw@ieee.org	1	G
Carr	Deniss	deniss.carr@ge.com	1	G
Chen	Binzhan	binzhan.chen@bchydro.com	1	G
Davis	Eric	esetdavis@aol.com	1	G
Delgado	Gabriel	gdelgado@invenergy.com	1	MR
Duffy	Jesse	jduffy@nespower.com	1	MR
Dutta Roy	Samragui	samragui.dutta_roy@siemens-energy.com	1	M
Elson	Eric	eelson@sdge.com	1	G
Ermakov	Evgenii	evgeniiermakov@hitachienergy.com	1	MR

Espindola	Marco	marco.a.espindola@hitachienergy.com	1	G
Ferreira	Marcos	mferreira@quanta-technology.com	1	M
Flores	Hugo	hugo.flores@hitachienergy.com	1	M
Foata	Marc	mfoata@reinhausen.com	1	G
Frye	Richard	richardfrye@eaton.com	1	G
Gara	Loren	lgara@shermco.com	1	G
Garcia	Eduardo	eduardo.garcia@ieee.org	1	G
Gardner	James	jmgardner@ieee.org	1	G
Gupta	Ravi	ravi.gupta@megger.com	1	G
Heiden	Kyle	kylejheiden@eaton.com	1	G
Heiuzig	Peter	peter.heiuzig@weidman-group.com	1	G
Hernandez	Jean Carlos	jh480@gatech.edu	1	G
John	John	john_john@vatransformer.com	1	M
Jonas	Ryan	ryan.jonas@pgn.com	1	G
Kessler	Stacey	stacey.kessler@ulteig.com	1	G
Leal	Fernando	ferleal@gmail.com	1	MR
Li	Eric	ERIC.LI@BCHYDRO.COM	1	G
Li	Jinming	jinming.li@bchydro.com	1	G
Locarno	Mario	mlocarno@doble.com	1	G
Loiselle	Luc	luc.loiselle2@tetrattech.com	1	G
Lopez	Ricardo	ricardol@efacec.com	1	G
Lopez Fernandez	Xose	xmlopez@uvigo.es	1	G
Marquardt	Bryan	bryan.marquardt@clevelandcliffs.com	1	G
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Montanhe	Juliano	juliano.montanhe@siemens-energy.com	1	G
Naderian	Ali	alinaderian@ieee.org	1	G
Narawane	Aniruddha	aniruddhasnarawane@eaton.com	1	Secretary
Natale	Anthony	anatale@hicoamerica.com	1	G
Neild	Kris	kris.neild@megger.com	1	G
Nims	Joe	jnims@allenhoshall.com	1	G
Olic	Mirna	mirna.olic@siemens-energy.com	1	G
Ortiz	Cuauhtemoc	cuauhtemoc.ortiz@gmail.com	1	G
Patel	Dipeshkumar	27dipesh@gmail.com	1	MR
Patel	Monil	monilpatell22@gmail.com	1	G
Reimer	Jonathan	jonathan.reimer@fortisbc.com	1	G

Reyes	Juan	juan.reyes@hitachienergy.com	1	G
Robalino	Diego	diego_robolino@ieee.org	1	Chair
Saad	Mickel	mickel.saad@hitchienergy.com	1	G
Sarkar	Amitabh	amitabh_sarkar@vatransformer.com	1	G
Sauer	Dan	dmsauer@eaton.com	1	G
Schmitt	Wolfgang	wolfgang.schmitt@ge.com	1	G
Sekhon	Harmanpreet Singh	hsekhon@ptitransformers.com	1	G
Shaikh	Abdulmajid	ashaikh@deltastar.com	1	MR
Slattery	Chris	cslattery@firstenergycorp.com	1	G
Snyder	Steven	slsnyder@ieee.org	1	G
Som	Sanjib	ssom@patransformer.com	1	M
Staley	Brad	brad.staley@leewardenergy.com	1	MR
Stechschulte	Kyle	kdstechschulte@aep.com	1	G
Sweetser	Charles	charles.sweester@omicronenergy.com	1	G
Tade	Sachin	stade@ptitransformers.com	1	G
Tanaka	Troy	ttanaka@burnsmcd.com	1	G
Tekin	Dervis	dervis.tekin@ge.com	1	G
Thiede	Andreas	a.thiede@highvolt.com	1	G
Tolcachir	Eduardo	ETOLCACHIR@TTE.COM.AR	1	M
Van Dreel	Cole	cvandreeel@atclk.com	1	MR
Vandermear	John	john.vandermear@bchydro.com	1	G
Vanderwall	Alwyn	alwyn.vanderwall@ecinsa.com	1	G
Varghese	Ajith	Ajith.Varghese@prolec.energy	1	M
Vyas	Pragnesh	pragnesh.vyas@sunbeltsolomon.com	1	MR
Wagner	John	jgwagner@aep.com	1	G
Waldrop	Mike	mwaldrop@mlgv.org	1	G
Wallach	David	david.wallach@duke-energy.com	1	M
Weiseusee	Matt	matthew.weiseusee@pacificorp.com	1	M
Weiss	Zachery	zweiss@weg.net	1	M
Welton	Drew	dwelton88@live.com	1	G
White	Joe	JOE.WHITE@powereng.com	1	G
Woods	Deanna	dwoods2@atcllc.com	1	G
Wright	Jeffrey	jwright@dualight.com	1	G

TF Revision to Low Frequency Dielectric Tests

Vancouver, BC, Canada Meeting – March 12, 2024 1:45-3:30pm PDT

Chair: Ajith Varghese

Vice Chair: Markus Schiessl

Secretary: Jason Varnell

1. The meeting was called to order at 1:45 PM.
2. 97 individuals were in attendance. A quorum was achieved with 33 of 48 total members present. 17 individuals requested membership; however, only 13 were given member status based on attendance and participation and will be added after the S24 meeting. 3 Members that were not present had missed 2 out of the last three meetings and will be moved to guest after the S24 meeting, which means there will be 58 members.
3. A motion was made by Steve Antosz (Stephen Antosz and Associates) and seconded by Fernando Leal (Prolec-GE) to approve the Spring 2024 meeting agenda. There were no objections to unanimous approval of the agenda. A motion was made by Kris Zibert (Allgeier, Martin and Associates) and seconded by Onome Avanoma (MJ Consulting) to approve the fall 2023 task force meeting minutes. There were no objections to unanimous approval of the fall 2023 task force meeting minutes.
4. PD in Bushings During Factory Testing
 - a. The chair reviewed the history of the topic and the October 30, 2023 dielectric test sub-committee survey results. The survey returned with 82% approval rate. The survey results were as follows:
 - i. Approved, No comments: 31
 - ii. Approved with comments: 9
 - iii. Disapproved: 7
 - iv. Abstain: 2
 - b. The chair provided a summary of each negative comment and opened the floor for discussion on each.
 - i. Discussion on Note 1 of the surveyed text: There was discussion on the term “partial vacuum” since one Egon Kirchenmayer stated that his experience indicates that the bushings are “under pressure”. There was some disagreement in which term best describes the conditions and therefore it was suggested to modify the text using “and/or” conditions instead of only “or” conditions. A vote was taken with the modified text. There were 18 in favor for modify Note 1 with the “and/or” statement. There

were zero against and zero abstentions. The revised note will remain in the document.

- ii. Discussion on Note 3 of the surveyed text: Negative survey comments wanted Note 3 to be deleted. Additionally, it was requested to clarify the term “parties”. It was agreed to replace the term “parties” with “manufacturer and purchaser.” There was a vote by task force members on whether or not to keep the revised note. 14 voted in favor of keeping the revised text, 0 voted in deleting the text and 4 abstained. The revised text will remain. Later, additional discussion came up regarding Note 3, in which it was observed that the note was actually normative since it gave requirements by using the term “shall”. The task force then voted 18 in favor of moving Note 3 out of the notes section and into the normative text of Subclause 10.8.5. There was 1 vote against and 0 abstention votes.
- iii. Discussion on Note 4 of the surveyed text: One of the negative SC survey comments requested to delete the note since it was argued that the bubble formation is part of the physics of OIP bushings and is not design factor. Another person stated that not all OIP bushings have issues with bubble formation. There were 18 in favor for keeping Note 4. There was one for removing it and zero abstentions. The note will remain.
- iv. Discussion on Note 5 of the surveyed text: One of the negative SC survey comments requested to delete the note since the field condition is not the same as the factory acceptance test condition. There were 21 in favor for keeping Note 5. There zero for removing it and zero abstentions. The note will remain.
- v. Discussion on Note 6 and 7 of the surveyed text: It was stated that Note 7 should be deleted since it was referring to the temperature rise test and “other tests”; however, this note is only in the induced voltage test Subclause and therefore will have little meaning or usefulness. Additionally, it was noted that leaving bushings unsealed during factory acceptance testing is not a practice allowed by bushing suppliers, and the note also had some redundancy with note 6. There were 23 in favor for deleting Note 7 and keeping Note 6 as-is. There were zero for keeping Note 7 and deleting Note 6. There were zero abstentions. The Note 7 will be deleted and Note 6 will be retained.
- vi. Dan Suer (Eaton Corporation) made a motion to take the revised text (copied below) to the dielectric tests subcommittee for a vote to later add it to C57.12.90. Detlev Gross (Power Diagnostix) seconded the motion. The motion passed with unanimous approval.

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 and 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.

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

- a. The Task Force did not meet in person during the week of the Spring 2024 IEEE Transformers Committee meeting.
- b. Don Ayers (Consultant) presented to the RLFT TF that the task force on PD testing of Class I Power Transformers agreed to a final draft for proposed changes to C57.12.00 and C57.12.90. Don Ayers made a motion to survey the proposed

changes to C57.12.00 and C57.12.90 for partial discharge testing of Class I power transformers to the RFLT and dielectric tests subcommittee. Detlev Gross (Power Diagnostix) seconded the motion. The motion passed with unanimous approval. Text to be surveyed is in Appendix A.

6. Task Force on PD Testing and Limits for DTR, Wind and Solar transformers

- a. Due to a lack of time in the RLFT, this task force gave a brief update of the work performed by their task force. Minutes from task force meeting are in Appendix B. The chair discussed the objectives of the task force, which included:
 - i. What is an accurate simulation and/or appropriate voltage level for transformers subjected to these applications which are built by distribution transformer manufacturers.
 - ii. Review studies done by end users on voltage levels in alternative energy applications
 - iii. Consult with Photo Voltaic and Wind inverter manufacturers on overvoltage recommendations.
 - iv. Depending on what is determined to be the appropriate test voltage, should transformer component manufacturers design components to pass at these levels or should they be bypassed for testing? Bypassing components takes time in distribution transformer factories that are building hundreds of units a day.
 - v. Is there a correlation to PD/Local Corona inherent in specific component use?
 - vi. What is the method/Process for performing a PD test on a typical Distribution class transformer?
 - vii. Consistency in test types - Design vs Other (user specified) test
- b. Several members of the attendance shared their opinion that the test should be a routine test for the Solar and Wind transformers, however it was shared by some manufacturers that this would have a considerable impact on the production cycle time, since the test would take a considerable amount of time.
- c. It was also mentioned that we need to equalize the methods and limits between the several standard applicable to this test, because as of right now, they are not aligned.

7. Old business

- a. The previous topic of contradictions within C57.12.90 and C57.12.00 related to the induced voltage test overvoltage factor was briefly discussed. The proposed changes was displayed and briefly summarized by Jason Varnell (Doble

Engineering). Jason Varnell will send a survey to the RLFT TF for comments prior to the F24 RLFT TF meeting.

8. New business

a. There was no new business.

9. The meeting was adjourned at 2:15 p.m. The next meeting will be in St. Louis, Missouri, USA at the Fall 2024 IEEE Transformers Committee Meeting.

Attendance Record

Role	First Name	Last Name	Company
Guest	Kayland	Adams	Prolec-GE Waukesha
Guest	Nabi	Almeida	Prolec-GE
Member	Stephen	Antosz	Stephen Antosz & Associates, Inc
Member	Elise	Arnold	SGB
Member	Javier	Arteaga	Hitachi Energy
Member	Onome	Avanoma	MJ Consulting
Member	Donald	Ayers	Ayers Transformer Consulting
Guest	Wallace	Binder	WBBinder Consultant
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	George	Bouty	Delta Star Inc.
Member	Jeffrey	Britton	Phenix Technologies, Inc.
Guest	Juan	Carrizales	Prolec GE
Guest	Eric	Davis	Consultant
Guest	Reto	Fausch	RF Solutions
Guest	Joseph	Foldi	Foldi & Associates, Inc.
Member	Raymond	Frazier	Ameren
Member	Rich	Frye	Eaton
Guest	Eduardo	Garcia Wild	Siemens Energy
Guest	Alexander	Gaun	Coil Innovation GMBH
Guest	Carlos	Gaytan	Prolec GE
Guest	Alireza	Gorzin	Black & Veatch
Member	Bill	Griesacker	Consultant
Member	Detlev	Gross	Power Diagnostix Consult GmbH
Guest	Peter	Heinzig	Weidmann Electrical Technology
Member	Sergio	Hernandez Cano	Hammond Power Solutions
Guest	Gary	Hoffman	Advanced Power Technologies

Member	Sramma	Hoffman	P&L
Member	Philip	Hopkinson	HVOLT Inc.
Guest	Chanmin	Jeong	HD Hyundai
Guest	Sheldon	Kennedy	Niagara Transformer
Member	Stacey	Kessler	ULTEIG ENGINEERS
Guest	Yeounsoo	Kim	MEPPI
Member	Egon	Kirchenmayer	Siemens Energy
Guest	Evan	Knapp	Eaton
Guest	Mathieu	Lachance	Omicron
Member	Mark	Lachman	Doble Engineering Co.
Guest	Andrew	Larison	Hitachi Energy
Member	Fernando	Leal	Prolec GE
Guest	Junho	Lee	HD Hyundai
Guest	Moonhee	Lee	Hammond Power Solutions
Guest	Samuel	Lewis	Hitachi Energy
Guest	Eric	Li	BC Hydro
Member	Gabriel	Mamede	Siemens Energy
Guest	Alberto	Martinez	WEG USA
Guest	James	McBride	JMX Services, Inc.
Member	Francis	Mills	Power Engineers
Member	Juliano	Montanha	Siemens Ltda
Member	Marta	Munoz	Hitachi Energy
Guest	Ali	Naderian	Metsco
Guest	Cuauhtemol	Ortiz	Power Transf
Guest	George	Partyka	PTI Transformers
Member	Monil	Patel	Pacific Gas & Electric Company
Member	Harry	Pepe	Phenix Technologies, Inc.
Member	Sylvain	Plante	Hydro-Quebec
Guest	Bertrand	Poulin	Hitachi ABB Power Grids
Guest	Ulf	Radbrandt	Hitachi ABB Power Grids
Guest	Juan	Reyes Perez	Hitachi Energy
Guest	Michael	Richardson	Ameren
Guest	Tim	Rocque	Prolec GE Waukesha
Member	Rodrigo	Ronchi	WEG-Voltran
Member	Hakan	Sahin	Virginia and Georgia Transformers
Member	Amitabh	Sarkar	Virginia Transformer Corp.
Guest	Gavret	Sarkinen	Exel Energy
Member	Daniel	Sauer	EATON Corporation
Vice-Chair	Markus	Schiessl	SGB
Member	Eric	Schleismann	Southern Company Services
Guest	Harmanseet	Selchon	PTI Transformers
Guest	Cihangir	Sen	Duke Energy

Guest	Aron	Sexton	Kinectrics
Member	AbdulMajid	Shaikh	Delta Star Inc.
Guest	Jaber	Shalabi	VanTran Industries, Inc.
Guest	Hemchandra	Shertukde	University of Hartford
Member	Christopher	Slattery	FirstEnergy Corp.
Member	Sanjib	Som	Pennsylvania Transformer
Member	Kyle	Stechschulte	American Electric Power
Guest	H. Allen	Steele	TVA
Guest	Andrew	Steineman	Delta Star Inc.
Member	Janusz	Szczechowski	Maschinenfabrik Reinhausen
Member	Matthew	Sze	OMICRON electronics Corp USA
Guest	Sachin	Tade	PTI Transformers
Guest	Jonathan	Tan	Northern Transformer
Guest	Andreas	Thiede	Highvolt Dresden
Member	Eduardo	Tolcachir	TTE S.A.
Chair	Ajith	Varghese	Prolec-GE Waukesha
Secretary	Jason	Varnell	Doble Engineering Co.
Member	Pragnesh	Vyas	Sunbelt-Solomon
Guest	John	Wagner	AEP
Guest	Mike	Waldrop	MLGW
Guest	David	Wallach	Duke Energy
Guest	Joshua	Watson	Nebraska Public Power District
Guest	Jeffrey	Wright	Duquesne Light Co.
Guest	Fei	Yang	Hitachi Energy
Member	Shibao	Zhang	PCORE Electric
Member	Kris	Zibert	Allgeier, Martin and Associates

Appendix A: TF Partial Discharge for Class I Transformers Survey Text

From C57.12.00

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

Maximum system voltage (kV rms)	Nominal system voltage ^{a, b} (kV rms)	Applied-voltage test ^c (kV rms)			Induced-voltage test ^d (phase to ground) (kV rms)	Winding line-end BIL ^{e, f} (kV crest)			Neutral BIL ^{g, h} (kV crest)	
		Delta or fully insulated wye	Grounded wye	Impedance grounded wye or grounded wye with higher BIL		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 10	Col 11
Part A - Distribution transformers:										
1.5	1.2 ^a	10	-	10	1.4	30			30	30
3.5	2.5 ^a	15	-	15	2.9	45			45	45
6.9	5 ^a	19	-	19	5.8	60			60	60
11	8.7 ^a	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, b} (kV rms)	Applied-voltage test ^c (kV rms)			Induced-voltage test ^d (phase to ground) (kV rms)		Winding line-end BIL ^{e, f} (kV crest)		Neutral BIL ^{g, h} (kV crest)	
		Delta or fully insulated wye	Grounded wye	Impedance grounded wye or grounded wye with higher BIL	Enhanced 7200 cycle	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.

From C57.12.90

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

10.7.1 Test duration

The induced-voltage test shall be applied for 7200 cycles, or 60 s, whichever is shorter.

10.7.2 Test frequency

As an induced-voltage test applies greater than rated volts-per-turn to the transformer, the frequency of the impressed voltage shall be high enough to limit the flux density in the core to that permitted by 4.1.6.1 of IEEE Std C57.12.00-2021. The minimum test frequency to meet this condition is given in Equation (27).

$$\text{Minimum test frequency} = \frac{E_t}{1.1 \pi E_r} \times \text{rated frequency} \quad (27)$$

where

E_t is the induced voltage across winding (V)

E_r is the rated voltage across winding (V)

10.7.3 Application of voltage

The voltage should be started at one quarter or less of full value and be brought up gradually to full value. After being held for the time specified in 10.7.1, it should be reduced gradually before the circuit is opened.

10.7.4 Grounding of windings

When a transformer has one end of the high-voltage winding grounded, the other windings should be grounded during the induced-voltage test. This ground on each winding may be made at a selected point of the winding itself or of the winding of a step-up transformer that is used to supply the voltage or that is connected for the purpose of furnishing the ground.

10.7.5 Need for additional induced tests

When the induced test on a winding results in a voltage between terminals of other windings in excess of the low-frequency test voltage specified in Table 3 or Table 4, as applicable, of IEEE Std C57.12.00-2021, the other winding may be sectionalized and grounded. Additional induced tests shall then be made to give the required test voltage between terminals of windings that were sectionalized.

10.7.6 Failure detection

Careful attention should be maintained for evidence of possible failure, such as an indication of smoke and bubbles rising in the insulating liquid, an audible sound such as a thump, a sudden increase in test circuit current, or an appreciable increase in partial discharge level. Any such indication should be carefully investigated by observation, by repeating the test, or by other tests to determine whether a failure has occurred.

10.7.7 Special induced voltage test for distribution and Class I power transformers with a wound core

This test to detect improper core grounding applies to distribution transformers and Class I power transformers, with a wound core, low-high winding construction, and having a high-voltage winding voltage of 25 kV (15 kV to ground) or greater. Note that this test is intended only for detection of inadequate core grounding issues and not for accessories like dead front bushings, tap-changers, current limiting fuses, or dual-voltage switches, which may have difficulty passing this test at 100 pC. The transformer may or may not contain such components. If the transformer fails the test with such components, the components may be removed or bypassed and the test re-run. The test shall be conducted on a transformer with functionally similar core grounding.

10.7.7.1 Minimum test duration and application of voltage

Partial discharge (PD) is to be measured as an apparent charge in picocoulombs (pC). One reading shall be made at the end of each interval. The minimum test durations and application of voltages are as follows:

- a) Voltage shall be raised to 100% of rated volts for 30 s, and PD shall be measured and recorded.
- b) Voltage shall be raised to 110% of rated volts for 30 s, and PD shall be measured and recorded.
- c) Voltage shall be raised to 150% of rated volts for 60 s, and PD shall be measured and recorded.
- d) Voltage shall be lowered to 140% of rated volts for 60 s, and PD shall be measured and recorded.
- e) Voltage shall be lowered to 130% of rated volts for 60 s, and PD shall be measured and recorded.
- f) Voltage shall be lowered to 120% of rated volts for 60 s, and PD shall be measured and recorded.
- g) Voltage shall be lowered to 110% of rated volts for 10 min, and PD shall be measured and recorded.

10.7.7.2 Test frequency

The test frequency shall be in accordance with 10.7.2.

10.7.7.3 Grounding of windings

Windings shall be grounded in accordance with 10.7.4.

10.7.7.4 Failure detection

The test is considered passed if PD recorded in step g) of 10.7.7.1 does not exceed 100 pC. Judgment shall be used in test intervals such that momentary excursions beyond 100 pC may be acceptable; however, at the end of step g) of 10.7.7.1, PD shall not exceed 100 pC.

NOTE—Normally, transformers will pass the test if they are equipped with outside core grounds and with shielded and grounded inside outer core loops. In cases where pass-fail is marginal at the 110% voltage level, it is useful to continue reducing voltage until partial discharge is extinguished. Core gassing results in bubbles between core laminations that push liquid out and leave only gas that ionizes at much lower voltages than the insulating liquid. Hence, core gassing usually results in partial discharge extinction well below rated voltage. Most other components in the transformer behave more linearly and do not persist with partial discharge at or below rated voltage.

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 based on each line terminal rated 34.5 kV and above. 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.

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 rated 34.5 kV and above the magnitude of the partial discharge level does not exceed 250 pC during the 1 h test period. For transformers rated below 34.5 kV, the magnitude of the partial discharge level shall be set by agreement between the purchaser and the manufacturer.
- b) For transformers rated 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, 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.

40.8.10.9 Induced-voltage test for Class II power transformers

40.8.10.9.1 General

Each Class II 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 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 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 4 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.

0.8.2 10.9.2 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 based on each line terminal rated 69 kV and above. 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.

10.8.310.8.6 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.

10.8.410.8.7 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.

10.8.510.8.8 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.

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.

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

Task Force on Partial Discharge Testing in Distribution, Wind and Solar Transformers - Vancouver - Spring 2024

This was the first meeting of the task force. We had **59** attendees and **25** indicated that they want to participate in the task force.

The meeting started at 9:30 on 3/11/2024. We had all attendants do a quick introduction and we started the discussion.

Andrew started giving a summary of the current standard requirements for PDs. Then dived into the details for C57.12.00, where it mentions the test is a design test. Moving onto C57.12.90, where it states that is acceptable to remove some components in case the test fails, and it's mentioned by the chair that this provision is not available in the other standards where PD is mentioned.

Then the details for Class II are discussed, where the limits are 250 pC. Then C57.159 is discussed the limit is 100 pC and refers to C57.12.01 (Dry-type Transformers), which requires ramping from to 180% then down to 130%.

A side-by-side comparison was then presented to the audience where it compares the different standards and their requirements.

The discussion then went into the components used in the transformers and their commonality in the Wind/Solar application and the fact that some of these components are known to generate PD/Corona which would impact the test results.

After sharing the information, the chair shared some intended goals for the TF and opened the discussion with the audience.

1. What is an accurate simulation and/or appropriate voltage level for transformers subjected to these applications which are built by distribution transformer manufacturers.
 1. Review studies done by end users on voltage levels in alternative energy applications
 2. Consult with Photo Voltaic and Wind inverter manufacturers on overvoltage recommendations.
2. Depending on what is determined to be the appropriate test voltage, should transformer component manufacturers design components to pass at these levels or should they be bypassed for testing? Bypassing components takes time in distribution transformer factories that are building hundreds of units a day.

3. Is there a correlation to PD/Local Corona inherent in specific component use?
4. What is the method/Process for performing a PD test on a typical Distribution class transformer?
5. Consistency in test types - Design vs Other (user specified) test.

Karl Jakob with Cargill shared his experience on DGA and how the PD affects this test. He asked if this was also a motivation for the TF. He mentions that FR3 has higher PD inception, and he is concerned about safety. He also asked whether the test being done simulates the application condition (inverter, etc).

Zach Weiss with WEG, he mentions that the 180% is too high for DT transformers and that historically, 130% should be more than enough for this type of transformer. He also mentions that it's very easy to reach 100 pC with only the active part, but when you add all the components in this type of transformer. There is correlation between PD and components. Their method of testing is by-passing the components. He also shared that from his experience the PD test is a protection for the mfg.

Harman Singh with PTI – He mentions that the initiative is a need for the industry and that for the users is very important to have clearly specified the requirements for the PD. He then mentions that looking at the important components of the test and that the survey proposed is a good start but that it will be difficult to find a solution for all the different applications. He encouraged everyone to move forward with this work.

Carlos Gaytan with PGE – He mentions that some customers require that more than one unit is tested and that doing the test together with induced test above 140% causes increase of time for testing in high production environments. He mentions about the difference of the different requirements in the standards and shares details about a single phase transformer test where this test is done to validate the grounding of the core. He volunteers to participate in this TF to clarify all the test requirements.

Wolfgang Schmitt from Schneider Electric – He mentions that C57.12.90 already mentions some potential voltages from phase to ground and that he believes some manufacturers still do not understand what that means. So, he proposes that the first step is to really understand the results that come from the test and also that he believes that if the PD test was routine it would help in detecting Hydrogen generation in inverter transformers. He shared also that when speaking about the test level it's necessary to understand which are the voltage levels and mainly the voltage phase to ground. In his opinion, the phase-to-phase voltage is not the most critical for the PD detection. He mentions that from a user POV, if the PD test was not required by the customer at the time of purchase, and later is tested in the field it will have higher PD than the requirement does the unit fail?

Brian Sparling with Kinectrics – He requested clarification on the type of transformers and understood that all types of transformer are included. He mentions that from his experience,

having PD test should be mandatory for Solar type transformers because it would help to detect manufacturing defects.

Peter Heinzig with Weidmann - Recommended to have partial discharge test mandatory for all the transformers because this would allow to detect failures that damage the insulation and affect the transformer life. He also mentions about the ground and earthing practices and how the testing voltage should follow those requirements.

Paul Weyandt with Schneider Electric – He mentions that a lot of the components that are used do not have this type of test and the level of voltage that they can withstand and that this needs to be considered in the standard

Alexsander Levin with Weidmann – He asked for clarification if we are talking about the general distribution transformer versus the special application transformers (solar and wind) and the Chair mention that initially the idea was to compare the general DT with the other application. He mentions that the scope needs to be clearer where we want or not to change the standard DT transformer.

Volodymyr Prychodko with ZTZ Services – asked if we are testing the transformer only during the FAT or also during the operation condition. He is asking if there is also the intention to monitor PD during operation.

After this, the meeting was adjourned with the feedback from the Chair that the information and the discussed topics would be shared with the main TF.

Name	Position	Email	Rooster Spring 2024
Ajith Varghese	Guest	Ajith.Varghese@prolec.energy	n
Aleksandr Levin	Member	aleksandr.levin@weidmann-group.com	y
Andreas Thiede	Guest	a.thiede@highvolt.com	y
Andrew Larison	Chair	andrew.t.larison@hitachienergy.com	y
Aron Sexton	Guest	aron.sexton@kinectrics.com	y
Barroh Winberh	Guest	barroh.winberh@ge.com	y
Binzhan Chen	Guest	binzhan.chen@bchydro.com	y
Brad Greaves	Guest	brad.greaves@weidmann-group.com	y
Brian Sparling	Member	brian.sparling@kinectrics.com	y
Carlos Gaytan	Member	carlos.gaytan@prolec.energy	y
Chris Steineman	Guest	csteineman@hubbel.com	y
Christopher Slattery	Member	cslattery@firstenergycorp.com	n
Dan Sauer	Member	dmsauer@mtu.edu	n
Danitz Berler	Member	berlerdanitz@ztzservices.us	y
David Komm	Member	dkomm@hammondpowersolutions.com	y
Deniss Carr	Guest	deniss.carr@ge.com	y
Diego Robalino	Guest	diego.robalino@megger.com	y
Dominique Bolliger	Member	d.bolliger@hvtechnologies.com	y
Eloy Gasperin	Guest	mistras	y
Eric Davis	Guest	esctdavis@aol.com	y
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Mathieu Lachance	Guest	mathieu.lachance@omicronenergy.com	y
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Michael Gonzalez	Guest	michael.x.gonzales@scc.com	y
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Onome Avanoma	Member	o.avanoma@outlook.com	n
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Yaw Nyanteh	Guest	yaw.nyanteh@hyosung.com	y
Zach Gagne	Guest	zach.gagne@ifdtech.com	y
Zach Weiss	Member	zweiss@weg.net	y

Task Force on Revision of Impulse Tests

Chair: Sylvain Plante

Vice Chair: Daniel Sauer

Vancouver, BC, Canada, Spring 2024

Unapproved meeting minutes

The TF met on March 12th, 2024, from 08:00 am to 09:15 am.

Twenty-seven (28) members and seventy-two (72) guests attended the meeting (see attached attendance list). Thirty-four (34) Guests were attending for the first time the Task Force. Twenty-two (22) guests requested membership but only Thirteen (13) are eligible to have attended at least 2 of the last 3 meetings. After this meeting, thirteen (13) 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 08:00 am.

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 53 members was required, we had 27 after third request of 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 Onome Avanoma.

The F23 virtual meeting minutes have been approved unanimously. Motion has been made by John John and was seconded by David Wallach.

The first item of business was related to the results of a survey related to a proposal made by Ajith Varghese regarding the phase-to-phase switching impulse clause 10.2.4. This proposal is to add some text in the clause needed when the switching impulse is performed as an option and not mandatory. During last meeting in Kansas City, the TF has requested the Chair to make a proposal following the result of the survey.

After some discussion, the following text has been proposed to be added to clause 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."

It has been proposed by Ajith Varghese and seconded by Stephen Antosz to send the text to the Dielectric Test Sub Committee for vote. Motion has been unanimously approved.

A new business has been bring to the TF regarding the current sensitivity when for chopped wave.

A motion to create a TF to investigate the requirement for sensitivity of current measurement during chop wave compare with full wave lightning surge has been made by Jim McBride and second by Dan Sauer. Motion has been unanimously approved. Volunteer were Jim McBride, Stephen Antosz, Sylvain Plante and Dan Sauer. Dan will call the meeting.

Another new business has been brought by Jason Varnell regarding the need to compare only last lightning curve with the reduce. Detail information will be sent by E-mail for study during next meeting.

The meeting adjourned at 09:15 am on March 12th , 2024.

The next meeting is planned to be held in St-Louis, Missouri, October 27-31, 2024.

Minutes wrote by:

Sylvain Plante, Eng.

TF Chair

April 2nd , 2024

Attendance Record

Role	First Name	Last Name	Company
New Guest	Isaac	Abdalla	
Member	Kayland	Adams	GE Prolec
Member	Stephen	Antosz	Stephen Antosz & Associates, Inc
member	Javier	Artega	
Member	Onome	Avanoma	MJ Consulting
New Guest	sean	barker	
Member	William	Boettger	Boettger Transformer Consulting LLC
Member	Dominique	Bolliger, Ph.D.	HV TECHNOLOGIES, Inc.
Guest	Jeffrey	Britton	Phenix Technologies, Inc.

Guest	Juan Alfredo	Carrizales	Prolec GE
Member	camilo	casallas	
Guest	Vivian	Chan	Hitachi Energy
Guest	Eric	Davis	Consultant
Member	Gabriel	Delgado	Invenergy
Guest	Don	Dorris	Nashville Electric Service
New Guest	Jesse	Duffy	
Member	Janko	Dzodan	Koncar
New Guest	Eric	Elson	
New Guest	Miguel	Fernandez	
Member	Raymond	Frazier	Ameren
Member	Richard	Frye	EATON Corporation
New Guest	Dragana	Gasic	Koncar
Guest	Jeffrey	Gragert	Xcel Energy
Member	Peter	Heinzig	Weidmann Electrical Technology
New Guest	Kyle	Helden	
Member	Giovanni	Hernandez	
Member	Saramma	Hoffman	PPL
Member	saif	Hossain	Trench limited
New Guest	Chanman	Jeong	
Member	John	John	Virginia Transformer Corp.
New Guest	Jerzy	Kazmierzak	
New Guest	Stacey	Kessler	
New Guest	Yeounsoo	Kim	
Member	Evan	Knapp	Eaton corp
New Guest	Matija	Koprivnjak	Koncar dst
Member	Mark	Lachman	Doble Engineering Co.
Member	Fernando	Leal	Prolec GE
Member	Moonhee	Lee	Hammond Power Solutions
Member	Junho	Lee	Hyundai Electric
New Guest	Samuel	Lewis	
New Guest	Weijun	Li	
New Guest	Ricardo	Lopes Mamede	
New Guest	Alberto	Martinez	
Member	James	McBride	JMX Services, Inc.
New Guest	Gabriel	Menede	
Member	Francis	Mills	Power engineer
Member	Juliano	Montanha	Siemens Energy
New Guest	Rhea	Montpool	
Guest	Martha	Munoz	Hitachi Energy
Member	David	Murray	Tennessee Valley Authority

New Guest	Alireca	Nadenriar	
New Guest	anthony	Natalle	
New Guest	Kris	Neild	
New Guest		ortiz	
Guest	George	Partyka	PTI Transformers
New Guest	Monil	Patel	
Guest	Harry	Pepe	Phenix Technologies, Inc.
Chair	Sylvain	Plante	Hydro-Quebec
New Guest	Crhritoph	Ploetner	
Guest	Klaus	Pointner	Trench Austria GmbH
Member	Jarrood	Prince	ERMCO
New Guest	Juan	Reyes	Hitachi Energy
New Guest	Michael	Richardson	Ameren
New Guest	Time	Rocque	
New Guest	Matthew	S	
Member	Hakan	Sahin	Virginia/Georgia Transformer
Vice-Chair	Daniel	Sauer	EATON Corporation
Guest	Eric	Schleisman	Southern Company Services
Guest	Alfons	Schrammel	Siemens Energy
New Guest	Harmandret	Sekhon	
Member	Cihangir	Sen	Duke Energy
Member	Mike	Shannon	REA Magnet Wire
Guest	Michael	Sharp	Trench Limited
Guest	Hemchandra	Shertukde	University of Hartford
Member	Christopher	Slattery	FirstEnergy Corp.
Member	Sanjib	Som	Pennsylvania Transformer
Member	Kyle	Stechschulte	American Electric Power
Guest	Hampton	Steele	Tennessee Valley Authority
Guest	Andrew	Steineman	Delta Star Inc.
Guest	Shankar	Subramany	KEMA
New Guest	Sachin	Tade	
New Guest	Johnathan	Tan	
New Guest	Troy	Tanaka	
New Guest	Andrewa	Thiede	
Member	Scott	Thomas	Hitachi Energy
Member	Eduardo	Tolcachir	Tubos Trans Electric S.A.
Member	core	van dreel	american transmission
New Guest	John	Vandermaar	
Member	Ajith	Varghese	SPX Transformer Solutions, Inc.
Member	Jason	Varnell	Doble Engineering Co.
New Guest	Peagnesn	Vyas	

New Guest	John	Wagner	
Guest	Mike	Waldrop	
Member	David	Wallach	Duke Energy
New Guest	Alan	Washburn	
New Guest	soshua	Watson	
Guest	Matthew	Weisensee	PacifiCorp
Guest	Rene	Wind	Siemens Energy
New Guest	Terry	Wong	
Member	Kris	Zibert	Allgeier, Martin and Associates

Task Force on Guide for DFR Test (C57.161)

Chair: Evgenii Ermakov

Secretary: Diego Robalino

Vancouver, BC, Canada, Spring 2024

Unapproved meeting minutes

DFR TF summary 1:45 PM Regency E/F

Total attendees = 37

Attended members = 15 (no quorum)

Requested membership = 11

TF Chair informed this is the last meeting for this TF.

- Patent claim review
- Copyright policy review

A summary of the work done in the previous meetings was discussed.

TF Chair presented as agreed during the last virtual meeting, the new Title and Scope for the revision of the C57.161 guide.

The purpose of the guide was not modified.

Title

“IEEE Guide for Dielectric Frequency Response Test for liquid-immersed transformers and reactors.”

Scope

This guide is applicable to Dielectric Frequency Response (DFR) measurement and analysis for liquid-immersed transformers and reactors. The guide includes recommendations for instrumentation, procedures for performing the tests, and techniques for analyzing the data. This guide can be used in both field and factory applications.

Purpose

The purpose of this guide is to provide the user with information that will assist in performing Dielectric Frequency Response measurements and interpreting the results from these measurements

With this information, the TF members voted affirmative during the virtual meeting carried out before the in-person meeting, to bring a motion to the DTSC to approve a new PAR to revise the C57.161 DFR guide.

Discussion of the TF guests and Members for the future revision (Upon PAR approval):

- TF Chair emphasized on:
 - o The revision should cover potential gaps and improve some of the sections.
 - o Add the link to IEEE Std C57.12.200™-2022 **Guide for the DFR Measurement of Bushings**
 - o Provide more detailed description of moisture estimation algorithm
 - o Further explanation to interpreting of GST measurements.
- Mario Locarno, mentioned that during the last meeting it was discussed the inclusion of alternative fluids. Literature review and data available.
- Ali Naderian commented – addressing GST measurements on distribution transformers with common neutral or grounded neutral.
- Charles Sweetzer – Other geometrical designs of core-coil assemblies to be considered.
- Open a discussion board for Comments – IEEE SA (ask Patrycja) – Suggested by M. Locarno

Meeting adjourned at 2:45 PM.

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Attendees to TF meeting

Role	First Name	Last Name	3/12/2024
Guest	Isaac	Abdalla	X
Guest	Dominique	Bolliger	X
Guest	Deniss	Carr	X
Guest	Vivian	Chan	X
Guest	Sami	Debass	X
Member	Gabriel	Delgado	X
Chair	Evgenii	Ermakov	X
Guest	Marco	Espindola	X

Guest	Marc	Foata	X
Guest	Lorne	Gara	X
Member	Rob	Ghosh	X
Member	Alireza	Gorzin	X
Member	Ismail	Guner	X
Member	Ronald	Hernandez	X
Guest	Giovanni	Hernandez	X
Guest	Egon	Kirchenmayer	X
Guest	Mark	Lachman	X
Guest	Fernando	Lagos	X
Member	Mario	Locarno	X
Guest	Kumar	Mani	X
Member	David	Murray	X
Member	Ali	Naderian	X
Guest	Mark	Newbill	X
Guest	David	Olan	X
Guest	Parminder	Panesar	X
Guest	Marilia	Ribeiro	X
Secretary	Diego	Robalino	X
Member	Rodrigo	Ronchi	X
Guest	Aron	Sexton	X
Guest	Markus	Soeller	X
Guest	Brad	Staley	X
Guest	Janusz	Szczechowski	X
Guest	Jonathan	Tan	X
Member	Eduardo	Tolcachir	X
Member	Drew	Welton	X
Member	Guang	Yuan	X
Member	Shibao	Zhang	X

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
Vancouver, March 12th, 2024, Room: Balmoral (3)

▪ Meeting Attendance

The working group met at 9:30 AM. 36 participants were in the room including 9 of the 20 members. Quorum was not met. Attendance list is shown at the end of the present minutes.

▪ Discussions

After the call for patent and showing the copyright policy, it was announced that after a few questions, the PAR was approved in February. Our work from now on will be conducted under an official working group. The schedule has been updated accordingly but the committee website is still pending an update.

Our intention to allow short presentations was validated with the subcommittee. They are beneficial to the entire group to establish a common ground on the technology as well as to introduce new methods. Such presentations can be scheduled within the working group with the following recommendations:

- Presentations must be sent in advance to the WG officers.
- Commercial references must be removed from the presentation.

Requests for presentation can be sent to officers (Detlev Gross, Jack Harley, David Larochelle).

It was mentioned that the document does not need major modifications and will surely be republished before the expiration of our PAR in 2028. The following remarks were made by group:

1. Add more details on what conditions usually trigger an acoustic measurement, for example PD levels, DGA, monitoring etc. (Markus Soeller)
2. Chapter 7.2 should provide more details on the injected signal properties. Is it possible to identify a procedure? (Markus Soeller)
3. Chapter 8.3 uses the term “calibrated” and should be reviewed (Markus Soeller)
4. Phase shift between electrical and acoustic PD could provide additional useful information. (Markus Soeller)
5. Acoustic cameras are used to detect if PD emitted from the surroundings and could be added to the section that introduces the parabolic acoustic sensors. (Detlev Gross)
6. Annex B on signal processing needs rework (Detlev Gross)
7. The section 9.1 refers to a severity threshold of 300 to 500 pC. Such range is dependent on the type of PD and its location. Should be reviews (Markus Soeller).
8. Table 1 could be updated with speed of sound in silicone and ester oil with references. (Mathieu Lachance)
9. Localization cases could be added to Annexe C. (Detlev Gross)

It was observed that a few individuals missed the meeting because of a schedule conflict with the Condition Assessment Guide working group (PC57.170). A schedule change will be requested.

▪ Adjournment

The meeting was adjourned at 10h30.

David Larochelle

o **Attendance List**

Last Name	First Name	Affiliation	Status
Barker	Sean	Hitachi Energy	G
Berler	Daniel	ZTZ Services	G
Bouty	Georges	Delta Star inc.	G
Chan	Vivian	Hitachi Energy	G
Chiang	Solomon	TGC	G
Gagné	Zach	IFD Technologies	G
Garcia	Eduardo	Siemens Energy	G
Gasperin	Eloy	Mistras	G
Grandbois	Luke	IFD Technologies	G
Gross	Detlev	Independent	C
Harley	John	FirstPower Group LLC	VC
Hollrah	Derek	Burns McDonnell	G
Juchem	Kevin	Hitachi Energy	G
Lachance	Mathieu	Omicron	G
Larochelle	David	NDB Technologies	S
Lewis	Samuel	Hitachi Energy	G
Lin	David	IFD Technologies	G
Lopez-Fernandez	Jose	Universidad de WGO	G
Mamede	Gabriel	Siemens Energy	G
Martinez	Alberto	WEG USA	G
Maryer	Robert	Siemens Energy	G
Mbouombouo	Mama	Hitachi Energy	G
Mendez	Omar	Prolec GE	G
Montanha	Juliano	Siemens Energy	G
Moreno	Andre	Siemens Energy	M
Newbill	Mark	Hitachi Energy	G
Ortiz	Cuauhtemol	Niagara Power	G
Reimer	Jonathan	Fortis BC	G
Rocque	Timothy	Prolec Energy	M
Shalkh	Abdulmajid	Delta Star inc.	M
Soeller	Markus	Power diagnostix Systems	M
Szczechowski	Janusz	Reinhausen	M
Sze	Matthew	Omicron	M
Tan	Jonathan	Northern Transformer	G
Todstrud	Mark	Dynamic Ratings	G

WG C57.138 - Recommended Practice for Routine Impulse Tests

Unapproved Meeting Minutes

Vancouver, BC, Canada, Spring 2024

Chair:	<u>Hakan Sahin</u>	Vice-Chair	<u>N/A</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>12 March 2024</u>	Time:	<u>3:15pm</u>

Location:	<u>Van Couver, BC, CA</u>

o Attendance:	o Members	<u>9</u>
o	o Guests	<u>23</u>
o	o Guests Requesting Membership	<u>4</u>
o	o Total*	<u>32</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, March 12, 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. 32 people were in attendance with 9 out of 15 members present. Quorum was **achieved.**
 - ii. Fall_23 unapproved meeting minutes and Spring_24 agenda were approved with no objections from the members.
 - iii. 4 attendees requested membership.

2. **Old Business**

WG continued to review the document from clause 6.2.3.5, where we had stopped at the end of Fall_23 meeting, thru clause 8.3.2, which is where we will continue from during the Fall_24 meeting. Proposed changes approved during the meeting. Below is the summary of the review comments.

6.2.3.5 – No change

6.2.3.6 – Update year of clause C57.12.90.

Move figure 19 so sentence with permissible are ahead of figure.

Figure 19 and 20 will be updated based on previous comments.

Clarify exciting current wording (excitation current)

6.3 – No change

7.0 - No change

7.1 – No change

7.2 – Typical value of capacitance should be increased to 10.0 μF from 2 μF . Votes were held with the members, no objections.

7.3 – No change.

7.3.1 – No change

7.3.2 – no change

8.0 – No change

8.1 – No change

8.2 – Instead of using specific clause number, list clause 10. Do not use the date in reference to the main clause. Remove the subclause numbers for the two test methods. No objections from the members on making the change.

8.3 – No change

8.3.1 – No change

8.3.2 – Remove “A digital system is changed by installing a new program.” Change to “A digital system can be adjusted by changing parameters in the software.” No objections from members.

Jim McBride and Dan Sauer to supply new waveform figures to replace figures 27 and 28.

Stopped review at Section 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: FALL 2024 MEETING ST LOUIS, MISSOURI, USA OCTOBER 27 – 31, 2024

4. Close of meeting

a. Meeting adjourned at 4:25pm

Submitted by: Hakan Sahin Date: 3/30/24

WG C57.138 Members and Guests list

Below membership as of Spring_24 meeting, which will be updated by the Fall-24 meeting

Last Name	First Name	Company	Status
Abdalla	Isaac	Hico America	Guest
Alonso	Mario	Georgia Transformers	Guest
Arnold	Elise	SGB	Guest
Avanoma	Onome	MJC	Guest
Beaudoin	Jason	Weidmann	Guest
Betancourt	Edwin	Siemens Energy	Guest
Binder	Wallace	Consultant	Guest
Bolliger	Alain	HV Technologies	Member
Bolliger	Dominiques	HV Technologies	Guest
Britton	Jeffery	Phenix Technology	Guest
Carr	Deniss	GE	Guest
Costa	Florian	Corimpex	Guest
CruzValdes	Juan Carlos	Prolec GE	Guest
Davis	Eric	Consultant	Guest
Derouen	Craig	ERMCO	Guest
Diaz	Cesar	Eaton	Guest
Dolloff	Paul	EKPC	Guest
Door	Jeffrey	H-J	Guest
Elliott	William	Prolec GE	Guest
Eshenroder	Jacob	Burns and McDonnell	Guest
Fausch	Reto	RF Solutions	Member
Fayad	Fadi	ASD	Guest
Flores	Hugo	Hitachi	Guest
Frye	Richard	Eaton	Member
Garcia	Eduardo	Siemens Energy	Guest
Gaytan	Carlos	Prolecge	Guest
Ghosh	Rob		Guest
Givaldo	Orlando	HJ Family	Guest
Hernandez	Giovannie	Virginia Transformers	Member
Himow	Monkin	Highvolt	Guest
Hochanh	Thang	PowerTech	Guest
Hopkinson	Phil	Hvolt	Member
Jarosz	Patrycja	IEEE SA	Guest
Jordan	Steve	TVA	Guest
Katz	Nathan	Pacificorp	Guest
Kennedy	Gael	GRKennedy&Associates LLC	Guest
King	Gary	Howard Industry	Guest
Knapp	Evan	Eaton	Guest
Lachman	Mark	Doble	Guest
Lambert	Jason	JST Power	Guest

Last Name	First Name	Company	Status
Leal	Fernando	Prolec GE	Guest
Lee	Moonhee	Hammond power solutions	Guest
Mani	Balakrishnan	ITEC	Guest
McBride	Jim	JMXHV	Member
Montanha	Juliano	Siemens Energy	Guest
Moreno	Andre	Siemens Energy	Guest
Morris	Tim	Walton EMC	Guest
Morrow	Gianetta	Crane Aerospace	Guest
Murray	David	TVA	Guest
Orozco	Polo	GE Grid Solutions	Guest
Owen	John	PowerTech Labs	Guest
Parrales	Herman	Prolec GE	Guest
Patel	Poorvi	EPRI	Member
Pepe	Harry	Phenix Technology	Guest
Plante	Sylvain	Hydro-Quebec	Guest
Plisic	Goran	Siemens Energy	Guest
Posadas	Daniel	CELECO	Guest
Pousset	Baptiste	Transformer Protection Co.	Guest
Prince	Jarrold	ERMCO	Guest
Rhett	Chrysler	ERMCO	Guest
Ronchi	Rodrigo	WEG	Guest
Sahin	Hakan	Virginia and Georgia	Member
Salinas	Fernando	Power Partners	Member
Sarkar	Amitabh	VA Transformer	Guest
Sauer	Dan	Eaton	Member
Schrammel	Alfons	Siemens Energy	Guest
seluargj	Pugual	VA Transformer	Guest
Sexton	Aron	Kinectrics	Guest
Shalabi	Jaber	Vantran	Guest
Sharp	Michael	Trench, LTD	Guest
Slattery	Chris	First Energy	Member
Snyder	Steve	Hitachi Energy	Guest
Som	Sanjib	PTI, LLC	Guest
Steele	Hampton	TVA	Guest
Stretch	Kerwin	Siemens Energy	Guest
Sze	Matthew	Omicron Energy	Guest
Thibolt	Mike	PG&E	Guest
Thomas	Scott	Hitachi Energy	Guest
Tillery	Tim	Howard Industry	Guest
Traut	Alan	Howard	Member
Verdell	Joshua	ERMCO	Guest
Waldrop	Mike	MLGW	Guest
Walker	David	MGM Transformers	Guest
Wallace	David	Mississippi State University	Member
Weisensee	Matt	Pacificorp	Guest
Wimberly	Barret	GE	Guest
Winter	Alexandar	Highvolt	Guest
Yun	Joshua	Virgina Transformer Corp	Member
Zanwan	Anand	Siemens Energy	Guest
Zhang	Shibao	PCORE	Guest
Ziger	Igor	Kovear	Guest

WG C57.160 PD in Bushings/PTs/CTs

Chair: Thang Hochanh
Vice Chair: Reto Fausch
Secretary: vacant

No meeting held in Vancouver. Document in publication process.

WG – Transformer Impulse Test Guide PC57.98

Unapproved Meeting Minutes

March 11, 2024 | 3:15pm – 4:30pm CST

Vancouver, BC Canada

Chair: Thang Hochanh
Vice Chair: Reto Fausch
Secretary: vacant

Meeting Attendance

The working group met at 3:15pm CST

There were 57 attendees 47 Guest
and 10 of 11 members present.

Quorum was achieved to conduct official business.

- The Minutes of Fall 2023 meeting in (Kansas City, MO, USA) had been approved as written.
 - o Motion made by Waldemar Ziomek and second by Fernando Leal.
- approve the Agenda for this meeting
 - o Motion made by Jeffrey Britton and second by Sylvain Plante .
- Call for patents
 - o No claims
- No copyright violations noted.
- **Discussion of the Draft Document**
 - o The following items were discussed the correction of Fig. 35 on Page 51 of the draft the labeling in the diagram of the test connection the – E/3 to – E/2, no comments and it was accepted as such
 - o In comment to figure C1 we added a new phrase
 - Sudden drop of voltage results in insufficient electric stress across the gap at the time of chop

- o In comment to figure C2 we added a new phrase
 - Changing the electronic trigger timing of the chopping gap may produce a chop. If this causes the chop time to be out of specification, it can be discussed between the customer and manufacturer.
- Those changes were approved by the WG with no comments
- The final version of the complete draft was then presented to the WG and ask for submission of it to the SC for Ballotting.
Motion made by Sylvain Plante and second by Sergio Hernandez
- WG ask for a 2 year extension of PAR to be submitted
 - Motion made by Waldemar Ziomek and second by Sylvain Plante

A CRG was formed with the following Volunteers

Waldemar Ziomek
Vivian Chan
Sergio Hernandez
James McBride

- Old business: None

New business: None

Adjournment: Motion made by Sergio Hernandez and second by Waldemar Ziomek

Thang Hochanh, Chair

Reto Fausch, Vice-Chair

Annex:

PC 57.98 - MEMBERS & Guests

MEETING - Fall 2023

Quorum

Total attendance: 57

Guests: 47

Members attending Spring 2023	
Oname	Avanoma
Dominique	Bolliger
Jeffrey	Britton
Reto	Fausch
Sergio	Hernandez Cano
Thang	Hochanh
Fernando	Leal
Gabriel	Mamede
Sylvain	Plante
Waldemar	Ziomek

Members	11
Memb. Present	10
Quorum	90.9%

Requested Membership	
James	McBride

Attendance Spring 2023	
Isaac	Abdalla
Mario	Alonso
Levant	Beser
Georges	Bouty
Deniss	Carr
Vivian	Chan
Jaroslav	Chorzepa
Richard	Frye
Didier	Hamoir
Peter	Heinzig
Martin	Himow
Miljenko	Hrwac
Patrycja	Jarosz
Evan	Knapp
Fernando	Lagos
David	Larochelle
Samuel	Lewis
Eric	Li
David	Liu
Luc	Loisette
Ricardo	Lopez
Xose	Lopez-Fernandez
Alberto	Martinez
Mama	Mbouombouo
James	McBride
Julian	Montanho
Ismael	Naja
Mark	Newhill
Cauhtemoc	Ortiz
Joel	Pacas
Parminder	Panesar
Harry	Pepe
Goran	Plisic
Jonathan	Reimer
Aron	Sexton
AbdukMajid	Shaikh
Ho Allen	Steele
Sachin	Tade
Jonathan	Tan
Andreas	Thiede
Eduardo	Tolcachir
John	Vandermmaar
Mike	Waldrop
Joshua	Watson
Barret	Wimberly
Malia	Zaman
Gigi	Zhang

Liaison Report – HVTT

(J. Britton)

- **Standards Activity:**
 - IEEE 1122 – IEEE Standard for Digital Recorders for Measurements in HV Impulse Tests
 - *Comment Resolution Completed (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 - Fall 2024, Atlanta GA (Hybrid)
-

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

**Vancouver, BC Canada
Tuesday March 12th, 2024
11:00 AM – 12:15 PM PDT
Balmoral (Level 3)**

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

- 1) Welcome and Chair's Remarks
- 2) Circulation of Attendance Sheets
 - Member count as indicated by signed attendance roster was 33 of 50 members; therefore, quorum was achieved. 60 Guests were present, 7 of which requested Membership. Total Attendance was 93. (Note: the room size was not sufficient for all Members and Guests)
- 3) IEEE Patent Policy Slides presented. There were no conflicts or patent claims.
- 4) Presentation and approval of meeting Agenda (motion by John John / second by Phil Hopkinson) and Minutes from Fall 2023 Meeting (motion by Amitabh Sarkar / seconded by Egon Kirchenmayer) – approved without opposition.
- 5) C57.142 Ballot and Comment Resolution – Jim McBride: The Chair presented a summary of the status of open comments before the ballot resolution group as follows:

Total Comments - 305
Comments Incorporated - 285
Remaining Comments to Address – 20
All Figures – Completed and Included thanks to Dr. Xose Lopez-Fernandez

The latest BRG document and link to the IEEE transactions paper
(<https://ieeexplore.ieee.org/document/9161400>) are posted on WG website.

- 6) Update on Switchgear Liaison TF - No Task Force meeting held as the Document is in Ballot Resolution. Dave Caverly could not be present at this meeting.

- 7) Mitigation Methods Task Force Update – Jim McBride / Phil Hopkinson:

Chair requested the TF meet remotely as soon as next week. An invitation will be sent out in the coming days.

- 8) New Business

The chair discussed the submission of statements by Bertrand Poulin regarding transformer **protection by use of internal surge arrestors** in Section 7.5.

A motion was made by Bertrand Poulin / seconded by Phil Hopkinson to include the submitted paragraph in the Guide.

Discussion followed: Phil Hopkinson stated that series resonances are most damaging to the windings. Bertrand Poulin stated that “everything magnetically couples to everything” inside of a transformer. The WG by and large agreed with these points. Egon Kirchenmayer suggested deleting the phrase “*prevents the excitation of natural frequencies*”, as this mitigation only dampens the voltage. Phil Hopkinson agreed this mitigation absorbs energy and provides damping; therefore, a motion was made by Jeffrey Britton / second by Ajith Varghese that the phrase “*reduces the amplitude of natural frequency oscillations*” be adapted. There was no opposition to the motion to include the amended statement and the motion carried without opposition.

The Chair presented prior comments from research by Jin Sim on STLI testing. Dharam Vir made a presentation and commented that in the past modeling was not possible, but modern software can model and predict stresses of a simulated STLI test. The content OF Dharam Vir’s presentation will be included within the meeting slides and posted to the WG website.

Phil Hopkinson commented per (Loren Wagenaar) that for 765kV BIL steep-front / long tail should still be considered. Bertrand Poulin agreed with the conclusions of the presentation. Christopher Johnson commented that certainly different models could yield different results and each manufacturer must determine the need for STLI testing independently.

Open discussion of possible mitigation methods summary:

Chair suggested tutorial panel at upcoming TC meeting and a possible technical report or IEEE transactions paper.

Per the last meeting, the WG will move ahead with a group presentation for a future tutorial. Phil Hopkinson suggested eventually incorporating the potential technical report

into perhaps an annex of a future version of C57.142. Joe Watson suggested as we move forward we allow the Dielectric Subcommittee to decide if a new TF should be formed to pass on the WG recommendations to the appropriate standards groups.

- 9) Presentation by Phil Hopkinson – Switching Mitigation Concepts. Will be posted on the WG website
- 10) Next Meeting – Fall 2024 in St. Louis, MO
- 11) Motion to Adjourn at 12:17 PM CDT made by JC Hernandez / seconded by Jeffery Britton with no opposition.

Role	Last Name	First Name	Company
Chair	McBride	James	JMX High Voltage
Vice-Chair	Lopez-Fernandez	Xose	Universidade de Vigo
Secretary	Melle	Thomas	HIGHVOLT
Member	Betancourt	Enrique	Prolec GE
Member	Boettger	William	Boettger Transformer Consulting
Member	Britton	Jeffrey	Phenix Technologies, Inc.
Member	Caverly	David	Trench Limited
Member	Garcia Wild	Eduardo	Siemens Energy
Member	Hopkinson	Philip	HVOLT Inc.
Member	John	John	Virginia Transformer Corp.
Member	Kirchenmayer	Egon	Siemens Energy
Member	Lee	Moonhee	Hammond Power Solutions
Member	Li	Weijun	Braintree Electric Light Dept.
Member	Montanha	Juliano	Siemens Energy
Member	Pepe	Harry	Phenix Technologies, Inc.
Member	Pointner	Klaus	Trench Austria GmbH
Member	Poulin	Bertrand	Hitachi Energy
Member	Roussell	Marnie	Entergy
Member	Sarkar	Amitabh	Virginia Transformer Corp.
Member	Sen	Cihangir	Duke Energy
Member	Sharp	Michael	Trench Limited
Member	Spurlock	Mike	Spurlock Engineering Services
Member	Varghese	Ajith	SPX Transformer Solutions, Inc.
Member	Verdolin	Rogério	Verdolin Solutions Inc.
Member	Vir	Dharam	Prolec-GE Waukesha

Member	Ziomek	Waldemar	PTI Transformers
Guest	Allison	Robert	Dominion Energy
Guest	Benach	Jeff	Megger
Guest	Bhatt	Vivek	Prolec-GE Waukesha
Guest	Bojan	Popovic	KPT
Guest	Bracum	Robert	KPT
Guest	Casallas	Camilo	Trench LTD
Guest	Digby	Scott	Duke Energy
Guest	Dolloff	Paul	EKPC
Guest	Dorpmanns	Luc	SMIT Transformatoren B.V.
Guest	Espindola	Marco	Hitachi Energy
Role	Last Name	First Name	Company
Guest	Fitzgerald	Sean	ComEd
Guest	Frazier	Raymond	Ameren
Guest	Gamboa	Jose	H-J Family of Companies
Guest	Gara	Lorne	Shermco
Guest	Garcia	Miguel	Hitachi Energy
Guest	Hakim	Shamaun	WEG Transformers USA Inc.
Guest	Hernandez	JC	Georgia Tech - NEETRAC
Guest	Hernandez	Giovanni	Virginia Transfomrer Corp.
Guest	Hoffman	Saramma	PPL Electric Utilities
Guest	Holifield	Thomas	Howard Industries
Guest	Hossain	Saif	Trench Limited
Guest	Howell	Logan	Hitachi Energy
Guest	Johnson	Christopher	Oncor
Guest	Katz	Nathan	Pacific Corp
Guest	Kennedy	Gael	GR Kennedy & Associates LLC
Guest	Kessler	Stacey	Ulteig Engineers
Guest	Khan	Qasim	Georgia Tech - NEETRAC
Guest	King	Gary	Howard Industries
Guest	Kiparizoski	Zan	Howard Industries
Guest	Leal	Fernando	Prolec GE
Guest	Lee	Junho	Hyundai Electric
Guest	Mani	Kumar	Duke Energy
Guest	Martinez	Alberto	WEG
Guest	McBride	Joseph	JMX High Voltage
Guest	Mikulecky	Filip	Siemens Energy
Guest	Munoz	Marta	Hitachi Energy
Guest	Naranjo	Volney	Megger
Guest	Natale	Anthony	HICO America
Guest	Nims	Joe	Allen & Hoshall, Inc.
Guest	Orr	Paul	NEMA
Guest	Pandza	Tihomir	Siemens Energy

Guest	Parkinson	Dwight	EATON Corporation
Guest	Partyka	George	PTI Transformers
Guest	Patel	Nitesh	Hyundai Power Transformers USA
Guest	Patel	Sanjay	SMIT Transformer Sales, Inc.
Guest	Pidcock	Jay	Ameren
Guest	Ploetner	Christoph	Siemens Energy
Guest	Prince	Jarrold	ERMCO
Guest	Radbrandt	Ulf	Hitachi Energy
Guest	Radu	Ion	Hitachi Energy
Guest	Raymond	Tim	EPRI
Guest	Reimer	Jonathan	Fortis BC
Role	Last Name	First Name	Company
Guest	Reyes Perez	Juan	Hitachi Energy
Guest	Richardson	Michael	Ameren
Guest	Rocque	Tim	Prolec GE Waukesha
Guest	Ronchi	Rodrigo	WEG-Voltran
Guest	Schleismann	Eric	Southern Company Services
Guest	Schrammel	Alfons	Siemens Energy
Guest	Sethi	Kabir	Hitachi Energy
Guest	Sharifi	Masoud	Siemens Gamesa Renewable
Guest	Sharpless	Samuel	Rimkus Consulting Group
Guest	Shertukde	Hemchandra	University of Hartford
Guest	Shull	Stephen	BBC Electrical Service, Inc.
Guest	Singh	Kushal	ComEd
Guest	Stacy	Fabian	Hitachi Energy
Guest	Steele	Hampton	Tennessee Valley Authority
Guest	Steineman	Andrew	Delta Star Inc.
Guest	Tabakovic	Dragan	Hubbell Power Systems
Guest	Tolcachir	Eduardo	TTE
Guest	Vermette	Yves	Electro Composites ULC
Guest	Vijayan	Krishnamurthy	PTI Transformers
Guest	Watson	Joe	JD Watson & Associates
Guest	Weatherbee	Eric	PCORE Electric
Guest	Weisensee	Matthew	PacifiCorp
Guest	Wong	Terry	Trench LTD
Guest	Yun	Joshua	Virginia Transformer Corp.
Guest	Zhang	Shibao	PCORE Electric

List of Attendees to the DTSC meeting of March 13, 2024

Role	First Name	Last Name	Company	3/13/2024
Guest	Isaac	Abdalla		X
Guest	Juan	Acosta	Ergon, Inc.	X
Guest	Mihir	Amin		X
Guest	Edmundo	Arevalo		X
Member	Javier	Arteaga	Hitachi Energy	X
Guest	Steven	Ashcraft		X
Member	Onome	Avanoma	MJ Consulting	X
Guest	Sean	Barker		X
Guest	Jason	Beaudoin		X
Guest	Jean-Noel	Berube	Rugged Monitoring Inc.	X
Guest	Edwin	Betancourt		X
Guest	Wallace	Binder	WBBinder Consultant	X
Member	Daniel	Blaydon	Baltimore Gas & Electric	X
Member	William	Boettger	Boettger Transformer Consulting LLC	X
Guest	Sanket	Bolar	Oncor Electric Delivery	X
Guest	George	Bonty		X
Guest	Jeremiah	Bradshaw	Bureau of Reclamation	X
Member	Jeffrey	Britton	Phenix Technologies, Inc.	X
Guest	Deniss	Carr		X
Member	Juan Alfredo	Carrizales	Prolec GE	X
Member	Juan	Castellanos	Prolec GE	X
Guest	Vivian	Chan		X
Guest	Eunyoung	Cho		X
Guest	Rhett	Chrysler	ERMCO	X
Guest	Lian	Conway		X
Member	Juan Carlos	Cruz Valdes	Prolec GE	X
Guest	Marcos	Czernorecki		X
Member	Eric	Davis	Burns & McDonnell	X
Guest	Pouneh	Davoudi	Delta Star Inc.	X
Member	Sami	Debass	Electric Power Research Institute (EPRI)	X
Guest	Gabriel	Delgado		X
Guest	Scott	Digby	Duke Energy	X
Guest	Nikolaus	Dillon	Dominion Energy	X
Member	Huan	Dinh	Hitachi Energy	X
Guest	Luc	Dorpmanns		X
Guest	Jesse	Duffy		X
Member	Samraghi	Dutta Roy	Siemens Energy	X
Member	Evgenii	Ermakov	Hitachi Energy	X
Member	Marco	Espindola	Hitachi Energy	X

Member	Reto	Fausch	RF Solutions	X
Guest	Miguel	Fernandez		X
Guest	Marcos	Ferreira	Bonneville Power Administration	X
Member	Bruce	Forsyth	Bruce Forsyth and Associates PLLC	X
Member	Raymond	Frazier	Ameren	X
Guest	Rich	Frye	EATON Corporation	X
Guest	Jose	Gamboa	H-J Family of Companies	X
Member	Miguel	Garcia		X
Member	Rob	Ghosh	General Electric	X
Guest	Orlando	Giraldo	H-J Family of Companies	X
Guest	Alireza	Gorzin		X
Member	Bill	Griesacker	Duquesne Light Co.	X
Member	Detlev	Gross	Power Diagnostix Consult GmbH	X
Guest	Ravi	Gupta		X
Member	John	Harley	FirstPower Group LLC	X
Guest	Kyle	Heiden	EATON Corporation	X
Member	Ronald	Hernandez	Doble Engineering Co.	X
Member	Jean Carlos	Hernandez		X
Vice-Chair	Thang	Hochanh	Surplec Inc.	X
Member	Saramma	Hoffman	PPL Electric Utilities	X
Guest	Ryan	Hogg	Bureau of Reclamation	X
Guest	Derek	Hollrah	Burns & McDonnell	X
Guest	Traci	Hopkins		X
Member	Philip	Hopkinson	HVOLT Inc.	X
Guest	Miljenko	Hrkac		X
Guest	Patrycja	Jarosz		X
Guest	Marion	Jaroszelski		X
Guest	Chanmin	Jeong		X
Member	John	John	Virginia Transformer Corp.	X
Guest	Christopher	Johnson		X
Member	Kurt	Kaineder	Siemens Energy	X
Guest	Sergiur	Kapka		X
Member	Jerzy	Kazmierczak	Hitachi Energy	X
Member	Sheldon	Kennedy	Niagara Transformer	X
Member	Stacey	Kessler	TC Energy	X
Guest	Yeounsoo	Kim		X
Member	Egon	Kirchenmayer	Siemens Energy	X
Guest	Dmitriy	Klempner	Southern California Edison	X
Guest	Evan	Knapp	EATON Corporation	X
Guest	Anton	Koshel	Delta Star Inc.	X
Guest	Rafal	Kowalski		X
Guest	Fernando	Lagos		X
Guest	Andrew	Larison	Hitachi Energy	X

Member	David	Larochelle	NDB Technologies	X
Member	Fernando	Leal	Prolec GE	X
Member	Moonhee	Lee	Hammond Power Solutions	X
Guest	Junho	Lee		X
Guest	Angela	Leigl	EATON Corporation	X
Member	Aleksandr	Levin	Weidmann Electrical Technology	X
Guest	Samuel	Lewis		X
Member	Weijun	Li	Braintree Electric Light Dept.	X
Guest	Jinming	Li		X
Guest	Cesar	Lizcano		X
Guest	Ricardo	Lopez		X
Guest	Xose	Lopez-Fernandez	Universidade de Vigo	X
Guest	Tiffany	Lucas, P.E.	SPX Transformer Solutions, Inc.	X
Guest	Andrew	Lugge		X
Guest	Luis	Machain		X
Member	Tim-Felix	Mai	Siemens Energy	X
Guest	Jinesh	Malde		X
Guest	Alberto	Martinez		X
Guest	Robert	Mayer	Siemens Energy	X
Member	James	McBride	JMX Services, Inc.	X
Member	Thomas	Melle	HIGHVOLT	X
Guest	Omar	Mendez		X
Member	Francis	Mills		X
Member	Juliano	Montanha	Siemens Energy	X
Member	Emilio	Morales-Cruz	Qualitrol Company LLC	X
Guest	Gianetta	Morrow		X
Guest	Marta	Muñoz		X
Member	David	Murray	Tennessee Valley Authority	X
Member	Ali	Naderian	METSCO Energy Solutions Inc.	X
Guest	Ismael	Naja		X
Member	Aniruddha	Narawane	EATON Corporation	X
Guest	Kristopher	Neild	Megger	X
Guest	Mark	Newbill		X
Guest	Yaw	Nyanteh		X
Guest	Rudolf	Ogajanov	ABB Inc.	X
Guest	Cuauhtemoc	Ortiz		X
Member	Dwight	Parkinson	EATON Corporation	X
Guest	Pedro	Pedro		X
Member	Harry	Pepe	Phenix Technologies, Inc.	X
Member	Bertrand	Poulin	Hitachi Energy	X
Member	Thomas	Prevost	Weidmann Electrical Technology	X
Member	Jarrold	Prince	ERMCO	X
Member	Ulf	Radbrandt	Hitachi Energy	X

Guest	Farnoosh	Rahmatian		X
Member	Timothy	Raymond	Electric Power Research Institute (EPRI)	X
Member	Scott	Reed	MVA	X
Guest	Jonathan	Reimer	FortisBC	X
Guest	Juan	Reyes		X
Guest	Arash	Rezvan		X
Guest	Michael	Richardson		X
Secretary	Diego	Robalino	Megger	X
Guest	Tim	Rocque	SPX Transformer Solutions, Inc.	X
Member	Zoltan	Roman	GE Grid Solutions	X
Member	Rodrigo	Ronchi		X
Member	Mickel	Saad	Hitachi Energy	X
Member	Hakan	Sahin	Virginia/Georgia Transformer	X
Member	Amitabh	Sarkar	Virginia Transformer Corp.	X
Member	Daniel	Sauer	EATON Corporation	X
Member	Alan	Sbravati	Cargill, Inc.	X
Member	Markus	Schiessl	SGB	X
Guest	Eric	Schleismann	Southern Company Services	X
Member	Ewald	Schweiger	Siemens Energy	X
Member	Cihangir	Sen	Duke Energy	X
Member	Abdulmajid	Shaikh		X
Guest	Jin Woo	Shin		X
Guest	Stephen	Shull	BBC Electrical Services, Inc.	X
Member	Jonathan	Sinclair	PPL Electric Utilities	X
Member	Christopher	Slattery	FirstEnergy Corp.	X
Member	Steven	Snyder	Hitachi Energy	X
Member	Markus	Soeller	Power Diagnostix	X
Guest	Yong Tae	Sohn		X
Guest	Brian	Sparkins		X
Member	Fabian	Stacy	Hitachi Energy	X
Member	Brad	Staley	Salt River Project	X
Member	Kyle	Stechschulte	American Electric Power	X
Guest	Hampton	Steele	Tennessee Valley Authority	X
Member	Andrew	Steineman	Delta Star Inc.	X
Member	Charles	Sweetser	OMICRON electronics Corp USA	X
Member	Matthew	Sze	Omicron Electronics	X
Guest	Jonathan	Tan		X
Member	Troy	Tanaka	Burns & McDonnell	X
Member	Vijay	Tendulkar	Power Distribution, Inc. (PDI)	X
Guest	Marko	Teofanovic		X
Guest	Andreas	Thiede		X
Guest	Scott	Thomas	Hitachi	X
Guest	Mark	Tostrud	Dynamic Ratings, Inc.	X

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Guest	Cole	Van Dreel		X
Guest	John	Vandermar		X
Member	Ajith	Varghese	SPX Transformer Solutions, Inc.	X
Member	Jason	Varnell	Doble Engineering Co.	X
Member	Rogério	Verdolin	Verdolin Solutions Inc.	X
Member	Dharam	Vir	SPX Transformer Solutions, Inc.	X
Guest	Richard	vonGemmingen	Dominion Energy	X
Member	Pragnesh	Vyas	Sunbelt-Solomon Solutions	X
Guest	John	Wagner		X
Member	Mike	Waldrop	Memphis Light, Gas & Water	X
Member	David	Wallace	Mississippi State University	X
Member	David	Wallach	Duke Energy	X
Guest	Alan	Washburn	Burns & McDonnell	X
Guest	Joshua	Watson		X
Member	Bruce	Webb	Knoxville Utilities Board	X
Member	Matthew	Weisensee	PacifiCorp	X
Member	Drew	Welton	Intellirent	X
Member	Daniel	Weyer	Nebraska Public Power District	X
Guest	Joe	White		X
Guest	Rene	Wind		X
Guest	Jeffrey	Wright	Duquesne Light Co.	X
Guest	Shuzhen	Xu		X
Guest	Fei	Yang		X
Guest	Guang	Yuan		X
Guest	Joshua	Yun	Virginia Transformer Corp.	X
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Meeting Adjourned at 12:15 PM.

