Annex J Performance Characteristics Subcommittee (PCS)

October 30th, 2024, Hyatt Regency, St. Louis, MO

UNAPPROVED MINUTES

Chair: Rogerio Verdolin
Vice Chair: Sanjib Som
Secretary: Kris Zibert

J.1 Introduction / Attendance

Quorum was achieved with 70 members present (64.8% in attendance). In addition, 67 guests were present at the meeting. The total attendance at the meeting was 137. Guests should contact the Vice Chair to request membership. Their requests for membership and past attendance will be reviewed. If they meet the membership requirements, they will be granted membership before the next meeting in Denver, Colorado, March 24-27, 2025.

J.2 Chairman's Remarks

The Chair gave the Chairman's Remarks.

The Chair introduced himself, the Vice Chair and secretary and provided the below updates and comments.

The Chair discussed that the meeting would be recorded for minutes purposes and then deleted.

The Chair asked anyone with new business to submit said business in writing prior to the meeting.

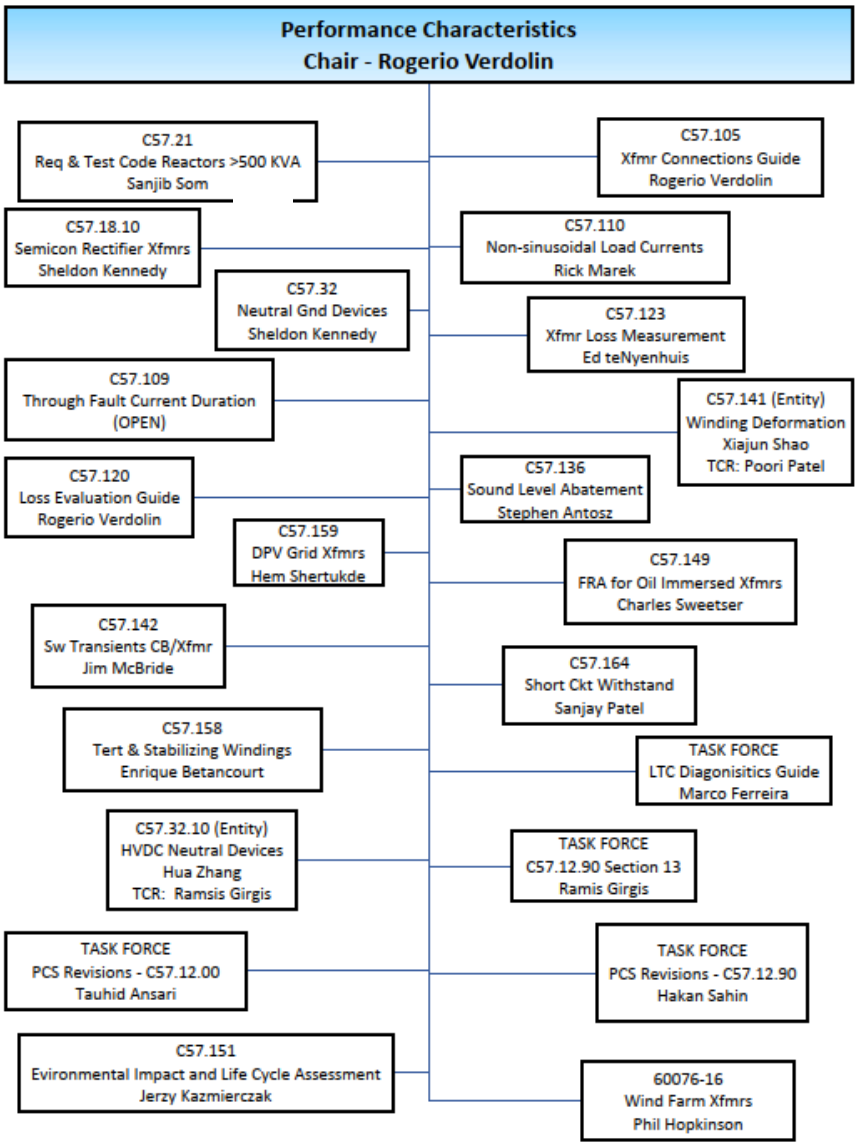
The Chair gave a reminder regarding affiliation data as a requirement and to continue updating attendance manually.

PCS Responsibilities: Defined by the Transformers Committee Organization and Procedures Manual.

The Performance Characteristics Subcommittee shall be responsible for the following:

- Studying and reviewing the treatment of loss, impedance, exciting current, inrush current audible sound and vibration, and other performance characteristics and their methods of application, measurement, or test for liquid filled transformers and liquid filled and dry type reactors.
- Studying and reviewing the treatment of the performance characteristics of other special use transformers e.g. photovoltaic, wind, and rectifier transformers.
- Developing and maintaining related standards, recommended practices, and guides for such criteria
- Coordinating with other technical committees, groups, societies, and associations as required

Standards Supported by PCS:



- C57.12.00 – TF to provide PCS revisions – T. Ansari
- C57.12.90 – TF to provide PCS revisions – H. Sahin (test code) & R. Girgis (audible sound)
- C57.18.10 – Semiconductor rectifier transformers – S. Kennedy
- C57.21 – Requirements & Test Code For Shunt Reactors >500kVA – S. Som
- C57.32-2015 – Neutral Grounding Devices (2025) – S. Kennedy
- C57.32.10 – Entity WG Neutral Grounding Reactors Guide for HVDC Converter Transformers – H. Zhang (TCR: R. Girgis)
- C57.105 – Transformer connections guide – R. Verdolin
- C57.109 – Through Fault Current Duration – OPEN
- C57.110 – Xfrmr Capability when Supplying Nonsinusoidal Load Currents – R. Marek
- C57.120 – Guide for loss evaluation – R. Verdolin

- C57.123 – Transformer Loss Measurement – E. teNyenhuis
- C57.136 – Sound Abatement Guide – S. Antosz
- C57.141 - Entity - Winding Deformation – X. Shao (TCR: P. Patel)
- C57.142 – Switching Transients Circuit breaker/Transformer – J. McBride
- C57.149 – FRA for Oil Immersed Transformers – C. Sweetser
- C57.158 – Tertiary & Stabilizing Windings (2027) – E. Betancourt
- C57.159 – DPV Transformers (2026) – H. Shertukde
- C57.164 – Short Circuit Withstand – S. Patel
- TF for Insulating Fluid for Factory Testing – E. teNyenhuis
- TF for LTC Diagnostics Guide – M. Ferreira
- 60076-16 – Wind Turbine Generator Transformers – P. Hopkinson
- C57.151 Eval Guide Environmental Impact of Transformers & Reactors – J. Kazmierczak

Status of Active PAR's:

- 2024 PAR's
  - C57.32.10 Entity WG Guide for the Selection of Neutral-Grounding Devices for HVDC Converter Transformers (Recirc Ballot Complete)
- 2025 PAR's
  - C57.142 Transient Guide (Comment Resolution)
  - C57.141 Entity WG Guide for Detection, Monitoring and Evaluation of Winding Deformation
- 2027 PAR's
  - C57.32 Neutral Grounding Devices
  - C57.158 Application of Tertiary and Stabilizing Wdgs Guide
- 2028 PAR's
  - C57.159 DPV Transformers Guide
  - C57.151 Enviro & Life Cycle Assessment (New WG)

Status of Standards without active PARs

- C57.120-2017 – Loss Evaluation Guide (2027)
- 60076-16-2018 – Wind Turbine Generator Transformers (2028)
- C57.109-2018 – Through Fault Current Duration (2028)
- C57.110-2018 – Transf. Capability when Supplying Nonsinusoidal Loads (2028)
- C57.105-2019 – Transformer connections guide (2029)
- C57.123-2019 – Loss Measurement Guide (2029)
- C57.164-2021 – Short Circuit Withstand Guide (2031)
- C57.21-2021 – Shunt Reactors over 500kVA (2031)
- C57.18.10-2021 – Semiconductor Rectifier Transformers (2031)
- C57.136-2023 – Sound Level Abatement Guide (2033)
- C57.149 – FRA Guide (2034)

Performance Characteristics Subcommittee Membership Requirements

- Voting membership may be requested and granted after attending three of the last five meetings.
- If a voting member misses two consecutive meetings, his or her voting privileges may be revoked. Notification will be sent if voting privileges are revoked.
- Refer to TC P&P 4.3.1 for more information.

Performance Characteristics Subcommittee WG / TF Leaders

- Issue agenda at least 30 days ahead of time
- Minutes are due in 15 days; please get a rough draft of them to us today in MS Word (not PDF) format
- Please keep your webpages up to date – review regularly and send any content/files to tc-webmaster@ieee.org.
- A patent and copyright call must occur at every WG/TF meeting
- Please send to Patrycja Jarosz (p.jarosz@ieee.org) your WG roster by November 13th, 2024, including last name, first name, email address, and voting status.

Performance Characteristics Subcommittee Meeting Minutes

- Name of the group, time, date, and location of meeting
- Officers' names, meeting participants, member status, and affiliations
- Chair's remarks and reminders of IEEE policies (Patent and Copyright)
- Approval of minutes of previous meeting and agenda
- Technical topics: Brief summary (discussions and conclusions, motions exactly as they are stated, including the names of mover and seconder, and the outcome of each motion)
- Action items, items reported out of executive session
- Recesses and time of final adjournment
- Next meeting—date, time, and location

WG / TF Balloting Reminder

- Working Groups must achieve a 2/3 majority to submit a document for Sponsor Ballot.
- The Subcommittee must achieve a simple majority to submit a document for Sponsor Ballot.

Attendance / Membership – moved to Guest status

The following 2 Members missed more than 2 consecutive meetings and have been moved to "Guest" status:

Steven Brzonowski	David Caverly	Everton De Oliveira
Scott Dennis	Shawn Gossett	Stephen Jordan
Akash Joshi	Samuel Sharpless	Krishnamurthy Vijayan
Marcos Ferreira	Joseph Foldi	Anthony Franchitti
Sanjay Patel	Kiran Vedante	Baitun Yang

Please contact Sanjib by sending him a message or see him after the meeting if you believe your membership status is not accurate and/or you would like to become a member.

Attendance / Membership – New Members
The following Guests requested membership at the Spring 2024 meeting and have attended 3 of the past 5 meetings:

Alex Ayala	Juan Alfredo Carrizales
Ravi Gupta	Jean Hernandez-Myia
Saif Hossain	Jose Luis Machain
Rodrigo Ronchi	Abdul Majid Shaikh
Cole Van Dreel	Guang Yuan

Attendance / Membership – Quorum determination

- Current breakdown of the Subcommittee:
  - 108 Members
  - 55 are needed for a quorum
- Quorum was established with 70 members in attendance.

J.3 Approval of Agenda

The Chair presented the agenda and entertained a motion to approve. The agenda had been sent to the members by email several weeks prior to the meeting. The motion was made by M. Roussel and seconded by W. Binder. The motion passed by unanimous consent.

J.4 Approval of Last Meeting Minutes

The Chair presented the minutes of meeting held in March 2024 and entertained a motion to approve. The minutes had been sent to the members by email several weeks prior to the meeting. The motion was made by R. Musgrove and seconded by D. Wallach. The motion passed by unanimous consent.

J.5 Minutes from Working Groups and Task Force

The following WG and Task Force reports were received (the reports are appended later).

