Annex K Power Transformers Subcommittee

March 22, 2023
Milwaukee, Wisconsin, USA
Meeting Time: 1:30-2:45 p.m.

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

K.1 Meeting Attendance

The Power Transformers Subcommittee (PTSC) met on Wednesday, March 22 at 1:30 p.m. The attendance record indicates that 84 out of 107 members of the subcommittee were in attendance; a quorum at the meeting was achieved. A total of 223 individuals attended the meeting; 5 guests requested membership.

PTSC Chair Chair Ryan Musgrove (Oklahoma Gas & Electric) and Secretary Weijun Li (Braintree Electric Light Department) were present. Vice Chair Alwyn VanderWalt (Electrical Consultants, Inc.) was not in attendance.

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. Dan Sauer (Eaton Corporation) made a motion to approve the agenda which was seconded by Ewald Schweiger (Siemens Energy). The agenda was approved without objection. The approved agenda can be found in Attachment K.2.

The Chair asked the membership for a motion to approve the Fall 2022 meeting minutes. Dan Sauer (Eaton Corporation) made a motion to approve the minutes which was seconded by Marcos Ferreira (Bridge View Resources). The minutes were approved without objection.

K.3 Chair's Remarks

The Chair provided an update on PTSC roster. 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.

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 also announced that a new system tracking attendance is expected to be ready for data migration in the 2nd quarter of 2023 and encouraged the membership to join the new system upon receipt of email invitation from Transformers Committee Chair Ed teNyenhuis.

The Chair announced that the working group leadership training through IEEE has been changed to optional, but it is highly recommended that all active members of the standards organization take advantage of this training.

The Chair introduced Patrycja Jarosz, the new IEEE staff contact for PTSC, and provided her contact information. Malia Zaman will continue to be available for assistance during the transition period.

The Chair introduced one new member that was added to the PTSC membership list since the Fall 2022 meeting. The new member is Ryan Hogg with Bureau of Reclamation.

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 working group met on Monday and achieved a quorum. The draft document has been adjusted based on MEC (Mandatory Editorial Coordination) review. The working group received copyright approval from IEC on specific text, figures, and tables. Ballot pool was being formed with April 6, 2023 being the deadline.

The complete meeting minutes can be found in Attachment K.4.1. The next in-person meeting is planned for Fall 2023 in Kansas City.

K.4.2 TF C57.156, Guide for Tank Rupture Mitigation of Liquid-Immersed Power Transformers and Reactors – Peter Zhao

This task force met on Monday and achieved a quorum. The task force voted unanimously to seek PTSC's approval to form a working group to revise the document.

Peter Zhao (Hydro One) made a motion to create a PAR to revise C57.156, Guide for Tank Rupture Mitigation of Liquid-Immersed Power Transformers and Reactors. Dan Sauer (Eaton Corporation) seconded the motion. The motion passed with unanimous approval.

The complete meeting minutes can be found in Attachment K.4.2. The next in-person meeting is planned for Fall 2023 in Kansas City.

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 4-5 years.

K.4.4 PAR Study Group for IEEE 638, Standard for Qualification of Class 1E Transformers for Nuclear Power Generating Stations – Craig Swinderman

This PAR study group met on Monday and achieved a quorum. The group voted unanimously to seek PTSC's approval to proceed with a PAR for revision of the existing IEEE Std. 638.

Craig Swinderman (Mitsubishi Electric Power Products) made a motion to create a PAR to revise IEEE 638, Standard for Qualification of Class 1E Transformers for Nuclear Power Generating

Stations. 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.4.4. The next in-person meeting is planned for Fall 2023 in Kansas City.

K.4.5 Revision of C57.135, Guide for the Application, Specification, and Testing of Phase-Shifting Transformers – Ewald Schweiger

This working group met on Monday and achieved a quorum. Richard vonGemmingen (Dominion Energy) was introduced as the new secondary of the working group. IEEE is currently in process of preparing an IEEE/IEC dual logo document of the PC57.135 – Guide for the Application, Specification, and Testing of Phase-Shifting Transformers. Kevin Juchem (ABB AG) is the representative of IEC. IEC needs to appoint technical experts to get process moving on their end. There will be a need for harmonization between IEEE and IEC to review and change the title of the document as Guide is not allowed in IEC documents. A PAR revision will likely be required. Once IEC appoints their technical experts, virtual meetings will be coordinated. This working group is looking for volunteers to review the existing document for improvements.