Annex C Distribution Subcommittee – Chair: Jerry Murphy

March 13, 2024

Vancouver, B.C. CANADA

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 53 members in attendance by count of those identified on a slide presented in the meeting. Recorded attendance gave 147 in attendance and 58 members. List of attendees and affiliation attached below.

The agenda was reviewed and a change was proposed. Dan Sauer made a motion to approve the agenda with the addition of the below:

“Add New Business PAR Study for Pad-mounted Voltage Regulators”

This motion was seconded by Steve Shull

The Fall 2023 meeting minutes were reviewed, a motion was made to approve by Rhett Chrysler, seconded by Steve Shull, and approved by unanimous acclamation of the members in attendance.

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 March 12, 2024 at 8:00 a.m. in with 65 in attendance.

1. Dan Mulkey called the meeting to order at 8:00 AM PST. Group introductions were made.
2. Opening remarks and announcements
 - a. AMS system has been discontinued. 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: Alex Ayala, Timothy Menter, Martin Munoz, Jaber Shalabi**
 - b. **Removed: none**
5. Quorum was verified. The working group consisted of **69** members, requiring **35** for quorum. Over **35** members were counted at the start of the meeting. Attendance records later confirmed **45** members attended.
6. Dan Mulkey requested approval of the Spring 2024 Agenda. Igor Simonov made a motion, second by Jerry Murphy. Agenda was unanimously approved.
7. Dan Mulkey requested approval of the Fall 2023 Minutes. Al Traut made a motion, second by Shelby Walters 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: 12/31/2024
 - ii. PAR expiration: 12/31/2024
 - iii. Status: **Approved by RevCom Dec 5, 2023**
 - b. C57.12.29 Standard for Pad-Mounted Equipment – Enclosure Integrity for Coastal Environments, Approved 2014
 - i. Expires: 12/31/2024
 - ii. PAR expiration: 12/31/2024
 - iii. Status: **Approved by RevCom Dec 5, 2023**
 - 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 expiration: 12/31/2027**
 - iii. Status: **PAR Approved by NesCom Dec 6, 2023**
9. Old business:
 - a. Justin Minikel reviewed C57.12.32 Draft 1.4 which included updates based on the recently updated C57.12.28 and C57.12.29 standard. A summary of the changes are listed below.
 - i. Updated content order to match the other standards.
 - ii. Added Section 4.2.9 Fire resistance as it appears in C57.12.29. Group discussed if this section was applicable. Fire resistance applies to non-metallic enclosures, listed UL requirements UL 94 or UL 746C means the substrate will stop burning when you take the flame away.

- iii. Added Section 5.3 Enclosure color even though no specific color is specified for submersibles. The group discussed that black, grey and green are all used. Dan Mulkey commented that black submersibles are not very visible and grey is better for visibility while installed in typically dark areas.
- iv. Modified Section 5.5 Test specimens. Simplified and added gauge thickness.
- v. Section 5.6.2 Adhesion test. Simplified and removed test details as it is captured in the ASTM method.
- vi. Section 5.6.3 Soak test. Changed duration to 1008 hours from 1000 hours. This makes it easier for the test labs as the sample comes out at the same time it goes in.
- vii. Section 5.6.4 Impact Test. Simplified and clarified pass / fail criteria. Also included wrinkling as a fail criteria. Group discussed that wrinkling is not defined by ASTM but bubbling is. Justin Minikel commented that bubbling is not the same failure mode as wrinkling. Group agreed that further work should be done to define wrinkling as a failure criteria.
- viii. Section 5.6.5 Insulating liquid resistance test. Removed references to gasses, as the intent of this test is to look at insulating liquids. Suggested that if the group wants to keep testing with gasses it should be broken into a separate section.
 - 1. Dan Mulkey later commented that as switchgear has been removed from the document scope so testing related to insulating gasses may no longer need to be included in this document.
- ix. Section 5.6.6 Ultraviolet accelerated weathering test. Removed acronym of QUV as it is a trade name. Changed duration to 504 from 500 hours (again to make it easier for the test labs).
- x. Section 5.6.7 SCAB test. Updated to be in align with the wording in the other standards, no change to requirements.
- xi. Section 5.6.8 Abrasion resistance. Cleaned up pass / fail wording to be more concise.
- xii. Section 5.6.9 Chipping resistance test. Cleaned up pass / fail wording to be more concise.
- xiii. Annex B SCAB procedure. No change in content but the layout and formatting has shifted.
- b. Dan Mulkey stated that this draft with the proposed changes will be circulated to the group for review. He asked all member to please read the document before the next meeting. If any questions arise, please reach out to Dan Mulkey or bring them to the next meeting for discussion.

10. New business:

- a. Dan Mulkey asked the group if there are any additional coating tests that should be considered.
- b. A question was asked why chip resistance is included in submersible standard as once installed there is generally low risk of impacts that could cause chips on these transformers. Dan Mulkey responded that chip resistance is required as these transformers are still exposed to risks during shipping, storage, and installation. For this reason, this clause has also been added to the overhead standard.

- c. Jane Hall asked the group how 80 in-lbs was determined for the impact test. She commented this is very high as in the pipeline industry much lower forces are used.
 - i. Carlos Gaytan commented that in the 90's the requirement used to be 160 in-lbs in pad type transformers and 80 in-lbs in pole type transformers. This specification was chosen as to pass it the coating needs to have a specific thickness and softness to absorb the impact.
 - ii. A post meeting comment by Petra Labbe. They have the impact go through the coating and the substrate. This failure mode is currently not captured in standards and the group should consider adding it as it is a failure of both the substrate and the coating.
 - iii. A post meeting conversation – Justin Minikel is going to investigate using the Holiday test for pass/fail evaluation of panels possibly in lieu of the salt spray test.
 - iv. Post meeting observation – While the standards require that the test panels be of the actual substrates being used to construct the applicable equipment, it appears that thinner substrates are sometimes being tested. The WG should discuss this topic.

11. Next meeting: October 29, 2024 in St. Louis, Missouri, USA.

- a. The following attendees requested membership and will be added to membership for the Fall 2024 meeting: **Jeffrey Brooks, Noah Chesser, Miguel Plascencia, Daniel Posadas.**

12. The meeting was adjourned at 8:39 AM PST.

Submitted by: Audrey Siebert-Timmer

Date: March 12, 2024

List of Members:

Daniel Mulkey (Mulkey Engineering Inc.)
Jeremy Van Horn (IFD Technologies)
Audrey Siebert-Timmer (IFD Technologies)
Nabi Almeida (Prolec GE)
Alex Ayala (Power Partners)
Martin Bachand (Cloverdale Paint Inc.)
Darren Brown (Howard Industries)
Thomas Callsen (Weldy-Lamont Associates)
Rhett Chrysler (ERMCO)
Douglas Craig (Richards Manufacturing Co.)
Benjamin Garcia (Southern California Edison)
James Gardner (Prolec GE)
Carlos Gaytan (Prolec GE)
Ali Ghafourian (H-J Enterprises, Inc.)
Jane Hall (Cloverdale Paint Inc.)
Kenneth Hampton (Baltimore Gas & Electric)

Ramadan Issack (American Electric Power)
Brian Klaponski (Carte International Inc.)
Gilbert Kozer (Northeast Transformer Services, LLC)
Patrick Kozer (Northeast Transformer Services, LLC)
Andrew Larison (Hitachi Energy)
Tiffany Lucas, P.E. (Prolec GE)
Alejandro Macias (CenterPoint Energy)
Justin Minikel (EATON Corporation)
Michael Morgan (Duke Energy)
Jerry Murphy (Reedy Creek Energy Services)
Dwight Parkinson (EATON Corporation)
Vinay Patel (Consolidated Edison Co. of NY)
Ion Radu (Hitachi Energy)
James Ratty (Electronic Technology Inc.)
Robert Reepe (Georgia Power Co.)
Mason Rush (Central Moloney Inc)
Fernando Salinas (Power Partners)
Pugal Selvaraj (Virginia Transformer Corp.)
Stephen Shull (BBC Electrical Services, Inc.)
Igor Simonov (Toronto Hydro)
Travis Spoone (EATON Corporation)
Michael Thibault (Pacific Gas & Electric)
Alan Traut (Howard Industries)
Reinaldo Valentin (Duke Energy)
John Vartanian (National Grid)
Joshua Verdell (ERMCO)
Shelby Walters (Howard Industries)
Alan Wilks (Consultant)
Michael Zarnowski (Carte International)

List of Guests:

Jeffrey Brooks (POWER Engineers)
Noah Chesser (Oncor Electric Delivery)
Miguel Plascencia (Pacific Gas & Electric)
Daniel Posadas (Prolec-Celeco)
Jared Bates (Oncor Electric Delivery)
Andrew Berman (S&C Electric)
Duane Brown (Measurements International)
Janet Crocket (Fayetteville PWC)
Rohrer David (First Energy)
Luke Grandbois (IFD Technologies)
Petra Labbe (Sherwin Williams)
Steve Lesch (PPR)
David Lin (IFD Technologies)
Loiselle Luc (Teta Tech)
Nicholas Manske (Oncor Electric Delivery)
Ismael Naja (EATON Corporation)

Fernando Tirado (Prolec)
 Steve Tsai (JST Power Equipment)
 Bruce Webb (Knoxville Utilities Board)
 Paul Weyandt (Schneider Electric)

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

Steve Shull presented the following minutes from the working group meeting on March 11, 2024 at 3:15 p.m. in with 80 in attendance.

The Chair called the meeting to order at 3:15 P.M. PDT on March 11, 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 Dan Mulkey and seconded by Rhett Chrysler 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 Bruce Webb 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
 IEEE-SA’s copyright policy is described in Clause 7 of the *IEEE-SA Standards Board Bylaws* and Clause 6.1 of the *IEEE-SA Standards Board Operations Manual*. The Chair stated that any material submitted during standards development, whether verbal, recorded, or in written form, is a Contribution and shall comply with the IEEE-SA Copyright Policy. The Chair displayed this copyright policy.
7. IEEE SA Participant Behavior
 All participants in IEEE-SA activities are expected to adhere to the core principles of the IEEE Code of Ethics, IEEE Code of Conduct and the Standards Board Bylaws.
8. Old Business
 Task Force Reports
 - TF #1 – reported they reviewed the document and provided a report of all the locations where these references need to be updated. Chair stated he would update all references in the new draft document.
 Members include Weijun Li (Chair), Jared Bates, and Bruce Webb.
 - TF #2 – gathered data from three vendors on pad-mount transformer inquiries & orders from last 12 months and sorted them by low voltage configurations requests.

There were a total of 41 configurations including both WYE and DELTA. They determined the average usage percentage for each voltage configuration which resulted in only 7 being greater than a 1% average. This resulted in the recommendations of two new voltage configurations. These were:

- o 415Y/240 V – for digital currency applications (bit coin, blockchain, etc.) and
- o 690Y/398 V – for solar and BESS applications.

After reviewing the document, the task group recommends both of these configurations to be added to Table 3 – Range of kVA and voltage rating and Table 4 – Electrical characteristics and minimum electrical clearances of high-voltage bushings and low-voltage terminals. This recommendation was presented to the working group. The consensus was that the Working Group Chair should would update all references in the new draft document.

Members include Joshua Yun (Chair), Zack Weiss, and Dwight Parkinson.

- TF #3 – was able to provide an overview of the application of this device and methods of application. After a Working Group discussion, it was discovered that the transformers covered in this standard do not use this device. The consensus of the working group was to remove this section. The Working Group Chair would modify the new draft document to remove this section.
Members include Jeremy Van Horn (Chair), Martin Rave, and Leon White.
- TF #4 - reviewed the values and methods for the Induced Voltage Test. There was a lot of discussion but no conclusions. This was returned to the task force for further work. A recommendation would be brought back to the working group in the fall. Members include Michael Zarnowski (Chair), Gary King, and Andrew Larison.
- TF #5 – did not have a report due to a request received by the Chair. This was to be discussed in new business.
Members include Stephen Shull (Chair), Jose Gamboa, and Jared Bates.
- TF #6 – Steve Shull stated that references to Photovoltaic and Wind Power transformers will be added in the Bibliography. An informative note may be necessary to qualify this reference. Steve Shull is the only member of this task force.

In the new business, there were two items that were brought forth. The first was the discussion of an email from Glenn Anderson concerning the possible inadvertent elimination of the 30 kV BIL clearances in the drawings for insulated separatable connectors, both for specific and minimum dimensions. The working group voted to expand the scope of TF#5 to review this request. The motion was made by Jerry Murphy and seconded by Dan Mulkey. The working group approved this unanimously. The task force will report on this at the next meeting.

The second item in new business was a discovery by Task force #2 of the possible expansion of the kVA size ranges. This was discovered when they were researching the new voltages. The discussion that followed raised the question concerning of how this would affect the Maximum Available Fault Current (MAFC) with the impedance ranges shown in the standard. The Working Group Chair reminded the group that these impedance values had been set these to limit the MAFC to 65kA. The Task Force Chair volunteered to take this topic back to the group and provide a report back to the Working Group in the fall meeting.

The meeting adjourned at 4:30 P.M. PDT.

Submitted by: Alan Wilks

Date: 3/11/2024

Attendance:

Full Name	Company	Role		Full Name	Company	Role
Rehan Ali	Siemens Energy	Member		Alejandro Macias	CenterPoint Energy	Member
Thomas Callsen	Weldy-Lamont Associates	Member		Rhea Montpool	Schneider Electric	Member
Rhett Chrysler	ERMCO	Member		Daniel Mulkey	Mulkey Engineering Inc.	Member
Benjamin Garcia	Southern California Edison	Member		Jerry Murphy	Reedy Creek Energy Services	Member
Miguel Garcia	Hitachi Energy	Member		Dwight Parkinson	EATON Corporation	Member
Carlos Gaytan	Prolec GE	Member		Robert Reepe	Georgia Power Co.	Member
Ali Ghafourian	H-J Enterprises, Inc.	Member		Mason Rush	Central Moloney, Inc.	Member
Kenneth Hampton	Baltimore Gas & Electric	Member		Michael Shannon	Rea Magnet Wire	Member
Giovanni Hernandez	Virginia Transformer Corp.	Member		Stephen Shull	BBC Electrical Services, Inc.	Member
Ramadan Issack	American Electric Power	Member		Michael Thibault	Pacific Gas & Electric	Member
Brian Klaponski	Carte International Inc.	Member		John Vartanian	National Grid	Member
Gilbert Kozar	Northeast Transformer Services, LLC	Member		Pragnesh Vyas	Sunbelt-Solomon Solutions	Member
Patrick Kozar	Northeast Transformer Services, LLC	Member		Bruce Webb	Knoxville Utilities Board	Member
Andrew Larison	Hitachi Energy	Member		Zachery Weiss	WEG Transformers USA Inc.	Member
Weijun Li	Braintree Electric Light Dept.	Member		Alan Wilks	Consultant	Member
Parry Lively	Tempel	Member		Joshua Yun	Virginia Transformer Corp.	Member
				Michael Zarnowski	Carte International	Member
Javier Arteaga	Hitachi Energy	Guest		Justin Minikel	EATON Corporation	Guest
Alejandro Ayala	Power Partners	Guest		Michael Morgan	Duke Energy	Guest
Cheryl Basel	WEG Transformers USA Inc.	Guest		Martin Munoz	Orto de Mexico	Guest
Paulo Bautista	Enmax	Guest		Stephen Oakes	WEG Transformers USA Inc.	Guest
Andrew Berman	S&C Electric	Guest		Miguel Plascencia	Pacific Gas & Electric	Guest
Kevin Biggie	Weidmann Electrical Technology	Guest		Pedro Puente	Prolec GE	Guest
Jeffrey Brooks	Power Engineers	Guest		David Rohrer	First Energy	Guest
Jim Cai	JSHP Transformer	Guest		Audrey Siebert-Timmer	IFD Technologies	Guest
Noah Chesser	Oncor Electric Delivery	Guest		Igor Simonov	Toronto Hydro	Guest
Janet Crockett	Fayetteville PWC	Guest		Jimmy Smith	Howard Industries	Guest
Antonio Di Biase	Tempel	Guest		David Stockton	Stockton Business Consulting	Guest
Miguel Fernandez	Braintree Electric Light Dept.	Guest		Craig Tennant	H-J Family of Companies	Guest
Kevin Frye	Central Moloney, Inc.	Guest		Tim Tillery	Howard Industries	Guest
Stephen Gilbert	IFD Technologies	Guest		Fernando Tirado	Prolec GE	Guest
Luke Grandbois	IFD Technologies	Guest		Alan Traut	Howard Industries	Guest
Mohammad Iman	MGM Transformer Co.	Guest		Steve Tsai	JST Power Equipment	Guest
Adam Klaponski	Carte International Inc.	Guest		Reinaldo Valentin	Duke Energy	Guest
Petra Labbe	Sherwin-Williams	Guest		Jeremy Van Horn	IFD Technologies Inc.	Guest
Steve Lesch	PPR	Guest		Joshua Verdell	ERMCO	Guest
Nicholas Manske	Oncor Electric Delivery	Guest		David Walker	MGM Transformer Co.	Guest
Fernando Meza	Power Partners	Guest		Shelby Walters	Howard Industries	Guest
				Paul Weyandt	Schneider Electric	Guest

C57.12.36 – Distribution Substation Transformers – Jerry Murphy

Jerry Murphy presented the following minutes from the working group meeting on March 12, 2024 at 9:30 a.m. with 50 in attendance.

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 17 out of the 29 members present.

A motion for approval of the agenda was made by Dan Mulkey and seconded by Dwight Parkinson, and the motion was approved without opposition. A motion for approval of the past meeting in Kansas City was made by Steve Shull, seconded by Gary Hoffman and it was approved with no opposition.

On the topic in the agenda of consistency in Induced Potential requirements for Distribution Transformer Types, Andrew Larison made a comment about some issues related with the effects of the current test requirements on some transformer components and said that it would be addressed in the WG C57.12.34 three phase pad mounted transformers, so that the resolution could be incorporated into this 12.36 standard.

On the question of whether requirements for 50 Hz should be considered in the scope of the standard, Jerry confirmed that 50 Hz was part of the scope of the approved PAR. After some discussion, Steve Shull made a motion, seconded by Gary Hoffman, to leave the 50 Hz requirements in the scope, and it was unanimously approved.

Note of Table 1, Kilovoltampere Ratings, Dwight Parkinson made a motion to reword the note to read ““If specified, an additional percent increase in kilovolt-ampere rating can be achieved by adding fan capacity. Single-phase and three-phase ONAF kilovolt-ampere values 2500 and above have a 25% increase over the ONAN rating. All other kilovolt-ampere ratings are increased by 15%.” It was seconded by Steve Shull, and it was approved unanimously.

The first paragraph of Sect. 4.5 Taps, was reviewed. A proposal to modify the wording for better clarity to read: “Taps shall be provided unless otherwise specified. The standard high-voltage taps shall be two above the high-voltage nominal rating at 2.5% each, and two below the high-voltage nominal rating at 2.5% each”. A motion was made by Al Traut, seconded by Gary Hoffman, and after some discussion, the question was called, and it was approved unanimously.

Sect. 5.7.3 Unit substation grounding, was then reviewed. A clarification of the term “electrically bonded” was sought. Steve Shull suggested to use a reference from the NEC which referred to this term as “to establish electrical continuity and conductivity”. Steve Shull made a motion to include this wording, replacing the current term of “electrically bonded”. Dan Mulkey seconded, and the motion passed with no opposition.

The sect. 5.11.2 Fans was reviewed. There was some discussion of whether the fan motor voltage for 60 Hz should continue to be 240 V, recognizing that the present practice indicated a larger use of 120 V motors. After some discussion a motion to change from 240 V to 120 V in 60 Hz motors was made by Dan Mulkey and seconded by Dwight Parkinson, and it carried.

There was a discussion of whether the 400 V motor requirements for 50 Hz should be modified, but it was decided to leave it as it was.

Under new business, Javier Arteaga made a motion to modify Table 1, to use the term ONAN/KNAN instead of just ONAN, as the standard included insulating liquids other than mineral oil. Steve Shull seconded, and the motion carried.

Javier Arteaga was assigned the task to propose the necessary changes to standardize the use of ONAN/KNAN as applicable in the document and send a proposal of changes to Jerry.

The meeting adjourned at 10:27 am. 5.11.2 Fans

Submitted by: J. Murphy/C. Gaytan

Date: 03/12/2024

Attendance

Name	Last Name	Company	Member/Guest
Rehan	Ali	Siemens Energy Inc	Guest
Javier	Arteaga	Hitachi Energy	Member
Alex	Ayala	Power Partners	Guest
Cheryl	Basel	WEG Transformers	Guest
Kevin	Biggie	Weidmann	Guest
Jeffrey	Brooks	Power Engineers	Guest
Noah	Chesser	Oncor Electric Delivery	Guest
Rhett	Chrysler	ERMCO	Guest
Janet	Crockett	Fayetteville PWC	Guest
Tony	DiBiase	Tempel	Guest
Arnu	Dumke	Brockhaus Measurements	Guest
Salinas	Fernando	Power Partners/ERMCO	Guest
Kevin	Frye	Central Moloney Inc	Guest
Miguel	Garcia	Hitachi Energy	Member
Hector	Garza	Orto de Mexico	Guest
Carlos	Gaytan	Prolec GE	Vice-Chair
Gary	Hoffman	Advanced Power Technologies	Guest
Dave	Komm	Hammond Power Solutions	Guest
Gilbert	Kozer	Northeast Transformer	Guest
Andrew	Larison	Hitachi Energy	Member
Angela	Leigl	Eaton Corp	Guest
Parry	Lively	Tempel	Member
Bryan	Marquardt	Cleveland Cliffs	Guest
Fernando	Meza	Power Partners	Guest
Justin	Minikel	Eaton Corp	Guest
Rhea	Montpool	Schneider Electric	Member
Tyler	Morgan	Duke Energy	Guest
Dan	Mulkey	Mulkey Engineering Inc.	Member
Martin	Muñoz	Orto de Mexico	Member
Jerry	Murphy	Reedy Creek Energy Services	Chair
Dwight	Parkinson	Eaton Corp	Member
Besjan	Pojaziti	Brockhaus Measurements	Guest
Ion	Radu	Hitachi Energy	Member
Robert	Reepe	Georgia Power Co	Guest
Robert	Rohrer	First Energy	Guest
Mason	Rush	Central Moloney Inc	Guest
Jaber	Shalabi	Vantran Transformers	Member
Mike	Shannon	REA Magnet Wire	Member
Stephen	Shull	BBC Electrical Services Inc.	Member

Jimmy	Smith	Howard Industries	Member
Erik	Tarango	Olsun Electrics	Guest
Tim	Tillery	Howard Industries	Guest
Fernando	Tirado	Prolec GE	Guest
Alan	Traut	Howard Industries	Member
Steve	Tsai	JST Power Transformers	Guest
Reinaldo	Valentin	Duke Energy	Guest
Jeremy	Van Horn	IFD Technologies	Guest
Josh	Verdell	ERMCO	Guest
Bruce	Webb	Knoxville Utilities Board	Member
Zach	Weiss	WEG Transformers	Guest

C57.12.38 – Single-Phase Pad-Mounted Transformers – Ali Ghafourian

Ali Ghafourian presented the following minutes from the working group meeting on March 11, 2024 at 1:45 p.m. with 65 in attendance. Ali noted that they would not need to meet in the fall.

1. Presiding Officer and Secretary responsible for Meeting Minutes

Ali Ghafourian (Chair) – Presiding Officer

Jarrold Prince (Secretary) is responsible for Meeting Minutes.

2. Call to order, Verification of Quorum, and Chair's remarks

The meeting was called to order by the Chair, Ali Ghafourian, at 1:46 p.m. PDT on Monday, March 11th, 2024, held at the Hyatt Regency Vancouver in room, Oxford/Prince of Wales (3rd Floor).

Quorum was established with 24 out of 38 (~63%) Working Group members present by a show of hands counted at beginning of the meeting. Per paper rosters, we had 27 (~71%) of members accounted for as being present during the meeting. Quorum was established.

The Chair announced to the Working Group that the PAR extension was approved through the end of 2025.

The Chair informed the Work Group that the editorial and general comments not resolved from during Fall 2023 meeting that was deemed to be technical was resolved amongst the Ballot Comment Resolution Committee would be reviewed during this meeting. In all there were a total of eight proposed comments/changes to review with the Working Group.

The chair recognized and thanked the following Ballot Comment Resolution Committee Members:

Ali Ghafourian (Chair)	H-J Enterprises, Inc.
Martin Rave (Vice-Chair)	ComEd
Jarrold Prince (Secretary)	ERMCO
Joshua (Josh) Verdell	ERMCO
Ramadan Issack	American Electric Power

Robert Reepe
Andrew Larison
Jerry Murphy

Georgia Power Co.
Hitachi Energy
Reedy Creek Energy Services

3. Presented required IEEE SA Patent and Copyright Policies Slides, Call for Patents

The essential Patent and Copyright presentation slides were shown as required. During the review of the Patent and Copyright Policy slides, the Chair called for all essential Patents and Copyrights amongst the Working Group. No essential Patent or Copyright claims were brought forth to the Chair.

4. Approval of agenda

The agenda (AGENDA C57.12.38_2024_Vancouver(R0).pdf) was issued to the Working Group by email for review and posted to the Distribution Subcommittee website on Monday, March 4th, 2024, one week prior to the meeting.

The Chair asked the Working Group members for the unanimous approval of the agenda. Shelby Walters made the first Motion to unanimously approve the agenda.

Stephen Shull (Steve) seconded the Motion.

The agenda was unanimously approved.

5. Approval of minutes of previous meeting

The Fall 2023 meeting minutes (F23-C57.12.38-UnapprovedMinutesR1.pdf) were posted to the Distribution Subcommittee website on Wednesday, November 1st, 2023, for the Working Group members to review before this meeting, nine days after the meeting.

The Chair asked the Working Group members for the unanimous approval of the Fall 2023 meeting minutes.

Daniel Mulkey (Dan) made the first Motion to unanimously approve the Fall 2023 meeting minutes.

Benjamin Garcia (Ben) seconded the Motion.

The Fall 2023 meeting minutes were unanimously approved.

6. Meeting Discussion Topics

Editorial and general comments resolved/discussed from original Ballot on Draft 2.8 October 2022 that was incorporated into Draft 2.9 January 2024 before the Spring 2024 meeting in Vancouver.

- **Comment ID (310431) and # (I-77) on Clause 4.4.1, Line 11**

Proposed Change:

1. add the word "NOTE - " to the beginning of the paragraph.
2. delete "may" and replace with "can"
3. delete "greater than" and replace with "that might exceed"
4. add second sentence: "Users should take care to check for adequate ratings of other existing equipment when specifying or making replacements."

Disposition Status: Accepted.

Disposition Detail: None needed, if accepted.

- **Comment ID (310254) and # (I-52) on Clause A.5, Lines 3 and 4**

Comment: “Food for thought...do we want to mention in this section that a fluid level gauge is "strongly recommend" to be incorporated into the transformer design in conjunction with a load-break switch and dual-voltage switch? I only mention this because these devices called it out in A.3 and A.5 respectively.”

Disposition Status: Revised due to no proposed change.

Disposition Detail: Remove these two sentences from A.5 but keep in A.3 to match recent publication of C57.12.34-2022. A4 and A.4.8.

- **Comment ID (310443) and # (I-86) on Clause 8.4, Note 2 (Figure 7)**

Proposed Change: “Revise the last sentence of NOTE 2 to read "Stud thread sizes are trade sizes which indicate the thread major diameter in inches followed by thread pitch in number of threads per inch."

Revise the numbers in table to fractions (instead of decimals) per normal trade practice.”

Disposition Status: Revised

Disposition Detail: WG accepted to revise the numbers in table to fractions (instead of decimals) per normal trade practice but not explaining trade sizes.

- **Comment ID (310071) and # (I-36) on Clause A.4, Lines 27 and 28**

Proposed Change: “The switch operating handle shall require a two-step action such as cap/wrench removal and reversal or removal of a set-screw to prevent inadvertent operations.”

Disposition Status: Accepted.

Disposition Detail: None needed, if accepted.

- **Comment ID (310253) and # (I-51) on Clause A.5, Lines 3 and 4**

Proposed Change: “Should read: “To that extent, a means shall be provided to externally verify the switch is sufficiently immersed under liquid before operation takes place.”

Disposition Status: Revised.

Disposition Detail: Since Comment ID# 310254 I-52 is approved as revised, then make this change to A.3 (3rd paragraph, last sentence) except it will state "To that extent, a means should be provided to verify that these switches are sufficiently immersed." due to Annex being informative the word “shall” was replaced with the word “should”.

- **Comment IDs (309963, 310077, 310110, and 310276) and # (I-23, I-42, I-45, and I-62) on Clause A.6.1.1, Lines 18, 19, 20, and 21**

Proposed Change: Remove and replace with sight-type liquid level indicators as shown in A.5.1 of C57.12.34-2022. (I-23 and I-42)
Remove content on face type liquid level indicators (section A.6.1.1) from the Annex. (I-45 and I-62)

Disposition Status: Accepted.

Disposition Detail: None needed, if accepted.

- **Comment IDs (309964 and 310075) and # (I-24 and I-40) on Clause A.6.2.2, Lines 1, 2, 3, 4, 5, and 6**

Proposed Change: Remove this subclause A.6.2.2.

Disposition Status: Accepted.

Disposition Detail: None needed, if accepted.

- **Comment IDs (309965 and 310076) and # (I-25 and I-41) on Clause A.7.2.1, Lines 20, 21, 22, 23, 24, and 25**

Proposed Change: Remove this subclause A.7.2.1.

Disposition Status: Accepted.

Disposition Detail: None needed, if accepted.

Motion was made by Stephen Shull (Steve) to accept all changes presented during the meeting except to compare Figure 7 in the current Draft to recently published standard C57.19.02 and modify Figure 7, if deemed necessary before proceeding with re-circulation ballot process.

Motion was seconded by Daniel Mulkey (Dan).

The motion was unanimously approved.

The Chair stated to the Working Group that he would proceed with the re-circulation ballot process for the latest draft and the Working Group might not meet in the Fall providing that there are no comments that need to be addressed by the Working Group from the re-circulation ballot.

7. Old Business

Continued to resolve Technical Comments from Draft 2.8 October 2022.

8. New Business

No new business items were brought forth to the Working Group during the meeting.

9. Next meeting – Date and Location

The Chair announced the next meeting for Fall 2024 will be held in St. Louis, Missouri, USA.

Dates: October 27th – 31st, 2024

10. Adjournment

The Chair adjourned the meeting at approximately 2:15 p.m. PDT.

Submitted by: Ali Ghafourian (Chair) and Jarrod Prince (Secretary)

Date: Tuesday, March 19th, 2024

List of Attendees, Affiliations, Membership Status

No New Members were introduced to the Working Group.

13 Members were changed to Guest status.

* A total of 16 guests requested Working Group membership.

Note – No Guest will be considered for membership at the Fall 2024 meeting due to the standard being in the ballot process.

1	Jared Bates	Oncor Electric Delivery	Member
2	Thomas Callsen	Weldy-Lamont Associates	Member
3	Benjamin Garcia	Southern California Edison	Member
4	Carlos Gaytan	Prolec GE	Member
5	Ali Ghafourian (Chair)	H-J Enterprises, Inc.	Member
6	Kenneth Hampton	Baltimore Gas & Electric	Member
7	Ramadan Issack	American Electric Power	Member
8	Andrew Larison	Hitachi Energy	Member
9	Angela Leigl	EATON Corporation	Member
10	Michael Morgan	Duke Energy	Member
11	Daniel Mulkey	Mulkey Engineering Inc.	Member
12	Jerry Murphy	Reedy Creek Energy Services	Member
13	Dwight Parkinson	EATON Corporation	Member
14	Jarrod Prince (Secretary)	ERMCO	Member
15	Robert Reepe	Georgia Power Co.	Member
16	Stephen Shull	BBC Electrical Services, Inc.	Member
17	Audrey Siebert-Timmer	IFD Technologies	Member
18	Igor Simonov	Toronto Hydro	Member
19	Michael Thibault	Pacific Gas & Electric (PG&E)	Member
20	Reinaldo Valentin	Duke Energy	Member
21	Jeremy Van Horn	IFD Technologies	Member
22	John Vartanian	National Grid	Member
23	Joshua Verdell	ERMCO	Member
24	Pragnesh Vyas	Sunbelt-Solomon Solutions	Member
25	Shelby Walters	Howard Industries	Member
26	Bruce Webb	Knoxville Utilities Board	Member
27	Alan Wilks	Consultant	Member
28	Rehan Ali	Siemens Energy	Guest
29	Javier Arteaga*	Hitachi Energy	Guest
30	Steve Ashcraft	Hitachi Energy	Guest
31	Alejandro Ayala*	Power Partners	Guest
32	Paulo Bautista	ENMAX	Guest
33	Andrew Berman	S&C Electric	Guest
34	Jeffrey Brooks	Power Engineers	Guest
35	Duane Brown*	Measurements International	Guest
36	Jim Cai*	JSHP Transformer USA	Guest
37	Noah Chesser*	Oncor Electric Delivery	Guest
38	Janet Crockett	Fayetteville PWC	Guest

39	Antonio Di Biase	Tempel	Guest
40	Kevin Frye	Central Moloney, INC	Guest
41	Hector Garza	Orto de Mexico	Guest
42	Luke Grandbois	IFD Technologies	Guest
43	Guy Halbrooks	TCI Sales, INC	Guest
44	Corey Hanson	Flex-Core	Guest
45	Jean Hernandez-Mejia	NEETRAC - Georgia Tech	Guest
46	Patrycja Jarosz	IEEE SA	Guest
47	Gilbert Kozer*	Northeast Transformer Services, LLC	Guest
48	Patrick Kozer*	Northeast Transformer Services, LLC	Guest
49	Petra L'Abbe*	Sherwin-Williams	Guest
50	Parry Lively	Tempel	Guest
51	Nicholas Manske*	Oncor Electric Delivery	Guest
52	Bryan Marquardt	Cleveland-Cliffs	Guest
53	Martin Munoz*	Orto de Mexico	Guest
54	Ismael Naja*	EATON Corporation	Guest
55	Miguel Plascencia*	Pacific Gas & Electric (PG&E)	Guest
56	Daniel Posadas*	Prolec S.A. DE C.V.	Guest
57	David Rohrer*	First Energy	Guest
58	Mason Rush*	Central Moloney Inc.	Guest
59	Fernando Salinas*	Power Partners	Guest
60	Steve Snyder	Hitachi Energy	Guest
61	David Stockton	Stockton Consulting	Guest
62	Craig Tennant	H-J Enterprises, Inc.	Guest
63	Fernando Tirado	Prolec GE	Guest
64	Alan Traut	Howard Industries	Guest
65	Steve Tsai	JST Power Equipment	Guest

C57.12.39 – Tank Pressure Coordination – Carlos Gaytan

Carlos Gaytan presented the following minutes from the working group meeting on March 12, 2024 at 3:15 p.m. with 45 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. Attendees were informed that since this is the first meeting of the working group, all attendees requesting membership will be granted. As such, Quorum was automatic. The meeting was attended by **45** attendees, and **38** requested membership and make up the initial membership of the working group.
4. Carlos Gaytan requested approval of the Spring 2024 Agenda. Steve Shull made a motion to accept the agenda with the removal of section 5 (past minutes approval), second by Nabi Almeida. Agenda was unanimously approved.
5. Old Business – Status of Standards:
 - a. C57.12.39 – Carlos informed the WG that the PAR was approved on Feb 15 2024, and expires Dec 31 2028.
6. New business –

- a. *Negative pressure requirements* – Carlos Gaytan introduced comments he had received regarding the requirements of negative pressure.

Dwight Parkinson suggested the following change to section 4.1 to prevent confusion with the sealing requirement of pressure relief valves in 4.2.2.3.

“The sealed-tank system shall be designed so that the tank will remain effectively sealed for internal gas pressures between 49 kPa (gauge) (7 psig) and –35 kPa (gauge) (–5 psig).”

Carlos Gaytan introduced a comment from Igor Simonov relating to clause 5.1.2 to address both the “oil preservation” and “tank strength” topics into a single clause.

Carlos Gaytan introduced a proposal to include the negative pressure withstand clause from C5712.34-2022 Clause 8.10.1 into C57.12.39.

A **motion was made** by Steve Shull and Seconded by Nabi Almeida to form a task force to address clarifying and coordinating negative pressure requirements, including:

- Sealing of tank and pressure relief devices
- Design for tank integrity (mechanical strength)
 - Tank deformation

The motion passed unanimously, and a **task force was formed**. The task force includes: Luke Grandbois (leader), Steve Shull, Nabi Almeida, Dwight Parkinson, Dan Mulkey, Brian Klapsonski, Ismael Naja.

- b. *Clarification of applicability of fault current capability test* – Carlos Gaytan introduced a comment he had received from Ben Garcia regarding the need for clarity regarding the applicability of the fault current capability test for rectangular tanks.

Jerry Murphy suggested drafting an informative note describing the inherent increased strength of rectangular tanks to withstand tank rupture. Carlos Gaytan will draft a note to propose to the group at the next meeting.

- c. *Review overall structure of the sections of the document for clarification* – Carlos introduced a comment relating to the differences between static and dynamic pressures for round and rectangular tanks.

Carlos and Jeremy will propose a change to the structure of the document to address the comment for review at the next working group meeting.

Dan Mulkey presented images comparing failures of round and rectangular tank transformers.

A brief discussion around the impact of CLFs on tank rupture occurred with no proposals or suggested changes to the standard.

- d. *Tank touch temperatures* – Ali Ghafourian asked if the topic of tank touch temperature should be addressed in the C57.12.39 standard. The group discussed and agreed it would be best not to include in this standard. No motion was put forward.
- e. Jim Cai suggested that the transformer fault current capability test be expanded in scope to include larger transformers. This item will be discussed at future meetings.

Next meeting: October 29, 2024 in St. Louis, Missouri, USA

7. The meeting was adjourned at 4:15 PM PST.

Submitted by: Jeremy Van Horn

Date: March 12, 2024

Attendance:

List of Members:

Gaytan	Carlos	Grandbois	Luke	Posadas	Daniel
Van Horn	Jeremy	Hamoir	Didier	Reepe	Robert
Almeida	Nabi	Issack	Ramadan	Rohrer	David
Arteaga	Javier	Klaponski	Brian	Rush	Mason
Ayala	Alejandro	Larison	Andrew	Salinas	Fernando
Brodeur	Samuel	Macias	Alejandro	Shull	Stephen
Brooks	Jeffrey	Manske	Nicholas	Siebert-Timmer	Audrey
Brown	Darren	Meza	Fernando	Stockton	David
Cai	Jim	Mulkey	Daniel	Tirado	Fernando
Chesser	Noah	Munoz	Molina	Traut	Alan
Garcia	Ben	Murphy	Jerry	Verdell	Joshua
Ghafourian	Ali	Naja	Ismael	Wilks	Alan
Gonzales	Michael	Parkinson	Dwight		

List of Guests:

Ali	Rehan	Garza	Hector	Walters	Shelby
Crockett	Janet	Nunn	Tommy		
Dinh	Huan	Ortega	Agustin		

Task Force on Transformer Efficiency and Loss Evaluation – Phil Hopkinson

Phil presented the following minutes from the task force meeting on March 11, 2024 at 9:30 a.m. with 115 in attendance.

1. Welcome- Phil Hopkinson welcomed the members. He remarked 1972 was his first IEEE meeting.
2. Roster

Over 115 were in attendance here in Vancouver. Attendance list embedded below:

3. Approval of Agenda – The agenda was approved as submitted.
4. Approval of the Minutes of the Last Meeting – October 23, 2023, Kansas City

Fall 2023 Task Force on Transformer Efficiency and Loss Evaluation

On Monday, October 2023 at 9:30am the Task Force met for the Fall 2023 meeting. There were 151 people in attendance according to a count of the circulated rosters. Phil Hopkinson, task force chairman, chaired the meeting. Minutes from the previous meeting were approved at the beginning of the session.

The meeting began with a discussion around the letters that attending persons had sent to the DOE regarding their proposed transformer efficiency increase from current 2016 DOE limits. The chairman remarked on the overall lack of response from the DOE to these letters. Jose _____ (NEETRAC) then addressed the task force and commented on his own personal experience from writing the DOE a letter back in July. Jose....

The chairman then asked Alan Traut (Howard Industries) to address the group. Mr. Traut presented several slides comparing load loss for amorphous and GOES core transformers as a function of loading. A key takeaway is that while amorphous core transformers may be the only viable option if the DOE goes ahead with their proposed increases for efficiency, their performance drops below that of GOES at around 50% load. This coupled with the fact that power consumption (and therefore loading) is trending ever upwards means that in many applications GOES may still be the better option, although the DOE proposed changes would essentially eliminate their use. Mr. Traut also showed a chart plotting core weight vs. efficiency for GOES and amorphous; of interest was that in both cases the core weight begins to rapidly skew upwards at the new efficiencies that the DOE has proposed. This increase in core material weight represents a substantial increase in transformer cost.

Next to address the task force was Bryan Markhart (Cleveland Cliffs). Cleveland Cliffs is the top steel sheet producer in the US, and electrical steel makes up 5% of their portfolio since the acquisition of AK Steel. This amounts to 200,000 tonnes of GOES annually. Bryan showed how the 2016 DOE changes had resulted in several products being essentially eliminated, and forecasts that if the 2022 DOE changes go ahead it will result in the elimination of their remaining products as well. The chairman then called upon Jerry Alan (Metglas) to speak, as Metglas are one of the largest amorphous steel producers in the United States. Jerry stated that currently Metglas produces 27,000 tonnes of amorphous annually and can get another caster up and running if demand dictates it. He expressed optimism that Metglas can meet an increase in demand, although he thinks it is unlikely that full 200,000 annual tonnes of GOES currently provided by Cleveland Cliffs will need to be substituted with 200,000 tonnes of amorphous. What followed was some discussion about the use of amorphous core transformers in Asia (particularly China) and the use of triplex cores. The discussion continued until the meeting time was up. Luke Grandbois, Secretary

The Oct. 2023 minutes are Approved.

5. Status of the DOE NOPR - Peter Ferrell, Director, Government Relations & Public Affairs, NEMA

Q&A

Overview of NEMAs expansion into more than Standards.

Shining some perspective on what the White House is thinking Congress is thinking and DOE is thinking.

NEMA responded to NOPR with 3 main points in response to the declaration focus on Workforce, availability of GOES, do not change efficiency standards as they are. Four months after that DOE issued the NOPR.

DOE has to review the standards every 7 years - don't have to change anything but have to review. DOE was petitioned by environmental groups because they did not review.

NEMA formed a transformer coalition to push back against the NOPR because it isn't practical to achieve due to supply chain etc. Not really about efficiency but lack of amorphous steel, transformers not standardized too many use cases, workforce issues, etc. (DOE hasn't issued a NOPR in 14 years (efficiency rules were changed).

Anything above TSL2 would need to get Congressional approval. Above TSL 2 would require Amorphous Steel.

Current status. Introduced, public comments, NEMA provided comments, NEMA formed coalitions to respond.

Rule within OMB office of information and reg affairs (OIRA). Court ordered to come out with something by June 1, 2024. DOE likely used the old EIA data of 2016 anticipating future loading which showed a decrease in loading, which is not the case. Bruce Webb noted at least 2 members of the IEEE committee participated in the coalition through APPA.

6. Technical Topics (Phil Hopkinson and Dan Mulkey) and Bruce Webb for Q&A

a. EEI Update - WSB Presentation

Phil shared Steven Rosenstock's (EEI's presentation) Americas Electric Companies Delivering the Future of Energy. Focused on 2024 industry priorities and leading on clean energy.

Wildfires - anything utilities can do to keep discharges down is good.

Over a 2yr period EEI has seen a move from 2.2 percent growth rate to a 4.4 percent growth rate.

b. EV Market Update

7. Assignments for next meeting
8. Next meeting date Mon. Oct 28, 2024, and location St. Louis, MO.
9. Adjourn The meeting was adjourned at 9:45 am.

PC57.167 – Guide for Monitoring Distribution Transformers – Gary Hoffman

This working group did not meet.

C57.12.35 – Bar Coding for Transformers and Regulators– Rhett Chrysler

Rhett Chrysler presented the following minutes from the working group meeting on March 12, 2024 at 1:45 p.m. with 40 in attendance. Rhett noted that the document is expired, the comment resolution group has completed its work, and that the ballot is currently recirculating.

1. Chair called the meeting to order at 1:45pm PDT. 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. A two year PAR extension was approved. The PAR now expires 12/31/2025.
 - b. The current published document C57.12.35-2013 expired 12/31/2023.
4. Total attendance of 39 is listed below. 11 of 21 members present and quorum was verified (52%). Five guests requested membership, however, the Chair stated that new members are not added after the document enters the ballot phase.

Alejandro	Ayada	Power Partners	Guest	Jerry	Murphy	Reedy Creek Energy Services	Vice-Chair
Paulo	Batista	Enmax	Guest	Ismael	Naja	Eaton	Guest (R)
Chris	Brown	SDG&E	Guest	Dwight	Parkinson	EATON Corporation	Guest
Darren	Brown	Howard Industries	Member	Daniel	Posadas	Prolec Celeco	Guest (R)
Noah	Chesser	ONCOR Electric Delivery	Guest (R)	Robert	Reepe	Georgia Power Co.	Member
Rhett	Chrysler	ERMCO	Chair	David	Rohrer	First Energy	Guest (R)
Janet	Crockett	Fayetteville PWC	Guest	Sherif	Salem	Eversource Energy	Guest
Hector	Garza	Orto	Guest	Fernando	Salinas	Power Partners	Guest
Stephen	Gilbert	IFD Technologies	Guest	Stephen	Shull	BBC Electrical Services, Inc.	Member
Kenneth	Hampton	Baltimore Gas & Electric	Member	Craig	Tennant	H-J	Guest
Ramadan	Issack	American Electric Power	Member	Fernando	Tirado	Prolec GE	Guest
Patrycja	Jarosz	IEEE SA	Guest	Alan	Traut	Howard Industries	Secretary
Angela	Leigl	EATON Corporation	Guest	Steve	Tsai	JST Power Equipment	Guest
Alejandro	Macias	CenterPoint Energy	Member	Reinaldo	Valentin	Duke Energy	Guest
Nicholas	Manske	ONCOR Electric Delivery	Guest	Jeremy	Van Horn	IFD Corporation	Guest
Fernando	Meza	Power Partners	Guest	Joshua	Verdell	ERMCO	Member
Justin	Minikel	Eaton	Guest	Shelby	Walters	Howard Industries	Guest
Michael (Tyle	Morgan	Duke Energy	Guest (R)	Bruce	Webb	Knoxville Utilities Board	Guest
Daniel	Mulkey	Mulkey Engineering Inc.	Member	Paul	Weyandt	Schneider Electric	Guest
5. Martin	Munoz	Orto	Guest				

Guest (R) = Requesting Membership\

6. Motion to approve meeting agenda (Josh Verdell/Steve Shull). Approved unanimously.
7. Motion to approve Fall 2023 meeting minutes (Josh Verdell/Jerry Murphy). Approved unanimously.
8. Status of SA ballot.
 - a. Ballot opened 8/1/2023 and closed 9/19/2023 with 75% return rate, 97% approval rate with 42 comments to resolve.
 - b. Comment resolution group (CRG) met to resolve the comments. 25 comments were accepted, 13 comments were accepted as revised, 0 comments were rejected.
 - c. The comments were all resolved by the CRG and do not required WG action.
 - d. A recirculation ballot was opened 3-6-2024 and closes 3-16-2024.
9. The Chair presented the following SCATE (Supply Chain and Asset Traceability for Energy) update:

EPM committee (external proposal management)

- Proposal ID Number - P0163
- Project Type - INDIVIDUAL
- Title of Proposal/project - Unique IDs and Smart Tags for Supply Chain and Asset Traceability for the Electric Grid
- Status/TCR - PENDING CONSIDERATION DISTRIBUTION SUBCOMMITTEE AS CO-SPONSOR

3/11/24 - Release of SCATE specifications for distribution transformers for IEEE industry Connections SA IC22-009 project

- Specification for Unique IDs and Smart Tags for Supply Chain and Asset Traceability for Energy - v1.0
- SCATE Unique ID Encoding Model - Distribution Transformers - v1.0
- <https://ieee-sa.meetcentral.com/scate/home> (available in April)

10. The chair presented the following list of manufacturers requesting a manufacturer two character ID codes.

Hitachi Energy (??), Fall 2021 WG meeting, Meeting Minutes, Andre Lainson
 SETI, Shinseong E&T, Inc. (SH), 6/01/2023, Email from Bruce Webb (KUB)
 WEG Transformers USA (WU), 7/03/2023, Email from Zach Weiss
 JST Power Equipment (JS), 11/10/2023, Email from Chris Talbert
 Emirates Transformers and Switchgear Ltd (ET), 2/15/2024, Email from Unmesh Kawale

A motion was made to accept SETI, WEG, JST, and Emirates. The motion passed unanimously.

Hitachi Energy was tabled pending identification of the new two character code.

11. Next meeting – St. Louis, MO USA October 27-31, 2024

Note – pending ballot recirculation status, if recirculation is successful then the WG will be removed from the Fall 2024 schedule

12. Meeting adjourned at 2:03 PDT.

Submitted by: Alan Traut, Secretary

Date: 3/12/2024

■ Task Force Tank Touch Temperature – Bruce Webb

Bruce Webb presented the following minutes (this TF did not meet):

- There was no in person meeting this week in Vancouver, BC
- As next steps from our F23 meeting, a DRAFT report of the TF results was prepared for presentation to this SC. The report was completed in January 2024 with the assistance of Messrs. Ryan Hogg U.S. Bureau of Reclamation and J.C. Hernandez-Mejia of NEETRAC. Thank you.
- Following the completion this DRAFT report, it was peer reviewed by volunteers from our F23 meeting. This TF Review Team consisted of (Dan Mulkey of Mulkey Engineering, Ryan Hogg, Jeremy Van Horn with IFD and Jim Spaulding of the City of Fort Collins – Light & Power). The DRAFT report was APPROVED in early February. Again, my thanks to this Team.
- Afterwards and following our F23 next steps, the completed DRAFT was submitted to the Standards Administration (SA) and the Administrative Committee (Adcom) for their review, consideration, and approval.
- SA/Adcom has responded to our submittal by requesting that the report be reformatted into an official IEEE SA White Paper.
- Once reformatted, the Chair will again have the paper peer reviewed and later sent out to the TF Members for approval, disapproval with comment or abstention prior to the F24 meeting in St. Louis.
- No in-person meeting is expected to take place at the F24 St. Louis, MO meeting.

■ C57.15 – Step-Voltage Regulators – Dan Sauer

Dan submitted the below minutes from the working group that met following the Transformer Committee Meeting.

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:

Dan	Sauer	Chair	Eaton Corp	USA
Stephen	Shull	Member	BBC Electrical Services Inc.	USA
Kyle	Heiden	Member	Eaton Corp	USA
Janet	Crockett	Guest	Fayetteville PWC	USA
Samragui	Datta Roy	Member	Siemens Energy Inc.	USA
Wilson	Tranum	Member	Siemens Energy Inc.	USA
Rehan	Ali	Member	Siemens Energy Inc.	USA
Patrycja	Jarosz	Guest	IEEE SA	USA
Miguel	Garcia	Guest	Not stated	USA
Yeounsoo	Kim	Member	Not stated	USA
Sherif	Salem	Member	Eversource Energy	USA
Sebastian	Rehkopf	Member	Reinhausen	GER
Jimmy	Smith	Member	Howard Industries	USA
Tim	Tillery	Guest	Howard Industries	USA
Guang	Yuan	Guest	Hitachi Energy	USA
Miguel	Plascencia	Member	PG&E	USA
Dwight	Parkinson	Guest	Eaton Corp	USA
Richard	Frye	Member	Eaton Corp	USA
David	Rohrer	Member	First Energy	USA
Chris	Slattery	Member	First Energy	USA
Michael	Gonzales	Member	Southern California Energy	USA
Lee	Matthews	Vice Chair	Howard Industries	USA
Nabi	Almeida	Secretary	Prolec GE	USA

Ismael	Naja	Member	Eaton Corp	USA
Alex	Macias	Member	CenterPoint Energy	USA

C.3 Old Business

- No old business was discussed

C.4 New Business

PC57.12.210

Vote was brought to submit PC57.12.210 to an Entity Ballot

Dan Sauer mad the motion

Steve Shull provided a 2nd

This motion was unanimously approved.

SCATE

Steve Shull gave an explanation of what SCATE is.

We are being asked to co-sponsor this project by providing input but not stewardship.

Steve Shull made a motion to co-sponser ths project.

Rhett Chrysler provided a 2nd

This motion was unanimously approved.

English Errors – Dan Mulkey

Dan noted several inconsistencies in the language used in various documents

Incorrect use of immersed

Non vs not-non being used in the same exclusion

Primary vs Secondary

Pad mounted Step Voltage Regulators

The Subcommittee unanimously voted to create a PAR for pad mount voltage regulators. This motion came from a task force that was formed with 7 members.

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	Role	Company
Ali	Rehan	Guest	Siemens Energy
Almeida	Nabi	Member	Prolec GE
Amin	Mihir	Guest	EATON
Arteaga	Javier	Member	Hitachi Energy
Ayala	Alex	Member	Power Partners
Ayers	Donald	Member	Ayers Transformer Consulting
Bautista	Paulo	Guest	Enmax
Berman	Andrew	Guest	S&C Electric Company
Berube	Jean-Noel	Guest	Rugged Monitoring Inc.
Biggie	Kevin	Member	Weidmann Electrical Technology
Blackwell	Zack	Guest	TCI
Blaszczyk	Piotr	Member	Specialty Transformer Components LLC
Blew	David	Member	Retired (PSE&G)
Britton	Jeffrey	Guest	Phenix Technologies, Inc.
Brooks	Jeffrey	Guest	Power Engineers
Brown	Duane	Guest	Measurements International Ltd.
Callsen	Thomas	Member	Weldy-Lamont Associates
Chesser	Noah	Guest	Oncor Electric Delivery
Chisholm	Matthew	Guest	IFD Technologies
Cho	Eunyoung	Guest	HICO America
Chrysler	Rhett	Member	ERMCO
Colopy	Craig	Member	Retired (Eaton)
Coughlan	William	Guest	Metglas, Inc.
Crockett	Janet	Guest	Fayetteville PWC
Currizales	Juan Alfredo	Guest	Prolec
Dulac	Hakim	Member	APT
Dutta Roy	Samraghi	Member	Siemens Energy
Espindola	Marco	Guest	Hitachi Energy
Fernandez	Miguel	Guest	Braintree Electric Light Dept.
Ferreira	Marcos	Member	Quanta Technology
Forsyth	Bruce	Guest	Cargill
Frye	Rich	Guest	EATON
Garcia	Benjamin	Member	Southern California Edison
Garcia	Miguel	Guest	Hitachi Energy
Gaytan	Carlos	Member	Prolec GE
Ghafourian	Ali	Member	H-J Enterprises, Inc.
Ghosh	Rob	Member	General Electric
Giraldo	Orlando	Guest	H-J Family of Companies
Gonzales	Michael	Guest	Southern California Edison
Gonzalez	Luis	Guest	Canduct Industries Limited

Grandbois	Luke	Guest	IFD Technologies
Greaves	Brad	Guest	Weidmann Electrical Technology Inc.
Gupta	Ravi	Guest	Megger
Gyore	Attila	Guest	MIDEL & MIVOLT FLUIDS
Hampton	Kenneth	Member	Baltimore Gas & Electric
Hanoir	Didier	Guest	Transformer Protector Corp
Heiden	Kyle	Member	EATON Corporation
Heineig	Peter	Guest	Weidmann
Hernandez	Jean	Guest	Georgia Tech NEETRAC
Hernandez Cano	Sergio	Member	Hammond Power Solutions
Hoffman	Saramma	Guest	PPL Electric Utilities
Hogg	Ryan	Guest	Bureau of Reclamation
Hopkinson	Philip	Member	HVOLT Inc.
Issack	Ramadan	Member	American Electric Power
Jacob	Nathan	Guest	Camlia Energy
Jarosz	Patricia	Guest	IEEE
John	John	Member	Virginia Transformer Corp.
Kim	Yeounsoo	Guest	MEPPI
Klaponski	Brian	Member	Carte International Inc.
Klaponski	Adam	Guest	Carte International
Knapp	Evan	Guest	EATON
Komm	Dave	Guest	Hammond Power Solutions
Laidse	Peeva	Guest	Sherwin-Williams
Larison	Andrew	Member	Hitachi Energy
Leal	Fernando	Guest	Prolec GE
Lee	Moonhee	Member	Hammond Power Solutions
Leigl	Angela	Guest	EATON
Levin	Aleksandr	Guest	Weidmann Electrical Technology
Li	Weijun	Member	Braintree Electric Light Dept.
Lin	David	Guest	IFD Corporation
Lizcano	Cesar	Guest	Shell USA, Inc.
Loiselle	Wes	Guest	TetraTech
Lopes	Ricardo	Guest	Efacec Energia, SA
Lopez-Fernandez	Xose	Guest	Universidade de Vigo
Lovins	Colby	Guest	Federal Pacific
Lugge	Andrew	Guest	Hitachi Energy
Macias	Alejandro	Member	CenterPoint Energy
Mai	Tim-Felix	Member	Siemens Energy
Malde	Jinesh	Guest	M&I Materials Inc.
Manske	Nicholas	Guest	Oncor Electric Delivery
Martinez	Daniel	Guest	JFE
McBride	Brian	Member	Cargill, Inc.

Mellin	Toni	Guest	Vaisala
Meza	Fernando	Guest	Power Partners
Minikel	Justin	Member	EATON Corporation
Montpool	Rhea	Member	Schneider Electric
Morgan	Michael	Guest	Duke Energy
Murphy	Jerry	Chair	Reedy Creek Energy Services
Naderian	Ali	Guest	METSCO Energy Solutions Inc. BBA
Naja	Ismael	Guest	Eaton
Narawane	Aniruddha	Member	EATON Corporation
Neild	Kristopher	Guest	Megger
Nunn	Tommy	Guest	JST Power
Oakes	Stephen	Member	WEG Transformers USA Inc.
Ogajanov	Rudolf	Guest	Hitachi Energy
Ortega	Asustin	Guest	Siemens Energy
Panesar	Parminder	Guest	Virginia Transformer
Parkinson	Dwight	Member	EATON Corporation
Patel	Vinay	Guest	Consolidated Edison Co. of NY
Patel	Dipesh	Guest	EATON
Payerle	George	Member	Carte
Pepe	Harry	Guest	Phenix Technologies, Inc.
Plascencia	Miguel	Guest	PG&E
Prince	Jarrod	Member	ERMCO
Puente	Pedro	Guest	Prolec GE
Radu	Ion	Member	Hitachi Energy
Reepe	Robert	Member	Georgia Power Co.
Rohrer	David	Guest	First Energy
Ronchi	Rodrigo	Guest	WEG-Voltran
Salem	Sherif	Guest	Eversource Energy
Salinas	Fernando	Member	Power Partners
Saraf	Manish	Guest	Hammond Power Solutions
Sarkar	Amitabh	Guest	Virginia Transformer Corp
Sauer	Daniel	Member	EATON Corporation
Sbravati	Alan	Guest	Hitachi Energy
Shalabi	Jaber	Guest	VanTran Industries, Inc.
Shull	Stephen	Member	BBC Electrical Services, Inc.
Siebert-Timmer	Audrey	Member	IFD Technologies
Simonov	Igor	Guest	Toronto Hydro
Slattery	Christopher	Guest	FirstEnergy Corp.
Smith	Jimmy	Guest	Howard Industries
Snyder	Steven	Member	Hitachi Energy
Soeller	Markus	Guest	Power Diagnostix
Sparling	Brian	Guest	Kinectrics

Tarengo	Erik	Guest	Olsun Electrics
Taylor	Marc	Guest	JFE Shoji Power Canada Inc.
Tendulkar	Vijay	Member	EATON Corp.
Tennant	Craig	Guest	H-J
Thibault	Michael	Member	Pacific Gas & Electric
Thiede	Andreas	Guest	Highvolt Dresden
Tillery	Timothy	Member	Howard Industries
Tostrud	Mark	Guest	Dynamic Ratings, Inc.
Traut	Alan	Member	Howard Industries
Van Horn	Jeremy	Member	IFD Technologies
Vandermaar	John	Guest	BC Hydro
Vartanian	John	Member	National Grid
Verdell	Joshua	Vice-Chair	ERMCO
Verdolin	Rogério	Member	Verdolin Solutions Inc.
Vyas	Pragnesh	Member	Sunbelt-Solomon
Washburn	Alan	Guest	Burns & McDonnell
Webb	Bruce	Member	Knoxville Utilities Board
Weiss	Zachery	Member	WEG Transformers USA Inc.
Wexamdt	Paul	Guest	Schneider Electric
Wilks	Alan	Member	Consultant
Yuan	Guang	Guest	Hitachi Energy
Yun	Joshua	Member	Virginia Transformer Corp.
Zuiderveen	Thomas	Guest	IFD Corporation

Subcommittee Dry Type Meeting Minutes

Wednesday, 13 March 2024, 1:30pm – 2:45 pm PT – Spring 2024 (Vancouver, BC Canada in-person meeting)

- Chair: Casey Ballard (DuPont)
- Vice-chair: Dave Walker (MGM Transformer)
- Secretary: Dave Stankes (3M) – notes taken by Evanne Wang (DuPont)

The Chair called the meeting to order at 1:30pm PT and welcomed attendees to the meeting. The leadership introduced themselves. A quorum was achieved including the Chair and Vice-Chair. The breakdown of attendees is shown below:

- Attendees present: Fifty-three (53)
- Members present: Twenty-three (23) (quorum minimum is 16 members)
- Guests requesting membership: Two (2)
- Guests granted membership: One member will be granted membership following the 2024 Spring Meeting
- Member moved to guest status: One (1)
- *New total of members: 31 (Following the 2024 Spring Meeting)*

Solomon Chiang (The Gund Company) proposes that the QR code system be used to take attendance at the next meeting.

The meeting agenda, Essential Patent Claims information, and copyright information were reviewed. No patent claims were noted.

The minutes from the last meeting on October 25th, 2023 were reviewed and unanimously approved. Colby Lovins (Federal Pacific) made the motion and was seconded by Ken Klein (Johnson Coil). The proposed agenda for this meeting was reviewed and unanimously approved. Tim-Felix Mai (Siemens Energy) made the motion and was seconded by Rhea Montpool (Schneider Electric). 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 SC.

Summary discussion of the WG and TF:

1) **C57.12.58**

– Ken Klein (Johnson Coil) presents a motion to open a PAR for C12.58 for the title and scope shown on the slide below. This was motioned by Ken Klein (Johnson Coil) and seconded by Vijay Tendulkar (Eaton), and unanimously passes.

IEEE C57.12.58	IEEE C57.12.58
Title: Guide for Conducting a Transient Voltage Analysis of a Dry-Type Winding Scope: This guide applies to the equipment setup, measurement, simulation, and analysis of the transient voltage response of a dry-type winding to a simulated impulse voltage waveform	Purpose: Transient voltage analysis is used to determine the response of various parts of the winding to a transient voltage waveform. This analysis may be made on specially designed prototype windings with embedded voltage leads. This testing may use lower voltages than the rated BIL to expedite the test time for each data point required. These tests may also be supported with simulations.
 	 

The Working Group met in Regency (EF) Meeting room. The meeting was called to order at 11:00 AM by Chair Ken Klein.

Chair and Subcommittee Chair Casey Ballard made opening comments.

TF Roster has been distributed and signed.

Attendance:

- 31 total participants
- 21 Members
- 10 guests

There were 19 out of 19 members present. A quorum was present.

PAR study group Meeting Agenda

1. Welcome & chair's remarks
2. Introduction of attendees, attendance
3. Approval of agenda
4. Call for essential Patents & IEEE SA Copyright Policy review
5. Title and Scope
6. Vote to open a Working Group
7. Meeting Adjournment

The chair presented the information on Patent Disclosures and IEEE SA Copyright Policy. He asked the group to report any relevant patent issues – None were communicated.

The Current Title was presented by the chair

Motion: Use the same title as the current as the current document.

‘Guide for Conducting a Transient Voltage Analysis of a Dry Type Transformer Coil’

Motion: Joe, Second: Vijay

Motion was approved unanimously.

The Current Scope was presented by the chair

Klaus asked if simulations should be included. Casey stated that it can be included even if it later not be addressed in the document.

Scope was adjusted to include simulation.

‘This guide applies to the equipment setup, measurement, simulation, and analysis of the transient voltage response of a dry-type transformer coil to simulate impulse voltage waveform.’

Motion Use the scope as displayed.

Motion: Manish, Second: David

Discussion: Casey if the wording should be changed from dry-type transformer coil to dry-type winding

3 in favor 13 against, 2 abstain.

Motion failed.

Scope was adjusted, the wording changed from dry-type transformer coil to dry-type winding.

‘This guide applies to the equipment setup, measurement, simulation, and analysis of the transient voltage response of a dry-type winding to a simulate impulse voltage waveform.’

Motion Use the scope as displayed.

Motion: Casey, Second: Klaus

Motion was approved unanimously.

Motion: Change the title that it matches the new scope, change from dry-type transformer coil to dry-type winding.
New title: 'Guide for Conducting a Transient Voltage Analysis of a Dry Type winding.'

Motion: Casey, Second: Joe

Motion was approved unanimously.

The Current Purpose was presented by the chair.

'Transient voltage analysis is used to determine the response of various parts of the coil to a $1.2 \mu\text{s} \times 50 \mu\text{s}$ impulse wave. This analysis can be made on specially designed prototype coils with embedded voltage leads. This testing uses significantly lower voltages than the rated BIL to expedite the test time for each data point required.'

Joe proposes to take out the time in the purpose statement. In the further discussion the group agreed to change the wording from coil to wind to match title and scope. Manish proposed to change the word impulse to transient. Klaus proposed to add wording about simulation to the purpose. Joe proposed to change the wording from can to may: 'Transient voltage analysis is used to determine the response of various parts of the winding to a transient voltage waveform. This analysis may be made on specially designed prototype windings with embedded voltage leads. This testing may use lower voltages than the rated BIL to expedite the test time for each data point required. These tests may also be supported with simulations.'

Motion Use the purpose as displayed.

Motion: Casey, Second: Colby

Motion was approved unanimously.

Motion To take the title. Scope and Purpose to the subcommittee

Motion: Joe, Second: Casey

Motion was approved unanimously.

The meeting was adjourned, without objection, at 12:10 PM.

Chair: Ken Klein

Secretary: Tim-Felix Mai

Participation list:

	First Name	Last Name	Company	
1	Tom	Melle	HV-ATS	Member
2	David	Walker	MGM Transformer	Member
3	Sherif	Salem	Eversou Energy	Guest
4	Moonhee	Lee	Hammond Power	Member
5	Edmu	Aralah	BPA	Guest
6	Caroline	Peterson	Xcel Energy	Member
7	Mihir	Amin	Eaton	Member
8	Tendulkar	Vijay	Eaton Corp	Member
9	Tommy	Nunn	JST Power Equipment	Guest
10	Shawn	Nunn	Hitachi Energy	Member
11	Manish	Saraf	Hammond Power	Member
12	Renjic	Fu	Ermco / V&F	Guest
13	Camilo	Casallas	Trench	Member
14	Andre	Moreno	Siemens Energy	Member

15	Rafael	Grajeda	Eaton	Guest
16	Alberto	Sancoral	Eaton	Guest
17	Luis	Mendez	JST Power Equipment	Guest
18	Giovanni	Hernandez	Virginia Transformer	Member
19	Serio	Herandez Cano	Hamond Power Solutions	Member
20	Val	Tatu	Powersmiths	Member
21	Erik	Tarango	Olsun Electric	Guest
22	Colby	Lovin	Federal Pacific	Member
23	Klaus	Pointer	Trench Austria	Member
24	Bob	Fyrer	DuPont	Member
25	Dave	Komm	Hammond Power Solutions	Member
26	Joseph	Tedesco	Hitachi Energy	Member
27	Casey	Ballard	Dupont	Member
28	Tim-Felix	Mai	Siemens Energy	Secretary
29	Ken	Klein	Jonsson	Chair
30	Patrycia	Janozs	IEEE SA	Guest

2) **C57.12.01** – summary given by the Chair - no comments from SC.

The meeting was called to order at 1:45 pm by Chair Casey Ballard.

The chair made opening comments and introduced the leaders of the WG.

This is the fifth meeting of the WG for this next round of IEEE C57.12.01 continuous revision.

Attendance was collected and the meeting was convened with 61 participants, 26 members were present out of 34 total WG members; the meeting quorum was established. The membership can be requested and will be granted if the attendance requirements are met.

The list of attendees is presented at the end of this report.

The Meeting Agenda was reviewed.