- **WG Eval Guide Environ Impact of Trans & Reactors PC57.151** **J. Kazmierczak**
- **TF Audible Sound Rev to Test Code** **R. Girgis**
- **TF Transformer Data Required for System Studies** **J. Watson**
- **TF Continuous Revisions to C57.12.00** **T.Ansari**
- **WG Standard for DPVTs C57.159** **H. Shertukde**
- **TF Continuous Revisions to Test Code C57.12.90** **H. Sahin**
- **WG Sw Transients Ind by Xfmr/Bkr Interaction PC57.142** **J. McBride**
- **WG C57.158 App. Guide for Tertiary and Stabilizing Windings** **E. Betancourt**
- **WG IEEE Neutral Grounding Devices PC57.32** **S. Kennedy**
- **WG PC57.32.10 Entity HVDC Neutral Grounding Device Guide** **Z. Hua**
- **WG PC57.141 Entity Winding Deformation Guide** **X. Shao**

Below are highlights that were discussed at the PCS meeting:

1) WG Eval Guide Environ Impact of Trans & Reactors PC57.151 J. Kazmierczak

- This is the first meeting of the guide after receiving PAR.
- A call to order was made at 11:00 AM CST
- The Agenda was presented
- The patent & copyright policy was reviewed. A call for any patents was made. There were two patents declared.
- Introduction of officers was made.
- Introduction of attendees was made, with a total of one hundred six attendees present, plus three officers
- Membership was offered. Sixty four attendees requested membership.
- Information & updates on IEC & CIGRE progress were reviewed
- The goal of the standard that is to be developed was discussed.
- A proposed outline was presented.
- Poorvi Patel, EPRI, requested that the outline be reviewed prior to the goal review.
- Jim Thompson, T&R Service Co., made a motion to delete the bullet points put forth in the goal statement & amend the PAR to include the purpose. This motion was withdrawn.
- There was further discussion surrounding including a purpose, or just clarifying a goal statement that will not be included in the guide but will serve to help the group develop an outline.
- Luiz Chem, Hitachi, made a motion to change section 3 to "Life Cycle Assessment" to define the LCA, methodologies & the potential issues surrounding the methods. Mani Kumar, Duke Energy, seconded the motion.
- A vote was made for the motion. 37 for, 0 opposed, 1 abstention. The motion passed.
- Mike Nolte, Kiewit, moved to take the outline and divide into task forces. This was seconded by Jim Thompson, T&R Service Co.
- The motion was voted on 38 for, 0 opposed, 1 Abstention. The motion passed.
- Hugo Avila, Hitachi, volunteered for leading task force for outline point 4: Product specific rules for the life cycle assessment (LCA)
- Michael Nolte, Kiewit, volunteered to lead task force on outline point 3: Environmentally conscious design and life cycle assessment
- Jim Thompson, volunteered to lead task force on outline point 5: Further environmental performance considerations
- Outline point 6: Reporting on environmental performance and life cycle assessment results, still needs to have a task force leader volunteer.
- Relevant industry documents need to be requested to share among the task forces as references.
- A motion was made to adjourn the meeting. It was adjourned at 12:09 PM CST.
- The next meeting will take place in Denver, CO. during IEEE Transformer Committee Meeting scheduled for March 23-27, 2025.

2) TF Audible Sound Code Revision R. Girgis

- Attendance: 39 out of 56 members + 48 guests, 87 Total, 17 requested membership

- Chairman presented measured Sound level data collected from four Manufacturers for several transformers with the objective to determine the difference between sound level of PAs in air vs in oil.
- Based on the data, a conservative difference of 5 dB is proposed.
- Chairman then presented methodology to determine sound level of PAs such that PA noise does not impact the sound level of the main Transformer by more than 1 dB
- Finally, the Chairman presented a proposed methodology for measuring sound level of PAs in air
- The chairman announced that he will put together proposed text to be added to the IEEE Noise Guide that will include:
- Methodology to determine sound level of PAs such that PA noise does not impact the sound level of the main Transformer by more than 1 dB
- Proposed methodology for measuring sound level of PAs in air
- The proposed text will be shared with attendees of the TF meeting well before the Spring meeting of the TF and comments will be reviewed and then discussed at the Spring meeting of the TF.

3) TF Transformer Data Required for System Studies J. Watson

- The TF met for the first time at 1:45PM on Monday, 10/28/24 with 43 attendees, with 17 members.
- Patent and Copyright requirements were covered. No motions or other official business were covered, and only general discussions were held on the purpose of the TF. Alwyn Vanderwalt volunteered to serve as Secretary.
- The general goals of the TF are to survey the industry to identify the commonly-used programs used by system operators and engineering firms for system studies for various conditions such as fault studies, load flows and transient overvoltage conditions, and to identify the transformer parameters required as inputs for those programs.
- Once the parameters are identified, the TF should prepare a report for the SC recommending whether or not a WG should be established to define and prescribe the methods for calculating or determining their values.
- Some of the programs that were identified are: PSCad, EMTP, CYME, OPAL-RT, and ETAP. We also learned that CIGRE published 2 Technical Bulletins in 2023, TB900 and TB901 on transformer models for network studies, and these will be reviewed.
- The attendees were requested to survey their organizations that use system studies programs to identify the more commonly-used programs for discussion in a remote meeting tentatively scheduled for 4-6 weeks from now.
- The TF will meet in Denver, and will need a permanent time slot.

4) TF Continuous Revisions to C57.12.00 T. Ansari

- Meeting Date/Time: October 28, 2024, 4:30 PM
- 91 total attendees, consisting of 31 members and 60 guests. The TF achieved a quorum (30 members required). 29 guests requested membership.
- Old Business
    - Update of KVA levels in table 11
    - The motion passed to prepare the note below the table 11. Prepare the verbiage and present in Spring 2025 meeting.
    - Add duration of the heat run test to the test report.

    - The subject matter will be surveyed in task force and result will be discussed in Spring 2025 meeting.
- New Business
    - Clarification on clearance between live part
    - Belongs to dielectric subcommittee.

5) WG Standard for DPV Transformers C57.159 H. Shertukde

- The C57.159 WG met in Spring 2024 and virtual meeting on 9/13/24 and 10/11/24. A quorum was not achieved in any of those meetings and official work could not be conducted.
- The Fall 2024 meeting the C57.159 WG achieved a quorum. Previous minutes were approved, and business was conducted as usual.
- The business of the Fall 2024 meeting primarily revolved around discussion of the contents and wording of the PAR Scope and Purpose. Many changes to the wording were discussed at length and approved. In addition, there was a lengthy discussion of the PAR scope. The key issues were what should be considered a photovoltaic transformer- the general agreement was that anything that was in a solar installation would count as a PVT.
- However, the primary concern of this standard is the transformers connected to the inverters on the output of solar panels or Battery Energy Storage due to the problems installations are having with these type of transformers.
- There was an open question of whether these transformers belonged in their own standard or if they should be in C57.18.10 (Power Rectifier Transformers). They were not included in the current revision because of revision publication timing but could be included in a future revision depending on schedule. This question was left open for further discussion.
- The next meeting will be Spring 2025 with a possibility of virtual meeting before that meeting.

6) TF on PCS Continuous Revisions to Test Code C57.12.90 H. Sahin

- Meeting started on time. Quorum was met
- Continued discussions on section 5.1 – Determination of cold temperature. TF agreed on the following wording to be surveyed; “The cold temperature of the windings for class II transformers shall be determined by temperature sensor(s) directly immersed in the liquid, or thermowell”
- A new business was submitted during the meeting to discuss possibility of adding tolerances on the current to be applied during load loss and impedance tests, which will be reviewed during the next meeting
- Meeting was adjourned on time.

6) WG Switching Transients Ind by Xfmr/Bkr Interaction PC57.142 J. McBride

- Welcome and Chair’s Remarks
- Circulation of Attendance Sheets (34 of 43 Members were present - quorum was achieved. 64 guests, Total 98 Attendees)
- IEEE Patent Policy Slides (no patent claims)

- Approval of Agenda and Minutes from Spring 2024 Meeting
- C57.142 Ballot status and Comment Resolution – Jim McBride
    - Total Comments – 306 (Editorial Required – 107; Editorial Not Required - 109
    - Technical Required – 67; Technical Not Required – 22)
    - Addressed Comments: 291; Need Resolution for Remaining Comments: 15
    - Draft 12 has been completed and incorporates all the 291 addressed comments.
- CRG is reviewing all comments remaining. Plan is to send out proposed resolutions from the WG officers to the CRG and seek to finish comment resolution of the remaining 15 comments for a recirculation in early 2025. The CRG has members from both the Transformers and Switchgear Committees.
- Mitigation Methods Task Force Update – Those present agreed to proceed with the Transformers Committee panel session to present the summary of the full list of mitigation methods that has been compiled. This update will be a tutorial during the Fall 2025 Meeting.
- There was an open discussion on the reliability of surge arresters used internally in transformers.
- Meeting adjourned at 12:05 PM

7) WG Guide for Application of Tertiary & Stabilizing Windings C57.158 E. Betancourt

- Meeting Date/Time: Oct 29, 2024; 4:45 PM
- 73 total attendees, consisting of 22 Members and 51 Guests. The TF achieved a quorum (19 members required). 11 guests requested membership.
- Highlights:
- Old Business
    - Report on TF 1 "General Editorial/Technical Review"
        - The Guide plus 8 Documents reviewed for identification of cross-references; 90+ items listed.
    - Report of TF 2 "Transformers Without a TW or SW"
        - New proposed text based on recent technical publications.
    - Report of TF 3 "Extension of Special Topics Currently in the Guide"
        - New material proposed with example for loading of multi-winding transformers.
    - Report of TF 4 "New Technical Topics"
        - Discussed considerations for design of Y-y-y renewables collector transformers
- No New Business

8) WG IEEE Neutral Grounding Devices PC57.32 S. Kennedy

- Task Force Assigned work is almost complete (Clause 4 Grounding Reactors has only new Annex remaining, Clause 5 Ground Fault Neutralizers is complete, Clause 6 Grounding Transformers is complete, Clause 7 Grounding Resistors is complete, Clause 8 Combination Devices is being surveyed by the TF and to be complete by December)
- Plan to have WG straw ballot done of completed draft 1 before the Spring Meeting
- Target to have draft ready for ballot by Dec 2025

9) WG Entity HVDC Neutral Grounding Devices PC57.32.10 Z. Hua

- MEC review comments was done in December 2023, new draft was created: D6.1 version.
- SA ballot was opened on April 26, 2024, and was closed successfully on May 26, 2024. 12 members joined the Ballot Group, and 11 members completed the voting, with 10 votes in favor and 1 vote against.
- The WG responded each of the 20 comments received in SA Ballot and revised the draft content, which resulted in draft version D6.2.
- The WG initiated the first Recirculation on September 19, 2024, and was closed successfully on September 29, 2024.
- Currently, the WG is preparing to initiate the second Recirculation.
- The latest draft version D6.3 and the response to SA Ballot and the first Recirculation Comments were uploaded under PCS webpage.

10) WG Entity Winding Deformation Guide PC57.141 X. Shao

- TCR: Poorvi Patel
- Anticipated completion date of Pre-MEC Editorial Review: End of November or beginning of December.
- 80% Complete- remaining 20% is for modifying Figures and Charts;
- WG needs to submit modified PAR to Nescom before December 20th Deadline.
- Modified PAR approval by SA: Beginning of 29th of January 2025.
- February 2024 for SC Approval to initiate SA ballot.
- SA ballot initialization date: Mid-February 2025
- Need SC approval for modified PAR
- Reason:
    - The reason for revising the scope is: At present, vibration test is rarely used in transformers with voltage levels of 66kV and below, meanwhile the data statistical basis and application cases of this guide only include transformers above 66kV. Therefore, the WG considered that it was appropriate to modify the use range of vibration test from “above 35kV” to “above 66kV”. Besides, the revised description about main contents of this guide is consistent with the text and annexes of the final draft (approved by the WG).
- Original
    - Purpose:
    - This guide provides the guidance for detection, monitoring and evaluation off transformer winding deformation based on vibration test, including its mechanism, influencing factors, equipment requirements, sensor placement and evaluation methods in normative text, as well as related calculation procedures, operation flows, and application cases in annexes. This guide applies to the vibration test of oil-immersed power transformers rated above 35kV.
- Modified
    - Purpose:
    - Scope of proposed standard: This guide provides guidance for the detection, monitoring, and evaluation of winding deformation in liquid-immersed power transformers based on the vibration test. This guide applies to the vibration test of

oil-immersed power transformers rated above 66 kV. The theoretical basis, instrument configuration, safety precautions, sensor arrangement, operating condition indexes, vibration characteristic quantities, and evaluation method are included in this guide. Additional materials related to the vibration test, such as typical vibration spectrums, optimal arrangement method, vibration test cases, research on winding condition threshold, and bibliography, are described in annexes

- P. Patel made a motion to modify the PAR's purpose per the request of the entity group. Second made by J. McBride. P. Jarosz explained that entity groups and individual groups have the same procedural requirements when their document belongs to a subcommittee. The motion passed by unanimous consent.

J.6 Unfinished (Old) Business

There was no unfinished business.

J.7 New Business

- IEC/IEEE 60076-16
  - IEC has decided to not renew this document.
  - E. teNyenhuis made a motion to form a PAR study group to determine if a PAR should be developed. Seconded by E. Schweiger. Motion was approved by unanimous consent.
- IEEE C57.120
  - Guide expires in 2027. D. Sauer made a motion to establish a PAR study group and W. Binder seconded. The motion passed by unanimous consent.
- The Chair announced that this is his last meeting as his term has expired. S. Som will be the Chair going forward.