The complete meeting minutes can be found in Attachment K.4.5. The next in-person meeting is planned for Fall 2023 in Kansas City.

K.4.6 Revision of C57.143, Guide for Application of Monitoring Equipment to Liquid-Immersed Transformers and Equipment – Mike Spurlock

This working group met on Monday and achieved a quorum. Working Group Chair Mike Spurlock (Spurlock Engineering Services, LLC) reported that Draft 1.3 was submitted on March 11 for MEC review and ballot invitations were sent out on March 18, 2023. The PAR expires December 31, 2023. A comment resolution group and the possibility of presenting a tutorial after publication were also discussed. A study group will discuss how to best present a tutorial on transformer monitoring.

The complete meeting minutes can be found in Attachment K.4.6. The next in-person meeting is planned for Fall 2023 in Kansas City.

K.4.7 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. Several open old business items have been concluded but some remain open. To stay on target of submitting a draft by May of 2024, discussions will continue via virtual meetings and emails before the Fall 2023 meeting. This guide expires on December 31, 2025.

The complete meeting minutes can be found in Attachment K.4.7. The next in-person meeting is planned for Fall 2023 in Kansas City.

K.4.8 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. Presentations were given by Task Forces #1, 2, and 3. The PAR expires on December 31, 2023. The working group voted unanimously to request a 2-year PAR extension to complete the revision of the guide. The group

also carried out additional discussion about a flow chart on how to use the guide. Working Group Chair Kumar Mani (Duke Energy) announced that two more volunteers will help with editing of the document and examining the flow of the guide upon completion of editing. The draft document will be circulated to the working group for a straw ballot before May 15, 2023.

The complete meeting minutes can be found in Attachment K.4.8. The next in-person meeting is planned for Fall 2023 in Kansas City.

K.4.9 TF C57.157, Guide for Conducting Functional Life Tests on Switch Contacts Used in Insulating Liquid-Immersed Transformers – Adam Sewell

This task force met on Tuesday and achieved a quorum. The task force voted unanimously to seek PTSC's approval to create a PAR to revise the document.

Adam Sewell (Quality Switch, Inc.) made a motion to create a PAR to revise C57.157, Guide for Conducting Functional Life Tests on Switch Contacts Used in Insulating Liquid-Immersed Transformers. Dan Sauer (Eaton Corporation) seconded the motion. The motion passed with unanimous approval.

The complete meeting minutes can be found in Attachment K.4.9. The next in-person meeting is planned for Fall 2023 in Kansas City.

K.4.10 Revision of C57.150, Guide for the Transportation of Transformers and Reactors Rated 10,000 kVA or Higher – Greg Anderson

This working group met on Tuesday. A quorum was not achieved. Invitation was sent on March 8, 2023 to form a ballot group. SA ballot process is expected to begin early April (targeting April 9). The goal is to submit final document to RevCom by October 16, 2023.

The complete meeting minutes can be found in Attachment K.4.10. This working group doesn't plan to meet in Kansas City.

K.4.11 TF PC57.17, Standard Requirements for Arc Furnace Transformers – Dom Corsi

This group met on Tuesday as a task force as PAR was not yet approved. Out of the 31 active participants, 14 requested membership and will become members. The TF chair Dom Corsi (Doble Engineering Company) requested volunteers to help updating the standard on a clause-by-clause basis.

The complete meeting minutes can be found in Attachment K.4.11. The next in-person meeting is planned for Fall 2023 in Kansas City.

K.4.12 WG C57.107, Recommended Practice for Developing Short-Term Overexcitation V/Hz Curves for Transformers Directly Connected to Generators – Joe Watson

The focus of the meeting was final resolution of the editorial and technical comments on the straw ballot for Draft 2 of the document. A summary of the comments was prepared by Drew Welton (Intellirent) and presented by the working group chair Joe Watson (JD Watson and Associates Inc.). The working group voted unanimously to request approval from PTSC to move the document, with noted editorial changes, to IEEE SA for MEC review and balloting.