Motion: “Approve the Agenda”, moved by C. Lovins, seconded by T-F. Mai, approved unanimously.

The Unapproved Minutes of the Fall 2023 meeting were reviewed (Minutes were posted on the website).

Motion: “Approve the Fall 2023 Meeting Minutes”, moved by R. Montpool, seconded by K. Klein, approved unanimously.

The Chair requested the *Patent Disclosure*, no patent claims were made.

IEEE Guidelines on WG procedure and IEEE Copyright policy have been reviewed and understood.

The Chair commented that to be the most efficient all suggestions should be provided in writing and sent to the Chair in advance of the WG meetings.

The Chair used the attached presentation to guide the WG meeting.



IEEE C57-12-01
Spring 24.pptx

Old Business

TF Annex Proposal on Fire Performance (Mai)

Nothing new to report. The TF will be continued until the Fall 2024 meeting.

TF on Environmental Conditions Update (Mai)

Nothing new to report. The TF will be continued until the Fall 2024 meeting.

Insulation Resistance Pass/Fail Criteria (Tedesco)

. No proposals at this time. The topic will be removed from future agendas.

Power Factor Testing Pass/Fail Criteria (Walker)

IEEE C57.12.91 recommends to measure and monitor of the PF's trend, but there is no Pass/Fail criteria. Concern is with the variability of the test conditions. M. Locarno offered to share the available dry-type's PF statistical data separated in field tests (majority of the data) and factory tests and, also, between open ventilated and cast resin designs. This data will be shared by Locarno with the WG at the Fall 2024 meeting.

Consequences of Exceeding a Maximum System Voltage (Tedesco)

Proposal: Clause 5.10.4 The preferred tapping range is 5% in 2.5% steps above and below rated voltage. Transformers may be provided with taps for voltages above rated voltages without increasing the insulation level, provided that the maximum system voltage defined in Table 3 is not exceeded. If the maximum system voltage is exceeded, the transformer shall be designed to withstand both the low frequency voltage level and the BIL for the next highest voltage class, according to Table 3.

It was recognized that these are very rare cases. As a transformer is a part of the system, the system limitations are will still apply. The respective recommendations of the IEEE 12.00 and IEC were reviewed.

In case of exceeding max system voltages, the agreement between a manufacturer and an user can be considered. Without any specific request, the proposal was tabled in the Fall 2023 meeting and no effort was made to resurrect it. The topic will be removed from future agendas.

New Business

On-Load Tap-Changers (Mai)

Tim-Felix made a motion: include the following modified text from IEEE C57.12.00 in IEEE C57.12.01:

“8.34 Additional routine tests on transformers with load tap changing ~~or regulating transformers~~

8.34.1 Ratio tests on load tap changing transformers

Ratio tests on load tap changing transformers shall be made

a) ~~At all connection positions of the tap-changer for de-energized operation with the LTC on the rated voltage position.~~

b) ~~At all LTC positions with the tap-changer for de-energized operation on the rated voltage position.~~

8.34.2 Impedance voltage and load-loss tests on load tap changing transformers

Impedance voltage and load-loss tests, at maximum, **rated and minimum voltage tap position**, as listed in ~~Table 18~~, shall be made on one unit of a given rating when multiple units are produced by one manufacturer at the same time”.

V. Tendulkar seconded the motion. In the discussion: IEEE C57.12.91 would have had many changes (following IEEE C12.90 OLTC tests). The concern was about the fact that this technology is, still, rare in dry-type transformers.

Vote: 2 for, 10 against, 9 abstain – motion failed.

Inclusion of 50 Hz (Tedesco)

There was no proposal for changes. The topic will be removed from future agendas.

Short Circuit Temperature Calculation (Hossain)

Comparison of C57.12.01 and C57.12.00 for liquid-type transformers. Differences in the similar equations described. There were no differences in the previous version of the C57.12.01.

It is shown that the temperature calculation equation shall be accidentally changed in the last revision of the standard and the editorial error is corrected.

As IEC calculation is easier compared to the IEEE one, D. Walker proposed to establish the IEC s.c. temperature calculation as a preferable method with IEEE method being optional. T-F. Mai seconded the motion. Vote: 18 for, 0 against, 3 abstain – motion passed.

V. Tendulkar proposed to consider a different way to calculate the s.c. temperature for the short duration currents (see attached file). Also proposed is an inclusion of the calculation of the asymmetrical fault current and respective temperatures. This will be discussed as a new business.



C57.12.01 – SHORT
CIRCUIT CALCULATIO

Dry-type pole-mounted transformers (Mai)

Corrections proposed:

- clause 4.1.10 Storage and 4.1.11 Operation: the added descriptions would not be applicable for pole-mounted units (outdoor application). – To be added to the New Business for Fall 2024.
- clause 6.3: correct the text "are directly exposed..." – corrected.
- 6.6.1: only the terminals should be per C57.12.20. The bushings could be designed in accordance with the dialectic requirements. – To be added to the New Business for Fall 2024.

Potential new business for the next meeting:

- Insulation coordination and tests

P. Hopkinson raised the question on the insulation coordination of the dry-type and oil-type distribution transformers: as both of these apparatus are subject of the switching over-voltages caused by the operation of the vacuum circuit breakers, the BIL test levels shall be similar in both cases. The current HV tests are not coordinated with the reality of the operation. The current discussions on the mitigation of the switching voltages in IEEE C57.142 considers both high voltage and medium voltage systems.

C. Ballard mentioned that this aspect has been considered in the previous work of this WG's current PAR and the previous motion failed. P. Hopkinson will bring up a new proposal to the attention of the WG.

- R. Hoggs questioned the current Table 13 of the standard: 3-ph class I transformers are limited to 500 kVA, which seems like not correct considering the current application practices. This definition affects the respective s.c. duration. The question will be reviewed as a new business.

The WG will meet again during the Spring 24 IEEE TC meeting.

With no further business, the meeting was adjourned at 3:00 pm.

Chair: Casey Ballard

Vice Chair: Joe Tedesco

Secretary: Sasha Levin

WG IEEE C57.12.01 Meeting Participants List – Spring 2024

	Last name	First name	Company Name	Role
p	Amin	Mihir	EATON	Guest
p	Ballard	Robert	DuPont	Chair
p	Chen	Binshan	BC Hydro	Guest
p	Chiang	Solomon	The Gund Company	Member
p	Debass	Samson	EPRI	Member
p	Dulac	Hakim	APT	Guest
p	Fernandez	Miguel	Braintree Electric Light Dept.	Guest
p	Fong	Sarford	GA Power	Guest

p	Fu	Renjie	ERMCO/VF Transformers	Guest (RM)
p	Fyrer	Bob	DuPont	Member
p	Gara	Lorne	Telos	Guest (RM)
p	Garcia	Miquel	Hitachi Energy	Guest
p	Ghosh	Rob	GE	Guest
p	Grajeda	Rafael	EATON Corporation	Guest (RM)
p	Gross	Detlev	Power Diagnostix Consultant	Guest
p	Guang	Yuan	Hitachi Energy	Guest
p	Hernandez	Giovanni	Virginia Transformer Corp.	Member
p	Hernandez Cano	Sergio	Hammond Power Solutions	Member
p	Hogg	Ryan	Bureau of Reclamation	Member
p	Hopkinson	Philip	HVOLT Inc.	Guest
p	Hossain	Saif	Trench Ltd.	Guest
p	John	John	Virginia Transformer Corp.	Member
p	Iman	Mohammad	MGM Transformer Company	Member
p	Klein	Ken	Johnson	Member
p	Komm	Dave	EATON	Guest
p	Lee	Monhee	Hammond Power Solutions	Member
p	Levin	Aleksandr	Weidmann Electrical Technology	Secretary
p	Li	Weijun	Braintree Electric Light Dept.	Member
p	Lovins	Colby	Federal Pacific	Member
p	Macias	Alejandro	Centerpoint Energy	Guest
p	Mai	Tim-Felix	Siemens Energy	Member
p	Mani	Kumar	Duke Energy	Guest (RM)
p	Martinez	Daniel	JFE Shoji Power, Canada	Guest
p	McBride	Jim	JMX Services, Inc.	Guest
p	Montpool	Rhea	Schneider Electric	Member
p	Moreno	Andre	Siemens Energy	Guest
p	Narawane	Aniruddha	EATON Corporation	Member
p	Nunn	Shawn	Hitachi Energy	Member

p	Nunn	Tommy	?	Guest
p	Ortega	Augustin	Siemens Energy	Guest
p	Patel	Dipeshkumar	EATON	Guest
p	Peterson	Caroline	Xcel Energy	Member
p	Salem	Sherif	Eversource Energy	Guest
p	Sandoval	Alberto	EATON Corporation	Guest (RM)
p	Saraf	Manish	Hammond Power Solutions	Member
p	Shannon	Mike	REA Magnet Wire	Guest
p	Shannon	Michael	REA Magnet Wire	Guest
p	Sohail	Mohammad Abdullah	Trench Limited	Guest (RM)
p	Sohail	Muhammad	Trench Limited	Guest
p	Tarango	Erik	Olsun Electric	Guest
p	Tatu	Valeriu	Powersmiths	Member
p	Tedesco	Joseph	Hitachi Energy	Member
p	Tendulkar	Vijay	Eaton Santa Ana, CA	Member
p	Tsai	Steve	JST Power Equipment	Guest
p	Walker	David	MGM Transformer Company	Member
p	Wang	Evanne	DuPont	Guest
p	Weyandt	Paul	Schneider Electric	Guest (RM)
p	Weyer	Daniel	Monolith	Guest
p	White	Joe	Power Engineering	Guest
p	Wicks	Roger	DuPont	Guest
p	Wong	Terry	Trench Ltd.	Guest

- 3) **IEEE 259** – summary given by Joe Tedesco (Hitachi) for Dave Stankes (3M). The Chair asks if WG can extend PAR without SC approval. Tom Prevost (Weidmann) confirms that the WG can extend a PAR without SC approval. No other comments.

The Working Group met in Regency (A) Meeting room. The meeting was called to order at 3:15 PM by Vice Chair Joseph Tedesco.

Chair made opening comments.

In the interest of time, introductions were foregone. WG Roster has been distributed and signed.

Attendance:

- 34 total participants
- 11 Members
- 23 guests

There were 11 out of 17 members present. A quorum was present.

WG Meeting Agenda

- 1. Introductions**
- 2. Attendance & determination of quorum (17 Members)**
- 3. Approval of agenda**
- 4. Approval of Fall 2023 and 2/21 (Virtual) meeting minutes**
- 5. Review of test procedure flow chart (Tim-Felix Mai)**
- 6. Review revised clauses in Draft 4 including:**
- 7. Clause 5. Insulation Test Specimens**
- 8. Clauses 5.1 Screening Tests and 6.1 Screening tests (Optional) Clause 5.2 Design screening test (optional) and Clause 5.3 Screening test**
- 9. Clause 7. Modifications to and existing system (Evanne Wang)**
- 10. Clause 8. Data analysis (Roger Wicks)**
- 11. Par Extension Request**
- 12. Meeting Adjournment**

Joe 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. Aniruddha, Second: Vijay

The WG Meeting minutes of the Fall 2023 and 2/21 virtual Meeting were approved unanimously without discussion.

Motion: Aniruddha, Second: Solomon

Old Business:

Joe showed the revised scope and purpose.

The test procedure flow chart reviewed and presented by Tim-Felix Mai

Discussion about the modification section 7. The wording cannot be simply copied from C7.12.60.

TF led by Evanne will come up with a proposal for next Meeting (Solomon will assist).

Typo in Table 1 section 6.1 is 504 to 480 should be 504 to 840.

In the draft the flow chart has a black background. Casey asked to change this to a white background. Tim-Felix will prepare a new version of the flow chart.

As Ed is retired Joe asked the group for a new volunteer for the test objects. No new volunteer found.

As Roger is retiring soon Joe asked the group for a new volunteer for the testing section. No new volunteer found maybe Dave can assist.

Mechanical stress, thermal exposure and moisture exposure will still be reviewed by Tim-Felix. Joe offered to help.

Motion: PAR extension for two years

Motion: Colby, Second: Aniruddha

Motion approved unanimously without discussion.

New Business:

None

The meeting was adjourned at 4:10 PM.

	Last Name	First Name	Company	
1	Ballard	Robert	DuPont	Member
2	Chiang	Solomon	The Gund Company	Member
3	Lee	Moonhee	Hammond Power Solution	Member
4	Levin	Alexander	Weidmann	Member
5	Lovins	Colby	Federal Pacific	Member
6	Mai	Tim-Felix	Siemens Energy	Secretary
7	Narawane	Aniruddha	Eaton Corporation	Member
8	Tedesco	Joseph	Hitachi Energy	Vice Chair
9	Tendulkar	Vijay	Eaton	Member
10	Wicks	Roger	DuPont	Member
11	Casallas	Camilo	Trench Limited	Guest
12	Mendez	Luis	JST Power Equipment	Guest
13	Grajeda	Rafael	Eaton	Guest
14	Patel	Dipesh	Eaton	Guest
15	Gaon	Alexander	Coil Innovation	Guest

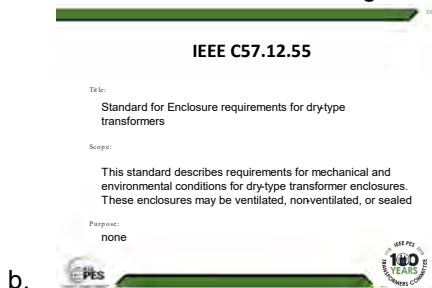
16	Fryer	Bob	Dupont	Guest
17	Wang	Evanne	DuPont	Requesting Membership
18	Chen	Binzhan	BC Hydro	Guest
19	Fu	Yao	BC Hydro	Guest
20	Yegor	Melo	BC Hydro	Guest
21	Yuan	Guang	Hitachi Energy	Guest
22	Erik	Tarango	Olsun Electric	Guest
23	Fu	Renjie	Ermco / V&F	Guest
24	Jarosz	Patrycja	IEEE SA	Guest
25	Patel	Vinay	Con Edison	Member
26	Peterson	Caroline	Xcel Energy	Guest
27	Pointer	Klaus	Trench Austria	Guest
28	Sandoval	Alberto	Eaton	Guest
29	Sharp	Michael	Trench LTD	Guest
30	Tatu	Val	Powersmiths	Guest
31	Klein	Ken	Johnson	Guest
32	Riberio	Marilia	GE	Guest
33	Matthew	Sze	Omicron Electronics	Guest
34	Moreno	Andre	Siemens Energy	Guest
35	Robalino	Diego	Megger	Guest
36	Nunn	Tommy	JST Power Equip.	Guest
37	Hossain	Saif	Trench Limited	Guest
38	Wong	Terry	Trench Limited	Guest
39	Komm	Dave	Hammond Power Solutions	Guest

40	Reiss	Tony		Guest
41	Wirth	Stefan	Coil Innovation	Guest
42	Ortega	Agostin	Siemens Energy	Guest
43	Mihir	Amin	Eaton	Guest
44	Tekin	Dervis	GE	Guest

4) **C57.12.55**

Shawn Nunn (Hitachi ABB Power Grid) makes a motion to submit the PAR for C57.12.55 that will become IEEE and no longer ANSI to use the title and scope shown on the screen without a purpose. Seconded by Aniruddha Narawane (Eaton). Manish Saraf (Hammond Power Solutions) comments that in the industry, he's not sure if it's a requirement to revise the standard because the numerous other enclosure standards commonly in use in the industry make an IEEE enclosure standard unnecessary. The Chair takes a vote for the motion:

- a. For the motion: 19 for, 0 against, 1 abstention. Motion carries.



b.

The meeting was called to order at 4:45 pm by Chair Shawn Nunn.

The chair made opening comments and discussed the history of the document.

The attendance roster was circulated with the instructions to indicate if the attendees would like to become a member of the Task Force.

After circulation, there were 16 participants, 8 individuals requested membership, and 8 guests. Meeting quorum was established since this was the first meeting of the taskforce. Please see the list of attendees at the end of the report.

The Chair reviewed the copyright and patent slides. No patent claims were stated.

The Chair reviewed the agenda for the meeting.

Motion by Casey Ballard to approve the Agenda.

- Motion seconded by Tim-Felix Mai
- No discussion
- Vote was held. 6 Approved, 0 Disapproved, 1 Abstention

New Business:

The Chair displayed the current document Title and proposed Title. Much discussion on what the document should contain. Discussion centered around if this should only be an enclosure document or still include the other items within the document. For example, thermal and sampling selection.

This led to a discussion about Scope expansion and the risk of conflicting with other IEEE standards.

Another point mentioned was that there may be transformer applications today there were not around when this document was last revised.

The proposed Title “IEEE Standard for Dry-Type Transformers Used in Unit Installations, Including Unit Substations” was word smithed by the group to the following, “Enclosure requirements for dry-type transformers”.

Question was raised on whether to include “IEEE Standard” at the beginning of the Title. The consensus was that this was not required for the PAR creation. IEEE would add the appropriate leading text.

Motion by Casey Ballard to change the Title to “Standard for Enclosure requirements for for dry-type transformers”

- Motion was seconded by Joe Tedesco.
- Discussion – Brief group discussion on whether the document should remain a standard. The consensus of the group was to retain the “Standard” designation.
- The chair called for a vote on the motion.
- 6 Approve, 0 Disapprove, 1 Abstention.
- Motion Passed.

The Chair then displays the current and proposed Scope and Purpose.

Discussion started with the Scope and what the Scope should include.

Comment was made that a OEM could put equipment other than transformers in the enclosure.

Another comment was made surrounding environmental conditions and what should be included.

The terms ventilated, non-ventilated, sealed, single-phase and polyphase were discussed and whether or not they should be removed or left in the Scope.

After the discussion concluded, the Proposed Scope presented by the Chair...

“This standard describes electrical and mechanical requirements for dry-type distribution, power transformers and for autotransformers. Such transformers may be remotely or integrally associated with primary or secondary switchgear or substations, or both. These transformers may be either single-phase or polyphase, with ventilated, nonventilated, or sealed enclosures. This standard covers all Unit installed and unit substation Dry-Type transformers except for the transformers as described as exceptions in IEEE Std. C57.12.01.”

Was revised to...

“This standard describes the requirements for mechanical and environmental conditions for dry-type transformer enclosures. These enclosures may be ventilated, non-ventilated, or sealed.”

Motion by Ken Klein to change the Scope to “This standard describes requirements for mechanical and environmental conditions for dry-type transformer enclosures. These enclosures may be ventilated, non-ventilated, or sealed.”

- Motion was seconded by Tim-Felix Mai.
- There was no Discussion.
- The chair called for a vote on the motion.
- 6 Approve, 0 Disapprove, 1 Abstention.
- Motion Passed.

The Chair then displayed the current and proposed Purpose.

After a brief discussion the consensus of the group was not to include a Purpose since the Title and Scope sufficiently explains the document. A vote was not required.

Next, the following motion was stated...

Motion by Joe Tedesco to take the Title and Scope, as written, to the Dry-Type Subcommittee for PAR approval.

- Motion was seconded by Ken Klein.
- There was no Discussion.
- The chair called for a vote on the motion.
- 6 Approve, 0 Disapprove, 1 Abstention.
- Motion Passed.

With no further business, the meeting was adjourned.

Chair: Shawn Nunn

Secretary: Colby Lovins

Task Force for PAR Development of C57.12.55 Meeting Attendees – Spring 2024

FIRST NAME	LAST NAME	AFFILIATION	GUEST / MEMBER
Shawn	Nunn	Hitachi Energy	Chair
Colby	Lovins	Federal Pacific	Secretary
Casey	Ballard	Dupont	Member
Joseph	Tedesco	Hitachi Energy	Member
Tim-Felix	Mai	Siemens Energy	Member
Ken	Klein	Johnson	Member
Tommy	Nunn	JST Power Equipment	Guest
Luis	Mendez	JST Power Equipment	Guest
Steve	Tsai	JST Power Equipment	Guest
Rob	Ghosh	GE	Vice Chair
Erik	Tarango	-	Guest
Bob	Fyrer	Dupont	Member
Andre	Moreno	Siemens Energy	Guest
Marnie	Roussell	Entergy	Guest
Ed	Arevib	BPA	Guest
Roger	Wicks	Dupont	Guest

5) **C57.94** – summary given by Ken Klein (Johnson Coil) – no comments from the SC.

The Working Group met in Roanoke Meeting room. The meeting was called to order at 8:00 AM by Chair Ken Klein.

Chair made opening comments.

WG Roster has been distributed and signed.

Attendance:

- 42 total participants
- 9 Members
- 33 guests

There were 9 out of 15 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
4. Approval of minutes from Fall 2023 meeting
5. Call for essential Patents & IEEE SA Copyright Policy review
6. Review of TF sections
 - o Normative references: 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 2024)
 - o Maintenance: Ken Klein & Kerwin - Ryan Hogg notes & new drying graph
7. Meeting Adjournment

The agenda was approved unanimously without discussion.

Motion: Joe, Second: Colby

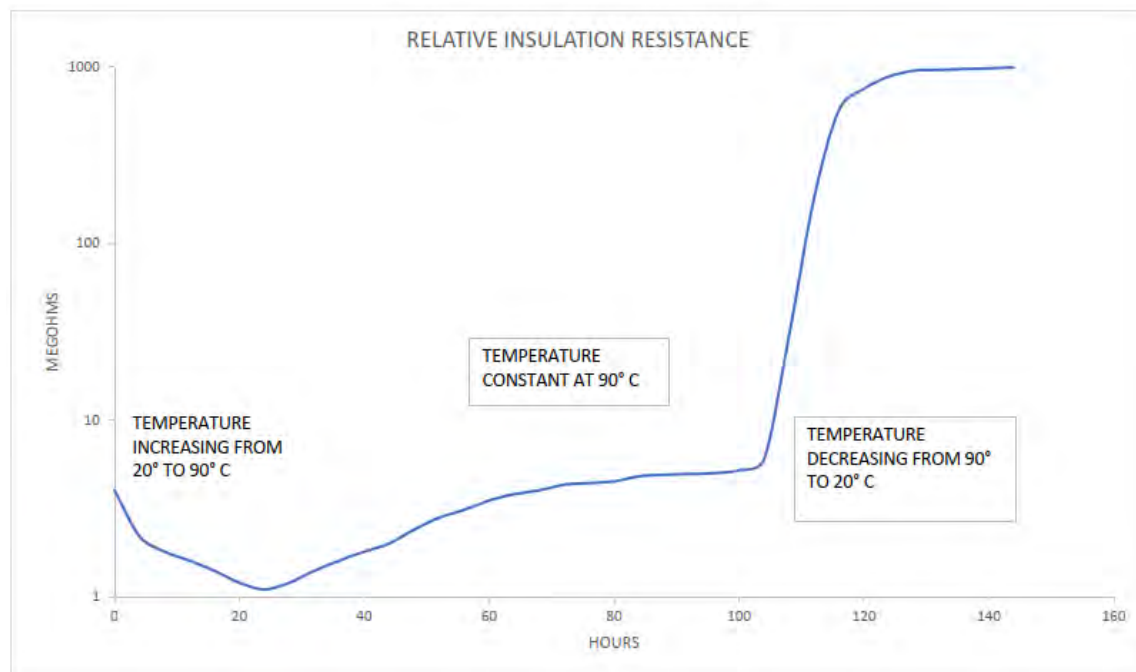
The WG Meeting minutes of the Fall 2023 Meeting were approved unanimously without discussion.

Motion: Casey, Second: Joe

The chair presented the information on Patent Disclosures and IEEE SA Copyright Policy. He asked the group to report any relevant patent issues – None were communicated. **Old Business:**

Ryan Hogg presented procedures from the Bureau of Reclamation like performing thermographic scans, checking temperature alarms, check fans, ... There was a discussion in the group what and how to include this in the document. Ryan will prepare a more detailed proposal by mid-April and sent it to the chair.

The chair presented a typical insulation resistance curve. The group commented that time and resistance values should be removed:



The wording is already in section 8.3.5.2. The old figure 1 will be replaced by the new updated figure. Solomon stated that it would be helpful to have a information that the shape of the curve can be different due to different environmental conditions.

Roger mentioned that as IEEE Std C62.2 is not used / referred in the body of the document it should be moved to the bibliography. The chair will do an editorial review of the normative reference and bibliography to check if all the standards are in the correct place.

The current draft is not in the latest IEEE template. The chair will update the current document to the latest template.

New Business:

The latest Draft D4 will be sent out end of April to the group for a straw ballot. The next meeting is planned to be the last meeting. At this point no new members will be accepted.

The meeting was adjourned, without objection, at 8:50 AM.

The WG will meet again at the Fall 2024 meeting in St. Louis, Missouri USA, October 27-31.

Chair: Ken Klein

(Vice-Chair: David Stankes)

Secretary: Tim-Felix Mai

Participation list:

	First Name	Last Name	Company	
1	Robert	Ballard	DuPont	Member
2	Tim-Felix	Mai	Siemens Energy	Secretary
3	Ken	Klein	Johnson	Chair
4	Joseph	Tedesco	Hitachi Energy	Member
5	Colby	Lovins	Federal Pacific	Member
6	Solomon	Chiang	TGC	Member
7	Vijay	Tendulkar	Eaton	Guest
8	Shawn	Nunn	Hitachi Energy	Guest
9	Erik	Tarango	Olsun Electric	Guest
10	Bob	Fyrer	DuPont	Guest
11	Andre	Moreno	Siemens Energy	Guest
12	Rafael	Garjeda	Eaton	Guest
13	Ryan	Hogg	Bureau of Reclamation	Guest
14	Aniruddha	Narawane	Eaton	Guest
15	Patrycja	Jarosz	IEEE SA	Guest
16	Val	Tatu	Powersmiths	Guest
17	Guang	Yuan	Hitachi Energy	Guest
18	Daniel	Weyer	Monolith	Guest
19	Tommy	Nunn	Comcast	Guest
20	Agustin	Ortega	Siemens Energy	Guest
21	Renjie	Fu	Ermco / V&F Transformer	Guest
22	Pollaro	Dominic	Nass	Guest
23	Roger	Wicks	DuPont	Member
24	Sherif	Salem	Eversource Energy	Guest
25	Dave	Komm	Hammond Power Solutions	Guest
26	Alberto	Sandoval	Eaton	Guest
27	Brayan	Dizb	Siemens Energy	Guest
28	Marko	Teofanovic	Ontario Power	Guest
29	Manish	Saraf	Hammond Power	Guest
30	Oscar	Castavon	Siemens Energy	Guest

31	Kumar	Mani	Duke Energy	Guest
32	Dipesh	Patel	Eaton	Guest
33	Sanford	Fong	GA Power	Guest
34	Luis	Mendez	JST Power	Guest
35	Pavlo	Bautista	Enmax	Guest
36	Sami	Debass	Epri	Guest
37	Bjorn	Vaagensmith	Idaho National	Guest
38	Jon	Bender	W.E.	Guest
39	Evanne	Wang	DuPont	Guest
40	Mihir	Amin	Eaton	Guest
41	Gonzals	???	South California Edison	Guest
42	David	Walker	MGM Transformer	Guest

- 6) **C57.96** – summary given by Aniruddha Narawane (Eaton). Aniruddha comments that this document is close to completion and the intent is to not have any more meetings. **Aniruddha makes a motion that: if the WG has a super majority vote, the SC would also take a ballot conducted via email. This was seconded by Mohammad Iman (MGM Transformers) and was unanimously approved.**

Chair: Aniruddha Narawane

Vice Chair: Iman Mohammed

Secretary: Kerwin Stretch (Not Present)

- Meeting was called to order at 11:00 AM March 12, 2024, with 10 members and 28 guests. 10 out of 18 members were present and a quorum was achieved.
- Slides of IEEE Patent and copyright material were shown, and no patent and copyright claims were brought to the notice of chair and the group.
- Vijay Tendulkar motioned to approve the agenda as it was submitted and Manish Saraf 2nd it. The agenda was approved with no objection.
- Tim Felix motioned to approve the minutes of the last meeting in Kansas City and Sam Debass second. Minutes of the last was approved with no objection.
- It was discussed to add the calculator prepared by Manish Saraf as an annex to the document. Manich Saraf motioned to add Excel calculator to annex B. Vijay Tendulkar seconded it. Vote was taken and motion was approved and carried. This will be referred to relevant IEEE authority via Patrycja for approval and action.
- Annex C examples checked for errors, and none found.
- Motion was made by Colby Lovins to accept equation 12 as is with a note refer C57.134 for “n” exponent instead of mentioning the value. Casey Ballard seconded it. Vote was taken and it was approved and subsequently motion carried.

- There was discussion about example in Annex C and the alignment with C57.12.91 about the max overload on transformer while using the calculation example which is above the limit. A note was recommended to be added to notify the user that the calculation example is approximate and for detailed calculation another method can be used. Manish motioned to add line 5 & 6 in C1 and Vijay Tendulkar seconded it. Vote was taken and approved with no objection. Motion carried.
- Casey Ballard motioned to go to E ballot after chair prepares draft 3 to include all changes made during this meeting. Vijay Tendulkar seconded it. Vote was taken and motion was approved with no objection.
- Roger Wicks agreed to help to calculate the values for some tables based on 155 C with additional review and from Aniruddha Narawane and Casey Ballard.
- Joe Tedesco motioned to form a Comment resolution group and empower the group to resolve the comments without the need to come back to WG. Casey Ballard seconded it. Vote was taken and approved with no objection.
- A CRG to be formed chaired by Manish Saraf with the help of Joe Tedesco, Tim Felix, Colby Lovins, Casey Ballard, Mike Iman, and Aniruddha Narawane to review all of the changes.
- With intent to go to ballot after the draft circulation well before Fall 24 meeting, WG does not plan to meet at St. Louis during fall 2024 meeting.

With no other new business meeting was adjourned at 12:15 PM.

Attendance

Status	Last Name	First Name	Affiliation
Member	Ballard	Robert	DuPont
Member	Debass	Samson	EPRI
Member	Hernandez	Giovanni	Virginia Transformer Corp.
Guest	Hernandez	Sergio	Hammond Power Solutions
Guest	Hernandez	Ronald	Doble
Guest	Hopkinson	Phil	Hvolt, Inc.
Vice-Chair	Iman	Mohammad	MGM Transformer Company
Member	Klein	Ken	Johnson Coil

Guest	Lambert	Jason	JST Power
Guest	Leaf	Gustavo	Dominion Energy
Member	Lee	Moonhee	Hammond Power Solutions
Guest	Levin	Aleksandr	Weidman Electrical Technology
Member	Lovins	Colby	Federal Pacific
Member	Mahajan	Kushal	EATON Corporation
Member	Mai	Tim-Felix	Siemens Energy
Guest	Mani	Kumar	Duke Energy
Guest	Martinez	Joaquin	Siemens Energy
Member	Montpool	Rhea	Schneider Electric
Guest	Nims	Joe	Allen & Hashall
Member	Nunn	Shawn	Hitachi Energy
Guest	Pointner	Klaus	Trench Austria
Member	Saraf	Manish	Hammond Power Solutions
Guest	Selvaraj	Pugal	Virginia Transformer Corp.
Guest	Sharifi	Masoud	Siemens Gamesa
Guest	Shrewsbury	Justin	AMR PEMCO
Guest	Stankes	David	3M
Secretary	Stretch	Kerwin	Siemens Energy
Guest	Tatu	Val	Powersmiths
Member	Tedesco	Joseph	Hitachi Energy
Member	Tendulkar	Vijay	EATON Corporation
Guest	Walker	David	MGM Transformer Company
Guest	Wazir	Muhammad Areeb	EATON Corporation

Guest	Weisenser	Matt	PacificCorp

7) **C57.12.91** – summary given by Dave Walker (MGM Transformers) – no comments from SC.

The Working Group met at the Hyatt Regency – Regency E/F Conference Room. The meeting was called to order at 4:45 PM by Chair, David Walker

Chair made opening comments.

16 of 24 members in attendance. Quorum was met.

Approval of Agenda: The Fall agenda was approved unanimously without discussion.

Motion: Aniruddha Narawene

Second: Vijay Tendulkar

Approval of Minutes: The Fall 2023 minutes were approved unanimously without discussion.

Motion: Ken Klein

Second: Manish Saraf

Call For Patents: The Chair presented the information on Patent Disclosures and asked the group to report any relevant patent issues – None were communicated.

Copyright Notice: The Chair presented the IEEE_SA Copyright Policy. No discussion.

Old Business

- **Review of PAR timeline – Expires 12/31/2026**
 - o Last meeting to make changes most likely Spring 2025
- **Updating exponents for temperature rise correction factors –Manish Saraf**
 - o Proposal to update temperature rise correction factors (Equations 25, 26, 27, and 42) based on testing
 - o Manish Saraf presented data from units tested from 2 transformers. One unit showed that current correction factor of 1 is correct. The other unit showed an accurate exponent of approx. 0.8.
 - o IEC standard is currently using 0.9 exponent.
 - o Motion by Manish Saraf:
 - No change to the Ambient Air (AA) cooled units.
 - Adjust the exponent for Forced Air (FA) Cooled Units to 0.9
 - o 2nd – Sergio Hernandez Cano
 - o Discussion:
 - Should there be a note stating why we are changing?
 - Does the amount of fan cooling change the exponent?

- Should IEC values be used.
- Turbulent vs. laminar flow will change the exponent.
- Duct size could change the exponent as well. Could vary by manufacturer.
- o Manish Saraf withdrew the motion until more data can be presented.

What to do with fans during AF testing

Current state:

- o Clause 11.1 requires fans to be on during the AF test
- o Clause 11.5 requires fans to be off prior to hot-resistance measurements
- o Clause 13.3.3 requires fans to be on during a sound test
- o Other tests do not specify any difference for AF testing

- o Proposal to Change Clause 11.5 to read:
- o The steady-state temperature rise is reached when the surface temperature rises over ambient of all surface temperature measurements required in 11.3 become stable, which is defined as a variation of no more than 2 °C during a consecutive 3 h period. When the temperature rises become stable, the test voltage and current shall be removed, and the fans, if used, shall be left on for the duration of the resistance measurements.

- o Manish Saraf presented graphs showing there is an initial temperature spike when the fans are turned off that impacts the cooling curve and temperature rise calculations. If the fans remain on during while the measurements are taken, there is no spike and the cooling curve is as expected.

- o Motion was withdrawn until more data can be presented.

Voltage correction factor in no Load Loss Test –

- o This topic is moved to the agenda for the Fall 2024 meeting.
- o Manish Saraf will provide a written proposal at the next meeting including proposed equations.

Current Tolerance During Load Loss Measurement

Current State:

- o 9.3.4.1 Two-winding transformers and autotransformers
 - With one winding and associated leads or bus bar short-circuited at the terminals, a voltage of sufficient magnitude at rated frequency is applied to the other winding and associated leads or bus bar at the terminals and adjusted to circulate rated current in the excited winding and associated leads or bus bar...

- o What happens if the test equipment can't reach rated current (low voltage and high kVA)?
- o Scale the losses by I^2 ?
- o Some other correction?
- o Does it depend on how close it is?
- o Neither C57.12.90 nor C57.12.91 mention the topic.

- o Valeriu Tatu has data relevant to this topic that will be presented at the Fall 2024 meeting.
- o Topic was added to the Fall 2024 Agenda.

Add a load loss metering angle correction

- Proposal:
 - o Add text, equations, and tables from Clauses 9.4 and 9.4.1 from C57.12.90
 - o Motion from Joe Tedesco to put the text, equations, and tables from C57.12.90-9.4 and 9.4.1 into an annex in C57.12.91
 - o 2nd : Casey Ballard
 - o Vote: Unanimous approval

Short Circuit of axially split windings (as per C57.12.90) –

- o C57.12.90 allows short circuiting testing where each winding is short circuited one winding at a time which is “worst case” This testing is currently not included in C57.12.91
- o Tim-Felix Mai made a motion to take the short-circuit test information and procedure from C57.12.90 and add it into C57.12.91.
- o 2nd : Casey Ballard
- o Vote: Unanimous approval

Impulse Testing- Low voltage/impedance windings

- o Impulse testing low voltage windings (<600V) can be difficult.
- o It's almost impossible to get a good wave shape
- o Question: Should we add something to address this topic?
- o This topic was previously discussed – No Change is needed

New Business - None

Adjourned at 6:00

The Working Group will meet again at the Spring 2024 meeting,

Chair: David Walker

Vice-Chair: Tim-Felix Mai

Secretary: Rhea Montpool

Participation list:

Last Name	First Name	Company
Amin	Mihir	Eaton

Ballard	Robert	DuPont
Britton	Jeffrey	Phenix Tech
Chrysler	Rhett	Ermco
Fu	Renjie	Ermco
Fyrer	Bob	DuPont
Garcia	Miguel	Hitachi Energy
Grajeda	Rafael	Eaton
Gupta	Ravi	Megger
Hernandez	Giovanni	Virginia Transformer
Hernandez Cano	Sergio	Hammond Power Solutions
Iman	Mike	MGM
Jarosz	Patrycja	IEEE SA
Klein	Ken	Johnson
Lee	Moonhee	Hammond Power Solutions
Lively	Parry	Tempec
Lovins	Colby	Federal Pacific Transformer
Mai	Tim-Felix	Siemens Energy
Mendez	Luis	JST Power Equipment
Moreno	Andre	Siemens Energy
Narawane	Aniruddha	Eaton
Nunn	Shawn	Hitachi Energy
Nunn	Tommy	JST
Ortega	Agustin	Siemens Energy
Patel	Dipesh	Eaton
Pepe	Harry	Phenix Tech
Sandoval	Alberto	Eaton
Saraf	Manish	Hammond Power Solutions
Selvaroy	Pugel	VA Transformer
Tarango	Erik	Olsun
Tatu	Valeriu	Powersmiths
Tedesco	Joseph	Hitachi Energy
Tendulkar	Vijay	Eaton
Tsai	Steve	JST Power Equipment
Walker	David	MGM
Wang	Evanne	DuPont
Weyandt	Paul	Schneider Electric
Wicks	Roger	DuPont
Yuan	Guang	Hitachi Energy

The documents that do not meet face-to-face:

- 8) C57.16 Air core reactors – a summary is given Arturo Del Rio (Siemens Energy) – no comments from SC.
Ballot Pool being formed, and draft will be submitted to MEC for review
- 9) C57.12.52 Sealed dry type – a summary is given by Joe Tedesco (Hitachi) - no comments from SC.
On the March 20th RevCom agenda
- 10) C57.134 Hottest spot temp – a summary is given by Colby Lovins (Fed Pac) – no comments from SC
On the March 20th RevCom agenda
- 11) C57.124 Partial discharge – a summary is given by Tom Prevost (Weidmann). Notes that Tom will be looking for help in conducting CAD work.
Ballot Pool formed and MEC review complete, will open ballot shortly
- 12) C57.12.59 Through-fault current – a summary is given by the Chair. The previous Chair of this WG, Derek Foster, will be unable to continue this work. The PAR has already been updated and passed, and the Chair is looking for a volunteer to do this work. **Paul Weyandt (Schneider Electric) volunteers to conduct work as the Chair of C57.12.59.**

Old Business

- No comments from SC.

New Business

Dan Mulkey (Mulkey Engineering, Inc.) says that for C57.12.52, the scope says it does not apply to any transformer. He notes that the scope says that it does not apply to “ventilated transformers” and does not apply to “non-ventilated transformers”. He notes that “non-ventilated” cancels “ventilated”, which indicates that this standard will exclude everything. He also notes that “non-ventilated dry type” and “ventilated dry-type” transformers are called out in 12.80, but that is not the same definitions as 12.52. Jerry Murphy (Reedy Creek Energy Services) agrees that it’s not clear if the scope of transformer is ventilated or not-ventilated, particularly when placed in the same sentence.

Dan points out a second problem, which is the term “loading” is used when the term “capability” should be used.

Phil Hopkinson (HVolt) asks if Dan has any fixes, and Dan says he has two fixes:

- 1) The term “loading” should be replaced with “capability” when referring to dry-type transformers.
- 2) To define scope of transformers, Dan proposes to use the following wording: “transformers with a ventilated cabinet” or “transformer with a non-ventilated cabinet and sealed transformers”.

Dan agrees to send the new proposed wording to the SC Chair prior to the start of the F24 meeting.

No additional input or comments were received, and the meeting was adjourned at 2:30 pm PT.

Respectfully submitted,

Casey Ballard, Chair
Dave Walker, Vice-Chair
Dave Stankes, Secretary

DTSC Spring 2024 Meeting Attendance List

Last Name	First Name	Role	Company
Amin	Mihir	Guest	Eaton
Ballard	Robert	Chair	DuPont
Casallas	Camilo	Guest	Trench Limited
Chen	Binzhan	Guest	BC Hydro
Chiang	Solomon	Member	The Gund Company
Del Rio	J. Arturo	Member	Siemens Energy
Fyrer	Bob	Guest	DuPont
Garcia	Miguel	Guest	Hitachi Energy
Ghosh	Rob	Member	GE
Grajeda	Rafael	Guest	Eaton
Hernandez Cano	Sergio	Member	Hammond Power Solutions
Hopkinson	Philip	Member	HVOLT Inc.
Hossain	Saif	Guest	Trench Limited
Iman	Mohammad	Member	MGM Transformer Company
Jarosz	Patrycja	Guest	IEEE-SA
John	John	Member	Virginia Transformer Corp.
Klein	Ken	Member	Johnson Coil
Lee	Moonhee	Member	Hammond Power Solutions
Levin	Aleksandr	Member	Weidmann Electrical Technology
Lovins	Colby	Member	Federal Pacific Transformer
Mai	Tim-Felix	Member	Siemens Energy
Montpool	Rhea	Member	Schneider Electric
Moreno	Andre	Guest	Siemens Energy
Murphy	Jerry	Guest	Reedy Creek Energy Services
Narawane	Aniruddha	Member	Eaton
Nunn	Shawn	Member	Hitachi ABB Power Grids
Ortega	Agustin	Guest	Siemens Energy
Peterson	Caroline	Guest	Xcel Energy
Pointner	Klaus	Member	Trench Austria GmbH
Prevost	Thomas	Member	Weidmann Electrical Technology
Radbrandt	Ulf	Guest	Hitachi ABB Power Grids
Sandoval Moreno	Alberto	Guest	EATON Corporation
Saraf	Manish	Member	Hammond Power Solutions
Sharp	Michael	Member	Trench Limited
Tarango	Erik	Guest	Olsun Electrics Corporation
Tatu	Valeriu	Guest	Powersmiths International
Tedesco	Joseph	Member	Hitachi Energy

Tendulkar	Vijay	Member	Eaton
Walker	David	Vice Chair	MGM Transformer Company
Wang	Evanne	Guest	Dupont
Wicks	Roger	Guest	DuPont
Wong	Terry	Guest	Trench LTD
Yuan	Guang	Guest	Hitachi Energy
Mulkey	Daniel	Guest	Mulkey Engineering Inc.
Salem	Shenif	Guest	Eversource Energy
Komm	Dave	Guest	Hammond Power Solutions
Coughlan	Will	Guest	Metglas, Inc.
Patel	Dipesh	Guest	Eaton
Weyandt	Paul	Guest	Schneider Electric
Faye	Richard	Guest	Eaton
Rohrer	David	Guest	First Energy
Knapp	Evan	Guest	Eaton
Debass	Samuel	Guest	EPRI

Annex E Transformers and Reactors for HVDC Applications Subcommittee

March 11, 2024, 4.45 pm local time – Regency E/F at Hyatt Regency Vancouver, BC, Canada

Chair: Ulf Radbrandt (ulf.radbrandt@ieee.org)

Vice Chair: Les Recksiedler (lrecksiedler@mhi.ca) – could not come this time

Secretary: Klaus Pointner (klaus.pointner@ieee.org)

E.1 Introduction / Attendance / Approval of the Agenda / Essential Patent Issues

There was a total of 32 persons in the meeting, 13 members and 19 guests present. 6 new requests for membership were received.

Call for patents (essential patent claim) and IEEE copyright policy have been addressed.

Actual membership prior the Spring 2024 meeting is shown below:

First Name	Last Name	Email	Company
Camilo	Casallas	camilo.casallas@trench-group.com	Trench Limited
David	Caverly	david.caverly@trenchgroup.com	Trench Limited
Solomon	Chiang	schiang@thegundcompany.com	The Gund Company
Eric	Davis	esetdavis@aol.com	Consultant (on his own)
Evgenii	Ermakov	evgenii.ermakov@hitachienergy.com	Hitachi Energy
Alexander	Gaun	alexander.gaun@coilinnovation.com	Coil Innovation GMBH
Peter	Heinzig	peter.heinzig@weidmann-group.com	Weidmann Electrical Technology
Giovanni	Hernandez	dayan_hernandez@vatransformer.com	Virginia Transformer Corp.
Kurt	Kaineder	kurt.kaineder@trench-group.com	Trench Austria GmbH
Sylvain	Plante	plante.sylvain.3@hydro.qc.ca	Hydro-Quebec
Christoph	Ploetner	cp.xfmr@gmail.com	Siemens Energy
Klaus	Pointner	klaus.pointner@trench-group.com	Trench Austria GmbH
Ulf	Radbrandt	ulf.radbrandt@ieee.org	Hitachi Energy
Leslie	Recksiedler	lrecksiedler@yahoo.ca	Manitoba Hydro
Hossain	Saif	saif.hossain@trench-group.com	Trench Limited
Lina	Sandsten	lina.sandsten@hitachienergy.com	Hitachi Energy
Michael	Sharp	sharp.michael@siemens-energy.com	Trench Limited
Waldemar	Ziomek	wziomek@ptitransformers.com	PTI Transformers

13 members out of 18 members were present, thus quorum was met.

The agenda for this meeting, that was distributed via E-mail on February 27, 2024, was presented. No comments received. Eric Davis made motion to approve the agenda, seconded by Peter Heinzig. The agenda was unanimously approved.

The list of all attendees of the meeting is shown below:

First Name	Last Name	Email	Company	Request SC Membership
Onome	Avanoma	o.avanoma@outlook.com	MJ Consulting	
Sean	Barker	sean.barker@hitachienergy.com	Hitachi Energy	X
Camilo	Casallas	camilo.casallas@trench-group.com	Trench Limited	
Binzhan	Chen	binzhan.chen@bchydro.com	BC Hydro	
Vivian	Chan	vivian.chan@hitachienergy.com	Hitachi Energy	
Solomon	Chiang	schiang@thegundcompany.com	The Gund Company	
Marcos	Czernorucki	marcos.czernorucki@hitachienergy.com	Hitachi Energy	X
Eric	Davis	esetdavis@aol.com	Consultant (on his own)	
Alexander	Gaun	alexander.gaun@coilinnovation.com	Coil Innovation GmbH	
Eduardo	Gomez-Hennig	eduardo.gomez_h@siemens-energy.com	Siemens Energy	X
Peter	Heinzig	peter.heinzig@weidmann-group.com	Weidmann Electrical Technology	
Kevin	Juchem	kevin.juchem@hitachienergy.com	Hitachi Energy	
Kurt	Kaineder	kurt.kaineder@trench-group.com	Trench Austria GmbH	
Nathan	Lange	nathan.lange@hspkoeln.de	Siemens Energy	
Gabriel	Mamede	gabriel.mamede@siemens-energy.com	Siemens Energy	
Omar	Mendez	omar.mendez@prolec.energy	Prolec GE	
Sylvain	Plante	plante.sylvain.3@hydro.qc.ca	Hydro-Quebec	
Christoph	Ploetner	cp.xfmr@gmail.com	Siemens Energy	
Klaus	Pointner	klaus.pointner@trench-group.com	Trench Austria GmbH	
Bertrand	Poulin	bertrand.f.poulin@hitachienergy.com	Hitachi Energy	
Thomas	Prevost	tom.prevost@weidmann-group.com	Weidmann Electrical Technology	X
Ulf	Radbrandt	ulf.radbrandt@ieee.org	Hitachi Energy	
Farnoosh	Rahmatian	frahmatian@nugridpower.com	NuGrid Power Corp.	
Hossain	Saif	saif.hossain@trench-group.com	Trench Limited	
Harmanpreet	Sekhan	hsekhan@ptitransformers.com	PTI Transformers	
Michael	Sharp	sharp.michael@siemens-energy.com	Trench Limited	
Chris	Steineman	csteineman@hubell.com	Hubbel/Meramec Instrument Transformers	
Dharam	Vir	dharam.vir@prolec.energy	Prolec GE	X
John	Wagner	jwagner@aep.com	AEP	
Stefan	Wirth	stefan.wirth@coilinnovation.at	Coil Innovation GmbH	
Terry	Wong	terry.wong@trench-group.com	Trench Canada Limited	X
Waldemar	Ziomek	wziomek@ptitransformers.com	PTI Transformers	

Qualification for membership of the received requests will be checked and the applicants will be notified.

E.2 Approval of the minutes of the Fall 2023 meeting in Kansas City

The minutes of the spring meeting as distributed by E-mail on February 27, 2024 have been presented. No comments were given. Mike Sharp made motion to approve the agenda, seconded by Sylvain Plante. 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 Spring 24 meeting. Unfortunately, the WG chair could not come to this meeting but is encouraged to do so for the Fall 2024 meeting in Saint Louis (MO).

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
March 11th 2024

IEEE

CURRENT STATUS OF WORKING GROUP

Date and Location of Last Working Group Meeting:
21ST, January 2024, Wuhan, China (Second WG meeting)



IEEE SA
STANDARDS ASSOCIATION

IEEE

CURRENT STATUS OF WORKING GROUP

During the second WG meeting, **37** experts participated, from China Southern Power Grid, State Grid Corporation of China, Siemens, ABB, North China Electric Power University, etc.)

Name	Signature	Signature	eMail Address	Source
Chen Jun	[Signature]	[Signature]	jun.chen@ieee.org	Chairman
Li Jun	[Signature]	[Signature]	lijun@ieee.org	Member
Wang Jun	[Signature]	[Signature]	wangjun@ieee.org	Member
...	...	...	...	...

IEEE SA
STANDARDS ASSOCIATION

IEEE

CURRENT STATUS OF WORKING GROUP

- ◆ WG Chair Dr. Jun Deng introduce the Agenda, Minutes from Prior Meeting and IEEE Policies (include Call for Patents, copyright policy).
- ◆ Agenda and Minutes from Prior Meeting are approved by motion without opposition respectively.

IEEE SA
STANDARDS ASSOCIATION

IEEE

CURRENT STATUS OF WORKING GROUP

Jun Deng(CSG) and Zhicheng Pan(CSG) introduce the Draft of PC57.132 part by part, respectively. The draft has been fully discussed by WG members, some suggestions have been proposed:

- In the Chapter 3 definitions, check if the terms and definitions in the existing IEEE standards, and if so, reference them directly. In addition, if it comes from IEC standards, it should be rewritten according to the definition of IEC.
- Definitions of terms such as main frequency, fundamental frequency, vibration power entropy, and odd even harmonic ratio should be added
- Vibration testing requires climbing to a high place, which poses a risk of falling, relevant safety measures need to be added in Chapter 6.
- Supplement the requirements for fiber optic vibration measurement in Chapter 7, including sensor types and installation forms, as well as requirements for voltage and current measurement devices such as load rate, range, frequency response, etc.

IEEE SA

IEEE

NEXT PLAN

- Modify the Draft according to the comment of second WG meeting
- Future Meeting

The third WG meeting is scheduled to be held in August 2024, detailed information will be posted on the WG website:

<https://sagroups.ieee.org/57-132/members/>

IEEE SA

IEEE

CURRENT STATUS OF WORKING GROUP

- Add test procedures for internal vibration measurement of transformers and tap changer vibration measurement in Chapter 8, including layout requirements, testing requirements, and testing procedures.
- In Chapter 9, identify the characteristic quantities that need to be analyzed and provide the formula for analysis.
- Add a principle explanation of vibration testing technology in Appendix A.

IEEE SA

IEEE

THANK YOU

Dr. Jun Deng
WG Chair
China Southern Power Grid
13822116195@139.com

IEEE SA

IEEE

Details of the WG see: <https://sagroups.ieee.org/57-132/>

Safety measures are not in the scope of a guide and shall be taken out. Main reason are liability issues connected to such recommendations. The SC chair will inform the WG chair accordingly.

The SC shall stay involved in this WG. Participation in person would be possible in an expert function. However, the ballot will be organized according to the rules for such entity PAR's (one entity – one vote), but this SC has to agree 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)

In the time slot of the SC meeting, the first WG meeting of this revision work took place. Details can be found in the annex of these minutes

E.5 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.6 Old Business

There was no old business

E.7 New Business

There is no new business

E.8 Adjournment

The meeting was adjourned at 5:23pm.

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

March 11, 2024, 5.00 pm local time – Regency E/F at Hyatt Regency Vancouver, BC, Canada

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 SC HVDC meeting. There was a total of 32 persons in the meeting

The list of all attendees of the meeting is shown below:

First Name	Last Name	Email	Company	Opt-out of membership
Onome	Avanoma	o.avanoma@outlook.com	MJ Consulting	
Sean	Barker	sean.barker@hitachienergy.com	Hitachi Energy	
Camilo	Casallas	camilo.casallas@trench-group.com	Trench Limited	
Binzhan	Chen	binzhan.chen@bchydro.com	BC Hydro	
Vivian	Chan	vivian.chan@hitachienergy.com	Hitachi Energy	
Solomon	Chiang	schiang@thegundcompany.com	The Gund Company	
Marcos	Czernorucki	marcos.czernorucki@hitachienergy.com	Hitachi Energy	
Eric	Davis	esetdavis@aol.com	Consultant (on his own)	
Alexander	Gaun	alexander.gaun@coilinnovation.com	Coil Innovation GmbH	X
Eduardo	Gomez-Hennig	eduardo.gomez_h@siemens-energy.com	Siemens Energy	
Peter	Heinzig	peter.heinzig@weidmann-group.com	Weidmann Electrical Technology	
Kevin	Juchem	kevin.juchem@hitachienergy.com	Hitachi Energy	X
Kurt	Kaineder	kurt.kaineder@trench-group.com	Trench Austria GmbH	
Nathan	Lange	nathan.lange@hspkoeln.de	Siemens Energy	
Gabriel	Mamede	gabriel.mamede@siemens-energy.com	Siemens Energy	
Omar	Mendez	omar.mendez@prolec.energy	Prolec GE	
Sylvain	Plante	plante.sylvain.3@hydro.qc.ca	Hydro-Quebec	
Christoph	Ploetner	cp.xfmr@gmail.com	Siemens Energy	
Klaus	Pointner	klaus.pointner@trench-group.com	Trench Austria GmbH	
Bertrand	Poulin	bertrand.f.poulin@hitachienergy.com	Hitachi Energy	
Thomas	Prevost	tom.prevost@weidmann-group.com	Weidmann Electrical Technology	
Ulf	Radbrandt	ulf.radbrandt@ieee.org	Hitachi Energy	
Farnoosh	Rahmatian	frahmatian@nugridpower.com	NuGrid Power Corp.	X
Hossain	Saif	saif.hossain@trench-group.com	Trench Limited	
Harmanpreet	Sekhan	hsekhan@ptitransformers.com	PTI Transformers	X
Michael	Sharp	sharp.michael@siemens-energy.com	Trench Limited	

First Name	Last Name	Email	Company	Opt-out of membership
Chris	Steineman	csteineman@hubell.com	Hubbel/Meramec Instrument Transformers	
Dharam	Vir	dharam.vir@prolec.energy	Prolec GE	
John	Wagner	jwagner@aep.com	AEP	
Stefan	Wirth	stefan.wirth@coilinnovation.at	Coil Innovation GmbH	X
Terry	Wong	terry.wong@trench-group.com	Trench Canada Limited	
Waldemar	Ziomek	wziomek@ptitransformers.com	PTI Transformers	

As this was the first WG meeting all attendees are members of the working group. However, some participants indicated to abstain from being a member as shown above.

2. WG Secretary

Eric Davis was proposed by the WG chair to become the secretary of this WG. Chris Ploetner made motion to approve this proposal, seconded by Sylvain Plante. The proposal was approved unanimously.

3. Agenda

The agenda for the WG meeting as presented by the WG chair. Sylvain Plante made motion to approve the agenda, seconded by Kurt Kaineder. The agenda was unanimously approved.

4. Status Report as presented by the WG chair

1	2
First meeting of WG Rev. to IEEE Standard 60076-57-129 IEC/IEEE International Standard – Power transformers-Part 57-129: Transformers for HVDC applications IEEE/PES Transformers Committee Spring 2024, Vancouver, BC WG Chair: Waldemar Ziomek	Agenda - Establishing the WG membership - Review the PAR's revision by NesCom - Approved PAR - Planned revisions to standard - Discussion
 	 

Scope of submitted PAR

5.2 Scope of proposed standard: This part of 60076 International Standard specifies requirements of liquid-immersed three-phase and single-phase converter transformers for use in high voltage direct current (HVDC) power transmission systems including back-to-back applications. It applies to transformers having two, three or multiple windings. This document does not apply to converter transformers for industrial applications (see IEC 61378-1 or IEEE Std C57.18.10); converter transformers for traction applications (see IEC 60310).



Title revision - rejected

The following comment on P60076-57-129 has been made on 23 Jan 2024 by NesCom Member:

Does the title correctly align with the Scope?

Will a title "Requirements of liquid-immersed three-phase and single-phase converter transformers for use in high voltage direct current (HVDC) power transmission systems" more accurately reflect the scope and contents of the standards

We simply stated that this is a title for current standard, already approved by IEEE and IEC.



Scope revision No 2 response

Chris Ploetner, IEC14 Chair, responded: The proposed text by the NesCom member is practically identical to current standard. The differences are
-the entry passage where the word 'document' is used instead of 'part of 60076-IS'. I support this proposal as it is neutral and applicable for IEC and IEEE.

-the second list entry where the word 'converter' is skipped before 'transformer'. I am not in favor of this because we deal with converter transformers and this applies also to rolling stock. Although not common anymore, rolling stock units may also be units not connected to converters. So, the clarification of unit types should stay as is. I also prefer to have the exemptions shown as list entries but do not insist here.

The corrected entry is as follows:

This document specifies requirements of liquid-immersed three-phase and single-phase converter transformers for use in high voltage direct current (HVDC) power transmission systems including back-to-back applications. It applies to transformers having two, three or multiple windings. This document does not apply to converter transformers for industrial applications (see IEC 61378-1 or IEEE Std C57.18.10), and converter transformers for rolling stock (see IEC 60310).



Scope revision No1

The following comment on P60076-57-129 has been made on 10 Jan 2024 :

Please consider Improving the first sentence of 5.2 as follows:

"This part of the IEC/IEEE 60076 family of standards specifies [...]"



Scope revision No 2

The following comment on P60076-57-129 has been made on 23 Jan 2024 :

Only some of IEC 60076 parts are IEC/IEEE dual logo standard, it's recommended to replace *This part of the IEC/IEEE 60076 family of standards* with this document. Regarding IEC 60310, it's only for traction transformers of rolling stock instead of converter transformer. Proposed changes is list as below:

This document specifies requirements of liquid-immersed three-phase and single-phase converter transformers for use in high voltage direct current (HVDC) power transmission systems including back-to-back applications. It applies to transformers having two, three or multiple windings. This document does not apply to converter transformers for industrial applications (see IEC 61378-1 or IEEE Std C57.18.10), and transformers for rolling stock (see IEC 60310).



Approved scope

5.2 Scope of proposed standard: This document specifies requirements of liquid-immersed three-phase and single-phase converter transformers for use in high voltage direct current (HVDC) power transmission systems including back-to-back applications. It applies to transformers having two, three or multiple windings. This document does not apply to converter transformers for industrial applications (see IEC 61378-1 or IEEE Std C57.18.10), and converter transformers for rolling stock (see IEC 60310)



Additional Explanatory Notes

The dual logo standard IEC/IEEE 60076-57-129-2017 was published in 2017 and its valid till 2027. Therefore, the HVDC SC wants to initiate the work on its revision, to extend its validity and to include some improvements, as well as the comments from the users. The HVDC transformers applications are becoming more common around the world, including the renewable energy stations and schemes, and it continuously brings new configurations and solutions. The revision and expansion of the standard would potentially include several items, such as: (i) the standard should recognize both LCC and VSC schemes – the transformers for VSC should be moved from Annex to main body, (ii) both LCC and VSC schemes should be explained in details, (iii) the LI and SI levels shall be based on the system studies and if the end user wants to use higher levels, it must be addressed in specification, (iv) the monitoring devices and systems should be included. More aspects of HVDC converter transformers may be covered, if raised during a work of the WG on this revision.



Initial steps for revision

- the standard should recognize both LCC and VSC schemes – the transformers for VSC should be moved from Annex to main body, and
- both LCC and VSC schemes should be explained in details,

FOREWORD	6
1 Scope	8
2 Normative references	8
2.1 IEC references	8
2.2 IEEE references	9
3 Terms, definitions and symbols	9
3.1 Terms and definitions	9
3.2 Symbols	9
4 Use of normative references	11
5 General requirements	11
5.1 General	11
5.2 Service conditions	11
5.2.1 General	11
5.2.2 Temperature	11
5.2.3 Load current	11
5.2.4 AC voltage	11
5.2.5 Direction of power flow	11
5.3 Unusual service conditions	12
5.4 Loading of transformer above rating	12
6 Rating data	12
6.1 General	12
6.2 Rated voltage	12
6.3 Rated current	12

New clause (s):
- 5.2.6. operation of LCC
- 5.2.7. operational schemes of VSC

Initial steps for revision

- Add explanation that the LI and SI levels shall be based on the system studies and if the end user wants to use higher levels, it must be addressed in specification, - **improve existing wording**
- the monitoring devices and systems should be included.

11 Sound levels	30
11.1 General	30
11.2 Determination of service sound levels	30
11.3 Guaranteed sound levels	30
12 Bushings	31
12.1 General	31
12.2 Line side winding bushings	31
12.3 Valve side winding bushings	31
13 Tap-changer	31
13.1 General	31
13.2 Current wave shape	31
13.3 Consecutive operation of tap-changers	31
14 High-frequency modelling	31
15 Tolerances	32
15.1 General	32
15.2 Short-circuit impedance tolerances	32
16 Rating plate	32
14. Monitoring devices	



New additions to revised standard

- comments from users,
- comments from IEC and/or IEEE
- comments from manufacturers



Rough Timeline

- formation of WG – Spring 24
- first draft preparation – Fall 24
- first draft review and correction – S25
- ballot within Subcommittee HVDC transformers – F25
- balloting standard – S2026, incl. comments resolution
- submit draft to RevCom F2026



It is noted that the IEC counterpart is not nominated yet. Chris Ploetner confirmed that prior the Fall 2024 meeting the nomination and call for experts in IEC TC14 will be done.

A task force for the new clauses 5.2.6 and 5.2.7 has been formed. This will be led by Ulf Radbrandt supported by Marcos Czernorucki and Peter Heinzig.

A second task force regarding LIWL and SIWL levels has been formed, led by Sylvain Plante and supported by Harmanpreet Sekhan

5. Old Business

There was no old business

6. New Business

There is no new business

7. Adjournment

The meeting was adjourned at 5:20pm.

Annex F Instrument Transformers Subcommittee

Chair: Thomas Sizemore

Vice Chair: David Wallace

F.1 Introductions

Attendees were requested to introduce themselves and provide affiliations at the time of the meeting.

A total of 58 attendees were present. 24 members were present 21 were required for quorum. Quorum was met.

Requests for membership will be reviewed for recent attendance to determine eligibility.

F.2 Agenda

An agenda was displayed by the chair. Igor Ziger made a motion to approve which was seconded by Diego Robalino. There were no objections to approving the agenda.

F.3 Approval of minutes – Fall 2024 meeting

Minutes were approved after a motion by Jim McBride and a second by Igor Ziger. There were no objections to approval.

F.4 Essential Patent Claims & IEEE Copyright Policy

A slide was displayed as a reminder to all WG/TF leaders that it is necessary to display the essential patent claim and IEEE copyright policy slides.

F.5 Status of C57.13 Standards

The chair briefly presented the status of the various standards handled by the ITSC including both those being actively worked on at this time as well as those not yet due for revision.

F.6 Working Group Reports

F.7.1 JWG on Station Service Voltage Transformers, IEC-IEEE 63253-5713-8 – David Wallace & Ross McTaggart (unable to attend)

This working group did not meet at the Transformers Committee meeting. However, it has been active in comment resolution from both IEEE and IEC voters. The status of the comment resolution and latest balloting results were presented.

F.7.2.3 Working Group Instrument Transformer Requirements C57.13 – David Wallace

Attendees: The number of participants was 61 over 3 time slots. 24 were members present and quorum was obtained in the 2 latter time slots. The comment resolution from the 1st time slot was communicated. Paper rosters / sign-in sheets were circulated. 12 people requested membership which will be reviewed.

Essential Patent Claims: Text was displayed, and the Chair inquired as to if anyone knew of essential patent claims. None were brought up.

Copyright: Text was displayed at the meeting

Minutes of the Fall 2023 meeting: Unanimously approved with motion brought forward by Ryan Hogg and seconded by Evan Knapp.

Agenda: Unanimously approved with motion brought forward by Jaroslaw Chorzepa and seconded by Stephen Oakes.

Resolution of comments on D1

- A total of 88 comments were addressed. There are 13 HW assignments outstanding from these comments which need to be completed by the next meeting
- Volunteers are welcome on any of those assignments
- There was a specific discussion on the comment made by S. Snyder on units with cast bushings. It was agreed to include the proposal into the standard
- R. Hogg submitted additional comments, which will be included after the document is revised to the new format

Motion to adjourn: A motion was put forth by William Solano and seconded by Robert Middleton

Next Meeting: This WG will meet to continue work at the St. Louis, Missouri Fall 2024 meeting.

F.7.5 TF for Instrument Transformers Accuracy – Igor Ziger

Attendees: The number of participants was 46. 21 members present and quorum was obtained. Paper rosters / sign-in sheets were circulated. 6 people requested membership which will be reviewed.

Essential Patent Claims: Text was displayed, and the Chair inquired as to if anyone knew of essential patent claims. None were brought up.

Copyright: Text was displayed at the meeting

Minutes of the Fall 2023 meeting: Unanimously approved with motion brought forward by Jaroslaw Chorzepa and seconded by Ryan Hogg.

Agenda: Unanimously approved with motion brought forward by David Wallace and seconded by Rudy Ogajanov

Review of the action items for this task force:**Information on non-5A secondary TF**

- It was announced that the activities for this will continue after the meeting and if anyone would like to join, is invited to contact the chairs. The activities of IEC WG which also is working on the mA standard will be followed closely, and the conclusions from the face-to-face meeting in Milano in early April will be reported back to the group.

New business**Relaying CT accuracy thru measurement range and PRC-005-6 Table 1-3 by Ryan Hogg**

- A presentation was held, followed by a discussion with multiple participants contributing.
- It was decided that the clause 9.1. will be rewritten to include this topic as well. The effort will be led by R. Hogg, with multiple people contributing.

Resolution of accuracy-related comments carried over from the main standard – D1

- A total of 40 comments were addressed either here or in the main standard WG. There are 8 HW assignments outstanding from these comments which need to be completed by the next meeting
- Volunteers are welcome on any of those assignments

All material presented in the meeting will be posted on the committee website and sent out to the TF body,

Motion to adjourn: A motion was put forth by David Wallace and seconded by Ryan Hogg

Next Meeting: This WG will meet to continue work at the St. Louis, MO Fall 2024 meeting.

F.7.6 WG for PLC capacitors and Coupling Capacitor Voltage Transformers (C57.13.9) – Zoltan Roman

The Working Group Chair, Zoltan Roman, started the meeting with Mike Craven as Secretary and introductions were made.

The Chair provided an update concerning online meetings to resolved remaining comments of this balloted standard. No official business took place for this WG in this meeting. Upon completion of this update the remaining time in the meeting was utilized by the WG to revise C57.13.

F.7.7 TF to integrate C57.13.5 into C57.13– Zoltan Roman

The Working Group Chair, Zoltan Roman, started this initial meeting.

A brief update was provided by Zolton Roman. task completed and an outline of work to be done over the coming months was discussed. No official business was conducted by this group.

Online meetings are expected throughout this effort.

Next Meeting: This WG will meet to continue work at the St. Louis, Missouri, Fall 2024 meeting.

F.7 Old Business

No old business was discussed.

F.8 New Business

Discussed the creation of sensor standard in the PSIM committee. There are two paths We as a group could ask that the IT subcommittee co-sponsor the new workgroup or we could a liaison for the workgroup to report back to the IT subcommittee. Displayed the proposed Sensor PAR draft.

Jim McBride discussed that there is a standard being developed on PSIM to cover the entire system of sensors that would deal with the accuracy of the complete system. He discussed how these sensors could be used for a variety of purposes that were not normally designed for. Jim believes that PSIM would like to partner with the IT subcommittee to help develop the new standard. This would help cover areas that are not covered by the PSIM committee.

Pete Zhao suggested that we need to take into consideration the power industry when we look into the sensors. We need to define what areas the IT subgroup will cover. Jeff Britton mentioned the reason for the focus on medium voltage is that this is where the market is now. The scope of the PSIM is on all sensors including High Voltage. PSIM is looking for suggestions on how to improve the overall scope.

Jeff mentioned the Panel session on sensors that will be held at the PES general meeting in Seattle in July 2024 and read the outline of the panel session. He invited members of the IT subcommittee to join the panel.

Peter Zhao suggested that the PAR should focus on the High Voltage Aspect of the sensor technology. Zolton Roman felt that the sensors guys were not interested in the High Voltage side of the sensors. He feels that there will be parallel work between the standards when the work begins due to the difference between the high voltage and medium/low voltage aspects.

Frank Neder discussed the approach of IEC towards the sensors. He agrees that we need to focus on the High Voltage aspects in the IT Subcommittee.

The floor was open for comments on how the committee wanted to proceed with regards to the sensors.

Jim McBride discussed his experience from 30 years ago on transmission level sensors. He feels the reason there is no sensor is due to the different varieties of sensors that are on the market. PSIM is trying to stay out of the design and focus on the performance aspects of the sensors. The distribution level sensors have a variety of outputs that must be addressed. Does the High Voltage side want to try to control the output of the sensors.

Dan Sauer discussed taking the outputs of the sensors, He feels that it is not productive to take higher level of outputs from the sensors and converting them to digital. Zoltan Roman discussed the IEC work on the platform that covers all sensors (61850) Jeff Britton discussed the cost of the sensors based on the quantity of the products being produced.

Kurt Kanideer discussed the reliability and accuracy of the sensors. This leads to different versions between the high voltage and medium voltage sensors. Kurt Kanideer feels that there should be liaison to work with the medium voltage group and have a separate group for the High Voltage side.

Zoltan Roman agreed with Kurt's approach. He feels that we can investigate the work that has been done in the IEC on the issue. He thinks we can do better than the IEC by working together with PSIM to form the standard. There is work already in process in the relaying committee.

Peter Zhao suggested forming a taskforce to investigate the sensors.

Farnoosh discussed the work being done on the PSIM committee and how it is medium voltage focused. He suggests that the workgroup should look into a white paper into all of the issues that are being faced in this project. He mentioned IEEE 1601 that was worked on between PSIM and IT subcommittee performed years ago.

Ryan Hogg discussed a user guide for sensor technology.

Zoltan Roman discussed the green book being put together by CIGRE that will cover sensors. That would be a good guide for us to look at.

Jeff Britton mentioned that there is a group in PSIM that wis working on a general guide. This will be kicked off with a survery being sent out to the industry for comments.

Thomas Sizemore asked for a motion to proceed with the work on sensors.

Chris Steinman motioned to co-sponsor a standard with PSIM and kick off a taskforce focusing on High Voltage. Kurt Kanideer seconded the motion.

A vote was held by the members – 22 approved. Motion passed.

Thomas called for volunteers to work on the taskforce.