J.8 Adjournment

- The meeting was adjourned at 3:51PM**.**

J.9 Minutes of Meetings of Working Group (WG) and Task Force (TF) Reports (all unapproved)

J.9.1 WG Eval Guide Environ Impact of Trans & Reactors PC57.151

Meeting Date/Time: Monday, October 28, 2024, 11:00 AM to 12:15 PM PT
Meeting Location: St. Louis, Missouri, USA
Chairman: J. Kazmierczak (Hitachi Energy)
Vice Chair: Ismail Guner (Hydro Quebec)
Secretary: Elise Arnold (SGB SMIT)

- This is the first meeting of the guide after receiving PAR.
- A call to order was made at 11:00 AM CST
- The Agenda was presented
- The patent & copyright policy was reviewed. A call for any patents was made. There were two patents that were declared by Luiz Chiem.
- Introduction of officers was made.

- Introduction of attendees was made, with a total of one hundred five attendees present, plus three officers
- Membership was offered. Sixty-nine attendees requested membership.
- Information & updates on IEC & CIGRE progress were reviewed
- The goal of the standard that is to be developed was discussed.
- A proposed outline was presented.
- Poorvi Patel, Epri, requested that the outline be reviewed prior to the goal review.
- Jim Thompson, T&R Service Co., made a motion to delete the bullet points put forth in the goal statement & ammend the PAR to include the purpose. This motion was withdrawn.
- There was further discussion surrounding including a purpose, or just clarifying a goal statement that will not be included in the guide, but will serve to help the group develop an outline.
- Luiz Chem, Hitachi, made a motion to change section 3 to "Life Cycle Assessment" to define the LCA, methodologies & the potential issues surrounding the methods. Mani Kumar, Duke Energy, seconded the motion.
- A vote was made for the motion. 37 for, 0 opposed, 1 abstention. The motion passed.
- Mike Nolte, Kiewit, moved to take the outline and divide into task forces. This was seconded by Jim Thompson, T&R Service Co.
- The motion was voted on 38 for, 0 opposed, 1 Abstention. The motion passed.
- Hugo Avila, Hitachi, volunteered for leading task force for outline point 4: Product specific rules for the life cycle assessment (LCA)
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- Jim Thompson, volunteered to lead task force on outline point 5: Further environmental performance considerations
- Outline point 6: Reporting on environmental performance and life cycle assessment results, still needs to have a task force leader volunteer.
- Relevant industry documents need to be requested to share among the task forces as references.
- A motion was made to adjourn the meeting. It was adjourned at 12:09 PM CST.
- The next meeting will take place in Denver, CO. during IEEE Transformer Committee Meeting scheduled for March 23-27, 2025.

List of Meeting Attendees from Spring 2024 meeting (including affiliation & member status).

Giraldo	Orlando	The HJ Family of Companies	Member
Verdolin	Rogerio	Verdolin Solutions	Member
Shull	Stephen	BBC Electrical Services Inc.	Guest
Bohrn	Joshua	Pacificorp	Member
Vanderwalt	Alwyn	ECI	Member
Munoz	Marta	Hitachi energy	Member
Tenyenhuis	Ed	Hitachi Energy	Member
Matthews	Lee	Howard Industries	Member
Machain	Jose Luis	Prolec GE	Member
Sohail	Muhammad Abdullah	Trench Limited	Member
Ziger	Igor	Koncar	Member
Tan	Jonathan	Northern Transformer	Member
Tanaka	Troy	Burns & McDonnell	Guest
Greaves	Brad	Weidmann Electrical Technology	Member
Hossain	Saif	Trench Canada	Member
Tolcachir	Eduardo	TTE Transformers	Member
Doak	Eric	D4 Energy Solutions	Member

Sweetser	Charles	Omicron	Guest
Parkinson	Dwight	Eaton	Member
Rehkopf	Sebastian	Reinhausen Germany	Member
Plotner	Chris	Siemens Energy	Guest
Foata	Marc	MR	Guest
Wallach	David	Duke Energy	Guest
Boettger	William	Boettger Transformer Consulting LLC	Member
Chelgi	Bhaumile	Hitachi Energy	Guest
Masathe	Swapnil	Megger	Guest
Mahajan	Kushal	Sungrow	Member
Bolar	Sanket	Oncor	Member
Schiessl	Markus	SGB	Member
Dillon	Nikolaus	Dominion Energy	Member
Sharp	Michael	Trench Limited	Member
Bhardwaj	Naveen	Trench Group	Member
Wong	Terry	Trench Limited	Member
Calil	Wilerson	Hitachi Energy	Member
Natale	Anthony	HICO America	Guest
Khan	Hasim	NEETRAC – Georgia Tech	Member
Kapka	Serivoz	Hitachi Energy	Guest
Kiwathahshin	Matenz	Hitachi Energy	Guest
Aleksandrowicz	Danieal	Hitachi Energy	Member
Kowalski	Rafal	Hitachi Energy	Member
Casallas	Camilo	Trench	Member
Mbovombolo	Mama	Hitachi Energy	Member
Herron	Bill	Reinhausen	Member
Sen	John	Duke Energy	Member
Hogg	Ryan	Bureau of Reclamation	Guest
Thompson	Jim	T&R Service Co.	Member
Patel	Sanjay	SGB-SMIT USA	Guest
Joshi	Akash	Kimley-Hoorn	Member
Garcia	Miguel	Hitachi Energy	Member
Hugo	Avila	Hitachi Energy	Member
Mani	Kumar	Duke Energy	Member
Trifunoski	Risto	Trench Canada	Member
Delgado	Gabrial	Invernergy	Member
Nolte	Michael	Kiewit	Member
Gyore	Attila	Midel	Member
Dorpmanns	Luc	Royal SMIT Transformers	Member
Schrammel	Alfons	Siemens Energy	Member
Kaineder	Kurt	Trench Austria	Member
Ansari	Tauhid	Hitachi Energy	Member
Thomas	Scott	Hitachi Energy	Guest
Swatkowski	Michael	Hitachi Energy	Member
Patel	Yakesh	Hitachi Energy	Member
Dragana	Gasic	Koncar Dist.	Guest
Diodan	Janko	Koncar Dist	Guest
Weyandt	Paul	Schneider Electric	Member
Neder	Frank	Trench Germany	Member
Patel	Poorvi	EPRI	Member

Gustavsson	Niklas	Hitachi Energy	Member
Labh	Ashwini	Hitachi Energy	Member
Cheim	Luiz	Hitachi Energy	Member
Fu	Peng	Chint	Guest
Mills	Francis	Power Engineers Inc.	Member
Luka	Kovacic	Koncar Instrument Transformers	Member
Crown	Alexander	Coil Innovation	Guest
Wirth	Stefan	Coil Innovation	Guest
McBride	Jim	JMX High Voltage	Guest
Gamboa	Jose	The H-J Family of Companies	Guest
Bayena	Hugo	The H-J Family of Companies	Guest
Schott	Cody	The H-J Family of Companies	Guest
Richardson	Michael	Ameren	Guest
Frazier	Raymond	Ameren	Guest
Radbrandt	Vif	Hitachi Energy	Guest
Schleismann	Eric	Southern Company	Guest
Furlanetto	Carlo	Siemens Energy	Guest
Hanson	Corey	Flex-Core	Member
Orozco	Eduardo	GE Grid Solutions	Member
Post	Nicholas	WEC Energy Group	Guest
Vir	Dharam	Prolec GE Waukesha	Member
Varghese	Ajith	Prolec GE Waukesha	Member
Steele	Hampton (Allen)	TVA	Member
Saad	Mickel	Hitachi Energy	Member
Dopplmair	Peter	Trench Group	Guest
Mendez	Omar	Prolec GE	Member
Avelino	Paulo	Hitachi Energy	Guest
Megdad	Mohammed	IPS	Member
Betancourt	Edwin	Siemens Energy	Member
Bernesjo	Mats	Hitachi Energy	Guest
Kirchenmayer	Egon	Siemens Energy	Member
Do Prado	Gustavo	Siemens Energy	Guest
Rossini	Yuri	Siemens Energy	Guest
Mamede	Gabriel	Siemens Energy	Guest
Mantoan	Francis	Siemens Energy	Guest
Taylor	Marc	JFE Shoji Canada	Member
Leal	Fernando	Prolec GE	Member
Som	Sanjib	PTT, LLC	Member
Arnold	Elise	SGB SMIT	Officer -Secretary
Guner	Ismail	Hydro Quebec	Officer - Vice Chair
Kazmierczak	Jerzy	Hitachi Energy	Officer -

J.9.2 TF "Audible Sound Revision to Test Code"

The TF met at 1:45 PM, on Monday, October 28, 2024. Dr. Ramsis Girgis, Chairman of the TF, presided over

the meeting, with Mats Bernesjo being the Secretary.

The Chairman & Secretary welcomed the audience to this meeting and reviewed the proposed agenda. The agenda was unanimously approved as was the unapproved minutes of the Spring 2024 TF meeting in Vancouver (Sanjib Som 1st, David Wallach 2nd).

The TF meeting was attended by 39 out of 56 members and a total meeting attendance of 87. A quorum was established. 17 attendees requested membership at this meeting (listed below) **.

The chairman presented Sound Pressure level data of several power transformers where the sound level of the PA was first measured in air and then compared with the Sound Level of the PA in oil determined from the difference between the measured sound pressure levels of these transformer in the bridging position versus the non-bridging position. These measurements showed that the sound level of the PA in oil was mostly in the range of 4 – 6 dB lower than that measured in air. The Chairman suggested using a conservative average value of 5 dB for that difference. The Sound Pressure level data used in this analysis was received for 9 different Transformers from four different manufacturers: Hitachi Energy, Prolec GE, SGB-SMIT, and WEG USA.

The Chairman then presented the methodology of determining the Sound pressure level of the PA in oil such that the PA noise does not increase the Sound Pressure Level of the main Transformer by more than 1 dB at the bridging Tap Position. Adding 5 dB to this value determines the sound Pressure level of the PA in air to be specified by power transformer manufacturers. A numerical example of this process was also presented. The chairman then presented a suggested methodology to measure the Sound Pressure level of PAs in air.

Two main questions were asked, and the following answers were given by the chairman:

1. In determining the limit for the Sound Pressure Level of the PA in air, a value of 1 dB was chosen as a conservative, but reasonable, limit for the impact of the PA noise on the sound pressure level of the main transformer.
2. In cases of power transformers, where the difference of the measured sound level of the transformer at the bridging tap position is in the 0.1- 0.2 dB range higher than that at the non-bridging tap position, caused by either the PA noise is:
    - Too low to impact the sound level of the main transformer, or
    - Too high such that it dominates the noise of the main transformer

The logarithmic difference between the measured sound power of the main transformer in the bridging tap position versus the non-bridging tap position results in a value for the PA sound power level that is not reliable. Therefore, this data could not be used to accurately determine the sound level of the PA in oil.

As agreed upon before, the Chairman suggested that a section would be added to the IEEE Noise Guide C57.136 to provide guidance to power Transformer manufacturers on how to determine the required "Sound Pressure Level of the PA in air" such that the PA noise would not cause an increase of more than 1 dB to the sound pressure level of the main transformer. This section would also include proposed method of measuring sound pressure level of PA in air. Manufacturers could choose to not use this information in specify the Sound levels of their PAs.

Since the IEEE noise Guide would not be slated for a revision for a number of years yet, Steve Antosz suggested that, in the meantime, an IEEE paper that includes the above information, could be published. The chairman agreed and informed that indeed an IEEE paper on this subject is planned to be submitted for next year's PES Conference.

Finally, the chairman stated that the presentation given at the TF meeting will be shared with the attendees of this meeting along with the unapproved minutes of the meeting.

With no new additional business raised, the meeting was adjourned upon unanimous approval (Dan Sauer 1st, Eduardo Garcia 2nd).

Respectfully submitted,

Mats Bernesjo, TF Secretary

** Attendees requested membership

Duvier Bedoya (Hitachi Energy), Steven Brzoznowski (BPA), Camilo Casallas (Trench Ltd), Akash Joshi (Kimley-Horn), Arvind Kumar (Delta Star Inc), Xose Lopez-Fernandez (Universidad de Vigo), Moses Manzano (Hyosung HICO), Daniel Martinez (JFE Canada), Ortiz Cuanhtemoc (Niagara Transformers), Dominic Pollaro (NASS), Davoudi Pouneh (Delta Star Inc.), Amitabh Sarkar (Virginia Transformer Corp.), Abdulmajid Shaikh (Delta Star Inc.), Igor Simonow (Toronto Hydro), Krishnamurthy Vijayan (PTI Transformers), Fei Yang (Hitachi Energy), and Kim Yeounsoo (MEPPI).