Joe Watson (JD Watson and Associates Inc.) made a motion to move Draft 3 of C57.107, Recommended Practice for Developing Short-Term Overexcitation V/Hz Curves for

Transformers Directly Connected to Generators to ballot. Bruce Webb (Knoxville Utilities Board) seconded the motion. The motion passed with unanimous approval.

The complete meeting minutes can be found in Attachment K.4.12. The next in-person meeting is planned for Fall 2023 in Kansas City.

K.4.13 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. An LTC Maintenance presentation was given to help the group consider whether to develop as part of the revised guide. The task force began discussions of what this guide should include so a title, scope, and purpose can be developed.

The complete meeting minutes can be found in Attachment K.4.13. The next in-person meeting is planned for Fall 2023 in Kansas City.

K.4.14 Liaison to PC57.93a Guide for Installation and Maintenance of Liquid-Immersed Power Transformers – Scott Reed

This is liaison activity related to the topic of low temperature cold starts for transformers with natural ester fluid. The Chinese task force studying cold start up for natural esters performed testing at -15°C, -25°C, and -35°C, and monitored the winding and fluid temperatures as the load increased. Preliminary conclusions were 2 additional hours of no load for every 10°C drop in temperature. No work has been done since Fall 2022 but more detailed update is expected to be provided on testing at the next meeting. Scott Reed (MVA) raised concerns about language barriers when interacting with the Chinese task force. PTSC Chair Ryan Musgrove (Oklahoma Gas & Electric) noted the concerns and will follow up with Patrycja Jarosz and Malia Zaman of IEEE SA.

There were no meeting minutes for this liaison activity.

K.4.15 TF C57.153, Guide for Paralleling Regulating Transformers – Mark Tostrud

This task force met on Tuesday and achieved a quorum. The group reviewed the results of the straw ballot that closed on March 13, 2023, and recommended the guide be updated to provide recommendations for reverse power flow conditions. No changes to the existing title, scope, and purpose of the guide were identified.

Mark Tostrud (Dynamic Ratings, Inc.) made a motion to create a PAR to revise C57.153, Guide for Paralleling Regulating Transformers. Dan Sauer (Eaton Corporation) 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 2023 in Kansas City.

K.5 Old Business

Transformer Seismic Concerns

Fabian Stacy (Hitachi Energy) pointed out that IEEE Draft Recommended Practice for Seismic Design of Substations Amendment is currently in balloting process. The next IEEE PES Substations Committee meeting is scheduled for May 1-5, 2023 in Philadelphia, Pennsylvania.

The changes are significant and appear to be driven by consultants. The contents of "amendment" represent drastic changes to the document. There is a need for others including the Transformers Committee to weigh in. Joe Watson (JD Watson and Associates Inc.) mentioned that he submitted a comment voicing concerns about the major changes but has not heard back. The working group (WGD4 – Seismic Design of Substations) chair is Michael Riley. Jason Varnell (Doble Engineering Co.) said that a technical presentation on the proposed amendment was given by Michael Riley and Jon Bender at the Fall 2021Transformers Committee virtual meeting. The general observation was that the Transformers Committee should voice concerns about the proposed major changes as they would affect power transformer designs. PTSC Chair Ryan Musgrove (Oklahoma Gas & Electric) noted the concerns and will follow up with Patrycja Jarosz and Malia Zaman of IEEE SA on how to proceed.

Entity PAR "Recommended Practice on Digital Twin Modeling and Analysis based on Spatial-temporal Data of Switch Cabinet and Transformer with 110kV and Below" – Brian Sparling

The PAR wording is in revision and will have more updates to provide at the next meeting. Like the liaison to Entity PAR PC57.93a, concerns have also been made on translation issues during meetings on this particular entity PAR.

K.6 New Business

Entity PAR Request "Guide for Power Transformers for Low-frequency (20Hz) Power Transmission"

The Chair displayed the slide deck titled "IEEE PAR - Guide for Power Transforms for Low-Frequency (20Hz) Power Transmission" by State Grid Zhejiang Electric Power Co., Ltd. Research Institute" that was sent to him through Transformers Committee Standards Coordinator Stephen Shull via an email dated February 3, 2022. The slides covered the background, requirement analysis, existing standards, scope, framework, and information about the working group based in China. The proposed scope states, "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."