Jim McBride mention the 1601cis at NESCOM for PAR. Do we need to expand the scope of the PAR to cover High Voltage.

Zolton Roman mentioned that CIGRE wants to work with the IT Subcommittee. He asked if they could present at the next meeting. Thomas agreed that they should attend.

F.9 ITSC Adjournment

Motion to adjourn made by Rober Middleton seconded by Diego Robalino. No objections. Meeting ended at 9:15 am

The next meeting is to be held in St. Louis, Missouri, in the Fall of 2024.

Annex G Insulating Fluids Subcommittee

March 13th, 2023 - 3:00 PM - 4:15 PM
Hyatt Regency, Vancouver, BC - Canada

Chair: Stephanie Mabrey
Vice-Chair: Jerry Murphy
Secretary: Alan Sbravati

1. Introductions, Roll Call of Members for Quorum, Meeting Agenda Approval, F23 Minutes Correction and Approval, and Chair's Comments

1.1 Chair's Opening Remarks:

- a. Meeting started at 3:00 PM
- b. Presentation of the Vice-Chair, Jerry Murphy, and the Secretary Alan Sbravati.
- c. Reminded that the SC minutes are due April 5th, 2024 - WG and TF meeting minutes are due for submittal to the Insulating Fluids Subcommittee (IFSC) Secretary Alan Sbravati due within 15 days of their meetings.

1.2 Roll Call of SC members: (Quorum requirement: 25 minimum)

- a. 36 Members signed in, from a total of 49 members. A quorum was achieved.
- b. Total of 90 attendees. A total of 54 guests, from which 13 requested membership, and three of them are eligible.
- c. Registered Attendance:

First Name	Last Name	Role
Edmundo	Arevalo	Guest
Jean-Noel	Berube	Guest
Kevin	Biggie	Member
William	Boettger	Member
Paul	Boman	Member
Jeremiah	Bradshaw	Member
John	Brett	Guest
Edward	Casserly	Member
Juan	Castellanos	Member
Stuart	Chambers	Member
Luiz	Cheim	Member
Gabriel	Delgado	Guest
Lee	Doyle	Guest
Zachary	Draper	Member
Jesse	Duffy	Guest
James	Dukarm	Guest
Florin	Faur	Member
Todd	Felton	Guest
Marcos	Ferreira	Member

Bruce	Forsyth	Member
Rainer	Frotscher	Member
Miguel	Garcia	Guest
James	Gardner	Guest
Carlos	Gaytan	Guest
Rob	Ghosh	Member
Orlando	Giraldo	Member
Luis	Gonzalez	Guest
Alireza	Gorzin	Guest
Attila	Gyore	Member
Didier	Hamoir	Guest
Florian	Hermann	Guest
Traci	Hopkins	Member
Patrycja	Jarosz	Guest
John	John	Member
Egon	Kirchenmayer	Guest
Donald	Lamontagne	Guest
Stefan	Lembacher	Guest
Samuel	Lewis	Guest

Eric	Li	Guest
Jinming	Li	Guest
Cesar	Lizcano	Guest
Luc	Loiselle	Guest
Tiffany	Lucas, P.E.	Member
Stephanie	Mabrey	Chair
Jinesh	Malde	Member
Gabriel	Mamede	Guest
Kumar	Mani	Guest
Robert	Mayer	Guest
Toni	Mellin	Guest
Yegor	Melo	Guest
Justin	Minikel	Guest
Gianetta	Morrow	Guest
Emma	Murowinski	Guest
Jerry	Murphy	Vice-chair
Anthony	Natale	Guest
Mark	Newbill	Guest
Dwight	Parkinson	Member
Nicholas	Perjanik	Guest
Thomas	Prevost	Member
John	Pruente	Member
Timothy	Raymond	Member
Scott	Reed	Member
Sebastian	Rehkopf	Guest
Yuri	Rossini	Guest

Mickel	Saad	Member
Alan	Sbravati	Secretary
Stephen	Shull	Guest
Jonathan	Sinclair	Member
Markus	Soeller	Guest
William	Solano	Guest
Brian	Sparling	Guest
Hampton	Steele	Guest
Gregory	Steeves	Member
David	Stockton	Guest
Ed	Tenyenhuis	Guest
Marko	Teofanovic	Guest
Ryan	Thompson	Member
Mark	Tostrud	Member
Alwyn	Van Der Walt	Member
John	Vandermaar	Guest
Karsten	Viereck	Guest
Mike	Waldrop	Guest
Evanne	Wang	Member
Zachery	Weiss	Guest
Drew	Welton	Guest
Paul	Weyandty	Guest
Kayla	Whitesel	Guest
Rene	Wind	Guest
Deanna	Woods	Member
Guang	Yuan	Guest

1.3 Agenda Approval:

- a. A motion for approval of the agenda was presented by Ed Casserly, and second by Marcos Ferreira. The agenda was unanimously approved.
- b. Stephanie presented some reminders:
 - a. The deadline for the submission of minutes is March 29th.
 - b. Request attendees to update their e-mail / contact information.
 - c. Informed the group that the creation of Sub-Task Forces requires voting.
 - d. The criterium for retaining membership is to attend 3 of last 5 meetings.
 - e. Clarification on requirements for becoming and keeping membership of the SC is to attend at least 3 of the last 5 meetings.

1.4 Approval of minutes from the F23 meetings:

- a. A motion for approval of the F23 minutes was presented by Traci Hopkins, second by John John. Minutes were unanimously approved.

2. WG & TF Reports Presented at the SC Meeting

2.1.1 IEEE C57.146 IEEE Guide for Interpretation of Gasses Generated in Silicone-Immersed Transformers

2.1.1.1 WG Chair: Paul Boman

- a. Attendance total 28, members 11, and 2 requested membership. Quorum was achieved and business could be conducted at this meeting.
- b. Call for essential patents – none at this time
- c. Agenda – no opposition to unanimous approval.
- d. Minutes from previous meeting accepted as presented.
- e. PAR extension will be requested from SC
- f. Issues raised by another WG brought up relating to the flow diagram in the standard.
- g. A request was made for the WG to review the latest draft and get all comments to chair for straw balloting

See **Appendix I** for the F23 Minutes (unapproved) of C57.146 WG Meeting as submitted.

2.1.2 IEEE C57.166 Consolidation of Insulating Liquids Guides (PAR Expiration: Dec 2024)

2.1.2.1 WG Chair: Tom Prevost

2.1.2.2 Although the WG Meeting did not meet, an update was presented at the IFSC meeting by the chair:

- a. Ballot ends on March 16th. Only 42% return till March 13th.
- b. Comments Resolution Group was already defined. They will work on the comments after the ballot. They were expected to be concluded before F24 meeting.
- c. Chair presented a claim for people who joined the ballot to effectively vote.

See *Appendix II* reserved for the Meeting Minutes not submitted.

2.1.3 TF PAR C57.104 IEEE Guide for the Interpretation of Gases Generated in Mineral Oil-Immersed Transformers

2.1.3.1 TF Chair: Ed teNyenhuis

- a. First meeting of the TF.
- b. Title, scope and purpose were revised.
- c. A motion was presented by Luiz Cheim to apply for a PAR. Seconded by Mickel Saad.
- d. Ed will submit a PAR.

Appendix III for the S24 Minutes (unapproved) of C57.104 TF Meeting as submitted.

2.1.4 C57.637 – Guide for the Reclamation of Mineral Insulating Oil and Criteria for Its Use

2.1.4.1 WG Chair: Stephanie Mabrey

- a. The meeting was called to order at 10:59 am by Chair Stephanie Mabrey.
- b. The Working Group (WG) was attended by 25 guests. The Working Group (WG) has 29 members and 19 were present so quorum was reached.
- c. A proposed timeline for the conclusion of the standard was presented.

See *Appendix IV* for the S24 Minutes (unapproved) of C57.637 WG Meeting as submitted.

2.1.5 C57.155 – Guide for Interpretation of Gases Generated in Natural and Synthetic Ester Liquid Type Transformers

2.1.5.1 WG Chair: Alan Sbravati

- a. There were 23 of 37 members present during the meeting. There were 46 guests, 16 membership requests. The quorum was achieved.
- b. No patent claim nor copyright issue were presented.
- c. Activities after F23 meeting were presented for all Task Forces.
- d. Chair confirmed almost 10k records were submitted to IEEE SA. An example of the anonymized process was shared.
- e. Process of data collection will be reopened till June/24.
- h. Good progress with the other task force activities.

See **Appendix V** for the S24 Minutes (unapproved) of C57.155 WG Meeting as submitted.

2.1.6 Working Group C57.139 – Guide for the Interpretation of Gases generated in Liquid Type Load Tap Changers

2.1.6.1 WG Chair: Rainer Frotscher

- a. Total: 70, Members: 24, Guests: 46, with 15 requesting membership. Quorum was achieved.
- b. F23 Meeting Minutes - unanimous approval
- c. Essential patent claims: none stated; Copyright requirements were shown.
- d. Task force leaders reported the progress.
- e. Good progress from all task forces.
- f. Chair asked the Task Forces to complete their work before the Fall Meeting 2024, so that a 1st Draft can be compiled until end of this year. This will then be distributed as Straw Ballot for comments by the WG. The official ballot process shall be initiated in Spring 2025
- i. Meeting adjourned 6:00 pm

See **Appendix VI** for the S24 Minutes (unapproved) of C57.139 WG Meeting as submitted.

2.1.7 Working Group C57.130 – Guide for the Use of Dissolved Gas Analysis Applied to Factory Temperature Rise Tests for the Evaluation of Mineral Oil-Immersed Transformers and Reactors

2.1.7.1 WG Chair: Bruce Forsyth

- a. Quorum requirement for the meeting was 20 out of 38 members. 17 members were present, so quorum not met.
- b. The agenda and meeting minutes presented to the attendees was not approved as quorum was not met. Prior to the Fall 2024 meeting, the minutes from Fall 2022, Spring 2023, and Fall 2023 meetings will be forwarded to members for approval through email. Minutes will be added to the IEEE C57.130 section on the website and they will be available in the subcommittee meeting minutes.
- c. The scope and purpose were shown in the meeting and the Chair mentioned that the scope and purpose will include esters if data is collected and analyzed by the working group (WG).
- d. WG milestones were presented. Substantive work needs to be completed by Spring 2025 so that the guide can be submitted for ballot in the Fall of 2025. See Appendix VII for the F23 Minutes (unapproved) of C57.130 WG Meeting as submitted.

2.1.8 Task Force – Development of a test method to determine the maximum continuous operating temperature of insulating liquids

2.1.8.1 TF Chair: Ahmed Gamil

- a. Neither the chair nor the secretary attended the meeting.
- b. Due to the absence of volunteers to assume the position of chair, the task force was disbanded.

See **Appendix VIII** no minutes were submitted.

3. Old Business

- a. The Task Force to define continuous operating temperatures for insulating liquids was not able to meet again, since neither the chair nor the secretary were able to attend the meeting. Both positions need to be replaced.
A request for volunteers to assume the positions was presented and failed to find a new chair and a new secretary.
A motion to disband the TF was presented by Bruce Forsyth and second by Scott Reed. The motion passed.
A second motion was presented by Bruce Forsyth to form a Study Group to confirm the interest in the work and define a title, scope and purpose. Motion failed.
Ed Casserly makes a motion to form a SG to write a paper summarizing the work that was made. Second by Brian Sparling. Motion failed.

4. New Business

- a. No new business.

5. Next IFSC Meeting:

Oct 27th, 2024 – St Louis, MO

6. Adjournment

The meeting was adjourned at 4:17 p.m.

Respectively Submitted, Alan Sbravati, Secretary IFSC

Unapproved Minutes from the F23 IFSC WG and TF meetings

Appendix I

Working Group C57.146 IEEE Guide for DGA in Silicone

Monday, March 11, 2024

11:00 AM to 12:15 PM

Hyatt, Regency, Vancouver, BC - Canada

Minutes of Working Group Meeting

Chair: Paul Boman (HSB)

Vice Chair: Lance Lewand (Doble)

Secretary: Tiffany Lucas (Prolec GE - Waukesha)

The meeting was called to order at 11:00am by the Chair.

There were 11 of 13 members present during the meeting. There were 17 guests, 0 membership requests.
The quorum was achieved.

S24 Attendance List

Role	First Name	Last Name	Attend 3/11/2024	Request membership
Chair	Paul	Boman	X	
Vice-chair	Lance	Lewand	X	
Secretary	Tiffany	Lucas	X	
Member	Stephane	Mabrey	X	
Guest *	Zachary	Draper	X	Ask Zach
Member	Florin	Faur	X	
Member	Rainer	Frotscher	X	
Member	Traci	Hopkins	X	
Member	Nick	Perjanik	X	
Member	John	Pruente	X	
Member	Scott	Reed	X	
Guest *	Mauricio	Soto	X	Ask Mauricio
Member	Greg	Steeves	X	
Guest	Randy	Cox	X	

Guest	James	Dukarm	X	
Guest	Todd	Felton	X	
Guest	Miguel	Fernandez	X	
Guest	Nathan	Jacob	X	
Guest	Mathieu	Lachance	X	
Guest	Donald	Lamontagne	X	
Guest	Weijun	Li	X	
Guest	Cesar	Lizcano	X	
Guest	Emma	Murowinski	X	
Guest	Marilia	Ribeiro	X	
Guest	Jonathan	Sinclair	X	
Guest	Brian	Sparling	X	
Guest	Marko	Teofanovic	X	
Guest	Patrycja	Jarosz	X	

Note to ask Zach Draper and Mauricio Soto if they would like to become members due to attendance.

1. Agenda for approval
 - Welcome
 - Approval of Agenda
 - Membership / Quorum
 - Call for Patent Claims / IEEE SA Copyright Policy
 - Approval of Meeting Minutes F23
 - PAR Extension Discussion

- Review Draft 1Guide
 - New Business Straw Ballot
 - Adjourn Meeting
2. Chair posted the Patent Claim. No claims were made.
 3. Chair presented the copyright policy slides.
 4. The agenda of the meeting was presented by the chair.
 5. Agenda for Spring 2024 was approved unanimously with no objections.
 6. Fall 2023 Minutes was approved, motion: Scott Reed with 2nd by Traci Hopkins
 7. Chair proposed PAR extension for 2 years. Concerns voiced that there isn't time for a straw ballot and balloting before the PAR would expire. Straw ballot (initial ballot) before MEC review is within the WG. Approval from the SC would be to move forward with formal balloting and resolution committees related to balloting.
 - a. 11 in favor of PAR extension, 0 against, and 0 abstain. PAR extension will be requested from SC
 8. Issues raised by another WG brought up relating to the flow diagram in the standard. Discussions around appropriate wording of flow diagram related to over flagging and over testing units with a baseline that is over first criteria. Language on flow diagram will be addressed with corrected language and circulated for comments.
 9. Continued discussion on normal distribution and confidence intervals. Alternatives to calculating confidence intervals with non-normal distributions was debated.
 10. Further review of online DGA monitoring needed and requested.
 11. Potential patent claim brought up in relation to a figure, but the figure had been removed based on comments so the patent claim should not be an issue.
 12. A request was made for the WG to review the latest draft and get all comments to chair for straw balloting.
 - a. Unanimous approval of staw ballot of PC57.146, 11 approve, 0 objections, 0 abstentions.
 13. New Business/Other Items for Discussion: No new business.
 14. Next meeting at Fall 2024, St Louis, Missouri, USA
 15. The meeting was adjourned at 12:15 with unanimous approval

Tiffany Lucas, Secretary
Paul Boman, Chair
Lance Lewand, Vice-Chair

Appendix II

Working Group for Acceptance and Maintenance of Insulating Liquids PC57.166

No meeting minutes.

Appendix III

Task Force PAR Study Group for C57.104 Interpretation of Gas Generated in Mineral Oil Immersed Transformers Vancouver, BC – Mar 12th, 2024

**Tuesday, March 12th, 2024
13:45 – 15:00, Vancouver, BC
Minutes of Task Force Meeting**

Chairman: Ed teNyenhuis
Vice Chair: Luiz Cheim
Secretary: Sami Debass

The meeting was called to order at 13:48 by the Chair.

There were 105 persons in attendance (see list below). There were 65 persons initially requesting membership, 29 guests, 10 with no comment and 1 person later requested membership which was granted. Since this was the first meeting, quorum was reached.

16. Attendance list:

Last Name	First Name	Role
teNyenhuis	Ed	Member
Luiz	Cheim	Member
Debass	Sami	Member
Girgis	Ramsis	Member
Verdolin	Rogério	Member
LI	Jinming	Member
Welton	Drew	Member
Mellin	Toni	Member
Fernandez	Miguel	Member
Jarosewski	Marion	Member
Felton	Todd	Member
SOHN	Yong Tue	Member
Mabrey	Stephanie	Member
Hopkins	Traci	Member
Patel	Vinay	Member
Tillery	Tim	Member
Dulac	Hakim	Member
Alonso	Mario	Member
Soto	Mauricio	Member

Gardner	James	Guest*
Gonzalez	Luis	Member
Rossini	Yuri	Member
Gagne	Zach	Guest
Lin	David	Guest
Pedro	Pedro	Guest
Chen	Kezmen	Guest
O'Malley	Anastasia	Guest
Cox	Randy	Member
Cheatham	Mark	Member
Ferreira	Marcus	Member
Soeller	Markus	Guest
Lizcand	Cesar	Guest
Lamontagne	Donald	Member
Lewand	Lance	Member
Casserly	Edward	Member
Delgado	Gabriel	Member
Vanderwalt	Alwyn	Member
Castellanos	Juan	Member
Brodeur	Samuel	Guest
Burk	Griffin	Guest

Holden	Andy	Member
Sinclair	John	Member
Radu	Ion	Member
Smith	Jimmy	Guest
Espindola	Marco	Member
Saad	Mickel	Member
Baser	Levent	Guest
Mbouombouo	Mama	Guest
Panesar	Parminder	Member
Hernandez	Giovanni	Member
Newbill	Mark	Member
Gorzin	Alireza	Member
Hernandez-Mejia	Jean Carlos	Guest
Reeder	Perry	Guest
Lucas	Tiffany	Guest
Garcia	Miguel	Member
Hernandez	Ronald	Guest
Thompson	Ryan	Member
Tanaka	Troy	Member
Murray	David	Member
Klempner	Dmitriy	Member
Plisic	Goran	Guest
Faur	Florin	Member
Van Dreel	Cole	Member
Prliente	John	Member
Frotscher	Rainer	Guest
Chambers	Stuart	Member
Duffy	Jesse	Member
Jonas	Ryan	Guest
Jarosz	Patrycja	Guest
Gyore	Attila	Guest
Malde	Jinesh	Guest
Rezvan	Arash	Member

Weyer	Daniel	Member
Xu	Shuzhen	Member
Raymond	Tim	Member
Forsyth	Bruce	Member
Reed	Scott	Member
Sparling	Brian	Member
Li	Weijun	Member
Staley	Brad	Member
Emilio	Morales - Cruz	Member
Loiselle	Luc	Member
John	John	Member
Woods	Deanna	Member
Steeves	Greg	Member
Nims	Joe	Guest
Brett	John	Guest
Doyle	Lee	Member
Draper	Zachary	Member
Dukarm	James	Member
Schmitt	Wolfgang	Guest
Jakob	Karl	Guest
Gara	Lorne	Guest
Reimer	Jonathan	Guest
Vir	Dharam	Member
Teofanovic	Marko	Guest
Murowinski	Emma	Member
Chu	Matt	Guest
Hamoir	Didier	Guest
Dillon	Nikolaus	Guest
Vu	Nguyen	Guest
Pacas	Joel	Guest
Zuiderveen	Thomas	Guest
Perjanik	Nick	Guest

- The task force met Mar 12, 2024 at 13.45 in the Regency C/D (3) room at the Vancouver Hyatt Regency Hotel. This was the first meeting of the task force PAR study group. The guide was published in 2019 and expires in 2029.

- The Chair, Ed teNyenhuis, led the meeting. The Chair introduced the Vice-Chair, Luis Cheim, and the Secretary, Sami Debass who recorded the attendance and meeting minutes.
- There were 105 persons in attendance (see list below). There were 65 persons initially requesting membership, 29 guests, 10 with no comment and 1 person later requested membership which was granted. Since this was the first meeting, quorum was reached.
- The Meeting Agenda was reviewed. A motion to approve the agenda was made by Scott Reed and seconded by Donald Lamontagne. The agenda was unanimously approved.
- Title was discussed and suggestion for comment was initiated. There was no comment or suggested changes from the attendees.
- The scope was discussed -
 - There was a comment by Donald Lamontagne to remove the word “combustible.”
 - A suggestion was made for (a) to include “Dissolved Gasses formation in a transformer from the insulation material.”
 - Mike Saad suggested to state the “Dissolved Gas Analysis” in (b).
 - Scott Reed proposed to remove Roger’s ratios from (b). Mike Saad seconded the motion made by Scott Reed. Hakim Dulac made a comment about the scope paragraph to stop at the diagnostic technologies. The statement was then amended by Scott to state “various diagnostic technique.” The motion passed.
- The purpose was discussed -
 - Bruce Forsyth made a motion to change “gasses” to “gas” and to add “in-service”. The motion was seconded by Lance Lewand. The motion passed.
- Luis Cheim commented that online DGA was not covered in the 2019 revision of the guide.
 - There is no information in the guide that explains how to calculate the DGA trend.
 - “We do not have any information that correlate here in this guide.”
 - Luis Cheim suggested to collect online data from the end users as well as the various oil analysis laboratories.
 - Is there any international data from CIGRE?
 - There needs to be an assessment between offline and online DGA data.
- Jim Dukarm asked – should this working group be doing research?
 - Shouldn’t this be developed outside the working group?
 - If we do is done outside the working group, then that would elevate data collection research and interpretation of the data.
 - Luis Cheim commented - If we separate the collection and interpretation of the data out of this working group to do the statistical analysis, then that would create deviation.

- Donald Lamontagne asked – how is the data utilized?
 - What to do with the data not the interpretation?
 - How do you analyze these data, there are over millions of data. It is a monumental task to manage this data.
- Brian Sparling made a statement – there are over 55 DGA analyzers in the market and these analyzers vary from one to another (3, 5 or 8 gas). This would be immense task.
 - Luis Cheim stated that gas analyses from 3, 4, 5 or more gas type monitors are available.
- Luis Cheim made a reference to the IEC table 3 and followed with a question where did they come from? There were 4 utilities who donated the DGA data...
 - IEC and CIGRE have these DGA data, but what do we have in IEEE?
 - What is their sampling rate? We do not have any guideline in this regard.
- Mike Saad asked what the standard/guide includes in terms for solar or hydro transformers?
- Gabriel Delgado stated there are brochures that have some information on the Solar/Hydro transformers. He recommends the working group review brochures.
 - Gabriel Delgado has also suggested that the study group can do the trend analysis to keep the online and offline analysis data referencing the brochures. However, how to handle the online data is going to be a challenging task.
 - Lance Lewand made a statement for consideration to perhaps to develop a second document separate from this guide that provide information as to how to evaluate the specific assessment.
 - Stuart Chamers suggested including this in the Appendix, but we need this guidance.
- Juan Castellanos brought up a separate discussion on the section “b” and “f” to state as following:
 - “B” Interpretation
 - “F” Evaluation of the DGA data
- Luiz Cheim made a statement “We moved away from the discussion of condition of the transformer. This discussion is not about the condition of the transformer. Rather it is about the DGA.”
- Lance Leward asked whether the guide include reactors. Donald Lamontagne stated the original guide started out with reactors. Why was it dropped?
- Bruce Forsyth asked whether the appropriate term is “oil immersed”, or “oil filled”?
 - The Chair responded both terms are acceptable.
- Traci Hopkins suggested to add “in-service” transformers to the scope.
- Mickel Saad suggested to keep the scope as developed during the meeting.

- Jim Dukarm made a motion to accept the scope as was presently edited.
 - Scott Reed seconded the motion.
 - There was no objection to the motion.
 - Motion passed (see final version below)
- Bruce Forsyth asked the Chair if he was going to make a motion to submit the PAR to NESCOM during the subcommittee meeting on Wednesday.
 - The Chair responded with “yes”
- There was one comment from an attendee not clearly identified who had several comments about some mistakes on the guide.
 - Update must be made to the Duval triangle T2 & T3
 - Pentagon 2 and 3 must be revised to include the latest versions.
 - Additional wording change to the online monitoring section of the guide.
- Ramsis Girgis asked a question - Has the generation of Hydrogen and Methane ratio been revised in C57-104 2019 guide as C57-1200 reference the potential for gas generation due to thin film heating of the oil between core laminations? He made a remark that it was not added to the guide.
- Mike Saad commented – Formal IEEE guidance for online gas monitoring is needed and it should be considered either to be added on this guide or to a new guide.
- Stephene Mabrey commented – we would like to have a discussion on the flowchart status 3 key gasses are high and that she is being challenged by her customers.
 - Mike Saad has also suggested to revise the status of three case studies.
- Rainer Frotscher suggested to review table 4 of the guide and make the necessary revision for an update.

Near the end of the meeting, the Chair requested if there was any last discussion on the final agreed version of the title, scope, and purpose (see below).

- Jim Dukarm made a motion to accept the title as developed in the meeting which was “IEEE Guide for the Interpretation of Gases Generated in Mineral Oil-Immersed Transformers.”
 - Donald Lamontagne second the motion
 - Motion passed.
- Jim Dukarm made a motion to accept the scope as developed during the meeting and shown below.
 - Scot Reed second the motion
 - Motion passed.
- Jim Dukarm made motion to accept the purpose as developed during the meeting and shown below.

- o Donald Lamontagne second the motion
- o Motion passed.

- A motion to submit a PAR to NESCOM will be made at the SC meeting by the Chair with the task force approved Title, Scope, and Purpose as written below.
- There was no new business to discuss.
- The meeting was adjourned at 15.00.

=====

The following title, purpose and scope was approved by the Task Force:

Title = IEEE Guide for the Interpretation of Gases Generated in Mineral Oil-Immersed Transformers is this the title purpose and scope as approved at the end of the meeting?

Scope = This guide applies to in-service mineral oil-immersed transformers and addresses:

- a) The theory of gas generation in a transformer
- b) The interpretation of dissolved gas analysis
- c) Suggested operating procedures
- d) Various diagnostic techniques
- e) Case studies and examples
- f) Evaluation criteria and guidelines
- g) A bibliography of related literature

Purpose = The purpose of this document is to provide a guide for evaluating dissolved gas analysis results from in-service mineral oil-immersed transformers

=====

Appendix IV

Working Group C57.637 Guide for the Reclamation of Mineral Insulating Oil and Criteria for Its Use

**Tuesday March 12, 2024
11:00 AM – 12:15 PM
Vancouver, BC – Canada**

Minutes of Working Group Meeting

The meeting was called to order at 10:58 am by Chair Stephanie Mabrey.

Attendees & Members:

The meeting was attended by 25 guests.

The Working Group (WG) has 29 members and 19 were present so quorum was reached.

1. Kevin Biggie	8. Rainer Frotscher	15. Mickel Saad
2. Jeremiah Bradshaw	9. Andy Holden	16. Jonathan Sinclair
3. Ed Casserly	10. Ismail Gunar	17. Greg Steeves
4. Stuart Chambers	11. Lance Lewand	18. Ed teNyenhuis
5. Jesse Duffy	12. Stephanie Mabrey	19. Deanna Woods
6. Todd Felton	13. Jinesh Malde	
7. Marc Foata	14. Scott Reed	

Chair's Remarks:

Chairwoman Mabrey (SM) made officer introductions. The Chair then reviewed with the Task Force (TF) the IEEE's copyright policy and a call for patents, of which no comments were made.

Quorum:

Quorum was confirmed by Secretary Andy Holden (AH). 19 members were present.

Approval of Minutes:

A motion to approve the Fall 2023 minutes by unanimous consent was made by Lance Lewand and it was seconded by Stuart Chambers. The motion carried with no objections or abstentions.

Approval of Agenda:

A motion to approve the meeting agenda by unanimous consent was made by Ed Casserly and it was seconded by Lance Lewand. The motion carried with no objections or abstentions.

Agenda

- 1) Introduction
- 2) Review Call for Patents

- 3) Review Copyright IEEE SA Notification
- 4) Obtain Quorum
- 5) Approval of prior minutes
- 6) Present proposed next steps & timeline
- 7) Conclude

Approval of Ballot Resolution Committee:

A motion to provide the Ballot Resolution Committee (BRC) with authority to make changes to the draft document without requiring approval from the general working group was made by Jeremiah Bradshaw and it was seconded by Deanne Woods. The motion carried with no objections or abstentions.

The BRC is tasked with returning a draft document to the general working group before the Fall 2024 meeting. The intent is to pass that document to the Insulating Fluids subcommittee after the Fall 2024 meeting.

Ballot Resolution Committee Membership:

- 1) Stephanie Mabrey (Chair)
- 2) Scott Reed (Vice-Chair)
- 3) Andy Holden (Secretary)
- 4) Jeremiah Bradshaw (editor)
- 5) Mike Bonn
- 6) Ed Casserly
- 7) Stuart Chambers
- 8) Jinesh Malde
- 9) Jonathan Sinclair
- 10) Ed teNyenhuis
- 11) Deanna Woods
- 12) Gabriel Zamora

Proposed Next Steps & Timeline:

SM shared this timeline with the general working group.

- **Spring 2024**
 - o Initial Ballot resolution Committee meeting
 - o Continued virtual meetings
- **Fall 2024**
 - o Present DRAFT document for ballot
 - o Bring to subcommittee for ballot
 - o MEC Review / Ballot Group
- **Spring 2025**
 - o Ballot Resolution / Recirculation

Conclusion:

The meeting was concluded at 11:11pm by SM.

Appendix V

Working Group C57.155 – Guide for Interpretation of Gases Generated in Natural Ester and Synthetic Ester-Immersed Transformers

**Monday, March 11, 2024
09:30 – 10:45, Vancouver, BC, Canada
Minutes of Working Group Meeting**

Chairman: Alan Sbravati
Vice Chair: Lance Lewand
Secretary: Attila Gyore

The meeting was called to order at 09:30 by the Chair.

There were 23 of 37 members present during the meeting. There were 46 guests, 16 membership requests.
The quorum was achieved.

17. Attendance list:

1	Levent	Baser	Guest
2	Paulo	Bautista	Guest
3	Paul	Boman	Member
4	Jeremiah	Bradshaw	Member
5	Griffin	Burk	Guest
6	Edward	Casserly	Member
7	Oscar	Castanon Barragan	Guest
8	Jonathan Mark	Ceatham*	Guest
9	Stuart	Chambers	Member
10	Luiz	Cheim	Member
11	Anthony	Coker	Guest
12	Randy	Cox	Guest
13	Pouneh	Davoudi	Guest
14	Bryan	Deb	Guest
15	Lee	Doyle	Guest
16	Zack	Draper	Member
17	James	Dukarm	Member
18	Marco	Espindola	Guest
19	Florin	Faur	Guest
20	Todd	Felton	Member
21	Bruce	Forsyth*	Guest
22	Rainer	Frotscher	Member
23	Miguel	Garcia	Member
24	Alireza	Gorzin*	Guest
25	Bill	Griesacker	Guest
26	Attila	Gyore	Secretary
27	Kevin	Hampton	Guest
28	Florian	Hermann	Guest
29	Traci	Hopkins	Member
30	Miljenko	Hrkac*	Guest
31	Patrycja	Jarosz	IEEE Staff
32	Marion	Jaroszewski	Guest
33	Egon	Kirchenmayer*	Guest

34	Stefan	Lembacher	Guest
35	Lance	Lewand	Vice-Chair
36	Eric	Li	Guest
37	Caser	Lizcano*	Guest
38	Tiffany	Lucas*	Guest
39	Stephanie	Mabrey*	Guest
40	Jinesh	Malde	Member
41	Kumar	Mani*	Guest
42	Mama	Mbouombouo*	Guest
43	Brian	McBride*	Guest
44	Toni	Mellin	Member
45	Stephen	Oakes	Guest
46	Cuauhtemoc	Ortiz	Guest
47	Nick	Perjanik	Member
48	Dominic	Pollaro*	Guest
49	Timothy	Raymond	Member
50	Scott	Reed	Member
51	Arash	Rezvan*	Guest
52	Yuri	Rossini*	Guest
53	Mickel	Saad*	Guest
54	Amitabh	Sarkar	Member
55	Alan	Sbravati	Chair
56	Jonathan	Sinclair	Guest
57	Steven	Small	Guest
58	William	Solano*	Guest
59	Mauricio	Soto	Member
60	Bradley	Staley	Guest
61	Greg	Steeves	Guest
62	Charles	Sweetser	Guest
63	Jonathan	Tan	Guest
64	Marko	Teofanovic	Guest
65	Evanne	Wang	Member
66	Rene	Wind	Guest
67	Deanna	Woods	Member

68	Jeffrey	Wright	Guest
69	Fei	Yang	Guest

*membership requested

18. Agenda for approval

- A. Welcome & Introduction
- B. Attendance and Establishment of Quorum
- C. Call for Patent Disclosure
- D. IEEE Copyright Policy
- E. Approval of Fall 2024 Minutes
- F. Working Group Activities
 - 1. Task Force 1, Statistical Analysis of Database, Annex A
 - 2. Task Force 2, Development of NEI parameters for Ester liquids
 - 3. Task Force 3, Draft of the revised document, PC57.155/D1, Annex G (References)
 - 4. Task Force 4, Reviewing Annexes B-F
 - Collecting case studies
- G. Discussions:
- H. Other Items for Discussion
- I. Adjournment

19. Chair posted the Patent Claim. No claims were made.

20. Chair presented the copyright policy slides.

21. The agenda of the meeting was presented by the chair.

22. Agenda for Spring 2024 was approved, motion: Scott Reed, second: Ed Casserly

23. Fall 2023 Minutes was approved, motion: Ed Casserly, second: Traci Hopkins

24. Discussions on Task Forces' work

- a. TF1 Statistical Analysis of Database, TF Leader: Lance Lewand, Doble
 More than 9900 records were sent. Thank you!
 Sample of anonymization and handling were presented.
 More records needed, submission will be reopened, new records will be accepted by end of June (extra 3 months)
 The data used for the actual standard will be resubmitted by the chair.
 Please send them to c57data@ieee.org, subject: PC57.155 Revision
 IEEE anonymize the data and then forward them back to the working group.
 Chair showed a section of anonymized data and then circulated.
 IEEE will have kept the data for 10 years
- b. TF2 Normalized Energy Index, TF Leader: Alan Sbravati, Hitachi Energy
 NEI works on natural and synthetic esters were presented.
 NEI number would be used if there would not be enough data to create increase of gas values within certain time like Table 3 and 4 in IEEE C57.104.
 We need to differentiate between natural esters based on their base oil
 Alan Sbravati presented Kevin Writz's work on NEI for natural esters
 Attila Gyore presented a though process of Russell Martin where mineral oil parameters were used for synthetic ester records. Conclusion was that any calculated NEI number would give us an indication of any fault only.
- c. TF3 Revision of the Document TF Leader: Stuart Chambers, EPRI International
 The revision of the main text was started, so far ~80 changes
- d. TF4 Reviewing Annexes TF Leader: Jinesh Malde, MIDEL & MIVOLT Fluids
 New structure of Annexes was presented
 New case studies are needed

25. New Business/Other Items for Discussion: No new business.

26. Next meeting at Fall 2024, St Louis, Missouri, USA

27. The meeting was adjourned at 10:45, on time, motion: Jinesh Malde, second: Stuart Chambers

Attila Gyore, Secretary
Alan Sbravati, Chair

Appendix VI

WG C57.139 – Guide for Interpretation of Gases Generated in Liquid Type Load Tap Changers

**Tuesday, March 12, 2024
4:45 PM to 6:00 PM
Vancouver, BC, Canada**

Chair Rainer Frotscher
Vice Chair John Prunte
Secretary Paul Boman
Meeting: Vancouver, BC, Canada, Tue March 12 2024, 4:45 – 6:00 PM
Attendance record: Total: 70, Members: 24, Guests: 46, with 15 requesting membership.

Attendees list:

First Name	Name	Status/ Membershi p Request
Paul	Boman	Secretary
Elizabeth	Bray	Guest
John	Brett	Guest
Edward	Casserly	Member
Juan	Castellanos	Guest
Randy	Cox	Guest *)
Sami	Debass	Guest *)
Lee	Doyle	Guest
Zachary	Draper	Member
James	Dukarm	Guest
Hakim	Dulac	Guest
Evgenii	Ermakov	Guest *)
Florin	Faur	Member
Zhatan	Fazlic	Guest *)
Todd	Felton	Member
Marcos	Ferreira	Guest *)
Hugo	Flores	Member
Joseph	Foldi	Guest
Rainer	Frotscher	Chair
James	Gardner	Guest *)

Hector	Garza	Guest
Attila	Gyore	Member
Florian	Hermann	Guest
Traci	Hopkins	Guest *)
Nathan	Jacob	Guest *)
Christopher	Johnson	Guest
Yeounsoo	Kim	Guest *)
Matthieu	Lachance	Guest
Angela	Leigl	Guest
Cesar	Lizcano	Guest *)
Luc	Loiselle	Guest
Stephanie	Mabrey	Member
Jinesh	Malde	Guest
Toni	Mellin	Member
Martin	Munoz	Member
Emma	Murowinski	Guest
Ali	Naderian	Guest
Mark	Newbill	Guest *)
Anastasia	O'Malley	Guest
Cuauhtemur	Ortiz	Guest
Parminder	Panesar	Guest
Nick	Perjanik	Member
John	Prunte	Vice-Chair

Tim	Raymond	Guest *)
Scott	Reed	Member
Perry	Reeder	Member
Sebastian	Rehkopf	Member
Jonathan	Reimer	Guest
Mickel	Saad	Member
Alan	Sbravati	Guest
Alfons	Schrammel	Guest
Steve	Shull	Guest
Jonathan	Sinclair	Member
Jimmy	Smith	Guest
William	Solano	Member
Brian	Sparling	Guest *)
Brad	Staley	Guest *)
Janusz	Szczechowski	Guest

Matthew	Sze	Guest
Marko	Teofanovic	Guest
Tim	Tillery	Guest
Cole	Van Dreef	Member
Robert	Vary	Guest
David	Wallach	Guest
Matthew	Webb	Member
Daniel	Weyer	Guest *)
Christopher	Whitten	Member
Deanna	Woods	Member
Jeffrey	Wright	Guest
Joshua	Yun	Member

*) : requesting membership

Agenda

- Welcome
- Membership / Quorum
- Approval of Agenda
- Call for Patent Claims / IEEE SA Copyright Policy
- Approval of Meeting Minutes F23
- Revision of C57.139 – Report of Task Forces TF1 - TF4
- Discussions
- New Business
- Adjourn Meeting

Minutes

- The WG met Tue, Mar 12, 4:45 pm. Chair showed membership list containing 31 members, with an initial count of 22 attending => Quorum was achieved.
- Chair asked for approval of the agenda; motion by Hugo Flores, 2nd by Stephine Mabrey => agenda was unanimously approved.
- Chair asked for Essential Patent Claims => none stated.
- IEEE Copyright Policy was shown.
- Fall 2023 Meeting Minutes: motion to approve by Stephanie Mabrey, 2nd by Marcos Ferreira => No corrections, unanimous approval.
- Task Force Reports:

TF1: LTC DGA Data evaluation (in collaboration with IEEE SA Tools and Data Group) – Zachary Draper

- DGA records for Guide now count 170,000 records, after receiving another 50,000 records from a utility. Another 10,000 records have been directly delivered to IEEE, and are currently anonymized.

- Only 3,000 records show operation counts, which only allow for a general idea on using this parameter in the analysis. Need more for being meaningful.
- Data of 84 documented LTC failures were processed to determine the most effective parameters. The Inter Quartile Range in combination with Annex B methods seems to be indicative to flag LTCs. Respective graphs for selected LTC classes and utilities were shown and explained.
- Performance of the method was confirmed by using ROC curves.
- Data analysis is expected to be finished by end of the year. Various statistical techniques will be applied which go beyond the methods which are currently in the guide.

TF2: Revision of Chapter 1–4 (General Section) – Florin Faur

- Edits on Scope, Purpose, References and Definitions are nearly completed.
- Chapter 4 (Nature, purpose and basis for DGA for LTCs) was significantly extended:
 - several paragraphs with general information moved from Chapters 5 and 6 to Chapter 4;
 - description of tap-changer architectures added;
 - list of gas-generating elements, their typical gas patterns and determining parameters added;
 - influencing factors on gas generation, retention, dissipation edited;
 - influence of stray-gassing added;
 - LTC faults and their fault gas pattern added;
 - section on gas ratios moved to Chapter 5.
- To be checked: “Types of Samples” (shifted from Ch. 6 to Ch. 4) wording should be aligned with C57.104.

TF3: Revision of Chapter 5 (Rules for LTC DGA interpretation) – Deanna Woods

- Classification scheme of LTC types moved from Annex A to main body => now normative;
- Discussion on LTC Classification scheme:
 - 5th letter added to distinguish between “on-tank” and “in-tank models
 - several improvements in wording for more clarity
 - Note to be added with reference to C57.131, where switching principles (reactor, resistor) are explained
- Section on gas ratios integrated from Chapter 4
- Chart “Combustible gases vs. Temperature” added for more clarity
- Table of LTC models and their classification added as new Annex; Discussion:
 - Table is regarded as very useful.
 - Tap-changer manufacturers shall not be mentioned, because they are considered commercial in nature. => column with tap-changer manufacturers will be deleted.
 - Information on OEM is regarded as useful nevertheless and will be made available somewhere else.
- Chapter 5 shows many open topics, a lot of work is to be done => call for experts to strengthen TF3; Nick Perjanik (AVO Diagnostics) and Marcos Ferreira (Quanta Technology) volunteered as additional members of TF3.

TF4: Revision of Chapter 6 (Interpretation of LTC DGA Data) – William Solano

- Purpose of this chapter is to describe how to apply the interpretation methods developed by TF1.
- Scope of chapter 6 was extended to also include recommendations, but should avoid any diagnosis.
- Table with condition codes shall be revised:
 - avoiding a diagnosis (e.g. “weak/strong indication of a fault”)
 - adding a 4th result code “Alarm”, to identify dangerous conditions; recommendation could be: “stop operation / arrange instant maintenance”
- Annex D requires further modification (wording for description of Triangle zones, population example)
- Data to be validated in order to determine triangle’s zones certainty.
- Emma Murowinski (DeltaX Research) volunteered to help and was added as new member of TF4.

- Chair asked the Task Forces to complete their work before the Fall Meeting 2024, so that a 1st Draft can be compiled until end of this year. This will then be distributed as Straw Ballot for comments by the WG. The official ballot process shall be initiated in Spring 2025.
- Meeting was adjourned at 6:00 pm.

Appendix VII

Working Group C57.130 – Guide for the Use of Dissolved Gas Analysis Applied to Factory Temperature Rise Tests for the Evaluation of Mineral Oil-Immersed Transformers and Reactors

**Tuesday, March 21, 2023
8:00 – 9:15 am
Hyatt, Vancouver, BC, Canada
Minutes of Working Group Meeting**

Chair: Bruce Forsyth
Vice Chair/Secretary: Jinesh Malde

Meeting Attendance:

Last Name	First Name	Status
Forsyth	Bruce	Chair
Malde	Jinesh	Vice-Chair
Alonso	Mario	Guest
Baser	Levent	Guest
Beaster	Barry	Guest
Berube	Jean-Noel	Guest
Boettger	William	Member
Bouty	Georges	Guest
Bradshaw	Jeremiah	Guest
Cai	Jim	Guest
Castellanos	Juan	Member
Cho	Eunyoung	Guest
Chu	Matt	Guest
Czernorucki	Marcos	Guest
Debass	Samson	Member
Digby	Scott	Guest
Dillon	Nikolaus	Guest
Dorpmanns	Luc	Guest
Draper	Zachary	Member
Fazlic	Zlatan	Guest
Felton	Todd	Member
Ferreira	Marcos	Guest
Foata	Marc	Guest
Foldi	Joseph	Guest

Last Name	First Name	Status
Gorzin	Ali	Guest
Griesacker	Bill	Guest
Gunge	Zach	Guest
Gyore	Attila	Guest
Hampton	Kevin	Guest
Hermann	Florian	Guest
Hernandez	Ronald	Guest
Hernandez-Mejia	Jean Carlos	Guest
Hollrah	Derek	Guest
Hopkinson	Phil	Guest
Hrkac	Miljenko	Guest
Jarosz	Patrycja	Guest
Jaroszewski	Marion	Guest
Jensen	Nick	Guest
Kennedy	Sheldon	Guest
Kirchenmayer	Egon	Member
Klempner	Dmitriy	Guest
Lamontagne	Donald	Guest
Lembacher	Stefan	Guest
Lewand	Lance	Member
Lizcano	Cesar	Guest
Mabrey	Stephanie	Guest
Mayer	Robert	Guest
Mbouombouo	Mama	Guest

Last Name	First Name	Status
Panesar	Parminder	Guest
Perjanik	Nick	Member
Puente	Pedro	Guest
Reed	Scott	Member
Rezvan	Arash	Guest
Ronchi	Rodrigo	Guest
Sankarakurup	Dinesh	Guest
Sarkar	Amitabh	Member
Sbravati	Alan	Guest
Schmitt	Wolfgang	Guest
schweiger	ewald	Guest
Sohn	Yougtné	Guest
Soto	Mauricio	Guest
Staley	Brad	Member
Thompson	Ryan	Member
Vanderwalt	Alwin	Guest
Vanderwalt	Alwyn	Guest
Verdolin	Rogério	Guest
Vir	Dharam	Member
Weiss	Zachory	Guest
Welton	Drew	Guest
White	Joe	Guest
Wright	Jeffrey	Guest
Yan	Patrick	Guest

Foster	Patrick	Guest
Frotscher	Rainer	Guest
Fu	Yao	Guest
Garcia	Eduardo	Guest
Gilbert	Stephen	Guest
Gonzalez	Luis	Guest

Mcbride	Brian	Guest
Morales-Cruz	Emilio	Member
Murowinski	Emma	Guest
Oakes	Stephen	Guest
Olan	David	Guest
O'Malley	Anastasia	Guest

Yang	Fei	Guest
Yun	Joshua	Member
Zhao	Peter	Guest
Ziomek	Waldemar	Guest

Quorum requirement for the meeting was 20 out of 38 members. 17 members were present, so quorum not met. The membership list was updated prior to the meeting to ensure that members had either attended 2 consecutive meeting of 3 out of 5 meetings. The membership list will be reviewed again.

The Chair requested the attendees to check and update their email to prevent bounce backs from the servers.

The Chair showed the 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 and meeting minutes presented to the attendees was not approved as quorum was not met. Prior to the Fall 2024 meeting, the minutes from Fall 2022, Spring 2023, and Fall 2023 meetings will be forwarded to members for approval through email. Minutes will be added to the IEEE C57.130 section on the website and they will be available in the subcommittee meeting minutes.

The scope and purpose were shown in the meeting and the Chair mentioned that the scope and purpose will include esters if data is collected and analyzed by the working group (WG).

WG milestones were presented. Substantive work needs to be completed by Spring 2025 so that the guide can be submitted for ballot in the Fall of 2025.

Participants discussions:

- Lance Lewand (taskforce leader) presented the list of companies and individuals who volunteered to provide data and the volunteers who would analyze the data.
- The Chair mentioned that it is important for the users to provide data on mineral oil and ester liquids, and it will be anonymized by IEEE. The data could be used for current draft revision as well as future revisions of the guide. Only IEEE will hold the data once guide is published.
- Amitabh Sarkar has requested the WG to look at the work being done in IEEE C57.155 to make sure that there is coordination between the guides. The Chair mentioned that that will be part of the review process for the document.
- Peter Zhou asked the attendance whether the limits for DGA in the guide work. The Chair mentioned that there were no comments on the data, so the assumption was that the data was good.
- Dharam Vir mentioned that end users are not requesting DGA for factory acceptance test. He has not seen a specification where limits are requested. Data is mainly for internal analysis.
- Peter Zhou mentioned that there should be relation between rate of rise and absolute limits. Joe Foldi mentioned that utility specs do not have DGA info in there, but rate of rise would be important information.
- Rainer Frotscher said that IEC standard mentions that there are differences in stray gassing behavior of the different types of liquids. That should be in the guide. Furthermore, data should be requested from IEC for the guide. Lance will request data from IEC (IEC use non thermally upgraded Kraft compared to thermally upgraded Kraft so the values may not match).
- The Chair and Secretary will review the guide and update it with new information prior to the next meeting.
- Juan Castellanos volunteered to look at the references section of the guide.

Meeting adjourned at 9:15 am

Respectfully submitted,

Jinesh Malde, Secretary

Date of Submission: April 2nd 2024

Appendix VIII

Task Force – Development of a test method to determine the maximum continuous operating temperature of insulating liquids

Tuesday, Oct 24, 2023

3:15 PM – 4:30 PM

Vancouver, BC - Canada

Minutes of Task Force Meeting

No minutes were prepared.

TF disbanded.

Insulation Life Subcommittee

March 13, 2024

Vancouver, British Columbia, Canada

Chair: Sam Sharpless

Vice-Chair: Jinesh Malde

Secretary: Anastasia O'Malley

The Insulation Life Subcommittee (ILSC) was called to order by the Chair on March 13, 2024, at 8:00 am PDT. 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 were shown a QR code that could be scanned to enter attendance. In addition, the attendance rosters were circulated.

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 one responded to this request.

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 and welcomed new members:

Anthony Coker	Christopher Johnson
Evgenii Ermakov	Francis Mills
Marco Espindola	Mark Newbill
James Gardner	Rakesh Patel
Rob Ghosh	Vijay Tendulkar
Traci Hopkins	Krishnamurthy Vijayan
Saif Hossain	Joe White

Former member Ken Skinger (RIP) was removed.

H.2 Secretary's Report

For the Spring 2024 Vancouver meeting a QR scan code was used during the meeting for quick attendance polling and recording. The QR code was supplemented with circulated attendance rosters. The QR scan code indicated that a quorum had been achieved with 62 out of 120 members in attendance. The circulated attendance rosters reported that 89 out of 120 members were present in the meeting together with 123 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. Twenty-eight guests requested membership. A list of attendees is provided at the end of this report.

The Fall 2023 subcommittee meeting minutes had been provided to participants in advance of the meeting for review.

Ed Casserly made a motion to approve the minutes. Hemchandra Shertukd seconded the motion. After hearing no objection from the attendees, the Fall 2023 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. Amitabh Sarkar moved for approval of the agenda as shown. The approval of the agenda was seconded by Dave Wallach. 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

March 12th, 2024, Vancouver, BC - Canada

TF - Temperature-rise Tests		
Chair: Dinesh Sankarakurup	Vice-Chair: Ajith M. Varghese	Secretary: Cihangir John Sen
Room: Regency C/D	Date: March 12 th , 2024	Time: 3:15 pm to 4:30 pm
Total TF Members: 28	Members present at the Quorum: 17	Attendance Per Roster: 53
Guests present: 34 (Table-2)	Membership requested: 7	Granted membership: 2
Status changed to Guest: 3		Final TF Members: 27 (Table-1)

Chair's Remarks

The meeting was called to order at 3:15 PM on March 12, 2024. The Chair welcomed members and guests to the Spring 2024 meeting.

Attendance rosters were circulated. There were 46 participants present (including the Chair, Vice Chair, and the Secretary) and 7 participants requested voting membership. 2 of the 7 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 Fall 2024. Table 1 is the final list of the 26 members of this TF. Table 2 lists the guests present at the Spring 2024 meeting.

Table-1: Final Membership List (after S24 Meeting)

	First Name	Last Name		First Name	Last Name
1	Alex	Alahmed	15	Bertrand	Poulin (N) (P)
2	Tauhid	Ansari	16	Jarrood	Prince
3	Steve	Antosz (P)	17	Dinesh	Sankarakurup (P)
4	Gilles	Bargone (P)	18	Ewald	Schweiger (P)
5	William	Boettger (P)	19	Cihangir John	Sen (P)
6	Juan	Castellanos (P)	20	Abdulmajid	Shaikh (P)
7	Samragini	Dutta Roy (P)	21	Michael	Shannon (P)
8	Bruce	Forsyth	22	Sam	Sharpless (P)
9	Saramma	Hoffman (P)	23	Sanjib	Som (N) (P)
10	Qasim	Khan	24	Valeriu	Tatu
11	Zan	Kiparizoski	25	Ajith	Varghese (P)
12	Egon	Kirchenmayer (P)	26	Jason	Varnell (P)
13	Fernando	Leal	27	David	Wallach (P)
14	Gabriel	Mamede (P)			

(P) Members Present, (N) New Member

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.

Table-2: Guests present during S24 WG Meeting

	First Name	Last Name		First Name	Last Name
1	Mario	Alonzo	18	Mart	Munoz
2	Jean Noel	Berube	19	Kris	Neild
3	Eunyoung	Cho	20	Cuauhtemoc	Ortiz
4	Matt	Chu	21	George	Partyka
5	Luc	Dorpmanns	22	Juan	Reyes Perez
6	Hakim	Dulac	23	Amitabh	Sarkar
7	Joseph	Foldi	24	Alfons	Scrammel
8	Renjie	Fu	25	Jaber	Shalabi
9	Alireza	Gorzin	26	Mauricio	Soto
10	Ravi	Gupta	27	Scott	Thomas
11	Peter	Heinzig	28	Ryan	Thomson
12	Philip	Hopkinson	29	Rene	Wind
13	Chanmin	Jeong	30	Stefan	Wirth
14	Bill	Li	31	Fei	Yang
15	Luc	Loisellez	32	Asam	Yu
16	Robert	Mayer	33	Malia	Zaman
17	Francis	Mills	34	Kris	Zibert

Quorum, Approval of Minutes and Agenda

At the time of quorum 17 of the 28 members were present so quorum was achieved shortly after the meeting start. The Unapproved minutes from the Fall 2023, meeting was presented by Chair and approved by the TF (Sam Sharpless, Michael Shannon seconded).

The agenda for Spring 2024 meeting was also unanimously approved (David Wallach, Ewald Schweiger seconded).

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.

Bertrand propose to ensure 12.90 makes this reference to difference between OFAF and others when it comes to evaluating the top oil. It is suggested that the section should be a part of the test core (C57.12.90) rather than a guide (C57.119).

Bertrand shared with the group a draft of Clause 11 that shows the added section from C57.12.119.

Bertrand Poulin explained with an example that the top oil and bottom oil temperatures are obtained by direct measurements, but the average winding and the top oil rise are calculated because they are well balanced inside the winding. This is not the case for OFAF and OFWF cooling method where there is no such correlation between temperatures.

Chair implemented all the comments from the circulation of the draft document, presented during the meeting and opened for discussion. The TF discussed about the top duct oil temperature in the OFAF cooling.

Several attendees mentioned that the temperature rise is not linear or uniform along the winding and fiber optics could give the most accurate HS measurement.

Bertrand Poulin mentioned that the f/o may not be as accurate as expected so we must be careful we say f/o is the true measurement for the HS temperature because it is one piece of information at one voltage. HS measurement with f/o could be the local heating information, Furthermore, HS calculation is based on the average calculation criteria that is not the case for f/o measurement method.

TF also discussed about the HS factor (being >1) and the ideal location of the fiber optic probes that are already covered under the new C57.169.2023 guide.

Chair suggested to circulate the revised clause 11.3.2 to all group including the guests after implementing the minor changes discussed during the meeting but the section has the approval of the TF and will be finalized until the next meeting in Fall 2024. TF agreed to review the revised section one more time and provide feedback until the next meeting.

2) Negative Altitude Correction (Transformers tested at factories located > 1000 m)

Egon Kirchenmayer (Siemens Energy) provided one formula that can be applicable to + or – altitude delta correction (works for both ways).

It was decided to survey the altitude correction section including the formula within the Task Force as well as in the ILSC to seek for technical feedback during the Fall 2023 meeting. Survey was circulated and completed. Chair has shared the results during the Spring 2024 meeting. According to the results:

- 69 participants responded.
- 62 approved
- 5 abstain.
- 2 disapproved.

There was one comment that was resolved during the voting process. The section was approved as submitted with almost %90 approval rate.

It was noticed during the meeting that the surveyed paragraph is still not clearly stating that the formula can be applied to both >1000m and <1000m conversions. Steve Antosz volunteered to review the surveyed paragraph and provide a revised paragraph that will cover both conditions until the Fall 2024 meeting.

3) Tap Selection for Temp Rise Test:

In line with discussion and motion approved during Fall 23 meeting, a survey was circulated on the proposed additions to C57.12.90 Section 11 regarding Tap & Connection Selection during Temperature rise test.

The survey results were received as below:

- 54 participants responded.
- 49 approved
- 4 abstain.
- 1 disapproved.

The proposed revision on the Tap & Connection Selection during Temperature Rise Test was approved with %90 approval rate. However, TF did not have time to discuss the survey results.

No new business was identified.

Meeting was adjourned at 4:30pm.

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 – 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, 11 March 2024, 11:00 am – 12:15 pm PDT – Spring 2024 Meeting (in-person)

- Chairman: Kevin Biggie (Weidmann)
- Vice-chair: George Frimpong (retired – not present)
- Secretary: Evanne Wang (DuPont)

Action items are in **bold** font.

The Chair called the meeting to order at 11:00 am PDT and welcomed attendees to the meeting. A quorum was achieved. The breakdown of attendees is shown below:

- Attendees present: Sixty-four (64)
- Members present: Nineteen (19) (of 33 Members - 17 required for quorum)
- Guests requesting membership: Ten (10)
- Guests requesting membership meeting requirements: Five (5)
- Members requesting Guest status: One (1)
- *New total number of Members: Thirty-seven (37)*

The Chair reviewed the purpose of the WG, which is to amend Annexes B&D of IEEE 1276. The group introduced themselves. The meeting agenda, Essential Patent Claims information, and copyright information were reviewed. No patent claims were noted.

Both the unapproved minutes from the last meeting and the proposed agenda were sent prior to the meeting to the members and guests of this Working Group. The minutes from the last meeting on October 23rd, 2023 were reviewed and unanimously approved with Phil Hopkinson (HVolt) making the motion and seconded by Stu Chambers (EPRI). The proposed agenda for this meeting was reviewed and unanimously approved with Mike Shannon (REA Magnet Wire) making the motion and seconded by Stephen Oakes (WEG Transformers).

The Chair then gave a short summary of the last full WG meeting (23 October 2023), as well as the last meeting of the Task Force drafting the amendment (14 December 2023). No comments were received from the WG on either of these topics.

The Chair then reviewed the progress of the TF drafting the amendment, including the latest proposed input aging examples and a proposed change to the structure of Annex B. The comments received from the WG on these topics are shown below, and a screenshot of the proposed structure change as discussed from the TF meeting in December 2023 is shown for reference:

B.1 Aging examples defining thermal class of insulation systems

- Industry Proven System Aging Examples
- Cellulose Pressboard Aging Example and Thermal Class
- Ester liquid-based system aging examples aged and evaluated per IEEE Std C57.100-2011 version or newer making thermal class claims
- Aramid-mineral oil (potential new info DuPont)
- Enhanced cellulose-ester liquid (potential info from Weidmann)

B.2 Other aging examples including discussion and reference

- Aramid insulation systems
- Natural ester liquid-based system aging examples with unit life analysis
- Understanding the cellulose aging differences between mineral oil and natural ester liquids

B.3 Loading guide example for 140 thermal class system

Guide:

- Making claim, already published
- Making claim, accepted for publication
- Discussion / not making claim / reference info completed

The cyan and blue additions will be discussed in the March 2024 virtual meeting for consideration in the draft for the straw ballot.

- Bruce Forsyth (Cargill) commented that Roberto Ignacio (Cargill) analyzed existing data and determined it was inconclusive to draw any additional analysis from the previous data. Thus, he noted that there will not be any “Additional analysis of the natural ester data from Roberto (potentially)” to be added to the new Section B.2.
- Bruce Forsyth (Cargill) commented that the loading guide example information (Section B.3) is important and of value, but he is concerned that there are a lot of experts from the IEEE C57.91 main loading guide document that would have valuable input. He proposed that additional experts should be involved in this conversation. Alan Sbravati (Hitachi) commented that the loading guide example in IEEE 1276 is just an example and should be included. The Chair commented that the content in Section B.3 has been carried over from the recently approved IEEE 1276 and has not been changed. Tim Raymond (EPRI) mentioned that a study group should be formed to determine where this information should be located and what additional information should be included. Sasha Levin (Weidmann) agreed with Bruce that more experts need to be included if there is work to be done to update the loading guide example, but proposed that the loading guide example should be kept as-is for now, but a **strong disclaimer explaining that the loading guide is an example needs to be included or added to clarify this point.**

The Chair then reviewed the latest draft (Draft D.5) in further detail:

- No comments received on updates to the new Section B.1.
- In the new Section B.2.1 (aramid insulation systems aging examples), **Roger Wicks (DuPont) offered to provide graphs and additional clarifying notes based on the recently published paper on dual-temperature aging, which may have info that applies to section B.1 also.**
- In the new Section B.2.2 (natural ester aging examples with unit life analysis), the Chair noted that Alan Sbravati (Hitachi) had submitted updated graphs and wording to this section. Jinesh Malde (Midel) asked for clarification as to what the update entailed. The Chair responded that new data points in the graphs and clarifying wording were the specific updates. Jinesh recommended that any new aging data from testing performed to the IEEE C57.100 method should be added to a different section of the document, and the information in the new Section B.2.2 be stated to be historic information that shall not be updated with further new data. Jinesh made a motion: ***That Section B.2.2 should only be for historical references and should be noted as such, and this note should be included in the introduction of Section B.2.2. Moving forward, the current version of IEEE C57.100 should be used to determine a thermal class of an insulation system.*** Sasha Levin (Weidmann) seconds this motion. This motion was unanimously approved by the WG. Roger Wicks (DuPont) commented that a similar problem with the aramid ESSERCO data is that the testing did not follow any of the current test methods, and that despite having useful data the test method is outdated.

Given the three additional change topics discussed in this meeting, the Chair noted that **a Draft D.6 will be prepared to incorporate the changes discussed today, and will be circulated to the WG voting members for an “up/down” vote via email prior to the Fall 2024 meeting to decide if the draft is ready for IEEE-SA ballot.** The goals for the Fall 2024 meeting would then be to approve a draft to go to IEEE-SA ballot, and also form the Comment Resolution Group (CRG).

No additional input or comments were received, and the meeting was adjourned at 12:18 pm PDT.

Respectfully submitted,

Kevin Biggie, Chair
George Frimpong, Vice-Chair
Evanne Wang, Secretary

Attendance WG IEEE 1276a Annex B & D Meeting (3/11/2024):

- Attendees present: Sixty-four (64)
- Members present: Nineteen (19) (of 33 Members - 17 required for quorum)
- Guests requesting membership: Ten (10)
- Guests requesting membership meeting membership requirements: Five (5)
- Members requesting Guest status: One (1)
- *New total number of Members: Thirty-seven (37)*

The following attendees were present, with status current as of after the meeting:

Last/Family/ Surname	First/Given Name	Affiliation / Company Name	Status / Role
Bargone	Gilles	FISO Technologies Inc.	Guest
Beaster	Barry		Guest
Berube	Jean-Noel	Rugged Monitoring	Guest
Biggie	Kevin	Weidmann Electrical Technology	Chair
Burk	Griffin	Ergon Inc.	Member
Casserly	Edward	Ergon	Member
Chambers	Stuart	EPRI	Member
Chiang	Solomon	The Gund Company	Guest
Cho	Eunyoung	Hico-America	Guest
Cruz Valdes	Juan Carlos	Prolec GE Mty	Guest
Door	Jeffrey	The H-J Family of Companies	Member
Farwaha	Sanjeev	Snopud	Guest
Forsyth	Bruce	Cargill	Member
Ghosh	Rob	GE	Member
Gonzalez	Luis	Conduct Industries	Member
Gorzin	Alireza	Black & Veatch	Guest
Gyore	Attila	Midel & MiVolt Fluids LTD	Member
Hermann	Florian	Trench France	Guest
Hernandez	Ronald	Doble Engineering	Guest
Hoffman	Saramma	PPL	Member
Hollrah	Derek	Burns & McDonnell	Guest
Hopkinson	Philip	HVolt	Member
Jarosewski	Marion	Delta Star	Guest
Jensen	Nick	Delta Star	Guest
Jeong	Chanmin	HD Hyundai Electric	Guest
Kaineder	Kurt	Siemens Energy	Member
Kennedy	Sheldon	Sheldon P. Kennedy Engineering PLLC	Guest
Larison	Andrew	Hitachi Energy	Guest
Lee	Junho	HD Hyundai Electric	Guest
Levin	Aleksandr (Sasha)	Weidmann	Member
Malde	Jinesh	M&I Materials	Member
Mayer	Robert	Siemens Energy	Guest
McBride	Brian	Cargill	Member
Mikulecky	Filip	Siemens Energy, KPT	Guest
Montpool	Rhea	Schneider Electric	Guest
Morales-Cruz	Emilio	Qualitrol	Member
Naja	Ismael	Eaton	Guest
Oakes	Stephen	WEG Transformers	Member
Olan	David	BC Hydro	Guest

O'Malley	Anastasia	Consolidated Edison	Guest
Orozco	Eduardo	GE Vernova Grid Solutions	Guest
Raymond	Tim	EPRI	Member
Reeder	Perry	GE Vernova	Guest
Reiss	Tony	Custom Materials Inc.	Member
Sabin	Hakan	Virginia Transformer	Guest
Sarkar	Amitabh	Virginia Transformer	Guest
Sarkinen	Garret	Xcel Energy	Guest
Sbravati	Alan	Hitachi Energy	Member
Schwartz	Dan	Quality Switch	Guest
Shannon	Michael	REA Magnet Wire	Member
Sharp	Michael (Mike)	Trench LTD	Guest
Sharpless	Samuel	Rimkus Consulting	Member
Steele	H. Allen	TVA	Guest
Steineman	Andrew	Delta Star	Guest
Stockton	David	Stockton Business Consulting	Guest
Tirado	Fernando	Prolec GE	Guest
Tostrud	Mark	Dynamic Ratings	Guest
Vir	Dharam	Prolec GE	Guest
Wang	Evanne	DuPont	Secretary
Webb	Matthew	GE Vernova	Guest
Wicks	Roger	DuPont	Guest
Wind	Rene	Siemens Energy	Guest
Young	Fei	Hitachi Energy	Guest
Zaman	Malia	IEEE SA	Guest

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 Vancouver. The ballot opened on January 16, 2024, and successfully closed on February 15, 2024. The ballot group had 141 members. One hundred and twelve (112) ballots were returned, exceeding the 75% minimum. There were two abstentions. The approval rate was 90%, exceeding the 75% minimum. There are 448 comments with 308, as approve and 140, as disapprove. Seventy-one (71) comments are technical and the remaining balance are general or editorial. A comment resolution group has been formed to resolve the comments. 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 Vancouver. The comment resolution group is meeting virtually to resolve over 800 comments. A recirculation ballot is expected before the end of Spring. A PAR extension was received and expires on December 31, 2024.

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 working group meeting was held in Vancouver. The comments were resolved and the document is being reviewed and will then be recirculated for ballot.

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

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 (PDT) on Monday March 11th, 2024
- 2) This was the first on site meeting as Study Group – A virtual meeting took place on January 31st, 2024
Here in Vancouver 85 attended our first on site the meeting.
- 3) The objective of our Study Group is to provide the Insulation Life Subcommittee (ILSC) with a recommendation whether the document needs revision
- 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
 - o A quorum was achieved since this was the first on site meeting.
- 6) Approval of agenda
 - a) No comments from the group
 - b) The agenda was unanimously approved (1st motion by Bertrand Poulin and 2nd Steve Antosz)
- 7) Approval of meeting minutes of the previous virtual meeting on January 31st, 2024
 - a) No comments from the group
 - b) The meeting minutes were unanimously approved (1st motion by Bertrand Poulin and 2nd Steve Antosz)
- 8) Bertrand Poulin gave a presentation with the title:
Establishment of the winding exponent for overload calculations
- 9) Discussion based on feedback from review of C57.119 and next steps
 - a) Feedback was collected about the requirements for revisions (like Errors, clarifications, improvements, updates, etc)
 - b) The feedback and discussion indicated clearly that a revision of the current document is needed
e.g. Title:
 - Guide instead of recommended practice (in order to provide options)
 - The title gives the impression that the procedure of the temperature rise test is the main content of the standard document while the purpose is to predict the overload capabilities and consequently the loss of life of the transformers if operated beyond nameplate rating

- 10) Bertrand Poulin made the motion to recommend to the ILSC to revise C57.119. Steve Antosz provided second.
 - o Motion was carried unanimously with no objections or abstentions.
- 11) Steve Antosz made the motion to form a PAR Study Group (in case the ILSC accepts our recommendation to revise C57.119). Bertrand Poulin provided second.
 - o Motion was carried unanimously with no objections or abstentions.
- 12) After the motion passed the Study Group collected thoughts and ideas on the title, scope and related to the content.
- 13) Therefore we will raise the motion to form a PAR Study Group to work on the title and scope of C57.119 during the meeting of the ILSC on Wednesday, March 13th, 2024
- 14) The meeting was adjourned at 10:40 AM (PDT)
- 15) Next on virtual meeting – to be scheduled before October 2024 in St Louis
Next on site meeting – October 2024 in St Louis, MO

Respectfully submitted,

Ewald Schweiger
Study Group Chair

List of attendees for this meeting:

Name	Last name	Given name	Affiliation
Isaac Abdalla	Abdalla	Isaac	HICO America Sales & Technology, Inc.
Kayland Adams	Adams	Kayland	Prolec GE Waukesha
Steve Antosz	Antosz	Steve	Stephen Antosz & Associated
Edmundo Arevalo	Arevalo	Edmundo	Bonneville Power Administration
Elise Arnold	Arnold	Elise	SGB
Gilles Bargone	Bargone	Gilles	FISO
Jason Beaudoin	Beaudoin	Jason	Weidmann
Jean-Noel Berube	Berube	Jean-Noel	Rugged Monitoring Quebec Inc
Piotr Blaszczyk	Blaszczyk	Piotr	Specialty Transformer Components LLC.
Daniel Blaydon	Blaydon	Daniel	Baltimore Gas & Electric
W Boettger	Boettger	W	Boettger Transformer Consulting LLC
Georges Bouty	Bouty	Georges	Delta Satar INC
Juan Alfredo Carrizales	Carrizales	Juan Alfredo	PROLEC
Juan G. Castellanos	Castellanos	Juan G.	Prolec
Vivian Chan	Chan	Vivian	Hitachi Energy
Michael Craven	Craven	Michael	Qualus Power Services
Marcos Czernorucki	Czernorucki	Marcos	HITACHI ENERGY
Scott Digby	Digby	Scott	Duke Energy
Nikolaus Dillon	Dillon	Nikolaus	Dominion Energy
Jesse Duffy	Duffy	Jesse	Nashville Electric Service
Eric Elson	Elson	Eric	San Diego Gas and Electric
Joseph Foldi	Foldi	Joseph	Foldi & Associates, Inc.
Raymond Frazier III	Frazier III	Raymond	Ameren
Richard Frye	Frye	Richard	Eaton
Dragana Gasic	Gasic	Dragana	KONCAR D&ST
Saurabh Ghosh	Ghosh	Saurabh	GE
Stephen Gilbert	Gilbert	Stephen	IFD Technologies
Luis Gonzalez	Gonzalez	Luis	Conduct Industries
Saramma Hoffman	Hoffman	Saramma	PPL
Ryan Hogg	Hogg	Ryan	Bureau of Reclamation
Nick Jensen	Jensen	Nick	Delta Star
Chan Min Jeong	Jeong	Chan Min	HD Hyundai

Name	Last name	Given name	Affiliation
Ryan Jonak	Jonak	Ryan	Portland General Electric
Quamar Jutt	Jutt	Quamar	Kruger Products Inc
Kurt Kaineder	Kaineder	Kurt	Trench Austria
Thrinadha Katapalli	Katapalli	Thrinadha	VA Transformer
Gael R Kennedy	Kennedy	Gael R	GR Kennedy & Associates LLC
Yeounsoo Kim	Kim	Yeounsoo	Mitsubishi Electric Power Products
Matija Koprivnjak	Koprivnjak	Matija	KONČAR D&ST
Donald Lamontagne	Lamontagne	Donald	Arizona Public Service Co.
JINMING LI	LI	JINMING	BC HYDRO
David Lin	Lin	David	IFD Technologies
Gabriel Mamede	Mamede	Gabriel	Siemens Energy
Alberto Martinez Mares	Martinez Mares	Alberto	WEG Transformers USA
Robert Mayer	Mayer	Robert	Siemens Energy
Brian McBride	McBride	Brian	Cargill
Juliano Montanha	Montanha	Juliano	Siemens-Energy
Anthony Natale	Natale	Anthony	HICO America
David Olan	Olan	David	BC Hydro
Anastasia O'Malley	O'Malley	Anastasia	Consolidated Edison Co. of NY
Eduardo Orozco	Orozco	Eduardo	GE Grid Solutions
Joel Pacas	Pacas	Joel	IFD Technologies
Caroline Peterson	Peterson	Caroline	Xcel Energy
sylvain plante	plante	sylvain	Hydro-Québec
Miguel Plascencia	Plascencia	Miguel	Pacific Gas & Electric
Goran Plisic	Plisic	Goran	Koncar Power Transformers Ltd. A Joint Venture of Siemens Energy and Koncar
Bertrand Poulin	Poulin	Bertrand	Hitachi Energy
Jonathan Reimer	Reimer	Jonathan	FortisBC
Juan Reyes Perez	Reyes Perez	Juan	HITACHI ENERGY
Michael Richardson	Richardson	Michael	Ameren
Timothy Rocque	Rocque	Timothy	Prolec GE Waukesha
Rodrigo Ronchi	Ronchi	Rodrigo	WEG Transformers
Hakan Sahin	Sahin	Hakan	GA Transformers
Hakan Sahin	Sahin	Hakan	Virginia Transformer Corporation
Dinesh Sankarakurup	Sankarakurup	Dinesh	Duke Energy
Garret Sarkinen	Sarkinen	Garret	Xcel Energy
Markus Schiessl	Schiessl	Markus	SGB
Alfons Schrammel	Schrammel	Alfons	Siemens Energy
Ewald Schweiger	Schweiger	Ewald	Siemens Energy
Cihangir Sen	Sen	Cihangir	Duke Energy
AbdulMajid Shaikh	Shaikh	AbdulMajid	Delta Star Inc.
Samuel Sharpless	Sharpless	Samuel	Rimkus Consulting Group, Inc.
Muhammad Abdullah Sohail	Sohail	Muhammad Abdullah	Trench Limited
Yong Sohn	Sohn	Yong	HYOSUNG HICO
Kyle Stechschulte	Stechschulte	Kyle	American Electric Power
Scott Thomas	Thomas	Scott	Hitachi Energy
Risto Trifunoski	Trifunoski	Risto	Trench Group
Cole Van Dreel	Van Dreel	Cole	American Transmission Company
AJohn Vandermaar	Vandermaar	AJohn	BC Hydro
John Wagner	Wagner	John	AEP
Matthew Weisensee	Weisensee	Matthew	PacifiCorp
Drew Welton	Welton	Drew	Intellirent

Name	Last name	Given name	Affiliation
Malia Zaman	Zaman	Malia	IEEE SA
Kris Zibert	Zibert	Kris	Allgeier Martin & Associates
Thomas Zuiderveen	Zuiderveen	Thomas	IFD Technologies

Ewald Schweiger made a motion to form a PAR Study Group to develop a title and scope of a PAR for the revision of C57.119. Juan Castellanos seconded the motion. There was no opposition to the motion. It passed by unanimous consensus.