2024 Fall Meeting Attendance and Affiliation is as follows:

First name	**Last name**	**Company Name**	**Status**
Kayland	Adams	Prolec GE Waukesha	Member
Daniel	Aleksanderowicz	Hitachi Energy	Member
Stephen	Antosz	Stephen Antosz & Associates, Inc	Member
Elise	Arnold	SGB-SMIT	Member
Onome	Avanoma	MJ Consulting	Member
Donald	Ayers	Ayers Transformer Consultants	Guest
Duvier	Bedoya	Hitachi Energy	Guest
Mats	Bernesjo	Hitachi Energy	Member
Enrique	Betancourt	Prolec GE	Member
William	Boettger	Boettger Transformer Consulting LLC	Member
Michael	Botti	Hyosung HICO	Guest
Darren	Brown	Howard Industries	Member
Samuel	Brodeur	Hitachi Energy	Guest
Steven	Brzoznowski	Bonneville Power Administration	Guest
Camilo	Casallas	Trench ltd	Guest
Jeong	Chanho	Iljin Electric	Guest
Eunnyoung	Cho	HICO America	Guest
Adriana	Cisco Sullberg	Salt River Project	Guest
Juan Carlos	Cruz Valdes	Prolec GE	Member
Ortiz	Cuauhtemoc	Niagara Transformer	Guest
Mateusz	Czernorucki	Hitachi Energy	Guest
Scott	Dennis	Hitachi Energy	Guest
Scott	Digby	Duke Energy	Member

Lim	Donyki	Iljin Electric	Guest
Peter	Dopplmair	Trench Group	Guest
Kenneth	Dugger	NASS	Guest
Joe	Foldi	Foldi & Associates	Guest
Richard	Frye	Eaton Corporation	Guest
Eduardo	Garcia Wild	Siemens Energy	Member
Ramsis	Girgis	Hitachi Energy	Member
Nicholas	Jensen	Delta Star Inc.	Member
Akash	Joshi	Kimley-Horn	Guest
Sergiusz	Kapka	Hitachi Energy	Guest
Alvin	Kopp	HVTC Inc.	Guest
Rafal	Kowalski	Hitachi Energy	Member
Fernando	Leal	Prolec	Guest
Arvind	Kumar	Delta Star Inc.	Guest
Jihun	Lee	HD Hyundai Electric	Guest
Junho	Lee	Hyundai Electric	Member
Xose	Lopez-Fernandez	Universidad de Vigo	Guest
Jose	Machain	Prolec GE	Member
Moses	Manzano	Hyosung HICO	Guest
Daniel	Martinez	JFE Canada	Guest
Mama	Mbouombouo	Hitachi Energy	Member
Francis	Mills	Power Engineers Inc	Member
Bhardwaj	Naveen	Trench Group	Guest
Marta	Munoz	Hitachi Energy	Guest
Joe	Nims	Allen & Hoshall	Member
Besjan	Pajatidi	Brockhaus	Guest
Chris	Ploetner	Siemens	Guest
Klaus	Pointner	Trench Austria GmbH	Member
Dominic	Pollaro	NASS	Guest
Davoudi	Pouneh	Delta Star Inc.	Guest
Hakan	Sahin	Virginia/Georgia Transformer	Member
Jesus	Sanchez Rodriguez	Voltyx	Guest
Dinesh	Sankarakarup	Duke Energy	Member
Amitabh	Sarkar	Virginia Transformer Corp.	Guest

Daniel	Sauer	Eaton Corporation	Member
Markus	Schiessl	SGB-SMIT	Member
John	Sen	Duke Energy	Member
Abdulmajid	Shaikh	Delta Star	Guest
Michael	Sharp	Trench Ltd. Canada	Member
Stefan	Siebert	Brockhaus	Guest
Igor	Simonov	Toronto Hydro	Guest
Christopher	Slattery	FirstEnergy Corporation	Member
Jason	Snyder	FirstEnergy Corporation	Guest
Sanjib	Som	Pennsylvania Transformer	Member
H. Allen	Steele	TVA	Guest
Andy	Steineman	Delta Star Inc.	Member
Michal	Swiatkowski	Hitachi Energy	Member
Troy	Tanaka	Burns & McDonnell	Member
Marc	Taylor	JFE Shoji Power Canada Inc.	Member
Samuel	Tekle	WEG Transformers USA	Guest
Ryan	Thompson	Burns & McDonnell	Member
Ajith	Varghese	Prolec-GE Waukesha	Member
Jason	Varnell	Doble Engineering Co.	Member
Krishnamurthy	Vijayan	PTI Transformers	Guest
David	Wallach	Duke Energy	Member
Trenton	Williams	Advance Power Technologies	Guest
Stefan	Wirth	Coil Innovation	Guest
Jeffrey	Wright	Duquesne Light	Member
Fei	Yang	Hitachi Energy	Guest
Koray	Yavuz	Noark Electric	Guest
Kim	Yeounsoo	MEPPI	Guest
Kim	Yonghui	Iljin Electric	Guest
Yu	Zhenquan	Sieyuan Toshiba	Guest
Kris	Zibert	Allgeier Martin	Member

J.9.3 TF PCS Continuous Revisions to C57.12.00

PCS Task Force on General Requirements C57.12.00

Performance Characteristics Subcommittee
IEEE / PES Transformers Committee

October 28, 2024
Saint Louis, MO (Saint Louis)

UNAPPROVED MINUTES

The PCS Task Force on General Requirements for C57.12.00 met at 3:15 PM on Monday, October 28, 2024. Chairman Tauhid Ansari presided over the meeting together with Vice Chair Enrique Betancourt and Mats Bernesjo being the secretary. The meeting was called to order and the Chairman reminded the group of the purpose and scope of this Task Force. The copyright and patent statements from IEEE were presented to the group; none of the members and guests present were aware of any issues related to this TF's activities.

The meeting was attended by **42** members (out of **59**), 65 guests, for a total meeting attendance of 107 people, including 29 requests for membership at this meeting. A quorum was established with 42 / 59 = 71 % attendance.
The agenda was unanimously approved (1st Amitabh Sarkar, 2nd Marnie Rousell). The unapproved minutes from the previous meeting (Spring meeting, Vancouver, 2024) was unanimously approved (1st Phil Hopkinson, 2nd Hakan Sahin).
The following 29 guests requested membership:

Duvier	Bedoya	Hitachi Energy		Josh	Bohrn	PacifiCorp
Steven	Brzoznowski	BPA		Gilles	Bargune	FISO
Sudip	Chanda	Delta Star		Mama	Mbouombouo	Hitachi Energy
Pouneh	Davoudi	Delta Star		Paul	Dolloff	EKPC
Scott	Dennis	Hitachi Energy		Miguel	Plascencia	PG&E
Nick	Jensen	Delta Star		Francis J	Mills	Power Eng. Inc
Fernando	Leal	Prolec		Dominique	Bolliger	HV Techn.
Mike	Nolte	Kiewit		Nihat	Kosedagi	Hitachi Energy
Edward	Orozco	GE Grid Sol.		Miljenko	Hrkac	Hitachi Energy
AbdulMajid	Shaikh	Delta Star		Hongzhi	Zhang	Hitachi Energy
Michal	Swiatkowski	Hitachi Energy		Ismael	Naja	Eaton
Cole	Van Dreel	ATC		Risto	Trikundski	Trench group
Fei	Yang	Hitachi Energy		Garrett	Bradshaw	Howard Ind.
Richard	Frye	Eaton		Onome	Avanoma	MJ Consult.
Arvind	Kumar	Delta Star				

Next, the Chair briefly provided background and relevance of each item brought up for Group's discussion in the agenda. The Chair started Group's regular business.

WG Item 115, Adding Sec 4.1.10 on DC current injection limits

Andrew Larison was unfortunately not able to attend. The item was passed on but will be discussed in upcoming TF meetings.

WG Item 116, Update of KVA levels in table 11

Ryan Hogg gave the TF an excellent presentation on this topic and how these levels (Table 11) have been consistent throughout the revisions, 15 – 500 KVA category I. It was suspected that it could have been a typo in this table, but it appeared not to be!
Dan Sauer 1st and Ryan Hogg 2nd proposed to table this matter and work together putting together proposed wording to follow the table following the recommendation by Ryan Hogg (Item 1.1 in his

presentation). It was unanimously approved to go ahead with this table but add the note. The motion was carried (1 abstain) to discontinue the discussion for now, but to be continued in future TF meetings.

WG Item 117, C57.12.00 Short Circuit Table – Table 11

Ryan Hogg had a new business item: adding zero sequence impedance to the nameplate and adding nameplate A, B, and C. Ryan Hogg requested to withdraw the new business he proposed.

WG Item 118, add duration of the heat run test to the test report

Jason Varnell presented a proposal for the TF on why he suggested to add the duration of the heat run to the test report. It is mainly to be able to correlate the DGA results (per C57.30) with time the transformer is tested thermally. A great discussion involving a large number of the TF participants followed. It was proposed by the attendees to Jason Varnell to put together a write-up for the TF Chair. Tauhid will then send it out for survey. A motion to survey the verbiage was held (Steve Antosz 1st, Dan Sauer 2nd). It was unanimously approved (1 abstain) and hence, passed.

A few final discussions were held on live parts of power transformers but this discussion was asked to be moved to another workgroup on dielectrics where this subject matter belong.

With a quiet floor, the Chairman asked for the meeting to be adjourned (1st Dan Sauer, 2nd by Marnie Rousell)

Meeting was adjourned at 4:15 PM.

Respectfully submitted,

Tauhid Ansari Enrique Betancourt
Mats Bernesjo
Chair Vice-Chair Secretary

Attendance Fall 2024 Meeting – PCS TF to Revision C57.12.00

First Name	Last Name	Affiliation	Status
Tauhid	Ansari	Hitachi Energy	Member
Stephen	Antosz	Stephen Antosz & Associates, Inc.	Member
Elise	Arnold	SGB-SMIT	Member
Onome	Avanoma	MJ Consulting	RM
Donald	Ayers	Ayers Transformer Consultants	Member
Gilles	Bargune	FISO	RM
Christopher	Baumgartner	WE Energies	Member
Duvier	Bedoya	Hitachi Energy	RM
Orlando	Benitez	Hyosung HICO	Guest
Mats	Bernesjo	Hitachi Energy	Member
Edwin	Betancourt	Siemens-Energy	Guest
Enrique	Betancourt	Prolec GE	Member
Chokso	Bhaumik	Hitachi Energy	Guest
Dan	Blaydon	BG&E	Member
William	Boettger	Boettger Transformer Consulting LLC	Member
Josh	Bohrn	Pacificorp	RM
Sanket	Bolar	Oncor	Guest
Dominique	Bolliger	HV Technologies	RM

Michael	Botti	Hyosung HICO	Guest
Garrett	Bradshaw	Howard Industries	RM
Darren	Brown	Howard Industries	Member
Steven	Brzoznowski	BPA	RM
Alfredo	Carrizales	Prolec Energy	Guest
Sudip	Chanda	Delta Star	RM
Eric	Davis	Consultant	Member
Pouneh	Davoudi	Delta Star	RM
Scott	Dennis	Hitachi Energy	RM
Nikolaus	Dillon	Dominion Energy	Member
Paul	Dolloff	EKPC	RM
Luc	Dorpmanns	SMIT	Guest
Eric	Elson	SDG&E	Guest
Reto	Fausch	RF Solutions	Guest
Joe	Foldi	Foldi & Associates	Guest
Richard	Frye	Eaton	RM
Eduardo	Garcia Wild	Siemens Energy	Member
Ramsis	Girgis	Hitachi Energy	Member
Bill	Griesacker	Duquesne Light	Member
Detlev	Gross	Power Diagnostics consult	Guest
Shertukde	Hemchandra	University of Hartford	Member
First Name	Last Name	Affiliation	Status
Sergio	Hernandez Cano	Hammond Power Solutions	Guest
Ryan	Hogg	USBR	Member
Philip	Hopkinson	HVOLT Inc	Member
Miljenko	Hrkac	Hitachi Energy	RM
Patrycia	Jarosz	IEEE SA	Guest
Nick	Jensen	Delta Star	RM
Akash	Joshi	Kimley-Horn	Guest
Sheldon	Kennedy	Sheldon Kennedy Engineering, PLLC	Member
Zan	Kiparizoski	Howard Industries	Member
Nihat	Kosedagi	Hitachi Energy	RM
Anton	Koshel	Delta Star	Guest
Arvind	Kumar	Delta Star	RM
Mark	Lachman	Doble	Member
Fernando	Leal	Prolec	RM
Jihun	Lee	HD Hyundai Electric	Guest
Junho	Lee	HD Hyundai Electric	Guest
Gabriel	Mamede	Siemens Energy	Guest
Mama	Mbouombouo	Hitachi Energy	RM
Doug	McCullough	Maxima - Hyundai	Guest