Dan Sauer (Eaton Corporation) asked if IEEE has any existing documents that address all or part of the proposed scope. Sheldon Kennedy (Niagara Transformer) mentioned that Niagara Transformer recently manufactured some 25 Hz power transformers but there are no standards that can be referred to. Joe Watson (JD Watson and Associates Inc.) said that if PTSC approves this entity PAR, PTSC will have a representative, but the document will only be voted on by the listed entities.

Ewald Schweiger (Siemens Energy) commented that an entity PAR request like this should send a representative to present their materials as these are complex topics and such requests seem to be on the rise.

Stephen Shull (BBC Electrical Services, Inc.) made a motion for the PTSC to accept this entity PAR request. Joe Watson (JD Watson and Associates Inc.) seconded the motion. The motion passed with unanimous approval.

While there are concerns that this entity PAR will cover more than just the PTSC documents, PTSC is the appropriate subcommittee to lead the efforts. Anyone who is interested in being the entity PAR liaison is encouraged to contact the PTSC Chair at ryan.musgrove@ieee.org.

Other New Business

New business requesting a task force for creation of a new IOT document was brought up by Sanjib Som (Pennsylvania Transformer) but there was not enough time to fully discuss. Dan Sauer (Eaton Corporation) made a motion to have this topic tabled and discussed at the next PTSC meeting. Kumar Mani (Duke Energy) seconded the motion. The motion passed with unanimous approval.

K.7 Adjournment

The meeting adjourned at 2:45 p.m.

K.8 Attachments

Attachment K.1 – Attendance
Attachment K.2 – F22 PTSC Agenda
Attachment K 4.1 – C57.131 Minutes
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 Minutes
Attachment K 4.7 – C57.125 Minutes
Attachment K 4.8 – C57.170 Minutes
Attachment K 4.9 – C57.157 Minutes
Attachment K 4.10 – C57.150 Minutes
Attachment K 4.11 – C57.17 Minutes
Attachment K 4.12 – C57.107 Minutes
Attachment K 4.13 – C57.93 Minutes
Attachment K 4.14 – Liaison to PC57.93a (No Meeting Minutes)
Attachment K 4.15 – C57.153 Minutes

Attachment K.1

Role	First Name	Last Name	Company / Affiliation
Member	Kayland	Adams	Prolec GE Waukesha
Guest	Alex	Alahmed	Evergy Wolf Creek
Guest	Rehan	Ali	Siemens Energy
Member	Tauhid Haque	Ansari	Hitachi Energy
Guest	Gregory	Ante	Southern California Edison
Member	Stephen	Antosz	Stephen Antosz & Associates, Inc
Guest	Elise	Arnold	SGB
Member	Javier	Arteaga	Hitachi Energy
Member	Donald	Ayers	Ayers Transformer Consulting
Member	Gilles	Bargone	FISO Technologies Inc.
Member	Christopher	Baumgartner	We Energies
Guest	Barry	Beaster	H-J Family of Companies
Guest	Jason	Beaudoin	Weidmann Electrical Technology
Guest	Jean-Noel	Berube	Rugged Monitoring Inc.
Member	Enrique	Betancourt	Prolec GE
Guest	Vivek	Bhatt	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	Susan	Bonfiglio	Western Area Power Admin.
Guest	Michael	Botti	Hyosung HICO
Guest	Jeremiah	Bradshaw	Bureau of Reclamation
Guest	Jeffrey	Britton	Doble Engineering Co.
Guest	Samuel	Brodeur	Hitachi ABB Power Grids
Member	David	Calitz	Siemens Energy
Guest	Juan Alfredo	Carrizales	Prolec GE
Guest	Arup	Chakraborty	Delta Star Inc.
Member	Stuart	Chambers	Powertech Labs Inc.
Guest	Vivian	Chan	Hitachi Energy
Guest	Raymundo	Chapa	WEG Transformers USA Inc.
Guest	Jonathan	Cheatham	General Electric
Guest	Anthony	Coker	M&I Materials Inc.
Member	Craig	Colopy	Retired
Guest	Michael	Craven	Qualus Corp.
Guest	Daniel	Crockett	Ameren