**C57.119 Study Group Recommended Practice for Performing Temperature Rise Tests on
Liquid-Immersed Power Transformers at Loads Beyond Nameplate Ratings**

Virtual meeting held on January 31, 2024, 10:30am – 12:00 pm EST

Attendance: Members: 5
Guests: --
Total: 5

- 1) Meeting was called to order at 10:30 AM (EST) with Welcome & Chair's remarks
 - a) About this Study Group:
In Kansas City F23 meeting, it was decided to start a Study Group for the C57.119 *Recommended Practice for Performing Temperature Rise Tests on Liquid-Immersed Power Transformers at Loads Beyond Nameplate Ratings*.

The objective our Study Group is to provide the
Insulation Life Subcommittee (PTSC) with a recommendation whether the document needs revision.
- 2) Call for patents & Copyright statement
 - c) 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.
 - d) 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.
- 3) Study Group Members
 - i. The list of members is at the end of the minutes
- 4) Establish quorum
 - A quorum was not achieved - 5 of 11 members present.
- 5) Approval of agenda
 - c) No comments from the group
 - d) Because no quorum was established the agenda could not been approved
- 6) Presentation from Bertrand Poulin on *Temperature rise test on power transformers – Determination of winding hottest spot exponent m*
followed by a discussion:
 - a) In the current standard document C57.119-2018 includes three methods for the “Winding hottest spot temperature rise determination” – clause 9.8.3.1, 9.8.3.2 and 9.8.3.3

→ Bertrand presented another, alternative method based on his experience
The determination of winding exponent based on winding gradient, defined as the difference between the average temperature of a winding and the average temperature of the fluid.

Bertrand presented the determination of a parameter A – which is closely related to the winding gradient and can be used to determinate errors in measurements (e.g between phases, duplicate units)

Further Bertrand plans to join the meeting in Vancouver, BC and present more details.

- b) Juan started the discussion about the title of the document:
The current title of C57.119 *Recommended Practice for Performing Temperature Rise Tests on Liquid-Immersed Power Transformers at Loads Beyond Nameplate Ratings* gives the impression that the procedure of the temperature rise test is the main content of the standard document.

The title of the document should be more precise, to mention that the purpose is to predict the overload capabilities and consequently the loss of life of the transformers if operated beyond nameplate rating.

7) Next steps

- a) The chair requested the group to continue to review (Document is posted at ILSC internet site)
- b) Collection of the feedback (via email before S24 meeting)
- c) On site meeting is scheduled in Vancouver, BC
Monday, March 11th from 9:30am-10:45am – Regency A (3rd Floor)
- d) In Vancouver: Present the collected feedback and follow up presentation from Bertrant Poulin
- e) Discussion about the feedback / recommendation
- f) Check if further discussions are needed and timeline about next steps (e.g. voting)

8) Adjournment of meeting

- Meeting was adjourned at 12:00 PM EST.

9) Next meeting will be in Vancouver S24

→ Invitation will follow

Respectfully submitted,

Ewald Schweiger
Study Group Chair

List of attendees for this virtual meeting:

Name	Last name	Given name	Affiliation	Status
Castellanos Juan G.	Castellanos	Juan G.	Prolec	M
Kennedy Gael R	Kennedy	Gael R	GR Kennedy & Associates LLC	M
Poulin Bertrand	Poulin	Bertrand	Hitachi Energy	M
Schrammel Alfons	Schrammel	Alfons	Siemens Energy	M
Schweiger Ewald	Schweiger	Ewald	Siemens Energy	M

H.4.6 Task Force – Test Degradation of Cellulose in Liquid Type Transformers – Lance Lewand Chair

Chair: Lance Lewand

Vice Chair/Acting Secretary: Stuart Chambers

Unapproved Meeting Minutes **IEEE TF – Tests for Degradation of Cellulose in Liquid Filled Transformers**

Monday, March 11, 2024

13:45 - 17:00

Vancouver, British Columbia, Canada

Chairman: Lance Lewand
Vice Chair: Stuart Chambers
Secretary: Currently vacant

The meeting was called to order at 13:45 by the Chair.

As this was a new task force, all attendees were eligible for membership.
There were 71 attendees during the meeting.

1. Attendance list:

1	Mario	Alonso
2	Gilles	Bargone
3	Barry	Beaster
4	Kevin	Biggie
5	Piotr	Blaszczyk
6	Sanket	Bolar
7	Jeremiah	Bradshaw
8	Samuel	Brodeur
9	Griffin	Burk
10	Ed	Casserly
11	Juan	Castellanos
12	Stuart	Chambers
13	Luiz	Cheim
14	Anthony	Coker
15	Liam	Conway
16	Mike	Craven
17	Lee	Doyle
18	Zack	Draper
19	Florin	Faur
20	Todd	Felton
21	JD	Fraser
22	Yas	Fu
23	Luis	Gonzalez
24	Brad	Greaves
25	Attila	Gyore
26	Florian	Hermann
27	Andy	Holden
28	Derek	Hollrah
29	Christopher	Johnson
30	Quamar	Jutt
31	Stacey	Kessler
32	Don	Lamontagne
33	Lance	Lewand
34	Jinming	Li
35	Cesar	Lizcano

40	Gabriel	Mamede
41	Toni	Mellin
42	Yegor	Melo
43	Filip	Mikulecky
44	Emilio	Morales-Cruz
45	Mirna	Olic
46	Eduardo	Orozco
47	Joel	Pacas
48	Munil	Parel
49	Pedro	Pedro
50	Goran	Plisic
51	Thomas	Prevost
52	John	Pruente
53	Tim	Raymond
54	Perry	Reddek
55	Jonathan	Reimer
56	Tony	Reiss
57	Juan	Reyes
58	Michael	Richardson
59	Mickel	Saad
60	Garret	Sarkinen
61	Sam	Sharpless
62	Mounano	Silo
63	Harmanpreet	Singh
64	Steven	Small
65	H. Allen	Steele
66	Marko	Teofanovic
67	Mark	Tostrud
68	John	Vandermaar
69	Matthew	Webb
70	Shuzhen	Xu
71	Waldemar	Ziomeh

2. Welcome and introductions of the chair and vice chair were made. A call for a secretary was made, but no volunteers came forward at this time.
3. The guidelines of IEEE meetings were presented to the group
4. The chair presented the patent disclosure slide and made a call for patent disclosure
 - i. Don Lamontagne from Arizona Public Service for the estimation of DP from carbon oxide levels
5. Chair presented the copyright policy slides
 - No copyright issues were presented
6. The proposed topic of the TF was presented by the chair to the group
“Guide for the Use and Interpretation of Tests used to Assess the Degradation of Cellulosic Materials”
7. The proposed purpose of the document was presented to the group by the chair
“To provide users with a reference document concerning paper aging processes in a transformer, what tests to use, as well as when and how to interpret those results” and “provide aid for determining the life expectancy of a transformer with the long-range goal of fleet asset management.”
8. The chair reiterated that the document would be a guide, was not intended to include aramid solid insulation (but could if the group decided it should be), and will be a consolidation.

9. The chair provided a presentation of the proposed outline of the 15 possible sections of the document
 - i. Introduction
 - ii. Discussion of cellulose materials inside a transformer
 - iii. Discussion of aging mechanisms and the stressors involved
 - iv. How the paper is mechanically changed and what byproducts are produced due to the aging process
 - v. Tests to determine the condition of the cellulosic insulation
 - vi. Analysis in mineral oil and non-mineral oil insulating liquids
 - vii. How the oil quality affects the tests
 - viii. Transformer preservation systems
 - ix. Partitioning of oil soluble aging markers
 - x. Interpretation of Results
 - xi. Impact of oil processing
 - xii. Calculations
 - xiii. Minimizing Cellulosic Insulation Degradation in Transformers
 - xiv. Bibliography
 - xv. Annexes
10. Discussion
 - a) Jinesh Malde (Midel and Mivolt Fluids) asked if particle count could be included in the document. The chair said it could be and it was noted.
 - b) Barry Beaster (HJ Family of Companies) asked if PD is affected by paper degradation and should be added. The chair said PD is not significantly impacted or a measure for cellulose health.
 - c) Jinming Li (BC Hydro) asked if the vapor phase process affects the paper quality and if so, could it be discussed in the document. The chair said it could be and it was noted.
 - d) Tim Raymond (EPRI) started by making the comment that there is lot of information proposed as the scope. He continued by asking can guidance be given to testing results interpretation (i.e., furans) in the document. The chair said it could be and it was noted for further discussion at the next meeting.
 - e) Tom Prevost (Weidmann) mentioned a paper was made about 12 years ago that looked into if furans were reliable to provide health assessments of cellulose. At that time the answer was “no”. He continued to ask if there was enough technical info to create a guide and the scope at this point looked too big and would need to reduce to not include research. The chair said there was enough info in his opinion and that it would be discussed further on ways to reduce the scope.
 - f) Luis Cheim (Hitachi) commented that looking at more than furans for cellulose is good by in his opinion a daunting task. Perhaps many items could be appendixes instead of in the main body/scope of the text. The chair said it could be and it was noted for further discussion at the next meeting.
 - g) James Garner (GE) asked if can degrade further after being generated and if furans were dynamic in a transformer. The chair said yes to both items and furans could be discussed in the document if wanted. It was noted for further discussion at the next meeting.
 - h) Tim Raymond (EPRI) commented he though that the science was not at the stage to provide guidance. The chair and vice-chair provided feedback indicating there should be.
 - i) Quamar Jutt (Kruger) made the comment that there are no guides to give end-of-life of a transformer and could it be in the scope. The chair responded by saying the guide will not provide a solid “yes/no” to be considered end-of-life as there are too many variables for each system.
 - j) Sam Sharpless (Rimkus) asked if this topic was a crossover from C57.162. Tom Prevost commented that the two topics were different. The chair then commented that we do not want to reinvent writings that are already present, and the aim would be to be new with just referencing other documents.
 - k) Shuzhen Xu (FM Global) commented about the title not including bushings and asked if bushing could be included in the document. The chair said it could be and it was noted for further discussion at the next meeting.
 - l) Luis Cheim (Hitachi) mentioned it would be good to include a section on lab vs. on-site/field results in the document. This was noted for further discussion at the next meeting.
11. The chair mentioned again that that all attendees could be made members as this was the first meeting. However, the attendance sheets did not provide a space for members to indicated this. The vice-chair said he would reach out to every attendee that provided an email address in the summer to see if they would

want member status. Those that respond would have member status at the next meeting.

12. An informal vote was held to see from the discussion if there was enough interest in the topic and that another meeting in St Louis in the fall should be held to refine the scope. The vote was unanimous that there was interest and further discussion should happen at the next meeting.
13. Another mention of looking for a volunteer for the TF (and potential later working group) made and the group informed they could email the Chair or Vice Chair if interested in volunteering.
14. Next meeting at Fall 2024, St Louis, Missouri, USA
15. The meeting was adjourned at 14:58

Stuart Chambers, Vice Chair
(acting secretary)
Lance Lewand, Chair

H.5 Old Business

None.

H.6 New Business

Tim Raymond raised the potential need for a loading guide for transformers that utilize non-C57.91 systems that do not use mineral oil and cellulose insulation. Roger Wicks recommended to consider IEEE 1276 as a starting document. Rainer Frotscher suggested to also consider C57.154.

Tim Raymond made a motion to form a study group to consider transformer loading characteristics for insulation systems that are not covered by C57.91. Dave Wallach seconded the motion. There was no opposition to the motion. It passed by unanimous consensus.

The meeting adjourned at 9:15am PDT.

Attendance:
89 Members
123 Guests

Role	Last	First	Affiliation
Member	Adams	Kayland	Prolec Energy
Guest	Amin	Mihir	Eaton Corp.
Guest	Arash	Rezvan	Delta Star Inc.
Member	Arteaga	Javier	Hitachi Energy
Member	Avanoma	Onome	MJ Consulting
Member	Ayers	Donald E.	Ayers Transformer Consulting
Member	Ballard	Casey	Dupont
Member	Bargone	Gilles	FISO Technologies Inc.
Guest	Baser	Levent	Hitachi Energy
Member	Beaster	Barry	H-J Family of Companies

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Guest	Beaudoin	Jason	Weidmann
Guest	Bender	Jon	WE Gundy & Associates
Guest	Berube	Jean-Noel	Rugged Monitoring
Member	Biggie	Kevin	Weidmann
Member	Boettger	William	Boettger Transformer Consulting LLC
Guest	Bolar	Sanket	Oncor
Guest	Bouty	Georges	Delta Star
Guest	Bradshaw	Jeremiah	Bureau of Reclamation
Guest	Cai	Jim	JSHP Transformers
Guest	Carrizales	Juan Alfredo	Prolec GE
Member	Casallas	Camilo	Trench
Member	Casserly	Edward	Ergon
Member	Castellanos	Juan	Prolec Energy
Member	Chambers	Stuart	ERPI
Member	Cheim	Luiz	Hitachi Energy
Member	Chiang	Solomon	The Gund Company
Guest	Cho	Ennyoung	HICO-America
Member	Coker	Anthony	MIDEL/Shell
Guest	Colopy	Craig	retired from Eaton
Guest	Czernoracki	Marcos	Hitachi Energy
Guest	Davoudi	Pouneh	Delta Star Inc.
Guest	Debass	Sami	EPRI
	Delgado		
Guest	Zamora	Gabriel	Invenergy
Member	Digby	Scott	Duke Energy
Guest	Dillon	Nikolaus	Dominion Energy
Guest	Door	Jeffrey	H-J Family of Companies
Guest	Draper	Zachary	Delta-X Research
Guest	Duffy	Jesse	Nashville Electric Power
Member	Dulac	Hakim	Advanced Power Technologies
Member	Dutta Roy	Samragini	Siemens Energy
Guest	Elson	Eric	SDGE
Member	Ermakov	Evgenii	Hitachi Energy
Member	Espindola	Marco	Hitachi Energy
Guest	Fernandez	Miguel	Braintree Electric Light Dept.
Member	Ferreira	Marcos	Quanta Technology
Guest	Foldi	Joseph	F&A
Member	Forsyth	Bruce	Cargill
Guest	Foster	Patrick	Florida Power and Light
Guest	Frazier	Raymond	Ameren
Member	Frotscher	Rainer	Reinhausen
Guest	Fu	Yao	BC Hydro
Guest	Garcia	Miguel	Hitachi Energy

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Member	Garcia Wild	Eduardo	Siemens Energy
Member	Gardner	James	Prolec GE Waukesha
Member	Ghosh	Rob(Saurabh)	GE
Member	Giraldo	Orlando	H-J Family of Companies
Member	Gonzalez	Luis	Conduct
Guest	Gorzin	Alireza	Black & Veatch
Guest	Grandbois	Luke	IFD Technologies
Guest	Greaves	Brad	Weidmann
Member	Griesacker	William	William Griesacker & Associates
Guest	Guner	Ismail	Hydro Quebec
Member	Gyore	Attila	Midel & Mivolt Fluids
Guest	Hamoir	Didier	Transformer Protector Corp
Guest	Hampton	Kevin	Siemens Energy
Guest	Heinzig	Peter	Weidmann Group
Guest	Hermann	Fenian	Trench
Guest	Hernandez	Ronald	Doble Engineering
Member	Hernandez	Sergio	Howard Power Solutions
Guest	Hernandez-Mejia	Jean Carlos	Georgia Tech Neetrac
Member	Hoffman	Saramma	PPL Electric Utilities
Guest	Hollrah	Derek	Burns & McDonnell
Member	Hopkins	Traci	H2scan
Guest	Hopkinson	Philip	HVOLT, Inc.
Member	Hossain	Saif	Trench
Guest	Hrkac	Miljenko	Hitachi Energy
Member	Issack	Ramadan	American Electric Power
Guest	Jaroszewski	Marion	Delta Star
Guest	Jensen	Nick	Delta Star Inc.
Guest	Jeong	chanmin	HD Hyundai
Member	John	John	Virginia Transformer
Member	Johnson	Christopher	Oncor
Guest	Jutt	Quamar	Kruger Products
Member	Kazmierczak	Jerzy	Hitachi Energy
Member	Kennedy	Sheldon	Sheldon P. Kennedy Engineering, LLC.
Guest	Kim	Yeoundoo	MEPPI
Member	Kirchenmayer	Egon	Siemens Energy
Guest	Klempner	Dmitriy	SCE
Guest	Lamontagne	Donald	Arizona Public Service
Guest	Larison	Andrew	Hitachi Energy
Guest	Leal	Fernando	Prolec GE
Guest	Lee	Junho	HD Hyundai
Member	Lee	Moonhee	Hammond Power Solutions
Guest	Leigl	Angela	Eaton

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Guest	Lembacher	Stefan	Siemens Energy
Member	Levin	Aleksandr	Weidmann
Guest	Lewis	Samuel	Hitachi Energy
Member	Li	Weijun	Braintree Electric Light Dept.
Guest	Lizcano	Cesar	Shell USA Inc.
Guest	Loiselle	Luc	Tetra Tech
Guest	Lopes	Ricardo	Efacec
Member	Lucas	Tiffany	Prolec GE - Waukesha
Member	Mabrey	Stephanie	Weidmann
Vice			
Chair	Malde	Jinesh	MIDEL/Shell
Guest	Mamede	Gabriel	Siemens Energy
Guest	Machain	Jose Luis	Prolec GE
Member	Mani	Kumar	Duke Energy
Guest	Martinez	Alberto	WEG USA
Guest	Mayer	Robert	Siemens Energy
Guest	Mbouombouo	Mama	Hitachi Energy
Member	McBride	Brian	Cargill
Guest	Mellin	Toni	Vaisala
Guest	Mendez	Omar	Prolec Energy
Member	Mills	Francis	Power Engineers
Guest	Minkel	Justin	Eaton Corp.
Member	Montanha	Juliano	Siemens Energy
Member	Morales-Cruz	Emilio	Qualitrol Corp.
Guest	Mulkey	Daniel	Mulkey Engineering Inc.
Member	Murray	David	TVA
Guest	Naja	Ismael	Eaton Corp.
Guest	Narawane	Aniruddha	Eaton
Member	Newbill	Mark	Hitachi Energy
Guest	Nyanteh	Yaw	
Secretary	O'Malley	Anastasia	Consolidated Edison Co. of NY
Guest	Ortiz	Amlerb	Siemens Energy
Guest	Ortiz	Cuauhtemoc	Niagara Transformer
Guest	Panesar	Parminder	Virginia Transformer
Member	Parkinson	Dwight	Eaton Corp.
Guest	Patel	Monil	PG&E
Guest	Patel	Dipeshkumar	Eaton
Guest	Pepe	Harry	Doble Engineering
Guest	Plascencia	Miguel	PG&E
Guest	Pollaro	Dominic	NASS
Member	Posadas	Daniel	Prolec Energy
Member	Pointner	Klaus	Trench
Guest	Pollaro	Dominic	NASS

Annex H

Guest	Poulin	Bertrand	Hitachi Energy
Member	Prevost	Thomas	Weidmann
Member	Prince	Jarrold	ERMCO
Member	Radu	Ion	Hitachi Energy
Member	Raymond	Timothy	EPRI
Member	Reed	Scott	MVA Diagnostics
Guest	Reepe	Robert	Georgia Power
Guest	Reimer	Jonathan	FortisBC
Guest	Reyes Perez	Juan	Hitachi Energy
Member	Richardson	Michael	Ameren
Guest	Reiss	Tony	Custom Materials Inc.
Guest	Rocque	Timothy	Prolec Energy
Guest	Ronchi	Rodrigo	WEG Transformers USA
Member	Saad	Mickel	Hitachi Energy
Member	Sahin	Hakan	Virginia Transformer
Member	Sankarakurup	Dinesh	Duke Energy
Member	Sarkar	Amitabh	Virginia Transformer
Member	Sbravati	Alan	Hitachi Energy
Guest	Schrammel	Alfons	Siemens Energy
Member	Schweiger	Ewald	Siemens Energy
Guest	Sekhon	Harmanpreet Singh	PTI Transformers
Member	Sen	Cihangir	Duke Energy
Guest	Shalabi	Jaber	Vantran
Member	Sharp	Michael	Trench
Chair	Sharpless	Samuel	Rimkus Consulting Group
Member	Shertukde	Hemchandra	Hartford University
Guest	Shull	Stephen	BBC Electric Services
Guest	Simons	Andre	JFE Shoji Power
Member	Sinclair	Jonathan	Black & Veatch
Guest	Sohn	YongTae	Hyosung
Member	Som	Sanjib	Pennsylvania Transformer
Guest	Soto	Mauricio	Hitachi Energy
Guest	Stacy	Fabian	Hitachi Energy
Member	Staley	Brad	Leeward Renewable Energy
Guest	Stechschulte	Kyle	American Electric Power
Guest	Steele	Hampton (Allen)	TVA
Guest	Steineman	Andrew	Delta Star Inc.
Guest	Sweetser	Charles	Omicron Energy
Guest	Sze	Matthew	Omicron Energy
Guest	Tade	Sachin	PTI Transformers
Guest	Tan	Jonathan	Northern Transformer
Member	Tanaka	Troy	Burns & McDonnell

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Guest	Taylor	Marc	JFE Shoji Power
Member	Tendulkar	Vijay	Eaton
Guest	Teofanovic	Marko	Ontario Power Generation
Guest	Thiede	Andreas	High Volt
Guest	Thomas	Scott	Hitachi Energy
Guest	Tillery	Tim	Howard Industries
Guest	Tirado	Fernando	Prolec GE
Member	Tostrud	Mark	Dynamic Ratings
Member	Traut	Alan	Howard Industries
Guest	Vaagensmith	Bjorn	Idaho National Laboratory
Guest	Van Dreef	Cole	American Transmission Co. LLC
Guest	Vanderwalt	Alwyn	Electrical Consultants, Inc.
Member	Varnell	Jason	Doble Engineering
Member	Verdolin	Rogério	Verdolin Solutions Inc.
Member	Vir	Dharam	Prolec Energy
	Von		
Guest	Gemmingen	Richard	Dominion Energy
Member	Vyas	Pragnesh	Dunbelt-Solomon
Guest	Wagner	John	American Electric Power
Guest	Waldrop	Mike	MLGW
Member	Wallach	David	Duke Energy
Member	Wang	Evanne	Dupont
Guest	Washburn	Alan	Burns & McDonnell
Guest	Webb	Bruce	Knoxville Utilities Board
Guest	Weisensee	Matt	Pacific Corp.
Member	Weiss	Zachery	WEG Transfomers USA
Guest	Weyandt	Paul	Schneider Electric
Guest	Wicks	Roger	Dupont
Guest	Wind	Rene	Siemens Energy
Guest	Wong	Terry	Trench
Guest	Wright	Jeffrey	Duquesne Light Co.
Guest	Xu	Shuzhen	PM Global
Guest	Yang	Fei	Hitachi Energy
Guest	Yuan	Guang	Hitachi Energy
Member	Yun	Joshua	Virginia Transformer

28 Guests requested membership:

Guest	Arash	Rezvan	Delta Star Inc.
Guest	Debass	Sami	EPRI

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Guest	Delgado Zamora	Gabriel	Invenergy
Guest	Door	Jeffrey	H-J Family of Companies
Guest	Gorzin	Alireza	Black & Veatch
Guest	Hopkinson	Philip	HVOLT, Inc.
Guest	Machain	Jose Luis	Prolec GE
Guest	Mbouombouo	Mama	Hitachi Energy
Guest	Naja	Ismael	Eaton Corp.
Guest	Narawane	Aniruddha	Eaton
Guest	Panesar	Parminder	Virginia Transformer
Guest	Patel	Dipeshkumar	Eaton
Guest	Plascencia	Miguel	PG&E
Guest	Pollaro	Dominic	NASS
Guest	Ronchi	Rodrigo	WEG Transformers USA
Guest	Shalabi	Jaber	Vantran
Guest	Sohn	YongTae	Hyosung
Guest	Soto	Mauricio	Hitachi Energy
Guest	Stacy	Fabian	Hitachi Energy
Guest	Stechschulte	Kyle	American Electric Power
Guest	Sze	Matthew	Omicron Energy
Guest	Tade	Sachin	PTI Transformers
Guest	Thomas	Scott	Hitachi Energy
Guest	Vanderwalt Von	Alwyn	Electrical Consultants, Inc.
Guest	Gemmingen	Richard	Dominion Energy
Guest	Waldrop	Mike	MLGW
Guest	Weisensee	Matt	Pacific Corp.
Guest	Yuan	Guang	Hitachi Energy

Respectfully submitted,

Anastasia O'Malley
Secretary, Insulation Life Subcommittee

Annex J Performance Characteristics Subcommittee (PCS)

March 13th, 2024, Hyatt Regency, Vancouver, BC, CA

UNAPPROVED MINUTES

Chair: Rogerio Verdolin

Vice Chair: Sanjib Som

Secretary: Kris Zibert

J.1 Introduction / Attendance

Quorum was achieved with 85 members present (75% in attendance). In addition, 110 guests were present at the meeting. The total attendance at the meeting was 195. 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 St. Louis, Missouri, October 27-31, 2024.

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.

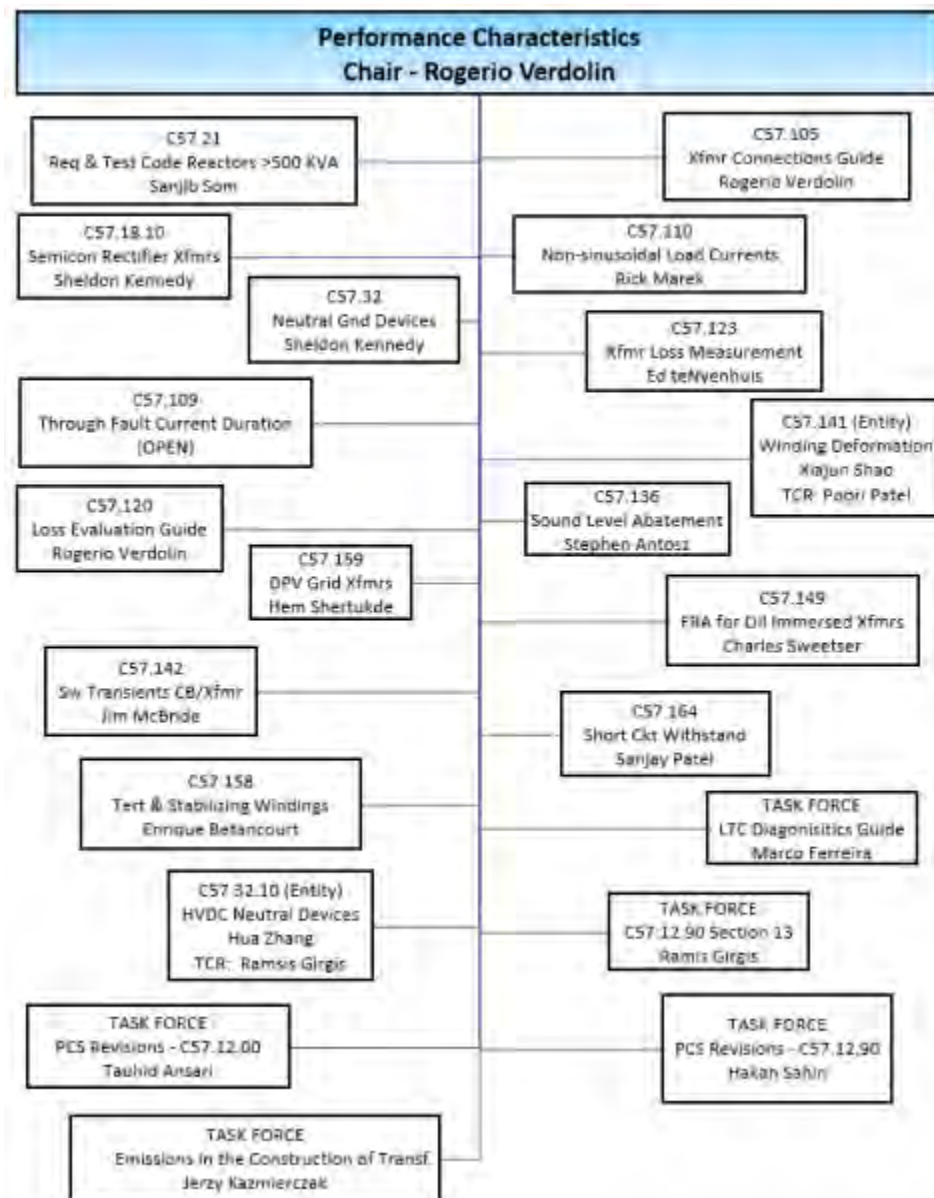
The Chair gave a reminder regarding affiliation data as a requirement and to continue updating attendance manually.

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
- TF for Emissions in the Construction of Transformers – 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 (Preballot)
 - C57.105-2019/Cor 1 (Submitted to RevCom)
 - C57.149 FRA Guide (Comment Resolution)
- 2025 PAR's
 - C57.136 Audible Sound Guide (Recirc Ballot Complete)
 - 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 (New WG)
 - C57.158 Application of Tertiary and Stabilizing Wdgs Guide (New WG)
- 2028 PAR's
 - C57.159 DPV Transformers Guide (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)
- C57.105-2023 – Transf. Connections in Three-Phase Distribution Systems (2033)
- C57.136-2023 – Sound Level Abatement Guide (2033)

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 Malia Zaman (m.zaman@ieee.org) your WG roster by March 28, 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:

▪ Steve Schappell	▪ Dr Alexander Winter

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 Fall 2023 meeting and have attended 3 of the past 5 meetings:

▪ Kayland Adams	▪ Alex Alahmed
▪ Camilo Casallas	▪ Nikolaus Dillon
▪ Evgenii Ermakov	▪ Marco Espindola
▪ Rob Ghosh	▪ Jerzy Kazmierczak
▪ Francis Mills	▪ Ewald Schweiger
▪ Scott Thomas	▪ Drew Welton

Attendance / Membership – Quorum determination

- Current breakdown of the Subcommittee:
 - 113 Members
 - 57 are needed for a quorum
- Quorum was established with 85 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 H. Flores and seconded by A. Sarkar. The motion passed by unanimous consent.

J.4 Approval of Last Meeting Minutes

The Chair presented the minutes of meeting held in October 2023 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 H. Flores and seconded by A. Sarkar. 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).

• TF CO2 Emissions in the Construction of Transformers	J. Kazmierczak
• TF Audible Sound Rev to Test Code	R. Girgis
• 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) TF CO2 Emissions in the Construction of Transformers	J. Kazmierczak
• This was the second meeting of this TF. • A call to order was made at 11:00 AM PT. • The patent & copyright policy was reviewed. • Introduction of officers was made. • Introduction of attendees was made with a total of 70 attendees present. • Fifty-three attendees requested & were granted membership at the last meeting. Therefore, 27 needed to be in attendance to achieve quorum. • Initially a quorum was not achieved. However, shortly after the beginning of the meeting, another tally was taken. • Twenty-seven members were present. Quorum was achieved.	

- Minutes of the last meeting were reviewed. John Sen, Duke Energy, made a motion to approve the minutes. Ed TeNyenhuis, Hitachi Energy, seconded.
- No objections. The minutes were unanimously approved.
- The agenda was reviewed. The agenda was also unanimously approved.
- After the Fall 2023 meeting in Kansas, there were approximately 5 online meetings with members held. During these meetings, we looked at what we currently have in relation to this topic in the industry, specifically what Cigre & IEC are currently doing. Many of these documents are still drafts. However, based on the reviews conducted we had a look again at the title of the proposed guide, and the group agreed that the title should be revised.
- A proposal for the revision of the title to: *IEEE guide for the environmental performance and life cycle assessment of Shunt Reactors, Distribution and Power Transformers*
- Additionally, a presentation of two slides prepared by Ghazi Kablouti, Hitachi Energy (not in attendance), was presented by the Chair detailing the established Life Cycle Analysis methodology and explaining the rationale of the suggested title amendment.
- An amended proposed scope was also presented.
- There was considerable discussion regarding the topic, including adding Evaluation to the title, the inclusion of instrument transformers, the difference between Environmental impact and carbon footprint, what the group should focus on in terms of scope (definition of inclusions/exclusions), the necessity to define the calculation method, if the topic needs to be from the manufacturer or end-user perspective and if the amended title covered these points in the proper manner.
- Luc Dorpmanns, SMIT, pointed out that ISO 14004 covers environmental impacts and that we may want to also look at this in further defining scope.
- Ultimately, it was agreed that the title needed to be amended.
- Curtis Frazier, Ameren, motioned to amend it to “**IEEE Guide for the Evaluation of the environmental impact & life cycle assessment of Transformers & Shunt Reactors.**” Luiz Cheim, Hitachi, seconded the motion.
- A vote was taken on the amended title with 0 no’s, 17 yes’s, and 5 abstentions. The amended title was approved.
- Ed TeNyenhuis, Hitachi, made a motion to include the scope as is. John Sen, Duke Energy, seconded the motion.
- There was discussion on whether to replace “covers” with “includes”, but ultimately it was decided to leave “covers” in the scope.
- Curtis Frazier, Ameren, moved to vote on the scope. John Sen, Duke Energy, seconded the motion.
- The scope: “**This guide covers the methodology of calculation and reporting of the environmental impact and carbon footprint of transformers and shunt reactors over their life cycle**” was unanimously approved.
- Ed TeNyenhuis, Hitachi, made a motion to adjourn. John Sen, Duke Energy, seconded.
- The meeting was adjourned at 12:15 PM PT.
- The next meeting will take place in St. Louis, Missouri, USA, during Fall IEEE Transformer Committee Meeting scheduled for October 27-31, 2024.

- J. Kazmierczak made a motion to create a PAR with the following title and scope:
 - **Title:** *IEEE Guide for the Evaluation of the environmental impact & life cycle assessment of Transformers & Shunt Reactors*
 - **The scope:** *This guide covers the methodology of calculation and reporting of the environmental impact and carbon footprint of transformers and shunt reactors over their life cycle.*
- Motion passed by unanimous consent.

2) TF Audible Sound Code Revision

R. Girgis

- The first item presented is data on impact of noise of Preventive Autotransformers (PAs) on sound level of the main transformer. The data demonstrated that noisy PAs increase sound level of the main transformer and can cause the transformer to exceed the guaranteed sound level.
- The Chairman then presented the following items:
 1. Methodology of determining the Sound pressure level of PAs in oil from sound level measurements of the main transformer at non-bridging and bridging tap positions.
 2. Data on 2 transformers that showed that the sound level of the PAs in oil was 4-6 dB lower than the sound level measured in air.
 - The discussion that followed showed that this difference appears to be dependent on the way the PA is installed in the main tank.
 - The Chairman requested attendees to submit data in this area to try to establish the value(s) at difference.
 3. Methodology of specifying the sound level of the PA in air such that the PA noise would have a minimal impact on the sound level of the main transformer at bridging tap positions.
 4. Information on measuring Sound level of PAs in air.
- The Chairman suggested that above information be added to the IEEE Noise Guide. Since the next revision of the Guide would be slated for several years yet, it was suggested to publish an IEEE paper that includes such information.

3) TF Continuous Revisions to C57.12.00

T. Ansari

- Meeting Date/Time: March 11, 2024, 3:15 PM
- Acting Chair: Enrique Betancourt (Prolec GE). Secretary: Mats Bernesjo (Hitachi Energy)
- After scope and purpose of the Group, the Chair presented IEEE Copyright and Patent statements, with no issues raised by Members present.
- 76 total attendees, consisting of 41 (out of 57) Members and 35 Guests, so a quorum was achieved; 9 Guests requested membership. Agenda and Minutes from previous meeting were unanimously approved.

- Highlights
 - Old Business
 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.*
 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, Dy1
 - Motion #3: Revise Table 6, Row 11 for Nameplates A, B, and C. Change "Phasor Diagram" to "Phasor Diagram and Phasor Group Designation"
 3. WG Item 115, Adding Sec 4.1.10 on DC current injection limits as % of Rated current/Andrew Larison.
 - Andrew Larison could not attend the meeting to answer questions about his proposal. As the Group could not understand clearly the material presented as explanation for the request, a motion was made to survey the subject among the PCS to collect

feedback on its relevance and pertinence; the motion passed with 23 in favor, 1 against, 3 abstained. TF Chair will also ask DT SC Chair regarding his position to backup the request.

4. WG Item 116, Update of KVA levels in table 11/Ryan Hogg (Bureau of Reclamation).
 - Ryan gave the TF Group a presentation on how Table 11, defining kVA limits for single-phase and three-phase transformer, has remained consistent throughout the revisions of C57.12.00, 15-500 KVA category I. It was suspected that it could be a typo in this table, but it appears not to be.
 - By proposal from Dan Sauer, this matter was tabled for next TF meeting, expecting more supporting information from Ryan Hogg, as well as investigation of position of the DT Transformers SC.

o New Business

1. Jason Varnell (Doble Engineering) proposed to add the duration of the heat-run test to the test report so gas generation rates could be estimated. After short discussion, he accepted to put together a proposal for the upcoming Fall meeting in St. Louis.
 2. With no further new business, the meeting was adjourned at 4:15 PM.
- E. Betancourt made a motion to forward the changes to Sec 5.7.2 to add the phasor group designation to nameplates to the C57.12.00 WG. It was seconded by H. Flores. There was an objection to unanimous consent of the motion. The motion passed by a show of hands.
 - E. Betancourt made a motion to forward three changes to aux loss language to C57.12.00 WG. It was seconded by A. Varghese. The motion passed by unanimous consent.

4) WG Standard for DPV Transformers C57.159

H. Shertukde

- First Working Group meeting held on Monday, 4:45 PM in Regency C/D.
- 60 attendees.
- Presentation given by Phil Hopkinson discussing NEMA draft document 80042: Product Guide for Wye-Connected transformers for use with Inverters.
- Carlos Guitan summarized the significant contributions NEMA 80042.
- Standard document layout and section titles were presented.
- Volunteers were solicited to begin work on specific sections of the Standard.
- Working Group will meet in Fall 2024.

5) TF on PCS Continuous Revisions to Test Code C57.12.90

H. Sahin

- 102 Total attendees
- 30/52 members were present—quorum was achieved
- Discussions continued on the Clause 5.1 – Determination of cold temperature, under Clause 5: Resistance measurements
- Group agreed (voted – passed) to hand this business over to TF Continuous Rev Clause 11 Temp Rise Tests C57.12.90, as the temperature recording of cold resistance for temperature rise test is very critical

- Group also agreed (voted – passed) to continue to review within our TF to possibly define type/class of transformers where the cold temperature determination can be adapted from the other TF when their work is completed, also define type/class where we can keep the current wording for
- Meeting 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 (33 of 50 Members were present – quorum was achieved. 60 guests, Total 93 Attendees)
- IEEE Patent Policy Slides (no patent claims)
- Approval of Agenda and Minutes from Fall 2023 Meeting
- C57.142 Ballot status and Comment Resolution – Jim McBride
 - o **Total Comments: 305** (Editorial Required – 107; Editorial Not Required – 109; Technical Required – 67; Technical Not Required – 22)
 - o **Addressed Comments: 285; Need Resolution for Remaining Comments: 20**
 - o Draft 12 has been completed and incorporates all the 284 addressed comments.
- CRG is reviewing all comments remaining. Plan is to meet the week of March 18, 2024, to review final comments. The group has members from both the Transformers and Switchgear Committees.
- A proposed change was presented to Section 7.5 of C57.142. This change was discussed and the change was introduced into Draft 12 for recirculation.
- Dharam Vir with GE Waukesha presented a summary of STLI Testing and Simulation Results with comparison to Standard LI Testing.
- 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.
- Phil Hopkinson made presentation on shielding using series capacitance as mitigation method.
- Meeting adjourned at 12:17 PM

7) WG Guide for Application of Tertiary & Stabilizing Windings C57.158

E. Betancourt

- Meeting Date/Time: March 12, 2024; 4:45 PM
- Co-Chair: Xose M. Lopez-Fernandez (Universidad de Vigo), Secretary: Kayland Adams (Prolec GE)
- After scope and purpose of the Group, the Chair presented IEEE Copyright and Patent statements with no issues raised by Members present.
- With attendance of 23 out of 37 Members in the WG and 49 Guests, a quorum was established. Agenda and Minutes from previous meeting were accepted with no comments.
- Highlights
 1. The Chair explained that the base MS Word file for development of our Draft Document was already obtained from IEEE SA, with support of Malia Zaman.
 2. The Chair presented the Group SOW of 4 TF teams with following titles:
 - TF 1: General editorial overview

- TF 2: Recommendations for Y-connected transformers without a delta connected winding
 - TF 3: Improvement and/or simplification of some concepts in the Guide
 - TF 4: New recommendations for TW or SW
 - The TF SOW and deliverables were accepted by the Group (Estimated 19 in favor and 2 Abstentions).
 - Two WG Members readily volunteered as Leaders for TF 1 (Emilio Morales/Qualitrol) and TF2 (Dr. Xose Lopez-Fernandez/Universidad de Vigo).
 - Recognizing that the subjects for TF 3 and TF 4 are more specialized, the WG Chair offered to produce a more detailed proposal to address WG Members before the next meeting
 - TF groups will be formed with WG Members by invitation, and Guests were also offered the possibility to participate.
3. The Chair presented a preliminary timetable to identify correction or improvement opportunities to the existing document.
 4. Suggestion was made to address IEEE and CIGRE for access to specific documents (IEEE articles, CIGRE GB, IEC) that will be explored next by the Chair.
- With no New Business, the meeting was adjourned at 5:30 PM.

8) WG IEEE Neutral Grounding Devices PC57.32

S. Kennedy

- Vice Chair: Tom Melle, Secretary: Ed teNyenhuis
- Met Tuesday, March 13 at 4:45 PM – 6:00 PM
- Achieved quorum
- Received reports from the 5 Task Forces
 - Clause 4 Grounding Reactors, Clause 5 Ground Fault Neutralizers, Clause 7 Neutral Grounding Resistors, and Clause 8 Combination Devices TF's have held meetings and plan to try to be complete by Fall
 - Clause 6 Grounding Transformers TF is complete
- Will begin to prepare document draft with TF inputs to review for Fall meeting

9) WG Entity HVDC Neutral Grounding Devices PC57.32.10

Z. Hua

- WG met in China and has held 5 working group meetings. The fifth working group meeting was held online on March 16, 2023. After the meeting, the working group made modifications to the content of the draft and formed the sixth version of the draft.
- In July 2023, internal email ballots were completed and the sixth draft was submitted to the TR PCS subcommittee. In October 2023, the working group sorted out your feedback on the opinions and suggestions of the committee members and provided a response. The draft content was also modified accordingly and the Draft 6.0-IEEE PC57.32.10-rev1025 version was formed.

- In November 2023, the working group initiated MEC and SA ballot invitation. By December 2023, the construction of the SA ballot pool was completed. So far, it has been over three months since the working group initiated the MEC review process. The working group is now waiting for the MEC review results in order to initiate the SA vote.
- MEC Review was sent back in December per Malia.

10) WG Entity Winding Deformation Guide PC57.141

X. Shao

- TCR: Poorvi Patel
- 6th WG meeting was held on January 8th and a follow up 7th WG meeting on March 7th.
- The document is almost complete – still a few comments from Pre-balloting to resolve.
- The document will then be sent in for editors' language revision/review
- After this the Document will be sent for approval to the Entity WG..
- Then it will be sent to SC in around 2-3 months for approval to send the document for balloting.

J.6 Unfinished (Old) Business

There was no unfinished business.

J.7 New Business

- J. Watson brought up for discussion a possible need to create a task force to determine if a WG should be formed to develop a document on transformer modeling data for use by system power flow models. J. Watson made a motion to create a task force to study this topic to determine what, if any, action should be taken by PCS. Seconded by M. Schiessl. Passed by show of hand.
- W. Ziomek presented on Renewable Energy Connected Transformers (RCTs).

J.8 Adjournment

- The meeting was adjourned at 4:28PM.

J.9 Minutes of Meetings of Working Group (WG) and Task Force (TF) Reports (all unapproved)

J.9.1 TF CO2 Emissions in the Construction of Transformers

Meeting Date/Time: Monday, March 11, 2024, 11:00 AM to 12:15 PM PT

Meeting Location: Vancouver, British Columbia, Canada

Chairman: J. Kazmierczak (Hitachi Energy)

Vice Chair: Ismail Guner (Hydro Quebec)

Secretary: Elise Arnold (SGB SMIT)

- This was the second meeting of this task force.
- A call to order was made at 11:00 AM PT.
- The patent & copyright policy was reviewed.
- Introduction of officers was made.
- Introduction of attendees was made, with a total seventy attendees present, plus three officers

- Fifty-three attendees requested & were granted membership at the last meeting. Therefore, twenty-seven needed to be in attendance achieve quorum.
- Initially a quorum was not achieved. However, shortly after the beginning of the meeting another tally was taken.
- Twenty-seven members were present. Quorum was achieved.
- The minutes of the last meeting were reviewed. John Sen, Duke Energy, made a motion to approve the minutes. Ed TeNyenhuis, Hitachi Energy, seconded.
- No objections. The minutes were unanimously approved.
- The agenda was reviewed. The agenda was also unanimously approved.
- After the fall 2023 meeting in Kansas there were approximately five online meetings with members held. During these meetings we looked at what we currently have in relation to this topic in the industry, specifically what Cigre & IEC are currently doing. Many of these documents are still drafts. However, based on the reviews conducted we had a look again at the title of the proposed guide and the group agreed that the title should be revised.
- A proposal for revision of title to: ***IEEE guide for the environmental performance and life cycle assessment of Shunt Reactors, Distribution and Power Transformers***
- Additionally, a presentation of two slides prepared by Ghazi Kablouti, Hitachi Energy (not in attendance) was presented by the chair detailing the established Life Cycle Analysis methodology and explaining the rationale of the suggested title amendment and.
- An amended proposed scope was also presented.
- There was considerable discussion regarding the topic, including adding Evaluation to the title, the inclusion of instrument transformers, the difference between Environmental impact and carbon footprint, what the group should focus on in terms of scope (definition of inclusions/exclusions), the necessity to define the calculation method, if the topic needs to be from the manufacturer or end-user perspective and if the amended title covered these points in the proper manner.
- Luc Dorpmans, SMIT pointed out that ISO 14004 covers environmental impacts and that we may want to also look at this in further defining scope.
- Ultimately, it was agreed that the title needed to be amended.
- Curtis Frazier, Ameren motioned to amend it to “IEEE Guide for the Evaluation of the environmental impact & life cycle assessment of Transformers & Shunt Reactors”. Luiz Cheim, Hitachi: seconded the motion.
- A vote was taken on the amended title with zero no’s, seventeen yes’s and five abstentions. The amended title was approved.
- Ed TeNyenhuis, Hitachi made a motion to include the scope as is. John Sen, Duke Energy seconded the motion.
- There was discussion on whether to replace “covers” with “includes”, but ultimately it was decided to leave “covers” in the scope.

- Curtis Frazier, Ameren moved to vote on the scope. John Sen, Duke Energy seconded the motion.
- The scope: “This guide covers the methodology of calculation and reporting of the environmental impact and carbon footprint of transformers and shunt reactors over their life cycle.” was unanimously approved.
- Ed TeNyenhuis, Hitachi made a motion to adjourn.
- John Sen, Duke: Seconded
- The meeting was adjourned at 12:15 PM Pacific Time Zone.
- The next meeting will take place in St. Louis MO, USA during IEEE Transformer Committee Meeting scheduled for October 27-31, 2024.

Title: *IEEE Guide for the Evaluation of the environmental impact & life cycle assessment of Transformers & Shunt Reactors*

The scope: *This guide covers the methodology of calculation and reporting of the environmental impact and carbon footprint of transformers and shunt reactors over their life cycle.*

List of Meeting Attendees from Spring 2024 meeting (including affiliation & member status).

Daniel	Aleksandrowicz	Hitachi Energy	Member
Elise	Arnold	SGB SMIT	Officer -Secretary
Levent	Baser	Hitachi Energy	Guest
Mats	Bernesjo	Hitachi Energy	Member
Piotr	Blaszczyk	Specialty Transformer Components	Guest
William	Boettger	Boettger Transformer Consulting LLC	Member
Juan	Castellanos	Prolec GE	Guest
Luiz	Cheim	Hitachi Energy	Member
Craig	Colopy	Retired from Eaton	Guest
Liam	Conwax	IDF Technologies	Guest
Wiliam	Coughlan	Metglas	Guest
Sami	Debass	EPRI	Guest
Nikolaus	Dillon	Dominion Energy	Member
Luc	Dorpmanns	Royal Smit Transformers	Member
Janko	Dzodan	Koncar	Guest
Ken	Fedor	SGB-SMIT Group	Guest
Raymond	Frazier	Ameren	Member
Jose	Gamboa	H-J Family of Comp	Guest
Miguel	Garcia	Hitachi Energy	Member
Dragana	Gasic	Koncar DRST	Guest
Alexander	Gaun	Coil Innovation	Member
Orlando	Giraldo	HJ Family of Companies	Member
Ramsis	Girgis	Hitachi Energy	Member
Eduardo	Gomez Henning	Siemens Energy	Guest
Ismail	Guner	Hydro Quebec	Officer - Vice Chair
Ryan	Hogg	Bureau of Reclamation	Guest
Saif	Hossain	Trench Ltd.	Member
Miljenko	Hrkac	Hitachi Energy	Guest
Segiursz	Kapka	Hitachi Energy	Guest
Jerzy	Kazmierczak	Hitachi Energy	Officer - Chair

Egon	Kirchenmayer	Siemens Energy	Member
Krzysztof	Klasek	Delta Star	Member
Evan	Knapp	Eton	Guest
Matjia	Koprivnjak	Koncar DRST	Guest
Antol	Koshel	Delta Star Inc	Guest
Luka	Kovacic	Koncar Instrument Transformer	Guest
Samuel	Lewis	Hitachi Energy	Guest
Jose Luis	Machain	Prolec GE	Guest
Gabriel	Mamede	Siemens Energy	Guest
Kumar	Mani	Duke Energy	Guest
Mama	Mbouombouo	Hitachi Energy	Guest
Omar	Mendez	Prolec GE	Guest
Francis	Mills	Power Engineers	Guest
Masta	Munoz	Hitachi Energy Spain	Member
Goran	Palisic	Siemens Energy	Guest
Dwight	Parkinson	Eaton	Guest
George	Partyka	PTI Transformers	Guest
Pedro	Pedro	Efacec	Guest
Pedro	Puente	Prolec GE	Guest
Kowalski	Rafal	Hitachi Energy	Member
Sebastian	Renkopf	Reinhausen Manufacturing	Guest
Michael	Richardson	Ameren	Member
Rodrigo	Ronchi	WEG Transformers	Member
Dinesh	Sankarakurup	Duke Energy	Member
Markus	Schiessl	SGB	Member
John	Sen	Duke Energy	Member
Michael	Sharp	Trench LTD.	Member
Andre	Simons	JFE Snoji Canda	Guest
Muhammad Abdullah Sohail		Trench Limited	Guest
Michael	Swiatkowski	Hitachi Energy	Member
Jonathan	Tan	Northern Transformer	Guest
Marc	Taylor	JFE Snoji Canda	Guest
Ed	TeNyenhuis	Hitachi Energy	Member
Scott	Thomas	Hitachi Energy	Guest
Ryan	Thompson	Burns & McDonnell	Guest
Robert	Vary	Reinhausen Manufacturing	Guest
Rogério	Verdolin	Verdolin Solution	Member
Richard	Von Gemmingen	Dominion Energy	Guest
Paul	Weyandt	Schneider Electric	Guest
Stefan	Wirth	Coil Innovation	Guest
Terry	Wong	Trench ltd.	Member
Igor	Ziger	Koncar Instrument Transformer	Guest
Waldemar	Ziomek	PTI	Guest

J.9.2 TF “Audible Sound Revision to Test Code”

Unapproved Minutes of Spring 2024 TF “Audible Sound Revision to Test Code” Meeting

The TF met at 1:45 PM, on Monday, March 11, 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 Fall 2023 TF meeting in Kansas City (Sanjib Som 1st, Eduardo Garcia 2nd).

The TF meeting was attended by 39 out of 51 members and a total meeting attendance of 92. A quorum was established. 21 attendees requested membership at this meeting (listed below) **.

The Secretary introduced the topic of PA noise by playing a recording of the noise of a transformer with a noisy PA, provided by Scott Digby (Duke Energy). The recording demonstrated the higher sound level of the transformer when the Tap changer was moved from a non-Bridging to a Bridging tap position. This was followed by a presentation on impact of noise of the PA on sound level of the main transformer when on a bridging tap position, using 3 different cases: one with a low noise PA, one with a noisy PA, and one with a very noisy PA. The cases demonstrated that noisy PAs increase the sound level of the main transformer significantly. Following this presentation, Markus Schiessl of SGB presented measured sound levels of a large number of PAs measured in air. A few of these had high sound levels and needed to be replaced.

The chairman then presented the following:

1. Methodology of determining the Sound pressure level of the PA in oil from sound level measurements of the main transformer at non-bridging and bridging tap positions.
2. Data on 2 transformers where the sound level of the PA was measured in air and compared with the determined Sound Level of the PA in oil. These measurements showed that the sound level of the PA in these 2 cases was 4 – 6 dB lower in oil than the sound level measured in air. The Chairman requested attendees to submit data in this area to try to establish possible values of this difference. Based on the discussion that followed, this difference appears to be dependent on the way the PA is installed in the main tank. Following the meeting, representatives of a number of transformer manufacturers expressed willingness to provide such data. This will require transformer manufacturers to measure the sound level of the main transformer at both a bridging tap position and at a nonbridging tap position, as well as measuring sound level of the PA in air. Data received on this item will be presented in the fall meeting of this TF.
3. Methodology of specifying the sound level of the PA in air such that the PA noise would have a minimal impact on the sound level of the main transformer at bridging tap positions.
4. Information on measuring Sound level of PAs in air.

The Chairman suggested that the above information can be added to the IEEE Noise Guide C57.136 to provide guidance to the transformer industry on this subject. Since the next revision of the Guide would not be slated for a number of years yet, Steve Antosz suggested that, in the meantime, an IEEE paper that includes such information, could be published.

With no new additional business raised, the meeting was adjourned upon unanimous approval.

Respectfully submitted,

Mats Bernesjo, TF Secretary

Spring 2024 TF Meeting Attendance and Affiliation is as follows:

Kayland	Adams	Prolec GE Waukesha	Member
Thomas	Aikens	Delta Star	Guest
Daniel	Aleksanderowicz	Hitachi Energy	RM
Stephen	Antosz	Stephen Antosz & Associates, Inc	Member
Rezvan	Arash	Delta Star Inc.	Guest
Edmundo	Arevalo	BPA	RM
Elise	Arnold	SGB	Member
Javier	Arteaga	Hitachi Energy	RM
Onome	Avanoma	MJ Consulting	Member
Donald	Ayers	Ayers Transformer Consultants	Guest
Levent	Baser	Hitachi Energy	Guest
Paulo	Bautista	Enmax	Guest
Mats	Bernesjo	Hitachi Energy	Secretary
Enrique	Betancourt	Prolec GE	Member
William	Boettger	Boettger Transformer Consulting LLC	Member
Georges	Bouty	Delta Star Inc.	Guest
Darren	Brown	Howard Industries	Member
Alfredo	Carrizales	Prolec GE	Member
Camilo	Casallas	Trench ltd	Guest
Eunyoung	Cho	HICO America	Guest
William	Coughlan	Metglas	Guest
Juan Carlos	Cruz Valdes	Prolec GE	Member
Scott	Digby	Duke Energy	Member
Hugo	Flores	Hitachi Energy	Member
Joe	Foldi	F&A	Guest
Raymond	Frazier	Ameren	Guest
Richard	Frye	Eaton	Guest
Zach	Gagne	IFD Technologies	Guest
Eduardo	Garcia Wild	Siemens Energy	Member
Alexander	Gaun	Coil Innovation	Gust
Ramsis	Girgis	Hitachi Energy	Chair
Bill	Griesacker	W. Griesacker & Associates	Guest
Miljenko	Hrkac	Hitachi Energy	Guest
Nicholas	Jensen	Delta Star Inc.	Member
Chan Min	Jeong	HD Hyundai	RM
Jerzy	Kazmierczak	Hitachi Energy	Member
Sheldon	Kennedy	Sheldon P Kennedy Engineering PLLC	Guest
Dmitry	Klempner	Southern California Edison	Guest
Rafal	Kowalski	Hitachi Energy	Member
Mark	Lachman	Doble	Member
Junho	Lee	Hyundai Electric	Member
Samuel	Lewis	Hitachi Energy	Guest
Eric	Li	BC Hydro	Guest
Xose	Lopez-Fernandez	Universidade de Vigo	RM
Jose	Machain	Prolec GE	Member
Alberto	Martinez	WEG USA	RM
Mama	Mbouombouo	Hitachi Energy	RM
Brian	McCarrick	Virginia Transformer Corp.	RM
Francis	Mills	Power Engineers Inc	Guest

Juliano	Montanha	Siemens Energy	Guest
Marta	Munoz	Hitachi Energy	RM
David	Murray	TVA	Guest
Joe	Nims	Allen & Hoshall	Member
Anastasia	O'Malley	ConEdison Co NY	Guest
Cuauhtemoc	Ortiz	Niagara Transformer	Guest
George	Partyka	PTI Transformers	Guest
Sylvain	Plante	Hydro-Quebec	Guest
Klaus	Pointner	Trench Austria GmbH	Member
Bertrand	Poulin	Hitachi Energy	Guest
Ulf	Radbrandt	Hitachi Energy	Member
Tim	Rocque	Prolec GE Waukesha	Member
Marnie	Rousell	Entergy	Member
Hakan	Sahin	Virginia/Georgia Transformer	RM
Dinesh	Sankarakurup	Duke Energy	Member
Amitabh	Sarkar	Virginia Transformer Corp.	RM
Daniel	Sauer	EATON Corporation	Member
Markus	Schiessl	SGB	Member
Cihangir	Sen	Duke Energy	Member
Abdulmajid	Shaikh	Delta Star	RM
Michael	Sharp	Trench Ltd Canada	Member
Andre	Simons	JFE Shoji	Member
Christopher	Slattery	FirstEnergy Corp.	Member
Jimmy	Smith	Howard Industries	Guest
Yong Tae	Sohn	Hyosung HICO	RM
Sanjib	Som	Pennsylvania Transformer	Member
Andy	Steineman	Delta Star Inc.	Member
Michal	Swiatkowski	Hitachi Energy	RM
Sachin	Tade	PTI Transformers	Guest
Troy	Tanaka	Burns & McDonnell	Member
Marc	Taylor	JFE Shoji Power Canada Inc.	Member
Ryan	Thompson	Burns & McDonnell	Member
Cole	Van Dreel	American Transmission Co	Guest
Alwyn	Vanderwalt	Electrical Consultant	RM
Ajith	Varghese	SPX Transformer Solutions, Inc.	Member
Jason	Varnell	Doble Engineering Co.	RM
Mike (Hugh)	Waldrop	MLG-W	Guest
David	Wallach	Duke Energy	Member
Stefan	Wirth	Coil Innovation	Guest
Jeffrey	Wright	Duquesne Light	Member
Fei	Yang	Hitachi Energy	Guest
Kim	Yeounsoo	MEPPI	Guest
Kris	Zibert	Allgeier Martin & Associates	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*

*March 11, 2024
Vancouver, BC (Canada)*

UNAPPROVED MINUTES

The PCS Task Force on General Requirements for C57.12.00 met at 3:15 PM on Monday, March 11, 2024. Acting Chairman Enrique Betancourt presided over the meeting with Mats Bernesjo being the Acting Vice-chair / Formal 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 41 members (out of 57), 35 guests, for a total meeting attendance of 76 people, including 9 requests for membership at this meeting. A quorum was established with $41 / 57 = 72\%$ attendance.

The agenda and the unapproved minutes from the previous meeting (Fall meeting, Kansas City, 2023) was unanimously approved (1st Hugo Flores, 2nd Eduardo Garcia Wild).

The following 9 guests requested membership:

Nick Jensen (Delta Star), Tom Melle (Highvolt), Eduardo Orozco (GE Grid Solutions), Subramany Shankar (KEMA), Rogerio Verdolin (Verdolin Solutions Inc), Alireza Gorzin (Black & Veatch), Arash Rezuhan (Delta Star), Piotr Blaszyk (STC), and Mohammad Abdullah Sohau (Trench Limited).

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 113, Measurement of Auxiliary Loss

Submitted by Ajith Varghese:

"I see there is some disconnect between what different manufactures are doing for measuring control losses – based on how one interprets 'integral parts of transformers'".

"We can't have each component listed in IEEE, but I think there need to be some additional clarity needed. Some of the disconnects:

- Heaters
- When dual temp heaters, many are taking only one stage
- Heaters in Cubicles/bus duct (supplied with transformer) are not included
- Heaters in LTC cubicles
- Breathers

- Power for LTC Motor
- Power consumed by N2 generator
- Power consumed by Oil Filters.

Also – Need clarity of inrush/starting power needed for cooling fans, etc.”

Present wording from C57.12.00 Sec 5.9.

For Class II transformers (see 5.10), control/auxiliary (cooling) losses shall be measured and recorded. All stages of cooling, pumps, heaters, and all associated control equipment shall be energized, provided these components are integral parts of the transformer.

A Taskforce meeting was held on Feb 20th, 2024, decided on following to replace the existing wording.

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.

The manufacturer to provide total power consumption of all devices on the control schematic drawing to evaluate the supply power requirements.

A short informative discussion was held on this topic with input from both Manufacturers, Utilities, and Consultants. A vote was held among the TF whether to approve the revised wording proposed (Ajith Varghese 1st, Dan Sauer 2nd). The majority of the members present voted in favor of approving the above wording, 1 vote opposed, 0 abstained. Hence, the motion to accept the changes to the writeup was approved.

WG Item 114, Modification of Sec 5.7.2

Steve Antosz proposed that we add a requirement that the phasor group designation (also known as: vector group or clock number notation) be the required IEEE nomenclature for identifying the angular displacement between windings for three-phase power and distribution transformers. The reason I am suggesting this is because C57.12.70 Standard Terminal Markings and Connections was revised and includes this slightly new requirement in Clause 7. See attached C57.12.70-2020 Clause 7 and Annex A. 12.00 already refers to 12.70 in subclauses 5.7.2 and 5.7.3; and most Product Standards refer to 12.70 also. So, I am proposing that we enhance 12.00 to highlight the requirement that the phasor group designation be shown on the transformer’s nameplate. The nomenclature is detailed in 12.70. This proposal also harmonizes with IEC, for whatever that’s worth.

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, Dy1

Motion # 3:

Revise Table 6, Row 11 for Nameplates A, B, and C. Change; “Phasor Diagram” to “Phasor Diagram and Phasor Group Designation”

Vote on these motions was motioned by Steve Antosz (1st), Hugo Flores (2nd)

A good discussion across the TF members & guests was held on this topic until Dan Sauer called the question 2nd by Steve Snyder and to vote. A vote to end the discussion was held, none opposed, hence, calling the question was approved.

Vote on Motion 1: None opposed, none abstain, motion passed.

Vote on Motion 2 Hugo Flores 1st, Dan Sauer 2nd: None opposed, none abstain, motion passed.

Vote on Motion 3: Steve Snyder 1st, Hugo Flores 2nd). None opposed, none abstain, motion passed.

WG Item 115, Adding Sec 4.1.10 on DC current injection limits

Andrew Larison was unfortunately not able to attend. However, the WG item was presented to the TF and discussed. Dan Sauer (1st) and Jason Varnell (2nd) proposed to motion a survey to PCS with the content provided to get a broader consensus on the topic. There are lots of questions on this topic and its accuracy, and really needs to be reviewed. There appears not to be a theoretical basis for the 0.5 % limit.

A vote was held, 23 members voted to approve the motion to survey to PCS, 1 against, and 3 abstained. Motion to survey passed. Before setting the survey in motion, the TF Leaders intend to approach Distribution Transformers SC Leadership to understand their position about the proposal.

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 be a typo in this table, but it appears not to be.

Dan Sauer 1st and Hugo Flores (2nd) proposed to table this matter. It was unanimously approved to discontinue the discussion, to be continued in future TF meetings.

New business

Ryan Hogg had new business items: adding zero sequence impedance to the nameplate and adding nameplate A, B, and C. He had prior to the meeting discussed with our Chair, Tauhid Ansari, deciding to withdraw the new business he proposed.

Other new Business

Jason Varnell, proposed to add the duration of the heat run test to the test report. He will put together a proposal for the Chairman and present at the upcoming Fall meeting in Saint Louis.

With a quiet floor, the Chairman asked for the meeting to be adjourned (1st Hugo Flores, 2nd by Dan Sauer)

Meeting was adjourned at 4:15 PM.

Respectfully submitted,
Enrique Betancourt
Vice-Chair

Mats Bernesjo
Secretary

Attendance Spring 2024 Meeting – PCS TF to Revision C57.12.00

Kayland	Adams	Prolec GE Waukesha	Member
Nabi	Almeida	Prolec GE	Guest
Stephen	Antosz	Stephen Antosz & Associates, Inc.	Member
Elise	Arnold	Starkstrom Geraetebau GMBH	Member
Stephen	Ashcraft	Hitachi Energy	Guest
Donald	Ayers	Ayers Transformer Consultants	Member
Mats	Bernesjo	Hitachi Energy	Member
Enrique	Betancourt	Prolec GE	Member
Piotr	Blaszcyk	STC	RM
William	Boettger	Boettger Transformer Consulting LLC	Member
Darren	Brown	Howard Industries	Member
Eunyoung	Cho	HICO-America	Guest
Michael	Craven	Qualus Power Services	Guest
Eric	Davis	Consultant	Guest
Nikolaus	Dillon	Dominion Energy	Member
Luc	Dorpmanns	Royal SMIT Transformers	Guest
Samragani	Dutta Roy	Siemens Energy	Member
Eric	Elson	SDGE	Guest
Hugo	Flores	Hitachi Energy	Member
Joe	Foldi	Foldi & Associates, LLC	Guest
Bruce	Forsyth	Bruce Forsyth and Associates LLC	Guest
Raymond	Frazier	Ameren	Member
Eduardo	Garcia Wild	Siemens Energy	Member
Dragana	Gasic	Koncar D&ST	Guest
Ramsis	Girgis	Hitachi Energy	Member
Alireza	Gorzin	Black & Veatch	RM
Bill	Griesacker	Duquesne Light	Member
Detlev	Gross	Power Diagnostic Consult	Guest
Shertukde	Hemchandra	University of Hartford	Member
Ryan	Hogg	USBR	Member
Philip	Hopkinson	HVOLT Inc	Member
Nick	Jensen	Delta Star Inc.	RM
Christopher	Johnson	Oncor	Member
Jerzy	Kazmierczak	Hitachi Energy	Member
Sheldon	Kennedy	Sheldon Kennedy Engineering, PLL	Member
Mark	Lachman	Doble	Member
Daniel	Martinez	JFE Shoji Power Canada	Guest
Tom	Melle	Highvolt	RM
Omar	Mendez	Prolec GE	Guest

Francis J	Mills	Power Engineers	Member
Marta	Munoz	Hitachi Energy	Guest
David	Murray	TVA	Member
Kristopher	Neild	Megger	Member
Joe	Nims	Allen & Hoshall	Member
Edward	Orozco	GE Grid Solutions	RM
George	Partyka	PTI Transformers	Guest
Monil	Patel	PG&E	Guest
Bertrand	Poulin	Hitachi Energy	Member
Jarrold	Prince	ERMCO	Member
Ulf	Radbrandt	Hitachi Energy	Guest
Juan	Reyes Perez	Hitachi Energy	Guest
Arash	Rezuan	Delta Star Inc.	RM
Marnie	Roussell	Entergy	Member
Hakan	Sahin	Virginia / Georgia Transformers	Member
Sherif	Salem	Eversource Energy	Guest
Fernando	Salinas	Power Partners / ERMCO	Guest
Farwaha	Sanjeev	Snohomish county PUD	Guest
Dinesh	Sankarakurup	Duke Energy	Guest
Amitabh	Sarkar	Virginia Transformers	Member
Daniel	Sauer	Eaton Corporation	Member
Markus	Schiessl	SGB	Member
Harmanpreet	Sekhon	PTI Transformers	Guest
Cihangir	Sen	Duke Energy	Member
Subramany	Shankar	KEMA	RM
Christopher	Slattery	FirstEnergy Corp.	Member
Steven	Snyder	Hitachi Energy	Member
Mohammad Abdullah		Sohau	Trench Limited RM
Yong Tae	Sohn	Hyosung HICO	Member
Kyle	Stachshulte	AEP	Guest
Ajith	Varghese	Prolec GE	Member
Jason	Varnell	Doble Engineering	Member
Rogerio	Verdolin	Verdolin Solutions Inc	RM
Dharam	Vir	Prolec GE Waukesha	Member
David	Wallach	Duke Energy	Member
Rene	Wind	Siemens Energy	Guest
Faye	Yang	Hitachi Energy	Guest

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

Vancouver, BC, Canada

4:45-6:00 PM, March 11, 2024

The Working Group met at the Hyatt Hotel – Regency C/D Conference Room. The meeting was called to order at 4:45 PM by Chair, Dr. Hemchandra Shertukde.