Omar	Mendez	Prolec GE	Guest
Francis J	Mills	Power Engineer Inc	RM
Ismael	Naja	Eaton	RM
Joe	Nims	Allen & Hoshall	Member
Mike	Nolte	Kiewit	RM
Edward	Orozco	GR Grid Solutions	RM
Sanjay	Patel	Royal SMIT	Member
Tomiscav	Pavicic	Siemens Energy	Guest
Harry	Pepe	Phenix Technologies Inc.	Guest
Sylvain	Plante	HQ	Guest
Miguel	Plascencia	PG&E	RM
Bertrand	Poulin	Hitachi Energy	Member
Ulf	Radbrandt	Hitachi Energy	Member
Juan	Reyes Perez	Hitachi Energy	Guest
Rodrigo	Ronchi	WEG Transformers USA	Guest
Marnie	Rousell	Entergy	Member
Hakan	Sahin	Virginia / Georgia Transformers	Member
Dinesh	Sankarakurup	Duke Energy	Member
Amitabh	Sarkar	Virginia Transformers	Member
Daniel	Sauer	Eaton	Member
Markus	Schiessl	SGB-SMIT	Member
Eric	Schleismann	Southern Company	Guest
Cihangir	Sen	Duke Energy	Member
AbdulMajid	Shaikh	Delta Star	RM
Jaber	Shalabi	Van Tran Industries	Guest
Christopher	Slattery	FirstEnergy	Member
Steven	Snyder	Hitachi Energy - Retired	Member
H. Allen	Steele	TVA	Guest
Charles	Sweetser	Omicron Electronics Corp	Guest
Michal	Swiatkowski	Hitachi Energy	Member
Jonathan	Tan	Northern Transformer	RM
Andreas	Thiede	Highvolt Dresden	Guest
Fran	Topol	Koncar Power Transformers	Guest
Mark	Tostrud	Dynamic Ratings	Guest
Risto	Trikundski	Trench Group	RM
Cole	Van Dreel	ATC	RM
Ajith	Varghese	Prolec-GE	Member
Jason	Varnell	Doble Engineering	Member
Juan David	Velasquez	Magnetron SAS	Guest
Krishnamurthy	Vijayan	Quanta Services	Member
Dharam	Vir	Prolec-GE Waukesha	Member
John	Wagner	AEP	Guest

David	Wallach	Duke Energy	Member
Paul	Weyandt	Schneider Electric	Guest
Fei	Yang	Hitachi Energy	RM
Hongzhi	Zhang	Hitachi Energy	RM
Zhixiang	Zhu	Chint	Guest
Kris	Zibert	Allgeier Martin & Associates	Member

RM = Request membership

J.9.4 WG Standard for DPVTs C57.159

Working Group C57.159: Standard for Distributed Photo-Voltaic Transformers (DPVTs)
Unapproved Meeting Minutes
Spring 2024 Meeting
October 28, 2024, 4:45pm
Hyatt Regency at the Arch Grand Ballroom D
St. Louis, Missouri

The meeting was called to order at 4:45PM CDT by Chair, Dr. Hemchandra Shertukde.

25 Members attended and a quorum was achieved; official business was conducted.

Joe White moved to approve the agenda as written, Kumar Mani seconded. Approval of Agenda unanimously passed.

Ed teNyenhuis moved to approve minutes from the Spring 2024 and virtual meetings on 9/13/24 and 10/11/24 as written. Joe White seconded. The minutes were unanimously approved.

Phil Hopkinson shared the history and need for a standard for transformers attached to inverters. Paul Orr from NEMA attended. NEMA has a new guide for inverter transformers from which we hope to use material. NEMA has given us a copyright permission form to allow us to use the NEMA information. Patrycja from IEEE needs to be notified on the IEEE side.

Call for patents was issued and none were mentioned.

Copyright and Behavior slides were presented.

The Chair recognized the contributors to the current document.

New Business:

Most of the new business was discussion of the Scope and Purpose of the PAR. Joe Watson suggested that the WG would hold off on a revision to the PAR until the draft more finished to avoid needing multiple revisions to the PAR. Chair agreed.

Discussion on PAR Scope:
Much discussion of the grammar and wording of the Scope ensued. Kumar Mani proposed modifying the scope to include battery energy storage transformers. Joe White questioned in the word “practice”

should be in line 10 of the scope. He suggested that "Practical" would be better. Kuman Mani suggested that "or cast resin transformers" should be deleted from the scope since they fall under dry-type. Don Ayers and Joe Watson suggested changes in wording. Akash Joshi felt that these are power transformers but that the IEEE is considering a new class of transformer between power and distribution. Don Ayers suggested separating the application from the electrical specifications and configuration (like padmount).

Joe Watson suggested that Photo-Voltaic could be expanded to inverter transformers. David Walker also suggested that maybe the scope should be transformers connected to inverters. Phil Hopkinson felt that inverter transformers were the key reason to update this standard. Chair felt that restricting the standard to inverter transformers might leave out some applications. Joe Watson noted that there is consideration in the Committee of eliminating Class 1 as a designation. Jason Beaudoin mentioned the same and that in C57.135 in Dielectric Tests there was a Task Force considering testing of wind and solar transformers for partial discharge creating what would create a different category. Phil Hopkinson that if Class I power was eliminated then we might need two types- one per the DOE scope (Class 1 Distribution) and another for at least to 1.2kV Class and 10MVA (Class II Distribution). Akash Joshi proposed to keep the PAR scope as it stands. Sheldon Kennedy noted that C57.18.10 covers inverter transformers. The difference is IGBT-based inverters are what is causing the problems compared to earlier units. Phil Hopkinson felt that this could have fit into C57.18.10 except from timing of revisions. Maybe BESS transformers belong there. Xoze Lopez-Fernandez suggested that the scope be left alone Andrew Larison felt that the Scope is different than one for distribution transformers and maybe needs a different name. More suggestions of wording from many people.

Patrycja Jarosz IEEE) asked- Do changes broaden the PAR scope? Chair replied- we don't know yet. If needed, we will do a PAR revision later.

Akash Joshi- Moved to accept changes to scope wording as displayed on screen. Joe Watson seconded. Passed unanimously.

Discussion on PAR Purpose:

Discussion on editing the wording for clarity. Because of time the WG agree to finish the discussion of the PAR Purpose in next meeting.

The attendees of the meeting were as follows:

Full Name	Affiliation	Participation
Ayers, Donald	Ayers Transformer Consulting	Member
Bayena, Hugo	H-J Industries	Guest
Beaudoin, Jason	Weidmann Group	Member
Biggie, Kevin	Weidmann Group	Member
Boettger, William	Boettger Transformer Consulting	Guest
Chrysler, Rhett	Ermco	Guest
Conneighton, Brian	Cleveland Cliffs	Guest

Cordova, David	Maddox	Guest
Crockett, Janet	Fayetteville PWC	Guest
Delgado Zamora, Gabriel	Invenergy	Member
de Olivera, Luiz	Hitachi Energy	Guest
Dinh, Huan	Hitachi Energy	Member
Door, Jeff	H-J Industries	Member
Dugan, Roger	EPRI (Retired)	Guest
Fu, Peng	Chint Electric	Guest
Gamboa, Jose	H-J Industries	Member
Garcia, Miguel	Hitachi Energy	Member
Garza, Gilberto	Prolec	Guest
Gaytan, Carlos	Prolec	Member
Grajeda, Rafael	Eaton	Member
Griesacker, Bill	Verizon	Member
Hansman, Jeremy	Cleveland Cliffs	Guest
Hipchen, John	Copper Development Assn	Guest
Hopkinson, Phil	Hvolt, Inc	Vice-Chair
Kennedy, Sheldon	Sheldon P Kennedy Engineering	Member
Larison, Andrew	Hitachi Energy	Member
Leigl, Angela	Eaton	Member
Lopez-Fernandez, Xose	Universidade de Vigo	Member
Mani, Kumar	Duke Energy	Member
Marquardt, Bryan	Cleveland Cliffs	Guest
Marulonda, Katherine	Magnetron SAS	Guest
Mennonna, Robert	Maddox	Guest
Murcia, Fredy	Siemens Energy	Guest
Murillo, Hugo	H-J Industries	Guest
Oakes, Stephen	WEG	Member
Orr, Paul	NEMA	Member
Patel, Sanjay	SMIT USA	Guest
Patel, Vinay	Commonwealth Edison	Guest
Joshi, Akash		Guest
Radu, Ion	Hitachi Energy	Guest
Ronchi, Rodrigo	WEG	Guest
Salvato, Paul	IntelliRent	Guest
Sandoval, Alberto	Eaton	Member
Schindler, Stefan	Reinhausen	Guest
Sharifi, Masoud	Siemens Gamesa	Guest
Shertukde, Hemchandra	University of Hartford	Chair
Simon, Preston	Electrical Technologies	Guest

Sinclair, John	Black and Veatch	Guest
Sparling, Brian	Kinectrics	Guest
Spaulding, Jim	Fort Collins	Guest
Staley, Brad	Leeward Energy	Member
Stockton, David	Stockton Consulting	Member
Suman, Gerry	Electrical Technologies	Guest
teNyenhuis, Ed	Hitachi Energy	Member
Velasquez, Juan David	Magnetron SAS	Guest
Walker, David	MGM Transformers	Secretary
Watson, Joe	JD Watson and Associates	Member
Weisensee, Matt	PacificCorp	Guest
Weyandt, Paul	Schneider Electric	Member
White, Joe	Power Engineers	Member
Yavuz, Koray	Noark Electric	Guest
Yuan, Guang	Hitachi Energy	Member

The meeting was adjourned at 5:53 CDT.

The next meeting will be at the Transformers Committee Spring 2024 Meeting in Denver, Colorado. If additional virtual meetings are scheduled before the Spring 2024 meeting all Working Group members and non-member attendees will be notified.

Respectfully submitted

Hemchandra Shertukde, Chair, C.57.159 Standard

J.9.5 PCS Task Force Continuous Revision to Test Code C57.12.90

Vancouver, BC, Canada
March 12, 2024
9:30 AM – 10:45 AM
Chair – Hakan Sahin
Vice Chair – Pugal Selvaraj
Secretary – Adam Sewell

Meeting Minutes / Significant Issues / Comments:

Meeting was called to order at 9:30am, October 29, 2024 at Hyatt Regency St. Louis at The Arch.

1. Administrative
    a. IEEE Patent Policy and Call for Patents and IEEE SA Copyright Policy
        i. No comments from group
    b. Review of Fall 2024 agenda
        i. No comments from group
    c. Introductions of the attendees

i. Attendance sheets were passed out. Due to time constraints, chair did not have each attendee announce their name/affiliation. Name/affiliation was announced as attendees spoke during the meeting.
ii. Secretary asked all who wanted on email distribution for the C57.12.90 PCS Task Force to send him an email at: adamsewell@ieee.org

d. Updated membership review and count for quorum
i. 47 members were listed and 29 were counted as present by hand count. Based on the hand count, the chair announced there was QUORUM for this meeting.
ii. Attendance sheets after meeting completed showed 33 members attended.
iii. **Members are expected to attend and stay in the meeting so business can be conducted.**
iv. **Member requests should be sent to secretary – adamsewell@ieee.org**

e. Approval of Spring 2024 unapproved minutes and Fall 2024 agenda
i. Motion-S.Som, 2nd-J.John
1. No opposition to unanimous approval – minutes/agenda approved

2. Old Business
a. Review of the recommended revision to Clause 5.1: Determination of cold temperature, under Clause 5: Resistance measurements

5.1 Determination of cold temperature

The cold temperature of the windings shall be determined ~~as accurately as possible when measuring the cold Resistance~~ *by using top liquid (What to do for conservator units?), top and bottom temperature probes or sensors, to determine top liquid and average liquid temperatures. If a temperature rise test is required on the subject transformer, same temperature probes shall be used to determine the liquid temperatures*. The precautions in 5.1.1, 5.1.2, and 5.1.3 shall be observed.

5.1.1 General

Cold-resistance measurements shall be made on a transformer only when the liquid or winding temperature is stable. The temperature is considered stable if the ~~top~~ *average* liquid temperature does not vary more than 2 ºC in a 1 h period. Define average??