Member	Juan Carlos	Cruz Valdes	Prolec GE
Guest	Roberto	Da Silva	Cargill, Inc.
Member	Eric	Davis	Burns & McDonnell
Guest	Samson	Debass	EPRI
Member	Scott	Digby	Duke Energy
Guest	Nikolaus	Dillon	Dominion Energy
Guest	Zachary	Draper	Delta-X Research Inc.
Guest	Jesse	Duffy	Nashville Electric Service
Guest	Roger	Dugan	EPRI
Member	Hakim	Dulac	Advanced Power Technologies
Member	Samragni	Dutta Roy	Siemens Energy
Guest	William	Elliott	AEP-SWEPCO
Member	Evgenii	Ermakov	Hitachi Energy
Guest	Marco	Espindola	Hitachi Energy
Member	Reto	Fausch	RF Solutions
Member	Marcos	Ferreira	Bridge View Resources
Member	Hugo	Flores	Hitachi Energy
Guest	Marc	Foata	Maschinenfabrik Reinhausen
Guest	Raymond	Frazier	Ameren
Guest	Jose	Gamboa	H-J Family of Companies
Member	Eduardo	Garcia Wild	Siemens Energy
Guest	James	Gardner	Prolec GE Waukesha
Guest	Rob	Ghosh	General Electric
Member	Ramsis	Girgis	Hitachi Energy
Guest	Jose Antonio	Gonzalez Ceballos	Georgia Transformer
Guest	Alireza	Gorzin	Black & Veatch
Member	Bill	Griesacker	William Griesacker and Associates
Guest	Brad	Grooms	NTS
Member	Ismail	Guner	Hydro-Quebec
Guest	Ravi	Gupta	Megger
Member	Niklas	Gustavsson	Hitachi Energy
Member	Attila	Gyore	M&I Materials Ltd
Guest	Corey	Hanson	Advanced Power Technologies
Member	Roger	Hayes	General Electric
Member	Kyle	Heiden	EATON Corporation
Guest	Ronald	Hernandez	Doble Engineering Co.
Member	John	Herron	Raytech USA
Member	Saramma	Hoffman	PPL Electric Utilities
Member	Ryan	Hogg	Bureau of Reclamation
Guest	Derek	Hollrah	Burns & McDonnell

Member	Philip	Hopkinson	HVOLT Inc.
Guest	Darren	Hoppins	Sensorlink Corp.
Guest	Nicholas	Jensen	Delta Star Inc.
Member	John	John	Virginia Transformer Corp.
Guest	Christopher	Johnson	Oncor Electric Delivery
Member	Akash	Joshi	Mott MacDonald
Member	Kurt	Kaineder	Siemens Energy
Guest	Jerzy	Kazmierczak	Hitachi Energy
Member	Sheldon	Kennedy	Niagara Transformer
Guest	Christoph	Kerschenbauer	Siemens Energy
Guest	Stacey	Kessler	Ulteig
Guest	Qasim	Khan	Neetrac Georgia Tech
Member	Zan	Kiparizoski	Howard Industries
Member	Egon	Kirchenmayer	Siemens Energy
Member	Dmitriy	Klempner	Southern California Edison
Guest	Anton	Koshel	Delta Star Inc.
Guest	Rafal	Kowalski	Hitachi Energy
Guest	Jusuf	Krvavac	Sargent & Lundy
Guest	Krzysztof	Kulasek	Delta Star Inc.
Guest	Bernard	Labean Jr.	Consumers Energy
Guest	Mark	Lachman	Doble Engineering Co.
Secretary	Weijun	Li	Braintree Electric Light Dept.
Guest	Tiffany	Lucas, P.E.	SPX Transformer Solutions, Inc.
Guest	Stephanie	Mabrey	Weidmann Electrical Technology
Guest	Jose	Machain	Prolec GE
Guest	Jinesh	Malde	M&I Materials Inc.
Guest	Gabriel	Mamede	Siemens Energy
Member	Kumar	Mani	Duke Energy
Guest	Robert	Mayer	Siemens Energy
Guest	Kevin	Mazzei	Black & Veatch
Guest	James	McBride	JMX Services, Inc.
Guest	Toni	Mellin	Vaisala
Guest	Kent	Miller	Retired
Guest	Francis	Mills	Power Engineers, Inc.
Guest	Justin	Minikel	EATON Corporation
Guest	Marian	Mohamed	Xcel Energy
Guest	Juliano	Montanha	Siemens Energy
Member	Emilio	Morales-Cruz	Qualitrol Company LLC
Guest	Hugo	Murillo	H-J Family of Companies
Member	David	Murray	Tennessee Valley Authority
Chair	Ryan	Musgrove	Oklahoma Gas & Electric