Chair made opening comments.

60 attendees. This is the first meeting of the Working Group.

Chair presented Working Group Policies stating all attendees at first meeting today requesting membership are granted membership.

Introductions -

Call For Patents: The Chair presented the information on Patent Disclosures and asked the group to report any relevant patent issues – None were communicated.

Copyright Notice: The Chair presented the IEEE_SA Copyright Policy. No discussion.

Approval of Agenda: The Spring 2024 agenda was approved unanimously without discussion.

Motion: Steve Oaks

Second: Kumar Mani

Old Business

Chair reviewed PAR Status - Approved

Chair reviewed Approved Scope and Purpose – No discussion.

New Business

Review NEMA document 80042, Product Guide for Wye-Connected transformers for use with Inverters – Phil Hopkinson

Carlos Guitan– presented significant contributions of NEMA 80042.

- A significant number of transformer failures have occurred due to the interaction between the inverter output with high harmonic content, and the transformer primary winding.
- This situation is not specific to the transformer or inverter manufacturers.
- High frequency harmonics, up to the 200th order, have been measured.
- Harmonics are not an issue as long as the input windings are not grounded.
- NEMA 80042 describes mitigation measures such as:
 - Suitable core grounding practices, based on the core construction (wound/stacked)
 - Alternatives for the use of a core ground shield, and how it would be required or not, depending on such core construction.
 - Harmonics are not an issue as long as the input windings are not grounded.
 - Importance of impedance requirements between multiple LV windings, for transformers connected to multiple inverters.

Standard document layout and section titles were reviewed. Standard IEEE-TC template to develop the standard for C.57.159 presented.

Proposed chapter titles were presented.

Discussion regarding chapter contents and Scope

Items such as Power Quality, Safety, and Relaying we discussed and were deemed beyond the scope of this Standard.

Volunteers were solicited to begin working specific sections.

Chapter 1
Introduction DPV Transformers - Joe Watson
Chapter 2
Voltage Flicker and Variation – Hemchandra Shertukde
Chapter 3
Harmonics and Waveform Distortion – Gaytan Carlos
Chapter 4
Frequency Variation - Gaytan Carlos
Chapter 5
Power Factor Variation – Hemchandra Shertukde
Chapter 6
Safety and Protection Related to Public - Paul Weyandt & Wolfgang Schmidt
Chapter 7
Islanding – Paul Weyandt & Wolfgang Schmidt
Chapter 8
Removed - Relay Protection ; Steve Shull
Chapter 9
DC Bias
Chapter 10
Thermo Cycling (Loading)
Chapter 11
Neutral Grounding – Phil Hopkinson
Chapter 12
Low Voltage Fault Ride-Through David Walker
Chapter 13
Power Storage – David Walker
Chapter 14
Voltage Transients and Insulation Coordination – Hemchandra Shertukde
Chapter 15
Magnetic Inrush Current – Hemchandra Shertukde
Chapter 16
Eddy Current and Stray Losses – Hemchandra Shertukde
Chapter 17
Design Considerations: Inside/Outside Windings -David Walker; Zak Weiss
Chapter 18
Special Tests Considerations – A Naderian; Hemchandra Shertukde : Class I or Class II
Chapter 19
Special Design Consideration - NEMA guidelines – Phil Hopkinson
Chapter 20
Battery Storage – David Walker

Many more members were requested to be contributors, who will send us their emails and interests when ready to do so.

Further Discussion:

Some inverter manufacturers require the neutral of the transformer to be grounded.

The inverter OR the transformer can be grounded, but not both.

Battery energy storage needs to be considered in this standard.

Testing should be considered (Class 1 or Class 2)

Adjourned at 6:05

The Working Group will meet again at the Fall 2024 meeting,

Chair: Dr. Hemchandra Shertukde

Vice Chair: Phil Hopkinson

Secretary: Rhea Montpool

Meeting Attendance:

Mihir	Amin	Eaton	Member
Stephen	Ashcraft	Hitachi Energy	Member
Donald	Ayers	Ayers Transform Consulting	Member
Jason	Beaudoin	Weidmann Electrical Tech	Member
Kevin	Biggie	Weidmann Electrical Tech	Guest
Gabriel	Delgado Zamora	Invenergy	Member
Huan	Dinh	Hitachi Energy	Member
Jeff	Door	The H-J Family of Companies	Member
Marco	Espindola	Hitachi Energy	Guest
Jose	Gamboa	H-J Family of Companies	Member
Miguel	Garcia	Hitachi Energy	Member
Carlos	Gaytan	Prolec GE	Member
Rafael	Grajeda	Eaton	Member
Bill	Griesacker	W. Griesacker & Assoc	Member
Phil	Hopkinson	Hvolt	Member
Sheldon	Kennedy	Sheldon P Kenndy Engineering	Member
Dave	Komm	HPS	Member
Andrew	Larison	Hitachi Energy	Member
Moonhee	Lee	HPS	Member
Angela	Leigl	Eaton	Member
Aleksandr	Levin	Weidmann Electrical Tech	Member
Ricardo	Lopes	Efacec Transformers	Guest
Xose	Lopez-Fernandez	Universidade De Vigo	Member
Kumar	Mani	Duke Energy	Member
Daniel	Martinez	JFE	Guest
Toni	Mellin	Vaisala	Guest
Rhea	Montpool	Schneider Electric	Member
Tyler	Morgan	Duke Energy	Member
Ali	Naderian	BBA	Member
Aniruddha	Narawane	Eaton	Member
Mark	Newbill	Hitachi Energy	Member
Stephen	Oakes	WEG	Member
Paul	Orr	NEMA	Guest
Dwight	Parkinson	Eaton	Member
George	Partyka	PTI Transformers	Member
Dipesh	Patel	Eaton	Member
Harry	Pepe	Phenix Technologies	Guest

Miguel	Plascencia	PGE	Guest
Jarrold	Prince	Ermco	Guest
Pedro	Pueute	Prolec GE	Guest
Alberto	Sandoval	Eaton	Member
Manish	Saraf	HPS	Member
Wolfgang	Schmitt	Schneider Electric	Member
Russ	Sewel	Quality Switch	Guest
Steven	Shull	BBC Electrical Services In	Member
Steven	Snyder	Hitachi Energy	Guest
Brad	Staley	Leeward Renewable Energy	Member
David	Stockton	Stockton Business Consulting	Member
Janosz	Szczechowski	MR GmbH	Member
Vijay	Tendulkar	Eaton	Member
Ed	teNyenhuis	Hitachi Energy	Member
Fernando	Tirado	Prolec GE	Guest
Retinaldo	Valentin	Duke Energy	Member
Rogério	Verdolin	Verdolin Solutions	Member
David	Walker	MGM Transformer Co	Guest
Joe	Watson	JD Watson & Assoc	Member
Zachery	Weiss	WEG	Member
Paul	Weyandt	Schneider Electric	Member
Joe	White	Power Engineers	Member
Guang	Yuan	Hitachi Energy	Member

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, March 12, 2024, at Hyatt Regency Vancouver; Vancouver, British Columbia, Canada.

1. Administrative

- a. IEEE Patent Policy and Call for Patents and IEEE SA Copyright Policy
 - i. No comments from group
- b. Review of Spring 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. 52 members were listed and 27 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 showing 31 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 Fall 2023 unapproved minutes
 - i. Chair asked if there was any opposition to unanimous approval of the minutes
 - 1. No opposition to unanimous approval – minutes approved
- f. Approval of Spring 2024 agenda
 - i. Chair asked if there was any opposition to unanimous approval of the agenda
 - 1. No opposition to unanimous approval – agenda approved
- 2. Old Business
 - a. Chair reviewed a proposed revision to Clause 5.1: Determination of cold temperature, under Clause 5: Resistance measurements and had discussions among the task force members.
 - i. MOTION made by D.Sauer, 2nd by S.Antosz – Leave Clause 5.1 as is and send topic to Insulation Life Subcommittee TF Continuous Rev Clause 11 Temp Rise Tests C57.12.90.
 - 1. During discussions, it was brought up that the temperature recording of cold resistance for temperature rise test is very critical
 - 2. No objections to unanimous approval – APPROVED
 - b. MOTION made by R.Frazier, 2nd by J. Varnell - Continue to review within our TF to possibly define type/class of transformers where the cold temperature determination can be adapted from the other TF when their work is completed, also define type/class where we can keep the current wording for.
 - i. Vote: 15 APPROVE, 8 REJECT, 5 ABSTAIN - APPROVED
- 3. New Business
 - a. 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 immersed in oil.
- 4. Membership changes
 - a. Officers will look at attendance and change TF membership status before next meeting.
- 5. Next meeting: October 29, 2024 at Fall 2024 Transformer Committee Meeting scheduled for October 27-31, 2024, St. Louis, Missouri, 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: 3/30/24

March 12, 2024, Meeting Attendance:

(RM3=Requested Membership 3 times, RM2=Requested Membership 2 times, RM1=Requested Membership 1st time)

Kayland	Adams	Prolec GE Waukesha	Member
Alex	Alahmed	Evergy	Guest-RM1
Tauhid	Ansari	Hitachi Energy	Guest-RM1

Stephen	Antosz	Stephen Antosz & Associates, Inc.	Member
Elise	Arnold	SGB	Member
Hugo	Avila	Hitachi Energy	Guest-RM1
Donald	Ayers	Ayers Transformer Consulting	Member
Gilles	Bargone	FISO Technologies Inc.	Guest-RM3
Chris	Baumgartner	We Energies	Member
Duvier	Beoya	Hitachi Energy	Member
Mats	Bernesjo	Hitachi Energy	Member
Daniel	Blaydon	Baltimore Gas & Electric	Member
William	Boettger	Boettger Transformer Consulting LLC	Member
Sanket	Bolar	Oncor	Guest
Dominique	Bolliger	HV Technologies, Inc.	Guest-RM1
Elizabeth	Bray	Southern Company Services	Guest
Jeffrey	Britton	Phenix Technologies, Inc.	Member
Darren	Brown	Howard Industries	Guest
Juan Alfredo	Carrizales	Prolec GE	Guest
Thomas	Dauzat	AEP-SWEPCO	Guest-RM3
Everton	De Oliveira	Siemens Energy	Member
Scott	Dennis	Hitachi Energy	Member
Nikolaus	Dillon	Dominion Energy	Guest
Luc	Dorpmanns	SGB SMIT	Guest
Samraghi	Dutta Roy	Siemens Energy	Member
Evgenii	Ermakov	Hitachi Energy	Guest
Florin	Faur	Prolec GE Waukesha	Guest
Sean	Fitzgerald	ComEd	Guest
Raymond	Frazier	Ameren	Member
Richard	Frye	EATON Corporation	Guest
Renjie	Fu	ERMCO	Guest
Ramsis	Girgis	Hitachi Energy	Member
Alireza	Gorzin	Black & Veatch	Guest-RM1
Shawn	Gossett	Ameren	Guest-RM2
Ravi	Gupta	Megger	Guest-RM2
Shamaun	Hakim	WEG Transformers USA Inc.	Guest
Giovanni	Hernandez	Virginia Transformer Corp.	Guest-RM1
Sergio	Hernandez Cano	Hammond Power Solutions	Guest
John	Herron	Raytech USA	Member
Martin	Himow	HIGHVOLT	Guest-RM1
Thomas	Holifield	Howard Industries	Guest
Mohammad	Iman	MGM Transformer Company	Guest
Nathan	Jacob	Camlin Energy	Guest-RM1
John	John	Virginia Transformer Corp.	Member
Jerzy	Kazmierczak	Hitachi Energy	Guest-RM1
Sheldon	Kennedy	Sheldon P. Kennedy Engineering, LLC	Guest
Stacey	Kessler	Ulteig Engineers	Guest-RM2
Gary	King	Howard Industries	Member
Evan	Knapp	Eaton	Guest
Mark	Lachman	Doble Engineering Co.	Member
Fernando	Leal	Prolec GE	Member
Moonhee	Lee	Hammond Power Solutions	Guest
Swapnil	Marathe	Megger	Guest
Tim	Menter	Lincoln Electric System	Guest
Francis	Mills	Power Engineers	Guest
Juliano	Montanha	Siemens Energy	Guest
Marta	Munoz	Hitachi Energy	Guest
David	Murray	TVA	Member
Ali	Naderian	METSCO Energy Solutions Inc.	Guest-RM1

Ismael	Naja	Eaton	Guest-RM2
Shankar	Nambi	Bechtel Energy	Guest
Kristopher	Neild	Megger	Member
Joe	Nims	Allen & Hoshall	Guest
George	Partyka	PTI Transformers	Guest
Sanjay	Patel	Smit Transformers	Member
Harry	Pepe	Phenix Technologies, Inc.	Member
Miguel	Plascencia	PG&E	Guest
Bertrand	Poulin	Hitachi Energy	Guest
Jarrold	Prince	ERMCO	Guest
Sebastian	Rehkopf	Maschinenfabrik Reinhausen	Guest
Juan	Reyes Perez	Hitachi Energy	Guest
Michael	Richardson	Ameren	Guest
Marnie	Roussell	Entergy	Guest
Hakan	Sahin	Virginia/Georgia Transfomer	Member-Chair
Dinesh	Sankarakurup	Duke Energy	Guest
Daniel	Sauer	EATON Corporation	Member
Markus	Schiessl	SGB	Member
Pugal	Selvaraj	Virginia Transformer Corp.	Member-Vice Chair
Kabir	Sethi	Hitachi Energy	Guest-RM1
Adam	Sewell	Quality Switch, Inc.	Member-Secretary
Hemchandra	Shertukde	University of Hartford	Member
Kushal	Singh	ComEd	Guest
Christopher	Slattery	FirstEnergy Corp.	Guest-RM3
Jason	Snyder	FirstEnergy Corp.	Guest
Sanjib	Som	Pennsylvania Transformer	Member
Mike	Spurlock	Spurlock Engineering Svcs	Member
Andrew	Steineman	Delta Star Inc.	Guest
Michael	Swiatkowski	Hitachi Energy	Guest-RM1
Ed	teNyenhuis	Hitachi Energy	Member
Andreas	Thiede	HIGHVOLT	Guest
Scott	Thomas	Hitachi Energy	Guest
Cole	Van Dreef	American Transmission Company	Guest-RM3
Ajith	Varghese	Prolec GE Waukesha	Member
Jason	Varnell	Doble Engineering Co.	Member
Rogério	Verdolin	Verdolin Solutions Inc.	Guest-RM1
Krishnamurthy	Vijayan	PTI Transformers	Member
Pragnesh	Vyas	Sunbelt Solomon	Guest-RM3
David	Wallach	Duke Energy	Guest
Shelby	Walters	Howard Industries	Guest
Guang	Yuan	Hitachi Energy	Guest
Malia	Zaman	IEEE SA	Guest
Kris	Zibert	Allgeier, Martin & Associates	Guest
Waldemar	Ziomek	PTI Transformers	Guest-RM3

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**

Vancouver, BC, Canada
Tuesday, March 12, 2024
11:00 AM – 12:15 PM PT
Balmoral (Level 3)

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

- 1) Welcome and Chair's Remarks
 - 2) Circulation of Attendance Sheets
 - Member count as indicated by signed attendance roster was 33 of 50 members; therefore, quorum was achieved. 60 Guests were present, 7 of which requested Membership. Total Attendance was 93. (Note: the room size was not sufficient for all Members and Guests)
 - 3) IEEE Patent Policy Slides presented. There were no conflicts or patent claims.
 - 4) Presentation and approval of meeting Agenda (motion by John John / second by Phil Hopkinson) and Minutes from Fall 2023 Meeting (motion by Amitabh Sarkar / seconded by Egon Kirchenmayer) – approved without opposition.
 - 5) C57.142 Ballot and Comment Resolution – Jim McBride: The Chair presented a summary of the status of open comments before the ballot resolution group as follows:
 - Total Comments – 305
 - Comments Incorporated – 285
 - Remaining Comments to Address – 20
 - All Figures – Completed and Included thanks to Dr. Xose Lopez-Fernandez
- The latest BRG document and link to the IEEE transactions paper (<https://ieeexplore.ieee.org/document/9161400>) are posted on WG website.
- 6) Update on Switchgear Liaison TF – No Task Force meeting held as the Document is in Ballot Resolution. Dave Caverly could not be present at this meeting.
 - 7) Mitigation Methods Task Force Update – Jim McBride / Phil Hopkinson
 - Chair requested the TF meet remotely as soon as next week. An invitation will be sent out in the coming days.
 - 8) New Business
 - **Discussion of transformer protection:**
 - i. The chair discussed the submission of statements by Bertrand Poulin regarding transformer **protection by use of internal surge arrestors** in Section 7.5.
 - ii. A motion was made by Bertrand Poulin / seconded by Phil Hopkinson to include the submitted paragraph in the Guide.
 - iii. Discussion followed: Phil Hopkinson stated that series resonances are most damaging to the windings. Bertrand Poulin stated that “everything magnetically couples to everything” inside of a transformer. The WG by and large agreed with these points. Egon Kirchenmayer suggested deleting the phrase “*prevents the*

excitation of natural frequencies”, as this mitigation only dampens the voltage. Phil Hopkinson agreed this mitigation absorbs energy and provides damping; therefore, a motion was made by Jeffrey Britton / second by Ajith Varghese that the phrase “*reduces the amplitude of natural frequency oscillations*” be adapted. There was no opposition to the motion to include the amended statement and the motion carried without opposition.

- iv. The Chair presented prior comments from research by Jin Sim on STLI testing. Dharam Vir made a presentation and commented that in the past modeling was not possible, but modern software can model and predict stresses of a simulated STLI test. The content OF Dharam Vir’s presentation will be included within the meeting slides and posted to the WG website.
- v. Phil Hopkinson commented per (Loren Wagenaar) that for 765kV BIL steep-front / long tail should still be considered. Bertrand Poulin agreed with the conclusions of the presentation. Christopher Johnson commented that certainly different models could yield different results and each manufacturer must determine the need for STLI testing independently.

- **Open discussion of possible mitigation methods summary:**

- i. Chair suggested tutorial panel at upcoming TC meeting and a possible technical report or IEEE transactions paper.
- ii. Per the last meeting, the WG will move ahead with a group presentation for a future tutorial. Phil Hopkinson suggested eventually incorporating the potential technical report into perhaps an annex of a future version of C57.142. Joe Watson suggested as we move forward we allow the Dielectric Subcommittee to decide if a new TF should be formed to pass on the WG recommendations to the appropriate standards groups.

- 9) Presentation by Phil Hopkinson – Switching Mitigation Concepts. Will be posted on the WG website.
- 10) Next Meeting Fall 2024 in St. Louis, MO.
- 11) Motion to Adjourn at 12:17 PM PT made by JC Hernandez / seconded by Jeffery Britton with no opposition.

Spring 2024 WG Meeting Attendance and Affiliation (pending):

Robert	Allison	Dominion Energy	Guest
Jeff	Benach	Megger	Guest
Enrique	Betancourt	Prolec GE	Member
Vivek	Bhatt	Prolec-GE Waukesha	Guest
William	Boettger	Boettger Transformer Consulting	Member
Popovic	Bojan	KPT	Guest
Robert	Bracum	KPT	Guest
Jeffrey	Britton	Phenix Technologies, Inc.	Member
Camilo	Casallas	Trench LTD	Guest
David	Caverly	Trench Limited	Member
Scott	Digby	Duke Energy	Guest
Paul	Dolloff	EKPC	Guest
Luc	Dorpmanns	SMIT Transformatoren B.V.	Guest
Marco	Espindola	Hitachi Energy	Guest
Sean	Fitzgerald	ComEd	Guest
Raymond	Frazier	Ameren	Guest
Jose	Gamboa	H-J Family of Companies	Guest
Lorne	Gara	Shermco	Guest

Miguel	Garcia	Hitachi Energy	Guest
Eduardo	Garcia Wild	Siemens Energy	Member
Shamaun	Hakim	WEG Transformers USA Inc.	Guest
JC	Hernandez	Georgia Tech - NEETRAC	Guest
Giovanni	Hernandez	Virginia Transfomer Corp.	Guest
Saramma	Hoffman	PPL Electric Utilities	Guest
Thomas	Holifield	Howard Industries	Guest
Philip	Hopkinson	HVOLT Inc.	Member
Saif	Hossain	Trench Limited	Guest
Logan	Howell	Hitachi Energy	Guest
John	John	Virginia Transformer Corp.	Member
Christopher	Johnson	Oncor	Guest
Nathan	Katz	Pacific Corp	Guest
Gael	Kennedy	GR Kennedy & Associates LLC	Guest
Stacey	Kessler	Ulteig Engineers	Guest
Qasim	Khan	Georgia Tech - NEETRAC	Guest
Gary	King	Howard Industries	Guest
Zan	Kiparizoski	Howard Industries	Guest
Egon	Kirchenmayer	Siemens Energy	Member
First Name	Last Name	Company	Role
First Name	Last Name	Company	Role
Fernando	Leal	Prolec GE	Guest
Moonhee	Lee	Hammond Power Solutions	Member
Junho	Lee	Hyundai Electric	Guest
Weijun	Li	Braintree Electric Light Dept.	Member
Xose	Lopez-Fernandez	Universidade de Vigo	Vice-Chair
Kumar	Mani	Duke Energy	Guest
Alberto	Martinez	WEG	Guest
James	McBride	JMX High Voltage	Chair
Joseph	McBride	JMX High Voltage	Guest
Thomas	Melle	HIGHVOLT	Secretary
Filip	Mikulecky	Siemens Energy	Guest
Juliano	Montanha	Siemens Energy	Member
Marta	Munoz	Hitachi Energy	Guest
Volney	Naranjo	Megger	Guest
Anthony	Natale	HICO America	Guest
Joe	Nims	Allen & Hoshall, Inc.	Guest
Paul	Orr	NEMA	Guest
Tihomir	Pandza	Siemens Energy	Guest
Dwight	Parkinson	EATON Corporation	Guest
George	Partyka	PTI Transformers	Guest
Nitesh	Patel	Hyundai Power Transformers USA	Guest
Sanjay	Patel	SMIT Transformer Sales, Inc.	Guest
Harry	Pepe	Phenix Technologies, Inc.	Member
Jay	Pidcock	Ameren	Guest
Christoph	Ploetner	Siemens Energy	Guest
Klaus	Pointner	Trench Austria GmbH	Member
Bertrand	Poulin	Hitachi Energy	Member
Jarrood	Prince	ERMCO	Guest
Ulf	Radbrandt	Hitachi Energy	Guest
Ion	Radu	Hitachi Energy	Guest

Tim	Raymond	EPRI	Guest
Jonathan	Reimer	Fortis BC	Guest
Juan	Reyes Perez	Hitachi Energy	Guest
Michael	Richardson	Ameren	Guest
Tim	Rocque	Prolec GE Waukesha	Guest
Rodrigo	Ronchi	WEG-Voltran	Guest
Marnie	Roussell	Entergy	Member
Amitabh	Sarkar	Virginia Transformer Corp.	Member
Eric	Schleismann	Southern Company Services	Guest
Alfons	Schrammel	Siemens Energy	Guest
Cihangir	Sen	Duke Energy	Member
Kabir	Sethi	Hitachi Energy	Guest
Masoud	Sharifi	Siemens Gamesa Renewable	Guest
Michael	Sharp	Trench Limited	Member
Samuel	Sharpless	Rimkus Consulting Group	Guest
Hemchandra	Shertukde	University of Hartford	Guest
Stephen	Shull	BBC Electrical Service, Inc.	Guest
Kushal	Singh	ComEd	Guest
Mike	Spurlock	Spurlock Engineering Services	Member
Fabian	Stacy	Hitachi Energy	Guest
Hampton	Steele	Tennessee Valley Authority	Guest
Andrew	Steineman	Delta Star Inc.	Guest
Dragan	Tabakovic	Hubbell Power Systems	Guest
Eduardo	Tolcachir	TTE	Guest
Ajith	Varghese	SPX Transformer Solutions, Inc.	Member
Rogerio	Verdolin	Verdolin Solutions Inc.	Member
Yves	Vermette	Electro Composites ULC	Guest
Krishnamurthy	Vijayan	PTI Transformers	Guest
Dharam	Vir	Prolec-GE Waukesha	Member
Joe	Watson	JD Watson & Associates	Guest
Eric	Weatherbee	PCORE Electric	Guest
Matthew	Weisensee	PacifiCorp	Guest
Terry	Wong	Trench LTD	Guest
Joshua	Yun	Virginia Transformer Corp.	Guest
Shibao	Zhang	PCORE Electric	Guest
Waldemar	Ziomek	PTI Transformers	Member

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*

*March 12, 2024
Vancouver, BC (Canada)*

UNAPPROVED MINUTES

This group met for the second time Tuesday March 12, 2024 at 4:45 PM in Vancouver BC Canada. The attendance record showed 73 people attended the meeting with 23 out of the 37 Members present; a quorum to conduct business was established.

Following 15 Guests requested Membership (to be awarded after consecutive attendance to two WG meetings):

Yao Fu (BC Hydro), Orlando Giraldo (The HJ Family of Companies), Alireza Gorzin (Black & Veatch), Chanmin Jeong (HD Hyundai), Jerzy Kazmierzak (Hitachi Energy), Junho Lee (HD Hyundai), Kumar Mani (Duke Energy), Mama Mbouombouo (Hitachi Energy), Eduardo Orozco (GE Grid Solutions), Miguel Plascencia (PG&E), Bertrand Poulin (Hitachi Energy), Vyas Pragnesh (Sunbelt Solomon), Marnie Rousel (Entergy), Jonathan Tan (Northern Transformer), Joshua Watson (Nebraska Public Power District).

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 (Amitabh Sakar, Eduardo Garcia). The Minutes from the last meeting were also unanimously approved (Eduardo Garcia, Hemchandra Shertukde).

OLD BUSINESS

Four task forces were proposed by the chair.

Task Force 1: General editorial overview

SOW

- Review of current version of C57.158 for any visible editorial improvements.
- Confirm harmonization with recent changes in C57.12.00, C57.12.90, C57.12.10, C57.105 and C57.163, Others.
- Review CIGRE's Transformers' Green Book for concurrent references to TW or SW application.

DELIVERABLES

- List of possible editorial (or technical) improvements and suggested new text.
- List of (extracted) paragraphs from reviewed documents, that refer to TW or SWs, and possible suggested action for revised C57.158 (delete, change, or add segments).

Emilio Morales-Cruz (Qualitrol) volunteered to lead Task Force 1.

Task Force 2: Recommendations for Y-connected transformers without a delta connected winding.
SOW

- Expand section about Y-connected transformers without a TW or SW.

DELIVERABLES

- Paragraph(s) with recommendations to mitigate operation issues related to zero-sequence flux effects in three-phase transformers. (References for protection schemes?).
- General reference about when a delta-connected winding could be spared (possible extension to what is already stated in the Guide].
- Definition of Z0 for a three-phase, three-legged core transformer.

Dr. Xose Lope-Fernandez volunteered to lead Task Force 2.

Task Force 3: Improvement and, or simplification of some concepts in the Guide
SOW

- Describe more concisely the application of multi-winding transformers with different power factor loads.
- Expand discussion on transferred voltages to half-floating stabilizing windings (one corner grounded), and those with current limiting reactors (review also Annex D of IEC 60071-2018).
- Short-circuit requirements considering all windings connected to voltage sources.
- Recommendations for bushings layout of large TW, if heat run test required. Comments regarding heat-run request for a SW.

DELIVERABLES

- Suggested paragraphs to simplify, or to improve existing material in the Guide, with references for a deeper understanding, if necessary.

With no volunteer to lead Task Force 3, the Chair offered to appoint a leader at later date. [After the meeting, Krzysztof Kulasek (Delta Star) volunteered to lead this TF3].

Task Force 4: New recommendations for TW or SW Applications.

SOW

- Some experiences with collector transformers in Renewables Plants.
- Tertiaries for axial-split, Y-connected LVs.
- Section of grounding of neutrals in Y-connected transformers.

- Caution for application of outer-most Tertiaries: electrostatic voltage pick-up.
- Effects from Reverse Power Flow.
- Circulating currents in delta of single-phase banks.

DELIVERABLES

- Proposed new paragraph(s) on (possible) recommendations to evaluate or control above-described phenomena, with references to further understanding of the subject (if applicable).

No volunteer for Task Force 4. Chair will appoint leader at later date.

Motion passed with 19 Members in favor to approve the creation of the above task forces. Raymond Frazier made the motion, Eduardo Garcia seconded.

Next Steps were discussed:

New MS-Word version of standard has already been provided by IEEE SA (support from Malia Zaman). The Chair will distribute a PDF workfile for the Group's reference.

Invitation remains open for WG Members to sign up to participate in the approved Task Forces. [At the end of the meeting, some participants already approach TF Leaders to sign up].

Task Forces to develop material for WG review.

Working group to meet and discuss TF findings over the next two committee meetings.

Assemble and organize new draft document.

NEW BUSINESS

No new business was brought up.

ADJOURNMENT

Motion passed to adjourn the meeting by 5:25 PM (Hemchandra Shertukde, Raymond Frazier).

Respectfully submitted,

Enrique Betancourt
Chairman

Dr. Xose Lopez-Fernandez
Co-Chair

Kayland Adams
Secretary

Attendance Spring 2024 Meeting
RM=Request Membership

Onome	Avanoma	MJ Consulting	Member
Sean	Barker	Hitachi Energy	Guest
Levent	Baser	Hitachi Energy	Guest
William	Boettger	Boettger Transformer Consulting	Member
Vivian	Chan	Hitachi Energy	Guest
Marcos	Czernorucki	Hitachi Energy	Guest
Pouneh	Davoudi	Delta Star	Member
Gabriel	Delgado Zamora	Invenergy	Guest
Nikolaus	Dillon	Dominion Energy	Guest
Jesse	Duffy	Nashville Electric Service	Guest
Janko	Dzodan	Koncar D&ST	Guest
Eric	Elson	SDGE	Guest
Raymond	Frazier	Ameren	Member
Yao	Fu	BC Hydro	RM
Eduardo	Garcia	Siemens Energy	Member
Dragana	Gasic	Koncar D&ST	Guest
Orlando	Giraldo	The H.J Family of Companies	RM
Alireza	Gorzin	Black & Veatch	RM
Bill	Griesacker	W.Griesaker & Assoc	Guest
Derek	Hollrah	Burns & McDonnell	Guest
Nick	Jensen	Delta Star	Guest
Chanmin	Jeong	HD Hyundai	RM
John	John	Virginia Transformer	Member
Ryan	Jonak	PG&E	Guest
Kevin	Juchem	Hitachi Energy Germany AG	Guest
Jerzy	Kazmierczak	Hitachi Energy	RM
Egon	Kirchenmayer	Siemens-Energy	Member
Matija	Koprivnjak	Koncar D&ST	Guest
Anton	Koshel	Delta Star	Guest
Krzysztof	Kulasek	Delta Star	Member
Fernando	Leal	Prolec GE	Guest
Junho	Lee	HD Hyundai	RM
Xose	Lope-Fernandez	Universidade De Vigo	Member
Ricardo	Lopes	EFACEC Transformers	Guest
Gabriel	Mamede	Siemens-Energy	Guest
Kumar	Mani	Duke Energy	RM
Daniel	Martinez	JFE Canada	Member
Alberto	Martinez	WEG USA	Guest
Mama	Mbouombouo	Hitachi Energy	RM
Juliano	Montanha	Siemens-Energy	Guest
Marta	Munoz	Hitachi Energy	Member
Joe	Nims	Allen & Hoshall	Guest
Eduardo	Orozco	GE Grid Solutions	RM
Monil	Patel	PG&E	Guest
Miguel	Plascencia	PG&E	RM
Bertrand	Poulin	Hitachi Energy	RM
Vyas	Pragnesh	Sunbelt Soloman	RM
Pedro	Puente	Prolec GE	Guest

Michael	Richardson	Ameren	Member
Tim	Rocque	Prolec GE Waukesha	Member
Rodrigo	Ronchi	WEG	Member
Marnie	Roussell	Entergy	RM
Dinesh	Sankarakurup	Duke Energy	Member
Amitabh	Sarkar	Virginia Transformer	Member
Markus	Schiessl	SGB	Member
Harmanpreet	Sekhon	PTI Transformers	Guest
Hemchandra	Shertukde	UHART	Member
Christopher	Slattery	First Energy	Guest
Sanjib	Som	Pennsylvania Transformers	Member
Andrew	Steineman	Delta Star	Guest
Sachin	Tade	PTI Transformers	Guest
Jonathan	Tan	Northern Transformer	RM
Marc	Taylor	JFE Canada	Guest
Ajith	Varghese	Prolec GE	Member
Jason	Varnell	Doble	Member
Hugh	Waldrop	MLGW	Guest
Joe	Watson	JD Watson & Assoc	Guest
Joshua	Watson	Nebraska Public Power District	RM
Bruce	Webb	K.U.B	Guest
Matt	Weisensee	PacifiCorp	Guest
Joe	White	Power Engineers	Member
Fei	Yang	Hitachi Energy	Guest
Kris	Zibert	Allgeier Martin	Guest

J.9.8 WG PC57.32 Neutral Grounding Devices

IEEE Neutral Grounding Devices Working Group Meeting Hyatt Regency Hotel Vancouver, BC, Canada

**Tuesday, March 12, 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 – 14 of 24 Members; 15 Guests present).
There were 2 guests requesting membership. Since they have attended the last 2 meetings they will be granted membership. This includes Scott Thomas and Terry Wong.
3. Approval of Agenda (Motion to approve by Don Ayers, Second by Klaus Pointner – motion passed without objection)
4. Patent Call

5. Copyright and IEEE Ethics Policies
6. Approval of Minutes from previous Meeting.
 - (No objection to unanimous approval.)
7. Reports from TF Leader Assignments
 - **Clause 4 – Neutral Grounding Reactors** – Camilo Casallas
 - i. There has been 1 virtual TF meeting. The proposed changes were reviewed in the WG. These sections will be finalized by the Fall meeting.
 - **Clause 5 – Neutral Ground Gault Neutralizers** – Klaus Pointner
 - i. There has been 1 virtual TF meeting. It is planned to make this section consistent with IEC 60076-6 which is presently is not published yet. The WG will later need permission from IEC. The TF will put the changes into the document. The TF also requested to do a technical presentation at the Fall meeting if time allowed.
 - **Clause 6 – Neutral Grounding Transformers** – Don Ayers
 - i. The TF is complete and has a document with the proposed changes.
 - ii. There was discussion on the Table 21 BIL values in relation to C57.12.00 Table 4 Column 13 where the max BIL is 350kV. Tom Melle will prepare text to explain this apparent inconsistency.
 - **Clause 7 – Neutral Grounding Resistors** – Ryan Hogg, Sergio Panetta
 - i. The TF has held 13 meetings so far and has processed 85% of the comments. It is planned to be completed by the Fall meeting.
 - **Clause 8 – Combinational Devices** – Sergio Panetta
 - i. The TF is working through suggested changes.
8. Old Business
 - None
9. New Business
 - None
10. Next in-person meeting – Fall 2024 (IEEE TC October 27-31, 2024, in St. Louis, Missouri, USA)
11. Adjournment at 5:31 PM PT (motion by Don Ayers; Second by Ryan Hogg)

List of Meeting Attendees from Fall 2023 meeting (including affiliation & member status).

Robert	Allison	Dominion Energy	Guest
Robert	Arritt	EPRI	Member
Donald	Ayers	Ayers Consulting	Member
Jason	Beaudain	Wiedmann	Guest
Rahul	Bharduoaj	Burns & McDonnell	Guest
Vivek	Bhatt	Prolec GE	Guest
Sankey	Bolar	ONCOR	Member
Susan	Bonfiglio	WAPA	Member

Camilo	Casallas	Trench Ltd.	Member
David	Caverly	Trench	Guest
Arup	Chakraborty	Delta Star	Member
Juan Carlos	Cruz Valdes	Prolec GE	Member
Huan	Dinh	Hitachi Energy	Member
teNyenhuis	Ed	Hitachi Energy	Secretary
Will	Elliott	AEP/SWEPCO	Guest
Jeff	Grager	Xcel Energy	Guest
Ravi	Gupta	Megger	Guest
Roger	Hayes	GE	Guest
Ryan	Hogg	Bureau of Reclamation	Member
Darren	Hoppins	SensorLink	Guest
Saif	Hossain	Trench Ltd.	Member
Kevin	Juchem		Guest
Kurt	Kaineba	Trench Austria	Guest
Sheldon	Kennedy	Sheldon P. Kennedy Engineering PLLC	Chair
Klaus	Koeck	Trench Austria	Guest
Jusuf	Krvavac	Sargent & Lundy	Member
Mark	Lowthor	Kruger	Guest
Jim	McBride	JMX High Voltage	Member
Thomas	Melle	HIGHVOLT	Vice-Chair
Sergio	Panetta	I-Gard Corp.	Member
Klaus	Pointner	Trench Austria	Member
Daniel	Posadas	Prolec GE	Guest
Ulf	Radbrandt	Hitachi Energy	Member
Pugal	Selvaraj		Guest
Mike	Sharp	Trench Ltd.	Member
Kyle	Stechschulte	AEP	Member
Troy	Tanaka	Burns & McDonnell	Guest
Scott	Thomas	Hitachi Energy	Guest
Cody	Vanwyck	Commonwealth Associates	Member
Alan	Washburn	Burns & McDonnell	Member
Trenton	Williams	Advanced Power Technologies	Member
Terry	Wong	Trench	Guest
Maria	Zaman	IEEE	Guest
Kris	Zibert	Allgeier, Martin & Assoc.	Member

J.10 Performance Characteristics Subcommittee Attendance List

<u>First Name</u>	<u>Last Name</u>	<u>Affiliation</u>	<u>Status</u>
Kayland	Adams	Prolec-GE	Member
Mihir	Amin	EATON	Guest
Stephen	Ashcraft		Member
Onome	Avanoma	MJ Consulting	Guest
Alex	Ayala	Power Partners	Member
Donald	Ayers	Ayers Transformer Consulting	Guest
Robert	Ballard	DuPont	Member
Gilles	Bargone	FISO Technologies Inc.	Guest
Jason	Beaudoin	Weidmann	Guest

Enrique	Betancourt	Prolec GE	Guest
Wallace	Binder	WBBinder Consultant	Guest
Zack	Blackwell	TCI	Member
Piotr	Blaszczyk		Member
Daniel	Blaydon	Baltimore Gas & Electric	Guest
William	Boettger	Boettger Transformer Consulting LLC	Guest
Sanket	Bolar	Oncor Electric Delivery	Guest
Georges	Bouty		Guest
Jeffrey	Britton	Phenix Technologies, Inc./Doble Eng.	Guest
Juan Alfredo	Carrizales	Prolec GE	Guest
Camilo	Casallas	TRENCH	Guest
Ricardo	Castro Lopes	Efacec Transformers	Guest
Binzhan	Chen		Guest
Eunyoung	Cho	HICO-America	Member
Rhett	Chrysler	ERMCO	Guest
Craig	Colopy	Retired - EATON Corporation	Guest
Michael	Craven	Qualus Power Services	Guest
Janet	Crockett	Fayetteville PWC	Guest
Juan Carlos	Cruz Valdes	Prolec GE	Guest
Pouneh	Davoudi	Delta Star Inc.	Guest
Samson	Debass	EPRI	Member
J. Arturo	Del Rio	Siemens Energy	Guest
Scott	Digby	Duke Energy	Guest
Nikolaus	Dillon	Dominion Energy	Guest
Luc	Dorpmanns	Royal Smit Transformers	Member
Samraghi	Dutta Roy	Siemens Energy	Member
Janko	Dzodan	Koncar D&ST	Member
Eric	Elson	SDGE	Guest
Evgenii	Ermakov	Hitachi Energy	Member
Marco	Espindola	Hitachi Energy	Member
Reto	Fausch	RF Solutions	Guest
Miguel	Fernandez	Braintree Electric Light Dept.	Member
Hugo	Flores	Hitachi Energy	Guest
Raymond	Frazier	Ameren	Member
Rich	Frye	EATON Corporation	Guest
Yao	Fu		Guest
Jose	Gamboa	H-J Family of Companies	Guest
Miguel	Garcia	Hitachi Energy	Guest
Eduardo	Garcia Wild	Siemens Energy	Member
Dragana	Gasic	Koncar D&ST	Member
Rob	Ghosh	General Electric	Guest

Eduardo	Gomez Hennig	Siemens Energy	Guest
Brad	Greaves	Weidmann	Guest
Bill	Griesacker	Duquesne Light Co.	Member
Ismail	Guner	Hydro-Quebec	Member
Ravi	Gupta	Megger	Guest
Kevin	Hampton	Siemens Energy	Guest
Peter	Heinzig	Weidmann Electrical Technology	Member
Sergio	Hernandez Cano	Hammond Power Solutions	Member
Jean	Hernandez-Myia	Georgia Tech	Guest
Miljenko	Hikac		Guest
Saramma	Hoffman	PPL Electric Utilities	Member
Ryan	Hogg	Bureau of Reclamation	Guest
Derek	Hollrah	Burns & McDonnell	Guest
Philip	Hopkinson	HVOLT Inc.	Guest
Saif	Hossain	Trench Limited	Member
Ramadan	Issack	American Electric Power	Guest
Marion	Jaroszewski		Member
Nicholas	Jensen	Delta Star Inc.	Guest
Chanmin	Jeong		Member
John	John	Virginia Transformer Corp.	Guest
Christopher	Johnson	Oncor Electric Delivery	Guest
Kurt	Kaineder		Guest
Jerzy	Kazmierczak	Hitachi Energy	Guest
Sheldon	Kennedy	Sheldon P. Kennedy Engineering, PLLC	Guest
Stacey	Kessler	Ulteig Engineers	Guest
Yeounsoo	Kim		Corresponding Member
Egon	Kirchenmayer	Siemens Energy	Guest
Dmitriy	Klempner	Southern California Edison	Member
Dave	Komm		Guest
Matija	Koprivnjak	Koncar D&ST	Guest
Anton	Koshel	Delta Star Inc.	Guest
Krzysztof	Kulasek	Delta Star Inc.	Guest
Andrew	Larison	Hitachi Energy	Guest
Fernando	Leal		Member
Junho	Lee	Hyundai Electric	Guest
Moonhee	Lee	Hammond Power Solutions	Guest
Angela	Leigl	EATON Corporation	Member
Aleksandr	Levin	Weidmann Electrical Technology	Guest
Eric	Li	BC Hydro	Guest
Weijun	Li	Braintree Electric Light Dept.	Guest

Xose	Lopez-Fernandez	Universidade de Vigo	Guest
Jose Luis	Machain	Prolec GE-Waukesha	Guest
Tim-Felix	Mai	Siemens Energy	Member
Alberto	Martinez	WEG Transformers USA Inc.	Member
James	McBride	JMX Services, Inc.	Guest
Thomas	Melle	HIGHVOLT	Guest
Omar	Mendez	Prolec-GE	Guest
Francis	Mills	Power Engineers	Guest
Juliano	Montanha	Siemens Energy	Member
Rhea	Montpool	Schneider Electric	Guest
Emilio	Morales-Cruz	Qualitrol Company LLC	Guest
Marta	Munoz	Hitachi Energy	Guest
David	Murray	Tennessee Valley Authority	Guest
Ryan	Musgrove	Oklahoma Gas & Electric	Member
Ali	Naderian	METSCO Energy Solutions Inc.	Guest
Aniruddha	Narawane	EATON Corporation	Guest
Kristopher	Neild	Megger	Guest
Yaw	Nyanteh	Hyosung Hico	Member
Rudolf	Ogajanov	Hitachi Energy	Guest
Anastasia	O'Malley	Con Edison, NY	Guest
Dipesh	Patel		Member
Monil	Patel	Pacific Gas & Electric	Member
Harry	Pepe	Phenix Technologies, Inc.	Guest
Sylvain	Plante	Hydro-Quebec	Guest
Christoph	Ploetner	Siemens Energy	Member
Klaus	Pointner	Trench Austria GmbH	Guest
Daniel	Posadas	Prolec-Celeco	Guest
Bertrand	Poulin	Hitachi Energy	Guest
Jarrold	Prince	ERMCO	Member
Ulf	Radbrandt	Hitachi Energy	Member
Ion	Radu	Hitachi Energy	Guest
Farnoosh	Rahmatian	NuGrid Power	Guest
Jonathan	Reimer	FortisBC	Guest
Juan	Reyes	Hitachi Energy	Guest
Arash	Rezvan		Member
Michael	Richardson	Ameren	Guest
Tim	Rocque	Prolec GE Waukesha	Guest
David	Rohrer	First Energy	Guest
Rodrigo	Ronchi	WEG-Voltran	Member
Marnie	Roussell	Entergy	Member
Hakan	Sahin	Virginia/Georgia Transformer	Guest

Sherif	Salem	Eversource Energy	Guest
Fernando	Salinas		Guest
Dinesh	Sankarakurup	Duke Energy	Guest
Amitabh	Sarkar	Virginia Transformer Corp.	Guest
Daniel	Sauer	EATON Corporation	Guest
Markus	Schiessl	SGB	Member
Eric	Schleismann	Southern Company	Guest
Alfons	Schrammel	Siemens Energy	Member
Ewald	Schweiger	Siemens Energy	Guest
Cihangir	Sen	Duke Energy	Guest
Adam	Sewell	Quality Switch, Inc.	Member
Abdul Majid	Shaikh	Delta Star, Inc.	Guest
Michael	Sharp	Trench Limited	Guest
Harmanpuet	Singh Sekhon		Guest
Christopher	Slattery	FirstEnergy Corp.	Guest
Jimmy	Smith	Howard Industries	Guest
Steven	Snyder	Hitachi Energy	Guest
Yong Tae	Sohn	Hyosung Hico	Guest
Sanjib	Som	Pennsylvania Transformer	Guest
Mauricio	Soto	Hitachi Energy	Guest
Brad	Staley		Member
Kyle	Stechschulte	American Electric Power	Member
Andrew	Steineman	Delta Star Inc.	Guest
Charles	Sweetser	OMICRON electronics Corp USA	Member
Sachin	Tade		Member
Jonathan	Tan	Northern Transformer	Guest
Troy	Tanaka	Burns & McDonnell	Guest
Valeriu	Tatu	Powersmiths	Guest
Marc	Taylor	JFE Shoji Power Canada Inc.	Member
Vijay	Tendulkar	EATON Corporation	Guest
Andreas	Thiede	Highvolt Dresden	Guest
Scott	Thomas	Hitachi Energy	Guest
Tim	Tillery	Howard Industries	Guest
Fernando	Tirado	Prolec Energy	Guest
Mark	Tostrud	Dynamic Ratings	Guest
Bjorn	Vaagensmith	Idaho National Laboratory	Guest
Cole	Van Dreel	ATC	Guest
Jeramy	Van Horn	IFD Technologies	Guest
Ajith	Varghese	Prolec GE-Waukesha	Member
Jason	Varnell	Doble Engineering Co.	Guest
Joshua	Verdell	ERMCO	Guest
Rogério	Verdolin	Verdolin Solutions Inc.	Chair
Dharam	Vir	Prolec-GE	Member

Richard	vonGemmingen	Dominion Energy	Member
Pragnesh	Vyas	Sunbelt-Solomon	Member
John	Wagner		Guest
David	Wallach	Duke Energy	Member
Alan	Washburn	Burns & McDonnell	Guest
Joe	Watson	JD Watson and Associates Inc.	Member
Joshua	Watson	Nebraska Public Power District	Guest
Bruce	Webb	Knoxville Utilities Board	Member
Matthew	Weisensee	PacifiCorp	Guest
Joe	White	Power Engineers	Guest
Chris	Whitten		Guest
Terry	Wong	Trench Limited	Guest
Jeffrey	Wright	Duquesne Light Co.	Guest
Shuzhen	Xu		Guest
Fei	Yang	Hitachi Energy	Guest
Guang	Yuan	Hitachi Energy	Guest
Joshua	Yun	Virginia Transformer Corp.	Member
Malia	Zaman	IEEE	Guest
Peter	Zhao	Hydro One	Member
Kris	Zibert	Allgeier, Martin and Associates	Secretary
Waldemar	Ziomek	PTI Transformers	Member

Annex K Power Transformers Subcommittee

March 13, 2024

Vancouver, BC, Canada

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

Chair: Ryan Musgrove

Vice Chair: Alwyn VanderWalt

Secretary: Weijun Li

K.1 Meeting Attendance

The Power Transformers Subcommittee (PTSC) met on Wednesday, March 13 at 1:30 p.m. The attendance record indicates that 87 out of 108 members of the subcommittee were in attendance; a quorum at the meeting was achieved. A total of 225 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.

Four individuals requested membership by speaking with or emailing PTSC officers after the meeting. Three attended at least 3 out of the last 5 meetings and therefore qualified for “Member” status. The 4th has not been recorded in attendance in 3 out of the last 5 meetings, and therefore not yet qualified for membership.

Ten individuals updated their contact information. One individual has 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 110 members after the Spring 2024 meeting.

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

K.2 Approval of Agenda and Meeting Minutes

The Chair asked the membership for a motion to approve the agenda as presented and the Fall 2023 meeting minutes as circulated. Ewald Schweiger (Siemens Energy) made a motion to approve the agenda and meeting minutes, which was seconded by Marcos Ferreira (Quanta Technology). The agenda and Fall 2023 meeting minutes were approved without objection. The approved agenda can be found in Attachment K.2.

K.3 Chair’s Remarks

The Chair provided an update on the PTSC roster. Seven members 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. 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 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 reminded all attendees that Patrycja Jarosz, the new IEEE staff contact for PTSC, is available for assistance. Malia Zaman will continue to be available as well.

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

The Chair introduced 8 new members that were added to the PTSC membership list since the Fall 2023 meeting. The new members are listed below:

Michael Botti (Hyosung HICO)
Jeremiah Bradshaw (Bureau of Reclamation)
Rob Ghosh (General Electric)
Francis Mills (Power Engineers, Inc.)
Abdul Majid Shaikh (Delta Star Inc.)
Craig Swinderman (Mitsubishi Electric Power Products)
Ryan Thompson (Burns & McDonnell)
Trenton Williams (Advanced Power Technologies)

The Chair provided the requirements for establishing & maintaining membership and urged members to participate in all email ballot requests.

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 Vancouver. WG Chair Craig Colopy (Retired) reported that the final draft (D1.3) was approved as a revised standard by IEEE SA on February 15, 2024. The WG Chair thanked everyone involved for their contributions.

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 not achieved. WG Chair Peter Zhao (BC Hydro) reported that a standard template was created for proper documentation of comments and proposals. The group reviewed the 7 comments received thus far and discussed further actions and assignments. Two years or 4 meetings are planned for collection of changes and proposals with a tentative plan of completing a draft document by the end of 2026. Hakim Dulac (Advanced Power Technologies) is now the WG's secretary.

The complete meeting minutes can be found in Attachment K.4.2. The next in-person meeting is planned for Fall 2024 in St. Louis, Missouri.

K.4.3 Revision of C57.116, Guide for Transformers Directly Connected to Generators – Weijun Li

This working group has completed its work; therefore, they won't meet again until the next revision cycle, probably in 3-4 years.

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 24 guests present. 3 guests requested membership. WG Chair Craig Swinderman (Mitsubishi Electric Power Products) said that the PAR was approved on December 31, 2023 with an expiration date of December 31, 2027. The group reviewed Draft 1 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 complete meeting minutes can be found in Attachment K.4.4. The next in-person meeting is planned for Fall 2024 in St. Louis, Missouri.

K.4.5 WG C57.135, Guide for the Application, Specification, and Testing of Phase-Shifting Transformers – Ewald Schweiger

This group met on Monday with 50 attendees and achieved a quorum. WG Chair Ewald Schweiger (Siemens Energy) provided an update on document review since the Kansas City meeting. Presentations were given on the review of multiple clauses. This working group is looking for volunteers/specialists in protection & control to review the existing document for improvements and help with editorial changes. Sanjib Som (Pennsylvania Transformer) volunteered to coordinate assistance. Drew Welton (Intellirent) also offered to help.

Different task forces will be established to work on individual clauses and incorporate various findings/comments.

The complete meeting minutes can be found in Attachment K.4.5. The next in-person meeting is planned for Fall 2024 in St. Louis, Missouri.

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 Vancouver 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. PTSC Chair Ryan Musgrove (Oklahoma Gas & Electric) reported that the WG has one comment left to resolve (out of the original 676 comments). The plan is to submit the final draft to the WG for approval to go to recirculation ballot once this final comment is resolved. The target completion date is the end of March 2024. The PTSC Chair thanked the WG Chair and members for their efforts throughout the revision process.

K.4.7 TF C57.12.10, Standard Requirements for Liquid-Immersed Power Transformers – Scott Digby

This task force met on Monday with 64 attendees. 22 individuals requested membership. The current document expires at the end of 2027. The task force voted unanimously to seek PTSC's approval to create a PAR to revise the document.

Scott Digby (Duke Energy) made a motion to create a PAR to revise C57.12.10, Standard Requirements for Liquid-Immersed Power Transformers. Sanjib Som (Pennsylvania Transformer) seconded the motion. The motion passed with unanimous approval.

The complete meeting minutes can be found in Attachment K.4.7. The next in-person meeting is planned for Fall 2024 in St. Louis, Missouri.

K.4.8 TF C57.140, Guide for Evaluation and Reconditioning of Liquid-Immersed Power Transformers – Sanjib Som

This task force had their first in-person meeting on Monday. The task force had an earlier virtual meeting on February 26, 2024. The main purpose of the TF is to create the title, scope, and purpose (if necessary) for submitting a PAR to revise C57.140. Both meetings provided lots of input. Monday's in-person meeting showed support for keeping the title unchanged. The TF plans to finalize the title, scope and purpose and seek PTSC's approval at the Fall 2024 meeting to create a PAR to revise the document.

The complete meeting minutes can be found in Attachment K.4.8. The next in-person meeting is planned for Fall 2024 in St. Louis, Missouri.

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.

A motion to use the definition of compressive force from C57.164 was approved with no objections and one abstention. Other old business items regarding the investigation flow chart were reviewed with an expectation of completing after the Vancouver meeting. Once ready, the revisions associated with these old business items will be sent to WG members via email for approval. The approved revisions, along with all other previously approved changes, will be incorporated into a draft document. The tentative goal is to complete a draft document and move to ballot during the Fall 2024 meeting.

The complete meeting minutes can be found in Attachment K.4.9. The next in-person meeting is planned for Fall 2024 in St. Louis, Missouri.

K.4.10 WG C57.157, Guide for Conducting Functional Life Tests on Switch Contacts Used in Insulating Liquid-Immersed Transformers – Adam Sewell

This group met on Tuesday with a total of 41 attendees. A quorum was achieved. The PAR was approved June 2023 and expires December 2027. WG Chair Adam Sewell (Quality Switch, Inc.)

presented background information of why this guide was originally started. Florin Faur (Prolec GE) presented his comments on the current guide and his comments will be included in the meeting minutes for all to review. Discussion of synthetic esters was brought up as the current document does not have information about this type of ester. The WG Chair will either give a presentation or recruit a presenter for the next meeting on the topic of synthetic esters.

The complete meeting minutes can be found in Attachment K.4.10. The next in-person meeting is planned for Fall 2024 in St. Louis, Missouri.

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) provided an update on the project timeline. Saramma Hoffman (PPL Electric Utilities) provided an update on straw ballot comment resolution. Stephanie Mabrey (Weidmann Electrical Technology) said that the current draft is ready to go for IEEE MEC review followed by SA Ballot. Brian Sparling (Kinectrics) gave a presentation on how to develop transformer assessment indices.

The working group voted unanimously to seek approval from PTSC to move the document to IEEE SA for MEC review and balloting. A comment resolution group has also been formed to resolve comments from the SA ballot.

Kumar Mani (Duke Energy) made a motion to move draft guide C57.170, Guide for the Condition Assessment of Liquid Immersed Transformers, Reactors and Their Components to ballot. Peter Zhao (BC Hydro) seconded the motion. The motion passed with unanimous approval.

The complete meeting minutes can be found in Attachment K.4.11. The next in-person meeting is planned for Fall 2024 in St. Louis, Missouri.

K.4.12 Revision of C57.150, Guide for the Transportation of Transformers and Reactors Rated 10,000 kVA or Higher – Greg Anderson

Due to the absence of WG Chair Greg Anderson (GW Anderson & Associates, Inc.), WG Vice Chair Ewald Schweiger (Siemens Energy) provided the PTSC membership with a quick update.

The revised guide was approved in 2023. The publication process within IEEE is slightly delayed due to reasons outside the WG's responsibility. The new target publication date is the end of March 2024.

K.4.13 WG PC57.17, Standard Requirements for Arc Furnace Transformers – Dom Corsi

This group met on Tuesday with a total of 25 attendees. 13 of 20 members were present; therefore, a quorum was achieved. This was the second meeting as a working group. With one newly added member, the WG now has 21 members. WG Secretary Jason Varnell (Doble Engineering Co.) led the meeting as WG Chair Dom Corsi (Doble Engineering Co.) was not in attendance due to a conflict.

The group reviewed the PAR details and confirmed study group volunteers for each subclause. A motion passed to make temperature rise test a routine test within this standard and incorporate into Draft D1.1. Another motion passed to straw ballot the WG with Draft D1.1 prior to the Fall 2024 meeting.

The complete meeting minutes can be found in Attachment K.4.13. The next in-person meeting is planned for Fall 2024 in St. Louis, Missouri.

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 Vancouver. WG Chair Joe Watson (JD Watson and Associates Inc.) reported that the document was balloted with two re-circulations and Draft 5 was approved on February 4, 2024. The draft document has been submitted to RevCom for consideration at their next meeting. The WG Chair gave Thanks to all who participated in the development of this Recommended Practice and to all who participated in the balloting process.

This working group has completed its work; therefore, they won't meet again until the next revision cycle, probably in 4-5 years.

K.4.15 TF Liquid-Immersed Phase-Shifting Transformers 60076-57-1202 – Ewald Schweiger

This task force met on Tuesday. This was the first in-person meeting after having a virtual meeting on January 23, 2024. The current document expires at the end of 2027. The task force voted unanimously to seek PTSC's approval to create a PAR to revise the document.

Ewald Schweiger (Siemens Energy) made a motion to create a PAR to revise Part 57-1202: Liquid immersed phase-shifting transformers. Joe Watson (JD Watson and Associates Inc.) seconded the motion. The motion passed with unanimous approval.

The complete meeting minutes can be found in Attachment K.4.15. The next in-person meeting is planned for Fall 2024 in St. Louis, Missouri.

K.4.16 TF C57.93, IEEE Guide for Installation and Maintenance of Liquid-Immersed Power Transformers – Scott Reed

This task force met on Tuesday and achieved a quorum.

A motion passed to change the Title to read, "IEEE Guide for Installation and Maintenance of Liquid-Immersed Power Transformers and Reactors".

A motion passed to change the Scope to read, "The recommendations presented in this guide apply to the installation and maintenance of liquid-immersed power transformers and reactors."

A motion passed after the conclusion of the meeting, via email, by the Task Force to go before the Power Transformers Subcommittee to request a PAR to revise the document with the Title and Scope that was voted on during the meeting.

Scott Reed (MVA) made a motion to create a PAR to revise C57.93 with the Title and Scope stated above. Ewald Schweiger (Siemens Energy) seconded the motion. The motion passed with unanimous approval.

The complete meeting minutes can be found in Attachment K.4.16. The next in-person meeting is planned for Fall 2024 in St. Louis, Missouri.

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. There has been no update since the Fall 2023 meeting in Kansas City.

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. The WG approved John Sen (Duke Energy) as vice chair and Zan Kiparizoski (Howard Industries) as secretary,

WG Chair Mark Tostrud (Dynamic Ratings, Inc.) reviewed the PAR and project timeline with the group. A presentation was made on ways to improve and simplify Annex C – Concept of Apparent Circulating Current. Another presentation was made on recommended updates to the references used in the guide. The group also discussed how to define Reverse Power Flow in the guide and recommended actions during reverse power flow conditions.

The complete meeting minutes can be found in Attachment K.4.18. The next in-person meeting is planned for Fall 2024 in St. Louis, Missouri.

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) reported that he and Standards Coordinator Stephen Shull (BBC Electrical Services, Inc.) attended a virtual meeting earlier in 2024. The proposed document sounded more like a specification than a guide. The liaison referred the China-based working group to IEEE PC57.143 (Guide for Application of Monitoring Equipment to Liquid-Immersed Transformers and Components) but hasn't heard back. The liaison said the next WG call is scheduled for the week of March 18, 2024.

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, reported that there has been no update since the Fall 2023 meeting in Kansas City.

K.5 Old Business

Transformer Seismic Concerns – IEEE 693 “Amendment”

PTSC Chair Ryan Musgrove (Oklahoma Gas & Electric) shared an update that was provided by Bushings Subcommittee Chair Eric Weatherbee (PCORE Electric). According to an email dated February 1, 2024, the proposed IEEE 693 amendment “P693a” will be returned to the working

group and not go through the last approval process. The next document update is expected to be a full revision.

Discussion on Creation of a New IoT Document – Hemchandra Shertukde and Sanjib Som

Study group chair Hemchandra Shertukde was not present to provide an update on this activity.

K.6 New Business

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

PTSC Chair Ryan Musgrove (Oklahoma Gas & Electric) reiterated that any changes in the next revision of IEEE 693 would likely affect power transformer designs. We need volunteers from the Power Transformers and Bushings subcommittees, especially users and transformer manufacturers, to participate in the review and ballot of IEEE 693 once the document is open for revision. Anyone who is interested in getting involved is encouraged to contact 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 – S24 PTSC 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
Guest	Isaac	Abdalla	HICO America
Member	Kayland	Adams	Prolec GE Waukesha
Guest	Robert	Allison	Dominion Energy
Guest	Edmundo	Arevalo	Bonneville Power Administration
Guest	Elise	Arnold	SGB
Member	Onome	Avanoma	MJ Consulting
Member	Donald	Ayers	Ayers Transformer Consulting
Member	Gilles	Bargone	FISO Technologies Inc.
Guest	Sean	Barker	Hitachi Energy
Guest	Jason	Beaudoin	Weidmann Electrical Technology
Guest	Jean-Noel	Berube	Rugged Monitoring Inc.
Member	Enrique	Betancourt	Prolec GE
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
Guest	George	Bouty	Delta Star Inc.
Member	Jeremiah	Bradshaw	Bureau of Reclamation
Guest	John	Brett	Delta-X Research Inc.
Guest	Jeffrey	Britton	Doble Engineering Co.
Guest	Samuel	Brodeur	Hitachi ABB Power Grids
Guest	Duane	Brown	Measurements International
Guest	Juan Alfredo	Carrizales	Prolec GE
Member	Juan	Castellanos	Prolec GE
Member	Stuart	Chambers	EPRI
Guest	Vivian	Chan	Hitachi Energy
Guest	Luiz	Cheim	Hitachi Energy
Member	Craig	Colopy	Retired - General Interest
Guest	Michael	Craven	Qualus Corp.
Member	Juan Carlos	Cruz Valdes	Prolec GE
Guest	Marcos	Czernorucki	Hitachi Energy
Member	Eric	Davis	Consultant
Guest	Samson	Debass	EPRI
Guest	Gabriel	Delgado	Invenergy
Member	Scott	Digby	Duke Energy

Guest	Nikolaus	Dillon	Dominion Energy
Guest	Luc	Dorpmanns	Royal SMIT Transformers
Guest	Lee	Doyle	Vaisala
Guest	Zachary	Draper	Delta-X Research Inc.
Guest	Jesse	Duffy	Nashville Electric Service
Member	Hakim	Dulac	Advanced Power Technologies
Member	Samraghi	Dutta Roy	Siemens Energy
Guest	Eric	Elson	SDGE
Member	Evgenii	Ermakov	Hitachi Energy
Guest	Marco	Espindola	Hitachi Energy
Member	Reto	Fausch	RF Solutions
Guest	Miguel	Fernandez	Braintree Electric Light Dept.
Member	Marcos	Ferreira	Quanta Technology
Member	Hugo	Flores	Hitachi Energy
Member	Bruce	Forsyth	Cargill
Guest	Patrick	Foster	NextEra
Guest	Raymond	Frazier	Ameren
Guest	Yao	Fu	BC Hydro
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
Member	Rob	Ghosh	General Electric
Guest	Eduardo	Gomez Hennig	Siemens Energy
Guest	Luis	Gonzalez	Conduct Industries
Guest	Alireza	Gorzin	Black & Veatch
Guest	Brad	Greaves	Weidmann
Member	Bill	Griesacker	William Griesacker and Associates
Guest	Detlev	Gross	Power Diagnostix Consult GmbH
Member	Ismail	Guner	Hydro-Quebec
Member	Attila	Gyore	M&I Materials Ltd
Guest	Didier	Hamoir	Transformer Protector Corp
Guest	Kevin	Hampton	Siemens Energy
Member	Kyle	Heiden	EATON Corporation
Guest	Peter	Heinzig	Weidmann Electrical Technology
Guest	Florian	Hermann	Trench France
Guest	Ronald	Hernandez	Doble Engineering Co.
Member	Gary	Hoffman	Advanced Power Technologies
Member	Saramma	Hoffman	PPL Electric Utilities
Member	Ryan	Hogg	Bureau of Reclamation

Guest	Derek	Hollrah	Burns & McDonnell
Member	Philip	Hopkinson	HVOLT Inc.
Guest	Patrycia	Jarosz	IEEE SA
Guest	Marion	Jaroszewski	Delta Star Inc.
Guest	Nicholas	Jensen	Delta Star Inc.
Guest	Chanmin	Jeong	HD Hyundai
Member	John	John	Virginia Transformer Corp.
Guest	Christopher	Johnson	Oncor Electric Delivery
Guest	Kevin	Juchem	Hitachi Energy
Member	Kurt	Kaineder	Trench Austria
Guest	Jerzy	Kazmierczak	Hitachi Energy
Member	Sheldon	Kennedy	Sheldon P. Kennedy Engineering, PLLC
Guest	Stacey	Kessler	Ulteig
Guest	Yeamssoo	Kim	MEPPI
Member	Egon	Kirchenmayer	Siemens Energy
Member	Dmitriy	Klempner	Southern California Edison
Guest	Krzysztof	Kulasek	Delta Star Inc.
Guest	Petra	L'Abbe	Sherwin Williams
Guest	Donald	Lamontagne	Arizona Public Service Co.
Guest	Fernando	Leal	Prolec GE
Guest	Junho	Lee	Hyundai Electric
Guest	Angela	Leigl	EATON Corporation
Guest	Jinming	Li	BC Hydro
Secretary	Weijun	Li	Braintree Electric Light Dept.
Guest	Eric	Li	BC Hydro
Guest	Cesar	Lizcano	Shell USA, Inc.
Guest	Luc	Loiselle	Tetra Tech
Guest	Ricardo	Lopes	Efacec Energia, SA
Guest	Xose	Lopez-Fernandez	Universidade de Vigo
Guest	Tiffany	Lucas, P.E.	SPX Transformer Solutions, Inc.
Guest	Jose	Machain	Prolec GE
Guest	Jinesh	Malde	M&I Materials Inc.
Guest	Gabriel	Mamede	Siemens Energy
Member	Kumar	Mani	Duke Energy
Guest	Alberto	Martinez	WEG
Guest	James	McBride	JMX Services, Inc.
Member	Thomas	Melle	HIGHVOLT
Guest	Toni	Mellin	Vaisala
Guest	Yegor	Melo	BC Hydro
Guest	Filip	Mikulecky	Siemens Energy KPT

Member	Francis	Mills	Power Engineers, Inc.
Guest	Juliano	Montanha	Siemens Energy
Member	Emilio	Morales-Cruz	Qualitrol Company LLC
Guest	Marta	Munoz	Hitachi Energy
Guest	Emma	Murowinski	Delta-X Research Inc.
Member	David	Murray	Tennessee Valley Authority
Chair	Ryan	Musgrove	Oklahoma Gas & Electric
Guest	Anthony	Natale	HICO America
Guest	Kelly	Naunton	BC Hydro
Member	Kristopher	Neild	Megger
Guest	Mark	Newbill	Hitachi Energy
Guest	Yaw	Nyanteh	Hyosung HICO
Guest	Mirna	Olic	Siemens Energy KPT
Member	Anastasia	O'Malley	Consolidated Edison Co. of NY
Guest	Dwight	Parkinson	EATON Corporation
Guest	Monil	Patel	Pacific Gas & Electric
Guest	Harry	Pepe	Phenix Technologies, Inc.
Guest	Goran	Plisic	Siemens Energy KPT
Guest	Christoph	Ploetner	Siemens Energy
Guest	Dominic	Pollaro	NASS
Guest	Daniel	Posadas	Prolec SA DECV
Guest	Bertrand	Poulin	Hitachi Energy
Guest	Pedro	Puente	Prolec GE
Member	Ion	Radu	Hitachi Energy
Guest	Farnoosh	Rahmatian	NuGrid Power Corp
Guest	Timothy	Raymond	Electric Power Research Institute (EPRI)
Member	Scott	Reed	MVA
Guest	Sebastian	Rehkopf	Maschinenfabrik Reinhausen
Guest	Jonathan	Reimer	FortisBC
Guest	Michael	Richardson	Ameren
Guest	Tim	Rocque	Prolec GE Waukesha
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.
Guest	Garret	Sarkinen	Xcel Energy
Member	Daniel	Sauer	EATON Corporation

Member	Alan	Sbravati	Hitachi Energy
Member	Markus	Schiessl	SGB
Guest	Eric	Schleismann	Southern Company Services
Guest	Alfons	Schrammel	Siemens Energy
Member	Ewald	Schweiger	Siemens Energy
Guest	Harman	Sekhon	PTI Transformers
Member	Cihangir	Sen	Duke Energy
Member	Adam	Sewell	Quality Switch, Inc.
Member	Abdul Majid	Shaikh	Delta Star Inc.
Member	Stephen	Shull	BBC Electrical Services, Inc.
Guest	Andre	Simons	Cogent Power Inc.
Guest	Jonathan	Sinclair	Black & Veatch
Guest	Yong Tae	Sohn	Hyosung HICO
Member	William	Solano	Reinhausen Manufacturing Inc.
Guest	Markus	Soller	Power Diagnostix Systems
Member	Sanjib	Som	Pennsylvania Transformer
Guest	Mauricio	Soto	Hitachi Energy
Guest	Brian	Sparling	Kinectrics
Member	Fabian	Stacy	Hitachi Energy
Member	Brad	Staley	Leeward Energy
Member	Markus	Stank	Maschinenfabrik Reinhausen
Member	Kyle	Stechschulte	American Electric Power
Guest	Hampton	Steele	Tennessee Valley Authority
Guest	Andrew	Steineman	Delta Star Inc.
Guest	Christopher	Steineman	Hubbell/Meramec Inst.
Guest	Charles	Sweetser	OMICRON electronics Corp USA
Member	Craig	Swinderman	Mitsubishi Electric Power Products
Guest	Matthew	Sze	OMICRON electronics Corp USA
Guest	Sachin	Tade	PTI Transformers
Guest	Jonathan	Tan	Northern Transformer
Member	Troy	Tanaka	Burns & McDonnell
Guest	Marc	Taylor	JFE Shoji Power Canada Inc.
Guest	Ed	teNyenhuis	Hitachi Energy
Guest	Marko	Teofanovic	Ontario Power Generation
Guest	Andreas	Thiede	Highvolt
Guest	Scott	Thomas	Hitachi Energy
Member	Ryan	Thompson	Burns & McDonnell
Guest	Timothy	Tillery	Howard Industries
Member	Mark	Tostrud	Dynamic Ratings, Inc.
Guest	Bjorn	Vaagensmith	Idaho National Laboratory

Vice-Chair	Alwyn	Van Der Walt	Electrical Consultants, Inc.
Guest	Cole	Van Dreel	American Transmission Co.
Guest	John	Vandermaan	BC Hydro
Member	Ajith	Varghese	Prolec Energy
Member	Jason	Varnell	Doble Engineering Co.
Member	Rogerio	Verdolin	Verdolin Solutions Inc.
Guest	Karsten	Viereck	Maschinenfabrik Reinhausen
Guest	Dharam	Vir	Prolec GE
Member	Richard	vonGemmingen	Dominion Energy
Member	Pragnesh	Vyas	Sunbelt-Solomon
Guest	(Hugh) Mike	Waldrop	Memphis Light, Gas & Water
Member	David	Wallach	Duke Energy
Member	Joe	Watson	JD Watson and Associates Inc.
Guest	Joshua	Watson	NPPD
Member	Bruce	Webb	Knoxville Utilities Board
Guest	Matthew	Weisensee	PacifiCorp
Guest	Drew	Welton	Intellirent
Member	Daniel	Weyer	Monolith
Guest	Joe	White	Power Engineers
Guest	Christopher	Whitten	Hitachi Energy
Member	Trenton	Williams	Advanced Power Technologies
Guest	Deanna	Woods	Alliant Energy
Member	Jeffrey	Wright	Duquesne Light Co.
Guest	Fei	Yang	Hitachi Energy
Member	Joshua	Yun	Virginia Transformer Corp.
Member	Peter	Zhao	Hydro One
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
 - c. WG Revision of C57.116, GSU Transformers (Completed 2022 – no meeting)..... Weijun Li
 - d. WG Class 1E Transformer for Nuclear Power gen Std. 638 Craig Swinderman
 - e. WG C57.135, Guide for Phase shifting Transformers..... Ewald Schweiger
 - f. WG Revision of C57.143, Monitoring Guide (no meeting)..... Mike Spurlock
 - g. TF Std Requirement for Liquid-Immersed Power TR – C57.12.10..... Scott Digby
 - h. TF Guide for Evaluation & Reconditioning of Liquid Immersed TR C57.140..... Sanjib Som
 - i. WG Revision of C57.125, Failure Investigating and Reporting..... Hakan Sahin
 - j. WG C57.157, Guide for Life test of Switch Contacts..... Adam Sewell
 - k. WG C57.170, Condition Assessment Guide Kumar Mani
 - l. WG Revision of C57.150, Transportation Guide (No meeting)..... Greg Anderson
 - m. WG C57.17, Standard Requirements for Arc Furnace Transformers..... Dom Corsi
 - n. WG C57.107, Transformer Volts per Hertz (No meeting)..... Joe Watson
 - o. TF Liquid Immersed Phase-Shifting Transformers 60076-57-1202..... Ewald Schweiger
 - p. TF C57.93, Installation and Maintenance Guide..... Scott Reed
 - q. Liaison to PC57.93a – Installation and Maintenance Guide..... Scott Reed
 - r. WG C57.153, Guide for Paralleling Transformers..... Mark Tostrud
 - s. Liaison to Entity PAR C57.145 – Digital Twin for Power Equipment (DTPE)..... Brian Sparling
 - t. Liaison to Entity PAR Guide for PT for Low-Frequency Power Transmission..... Sheldon Kennedy
8. Old business
 - a. Transformer Seismic Concerns – IEEE 693 “Amendment” – Eric Weatherbee
 - b. Discussion on the creation of a new IOT Document – Sanjib Som/Hemchandra Shertukde
9. New business
 - a. IEEE 693 Recommended Practice for Seismic Design of Substations – Substations Standards Committee – Need volunteers, especially users and transformer manufacturers.
10. Adjournment

Title: WG Guide for Tank Rupture Mitigation PC57.156

Time: 9:30 AM- 10:45 AM, Monday, March 11, 2024

Place: Hyatt Regency Vancouver, Vancouver, BC, Canada

Chair: Peter Zhao

Vice-Chair: Samuel Brodeur

Secretary: Hakim Dulac

1. Call to Order at 9:30 AM

- a. Chair's Remarks
- b. IEEE-SA Policies
 - i. Call for Essential Patents slide presented. There were no patent claims made.
 - ii. Copyright policies slide presented.