5.1.2 Transformer windings immersed in insulating liquid

The temperature of the windings shall be assumed to be the same as the average temperature of the insulating liquid, provided the following occurs:
a) The windings have been under insulating liquid with no excitation and with no current in the windings for a minimum of 3 h for a transformer without pumps and for 1 h for transformer with pumps running before the cold resistance is measured.
b) The temperature of the insulating liquid has stabilized, and the difference between top and bottom temperature does not exceed 5 ºC.

b. J.Varnell proposed suggested wording for the TF discussion on the winding resistance:
i. The cold temperature of the windings for class II transformers shall be determined by a thermocouple or suitable thermometer immersed directly in oil.

c. Discussions were had about wording of cold temperature measurement and will be continued at next meeting

3. New Business
a. No new business, just review of Clause 5.1: Determination of cold temperature

4. Membership changes
a. Officers will look at attendance and change TF membership status before next meeting.

5. Next meeting: March 25, 2025 at Spring 2025 Tranformers Committee Meeting scheduled for March 23-27, 2025, Denver, CO, USA

6. Close of meeting
a. Meeting adjourned at 10:45am – Motion-D.Sauer, 2nd-J.John
i. No opposition to unanimous approval – MOTION APPROVED

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

October 29, 2024 Meeting Attendance: (RM = Request Membership)

Last Name	First Name	Company (Affiliation)	Role
Adams	Kayland	Prolec GE Waukesha	Member
Aikens	Tom	Delta Star Inc.	Guest
Antosz	Stephen	Stephen Antosz & Associates, Inc	Member
Arnold	Elise	SGB	Member
Ayers	Donald	Ayers Transformer Consulting	Member
Baumgartner	Chris	We Energies	Member
Beaster	Barry	H-J Family	Guest
Bedoya	Duvier	Hitachi Energy	Member
Bernesjo	Mats	Hitachi Energy	Member
Betancourt	Edwin	Siemens Energy	Guest
Blaszczyk	Piotr	Specialty Transformer Components LLC	Guest
Blaydon	Daniel	Baltimore Gas & Electric	Member
Boettger	William	Boettger Transformer Consulting LLC	Member
Bohrn	Joshua	PacifiCorp	Guest
Bolliger	Alain	HV TECHNOLOGIES, Inc.	Guest-RM1
Bolliger	Dominique	HV TECHNOLOGIES, Inc.	Guest-RM3
Botti	Michael	Hyosung HICO	Guest-RM1
Bradshaw	Garrett	Howard Industries	Guest
Brown	Darren	Howard Industries	Guest
Brzoznowski	Steven	Bonneville Power Administration	Guest-RM1
Calitz	David	Siemens Energy	Guest
Cantu	Jorge	Alliant Energy	Guest
Carrizales	Juan Alfredo	Prolec GE	Guest-RM2
Choksi	Bhaumilc	Hitachi Energy	Guest
Davis	Eric	Consultant	Guest
Dennis	Scott	Hitachi Energy	Member
Dillon	Nikolaus	Dominion Energy	Guest
Dorpmanns	Luc	SGB SMIT	Guest
Dzodan	Janko	Koncar DIST	Guest
Fausch	Reto	RF Solutions	Guest
Foldi	Joseph	Foldi & Associates, Inc.	Guest
Forsyth	Bruce	Bruce Forsyth and Associates PLLC	Guest-RM1
Frazier	Raymond	Ameren	Member
Frye	Richard	EATON Corporation	Guest-RM2
Garcia Wild	Eduardo	Siemens Energy	Guest
Gasic	Dragana	Koncar DIST	Guest
Girgis	Ramsis	Hitachi Energy	Member
Gorzin	Alireza	Black & Vcatch	Guest-RM3
Griesacker	Bill	Duquesne Light Co.	Member
Hernandez Cano	Sergio	Hammond Power Solutions	Guest
Hernandez	Giovanni	Virginia Transformer Corp.	Member
Holifield	Thomas	Howard Industries	Guest
Hopkinson	Phil	HVOLT Inc.	Guest
Hrkac	Miljenko	Hitachi Energy	Guest
Issack	Ramadan	AEP	Guest-RM4
Jaroszewski	Marion	Delta Star Inc.	Guest
Jarosz	Patrycja	IEEE SA	Guest
Jensen	Nick	Delta Star Inc.	Guest-RM2
Jeong	Chanho	Iljin Electric	Guest
John	John	Virginia Transformer Corp.	Member
Kapka	Sergiun	Hitachi Energy	Guest
Kennedy	Sheldon	Sheldon P. Kennedy Engineering, LLC	Guest
Khan	Qasim	NEETRAC - Georgia Tech	Guest
Kim	Yeounsoo	MEPPI	Guest-RM2
Kiparizoski	Zan	Howard Industries	Guest
Kircheumayer	Egon	Siemens Energy	Guest
Kosedagi	Nihat	Hitachi Energy	Guest
Kumar	Arvind	Delta Star Inc.	Guest
Kwiatkowski	Mateusz	Hitachi Energy	Guest
Lachman	Mark	Doble Engineering Co.	Member
Leal	Fernando	Prolec GE	Member
Lee	Moonhee	Hammond Power Solutions	Guest-RM1

Last Name	First Name	Company (Affiliation)	Role
Lim	Donggi	Iljin Electric	Guest
Mahajan	Kushal	Sunarow	Guest
Mamede	Gabriel	Siemens Energy	Guest
Marathe	Swapnil	Megger	Guest-RM1
Mbouombouo	Mama	Hitachi Energy	Guest
McBride	Brian	Cargill	Guest-RM1
McBride	James	JMX Services, Inc.	Guest
Mills	Francis	Power Engineers	Guest-RM3
Munoz	Marta	Hitachi Energy	Guest
Murray	David	TVA	Member
Naja	Ismael	Eaton	Guest-RM3
Nambi	Shankar	Bechtel Energy	Guest
Nims	Joe	Allen & Hoshall	Guest
Ortiz	Cuauhtemoc	Niagara Power	Guest
Pandya	Manan	Siemens Energy	Guest
Panesar	Parminder	Virginia Transformer Corp.	Guest
Patel	Sanjay	Smit Transformer	Member
Pepe	Harry	Doble Engineering Co.	Member
Plante	Sylvain	Hydro-Quebec	Guest
Plascencia	Miguel	PG&E	Guest-RM1
Poulin	Bertrand	Hitachi Energy	Guest
Prado	Gustavo	Siemens Energy	Guest
Reyes Perez	Juan	Hitachi Energy	Guest
Roussell	Marnie	Entergy	Guest
Sahin	Hakan	Virginia/Georgia Transformer	Member-Chair
Sankarakurup	Dinesh	Duke Energy	Guest
Sarkar	Amitabh	Virginia Transformer Corp.	Guest-RM1
Sarkinen	Garrett	Xcel Energy	Guest
Sauer	Daniel	EATON Corporation	Member
Schiessl	Markus	SGB	Member
Schwartz	Dan	Quality Switch, Inc.	Guest
Sewell	Adam	Quality Switch, Inc.	Member-Secretary
Sewell	Jeremy	Quality Switch, Inc.	Guest
Shaikh	Abdul Majid	Delta Star Inc.	Guest-RM1
Slattery	Christopher	FirstEnergy Corp.	Member
Som	Sanjib	Pennsylvania Transformer	Member
Stechschulte	Kyle	AEP	Guest
Steele	H. Allen	TVA	Guest
Steineman	Andrew	Delta Star Inc.	Guest
Swarna	Sunny	Virginia Transformer Corp.	Guest
Tan	Jonathan	Northern Transformer	Guest
Tekle	Samuel	WEG Transformers	Guest
teNyenhuis	Ed	Hitachi Energy	Member
Thiede	Andreas	HIGHVOLT	Guest-RM1
Van Dreel	Cole	American Transmission Company	Member
Varghese	Ajith	Prolec GE Waukesha	Member
Varnell	Jason	Doble Engineering Co.	Member
Veeran	Kannan	Virginia/Georgia Transformer	Guest
Velasquez	Juan	Magetron	Guest
Vijayan	Krishnamurthy	Quanta Services	Member
Vyas	Pragnesh	Sunbelt Solomon	Member
Walker	David	MGM Transformer Company	Guest
Wallach	David	Duke Energy	Guest-RM1
Walters	Shelby	Howard Industries	Guest
Wang	Luke	BC Hydro	Guest
Weyandt	Paul	Schneider Electric	Guest-RM1
Yang	Fei	Hitachi Energy	Guest
Youn	Joseph	Iljin Electric	Guest
Zaman	Malia	IEEE SA	Guest
Zhang	Hongzhi	Hitachi Energy	Guest
Zibert	Kris	Allgeier, Martin and Associates	Guest-RM1
Ziomek	Waldemar	PTI Transformers	Member

J.9.6 WG HV & EHV Breaker & Transformer Sw. Transients C57.142

IEEE / PES Transformers Committee
Performance Characteristics Subcommittee
WG to Investigate the Interaction between Substation Transients
And Transformers in HV and EHV Applications and Revision of C57.142

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

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

1) Welcome and Chair's Remarks
2) Circulation of Attendance Sheets. Quorum was achieved with 34/43 Members present. Guest attendance was 64 for a total of 98 attendees.
3) IEEE Patent Policy Slides – no patent claims
4) Approval of Agenda and Minutes from Last Meeting: Spring 2024 Minutes (motion by Akash Joshi / 2nd by Rogerio Verdolin) and Fall 2024 Agenda (motion by Phil Hopkinson / 2nd by Akash Joshi) unanimously approved.
5) C57.142 Ballot and Comment Resolution – Jim McBride
The Chair presented the list of BRG Members. The BRG has reduced the unresolved comment list to just 15 unresolved comments and plans to address at least five per month in online meetings between now and the Spring 2025 meeting.
Question from Phil Hopkinson: "what is the expected lifetime of MOV's internal to a transformer?". Eduardo Garcia commented they are designed to

last the lifetime of the transformer. Rogerio Verdolin commented that simulations of these arrestors in the circuit should be a key element of the designed resilience of the transformer. Bertrand Poulin commented that arrestors inside the winding are only required to absorb several hundred amperes at most and that failure of these arrestors is extremely rare. This is totally different from needing to absorb the external line energy (perhaps ~10kA / ~1MV or more).

6) Mitigation Methods Task Force Update – Jim McBride / Phil Hopkinson
The Chair presented the list of TF Members. A tutorial in the main session is being planned for Fall 2025 (latest Spring 2026).
Rogerio Verdolin mentioned a paper he presented on the application of surge arrestors which he provided to the WG. The Chair also presented a list of the mitigation methods being considered so far that will be part of the tutorial and possibly added as a future Annex to the Guide. The Chair provided an overview of the few remaining comments (mostly general, but a few would require extensive changes to the organization of the Guide).
Phil Hopkinson made a comment about older circuit breaker design utilizing "insertion of resistance" or "pre-insertion resistors" having dual sets of

contacts (the first step closing on a resistor and the second step shunting the resistor). Phil suggested there should be some review of these designs, as the
breakers have increased voltage ratings since the original designs.
Jesse Duffy commented that newer circuit breakers (vacuum, SF6) typically do not have pre-insertion resistors. This usage has become more specialized (as needed) rather than common. Kumar Mani commented that zero-voltage closing breakers now very common. Bertrand Poulin commented that certain utilities prefer closing at approx. 40º (phase angle), rather than zero-crossing, as this avoids the maximum potential for inrush currents. Phil Hopkinson discussed capacitance grading as an option, but suggested this was a more difficult approach. The Chair mentioned pending changes to vacuum-interrupter designs, as the industry moves away from SF6 breakers, as something to keep in mind.

Extensive discussions regarding the challenges of high-magnitude, high-frequency transients that the Guide is intended to address ensued. It was noted there are few (if any) factory tests that can simulate these occurrences. It was also mentioned that multi-contact vacuum interrupters rated 145 kV are increasingly common with 230 kV usage growing as well.
7) New Business – no new business
8) Next Meeting (Denver, CO March 23rd – 27th, 2025)
9) Adjournment at 12:05 PM

J.9.7 WG C57.158 Application Guide for Tertiary and Stabilizing Windings

PCS Working Group Revision of Application Guide for Tertiary and Stabilizing Windings C57.158

Performance Characteristics Subcommittee
IEEE / PES Transformers Committee

October 29, 2024
St. Louis, Missouri, US

UNAPPROVED MINUTES

This group met on Tuesday October 29, 2024 at 4:45 PM in St. Louis, MO, US. The attendance record showed **73** people attended the meeting with **24** out of the **37** Members present; a quorum to conduct business was established.