Guest	Paul	Mushill	Ameren
Guest	Ismael	Naja	EATON Corporation
Guest	Mark	Newbill	Hitachi Energy
Member	Anastasia	O'Malley	Consolidated Edison Co. of NY
Guest	Eduardo	Orozco	GE Grid Solutions
Guest	Dwight	Parkinson	EATON Corporation
Member	Poorvi	Patel	Electric Power Research Institute (EPRI)
Guest	Monil	Patel	Pacific Gas & Electric
Guest	Rakesh	Patel	Hitachi Energy
Guest	Verena	Pellon	Florida Power & Light
Guest	Harry	Pepe	Phenix Technologies, Inc.
Guest	Miguel	Plascencia	PG&E
Guest	Homero	Portillo	Advanced Power Technologies
Guest	Daniel	Posadas	Prolec SA DECV
Guest	Bertrand	Poulin	Hitachi Energy
Member	Ion	Radu	Hitachi Energy
Member	Scott	Reed	MVA
Guest	Sebastian	Rehkopf	Maschinenfabrik Reinhausen
Guest	Clemens	Reiss IV	Custom Materials, Inc.
Guest	Michael	Richardson	Ameren
Guest	Kevin	Riordan	WEG Transformers USA Inc.
Guest	Diego	Robalino	Megger
Guest	Patrick	Rock	American Transmission Co.
Guest	Tim	Rocque	Prolec GE Waukesha
Guest	Rodrigo	Ronchi	WEG-Voltran
Guest	Yuri	Rossini	Siemens Energy
Member	Marnie	Roussell	Entergy
Guest	Christopher	Rutledge	Dynamic Ratings, Inc.
Member	Hakan	Sahin	Virginia/Georgia Transformer
Member	Albert	Sanchez	Knoxville Utilities Board
Guest	Lina	Sandsten	Hitachi Energy
Member	Dinesh	Sankarakurup	Duke Energy
Guest	Amitabh	Sarkar	Virginia Transformer Corp.
Member	Daniel	Sauer	EATON Corporation
Member	Alan	Sbravati	Hitachi Energy
Guest	Alaor	Scardazzi	Siemens Energy
Guest	Stefan	Schindler	Maschinenfabrik Reinhausen
Member	Dan	Schwartz	Quality Switch, Inc.
Member	Ewald	Schweiger	Siemens Energy
Member	Cihangir	Sen	Duke Energy
Member	Adam	Sewell	Quality Switch, Inc.