2. Welcome and Introduction

- a. Introduction
- b. Roster circulation
- c. Quorum Check

WG active member	Member required for Quorum (> 50%)	Member present	Total attendance (Guest and member)	Quorum established
34	18	13	55	No

3. Approval of Meeting Minutes

- a. Motion to accept minutes of the fall 2023 meeting (Kansas City).
 - i. Moved: Martin Munoz
 - ii. Seconded: David Murray
 - iii. No objections from the floor. No quorum, so the Fall 2023 minutes remain unapproved.

4. Technical Topics

- a. Review and Discussion of Comments and Proposed Changes.
 - i. Comments # 1 to 7 were discussed.
- b. Further actions and assignments:
 - i. Discussion on the possible merger of section 4.1.2 (*4.2.2) and 4.1.3 (*4.2.3). Samuel Brodeur, Sanjib Som, and Enrique Betancourt volunteered to work on a proposal and will present it at the next meeting.
*Section number on the published standard document C57.156-2016.
 - ii. Marc Foata will revise 5.2 and come with a proposal for the next meeting.
 - iii. Discussion on section 5.3. Marc Foata, Chris Johnson, Ryan Musgrove and Didier Hamoir volunteered to come with a proposal for the next meeting. A comment was made to replace "thousands" saves by "numerous" saves in the PRD section.
 - iv. Figure 1 is the flow rate under air quoted as a reference, and Emilio Morales to check if the flow rate under insulating oil is available.

5. New Business - None

6. Meeting adjourned at 10:45AM

7. Next Meeting

- a. St. Louis, Missouri, March 2024

Reported by:

Hakim Dulac, P.Eng.
WG Secretary
Attendance:

Name	Affiliation	Member (yes, no or requested)
Anastasia O'Malley	Con Edison NY	yes
Andy Steineman	Delta Star	no
Christopher Johnson	Oncor	Yes
Craig Colopy	Retired from Eaton	no
Craig Swinderman	MEPPI	no
David Murray	TVA	yes
Derek Hollrah	Burns&McDonnell	requested
Didier Hamoir	Transformer Protector CORP.	requested
Emilio Morales Cruz	Qualitrol	requested
Enrique Betancourt	Prolec-GE	no
Eric Davis		no
Eric Schleismann	Southern Company	no
Filip Mikulecky	Siemens Energy KPT	requested
Francis Mills	Power Engineers	requested
Hakim Dulac	APT	Secretary
Hector Garza	Orto de Mexico	no
Ismael Guner	Hydro Quebec	no
James Gardner	Prolec-GE Waukesha	no
Jean Philippe Gagnon	Qualitrol	no
Jeff Gragert	XCEL Energy	no
Jerzy Kazmierczak	Hitachi Energy	requested
Joe Nims	Allen& Hoshall	no
Joe Watson	JDWatson & Associates	yes
Jon Bender	WEGAI Research LLC	no
Jose Luis Machain	Prolec GE	requested
Joshua Yun	Virginia Transformer	yes
Junho Lee	Hyundai Electric	requested
Kelly Naunton	BC Hydro	no
Kevin Juchem	Hitachi Energy	no
Krzysztof Kulasek	Delta Star	no
Luc Loiselle	Tetra Tech	requested
Marc Foata	MR	yes
Martin Munoz	Orto de Mexico	requested
Michal Swiatkowski	Hitachi Energy	requested
Mike Waldrop	MLGKL	no
Mirna Olic	Koncar Power Transformers	no

Omar Mendez	Prolec	no
Patrycja Jarosz	IEEE SA	no
Peter Zhao	Hydro One	Chair
Rafal Kowalski	Hitachi Energy	no
Ricardo Castro Lores	Efacec Transformers	no
Richard Vongemminen	Dominion Energy	no
Robert Middleton	RHM International	yes
Robert Vary	Reinhausen Manufacturng	no
Ryan Musgrove	Oklahoma Gas & Electric	no
Samson Debass	EPRI	yes
Samuel Brodeur	Hitachi Energy	Vice-Chair
Samuel Lewis	Hitachi Energy	no
Sanford Fong	Georgia Power	no
Sanjib Som	PTT, LLC	yes
Sebastian Rehkopf	MR	no
Sergiusz Kapka	Hitachi Energy	no
Shankar Subramany	Kema labs	requested
Stacey Kessler	Ulteig Engineers	no
Yegor Melo	BC Hydro	no

Document #: **638**

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

Chair: Craig Swinderman
Secretary:

Vice Chair
Percent Complete: 10%

Meeting Date: Monday, March 11, 2024 Time: 11:00 am to 12:15 pm.
Location: Hyatt Regency; Vancouver, BC, Canada – Regency B room.

Current draft being worked on: 1.0 Dated: February 2024
PAR Expiration date: December 31, 2027

Attendance: Members:	6 of 9
Guests:	24
Guests requesting membership:	3
Total*:	<u>30</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 9 members were in attendance of the meeting so quorum was achieved.
- 6. Approval of the Meeting Minutes from Kansas City Fall 2023 and Agenda for Spring 2024:
 - a. Approval of the Fall 2023 meeting unapproved minutes
 - i. Hemchandra Shertukde motioned to approve
 - ii. Robert Allison seconded
 - iii. Motion was carried unanimously with no objections or abstentions. – Approved.
 - b. Approval of the Spring 2024 agenda
 - i. Hemchandra Shertukde motioned to approve
 - ii. Robert Allison 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.
- 8. Old work:

Discussed scope and purpose to IEEE 638-2013, 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 2013, and reviews have been done to target changes that have been made by these revisions.

More than 40 changes identified from 323-2003 document to the 2016 revision. Much of the wording matched, but needed to have further detailed reviews of specific sections. These reviews are in progress. Chair called for other volunteers to assist with reviews. 323-2003 will be due for re-issue by December 2026, so we need to be aware of those potential changes.

Chair showed changes in summary between 323-2003 version compared to 2016 revision. Specifically into new sections 7.2.6.3, 7.2.6.4, and 7.4.1.10 is a new section on accident conditions.

Initial review topics of IEEE/IEC 60980-344 2020 was reviewed. Shared notes and comments from Robert Allison.

John Pender added as a seismologist that there is no significance of movements beyond 30, or even 20 Hz, so this range change may not have a significant or major impact to the overall revision of 638.

Chair continued with review of new chapters and additions to the 344 standard for the 2020 version, noting that there appear to be significant changes included in the 2020 version, which the corresponding material will require updating in 638.

Chair produced and displayed outline for P638 D1.

Request made to include GMD events to correlate with earthquakes in this review.

Chari noted Sections 5 (Approaches to Transformer Qualifications) and 6 (Design Qualification Procedure) need to be reviewed for updating based on changes to 323 and 344.

Chair discussed request for deeper review and shared access to draft document.

9. New Work:

Dominic Pollaro and Robert Allison volunteered as taking leadership on revisions to section 5 and section 6 of P638 draft (respectively).

Chair plans to have revisions from these included in the next updated draft of P638 to be present for review at the next meeting.

10. Next meeting: October 28, 2024 at the Fall 2024 Transformers Committee Meeting scheduled for October 27-31, 2024 St. Louis, MO, USA.
11. Close of meeting:
The meeting adjourned at 12:00 pm

Submitted by: Craig Swinderman Date: March 12, 2024

List of Meeting Attendees at Spring '24 Meeting, including affiliation & voting member status.

<i>Name</i>	<i>Company</i>	<i>Role</i>
Robert Allison	Dominion Energy	Member
Javier Arteaga	Hitachi Energy	Member
Elizabeth Bray	Southern Company	Member
Alfredo Carrizales	Prolec GE	Guest
Yuan Grace	Hitachi Energy	Guest
Robert Middleton	RHM International	Guest
Ryan Musgrove	Oklahoma Gas & Electric	Member

Name	Company	Role
Hem Shertukde	University of Hartford	Member
Craig Swinderman	Mitsubishi Electric Power Products, Inc.	Member
Jon Bender	WE Gundy and Associates, Inc.	Guest
Yeounsoo Kim	Mitsubishi Electric Power Products, Inc.	Guest
Marnie Roussell	Entergy	Guest
Matthew Sze	Omicron Energy	Guest
Oscar Castanou	Siemens Energy	Guest
Eric Schleismann	Southern Company	Guest
Jason Beaudoin	Weidmann	Guest
Kevin Hampton	Siemens Energy	Guest
Stefan Lembacher	Siemens Energy	Guest
Aron Sextan	Kinectrics	Guest
Arno Dumke	Brackhaus Measurements	Guest
Duane Brown	Measurements International	Guest
Corey Hanson	Flex-Core	Guest
Zach Gagne	IFD Technologies	Guest

<i>Name</i>	<i>Company</i>	<i>Role</i>
David Murray	TVA	Guest
Dominic Pollaro	Voltyx	Guest
Paulo Bautista	Enmax	Guest
Kayland Adams	Prolec GE Waukesha	Guest
Tim Rocque	Prolec GE	Guest
Kelly Naunton	BC Hydro	Guest
Bryan Deb	Siemens Energy	Guest
Didier Hamoir	Transformer Protector Corp.	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 (PDT) on Tuesday March 12th, 2024 with Welcome & Chair's remarks
2. Attendance: 50
Members: 13
Guests: 37
3. Call for essential patents
 - a) 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
 - b) 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
 - o A quorum was achieved
Total number of members is 24 requiring 13 members for quorum.
First member count had only 12 in attendance. Decision was to have brief review of approved PAR and allow a few minutes for late arrivals. Recount was made and 13 members were present establishing quorum.
6. Approval of agenda
 - a) Motion to approve agenda was made by Eric Davis and seconded by Kurt Kainerder.
No discussion or objections were made.
 - b) Motion was carried unanimously with no objections or abstentions.
7. Approval of meeting minutes of the previous Fall 2023 in-person meeting
 - a) Motion to approve agenda was made by Eric Davis and seconded by Kurt Kainerder.
No discussion or objections were made.
 - b) Motion was carried unanimously with no objections or abstentions.
8. Discussion of PAR and dual logo. The Phase-Shifting (PST) Guide is now a dual logo IEEE/IEC collaboration was updated.
 - a) Dual logo document will have the document number IEC/IEEE 60076-57-135
 - 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) Liaison for C37.245 is Michael Thompson. Mr. Thompson was not able to be present at today's meeting.
 - d) IEC does not allow the use of the word Guide. The PAR will have to be amended to change the word Guide to a term that is acceptable to IEC.
 - i. Discussion on this indicated that IEC will accept Guideline, however IEEE may not recognize Guidelines.

- ii. Craig Colopy pointed out that a dual logo document for tap changers was recently developed and has the title Guidelines which was accepted by both IEC and IEEE.
- 9) IEC/IEEE 60076-57-135 presented by Kevin Juchem and Ewald Schweiger
 - a) Accounting of PST guide and protection guide needs to be done for conformity of descriptions etc.
 - b) Volunteers for section comments are needed.
 - c) Comparison and suggestions for finalization are needed.
 - d) Clauses 1-6
 - i. Clause 3: The alignment between IEC and IEEE has been successfully established.
 - ii. Clause 5: Subclause 5.4. Protection requires a review.
 - iii. Clause 6: Sebastian Rehkopf and Matthias Spaeth will review rating data.
 - e) Clauses 7 -12
 - i. Clause 7: Construction Rich von Gemmingen will review.
 - ii. Clause 9: Control systems. General question if this section should remain in document.
 - iii. Clause 10 – 11: Luc Dorpmanns and Jos Veens.
 - iv. Clause 12: Bid document checklist needs review and comment.
 - v. Clauses 4,5,6 and 12: Received very valuable inputs from Joe Watson
- 10) Clause 3 presentation by Luc Dorpmanns
 - a) Definitions for windings (Excitation and exciting and series): Suggestion is to stick with standard as is
 - b) Discussion on two types of PST, single core section 3.11 and two core section 3.12
 - i. Luc summed up the 4 types of PST configurations by color coding to explain examples.
 - ii. One suggestion is to use this presentation to explain the examples already in guide.
 - iii. Some diagrams are not in standard and suggest adding these diagrams for the 2 core.
 - (1) Example D regulating, series, HV winding and LV winding.
 - (2) Example F two core auto transformer
 - iv. Other Suggestions
 - (1) add more diagrams with clearly identified winding names,
 - 1. clarify purpose of windings in text.
 - (2) add more vector diagrams.
 - v. Kevin Juchem commented that some of this might belong in the standard. If standard is open for revision this should be referred to the standard.
 - vi. Kurt Kaineder also agreed this should be in the standard.
 - vii. Group meeting for standard review is scheduled for Tuesday 3/12 at 1:45
- 11) Group number 6 presentation from Sebastian Rehkopf with contributions from Matthias Spaeth
 - a) From manufacturing perspective suggest adding rated impedance to definitions
 - b) Kevin Juchem filling in for Matthias Spaeth presented his comments.
 - i. Terminal markings in guide are not same as in standard.
 - ii. Angle is referred to as “delta” in C37.245 and as “alpha” in C57.135 should C57.135 adopt same nomenclature as in C37.245.
 - iii. Several examples designate S (source), L (load) and clockwise vs. counterclockwise. It would be good to know why. Should discuss with Michael Thompson from the C37.245 perspective.
- 12) Joe Watson provided list of wording for multiple clauses.
- 13) The chair called for volunteers to work on Guide and participants to reach out for volunteers. Plan is to have one or more virtual meetings before St. Louis meeting in Fall 2024.
- 14) The chair opened the floor for opinions and next steps.

- a) Joe Watson asked if we were dropping controls sections? As this is not decided Joe made case to keep it specifically for protection from exceeding retard capabilities etc.
 - b) Kevin Juchem asked as this is a guide, how do we avoid overloading the standard? Commented that he does not think section 9.3 is needed.
 - c) Joe Watson agreed if test code is in another standard, should just refer to other standard.
 - d) Joe Watson/ Ewald Schweiger suggest appointing a protective study with C37.245
 - e) No other discussion
- 15) The chair requested for interim meetings that members or guests who want to lead a TF for a chapter reviews/edits reach out to the chair or secretary. The Guide [C57.135-2011](#) in Word Format is available (post on PTSC Internet site)
- a) Luc Dorpmanns volunteered for definitions in sections 3, 10, and 11.
 - b) Joe Watson asked if we are changing from guide to guidelines will we have to change “shall’s” to “may” or “can” etc.
 - c) Gary Hoffman stated that IEEE only has PAR for Guides, Recommended Practices, and Standards but do not have PAR for Guidelines and this may be difficult to get changed without lots of explanations.
 - d) Craig Colopy pointed out that a Dual Logo for Tap Changing was recently completed as a Guideline so a precedent exists.
 - e) Gary Hoffman asked if guideline has “should” and “mays” and minimized “shalls”
- 16) The chair opened floor for discussions on old business.
- o No old business was brought up.
- 17) The chair opened floor for discussions on new business.
- o No new business was brought up.
- 18) The chair promoted upcoming new study group *60076-57-1202 Liquid immersed Phase-Shifting Transformers* IEC/IEEE – PST Standard meeting for Tuesday, March 12th, 2024.
- 19) The meeting was adjourned at 2:30 PM
- 20) Next meetings (planned):
- 2. Virtual meeting – to be scheduled before October 2024 in St Louis, MO
 - In-person meeting – October 28 or 29, 2024 in St Louis, MO

Respectfully submitted,
Ewald Schweiger – WG Group Chair
Richard von Gemmingen – WG Secretary

List of attendees for this meeting:

Name	Last name	First name	Company / Affiliation	Status
Sean Barker	Barker	Sean	Hitachi Energy	G
Jason Beaudoin	Beaudoin	Jason	Weidmann Electrical Technology	G
Jon Bender	Bender	Jon	W.E. Gundy & Associates	G
Jean-Noel Berube	Berube	Jean-Noel	Rugged Monitoring	G
Oscar Castanon Barragan	Castanon Barragan	Oscar	Siemens Energy Canada LTD	G
Vivian Chan	Chan	Vivian	Hitachi Energy	G
Craig Colopy	Colopy	Craig	Retired	G

Name	Last name	First name	Company / Affiliation	Status
Marcos Czernorucki	Czernorucki	Marcos	Hitachi Energy	G
Eric Davis	Davis	Eric	Consultant	M
Luc Dorpmanns	Dorpmanns	Luc	Royal SMIT Transformers B.V.	G
Eric Elson	Elson	Eric	SDGE	G
Ken Fedor	Fedor	Ken	SGB-Smit Group	G
Jean Philippe Gagnon	Gagnon	Jean Philippe	Qualitrol	G
Eduardo Gomez-Hennig	Gomez-Hennig	Eduardo	Siemens Energy	G
Didier Hamoir	Hamoir	Didier	Transformer Protector Corp	G
Kyle Heiden	Heiden	Kyle	EATON Corporation	G
Peter Heinzig	Heinzig	Peter	Weidmann Electrical Technology	G
Gary Hoffman	Hoffman	Gary	Advanced Power Technologies	G
Saramma Hoffman	Hoffman	Saramma	PPL	G
Patrycia Jarosz	Jarosz	Patrycia	IEEE SA	G
Kevin Juchem	Juchem	Kevin	Hitachi Energy	M
Kurt Kaineder	Kaineder	Kurt	Trench Austria	M
Stefan Lembacher	Lembacher	Stefan	Siemens Energy	G
Ricardo Lopes	Lopes	Ricardo	Efacec Transformers	G
Omar Mendez Zamora	Mendez Zamora	Omar	Prolec GE	M
Ryan Musgrove	Musgrove	Ryan	OG+E	M
Kelly Naunton	Naunton	Kelly	BC Hydro	G
Kris Neild	Neild	Kris	Megger	G
Anastasia O'Malley	O'Malley	Anastasia	Con Edison	G
Parminder Panesar	Panesar	Parminder	Virginia Transformer Corporation	G
Sebastian Rehkopf	Rehkopf	Sebastian	Maschinenfabrik Reinhausen GmbH	M
Alfons Schrammel	Schrammel	Alfons	Siemens Energy	M
Ewald Schweiger	Schweiger	Ewald	Siemens Energy	M
Hemecaosdra Shertukde	Shertukde	Hemecaosdra	University of Hartford	G
Markus Stank	Stank	Markus	Maschinenfabrik Reinhausen	M
Kyle D Stechschulte	Stechschulte	Kyle D	AEP	M
Shankar Subramany	Subramany	Shankar	KEMA Labs	G
Craig Swinderman	Swinderman	Craig	Mitsubishi Electric	G
Scott Thomas	Thomas	Scott	Hitachi Energy	G
Robert Vary	Vary	Robert	Reinhausen Manufacturing Inc.	G
Karsten Viereck	Viereck	Karsten	Maschinenfabrik Reinhausen	G
Dharam Vir	Vir	Dharam	Prolec GE Waukesha	G
Richard von Gemmingen	von Gemmingen	Richard	Dominion Energy	M
John Wagner	Wagner	John	American Electric Power	G
Alan Washburn	Washburn	Alan	Burns & McDonnell	G
Joe Watson	Watson	Joe	JD Watson and Associates Inc.	M
Matthew Weisensee	Weisensee	Matthew	Pacificorp	G
Joe White	White	Joe	Power Engineers	G
Trenton Williams	Williams	Trenton	Advanced Power Technologies	M
Guang Yuan	Yuan	Guang	Hitachi Energy	G

- **Guests requesting membership**
Of the 37 guests, there were 7 new membership requests. Five of the requesters did not meet the requirements for membership at this time.
Two of the requesters (Luc Dorpmanns and Saramma Hoffman), were granted membership after the meeting.

TF for the Revision of C57.12.10
IEEE Standard Requirements for Liquid-Immersed Power Transformers

3:15 p.m. – 4:30 p.m. Pacific Time, Monday, March 11, 2024

Hyatt Regency Vancouver, Vancouver, CA

Unapproved Meeting Minutes

TF Chair Scott Digby called the meeting to order at 3:15 p.m., Monday, March 11, 2024. As this was the first meeting of this new TF the other officer roles had not yet been established or filled.

Total Attendance	64
Attendees Requesting Membership	23 (membership granted thus quorum achieved)
Guests in Attendance	41
Guests Requesting Membership	N/A (first meeting of this activity)

The meeting attendance list is included at the end of these minutes.

The TF Chair reviewed the group’s task statement, with the directive from the SC being to determine how to move forward with a PAR between Sp-24 and Fa-24 with the objective to meet as WG in Fa-2024, so the task being to “Draft a Project Authorization Request (PAR) for consideration by the Sponsor.” It was noted that the active document was published in 2017 so expires 12/31/2027 (~3.5 years from now).

A proposed meeting agenda was presented by the TF Chair, with there being no comments so the meeting proceeded accordingly.

The TF membership rules per the P&P Manual were reviewed. 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 TF Chair made the requisite Call for Patents and there were none noted by those present. The TF Chair presented the IEEE-SA Copyright Policy slides as well as the IEEE-SA activity participant behavior slides.

The TF Chair provided a high-level review of the timeline of the prior revision cycle, which began as a WG in Spring-2015, with the balloting process concluding in 2017 thus the latest document having a 2017 publication date.

The TF Chair presented the Existing Title and Scope for discussion. There was consensus that the existing document Title does not need any revision. Regarding the existing Scope, there was some general discussion that concluded with the consensus that:

- Reference specifically to autotransformers is not necessary since they are inherently in scope because they are not listed in the exclusion list.
- Text referring to being “remotely or integrally associated with either primary switchgear or substations” be removed since did not seem to add any actual context or value.
- Reference to step-down/step-up removed since is not specifically needed within the scope.
- Removing reference to “induction voltage” regulators, as it was noted as being an antiquated term.

It was noted that the current, published document includes a Purpose section, however, the content of that section would more appropriately be considered a “Word Usage” clause under the standard IEEE document template. As such it was decided that the PAR documentation will not include a Purpose statement/section.

At the conclusion of the discussion, A Motion was made by Joe Watson and Seconded by Trent Williams to approve recommending to the SC to proceed with PAR submittal with the Title and Scope as stated below:

Title:

IEEE Standard Requirements for Liquid-Immersed Power Transformers

Scope:

This voluntary consensus standard sets forth the requirements for power transformer application. This standard is intended to be used as a basis for performance, interchangeability, and safety of the equipment covered, and to assist in the proper selection of such equipment.

This document is a product standard that covers certain electrical, dimensional, and mechanical characteristics of 50 Hz and 60 Hz liquid-immersed power transformers base rated as follows: 833 kVA and above single-phase, 750 kVA and above three-phase.

This standard applies to all liquid-immersed power transformers that do not belong to the following types of apparatus:

- a) Instrument transformers*
- b) Step voltage regulators*
- c) Arc-furnace transformers*
- d) Rectifier transformers*
- e) Specialty transformers*
- f) Grounding transformers*
- g) Mobile transformers*
- h) Mine transformers*

The motion was approved unanimously. The TF Chair indicated that he would make the requisite Motion at the upcoming Power Transformers SC meeting to obtain approval of the SC to proceed with PAR submittal as recommended by the TF.

This group would intend to meet during the Fall-2024 Transformer Committee meetings in St. Louis as a WG if the PAR is approved by that time.

The meeting was adjourned.

Respectfully Submitted,
Scott Digby, TF Chair

First Name	Last Name	Company Name	Requested and Granted Membership?
Tom	Aikens	Delta Star	
Daniel	Aleksandro...	Hitachi Energy	
Gilles	Bargone	Fiso	Y
Sean	Barker	Hitachi Energy	
Jean-Noel	Berube	Rugged Monitoring	
Dan	Blaydon	Baltimore Gas & Electric	
William	Boettger	Boettger Transformer Consulting LLC	Y
Samuel	Brodeur	Hitachi Energy	
Juan Alfredo	Carrizalos	Prolec-GE	
Anthony	Coker	Midel	
Craig	Colopy	EATON Corporation	
Marcos	Czernorucki	Hitachi Energy	
Gabriel	Delgado	Invenergy	Y
Hamoir	Didier	Transformer Protector Corp	Y
Scott	Digby	Duke Energy	Y
Hakim	Dulac	Advanced Power Technologies	Y
Janko	Dzodon	Koncar D&ST	
Marc	Foata	Reinhausen	Y
Jean-Philippe	Gagnon	Qualitrol	
Rob	Ghosh	General Electric	Y
Luis	Gonzalez	Conduct Industries	Y
Attila	Gyore	Midel & Midel Fluids	
Juan Carlos	Hernandez-	GT-NEETRAC	
Gary	Hoffman	Advanced Power Technologies	Y
Saramma	Hoffman	PPL	Y
Marion	Jaroszewski	Delta Star Inc.	
Chanmin	Jeong	HD Hyundai Electric	
John	John	Virginia Transformer Corp.	Y
Kevin	Juchem	Hitachi Energy	
Stacey	Kessler	ULTEIG Engineer	Y
Yeounsoo	Kim	MEPPI	
Dmitry	Klempner	SCE	Y
Mitija	Koprivnjak	Koncar D&ST	
Anton	Koshel	Delta Star Inc.	
Rafal	Kowalski	Hitachi Energy	

Junho	Lee	HD Hyundai Electric	
Angela	Leigl	Eaton	
Eric	Li	BC Hydro	
Jinming	Li	BC Hydro	
Jose Luis	Machain	Prolec-GE	
Brian	McCarrick	Virginia Transformer Corp	
Ryan	Musgrove	Oklahoma Gas & Electric	Y
Anthony	Natale	HICO America	Y
Mirna	Olic	Siemens Energy KPT	
Anastasia	O'Malley	Consolidated Edison Co. of NY	
Perry	Reeder	GE	
Michael	Richardson	Ameren	Y
Tim	Rocque	Prolec-GE	Y
Rodrigo	Ronchi	WEG-Voltran	Y
Garrett	SarKinen	Xcel Energy	
Markus	Stank	Reinhausen	
Andrew	Steineman	Delta Star Inc.	
Chris	Steineman	Meremec	
Michal	Swiatkowski	Hitachi Energy	Y
Craig	Swinderman	MEPPI	
Scott	Thomas	Hitachi Energy	
Risto	Trifunoski	Trench Group	
Richard	vonGemmingen	Dominion Energy	
Alan	Washburn	Burns & McDonnell	
Joe	Watson	JD Watson and Associates Inc.	Y
Matthew	Webb	GE Vernova	Y
Trenton	Williams	Advanced Power Technologies	Y
Patrick	Yan	GE Grid	
Peter	Zhao	Hydro One	Y

**TFC57.140 IEEE Guide for Evaluation and Reconditioning of Liquid Immersed Power
Transformers**

Spring 2024 IEEE Transformers Committee Meeting

Vancouver, B.C., Canada

11 March 2024

UNAPPROVED MINUTES

Chair: Sanjib Som – PTT

Vice-chair: Marcos Ferreira – Quanta Technology

Secretary: Traci Hopkins – H2scan

Meeting Start Time: 1515

SUMMARY:

The chair opened the meeting with an introduction and attendance. There were only 2 members present that attended the virtual meeting 26 FEB 2024. The sign-in sheet was distributed and there was a request for a volunteer to fill the open Secretary position. Traci Hopkins (H2scan) volunteered and was unanimously approved as Secretary of the Task Force.

The chair then reviewed the agenda, required IEEE policies and opened discussions by reviewing Title, Scope and Purpose. Discussion began regarding the Scope and if it needed to be changed. There were concerns that current scope did not accurately reflect what was in the guide and there was a comment that we should ask ourselves “What do we want from this guide that is not present in others?”

Then discussions turned to concerns that the C57.140 and the C57.170 were duplicating information. Brian Sparling (Kinetrics) explained the C57.170 helps the user to know what needs attention by assigning a grade to its condition and the C57.140 provides the user with the How to do it. After much discussion on compare and contrast of C57.140 to C57.170 it was determined that Marcus Ferreira to do assessment of the two standards, John Sinclair – Black & Veatch will help.

There was then a review of the Vancouver meeting attendees that desired membership and they were granted. **Added new members to achieve quorum. 20 members total with 12 present. We have Quorum.**

There was then a motion by Ed teNyenhuus (Hitachi Energy) to keep the title “as is, no changes.” It was seconded by Tim Raymond (EPRI). After discussion and a friendly amendment to the motion it was accepted that the motion be modified to change the title to: IEEE Guide for Evaluation and Life Extension of Liquid Immersed Power Transformers.

Voting results: 7 for the motion, 5 against, No abstentions.

The Task Force will meet again in St. Louis at the Fall 2024 meeting.

The meeting was adjourned at 1634. Below is a list of attendees for the Vancouver meeting.

Attendee List for Spring 2024 Meeting:

Role	First Name	Last Name	Company
Secretary	Traci	Hopkins	H2scan
Member	Timothy C.	Raymond	EPRI
Chair	Sanjib	Som	PTT
Vice-chair	Marcos	Ferreira	Quanta Technologies
Member	Luiz	Cheim	Hitachi Energy
Guest	Alan	Sbravati	Hitachi Energy
Member	Scott	Reed	MVA
Member	Ed	teNyenhuis	Hitachi Energy
Guest	Steven	Small	BC Hydro
Guest	Don	Lamontague	Arizona Public Service
Guest	Derek	Hollrah	Burns & McDonnell
Guest	Elizabeth	Bray	Southern Company
Guest	Cory	Hanson	Flex-core
Guest	Deanna	Woods	ATC
Guest	Brian	McBride	Cargill
Guest	Ryan	Jonak	PGN
Guest	Jinesh	Malde	MIDEL
Guest	Brad	Greaves	Weidmann Group
Guest	Robert	Vray	Reinhausen
Member	Michael	Saad	Hitachi Energy
Guest	Kumar	Mani	Duke Energy
Guest	Sanket	Bolar	Oncor
Guest	Lorne	Gara	Shermco
Guest	Mike	Shannon	RSA Magnet Wire
Guest	Guang	Yuan	Hitachi Energy
Guest	Cesar	Lizcano	Shell
Member	Jeremiah	Bradshaw	Bureau of Reclamation
Member	Joe	White	Power Engineers
Member	Emilio	Morales Cruz	Qualitrol
Member	Brian	Sparling	Kinetrics
Guest	James	Gardner	Prolec-GE Waukesha
Guest	Tiffany	Lucas	PROLEC
Guest	Evgenii	Ermakov	Hitachi Energy
Guest	Jeffrey	Wright	Duquesne Light

Guest	Quamar	Jutt	Kruger Products
Guest	Shuhen	Xu	FMGlobal
Guest	John	Sinclair	Black & Veatch

**37 TOTAL
ATTENDEES
25 GUESTS
12 MEMBERS**

Introduction and Attendance:

Quorum was not achieved, only the chair and Traci Hopkins (H2scan) were in attendance since the membership list was created at 1st meeting (virtual: 26 FEB 2024). *See below for original member list.*

List from First meeting (Virtual: 26 FEB 2024)

Role	First Name	Last Name	Company
Member	Jeff	Benach	Megger
Member	Jesse	Duffy	Nashville Electric Service
Guest	Ryan	Hogg	Bureau of Reclamation
Secretary	Traci	Hopkins	H2scan
Member	Zan	Kiparizoski	Howard Industries
Guest-C	Peter	Kleine	E CIV USARMY CENWP (USA)
Member	Ryan	Musgrove	Oklahoma Gas and Electric
Member	Timothy C.	Raymond	EPRI
Chair	Sanjib	Som	PTT
Member	Brad	Staley	Leeward Energy
Member	Shankar	Subramany	KEMA, Netherland
Member	Pragnesh	Vyas	Sunbelt Solomon
Member	Kris	Zibert	ALLGEIER, MARTIN and ASSOCIATES, INC.

The chair asked for a volunteer to fill the Secretary role, Traci Hopkins (H2scan) volunteered, and was unanimously elected as secretary since this is the first ever in person meeting for this group.

As this was the first in-person meeting of the Task Force the chair reviewed the agenda and required IEEE policies. The Vice-chair distributed the sign-in sheet.

The chair then began review of the Title, Scope and Purpose of C57.140 **IEEE Guide for Evaluation and Reconditioning of Liquid Immersed Power Transformers.**

Discussion of the title and scope:

Scott Reed (MVA) – the current scope talks about reclamation, but there is very little in the guide on reclamation. We have C57.637. We may want to pare down the language to reflect what is actually covered in the guide. DGA – we have C57.104 so we don't need to overlap.

Luiz Cheim (Hitachi) – should we instead, ask our selves what we want from the guide. What is the need that is missing in the other guides and standards that are not covered.

Alan Sbravati (Hitachi) – there is an evaluation criteria to perform reconditioning - C57.166

Chair (Sanjib Som – PTT) – reminded attendees during the 1st meeting (virtual: 26 FEB 2024), there was an issue with the word “Evaluation” in the title

Luiz Cheim (Hitachi) – suggested “Evaluation” should be removed from title...this is maybe reconditioning.

There was mention of the C57.170 Guide and if we were duplicating what is in this guide.

Discussion of this concern:

Chair – commented to the group the C57.170 is the assessment.

Brian Sparling (Kinectrics) - involved in previous revision of C57.140, also involved in C57.170 with Kumar Mani, also in CIGRE assessment guide. The purpose of C57.140 - how to identify candidates for replacement or renewal, not to give the criteria for reconditioning. Evaluation – what units deserve further evaluation. Purpose of 170. Before you touch it. #1 is it for refurbishment, replacement, whatever. Not how to bring it back to recondition. We have to define evaluation.

Tim Reymond (EPRI) – I took C57.170 and did a key word search for “Recondition.” One section refers the reader to this document. When you identify a candidate, you have to evaluate if it's “worth” doing all this stuff on a transformer. Economic evaluation has a role. You can do all this stuff, but is there paper life left to be worth replacing bushings, replace oil, etc.?

Chair – we should not get into the cost in this document. IEEE scope is technical only, not cost.

Jinesh Malde (MIDEL) – why isn't retrofill included? A lot of the work done in retrofilling is used to extend the life of the transformer. Add retrofilling to the scope of the purpose.

UNKNOWN – Retrofilling is mentioned in Annex

Ed teNyenhuys (Hitachi) – give the users tools to evaluate the transformers and it's up to the user to decide what they want to do based on cost or whatever. These are just evaluation tools for a user.

Vice-chair (Marcos Ferreira – Quanta Technology) – what I see that if a transformer is beyond repair then it should be replaced. This guide is to extend the life of the transformer. To do things that will extend the life of the transformer.

Joe White (Power Engineering) – if I am going to use this guide, what do I do first? Do I go here first or to C57.170 first?

Chair – our goal is to help the user use this to diagnose if they need to go to C57.170 next.

Brian Sparling (Kinetrics) – this is not a diagnostic tool. It's a report card that allows the user to understand the condition of the transformer. This is a piece by piece evaluation – like the condition of the tap changer, or the individual parts. This document helps user identify the grade “what is making it an F”. C57.170 is to say “what is the grade” of the equipment.

Shuhen Xu (FMGlobal) – will this document also address when to replace a bushing (component) or the whole transformer?

Chair – yes, this is included.

Michael Saad (Hitachi) – do we have to list the piece of auxiliary equipment? Can we just say “auxiliary equipment” in the scope.

Brian Sparling (Kinetrics) – we need to add cooling system to the scope

Michael Saad (Hitachi) – I want to remove “such as bushings, DETC, LTC, etc” out and just have “auxiliary equipment”

Kumar Mani (Duke) – when you evaluate the xfmr component you may determine that it is the end of life of the transformer. This document will cover that. The goal of the guide is to “extend the life of the transformer” may not be true if the xfmr is determined to be at end of life.

Quamar Jutt (Kruger Products) – the goal of this guide is to assist the user to determine if they can extend the life of the transformer or not. Suggested adding the word determining to extend the life.

Brade Greaves (Weidman) – the goal of this guide is to assist in extending the life of the transformer. This can give you steps to extend the life, but it's up to the user to determine the end of life of the transformer. This guide just gives advice on how to extend the life of the transformer.

Shuhen Xu (FMGlobal) – deficiency management of the transformer. Like oil contamination that you need to fix.

Brian Sparling (Kinetrics) – condition assessment guide already covers that. To identify candidates for repair or replacement. Identify the candidates and their condition – like a report card. This is a deficiency management based on the condition guide. Xfmr condition only a good as the worst performing component. Purpose is to recommend what to do

Vice-chair – until we understand how C57.170 and C57.140 interact and compliment each other we need to review those two scopes and define those for the Task Force.

After much discussion on compare and contrast of C57.140 to C57.170 it was determined that Marcus Ferreira to do assessment of the two standards, John Sinclair – Black & Veatch will help.

Jeremiah Bradshaw (Bureau of Reclamation) – the fault tree info is in C57.170 and C57.140 and per Brian also covered in CIGRE, so this is a duplication.

Chair – pull up the C57.140 and the C57.170 and compare them to ensure we don't have scope overlap.

Luiz Cheim (Hitachi) – suppose there is a grey zone between the two, what is missing? What guidance for the user is waiting for us to put in this condition assessment?

There was a review of the Vancouver attendees who desired membership to the taskforce.

Chair - reviewed who requested membership and asked Traci to update member list.

Chair - will send out the C57.140 document and plans to organize a digital meeting before the in-person meeting in St. Louis to review input after everyone has a chance to compare the C57.140 document and the C57.170 document side by side and make comments on title, scope and purpose.

Discussion of Purpose Statement:

Shuhen Xu (FMGlobal) – asked what is definition of “Upgrading” in Purpose statement?

Luiz Cheim (Hitachi) – asked should we replace “upgrading” with “operating”

Vice-chair – accessories you upgrade, gave examples

Luiz Cheim (Hitachi) – then suggested “refurbish”

Vice-chair: “refurbish” to make suitable for service does not address upgrades.

Luiz Cheim (Hitachi) – need to provide definitions to following words in the Purpose: upgrading, reconditioning, refurbishing, etc.

Chair – brought up List of Contents: to contribute to Title, Scope, and Purpose

Vice-chair – confirmed we are here to review Title, Scope, and Purpose to go to PAR under Power Xfmr Group

Chair – referred to sections 4, 5, and 6 to drive what we are doing.

Jeremiah Bradshaw (Bureau of Reclamation) – asked does C57.152 include all Field Testing

Vice-chair: C57.152 confirmed yes does include field testing but is more geared towards commissioning of transformers.

Chair – added new members to achieve quorum. 20 members total with 11 present. We have Quorum.

Ed teNhyenuis (Hitachi) - Motion to accept the title “as is, no changes.”

Tim Raymond (EPRI) - 2nd Motion on the title.

Discussion on the scope, no amendments to the title.

Kumar Mani (Duke) – suggested adding reactors to title

Alan Sbravati (Hitachi) – suggested “Evaluation of the viability of Reconditioning”

Jermiah Bradshaw (Bureau of Reclamation) – suggested removal of “and Reconditioning” from title. We already have C57.637 “Guide for Reclamation Insulating Liquids” Reconditioning is defined here and in C57.12.80 IEEE Terms & Definitions, specifically refers to the liquid insulation. the document overlaps with the C57.170

Jeffrey Wrght (Duquesne Light) – suggested title change to Liquid-Immersed Distribution Power Regulating Xfmrs

Jinesh Malde (MIDEL) – suggested change to refurbishing or reconditioning

Joe White (Power Engineering) – if we change Titel, Scope & Purpose will this change the schedule

Chair – No

Steven Small (B.C. Hydro) – suggested changing title to “IEEE Guide for Life Extension of Liquid-Immersed Transformers.”

Then a bunch of discussion about the title of the document.

Jeremiah Bradshaw (Bureau of Reclamation) - Rehabilitation and Refurbishment not defined in IEEE

Derrick Hollrah (Burns & McDonnell) – suggested change Refurbishment to Life Extension

...”Guide for Evaluation and Life Extension of Liquid-Immersed Transformers.”

Discussion on Rehabilitation and Refurbishment

Jeremiah Bradshaw (Bureau of Reclamation) - Rehab = non active parts; Refurbishment – active parts... refurbishment is scary , active part. Rehabilitation non-active part, bushings etc. Restoration should be the word that compromises both.

Vice-chair – restoration not accurate.

Restoration does not include upgrades

Eugenii Ermakov (Hitachi) – will we include load, etc for all life extension?

Chair – back to the motion – any discussion

Vote on Motion by Ed teNhyenuis for Title:

For:

Michael Saad

Timoth Raymond

Scott Reed

Ed teNhyenuis

Marcos Ferreira

Sanjib Som

Traci Hopkins

Against:

Kumar Mani

Jeremiah Bradshaw

Luiz Cheim

Emilio Morales Cruz

No abstentions.

End Result: IEEE Guide for Evaluation and Life Extension of Liquid Immersed Power Transformers.

Jeremiah Bradshaw (Bureau of Reclamation) – nope, not what we are looking for.

Meeting adjourned: 1634

After meeting adjourned:

Sanket Boler (Oncor) and Guang “Grace” Yuan (Hitachi) both requested membership.

Power Transformers Subcommittee Working Group Report

Document #: C57.125

Document Title: Guide for Failure Investigation, Documentation, Analysis and Reporting for Power Transformers and Shunt Reactors

Chair: Hakan Sahin Vice-Chair: Thomas Melle

Secretary: Adam Sewell Percent Complete: 75%

Current Draft Being Worked On: 1.0 Dated: n/a

PAR Expiration Date: December 31, 2025

Meeting Date: 11 March 2024 Time: 4:45pm – 6:00pm

Location: Vancouver, BC, CAN

Attendance:	Members	21 of 40
	Guests	49
	Guests Requesting Membership	22
	Total*	92

* 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, March 11, 2024 at Hyatt Regency Vancouver; Vancouver, British Columbia, Canada.

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. 40 members and 21 were counted as present. QUORUM ACHIEVED
 - 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.
- g. Approvals of previous minutes and agenda:
 - i. Approval of the agenda for Spring 2024
 - ii. Approval of the Fall 2023 unapproved meeting minutes
 - iii. Motion to approve as shown – H.Flores, 2nd – B.Forsyth
 - 1. No objection to unanimous approval – ALL APPROVED
- 2. Old Business
 - a. Review the changes proposed for Section 4.2 Investigation flow chart
 - i. Chair will send out proposed changes for the Fig-1 flowchart under clause 4.2 for WG electronic vote after the S24 meeting.
 - ii. MOTION made by B.Forsyth - upon approval/rejection of the revised flowchart for section 4.2 the document with all approved changes shall proceed to sponsor ballot.
 - 1. During discussions, a call to vote was made – B.Forsyth/W.Binder
 - a. 14/21 members approved the call to vote
 - 2. Vote was 20 YES, 1 ABSTAIN – MOTION PASSES
 - b. Definition for compressive force
 - i. MOTION made by A.Sarkar, 2nd – M.Saad to use definition from C57.164
 - 1. Vote was unanimously approved with 1 abstention
 - c. Review and revision of the old businesses will be completed offline, and the revisions will be sent to WG members via email for voting and continue to work offline until WG member agreement to revise, or not to revise, is achieved.
 - d. Once the above incomplete old businesses are approved by WG members - by electronic voting and comments resolved, Document revision starts.
 - e. The document will be revised with all agreed changes, emailed to WG members before the next meeting for voting and to receive all comments
 - f. These comments will be reviewed and answered before and during the next meeting if necessary.
 - g. The goal is to be able to get the WG approval of the revised document during the Fall_24 meeting.
 - 3.
- 3. New Business
 - a. Chair will send out Fig-1, clause 4.2 flowchart proposed changes via email for vote and will prepare the draft document and email out to all members for review.
- 4. Membership changes
 - a. Officers will look at attendance of members and member requests to make changes to WG membership list before the Fall 2024 meeting.
- 5. Next meeting: October 28, 2024 at the Fall 2024 Transformers Committee Meeting scheduled for October 27-31, 2024, St. Louis, MO, USA.
- 6. Close of meeting

a. Meeting adjourned at 6:00pm
Submitted by: Hakan Sahin Date: 3/30/24

March 11, 2024 Meeting Attendance (RM = Request Membership):

Last Name	First Name	Company (Affiliation)	Role
Adams	Kayland	Prolec GE Waukesha	Guest
Alonso	Mario	Georgia Transformer	Guest
Bargone	Gilles	FISO Technologies Inc.	Guest-RM1
Betancourt	Enrique	Prolec GE	Member
Binder	Wallace	WBBinder Consultant	Member
Boettger	William	Boettger Transformer Consulting LLC	Member
Bolar	Sanket	Oncor	Member
Bray	Elisabeth	Southern Company	Guest
Chambers	Stuart	EPRI	Member
Debass	Samson	EPRI	Guest-RM2
Dillon	Nikolaus	Dominion Energy	Member
Draper	Zachary	Delta-X Research	Guest-RM3
Dulac	Hakim	Advanced Power Technologies	Guest-RM2
Faur	Florin	Prolec GE Waukesha	Member
Flores	Hugo	Hitachi Energy	Guest-RM3
Forsyth	Bruce	Bruce Forsyth and Associates PLLC	Member
Garcia Wild	Eduardo	Siemens Energy	Member
Gorzin	Alireza	Black & Veatch	Guest-RM1
Guner	Ismail	Hydro-Quebec	Guest
Hampton	Kevin	Siemens Energy	Guest
Hernandez-Mejia	Jean Carlos	Georgia Tech	Guest
Hogg	Ryan	Bureau of Reclamation	Guest
Hollrah	Derek	Burns & McDonnell	Guest
Jarosz	Patrycia	IEEE	Guest
Johnson	Christopher	Oncor	Guest-RM1
Kazmierczak	Jerzy	Hitachi Energy	Guest
Kessler	Stacey	Ulteig Engineers	Guest-RM3
Klempner	Duritriy	Southern California Edison	Guest
Knapp	Evan	EATON Corporation	Guest
Koshel	Anton	Delta Star Inc	Guest
Loiselle	Luc	Tetra Tech	Guest
Lucas, P.E.	Tiffany	Prolec GE Waukesha	Guest
Machain	Jose Luis	Prolec GE	Guest-RM1
Melle	Tom	Highvolt	Member-ViceChair
Mills	Francis	Power Engineers	Guest-RM2
Montanha	Juliano	Siemens Energy	Guest-RM2
Morales-Cruz	Emilio	Qualitrol	Member
Munoz	Marta	Hitachi Energy	Guest
Musgrove	Ryan	Oklahoma Gas & Electric	Member
O'Malley	Anastasia	Consolidated Edison Co. of NY	Member
Orozco	Polo	GE Grid Solutions	Guest
Panesar	Parminder	Virginia Transformer Corp.	Member
Raymond	Timothy	EPRI	Guest-RM3
Reyes Perez	Juan	Hitachi Energy	Guest
Rocque	Timothy	Prolec GE Waukesha	Guest
Saad	Mickel	Hitachi Energy	Member

Last Name	First Name	Company (Affiliation)	Role
Sahin	Hakan	Virginia Transformer Corp.	Member-Chair
Sarkar	Amitabh	Virginia Transformer Corp.	Member
Schleismann	Eric	Southern Compnay	Guest
Schrammel	Alfons	Siemens Energy	Guest
Selvaraj	Pugal	Virginia Transformer Corp.	Member
Sewell	Adam	Quality Switch, Inc.	Member-Secretary
Solano	William	Maschinenfabrik Reinhausen	Guest-RM1
Som	Sanjib	Pennsylvania Transformer	Guest-RM3
Steele	Hampton	TVA	Guest
Subramany	Shankar	KEMA Netherlands	Guest-RM1
Tanaka	Troy	Burns & McDonnell	Member
Thompson	Ryan	Burns & McDonnell	Guest
Waldrop	Mike	Memphis Light, Gas & Water	Guest
Wallach	David	Duke Energy	Guest
Weisensee	Matthew	PacifiCorp	Guest
Weyer	Daniel	Monolith	Guest-RM1
Whitten	Christopher	Hitachi Energy	Guest
Yun	Joshua	Virginia Transformer Corp.	Member
Davoudi	Pouneh	Delta Star Inc	Guest
Rezran	Arash	Delta Star Inc	Guest
Himaw	Martin	Highvolt	Guest-RM1
Kim	Yeounsoo	MEPPI	Guest-RM1
Hamoir	Didier	Transformer Protector Grp	Guest
Hermann	Florian	Trench France	Guest
Elson	Eric	SDGE	Guest
Pedro	Pedro	EFFACEC Energia	Guest
Watson	Joshua	Nebraska Public Power District	Guest
Frazier	Raymond	Ameren	Guest
Bender	Jonathan	W.E. Gundy & Associates	Guest
Mbouombouo	Mama	Hitachi Energy	Guest-RM1
Lewis	Samuel	Hitachi Energy	Guest
Lembacher	Stefon	Siemens Energy	Guest
Murowinski	Emma	Delta-X Research	Guest-RM1
McCarrick	Brian	Virginia Transformer Corp.	Guest
Vyas	Pragnesh	Sunbelt Solomon	Guest-RM1
Lamontagne	Donald	Ariz Public Svc	Guest
Jeong	Chanmin	HD Hyundai	Guest
Tan	Jonathan	Northern Transformer	Guest-RM1
Gagnon	Jean Philippe	Qualitrol	Guest
Patel	Monil	PG&E	Guest
Baser	Levent	Hitachi Energy	Guest
Zhang	Gigi	Hico-America	Guest
Greaves	Brad	Weidmann Electrical Technology	Guest
Hrkac	Miljenko	Hitachi Energy	Guest
Yang	Fei	Hitachi Energy	Guest
Salem	Sherif	Eversource Energy	Guest

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>12 March 2024</u>	Time:	<u>8:00am-9:15am</u>
Location:	<u>Vancouver, BC, CAN</u>		
4. Attendance:	5. Members		<u>10 of 15</u>
6.	7. Guests		<u>27</u>
8.	9. Guests Requesting Membership		<u>5</u>
10.	11. Total*		<u>42</u>

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

Meeting Minutes / Significant Issues / Comments:

7. Meeting was called to order at 8:00am, March 12, 2024 at Hyatt Regency Vancouver; Vancouver, British Columbia, Canada - Balmoral room (3rd Floor).
8. Presentation of Agenda
9. 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
10. 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
11. Checking the Quorum – 15 members so 8 needed for quorum.
 - a. 10 out of 15 members were in attendance of the meeting so quorum was achieved.
12. Approval of the Meeting Minutes from Fall 2023 and Spring 2024 Agenda.

- a. Motion was made by D. Schwartz and seconded by F.Faur to approve Fall 2023 Meeting Minutes and Spring 2024 Agenda.
- b. No opposition to unanimous approval of the motion - APPROVED

13. Chair announcements

- a. Current guide standard 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. This group is now a working group.

14. Old work

- a. Request was made to share previous presentations that were used to develop this guide standard
 - 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 standard and previous presentations before Spring 2024 meeting and make suggestions as to what recommendations they have for this guide standard
- 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.

15. New Work

- a. Determine sections to review and ask for volunteers to look at those in detail for creating a draft.

- i. The following members volunteered to review the current guide standard and propose changes to be reviewed at the next working group meeting:
 - 1. Larry Dix
 - 2. Dan Schwartz
 - 3. Florin Faur
 - b. T. Tillery and P. Hopkinson brought up looking at synthetic esters for use in this guide standard 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.
 - 16. Next meeting: October 29, 2024 at Fall 2024 Transformers Committee Meeting scheduled for October 27-31, St. Louis, MO, USA.
 - 17. Close of meeting
 - a. Meeting adjourned at 8:50am
- Submitted by: Adam Sewell Date: March 24, 2024

Meeting Attendance March 12, 2024 (RM = Request Membership):

Last Name	First Name	Company (Affiliation)	Role
Ali	Rehan	Siemens Energy	Guest
Blaszczyk	Piotr	Specialty Transformer Components LLC	Secretary
Boman	Paul	HSBI&I Co.	Guest
Brodeur	Samuel	Hitachi Energy	Guest
Colopy	Craig	Retired from EATON	Guest
Cruz Valdes	Juan Carlos	Prolec GE	Member
Dutta Roy	Samraghi	Siemens Energy	Member
Faur	Florin	Prolec GE Waukesha	Member
Flores	Hugo	Hitachi Energy	Guest
Gamboa	Jose	H-J Family of Companies	Guest
Gara	Lorne	SHERMCO	Guest
Garza	Hector	Orto de Mexico	Guest
Greaves	Brad	Weidmann	Guest
Griesacker	Bill	Duquesne Light Co.	Guest
Hamoir	Didier	Transformer Protector Corp	Guest
Harley	Jack	First Power Group LLC	Guest
Jacob	Nathan	Cemlin Energy	Guest
Johnson	Christopher	Oncor	Guest
Kapka	Sergiusz	Hitachi Energy	Guest
Leigl	Angela	EATON	Guest
Lopez-Fernandez	Xose	Universidade de VIGO	Guest
Machain	Jose Luis	Prolec GE	Guest
McCarrick	Brian	VCT	Guest
Munoz Molina	Martin	Orto de Mexico	Guest-RM1
Musgrove	Ryan	Oklahoma Gas + Electric	Guest
Newbill	Mark	Hitachi Energy	Guest-RM1
Nims	Joe	Allen & Hoshall	Guest
Pruente	John	Prolec GE Waukesha	Guest-RM1
Raymond	Timothy	Electric Power Research Institute (EPRI)	Guest
Rehkopf	Sebastian	Maschinenfabrik Reinhausen	Member
Reimer	Jonathan	Foryis BC	Guest
Saad	Mickel	Hitachi Energy	Guest
Schwartz	Dan	Quality Switch, Inc.	Member
Sewell	Adam	Quality Switch, Inc.	Chair
Sewell	Jeremy	Quality Switch, Inc.	Member
Sewell	Russ	Quality Switch, Inc.	Guest
Smith	Jimmy	Howard Ind	Guest-RM1
Solano	William	Maschinenfabrik Reinhausen	Member
Tillery	Timothy	Howard Industries	Member
Vary	Robert	Reinhausen US	Guest
Vierelk	Karsten	Reinhausen	Guest
Whitten	Christopher	Hitachi Energy	Guest-RM1

IEEE TC MEETING Minutes

Working Group PC57.170

Condition Assessment Guide

March 12, 2024

9:30 AM – 10:45 AM (PST)

Hyatt Regency, Vancouver, BC Canada Conference Room: Regency C/D

Chair: Kumar Mani

Vice-Chair: James Cross

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. Quorum was established 33 of 54 members were present. There was a total of 116 attendees. Noted that Dharam Vir is to be added to the members list.
2. Spring 2024 Meeting Agenda Review and Approval. Reviewed and approved without any objections or abstentions.
 - a. Moved by, Dharam Vir
 - b. Second, Marcos Ferreira
3. Approval of Fall 2023 Meeting Minutes of the Previous meeting, No objections, or abstentions.
 - a. Moved by, Amitabh Sarkar
 - b. Second by, Rogerio Verdolin
4. PC57.170 Guide Progress
 - a. Saranna Hoffman reported on the straw ballot results, 27 in total, 18, technical, and 9 editorial. There were 4 unresolved, as there was no suggested alternative to the objection made. Draft 12 emailed out to the working group members includes all revisions made based on the straw ballot comments.
 - b. Stephanie Mabry reported good progress on editing and formatting, and suggested it was ready to go to the Power Transformers SC to move to formal ballot stage and then MEC.
 - c. A motion to move the approved Draft 12 to formal ballot.
 - d. Moved by, Hemchandra Shertukde
 - e. Second by, Hakim Dulac
 - f. 32 approved with no objections and no abstentions.

- g. Motion passed, and Chairman will carry forward the WG recommendation to move the Draft 12 after final editing to MEC/ballot.
- 5. List of Volunteers for SA Ballot comment resolution group, as taken at the WG meeting Tuesday March 12th 2024:
 - a. Sankett Bolar Sanket.Bolar@oncor.com
 - b. Ryan Musgrove
 - c. Joe White
 - d. Mark Tostrud
 - e. Saramma Hoffman
 - f. Deanna Woods
 - g. John Sinclair
 - h. Chris Johnson Christopher.Johnson@oncor.com
 - i. Brian Sparling
- 6. Presentation by Brian Sparling on Steps to Build a Condition Assessment Indices. PDF of PowerPoint file to be uploaded to the web site.
- 7. Roger Verdolin, Joshua Yun and Timothy Raymond requested Membership.
- 8. Next meeting is in St Louis, MO between Oct 27-31, 2024.
- 9. Meeting Adjourned.

Attendee List:

First Name	Last Name	Member Y/N	Affiliation
Mario	Alonso		Georgia Transformers
Giles	Bargone		FISO
Barry	Beaster		H-J Group of Companies
Jason	Beaudoin		Weidmann
Jean Noel	Berube		Rugged Monitoring
Enrique	Betancourt	Y	GE Prolec
Jeremy	Bradshaw		Bureau of Reclamation
John	Brett		Delta-X Research
William	Boettger	Y	Boettger Transformer Consulting LLC
Sanket	Bolar		Oncor
Paul	Bowman		Hartford Steam Boiler
Samuel	Brodeur		Hitachi Energy
Piotr	Blaszczyk		Specialty Transformers
Mark	Cheatham		GE Vernova
Matt	Chu		Shihlin Electric
Randy	Cox		GE Vernova
Alexander	Crown		Coil Innovation
Marcos	Czernorucki		Hitachi Energy
Luiz	Cheim	Y	Hitachi Energy
Hakim	Dulac	Y	APT Technologies
Lee	Doyle		Vaisala
Zack	Draper	Y	Delta X Research
Jesse	Duffy		Nespower
Evgenii	Ermakov	Y	Hitachi Energy
Zlatan	Fazlic		Camlin Power
Todd	Felton		MVA Diagnostics
Miguel	Fernandez		Braintree Electric Light Dept
Mark	Foata		MR Germany
Bruce	Forsyth		Cargill
Marco	Espindola	Y	Hitachi Energy
Marcos	Ferreira	Y	Quanta Technology
Jean Philippe	Gagnon		Qualitrol Inc
Eduardo	Garcia		Siemens Transformers Mexico
James	Gardner		Prolec GE
Brad	Greavas		Weidmann
Ismail	Guner	Y	Hydro One
Atila	Gyore	Y	M&I Materials Ltd

Didier	Hamoir		Transformer Protector Corp
Kevin	Hampton		Siemens Energy
Saramma	Hoffman	Y	PPL
Jean	Hernandez		Neetrac GA Tech
Traci	Hopkins		H2 Scan
Natan	Jakob		Camlin Energy
Christopher	Johnson		Oncor
Ryan	Jonak		PG&E
Patrycja	Jarosz		IEEE SA
Jerzy	Kazmierczak		Hitachi Energy
Sheldon	Kennedy		Sheldo P Kennedy Engineering
Dmitriy	Klempner		Southern California Edison
Rafal	Kowalski		Hitachi Energy
Stacey	Kessler		Ulteic Engineering
Donald	Lamontague		Arizona Public Service
Weijun	Li	Y	Beld
Cesar	Lizcano		Shell USA Inc
Ricardo	Lopez		Efacec Transformers
Tiffany	Lucas		Prolec GE
Stephanie	Mabrey	Y	Weidmann
Jinesh	Malde		MI Materials
Kumar	Mani	Chair	Duke Energy
Tony	Mellin		Vaisala
Emilio	Morales-Cruz	Y	Qualitrol Corp
Emma	Murowinski		Delta-X Research
Ryan	Musgrove		Oklahoma Gas & Electric
Joe	Nims		Allen & Hoshall, Inc.
David	Olan		BC Hydro
Anastasia	O'Malley		Con Edison NY
Eduardo	Crozco		GE Vernova
Parminder	Panesar		Virginia Transformer Corp
Pedro	Pedro		Efacec Transformers
Nick	Pervanik		AVO Diagnostic Services
John	Pruente		Prolec GE Waukesha
Ulf	Radbrandt		Hitachi Energy
Tim	Raymond	Y	EPRI
Scott	Reed	Y	MVA Diagnostics
Perry	Reeder		GE Prolec
Michael	Richardson		Ameren
Diego	Robalino		Megger

Mickel	Saad	Y	Hitachi Energy
Amitabh	Sarkar	Y	Virginia Transformer Corp
Alan	Sbravati	Y	Hitachi Energy
Aron	Sexton		Kinectrics
Hemchandra	Shertukde	Y	Univ. of Hartford
Michal	Sinatkowski		Hitachi Energy
Jonathan	Sinclair	Y	Black & Veatch
Yang Tac	Sohn		Hyosung HICO
Mauricio	Soto	Y	Hitachi Energy
Steven	Small		BC Hydro
Brian	Sparling	Y	Kinectrics
Brad	Staley	Y	Leeward Renewable Energy
Charles	Sweetser	Y	Omricon Energy
Mathew	Sze		Omricon Energy
Marko	Teofanovic		Ontario Power Generation
Roger	Ting		Shihlin Electric
Mark	Tostrud	Y	Dynamic Ratings
Alwyn	Vanderwalt		ECI
Robert	Vary		Reinhausen USA
Rogério	Verdolin	Y	Verdolin Solutions Inc.
Karten	Vierelk		MR Germany
Dharam	Vir	Y	GE Prolec
Patrick	Yan		GE Grid
Asam	Yu		Shihlin Electric
Joshua	Yun	Y	Virginia Transformer Corp.
Alan	Washburn	Y	Burns & Macdonald
Matthew	Webb		Prolec GE
Drew	Welton		Intellirent
Daniel	Weyer		Monolith
Joe	White		Power Engineers
Trenton	Williams		APT Technologies
Stefan	Wirth		Coil Innovation
Deanna	Woods		Alliant Energy
Jeffrey	Wright	Y	Duqlight Power
Shuzhen	Xu		FM Global
Guang	Yuan		Hitachi Energy
Joshua	Yun		Virginia Transformer Corp
Peter	Zhao	Y	Hydro One

Working Group Meeting for IEEE Standard PC57.17

K.8.1 Vancouver, BC Meeting – March 12, 2024 11:00-12:15 pm PDT

Chair: Dom Corsi
Secretary: Jason Varnell

1. The meeting was called to order at 11:00 AM PDT.
2. There were 25 active participants present, which consisted of 13 of the 20 members. Quorum was achieved.
3. Three (3) participants requested membership; however, only one (1) was granted membership due to attendance. With the new member, the new membership total is 21 members.
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. The PAR details were reviewed with the Working Group:
 - a. PAR Approval: June 5, 2023
 - b. PAR Expiration: December 31, 2027
 - c. Expected Date of submission of draft to the IEEE SA for Initial Standards Association Ballot: December 2026
 - d. Projected Completion Date for Submittal to RevCom: April 2027
7. A motion was made by Sanjib Som (Pennsylvania Transformer) and seconded by Dan Sauer (Eaton Corp.) to approve the Spring 2024 meeting agenda. There were no objections to unanimous approval of the agenda. A motion was made by Dan Sauer (Eaton Corporation) and seconded by Sanjib Som (Pennsylvania Transformer) to approve the Fall 2023 Kansas City Working group meeting minutes. There were no objections to unanimous approval of the Fall 2023 Kansas City working group meeting minutes.

8. **Old Business:** The chair announced that the current working draft (D1) was uploaded to the IEEE Transformers Committee website in MS WORD format on March 10, 2024.
9. **Old Business:** The volunteers who previously agreed to take lead on incorporating changes to subclauses were reviewed with the working group. New volunteers are as noted below.
 - a. Clause 4: Ratings section – Previous Volunteers: Dan Sauer (Eaton Corporation) and Jason Beaudoin (Weidmann). **New Volunteer: Sheldon Kennedy (Consultant).**
 - b. Clause 7: Connections section – Previous Volunteers: Sanjib Som (Pennsylvania Transformer), Emilio Morales (Qualitrol) and Thrinadha Katapalli (Virginia Transformers).
 - c. Clause 8: Testing section – Previous Volunteers: Dom Corsi (Doble Engineering) and Jason Varnell (Doble Engineering).
 - d. Clause 9: Construction section – Previous Volunteers: Sanjib Som (Pennsylvania Transformer).
 - e. Annex A – DC Arc Furnace section – Previous Volunteers: Dan Sauer (Eaton Corporation) and Jerzy Kazmierczak (Hitachi Energy).
 - f. Annex B – IEEE Guide for Arc-Furnace Protection section – Unassigned.
 - g. Annex C – Replacement and Remanufacturing of Low Voltage Bus Bars – Previous Volunteers: Jason Beaudoin (Weidmann) and Jason Varnell (Doble Engineering).
 - h. Annex D – Bid Document Checklist section - Unassigned.
 - i. Annex E - New Section on High Temperature Insulation Application (including Fiber Optics)– Previous Volunteers: Gilles Bargone (FISO) and Emilio Morales (Qualitrol).
10. **New Business:** The chair reviewed the wording in subclause 8.7 for thermal duplicate and the working group discussed the differences between the wording compared to the C57.12.00-2021 Subclause 8.5. Trenton Williams (Advanced Power Technologies) made a motion to replace the wording from Subclause 8.7 with the exact wording from C57.12.00-2021 Subclause 8.7. The motion was seconded by Sanjib Som (Pennsylvania Transformer) and passed with unanimous consent.
11. **New Business:** Sanjib Som (Pennsylvania Transformer) discussed the importance of the temperature rise test for transformers covered under this standard, citing that the transformers are very unique, difficult to replace, and often operate at full load. Sanjib Som made a motion to revise Subclause 8.1 to state that the temperature rise test be a routine type test for transformers within the scope of this standard. The motion was seconded by Emilio Morales (Qualitrol). The motion passed with five (5) votes in favor, one (1) against, and five (5) abstention votes. The chair did not cast a vote. Jason Varnell (Doble Engineering) agreed to draft the wording to incorporate the temperature rise test as a routine test in Subclause 8.1 and to provide additional details regarding the requirements in Subclause 8.7.
12. **New Business:** There was discussion on whether impulse tests, applied potential test, and induced voltage tests were considered routine tests since they were not directly stated to be in Subclause 8.1 (Routine tests). Upon review of Subclause 8.8 (Dielectric tests), the tests were stated to be required; therefore, the working group agreed that 8.1 should be revised to state that the dielectric tests were routine. Jason Varnell (Doble Engineering) agreed to incorporate the changes into draft D1.1.
13. **New Business:** Trenton Williams (Advanced Power Technologies) made a motion to submit draft D1.1 to the working group, which will include any updates as discussed during the S24 WG meeting,

for straw ballot. The straw ballot should be completed prior to the Fall 2024 working group meeting. The motion was seconded by Ryan Musgrove (OG&E). The motion passed with unanimous consent.