Following **11** Guests requested Membership (to be awarded after consecutive attendance to two WG meetings):

Alfredo Carrizales	Prolec GE
Eduardo Orozco (*)	GE Grid Solutions
Fei Yang	Hitachi Energy
Jerzy Kazmierzak (*)	Hitachi Energy
Jose Antonio Gonzalez	Georgia Transformer
Junho Lee (*)	HD Hyundai

Kim Yeounsoo	MEPPI
Manan Pandya	Siemens Energy
Marnie Rousell (*)	Entergy
Michael Botti	Hyosung HICO
Pedro Trujillo	HD Hyundai

(*) To become WG Members after this meeting.

The officers were introduced as Enrique Betancourt Chair, Xose Lope-Fernandez Vice Chair, and Kayland Adams Secretary.

IEEE Patent slides were covered, no issues were brought up.
IEEE Copyright Policy slides were discussed, no issues were brought up.

Attendance was conducted and quorum was achieved. Agenda was presented. Motion unanimously passed to approve agenda (Joe White, Sanjib Som).The Minutes from the last meeting were also unanimously approved (John John, Amitabh Sarkar).

1. OLD BUSINESS

Updates by each Task Force were presented.

1.1 Task Force 1: General editorial overview

Emilio Morales-Cruz, TF Leader, presented the findings. 92 comments were assembled, some editorial, some technical and some may require changes to other standards.

Sanjib Som made discussion to bring terminal labeling conflicts to C57.12.00 for resolving. Emilio will review the subject with his Group.

1.2 Task Force 2: Recommendations for Y-connected transformers without a delta connected winding.

Xose Lope-Fernandez, TF Leader, presented work in this section. Additional text was proposed to be added to clauses 4.3, 5.2, and 8.3 that refer to the following two papers that propose monitoring techniques that will allow Y-Y transformer without a tertiary to operate with a certain level of unbalance load:

[Alvarez-Gomez Part I 2024]
L. A. Alvarez-Gomez, X. M. Lopez-Fernandez, F. de Leon and A. Ramos, "Three-Phase Three-Legged Wye-Wye Transformers With Only One Neutral Grounded and No Stabilizing Winding–Part I: Zero-Sequence Performance," in IEEE Transactions on Power Delivery, vol. 39, no. 3, pp. 1451-1461, June 2024, doi: 10.1109/TPWRD.2024.3365857

[Alvarez-Gomez Part II 2024]
L. A. Alvarez-Gomez, X. M. Lopez-Fernandez, F. de Leon and A. Ramos, "Three-Phase Three-Legged Wye-Wye Transformers With Only One Neutral Grounded and no SW – Part II: Zero-

Sequence Permissible Temperature," in IEEE Transactions on Power Delivery, vol. 39, no. 3, pp. 1462-1473, June 2024, doi: 10.1109/TPWRD.2024.3365861.

Sanjib Som made a discussion that the guide should be standalone and not require the papers. Whatever methods recommended should be included in the guide and not require the review of other documents. Xose will discuss the subject within his Group.

One important question identified as part of the TF2 work is whether any tests could be recommended in the Guide, to validate the expected operational performance.

1.3 Task Force 3: Improvement and, or simplification of concepts in the Guide

Krzysztof Kulasek accepted the Leadership of this Task Force between the Spring 2024 meeting and Fall 2024 meeting. Work by Task Force 3 was presented by the WG Chair, as Krzysztof could not attend the meeting this time. Additions to clauses 5.4 and 8.1.2 were discussed, which explain "Loading of Multi-winding Transformers" and "Transfer of High Voltage to Low Voltage Windings".

1.4 Task Force 4: New recommendations for TW or SW

The WG Chair is currently leading this Task Force but has asked for other WG Member to volunteer to take the lead in future. Material was presented showing separate delta connected tertiary windings for axial split dual LV winding configurations. Additional text was proposed to be added to clause 4.1 to cover this topic.

A short presentation was given by the Chair to just introduce the topic of "Zero sequence flux and its effects on transformers/systems". A circuit model was also presented. Tutorial material will be supplemented by next WG's meeting, to cover the fundamentals necessary to understand the Guide's advanced concepts.

1.5 Next steps

Task Forces will continue working with the objective of recommending proposed text improvements, based on their findings and discussions, with the objective to incorporate them to Draft 2 version of the Guide.

2. NEW BUSINESS

No new business was brought up.

3. ADJOURN

Motion passed to adjourn. Rodrigo Ronchi made the motion, Emilio Morales-Cruz seconded. The meeting was adjourned at 6:00 PM.

Respectfully submitted,

Enrique Betancourt Chairman	Dr. Xose Lopez-Fernandez Co-Chair	Kayland Adams Secretary

Next Page: Attendance List (RM = Request membership):

Last Name	First Name	Affiliation	Status
Adams	Kayland	Prolec GE	Member
Antosz	Stephen	Consultant	Member
Barker	Sean	Hitachi Energy	Guest
Betancourt	Edwin	Siemens Energy	Guest
Betancourt	Enrique	Prolec GE	Member
Boettger	William	Boettger Transformer ConsultingLLC	Member
Botti	Michael	Hyosung HICO	RM
Calil	Wilerson	Hitachi Energy	Guest
Calitz	David	Siemens Energy Inc	Guest
Carrizales	Alfredo	PROLEC	RM
Chan	Vivian	Hitachi Energy	Guest
Chanda	sudip	Delta Star Inc	Guest
Choksi	Bhamile	Hitachi Energy	Guest
Dolloff	Paul	EKPC	Guest
do Prado	Gustavo	Siemens Energy	Guest
Dugan	Roger	RC Dugan	Guest
Dzodan	Janko	Koncar D&ST	Guest
Finn	Mark	Hitachi Energy	Guest
Frazier	Raymond	Ameren	Member
Garcia	Eduardo	Siemens Energy	Member
Garcia-Paredes	David	Virginia Transformers Corp	Guest
Garza	Hector	Orto de Mexico	Guest
Gasic	Dragana	Koncar D&ST	Guest
Gonzalez Ceballos	Jose Amtonio	Virginia/Georgia Transformers	RM
Griesacker	William	WGA	Guest
Hernandez	Carlos	Delta Star	Guest
Holifield	Thomas	Howard Industries	Guest
Jaroszewski	Marion	Delta Star Inc	Guest
Jensen	Nick	Delta Star	Guest
John	John	Virginia Transformer Corp.	Member
Juchem	Kevin	Hitachi Energy	Guest
Kazmierczak	Jerzy	Hitachi Energy	RM
Kim	Yeounsoo	MEPPI	RM

Kirchenmayer	Egon	Siemens-Energy	Member
Lee	Junho	HD Hyundai Electric	RM
Lopez-Fernandez	Xose M.	Universidad de Vigo	Member
Manzano	Moses	Hyosung HICO	Member
Morales-Cruz	Emilio	QUALITROL	Member
Munoz	Marta	Hitachi Energy	Member
Munoz	Martin	Orto de Mexico	Guest
Nambi	Shankar	Bechtel Energy, Inc.	Member
Nims	Joe	Allen & Hoshall	Guest
OMalley	Anastasia	Con Edison Co. NY	Guest
Orozco	Eduardo	GE Grid Solutions	RM
Pandya	Manan	Siemens Energy	RM
Pandza	Tihomir	Siemens Energy KPT	Guest
Patel	Sanjay	SGB-Smit USA	Member
Pavicic	Tomislav	Koncar Power Transformers Ltd	Guest
Plisic	Goran	Siemens Energy KPT	Guest
Prado	Gustavo	Siemens Energy	Guest
Reyes Perez	Juan	Hitachi Energy	Guest
Ronchi	Rodrigo	WEG Transformers Mexico	Member
Roussell	Marnie	Entergy	RM
Sankarakurup	Dinesh	Duke Energy	Member
Sarkar	Amitabh	Virginia Transformer Corporation	Member
Schiessl	Markus	SGB	Member
Snyder	Jason	FirstEnergy	Member
Som	Sanjib	PTT, LLC	Member
Speegle	Andy	Entergy	Member
Steineman	Andrew	Delta Star, Inc.	Guest
Tekle	Samuel	WEG Transformers USA	Guest
Tolcachir	Eduardo	TTE Transformers	Guest
Topol	Fran	Koncar Power Transformers	Guest
Trujillo	Pedro	HD Hyundai	RM
Varnell	Jason	Doble Engineering	Member
Vijayan	Krishnamurthy	Pennsylvania Transformers	Member
Wagner	John	American electric power	Guest
Wallach	David	Duke Energy	Guest
Washburn	Alan	Burns and McDonnell	Guest
Webb	Bruce	Knoxville Utilities Board	Guest
White	Joe	Power Engineers	Member
White	Leon	Hedrich	Guest
Woods	Deana	Prolec GE Waukesha	Guest

Yang	Fei	Hitachi Energy	RM
Yavuz	Koray	NOARK Electric	Guest
Zaman	Malia	IEEE SA	Guest
Zhang	Jie	CHINT Electric	Guest

J.9.8 WG PC57.32 Neutral Grounding Devices

IEEE Neutral Grounding Devices Working Group Meeting
Hyatt Regency Hotel
Vancouver, BC, Canada

Tuesday, Oct 29, 2024
4:45 PM – 6:00 PM

Chair – Sheldon P. Kennedy
Vice-Chair – Thomas Melle
Secretary – Ed teNyenhuis

1. **Welcome and Chair's Remarks**

2. **Circulation of Attendance Sheets**
   (Quorum achieved – 17 of 26 Members; 18 Guests present)

3. **Approval of Agenda**
   (Motion to approve by Don Ayers, second by Sergio Panetta – motion passed without objection)

4. **Patent Call -** none

5. **Copyright and IEEE Ethics Policies**

6. **Approval of Minutes from previous Meeting**
   (Motion to approve by Don Ayers, second by Mike Sharp – motion passed without objection)

7. **Reports from TF Leader Assignments**

   a. **Clause 4 - Neutral Grounding Reactors –** Camilo Casallas

All main body section draft work is complete. Will provide new Annex section on SPAR by December.
It was agreed to change the 92kV values in Table 3 to 115kV.

   b. **Clause 5 - Neutral Ground Fault Neutralizers –** Klaus Pointner

All work is complete including two new Annex's on "Failed Phase Grounding" and "Residual Current Compensator".

c. Clause 6 - Neutral Grounding Transformers – Don Ayers

All work is complete.

d. Clause 7 - Neutral Grounding Resistors – Ryan Hogg, Sergio Panetta

The TF held 18 meetings. All work is complete.

e. Clause 8 - Combination Devices - Sergio Panetta

The draft is being surveyed by the TF and will be complete by December.

8. **Working Group Survey**

   It is planned that all the remaining TF draft work is completed by the end of the year. An overall draft will be prepared that will be sent for straw ballot to the WG by Feb 2025. It is hoped the comments can be reviewed at the Spring 2025 meeting in Denver.

9. **Old Business**

   None

10. **New Business**

    None

11. **Next in-person meeting – Spring 2025 Meeting** (IEEE TC – Denver USA, March 23 – 27, 2025)

12. **Adjournment at 5.51PM local time**

List of Meeting Attendees (including affiliation & member status).

Kennedy	Sheldon	Sheldon P. Kennedy Engineering	Chair
Melle	Thomas	HIGHVOLT	Vice-Chair
teNyenhuis	Ed	Hitachi Energy	Secretary
Casallas	Camilo	Trench Ltd.	Member
Dinh	Huan	Hitachi Energy	Member
Hossain	Saif	Trench Ltd.	Member
Sharp	Mike	Trench Ltd.	Member
Ayers	Donald	Ayers Consulting	Member
Bolar	Sankey	ONCOR	Member
Cruz Valdes	Juan Carlos	Prolec GE	Member
Hogg	Ryan	Bureau of Reclamation	Member
Panetta	Sergio	I-Gard Corp.	Member
Pointner	Klaus	Trench Austria	Member
Radbrandt	Ulf	Hitachi Energy	Member
Stechschulte	Kyle	AEP	Member
Thomas	Scott	Hitachi Energy	Member

Wong	Terry	Trench	Member
Allison	Robert	Dominion Energy	Guest
Beaudain	Jason	Wiedmann	Guest
Benitez	Orlando	Hyosung HICO	Guest
Bhardwaj	Naveen	Trench Group	Guest
Biggie	Kevin	Weidmann	Guest
Brooks	Jeffrey	Asplundh Engineering	Guest
Brzaznowski	Steven	BPA	Guest
Dom	Corsi	Doble	Guest
Dopplmair	Peter	Trench Group	Guest
Jesus	Rodriguiz	Voltyx	Guest
Kaineder	Kurt	Trench Austria	Guest
Keels	Thomas	KEElectric Engineering PLLC	Guest
Machain	Jose Luis	Prolec GE	Guest
Nolte	Michael	Kiewit	Guest
Parkinson	Dwight	Eaton Corp	Guest
Starcevic	Vedrana	Koncar	Guest
Vyas	Pragnesh	Sunbelt Soloman	Guest
Watson	Joshua	NPPD	Guest

J.9.9 TF Transformer Data Required for System Studies **J. Watson**

Performance Characteristics Subcommittee Task Force Meeting Minutes
Transformer Data Required for System Studies
Hyatt Regency Hotel St. Louis at the Arch, St. Louis, MO
Grand Ballroom E(4)
Monday, October 28, 2024, 1:45 – 3:00PM

Chair: Joe Watson
Vice Chair: Rogerio Verdolin
Secretary: Alwyn Vanderwalt

The Task Force met for the first time at 1:45PM on Monday, 10/28/24 with 43 attendees. 17 attendees chose to become members. Patent and Copyright requirements were covered.