Guest	Jeremy	Sewell	Quality Switch, Inc.
Guest	Russell	Sewell	Quality Switch, Inc.
Guest	Abdul Majid	Shaikh	Delta Star Inc.
Guest	Salahuddin	Shaikh	Hitachi Energy
Guest	Hemchandra	Shertukde	University of Hartford
Member	Stephen	Shull	BBC Electrical Services, Inc.
Guest	Andre	Simons	Cogent Power Inc.
Guest	Jonathan	Sinclair	PPL Electric Utilities
Guest	Christopher	Slattery	FirstEnergy Corp.
Guest	Jason	Snyder	FirstEnergy Corp.
Guest	Muhammad Abdullah	Sohail	Trench
Member	William	Solano	Reinhausen Manufacturing Inc.
Member	Sanjib	Som	Pennsylvania Transformer
Guest	Mauricio	Soto	Hitachi Energy
Guest	Brian	Sparling	Dynamic Ratings, Inc.
Member	Mike	Spurlock	Spurlock Engineering Services, LLC
Member	Fabian	Stacy	Hitachi Energy
Member	Brad	Staley	Leeward Energy
Member	Markus	Stank	Maschinenfabrik Reinhausen
Member	Kyle	Stechschulte	American Electric Power
Guest	Ethan	Steiger	Qualitrol
Guest	Andrew	Steineman	Delta Star Inc.
Guest	Christopher	Steineman	Delta Star Inc.
Guest	Charles	Sweetser	OMICRON electronics Corp USA
Guest	Craig	Swinderman	Mitsubishi Electric Power Products
Member	Janusz	Szczechowski	Maschinenfabrik Reinhausen
Member	Troy	Tanaka	Burns & McDonnell
Guest	Marc	Taylor	JFE Shoji Power Canada Inc.
Guest	Ed	teNyenhuis	Hitachi Energy
Guest	Jacob	Thielbar	WAPA
Guest	Scott	Thomas	Hitachi Energy
Guest	Timothy	Tillery	Howard Industries
Member	Mark	Tostrud	Dynamic Ratings, Inc.
Guest	Risto	Trifunoski	Trench
Guest	Subhash	Tuli	Electrical T&D Apparatus Consultant Inc.
Guest	Olivier	Uhlmann	Reinhausen Canada Inc.
Guest	Cole	Van Dreel	American Transmission Co.
Guest	Cameron	Vant	Prolec-Waukesha
Member	Ajith	Varghese	Prolec Energy
Member	Jason	Varnell	Doble Engineering Co.

Guest	Karsten	Viereck	Maschinenfabrik Reinhausen
Guest	Dharam	Vir	Prolec GE
Guest	Duy	Vo	Central Maine Power (AVANGRID)
Guest	Richard	vonGemmingen	Dominion Energy
Member	Pragnesh	Vyas	Sunbelt-Solomon Solutions
Member	David	Wallach	Duke Energy
Member	Joe	Watson	JD Watson and Associates Inc.
Guest	Matthew	Webb	SPX Transformer Solutions, Inc.
Guest	Drew	Welton	Intellirent
Member	Daniel	Weyer	Monolith
Guest	Joe	White	Power Engineers
Member	William	Whitehead	H2scan Corporation
Guest	Christopher	Whitten	Hitachi Energy
Guest	Trenton	Williams	Advanced Power Technologies
Guest	Deanna	Woods	Alliant Energy
Member	Jeffrey	Wright	Duquesne Light Co.
Guest	Fei	Yang	Hitachi Energy
Guest	Kwasi	Yeboah	GE Energy Management
Guest	Joshua	Yun	Virginia Transformer Corp.
Guest	Gigi	Zhang	HICO America
Member	Peter	Zhao	Hydro One
Member	Kris	Zibert	Allgeier, Martin and Associates
Member	Waldemar	Ziomek	PTI Transformers

Attachment K.2

AGENDA

Power Transformers Subcommittee
IEEE PES Transformers Committee
Wednesday, March 22nd, 2023, 1:30-2:45 PM CST, Regency AB(2)
In Person – Welcome All