14. **New Business:** There was discussion on informative Annex C. Subclause C.1 was reviewed and as it stated, the annex was a direct duplication of ANSI C57.17-1965; therefore, the working group agreed to reduplicate the text and that there will be no major effort in reviewing the annex.
15. The next working group meeting will be in St. Louis, Missouri, USA during the Fall 2024 Transformers Committee Meeting.
16. The meeting adjourned at 12:00 PDT.

Attendance Record:

**Status as of
3/12/2024
(After S24
Meeting)**

	Last Name	First Name	Affiliation
Member	BARGONE	GILLES	FISO
Member	BEAUDOIN	JASON	WEIDMANN
Member	BOETTGER	WILLIAM	BOETTGER TRANSFORMER CONSULTING LLC
Guest	CZERNORUCKI	MARCOS	HITACHI ENERGY
Guest	FAUR	FLORIN	PROLEC-GE WAUKESHA
Guest	FOLDI	JOESPH	F&A INC.
Guest	GAGNON	JEAN PHILIPPE	QUALITROL
Guest	GORZIN	ALIREZA	BLACK & VEATCH
Member	KAZMIERCZAK	JERZY	HITACHI ENERGY
Member	KENNEDY	SHELDON	SHELDON KENNEDY ENGINEERING PLLC
Guest	KIM	YEOUNSOO	MEPPI
Guest	KOWALSKI	RAFAL	HITACHI ENERGY
Guest	LEWIS	SAMUEL	HITACHI ENERGY
Guest	MENDEZ	OMAR	PROLEC-GE
Member	MORALES-CRUZ	EMILIO	QUALITROL
Member	MUSGROVE	RYAN	<u>OG&E</u>
Member	NEWBILL	MARK	HITACHI ENERGY
Member	SAUER	DAN	EATON
Member	SOM	SANJIB	PTTI
Guest	STANK	MARKUS	MR
Secretary	VARNELL	JASON	Doble Engineering Co.
Guest	VERDOLIN	ROGERIO	VERDOLIN SOLUTIONS

TF/Study Group – 60076-57-1202

Chair: Ewald Schweiger

60076-57-1202

Liquid immersed Phase-Shifting Transformers

IEC/IEEE – PST Standard

1. Meeting took place at 1:45 PM (PDT) on Tuesday March 12th.
2. This was the first in-person meeting as Study Group – A virtual meeting took place on January 23rd, 2024.
Here in Vancouver 37 attended our first in-person the meeting.
3. The objective of our Study Group is to provide the Power Transformers Subcommittee (PTSC) with a recommendation whether the document needs revision.
4. Call for patents & Copyright statement
 - c) 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.
 - d) 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 since this was the first in-person meeting.
6. Approval of agenda
 - c) No comments from the group
 - d) The agenda was unanimously approved (motion by Kevin Juchem and seconded by Luc Dorpmanns)
7. Approval of meeting minutes of the previous virtual meeting on January 23rd, 2024
 - c) No comments from the group
 - d) The meeting minutes were unanimously approved (motion by Kevin Juchem and seconded by Joe Watson)
8. Discussion based on feedback from review of IEC/IEEE 60076-57-1202 2016 and next steps
 - a. Feedback was collected about the requirements for revisions (like Errors, clarifications, improvements, updates, etc.).
 - e) Christoph Ploetner as head of IEC TC14 shared with the group that he is in favor of revising the PST Guide (C57.135 – 60076-57-135) in parallel with the PST Standard (60076-57-1202).
 - f) Karsten Viereck proposed to include new methods in the revision, like for clause 6 (control) about paralleling to compare the phase angle instead of tap position synchronizing (like stated in the current version).
 - g) The feedback and the discussions indicated clearly that a revision of the current document is needed.

9. Joe Watson made a motion to recommend to the PTSC to revise 60076-57-1202. Williams Trenton provided a second.
 - o Motion carried unanimously with no objections or abstentions.
10. After the motion passed, the Study Group started to work on the Title and Scope.
11. Joe Watson made a motion to propose the title and scope as follows:

Title:
Part 57-1202: Liquid immersed phase-shifting transformers

Scope:
This document specifies requirements of liquid immersed phase-shifting transformers of all types.

The scope excludes transformers with an unregulated phase shift. This document is limited to matters particular to phase-shifting transformers and does not include matters relating to general requirements for power transformers covered in existing standards in the IEC 60076 series or IEEE Std C57.12.00™ and IEEE Std C57.12.10™.

For the sake of clarity:
The first sentence of the original scope was changed:
Deleted: This part of IEC 60076 covers the requirements for phase-shifting transformers of all types.
Added: This document specifies requirements of liquid immersed phase-shifting transformers of all types.
12. Luc Dorpmanns seconded the motion by Joe Watson.
 - o Motion carried unanimously with no objections or abstentions.
13. Therefore, we will seek approval from the PTSC on Wednesday, March 13th, 2024 to request a PAR to revise 60076-35-1202.
14. The meeting was adjourned at 2:45 PM (PDT)
15. Next meetings (planned):
Virtual meeting – to be scheduled before October 2024 in St Louis, MO
In-person meeting – October 28 or 29, 2024 in St Louis, MO

Respectfully submitted,
Ewald Schweiger - Study Group Chair

List of attendees for this meeting:

Name	Last name	Given name	Affiliation
Sean Barker	Barker	Sean	Hitachi Energy
Jason Beaudoin	Beaudoin	Jason	Weidmann
Jean-Noel Berube	Berube	Jean-Noel	Rugged Monitoring Quebec Inc
Oscar Castanon Barragan	Castanon Barragan	Oscar	Siemens Energy
Vivian Chan	Chan	Vivian	Hitachi Energy
Craig Colopy	Colopy	Craig	Retired from EATON
Marcos Czernorucki	Czernorucki	Marcos	Hitachi Energy
Bryan Deb	Deb	Bryan	Siemens Energy
Luc Dorpmanns	Dorpmanns	Luc	Royal SMIT Transformers
Eric Elson	Elson	Eric	San Diego Gas and Electric

Ken Fedor	Fedor	Ken	SGB-Smit Group
Patrick Foster	Foster	Patrick	NextEra Energy
Jean-Philippe Gagnon	Gagnon	Jean-Philippe	Qualitrol
Kevin Hampton	Hampton	Kevin	Siemens Energy
Kevin Juchem	Juchem	Kevin	Hitachi Energy
Stefan Lembacher	Lembacher	Stefan	Siemens Energy
Aleksandr Levin	Levin	Aleksandr	Weidmann Electrical Technology
Ricardo Lopes	Lopes	Ricardo	EFACEC Transformers
Omar Mendez Zamora	Mendez Zamora	Omar	PROLEC GE
Ryan Musgrove	Musgrove	Ryan	OG&E
David Olan	Olan	David	BC Hydro
Mirna Olic	Olic	Mirna	Koncar Power Transformers LTD
Christoph Ploetner	Ploetner	Christoph	Siemens Energy
Sebastian Rehkopf	Rehkopf	Sebastian	Maschinenfabrik Reinhausen
Alfons Schrammel	Schrammel	Alfons	Siemens Energy
Ewald Schweiger	Schweiger	Ewald	Siemens Energy
Michael Shannon	Shannon	Michael	Rea Magnet Wire
Steven Small	Small	Steven	BC Hydro
Markus Stank	Stank	Markus	Maschinenfabrik Reinhausen
Shankar Subramany	Subramany	Shankar	KEMA Labs
Robert Vary	Vary	Robert	Reinhausen Manufacturing Inc.
Karsten Viereck	Viereck	Karsten	Maschinenfabrik Reinhausen
Joe Watson	Watson	Joe	JD Watson and Associates Inc.
Matthew Weisensee	Weisensee	Matthew	PacifiCorp
Trenton Williams	Williams	Trenton	Advanced Power Technologies
Rene Wind	Wind	Rene	Siemens Energy
Guang Yuan	Yuan	Guang	Hitachi Energy

Task Force for Installation of Power Transformers C57.93

Tuesday, March 12, 2024

3:15 – 4:30 PM

Hyatt Regency Vancouver, Regency B

Vancouver, BC, Canada

Chairman: Scott Reed

Vice Chairman: Alwyn VanderWalt

Secretary: Kyle Stechschulte

Levent	Baser	Hitachi Energy	Guest
Barry	Beaster	Hj Family of Companies	Guest
Wallace	Binder	WBBinder Consultant	Guest
Sanket	Bolar	Oncor	Guest
Georges	Bouty	Delta Star	Guest
Jeremiah	Bradshaw	Bureau of Reclamation	Guest
Elizabeth	Bray	Southern Company	Guest
Stuart	Chambers	EPRI	Guest
Luiz	Cheim	Hitachi Energy	Guest
Mike	Craven	Qualous Power Services	Guest
Sami	Debass	EPRI	Guest
Gabriel	Delgado Zamora	Invenergy	Guest
Jesse	Duffy	Nashville Electric Service	Member
Evgenii	Ermakov	Hitachi Energy	Member
Florin	Faur	Prolec GE	Guest
Miguel	Fernandez	Braintree Electric Light Dept	Guest
Marcos	Ferreira	Quanta Technology	Guest
Rainer	Frotscher	Reinhausen	Guest
Lorne	Gara	Shermco	Member
Alexander	Gaun	Coil Innovation	Guest
Ismail	Guner	Hydro Quebec	Member
Saif	Hossain	Trench Ltd	Guest
Patrycja	Jarosz	IEEE SA	Guest
Jerzy	Kazmierczak	Hitachi Energy	Guest
Sheldon	Kennedy	Sheldon Kennedy Engineering	Guest
Stacey	Kessler	Ulteig Engineers	Guest
Yeounsoo	Kim	MEPPI	Guest
Mathieu	Lachance	Omicron	Guest
Jinming	Li	BC Hydro	Guest
Weijun	Li	Braintree Electric Light Dept	Member
Mario	Locarno	Doble	Member
Mama	Mbouombouo	Hitachi Energy	Guest
Toni	Mellin	Vaisala	Guest
David	Murray	TVA	Member

Ryan	Musgrove	OG&E	Member
Anthony	Natale	HICO America	Guest
Joe	Nims	Allen & Hoshall	Guest
David	Olan	BC Hydro	Guest
Eduardo	Orozco	GE Grid Solutions	Guest
Pedro	Pedro	Efacec Transformers	Guest
Dominic	Pollaro	NASS	Guest
Tom	Prevost	Weidmann	Guest
John	Pruente	Prolec GE Waukesha	Guest
Scott	Reed	MVA	Chair
Perry	Reeder	GE	Member
Sebastian	Rehkopf	Reinhausen	Guest
Jonathan	Reimer	FortisBC	Guest
Arash	Rezvan	Delta Star	Guest
Michael	Richardson	Ameren	Guest
Diego	Robalino	Megger	Guest
Mickel	Saad	Hitachi Energy	Member
Steven	Small	BC Hydro	Guest
William	Solano	Reinhausen	Member
Brian	Sparling	Dynamic Ratings	Member
Tommy	Spitzer	City Transformer Service Co.	Guest
Kyle	Steichschulte	AEP	Secretary
Charles	Sweetser	OMICRON electronics Corp USA	Guest
Jonathan	Tan	Northern Transformer	Guest
Troy	Tanaka	Burns & McDonnell	Guest
Marko	Teofanovic	Ontario Power Gener.	Guest
Eduardo	Tolcachir	TTE	Guest
Cole	Van Dreef	American Transmission Co	Guest
Alwyn	VanderWalt	ECI	Vice Chair
John	Wagner	AEP	Guest
Matthew	Webb	GE	Guest
Daniel	Weyer	Monolith	Guest
Terry	Wong	Trench Ltd	Guest
Deanna	Woods	ATC	Guest

The meeting was called to order at 3:16 pm by Chair Scott Reed. This is the fifth meeting for this Task Force. The current guide this Task Force is reviewing expires 12/31/29.

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

There were 15 of 26 members, so a quorum was achieved and a total of 54 guests. Two guests who met the attendance requirements requested and were granted membership after the TF meeting. Likewise,

three members have failed to meet the attendance requirements and were moved to guest status after the TF meeting.

A motion was made by Evgenii Ermakov to accept the agenda and seconded by David Murray. The agenda was approved with unanimous consent. Next, a motion was made by Weijun Li and seconded by Evgenii Ermakov. The minutes were approved with unanimous consent.

The chair shared the existing title with the Task Force to determine if it needs to be changed. There was a motion by Weijun Li to keep the title as written and seconded by David Murray. After discussion the motion was amended to keep the current title as written, but add “and reactors”. The amended motion was seconded by Evgenii Ermakov. The motion was unanimously approved.

The chair shared the existing scope with the Task Force to determine if it needs changed. After much discussion the scope was changed to “The recommendations presented in this guide apply to the installation and maintenance of liquid-immersed power transformers and reactors”. There was a motion by Weijun Li to accept the new scope and seconded by Marcos Ferreira

Discussion was held to prepare for approval of the WG by the subcommittee. The intention is to form task forces to review specific sections of the document. Further approval of the task forces and their scopes will be defined later.

The meeting was adjourned at 4:28 p.m. After adjournment Brian Spalding made a motion to submit a PAR request before the Power Subcommittee. Kyle Stechschulte seconded the motion, and an email vote was distributed to the members. The motion passed.

Unapproved Meeting Minutes

PC57.153 TF Guide for Paralleling Regulating Transformers

Minutes from March 12, 2024 - Vancouver Meeting

Officers

Chair – Mark Tostrud

Vice Chair – Cihangir

Sen

Secretary – Zan Kiparizoski

1. Call to Order

The meeting was called to order at 4:45 PM on March 12, 2024

2. Chairs Remarks

This is the first meeting of the working group for the revisions to C57.153. The PAR was approved during the October 2023 NESCOM meeting. The PAR for the working group expires December 2027. Being the first meeting of the working group, any attendees interested in becoming members should request membership on the attendance rosters being circulated.

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 37 attendees in the meeting
 - 18 attendees requested membership
 - All attendees not requesting membership were added as guests
- Quorum check
 - N/A since this was the first meeting of the working group

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

4.1. Meeting Agenda

No revisions to the emailed agenda were made. No objection to unanimous approval of the meeting agenda.

4.2 Approval of the minutes from the last task force meeting in fall, 2023

No objection to unanimous approval of the meeting minutes from fall 2023 task force meeting.

5. Nomination and Approval of Officers for the Working Group

The chair asked if there was any objection appointing the vice chair and secretary from the task force as officers for the working group as proposed in the agenda. No objection to unanimous approval of the officers.

- Vice Chair: Cihangir John Sen
- Secretary: Zan Kiparizoski

6. Old Business

Title, Scope, and Purpose from the PAR which was approved in October 2023 were reviewed. NesCom comments related to the use of Master/Follower were briefly discussed. No decisions were made on whether any changes in the body of the document are required since the guidelines for the use of inclusive language are still being drafted by IEEE.

6.1 Updates from volunteers from the last task force meeting

Concept of apparent circulating currents.

Karsten Viereck of Reinhausen presented slides on how Annex C which discusses apparent circulating current could be improved.

Definition of reverse power flow

Discussed whether there are any established definitions in other standards which could be used in the guide. The Task Force for Reverse Power Flow Effects on Transformers would be the most likely standard to reference but they have not defined it yet. Since the task force doesn't have an approved PAR yet, the working group felt we needed to come up with our own definition to avoid any delays. Several proposals were made, and the working group approved the following language:

Reverse power flow - a system condition in which the power flow in the transformer is from the normal energy output side to the normal energy input side.

Acceptable actions during the presence of reverse power flow were also discussed.

Review of the reference documents used in the 2015 version of the guide.

Francis Mills from Power Engineers presented his review of the reference materials used in

the guide.

- He was not able to locate the CEMA standard referenced in the guide and is unsure whether the standard is still valid or if it has been replaced by another standard. WG members were not familiar with the standard. The Chair agreed to review drafts from the guide from the original working group to see if the drafts contain any additional information or if there is an error in the reference.
- Minor changes were identified in the other references. The draft of the guide will be updated to reflect his findings.

7. New Business

No new business was identified.

8. Next Meeting

The next scheduled meeting will be at the fall meeting on October 29, 2024.

9. The meeting adjourned at 5:25 PM

10. Minutes

The minutes were recorded by John Sen – Vice Chair and reviewed by Mark Tostrud – Chair

C57.153 – Guide for Paralleling Regulating Transformers			
Last Name	First Name	Affiliation	Requested Membership
Bargone	Giles	FISO	X
Blaydon	Daniel	Baltimor Electric	X
Carrizales	Juan Alfredo	Prolec GE	
Colopy	Craig	Retired	
Hoffman	Saramma	PPL	X
Viereck	Karsten	Reinhausen	X
Kessler	Stacey	Ulteig-Engineers	
Knapp	Evan	Eaton	X
Li	Weijun	Braintree Electric Light Dept.	X
Machain	Luis	Prolec GE	
Millis	Francis	Power Engineers	X
Musgrove	Ryan	Oklahoma Gas&Electric	X
Rossini	Yuri	Siemens Energy	
Sauer	Dan	Eaton	
Schleismann	Eric	Southern Company	X
Sen	Cihangir	Duke Energy	X
Stank	Markus	Reinhausen	X
Tostrud	Mark	Dynamic Ratings	Chair
Vir	Dharam	Prolec GE	X

Fernandez	Miguel	Braintree Electric Light Dept.	
Crockett	Janet	Fayetteville PWC	
Reyes	Juan	Hitachi Energy	
Heiden	Kyle	Eaton	X
Koshel	Anton	Delta Star	
Alonso	Mario	Georgia Transformer	X
Mendez	Omar	Prolec GE	
Welton	Drew	Intellivent	X
Rahmatian	Farnoosh	NuGrid Power	
Lewis	Samuel	Hitachi Energy	
Arevalo	Edmundo	Bonneville Power Association	
Vaagensmith	Bjorn	Idaho National Lab	
Ashcraft	Stephen	Hitachi Energy	
Ogajanov	Rudolf	Hitachi Energy	
Radu	Ion	Hitachi Energy	X
Salem	Sherif	Eversource Energy	X
Zhang	Shibao	Pcore Electric	X
Bender	Jon	W.E. Grundy & Associates	

Standards Subcommittee

March 13, 2024, Vancouver, BC, Canada.

Standards Subcommittee		
Chair: Daniel Sauer	Vice-Chair: Marcos Ferreira	Secretary: Ajith Varghese
Standards Coordinator: Steve Shull		
Room: Regency E/F	Date: March 13, 2024	Time: 4:30 PM to 05:15 pm
Total Members: 70	Present at time of quorum check: 36	Attended per Record: 45
Guests present: 75	Membership requested: 20	Membership accepted: 15

L.1 Meeting Attendance

The Standards Subcommittee met on Wednesday; Mar 13th, 2024, at 4:32 PM (CST).

36 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 **45 of 70** members were present. 75 guests were also present of which **20** guests requested membership of which **15** met attendance requirement and will be granted membership.

L.2 Chair's Remarks

The Chair welcomed members and guests to the S24 meeting. Chair briefly highlighted the requirement that while introducing one need to state their affiliation.

The agenda was moved by Eric Davis and seconded by Francis Mills. The motion was carried with unanimous consent. The Minutes for Fall 2023 was moved by Sanjib Som and seconded by Jerry Murphy. 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 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, C57.12.80, C57.152 and C57.163 and TF on IEEE/IEC and Reverse Power flow provided an update on status of their standards/TF. Detailed WG/TF reports are included as part of this report.

- **WG C57.12.00:** During S24, PCS approved two changes for addition to the next revision of C57.12.00 . These are related to changes to reporting of Auxiliary losses and addition of Vector group to Nameplate. Chair (Eric Davis) stated that cut off for next revision will be after Spring 2025 meeting.
- **WG C57.12.90 Test Code:** Dielectric SC approved two changes for addition to C57.12.90- Additional notes to switching surge test section to verify phase to phase voltage withstand of LTC and allowing venting of bushings during induce test, when bushing is suspected as the cause of PD.

Sanjib Som wanted clarity of 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. It was clarified that all changes to these standards are discussed and approved in respect and approved by the respective subcommittee. Chair agreed to review this further during next P&P revision.

- **WG C57.12.70 Terminal Markings:** Currently not active and did not meet.
- **WG C57.12.80 Terminology Guide:** Currently not active and did not meet.
- **WG C57.152 Field guide:** Ballot is currently open, and document is under copyright review. WG Passed a motion "to create a comment resolution group and agree to give them full authority to resolve comments without bringing them back to the WG.
- **WG C57.163 Guide for Establishing Power Transformer Capability while under Geomagnetic Disturbances:** WG did not meet. Balloting process is complete and approved, pending editorial approval before releasing the guide.
- **TF IEEE/IEC Cross Reference:** TF met and discussed the framework and scope of work to be carried out. TF plan to start with creating an index document to compare IEC and IEEE and plan to start populating that before Fall meeting.
- **TF of Reverse Flow:** TF Chair (Ryan Hogg) reported that members agreed to disband this Task Force and sought a motion to submit a PAR to create a new guide for Evaluating Transformer Performance under Reverse Power Flow. Motion was moved by Sanjib Som and seconded by Jason Vernall.

Motion to proceed with PAR to create a new Guide for Evaluating Transformer Performance under Reverse Power Flow was approved 28 in favor and 1 against with 3 abstaining.

Dan Blaydon pointed out that Reverse Flor TF was initially set with two specific objective and one of them " Provide recommendations to update "service conditions" of the base standards" will be left out with disbanding the TF. Sanjib Som requested a presentation or any additional information to be shared, so that SC can make an informed decision. SC chair requested Dan Blaydon to prepare a document to be shared/presented to the SC.

Subcommittee New business and SC attendees list are included at end of this minutes after WG/TF reports.

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
Spring 2024 Vancouver, CA; March 13, 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 Partial Discharge Tests for Class I Transformers (DiTest)
 - o The SC authorized a survey of the subcommittee for the following proposals. Please refer to TF and SC meeting minutes for additional detail on the proposals.

- Proposal 1: Change PD Class I criteria to 250 pC with a maximum 50 pC rise to match the Class II requirements. Approved.
- Proposal 2: Keep the duration of the PD Test at 1 hour. Approved.
- Proposal 3: Remove acceptance criteria for PD for units below 34.5-kV. Approved.
- Proposal 4: All changes from the TF will be kept in Clause 10.7. Approved.
- Proposal 5: Modify Table 3 so we have a section for Class I without PD and a section for Class I with PD. Approved.
- Proposal 6: Modify Table 4. Not approved.
- Proposal 7: Modify the Title of Table 3: Refer to Proposal 5
- TF PCS Continuous Revisions to C57.12.00 (PCS)
 - o The TF approved the following items. Please refer to the TF and SC meeting minutes for additional details.
 - o Item 113: Measurement of Auxiliary Losses. Approved.
 - o Item 114: Section 5.7.2 Phasor Groups. Approved.
- TF Revision of Impulse Tests C57.12.00 & C57.12.90 (DiTest)
- TF Continuous Revisions of Low Frequency Tests (DiTest)

Changes already approved for the next revision:

1. Changes to Low Frequency Tests from Ajith Varghese's RLFT TF in the Dielectric Test SC. Final survey approved by TF and SC in the Spring 2023 meeting. 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.

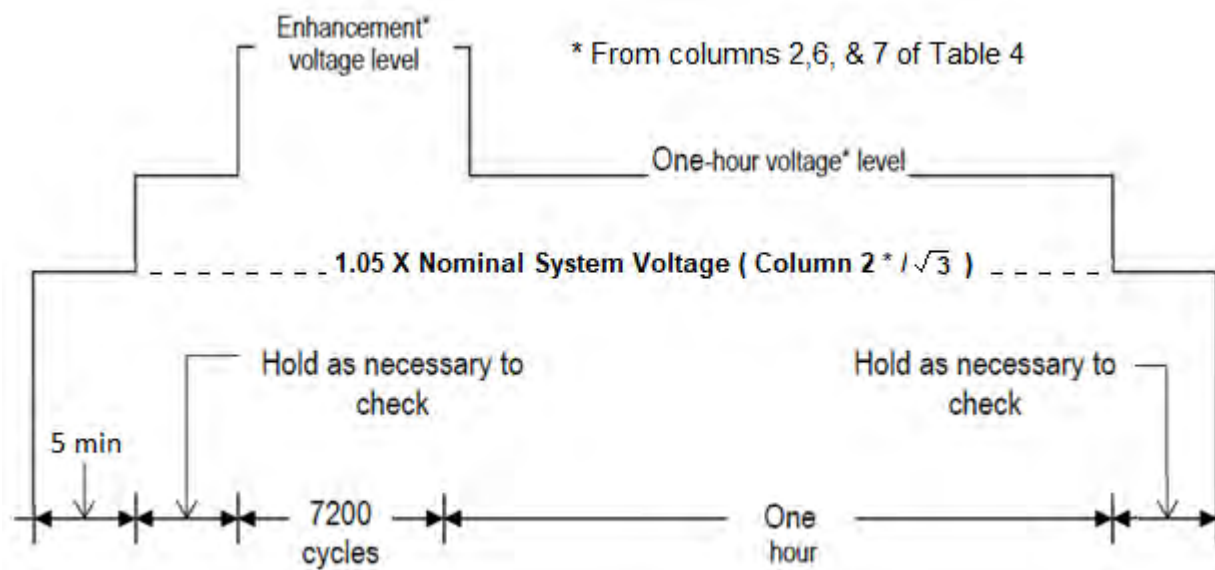


Figure 2 —Induced-voltage test for Class II power transformers

Respectfully submitted,
 Eric Davis, WG Chair
 March 24, 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

Spring 2024 Vancouver; March 13, 2024 (changes in purple text)

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.

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. As of March 12, 2024 there is only one item of business related to Clause 5 and determining the temperature used for measuring cold resistance. This item was

further discussed in Vancouver and it will be forwarded to Dinesh's TF on Temperature Test. However, some activity will remain.

2. Possible changes to Clause 13 sound test from Ramsis' TF. No open items. Measuring sound level of Preventive Autotransformers (PA) in air as a Quality Control check was presented and discussed. Possibly a Task Force Paper will be written.
3. Possible changes to Subclause 10.2 or 10.3 from Sylvain Plante's TF regarding switching and lightning impulse tests. The TF has the following items on its agenda and is working on possible revisions:
 - 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.
 - Establishing guidelines about use of +/-3% tolerance on voltage peak. Draft wording was presented and discussed. Survey was done prior to Kansas City with high approval rate. The following final wording was approved by the Dielectric Test SC during the F23 Kansas City SC meeting:
 - o 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.

o 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.

- Proposal regarding tap for phase-to-phase switching impulse, 10.2.4. This work was approved in S23, TF Chair to do slight rewording based on feedback. The S24 Vancouver Dielectric Tests SC approved a motion to add the following to 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.”

4. Other possible revisions to subclauses 10.5 to 10.10 from Ajith Varghese’s TF for revision of low frequency tests.

- Class I transformer PD test revision to the test procedure by Don Ayer’s sub Task Force. The sub-task force received approval from the S24 Vancouver RLFT TF to survey the Dielectric Tests SC for the sub-task force’s final text. This work is nearing its end and seems like a final version is imminent.
- Venting bushings during PD test, lots of discussion, this is a controversial topic, some proposed wording exists as a starting point and a small subgroup revised it again prior to Kansas City. Need collaboration with bushing manufacturers, transformer manufacturers, and users who all have different viewpoints. This work is nearing its end in F23 TF. It was approved at the F23 Dielectric Test Subcommittee meeting to go for survey of the DTSC. 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.
- A revision to add clarification to the overvoltage factor for Induced Test will be made in 12.00 and 12.90 as appropriate. Wording has been developed by Jason Varnell. It was agreed in Vancouver S24 by the RLFT TF to survey the TF for discussion at the F24 TF meeting and seems like a final version is imminent.
5. Possible changes to subclause 10.11 from Diego Robalino's TF regarding insulation resistance. This work is ongoing, the TF met in Vancouver. 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 ongoing in a small subgroup and was almost complete in F23 Kansas City. This was further discussed at TF meeting in Vancouver S24; Steve Antosz will revise based on comments and send to TF Chair.
- 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 will be circulated to the whole TF for comments.
- Proposal by Bertrand Poulin OFAF Cooling and Top Duct Oil temperature and diagram in C57.119. Prior to Kansas City a small sub group developed some wording, it was briefly discussed in Kansas City. It was circulated to the Task Force for comments. This was further discussed at TF meeting in Vancouver S24, and more work will be done.
- 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.
- Standardize Method for Hot resistance extrapolation not covered in Kansas City, but Bertrand Poulin submitted some info that should be circulated to the TF.

Respectfully submitted,
Stephen Antosz, WG Chair
Jason Varnell, WG Vice-Chair

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*

March 11, 2024, 4:45PM – 6:00PM
UNAPPROVED MINUTES

Welcome

The chair of the working group, Marcos Ferreira, opened the meeting at 4:45PM. Due to the absence of the secretary, Goran Milojevic, the notes of the meeting were kept by Evgenii Ermakov of Hitachi Energy.

1. Attendance and Attendance for Quorum

At the time of the meeting there were 38 Members, including Chair and Secretary. The chair counted the present members and established that the quorum was met. A total of 73 members and guests signed the circulating roster.

The list of attendees who signed into the paper roster is shown below:

Name	Affiliation	Status
Ferreira, Marcos	Quanta Technology	Chair
Bradshaw, Jeremiah	US Bureau of Reclamation	Member
Dutta Roy, Samragani	Siemens Energy	Member
Ermakov, Evgenii	Hitachi Energy	Member
Foata, Marc	Maschinenfabrik Reinhausen	Member
Gara, Lorne	Shermco	Member
Gardner, James	Prolec-GE Waukesha	Member
Harley, John	First Power Group	Member
Heiden, Kyle	EATON Corporation	Member
Locarno, Mario	Doble Engineering Company	Member
Mabrey, Stephanie	Weidmann Group	Member
Murray, David	TVA	Member
Reed, Scott	MVA	Member
Saad, Mickel	Hitachi ABB Power Grids	Member
Sauer, Dan	EATON Corporation	Member
Sweetser, Charles	OMICRON Electronics Corp USA	Member
teNyenhuis, Ed	IEEE	Member
Welton, Drew	Intellirent	Member
Woods, Deanna	ATC LLC	Member
Zhang, Shibao	PCORE Electric	Member

Boettger, William	Boettger Transformer Consulting LLC	Guest
Britton, Jeffrey	Phoenix Technologies	Guest
Castellanos, Juan	Prolec-GE Waukesha	Guest
Crockett, Janet	Fayetteville PWC	Guest
Cruz-Valdez, Juan Carlos	Prolec-GE Waukesha	Guest
Detlev, Gross	Power Diagnostix Consulting	Guest
Duffy, Jesse	Nashville Electric	Guest
Eun Young Cho	HICO America	Guest
Fazlic, Zlatan	Camlin Energy	Guest
Fu, Yao	BC Hydro	Guest
Gardner, James	Prolec-GE Waukesha	Guest
Gasperin, Eloy	Mistras	Guest
Hoffman, Sarama	PPL	Guest
Jonah, Ryan	PGE	Guest
Lachance, Matthew	OMICRON Electronics	Guest
Lagos, Fernando	GE Vernova	Guest
Leal, Fernando	Prolec-GE Waukesha	Guest
Lee, Junho	HD Hyundai	Guest
Lizcano, Cesar	Shell USA Inc	Guest
Martinez, Alberto	WEG USA	Guest
McBride, Brian	Cargill	Guest
McBride, Jim	JMX Services, Inc.	Guest
Melo, Yegor	BC Hydro	Guest
Murphy, Jerry	RCES	Guest
Natale, Anthony	HICO America	Guest
Neild, Kris	Megger	Guest
Nims, Joe	Allen & Hoshall	Guest
Nunez, Martin	Orto	Guest
Ortiz, Cuahtemoc	Niagara Transformer	Guest
Pruente, John	Prolec-GE Waukesha	Guest
Ravi, Gupta	Megger	Guest
Reepe, Robert	GA Power Co	Guest
Rehkopf, Sebastian	Maschinenfabrik Reinhausen	Guest
Reimer, Jonathan	Fortis BC	Guest
Richardson, Michael	Ameren	Guest
Salem, Sherif	Eversource Energy	Guest
Sar Kinen, Garrett	Xcel Energy	Guest
Shaikh, Abdul Majid	Delta Star	Guest
Soeller, Markus	Power Diagnostic Systems	Guest
Sparling, Brian	Kinetrics	Guest
Stechschulk, Kyle	AEP	Guest
Sze, Matthew	OMICRON Electronics	Guest
Tade, Sachin	PTI Transformers	Guest
Teofanovic, Marko	Ontario Power Generation	Guest
Thiede, Andreas	HIGHVOLT Prueftechnik Dresden	Guest
Tolcachir, Eduardo	TTE	Guest

Vandervalt, Alwyn	ECI	Guest
Vandermaar, John	BC Hydro	Guest
Vary, Robert	Reinhausen US	Guest
Vermette, Yves	Electro Composites	Guest
Washburn, Alan	Burns & McDonnell	Guest
Webb, Matthew	GE Vernova	Guest
Wright, Jeffrey	Duquesne Light	Guest

2. Approval of the Agenda

The motion to approve the agenda was made by Drew Welton, and seconded by Evgenii Ermakov. The motion was approved unanimously.

3. Approval of Minutes of Fall 2022 Meeting

The motion to approve the Minutes of Fall 2022 Meeting was made by Mickel Saad, and seconded by Evgenii Ermakov. 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.

“After the Fall 2023 meeting, the draft accepted by the Working Group and the Standards Subcommittee was submitted to MEC (Mandatory Editorial Coordination). During the January meeting, MEC has submitted its response with 10 action items that must be completed prior to the beginning of the ballot (Section 1), and additional 7 action items that must be completed prior to the final recirculation. The WG officers have been working on addressing the MEC comments from Section 1, with the goal of submitting the draft for ballot by the end of March.”

Stephanie Mabrey made a motion “to create a comment resolution group and agree to give them full authority to resolve comments without bringing back to the WG”. Ed teNyenhuis seconded. The motion was approved unanimously.

7. New Business

No new business.

8. Meeting Adjournment

The motion to adjourn the meeting was made by Evgenii Ermakov, and seconded by Mickel Saad. The meeting was adjourned at 5:30PM.

Respectfully submitted,

Marcos Ferreira – Chair

Goran Milojevic – Secretary

L.3.6 TF - IEEE / IEC Continuous Cross Reference

S24 Meeting Minutes (Unapproved)

Standards Subcommittee Task Force

IEEE / IEC Cross Reference

Monday, March 11, 2024, 9:30am to 10:45am

Chair: Alan Washburn

1. Welcome Meeting came to order at 9:35am
2. Introduction of participants
 - a. 13 attendees: Jaroslaw Chorzepa, Juan Carlos Cruz Valdes, Janko Dzodan, Anton Koshel, Marta Munoz, Monil Patel, Thomas Prevost, H. Allen Steele, Ryan Thompson, Steve Tsai, Ajith Varghese, Dharam Vir, Alan Washburn
3. IEEE SA patent policy and call for patents
4. IEEE SA copyright policy
5. Membership review
 - a. 4 of 8 members present, quorum achieved.
6. Review/approval of agenda.
7. Review/approval of S23 meeting minutes.
8. Old business
 - a. Scope of TF Continued discussion on index scope, format
 - i. Look for opportunities to make recommendations to IEEE or IEC organizations.
 - b. Creation of index document Involvement of other stakeholders/subcommittees, may help to collect information more quickly.
 - i. Start with TC-14 and TC-10 List of documents Added TC10, 15, 38, SC36A, and TC113 For IEEE we'll focus initially on standards Use of Collaboratec for a shared file area and working document tool.
 1. Setup is complete, additional invites will be sent to new participants.
 - ii. Document lists are uploaded.
 - iii. Initial concept index spreadsheet created.
9. New business
 - a. Presentation of index concept
 - i. Discussion on how to best structure index
 - ii. Several options suggested and to be considered.
10. Adjourn

L.4 Old Business

There was no old business to discuss.

L.5 New Business

Ryan Hogg brought up a new business of need for defining reverse power flow. It was pointed out that some WG like C57.153 is already working on creating own definition and it is important to have standard definition.

A motion was brought up by Francis Mill (seconded by Jeff Wright) to create a new TF for creating a definition for Reverse Power Flow. Chris Zibert commented that definitions are covered by C57.12.80 and there is no need for another TF. After some discussion and **motion was amended to create a PAR study group to develop an addendum to C57.12.80 for defining Reverse Power Flow.** Motion was carried 24 in support, 2 against and 7 abstentions.

L.6 Attendance

Included as last two pages of this minutes.

L.7 Adjournment

The meeting was adjourned at 5:22 PM CST.

Respectfully submitted,
Ajiith M. Varghese
Standards SC Secretary
04/06/2024

Standards SC S24 Attendance List

Role	First Name	Last Name	2024 Mar
Guest	Abdul Majid	Shaikh	X
Secretary	Ajith	Varghese	X
Member	Alan	Washburn	X
Guest	Alex	Ayala	X
Guest	Ali	Naderian	X
Guest	Alireza	Gorzin	X
Member	Alwyn	Van Der Walt	X
Member	Amitabh	Sarkar	X
Member	Andrew	Larison	X
Guest	Angela	Leigl	X
Guest	Anton	Koshel	X
Guest	Arash	Rezvan	X
Guest	Bertrand	Poulin	X
Member	Bruce	Webb	X
Member	Carlos	Gaytan	X
Guest	Chanmin	Jeong	X
Guest	Charles	Sweetser	X
Guest	Christopher	Johnson	X
Guest	Christopher	Whitten	X
Guest	Cole	Van Dreef	X
Member	Daniel	Blaydon	X
Chair	Daniel	Sauer	X
Guest	Daniel	Posadas	X
Member	David	Wallach	X
Member	Dharam	Vir	X
Guest	Didier	Hamoir	X
Guest	Dinesh	Sankarakurup	X
Member	Drew	Welton	X
Member	Dwight	Parkinson	X
Member	Ed	teNyenhuis	X
Member	Eduardo	Garcia Wild	X
Member	Egon	Kirchenmayer	X
Guest	Emilio	Morales-Cruz	X
Member	Eric	Davis	X
Guest	Evan	Knapp	X
Member	Evgenii	Ermakov	X
Guest	Fernando	Tirado	X
Guest	Fernando	Salinas	X
Member	Francis	Mills	X
Guest	Gabriel	Delgado	X
Guest	Garret	Sarkinen	X
Member	Gilles	Bargone	X
Guest	Grace	Guang Yuan	X
Guest	Harmanpreet	Shekon	X
Guest	Janet	Crockett	X
Member	Jarrold	Prince	X
Member	Jeffrey	Wright	X
Guest	Jeremiah	Bradshaw	X
Member	Jerry	Murphy	X
Guest	Jinming	Li	X
Guest	Joe	White	X
Member	John	John	X
Guest	john	Vandermaar	X
Guest	John	Wagner	X
Guest	Jonathan	Reimer	X
Guest	Jonathan	Tan	X
Guest	Jose Luiz	Machain	X
Member	Joseph	Tedesco	X
Guest	Joshua	Watson	X

Role	First Name	Last Name	2024 Mar
Guest	Joshua	Verdell	X
Member	Joshua	Yun	X
Guest	Juan	Acosta	X
Guest	Juan Alfredo	Carrizales	X
Member	Juan Carlos	Cruz Valdes	X
Guest	Juan	Reyes	X
Guest	Junho	Lee	X
Guest	Justin	Minikel	X
Member	kayland	Adams	X
Member	Kris	Zibert	X
Member	Kristopher	Neild	X
Guest	Kumar	Mani	X
Guest	Kyle	Helden	X
Guest	Kyle	Stechschulte	X
Guest	Luc	Loiselle	X
Guest	Malia	Zaman	X
Vice-Chair	Marcos	Ferreira	X
Guest	Mark	NewBill	X
Guest	Mark	Tostrud	X
Guest	Marko	Teofonic	X
Guest	Marnie	Roussell	X
Guest	Masta	Munoz	X
Guest	Matthew	Sze	X
Guest	Matthew	Weisensee	X
Guest	Michael	Richardson	X
Guest	Miguel	Fernandez	X
Guest	Miguel	Garcia	X
Guest	Miguel	Plascencia	X
Guest	Mihir	Amir	X
Guest	Monil	Patel	X
Guest	Omar	Mendez	X
Member	Onome	Avanoma	X
Guest	Orlando	Giraldo	X
Guest	Paul	Weyandt	X
Guest	Pouneh	Davoudi	X
Member	Pragnesh	Vyas	X
Member	Ramadin	Issack	X
Guest	Raymond	Frazier	X
Guest	Rhett	Chrysler	X
Member	Rob	Ghosh	X
Guest	Robert	Reepe	X
Guest	Ryan	Musgrove	X
Guest	Ryan	Hogg	X
Guest	Sherif	Salem	X
Guest	Samson	Debass	X
Member	Sanjib	Som	X
Member	Saramma	Hoffman	X
Member	Scott	Digby	X
Member	Scott	Reed	X
Guest	Scott	ThomAS	X
Member	Sergio	Hernandez Cano	X
Guest	Stacey	Kessler	X
Member	Stephen	Shull	X
Member	Steven	Snyder	X
Member	Thomas	Prevost	X
Guest	Tim	Rocque	X
Guest	Tim	Raymond	X
Member	Tim-Felix	Mai	X
Guest	Vijay	Tendulkar	X
Guest	Vivian	Chan	X
Member	Weijun	Li	X

Chairman: George Payerle

Vice-Chair: Tony Reiss

Meeting Date: March 13, 2024 Location: Vancouver, BC Time: 11:00 – 12:15

Meeting Administration:

Meeting Opened at 11:01 PST

- Sign In - 2 attendance rosters distributed
- Chairman's Comments - small enough group so introductions were made
- Quorum Determination, member list
 - 36 members, 19 needed for quorum - 19 in attendance
- Present agenda for approval
 - Motion to approve - Dave Blew, 2nd - Igor Simonov - Unanimous approval
- Approval of the Fall 2023 minutes
 - Motion to approve - Mark Faulkner, 2nd - Dan Schwartz - Unanimous approval
- Announce new members Piotr Blaszczyk, Daniel Posadas, James Spaulding, Travis Spoone, William Whitehead
 - 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 mites of previous meeting.
 - Chairman clarified - if a group hasn't met in several meetings, please reference back to the last meeting minutes (Fall/Spring and year)
- Does anyone request SC membership? Indicate on roster.
 - Stated at start of roster circulation

Meeting attendees

Members Present

* Sanford	Fong	
Benjamin	Garcia	Southern California Edison
Carlos	Gaytan	Prolec GE
Kenneth	Hampton	Baltimore Gas & Electric
Ramadan	Issack	American Electric Power
Alejandro	Macias	CenterPoint Energy
Daniel	Mulkey	Mulkey Engineering Inc.
Vinay	Patel	Consolidated Edison Co.
George	Payerle	Carte International Inc.
Clemens	Reiss IV	Custom Materials, Inc.
Dan	Schwartz	Quality Switch, Inc.

Jeremy	Sewell	Quality Switch, Inc.
Adam	Sewell	Quality Switch, Inc.
Igor	Simonov	Toronto Hydro
Travis	Spoone	EATON Corporation
Alan	Traut	Howard Industries
* Jeremy	Van Horn	IFD Corporation
John	Vartanian	National Grid
Joshua	Verdell	ERMCO
Michael	Zarnowski	Carte International

Guests Present

* Jared	Bates	Oncor Electric Delivery
Paulo	Bautista	Enmax
Kevin	Biggie	Weidmann Electrical Tech.
Jeffrey	Brooks	Power Engineers
Noah	Chesser	Oncor Electric Delivery
Sanford	Fong	Georgia Power Co.
Michael	Gonzales	Southern California Edison
Luke	Grandbois	IFD Technologies
Didier	Hamoir	Transformer Protector Corp
Adam	Klaponksi	Carte International
David	Lin	IFD Technologies
Jinesh	Malde	M&I Materials Inc.
Nicholas	Manske	Oncor Electric Delivery
Fernando	Meza	Power Partners, Inc.
Justin	Minikel	EATON Corporation
Daniel	Posadas	Prolec-Celeco
Sherif	Salem	Eersource Energy
Fernando	Salinas	Power Partners, Inc.
Russell	Sewell	Quality Switch, Inc.
Audrey	Siebert-Timmer	IFD Technologies
Fernando	Tirado	Prolec GE
Malia	Zaman	IEEE
* = requested membership		

Working Groups Report:

- **C57.12.23 Single-Phase Submersible Transformers** working group –
 - Alan Traut, Chairman,
 - Revision due date: 12/31/2028
 - PAR Approval Date:
 - PAR Expiration Date: 12/31/28

Stage:

Presented by Alan Trout - 3/13/24

PC57.12.23 – Single Phase Submersible Transformers

March 11, 2024

Vancouver, BC Canada

Chair: Alan Traut, Howard Industries

Vice-Chair: OPEN

Secretary: George Payerle, CARTE International (acting)

Call to order

The meeting was called to order by the Chair at 11:00AM PDT on Monday, March 11, 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 volunteers for vice-chair and 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 8 in-person meetings available to work on the revision. The chair is targeting to vote to send the document to ballot in Fall of 2027.

Membership & Quorum

Since this is the first meeting of the WG under the present PAR, 42 of the 61 attendees requesting membership at this meeting were granted immediate membership. Therefore, 100% quorum was declared. The meeting attendance is shown below.

Nabi	Almeida	Prolec GE	Member	Daniel	Mulkey	Mulkey Engineering Inc.	Member
Stephen	Ashcraft	Hitachi Energy	Guest	Martin	Munoz	Orto	Member
Alex	Ayada	Power Partners	Guest	Daniel	Oh	Hyundai	Guest
Jared	Bates	Oncor Electric Delivery	Member	Joel	Pacas	IFD Technologies	Guest
Piotr	Blaszczuk	Specialty Transformer Components	Member	Besjan	Pajaziti	Brockhaus Measurements	Guest
Jeffery	Brooks	Power Engineers	Member	Vinay	Patel	Con Edison of NY	Member
Jim	Cai	JSMP Transformer	Member	George	Payerle	Carte International Inc.	Member
Noah	Chesser	Oncor Electric Delivery	Vice Chair	Daniel	Posadas	Prolec Celeco	Member
Janet	Crockett	Fayetteville PWC	Guest	Jarrold	Prince	ERMCO	Member
Tony	DiBiase	Temple (Canada)	Guest	Robert	Reepe	Georgia Power Co.	Guest
Sanford	Fong	Georgia Power	Member	David	Rohrer	First Energy	Member
John	Fraser	IFD Technologies	Guest	Mason	Rush	Central Moloney	Member
Kevin	Frye	Central Moloney Inc	Guest	Fernando	Salinas	Power Partners	Member
Benjamin	Garcia	Southern California Edison	Member	Russ	Sewell	Quality Switch	Guest
Hector	Garza	Orto	Guest	Audrey	Siebert-Timmer	IFD Technologies	Member
Carlos	Gaytan	Prolec GE	Member	Igor	Simonov	Toronto Hydro	Member
Ali	Ghaforian	H-J Family of Companies	Member	Jimmy	Smith	Howard Industries	Member
Stephen	Gilbert	IFD Technologies	Guest	Shankar	Subramany	KEMA Netherlands	Member
Michael	Gonzales	Southern California Edison	Member	Jesse	Theberge	Temple (Canada)	Guest
Luke	Grandbois	IFD Technologies	Guest	Michael	Thibault	Pacific Gas & Electric	Member
Kenneth	Hampton	Baltimore Gas & Electric	Member	Tim	Tillery	Howard Industries	Member
Ramadan	Issack	American Electric Power	Member	Alan	Traut	Howard Industries	Chair
Adam	Klaponski	Carte International Inc.	Member	Steve	Tsai	JST Power Equipment	Member
Brian	Klaponski	Carte International Inc.	Member	Reinaldo	Valentin	Duke Energy	Member
Gilbert	Kozer	Northeast Transformer	Member	Jeremy	Van Horn	IFD Technologies	Member
Patrick	Kozer	Northeast Transformer	Member	John	Vartanian	National Grid	Member
Angela	Leigl	EATON Corporation	Guest	Joshua	Verdell	ERMCO	Guest
David	Lin	IFD Technologies	Guest	Shelby	Walters	Howard Industries	Member
Alejandro	Macias	CenterPoint Energy	Secretary	Bruce	Webb	Knoxville Utilities Board	Member
Nicholas	Manske	ONCOR Electric Delivery	Member	Alan	Wilks	Consultant	Guest
Fernando	Meza	Power Partners	Member	Michael	Zarnowski	Carte International Inc.	Member
Tyler	Morgan	Duke Energy	Member				

Approval of agenda

The Chair sent out the Agenda prior to the meeting for review. A motion was made to approve the agenda (Ben Garcia/Shelby Walters). Agenda was unanimously approved.

Approval of previous meeting minutes

The chair presented minutes from that last meeting in Spring 2018. A motion was made (Dan Mulkey/Ben Garcia) to approve the previous meeting minutes. The motion passed unanimously.

Old Business

The chair presented the unresolved or rejected comments from balloting of the previous revision of the standard. These comments are marked in the present draft and will be evaluated during the draft review.

New Business – Review of draft 1.0

Introduction - The first paragraph of the Introduction is a re-statement of the document's scope. This paragraph is unnecessary and will be deleted. The last paragraph of the Introduction states that the last revision was 2019. This is incorrect and will be changed to 2018.

Clause 1.2 Purpose - The purpose technically has not changed but the wording was modified slightly to match C57.12.24-2023.

Clause 5.5 Reference Temperature – During the ballot of the previous revision a comment was submitted to change the reference temperature to 20C plus the average winding rise as it is in C57.12.80. This standard assumes an average ambient of 30C therefore the clause will remain as-is in the published document. The current wording also allows for the use of designs utilizing higher temperature insulation systems with higher winding rise.

Clause 6.1 Low frequency dielectric test – The Chair will review the wording of this paragraph compared to other standards for single phase applications, eg, C57.12.90, C57.12.38, C57.12.20. Chair to report at the next meeting.

Terminal designations – The Chair suggested that we standardize on terminal designation using letter and number without using subscripts. Eg, H2 vs H₂. Members agreed to make this change.

Clause 7.2.2 LV terminals, Fig 2 and Fig 3 – The Chair will compare this document to C57.19.02 and bring recommendations back to the WG at the next meeting. The Chair will also check the referenced standard for LV cable leads to make sure it is current.

Table 4 Low voltage terminal sizes – Table 4 refers to an H spade but Fig 3 refers to a 4-hole spade. Members agreed to change Table 4 to 4-hole spade for consistency.

Clause 7.3 Accessories - Should we add components, e.g fuses, that appear in other standards? Task force #1 will look into this and provide recommendations at the next meeting.

Clause 7.5 Transformer tank integrity – Task force #2 will compare this clause with C57.12.39 and recommend changes , eg, incorporate 12.39 by reference. This includes PRV requirements when a PRV is specified. The dynamic tank integrity test reference is changed from C57.12.20 to C57.12.39.

Clause 7.6.1 Tank materials – Task force #1 will compare to C57.12.24 and recommend changes at the next meeting.

New Business - Rectangular Tanks

During the 2018 revision, the subject of adding rectangular tank designs was tabled due to lack of time to properly address the topic. Should this construction be added to the standard?

Mike Thibault/Dan Mulkey - PG&E has a rectangular design, it is used by a few other utilities including Fort Collins, and CenterPoint. The current users probably don't need advice on that as they have their own specifications. The only reason to include would be if new users wanted to start using a rectangular tank. Rectangular tanks may have a safety advantage over round tanks because they can flex and bulge to handle rapid pressure increases. Mike Thibault, will come back at the next meeting and do a presentation on the PG&E experience with rectangular tanks.

New Business – Task force assignments

Two new task forces were formed to address issues identified in the draft. The Chair will coordinate with the task force leaders for presentation at the Fall 2024 meeting.

Task force #1 will compare C57.12.23 and C57.12.24 and recommend changes to 12.23 building on the work previously done on the revision to 12.24. Members are:

Dan Mulkey (Chair)

Nabi Almeida

Alex Macias

Fernando Meza

Ali Ghafourian

Mike Thibault

Task force #2 will compare the tank integrity requirements in 12.23 to 12.39 and recommend changes to 12.23. They will also look at the benefits of rectangular tank construction vs round tank. Members are:

Carlos Gaytan (Chair)

Jeremy vanHorn

John Vartainian

Vinay Patel

The Chair will make the changes approved today and send the draft out for general comment among the meeting participants.

Next meeting

October 27 - 31, 2024 in St Louis, MO

The meeting adjourned at 12:05 pm PDT.

- **C57.12.24 Three-Phase Submersible Transformers** working group –
Ben Garcia, Chairman; Tom Dauzat, Vice Chair; George Payerle, Secretary
 - o Published: 2023
 - o Revision Due Date: 12/31/**2033**
 - o PAR Approval Date:
 - o PAR Expiration Date:

Presented by Ben Garcia - 3/13/24

Working group did not meet. The work has been published. Congratulations to the WG for their efforts!

- **C57.12.40 Secondary Network Transformer** working Group –
John Vartnian, Chairman, Dan Schwartz, Secretary
 - o Published 2017
 - o Revision due date: **12/31/2027**
 - o PAR Approval Date: 8/31/2012
 - o PAR Expiration Date: **12/31/2025**

Stage: Submitted to Revcom on RevCom Agenda 04-May-2017

Presented by John Vartanian - 3/13/24

Members Present

John Vartanian (Chair)	National Grid
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.
Mark Faulkner	Eaton Corporation
Brian Klaponski	Carte International Inc
Gilbert Kozier	Northeast Transformer Services
Patrick Kozier	Northeast Transformer Services
Alex Macias	CenterPoint Energy
Vinay Patel	Consolidated Edison of NY
George Payerle	Carte International Inc.
James Ratty	Richards Manufacturing Co.
Adam Sewell	Quality Switch
Jeremy Sewell	Quality Switch
Russell Sewell	Quality Switch
Igor Siminov	Toronto Hydro
Travis Spoone	Eaton Corporation
Mike Zarnowski	Carte International Inc

Company

Guests Present

*Javier Arteaga	Hitachi Energy
*Jeffrey Brooks	Power Engineers
Jim Cai	JSHP Transformer
*Sanford Fong	Georgia Power
*Orlando Giraldo	The HJ Family of Companies
Didier Hamoir	Transformer Protector Corp.
Adam Klaponski	Carte International Inc.

Company

Nicholas Manske

Fernando Meza

*Daniel Posada

Audrey Siebert-Timmer

*Jimmy Smith

*Requested Membership

Oncor Electric Delivery

Power Partners

Prolec Celeco

IFD Technologies

Howard Industries

- 1) The group met on Tuesday, March 12, 2024 at 11:00 AM PST with 19 members and 12 guests. Six (6) guests requested membership. Quorum was achieved with 20/29 (69%) 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 and the previous minutes from October 24, 2023 were presented for approval. Motion to approve was made by Dave Blew and seconded by Alex Macias. Both were approved unanimously.
- 6) The Chair reviewed that the PAR extension was approved and remains active through the end of 2025.
- 7) Old Business
 - a. The Chair reviewed the PAR timeline.
 - b. The Chair noted that the current revision (D2) is in ballot for final approval.
- 8) New Business
 - a. It was recommended by George Payerle to remove two members as they will no longer be attending Transformer Committee meetings.
 - b. Presentation by Martin Bachand from Cloverdale Paint, Inc on submersible enclosure coatings.
- 9) The meeting was adjourned at 11:42 AM PST with the next meeting set for St. Louis, MO on October 29, 2024.

Respectfully submitted,
D. Schwartz, Secretary

- **C57.12.44 Secondary Network Protectors** working group –
Mark Faulkner, Chairman, Alex Macias, Secretary
 - o Revision due date: **12/31/2024**
 - o PAR Approval Date: **3/26/2015**
 - o PAR Expiration Date:

Stage: In ballot resolution

Document #:	<u>C57.12.44</u>		
Document Title:	STANDARD REQUIREMENTS FOR SECONDAY NETWORK PROTECTORS		
Chair:	<u>Mark Faulkner</u>	Vice-Chair	<u>n/a</u>
Secretary	<u>Alex Macias</u>		

Current Draft Being Worked On: DRAFT 13 Dated: March 12, 2024

Meeting Date: March 11, 2024 Time: 4:45PM – 6PM CT

Meeting Attendance

Activity Name: C57.12.44 WG Secondary Network Protectors
Activity ID:
Number of Members in Activity = 16
Number of Members Present = 14
Quorum Present = 87.5%
Number of attendees = 25

Mark Faulkner-	Eaton	member
Dan Mulkey-	Mulkey Eng	member
Brian Klaponski-	Carte	member
Douglas Craig-	Richards Manufacturing	member
George Payerle-	Carte	member
James Ratty-	ETI-NJ	member
Jeremy Sewell-	Quality Switch	member
Travis Spoone-	Eaton	member
Dan Schwartz-	Quality Switch	member
Michael Zarnowski-	Carte International	member
David Blew-	DS Blew Consulting	member
Alejandro Macias -	CenterPoint Energy	member
John Vartanian-	National Grid	member
Igor Simonov-	Toronto Hydro	member
Jeffrey Brooks-	Power Engineers	guest
Nabi Almeida-	Prolec Energy	guest
Malia Zaman-	IEEE	guest
Tony Reiss-	Customer Materials	guest
Vinay Patel-*	Con Edison	guest
Javier Arteaga-*	Hitachi Energy	guest
Justin Minikel-	EATON	guest
Daniel Posadas-*	Prolec GE	guest
Jim Cai-	JSHP Transformers	guest
Adam Klaponski-	Carte	guest
Sanford Fong-	GA Power	guest

Meeting Minutes:

The minutes shall record the essential business of the Working Group, including the following items at a minimum:

1. Meeting called to order
 - a. 4:45 PM
2. Introduction of all attendees
3. Quorum Verification
 - a. Quorum was confirmed via count and presentation of current WG names
4. Membership
 - a. No new members since last meeting
 - b. The following have requested for WG membership; attendance will be reviewed (minimum 2 of last 3 meetings)
 - i. Vinay Patel
 - ii. Javier Arteaga
 - iii. Daniel Posadas
5. Confirmation of the essential patent statement and responses
 - a. No conflicts; presented to group
6. Copyright requirements were reviewed by the Chair
 - a. No conflicts; presented to group
7. Approval of minutes of the previous meeting held on October 23, 2023, 1:45 – 3PM at Kansas City, MO.
 - a. Minutes presented to group.
 - b. Motion to approve Michael Zarnowsk, 2nd David Blew
 - c. Minutes approved unanimously.
8. Approval of agenda for this meeting.
 - a. Agenda presented to group.
 - b. Agenda approved unanimously.
9. Meeting Discussion
 - a. Attendees Informed
 - i. Approval of Par extension to 12/31/2024.
 - ii. At this time the Draft 12 has been edited to reflect all the changes made and those accepted from the 69 comments returned on the initial ballot by CRG (Comment Resolution Group). Technical items were presented to the WG for resolution.
 - iii. D12 will be rename D13 for re-circulation ballot.
 - iv. Comment Resolution Group (CRG) reminder are Mark Faulkner, Doug Craig, Dan Mulkey and Cory Morgan
 - b. Members were asked to email Alex Macias their emails as a means to verify information on file.
10. Meeting adjourned approximately 5:30 pm
11. Fall Meeting
 - a. St. Louis, MO.
 - b. Dates: October 27-31, 2024

Submitted by: Mark Faulkner

Date: 3/13/2024

- **C57.167 Guide for Monitoring Distribution Transformers** working group – Gary Hoffman, Chairman, Mike Thibault, Secretary o Revision due date: **N/A – new standard**
- o PAR Approval Date: **6/14/2018**
- o PAR Expiration Date: **12/31/2022**

Reports to Distribution subcommittee, No presentation at this meeting 3/13/2024

PC 57.12.53 Guide for mitigating corrosion on subsurface transformers

Will Elliott, Chair; Avijit Shingari, Vice-chair; Audrey Siebert-Timmer, secretary

PA R Approval Date: **2/23/2022**

- o PAR Expiration Date: **12/31/2026**

Document #:	PC57.12.53		
Document Title:	C57.12.53 Guide on Mitigating Corrosion on Subsurface Transformers and Network Protectors		
Chair:	Will Elliott	Vice-Chair	Micheal Zarnowski
Secretary	Audrey Siebert-Timmer	Per Cent Complete	80%
Current Draft Being Worked On:	Draft 3	Dated:	December 2023
Meeting Date:	March 12, 2024	Time:	4:45 PM PST
Attendance:	Members	15	
	Guests	29	
	Total*	44	

Attending Members:

Nabi Almeida, Prolec GE
 Dave Blew, Consultant
 Douglas Craig, Richards Manufacturing Co.
 John Harley, First Power Group LLC
 Brian Klaponski, Carte International Inc.
 Tyler Morgan, Duke Energy
 George Payerle, Carte International Inc.
 Daniel Posadas, Prolec Celeco

James Ratty, Electronic Technology Inc.
 Dan Schwartz, Quality Switch, Inc.
 Adam Sewell, Quality Switch, Inc.
 Jeremy Sewell, Quality Switch, Inc.
 Audrey Siebert-Timmer, IFD Corporation
 John Vartanian, National Grid
 Michael Zarnowski, Carte International Inc.

Attending Guests:

Javier Arteaga, Hitachi Energy
Alex Ayala, Power Partners
Jeffrey Brooks, Power Engineers
Sami Debass, Epri
Jeffrey Door, The H-J Family of Companies
Didier Hamoir, Transformer Protector Corp
Sanford Fong, Georgia Power Co.
Jean Phillipe Gagnon, Qualitrol
Benjamin Garcia, Southern California Edison
Carlos Gaytan, Prolec GE
Michael Gonzales, Southern California Edison
Luke Grandbois, IFD Corporation
Ken Hampton, Baltimore Gas & Electric
Ramadan Issack, American Electric Power
Adam Klaponski, Carte International Inc.

Petra Labbe, Sherwin-Williams
Tiffany Lucas, Prolec GE
Alejandro Macias, Centerpoint Energy
Fernando Meza, Power Partners
Vinay Patel, Consolidated Edison Co. of NY
Jarrod Prince, ERMCO
Clemens Reiss IV, Custom Materials
Russ Sewell, Quality Switch, Inc.
Igor Simonov, Toronto Hydro
Michael Thibault, Pacific Gas & Electric
Fernando Tirado, Prolec GE
Alan Traut, Howard Industries
Reinaldo Valentin, Duke Energy
Shelby Walters, Howard Industries

Subsurface Transformers and Network Protectors Subcommittee Meeting Minutes

Meeting Minutes:

1. Micheal Zarnowski called the meeting to order at 4:45 PM PST.
2. Opening remarks and introductions were made.
 - i. AMS system has been discontinued. Paper rosters were circulated.
3. Micheal Zarnowski reviewed IEEE SA Copyright Policy and Essential Patent Claims. No issues were raised.
4. Membership changes were noted:
 - i. Added: **Verena Pellon, Daniel Posadas, James Ratty, Pedro Salgado**
 - ii. Changed to Guest: **None**
5. Quorum was verified. The working group consisted of **23** members, requiring **12** for quorum. **15** members were counted at the start of the meeting. Attendance records later confirmed **15** members attended.
6. Micheal Zarnowski requested approval of the Fall 2023 Minutes. **Dave Blew made a motion to approve the Fall 2023 Minutes. Second by George Payerle. Motion was unanimously approved.**
7. Micheal Zarnowski requested approval of the Spring 2024 Agenda. **Brian Klaponski made a motion to approve the Spring 2024 Agenda. Second by George Payerle. Motion was unanimously approved.**
8. Old Business:
 - i. Micheal Zarnowski review PAR scope: limited to transformers and network protectors in subsurface structures.
 - ii. Micheal Zarnowski presented taskforce findings formed to consider improvements to the definitions for submersible enclosure and vault
 - a. Taskforce members included: Tom Dauzat, Will Elliott, Tiffany Lucas, Dan Mulkey, George Payerle, John Vartanian, Mike Zarnowski.
 - b. **Brian Klaponski made a motion to accept the presented submersible enclosure definition with the addition of “physically” before the word protects. Second George Payerle. Motion unanimously approved.**
 - c. **Nabi Almeida made a motion to accept the presented vault definition with the following modification to the last part of the definition “that contains and protects electrical and related equipment from public access.” Second by Brian Klaponski. Motion unanimously approved.**
 - d. The definitions approved in the meeting are:
 1. Submersible Enclosure: The case or housing (i.e., tank) that surrounds and physically protects the internal components of the transformer or network protector from the environment, including occasional or continuous submersion.
 2. Vault: A structure with access for authorized personnel, which may be subsurface or above grade, that contains electrical and related equipment from public access.
 - iii. Glenn Stark, a materials engineering consultant, gave a presentation to the group on corrosion. A summary of the topics presented are listed below. The presentation will be shared with the group.
 - a. Corrosion Resistance of Copper Bearing Steels

Subsurface Transformers and Network Protectors

Subcommittee Meeting Minutes

1. Also known as Weathering Steels
 2. These materials are not suitable for continuous submersion (at any level) as crevice corrosion will occur.
- b. Galvanic / Dissimilar Metal Corrosion
1. Dissimilar metals form a battery, the “least noble” metal will corrode. (i.e. Copper / Copper alloy components interact with steel enclosure. Copper will be the cathode, low alloy steel will become the anode.)
 2. Magnesium is the most active / least noble. This is why it is often used in cathodic protection.
 3. Group asked if zinc primer / zinc rich paints are beneficial. Glenn Stark commented that only the portion of the zinc that is directly in contact to the steel provides cathodic protection. For this reason, these products act more like a coating / barrier.
 4. Glenn Stark commented that Section 5.1 in the guide advising user to coat all bare metal is a good suggestion.
 5. Glenn Stark commented that Section 5.2 in the guide to electrically insulate dissimilar metals is good but generally not feasible with grounding systems. Recommends that if you can't keep two dissimilar metals separate to remove the corrosive environment. One method is applying electrical contact grease (i.e. NO-OX).
- c. Stainless Steels
1. Five main families of stainless steels: austenitic (Type 3XX series), ferritic, duplex, martensitic, precipitation-hardening. The most common stainless steel is austenitic 304.
 2. All stainless steel needs 12 weight % of Cr in it. The Cr on the surface of the Stainless Steel will bond to oxygen and form chromium oxide. This becomes a barrier. If this coating is broken / scratched it will then form a new barrier.
 3. Type 304, good generic corrosion resistance in atmospheric environments. Is susceptible to pitting corrosion, specifically in marine environments.
 4. Type 316, 2.5 weight % of Mo. It has an upper limit, raw substrate cannot withstand really aggressive marine / road salt / fertilizer environments (i.e. 250 m from the ocean with no maintenance / cleaning of the surface).
 5. Coatings are your first line of defense. However, if the coating fails you can get preferential corrosion in these areas. This is why it is important to inspect your coatings and maintain them on a regular basis.
 6. For these extreme environments, you need to do a site-specific assessment with a corrosion engineer. There is no silver bullet that can address all problems as every case is unique (unless you make everything out of Platinum \$\$\$\$).
 7. In general, austenitic stainless steels are known to suffer from stress corrosion cracking. It is recommended to stay away from the 300 series steels in stagnate marine environments.
 8. Glenn Stark recommended that Section 6.2.2 in the guide can be further developed to provide a formal framework to help users properly assess what conditions they are dealing with. This will help the metallurgist in figuring out what materials makes sense.
- d. Fabrication of Stainless Steel
1. Must be completely segregated from carbon steel, only stainless steel wire brushes, wheels and blast media can be used. Many manufacturers spray paint stainless steel tools green.

Subsurface Transformers and Network Protectors

Subcommittee Meeting Minutes

2. Carbon contamination interrupts the normal self-passivating behavior of stainless steel. The transferred carbon will then start to corrode which will then transfer to the stainless steel. Carbon steel effectively poisons the stainless steel.
 3. You can use the same tools on different grades of stainless steel (i.e. does not matter if the stainless steel is 304 or 316).
 4. When you weld stainless steels often you can get segregation in the heat affected zones (HAZ). To mitigate this manufacture forces oxidation using a chemical after welding (artificial passivation). If the chemical is not completely removed this will cause a problem. It is important to have good washing and rinsing protocols. Don't rely on blasting to remove those chemicals. Wash rinse and neutralize if possible.
- e. Microbiologically Influenced Corrosion (MIC)
1. This can occur in almost any environment (including drinking water systems on the chlorinated side). Our chances of eliminate this is zero.
 2. To address this, you need to identify the species that are involved, this determines the mitigation plan.
- f. Group discussion
1. The group asked Glenn Stark to comment on cathodic protection. Glenn Stark commented that these systems need to be monitored and maintained (regardless if it is an active or passive system). These systems are not a set it and forget it, you need an active annual maintenance / monitoring program.
 2. The group asked if 304L and 316L perform differently. Glenn Stark responded the "L" stands for low carbon (makes it easier to weld). The corrosion behavior of these materials are roughly the same for 304 and 316.
 3. The group asked if there are guidelines available for the welding process. Glenn Stark commented that this ultimately ties to the ASTM material standard. The ASTM range for various metals is too big. Can have fabrication challenges if you receive metals on the low end, the middle range is ideal. However, mills will be targeting just above the minimum as it cost more to hit the middle. Get stainless steels from reputable suppliers that is delivering clean stainless steel. Get the mill certifications.
 4. The group asked what equipment can be used to validate steel content. Glenn Stark commented that there are lot of handheld units that can identify heavy elements, but carbon (a light element) can be tested by sending a sample to a lab. Carbon ultimately is what the welding engineer needs to know.
- iv. Group discussed next steps.
- a. Nabi Almeida suggested we could go out for a straw ballot to collect more feedback from members.
 - b. Brian Klaponiski suggested we should incorporate the presented learnings into the guide including possibly adding an annex specifically for fabricating stainless steels.
 - c. **Brain Klaponiski made a motion to generate a taskforce to review the information presented and come back to the group with recommendations on how to incorporate into the current draft. Second by Nabi Almeida. Motion unanimously approved.**
 1. Task force members include: Tiffany Lucas (chair), Nabi Almeida, John Vartanian, Will Elliott, Mike Zarnowski, Audrey Siebert-Timmer, Vinay Patel.
 2. Glenn Stark volunteered to participate in the task force in a technical advisor (non-voting) role.

Subsurface Transformers and Network Protectors Subcommittee Meeting Minutes

i. No new business was discussed.

10. Next meeting: October 29, 2024 in St. Louis, Missouri, USA.

- i. The following attendees requested membership and will be added to membership for the Fall 2024 meeting:
- a. Javier Arteaga, Hitachi Energy
 - b. Jeffrey Brooks, Power Engineers
 - c. Vinay Patel, Consolidated Edison Co. of NY
 - d. Igor Simonov, Toronto Hydro
 - e. Reinaldo Valentin, Duke Energy

11. The meeting was adjourned at 6:02 PM PST.

Submitted by: Audrey Siebert-Timmer

Date: 03/12/2024

Old Business:

None

New Business:

- Dan Mulkey - reminder to WG going to ballot. Please send him a membership list since spreadsheets are being developed to help notify members. Color wheel examples were shown on IEEE site that show the proper stages with links to requirements.
- Brian Klaponski - consider creating a document to help with corrosion issues
- George Payerle - reminder about signing the card for Greg Anderson
- George Payerle - 5 or 6 years as Chairman, so there will be a leadership change once reviewed/approved by the Transformer Committee Chairman

Next meeting:

October 30, 2024 St Louis, MO at 11am

Meeting adjourned at 11:26 PST

Respectively submitted by George Payerle - 3/13/2024