No motions or other official business were covered, and only general discussions were held on the purpose of the Task Force, which is to identify the system studies programs that are commonly used in the US by utilities and engineering firms and identify the transformer parameters that are required inputs to those programs. Once these programs and data inputs are identified, the Task Force will report or recommend

- Whether or not all parameters used in these programs are commonly available from design or test data
- If any commonly used parameters need to be defined to ensure consistent data
- Whether or not an IEEE document should be created or expanded to cover these transformer parameters

The Task Force discussed some of the programs that the attendees were familiar with such as

PSCAD, EMTP, CYME, OPAL-RT, and ETAP. We also learned that CIGRE published 2 Technical Bulletins in 2023, TB900 and TB901 on transformer models for network studies, and these will be reviewed.

In general, fault study and load flow studies appear to only require tap voltages, impedances and other data that are commonly available from transformer designers. Some stability programs, however, require data inputs that are not commonly available such as air core reactances, transformer core saturation curves, winding saturation locations and others.

The Task Force will meet in the Spring 2025 Denver meetings. The time slot for this first meeting was only available because a WG meeting had been cancelled. The Task Force will need another time slot.

The attendees were requested to survey their organizations that use system studies programs to identify the more commonly-used programs for discussion in a remote meeting tentatively scheduled for 4-6 weeks from now. The meeting adjourned at 3:00.

Meeting Attendees

First Name	Last Name	Affiliation	Status
Nabi	Almeida	Prolec GE	Member
Bhaumik	Choksi	Hitachi Energy	Guest
Mike	Craven	Qualus Power Services	Guest
Janet	Crockett	Fayetteville PWC	Guest
Luiz	de Oliveira	Hitachi Energy	Guest
Fernando	Duarte	EPRI	Guest
Roger	Dugan	EPRI (Retired)	Guest
Carlos	Gaytan	Prolec GE	Member
John	Hipchen	Copper Development Assn.	Guest
Miljenko	Hruac	Hitachi Energy	Guest
Zinan	Huang	Sieyum Toshiba	Guest
Basim	Khan	NEETRAC - Georgia Tech.	Guest
Egon	Kirchenmayer	Siemens Energy	Member
Evan	Knapp	Eaton	Guest
Nihat	Kosedagi	Hitachi Energy	Member
Anton	Koshel	Delta Star, Inc.	Guest
Andrew	Larison	Hitachi Energy	Guest
Lee	Matthews	Howard Industries	Guest
Tim	Menter	Lincoln Electric System	Member
Tyler	Morgan	Duke Energy	Guest
Dan	Mulkey	Mulkey Engineering Inc.	Guest
Jerry	Murphy	Retired - RCES	Member
Shankar	Nambi	Bechtel Energy, Inc.	Member
Verena	Pellon	NextEra/FPL	Guest

Goran	Plisic	Siemens Energy KPT	Member
Homer	Portillo	Advanced Power Technology	Guest
Bertrand	Poulin	Hitachi Energy	Guest
Ulf	Radbrandt	Hitachi Energy	Member
Marnie	Roussell	Entergy	Member
Eric	Schleismann	Southern Company	Guest
Stephen	Shull	BBC Electric Services Inc.	Member
Mike	Thibault	Pacific Gas and Electric	Guest
Fran	Topol	Koncar Power Transformers	Guest
Oliver	Uhlmann	Reinhausen Canada	Guest
Reinaldo	Valentin	Duke Energy	Guest
Alwyn	Vanderwalt	ECI	Secretary
Rogerio	Verdolin	Verdolin Solutions	Vice-Chair
Alan	Washburn	Burns and McConnell	Member
Joshua	Watson	Nebraska Public Power District	Member
Joe	Watson	JD Watson and Associates, Inc.	Chair
Bruce	Webb	KUB	Guest
Hongzhi	Zhang	Hitachi Energy	Member
Zhixsang	Zhu	Chint	Guest

J.10 Performance Characteristics Subcommittee Attendance List

First Name	Last Name	Affiliation	Status
Rogerio	Verdolin	Verdolin Solutions Inc.	Chair
Sanjib	Som	Pennsylvania Transformer	Vice-Chair
Kris	Zibert	Allgeier, Martin and Associates	Secretary
Kayland	Adams	Prolec-GE	Member
Tauhid Haque	Ansari	Hitachi Energy	Member
Donald	Ayers	Ayers Transformer Consulting	Member
Robert	Ballard	DuPont	Member
Christopher	Baumgartner	We Energies	Member
Wallace	Binder	WBBinder Consultant	Member
Daniel	Blaydon	Baltimore Gas & Electric	Member
William	Boettger	Boettger Transformer Consulting LLC	Member
Sanket	Bolar	Oncor Electric Delivery	Member
Juan Alfredo	Carrizales	Prolec GE	Member
Camilo	Casallas	TRENCH	Member
Craig	Colopy	Retired - EATON Corporation	Member
Juan Carlos	Cruz Valdes	Prolec GE	Member
J. Arturo	Del Rio	Siemens Energy	Member

Nikolaus	Dillon	Dominion Energy	Member
Evgenii	Ermakov	Hitachi Energy	Member
Reto	Fausch	RF Solutions	Member
Raymond	Frazier	Ameren	Member
Jose	Gamboa	H-J Family of Companies	Member
Eduardo	Garcia Wild	Siemens Energy	Member
Ramsis	Girgis	Hitachi Energy	Member
Sergio	Hernandez Cano	Hammond Power Solutions	Member
Saramma	Hoffman	PPL Electric Utilities	Member
Saif	Hossain	Trench Limited	Member
Ramadan	Issack	American Electric Power	Member
John	John	Virginia Transformer Corp.	Member
Jerzy	Kazmierczak	Hitachi Energy	Member
Sheldon	Kennedy	Sheldon P. Kennedy Engineering, PLLC	Member
Stacey	Kessler	Ulteig Engineers	Member
Egon	Kirchenmayer	Siemens Energy	Member
Moonhee	Lee	Hammond Power Solutions	Member
Weijun	Li	Braintree Electric Light Dept.	Member
James	McBride	JMX Services, Inc.	Member
Francis	Mills	Power Engineers	Member
Emilio	Morales-Cruz	Qualitrol Company LLC	Member
David	Murray	Tennessee Valley Authority	Member
Ryan	Musgrove	Oklahoma Gas & Electric	Member
Poorvi	Patel	Electric Power Research Institute (EPRI)	Member
Harry	Pepe	Phenix Technologies, Inc.	Member
Sylvain	Plante	Hydro-Quebec	Member
Klaus	Pointner	Trench Austria GmbH	Member
Ion	Radu	Hitachi Energy	Member
Rodrigo	Ronchi	WEG-Voltran	Member
Marnie	Roussell	Entergy	Member
Hakan	Sahin	Virginia/Georgia Transformer	Member
Amitabh	Sarkar	Virginia Transformer Corp.	Member
Daniel	Sauer	EATON Corporation	Member
Markus	Schiessl	SGB	Member
Ewald	Schweiger	Siemens Energy	Member
Abdul Majid	Shaikh	Delta Star, Inc.	Member
Hemchandra	Shertukde	University of Hartford	Member
Christopher	Slattery	FirstEnergy Corp.	Member
Steven	Snyder	Hitachi Energy	Member
Kyle	Stechschulte	American Electric Power	Member
Charles	Sweetser	OMICRON electronics Corp USA	Member
Ed	teNyenhuis	Hitachi Energy	Member

Ajith	Varghese	Prolec GE-Waukesha	Member
Jason	Varnell	Doble Engineering Co.	Member
Dharam	Vir	Prolec-GE	Member
Richard	vonGemmingen	Dominion Energy	Member
Pragnesh	Vyas	Sunbelt-Solomon	Member
David	Wallach	Duke Energy	Member
Drew	Welton	Intellirent	Member
Guang	Yuan	Hitachi Energy	Member
Joshua	Yun	Virginia Transformer Corp.	Member
Peter	Zhao	Hydro One	Member
Waldemar	Ziomek	PTI Transformers	Member
Akash	Joshi	Mott MacDonald	GuestNew
Sanjay	Patel	Smit Transformer	GuestNew
Krishnamurthy	Vijayan	Pennsylviana Transformers	GuestNew
Nabi	Almeida	Prolec GE	Guest
Elise	Arnold	SGB	Guest
Vivian	Chan	Hitachi Energy	Guest
Michael	Craven	Qualus Power Services	Guest
Thomas	Dauzat	AEP-SWEP CO	Guest
Pouneh	Davoudi	Delta Star Inc.	Guest
Luc	Dorpmanns	Royal Smit Transformers	Guest
William	Elliott	AEP-SWEP CO	Guest
Gary	Hoffman	Advanced Power Technologies	Guest
Ryan	Hogg	Bureau of Reclamation	Guest
Derek	Hollrah	Burns & McDonnell	Guest
Christopher	Johnson	Oncor Electric Delivery	Guest
Anton	Koshel	Delta Star Inc.	Guest
Fernando	Leal		Guest
Junho	Lee	Hyundai Electric	Guest
Yaquan (Bill)	Li	BC Hydro	Guest
Xose	Lopez-Fernandez	Universidade de Vigo	Guest
Kumar	Mani	Duke Energy	Guest
Alberto	Martinez	WEG Transformers USA Inc.	Guest
Omar	Mendez	Prolec-GE	Guest
Marta	Munoz	Hitachi Energy	Guest
Hugo	Murillo	H-J Family of Companies	Guest
Bertrand	Poulin	Hitachi Energy	Guest
Michael	Richardson	Ameren	Guest
Dinesh	Sankarakurup	Duke Energy	Guest
Eric	Schleismann	Southern Company	Guest
Avijit	Shingari	Pepco Holdings Inc.	Guest
Jason	Snyder	First Energy	Guest
Hampton	Steele	Tennessee Valley Authority	Guest

Andrew	Steineman	Delta Star Inc.	Guest
Joe	White	Power Engineers	Guest
Terry	Wong	Trench Limited	Guest
Fei	Yang	Hitachi Energy	Guest
Janet	Crockett	Fayetteville PWC	Guest
Eric	Elson	SDGE	Guest
Yeounsoo	Kim		Guest
David	Rohrer	First Energy	Guest
Brad	Staley	Leenard Renewable Energy	Guest
Sachin	Tade		Guest
John	Wagner	American electric power	Guest
Orlando	Benitez	Hyosung Hico	Guest
Sudip	Chanda	Delta Star Inc.	Guest
Peng	Fu	Chint Electric	Guest
Carlos	Hernandez	Delta Star	Guest
Miglenko	Hrvac	hitachi energy	Guest
Fawaz	Iqbal	Omicron	Guest
Marion	Jaroszewski	Delta Star Inc.	Guest
Dasim	Khan	Neetrac - Georgia Tech	Guest
Nihot	Kosedagi	Hatachi Energy	Guest
Arvind	Kumaria	Delta Star Inc.	Guest
Moses	Manzano	Hyosung Hico	Guest
Mark	Newbill	Hitachi Energy	Guest
Stephen	Oakes	WEG	Guest
Ednardo	Orozco	GE Grid Solutions	Guest
Pedro	Pedro	Efacec Energy	Guest
Gustavo	Prado	Siemens Energy	Guest
Thomas	Prevogt	Weidmamn	Guest
Garret	SarKinen	Xcel Energy	Guest
Sunny	Swarha	Virginia Trf Corp	Guest
Juan	Velasquez	Magnetron	Guest
Koray	Yavuz	Noark Electric (US)	Guest
Jie	Zhang	Chint Electric	Guest
Hongzhi	Zhang	Hitachi Energy	Guest
Zhinizang	Zhm	Chint Electric	Guest