Ryan Musgrove – Chair, Alwyn VanderWalt – Vice Chair, Weijun Li – Secretary

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
7. Working Group and Task Force reports
   a. WG Revision of C57.131, Tap Changers ..... Craig Colopy
      i. Monday Mar 20th, 9:30-10:45 – Milwaukee (2)
   b. TF C57.156, Guide for Tank Rupture Mitigation ..... Peter Zhao
      i. Monday Mar 20th, 9:30-10:45 – Regency A (2)
   c. WG Revision of C57.116, GSU Transformers (Completed 2022 – no meeting)..... Weijun Li
   d. WG Class 1E Transformer for Nuclear Power gen Std. 638 ..... Craig Swinderman
      i. Monday Mar 20th, 11:00-12:15 – Regency A(2)
   e. WG C57.135, Guide for Phase shifting Transformers ..... Ewald Schweiger
      i. Monday Mar 20th, 1:45-3:00 – Regency A(2)
   f. WG Revision of C57.143, Monitoring Guide ..... Mike Spurlock
      i. Monday Mar 20th, 3:15-4:30 – Lakeshore Ballroom (1)
   g. WG Revision of C57.125, Failure Investigating and Reporting ..... Hakan Sahin
      i. Monday Mar 20th, 4:45-6:00 – Regency B(2)
   h. WG C57.170, Condition Assessment Guide ..... Kumar Mani
      i. Tuesday Mar 21st, 8:00-9:15 – Lakeshore Ballroom (1)
   i. TF C57.157, Guide for Life test of Switch Contacts ..... Adam Sewell
      i. Tuesday Mar 21st, 8:00-9:15 – Gilpatrick (1)
   j. WG Revision of C57.150, Transportation Guide ..... Greg Anderson
      i. Tuesday Mar 21st, 9:30-10:45 – Executive Ballroom (1)
   k. TF C57.17, Standard Requirements for Arc Furnace Transformers ..... Dom Corsi
      i. Tuesday Mar 21st, 11:00-12:15 – Regency B (2)
   l. WG C57.107, Transformer Volts per Hertz ..... Joe Watson
      i. Tuesday Mar 21st, 1:45-3:00 – Regency B (2)
   m. TF C57.93, Installation and Maintenance Guide ..... Scott Reed
      i. Tuesday Mar 21st, 3:15-4:30 – Lakeshore Ballroom (1)
   n. Liaison to PC57.93a – Installation and Maintenance Guide ..... Scott Reed
   o. TF C57.153, Guide for Paralleling Transformers ..... Mark Tostrud
      i. Tuesday Mar 21st, 4:45-6:00 – Regency B (2)
8. Old business

a. Transformer Seismic Concerns
b. Entity PAR "Recommended Practice on Digital Twin Modeling and Analysis based on Spatial-temporal Data of Switch Cabinet and Transformer with 110kV and Below" – Brian Sparling

9. New business
    a. Entity PAR Request "Guide for Power Transformers for Low-frequency (20Hz) Power Transmission"
10. Adjournment

Power Transformers Subcommittee
Working Group Report

Document #:	**C57.131**
Document Title:	**Standard Performance Requirements and Test Methods for Tap-changers**

Chair:	**Craig A. Colopy**	**Vice-Chair**	**Axel Kraemer**
Secretary	**Adam M. Sewell**	**Percent Complete**	**99%**

Current Draft Being Worked On: **1.2** **Dated:** **March 2023**

PAR Expiration Date: **December 31, 2024**

Meeting Date: **20 March 2023** **Time:** **9:30am-10:45am**

Location: **Milwaukee, WI, USA**

Attendance:	**Members**	**24 out of 41**
	Guests	**35**
	Guests Requesting Membership	**6**
	Total*	**59**

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

Meeting Minutes / Significant Issues / Comments:

1. Meeting was called to order at 9:30am, March 20, 2023 at Hyatt Regency Hotel, Room-Milwaukee.
2. Distribution of attendance sheets
    a. If you didn't receive an email from this working group before this meeting or are not on the attendance sheet, please send an email to adamsewell@ieee.org with the subject: C57.131 EMAIL to be added to the C57.131 WG email list
3. Quorum Check / Introductions
    a. Introductions were made by name and affiliation
    b. 24 members out of 41 were in attendance – QUORUM MET
    c. Member requests can be sent to ADAMSEWELL@IEEE.ORG
4. Approval of 2023 Spring Agenda and Approval of minutes from Fall 2022 Charlotte Meeting
    a. Motion – M.Ferreira, 2nd-H.Flores
    b. No opposition to unanimous approval. APPROVED
5. OLD BUSINESS

a. Fall 2022 meeting discussion from S. Patel (WG Guest) about reactor type vs reactance type and resistor type vs resistance type wording change that was done on previous draft.
    i. Fall 2022 meeting had discussion with S. Patel (WG Guest) regarding use of wording "reactor type" in lieu of "reactance type" and "resistor type" in lieu of "resistance type" found in the IEC standard 60214-1 ED2.0
    ii. Chair agreed to consider changing wording to "reactance type" and "resistance type" found in C57.131 -2012. No MOTION was made to vote on this change to the document, so Draft 1.2 wording was not changed. Draft 1.1 also had this wording also which had been finalized at work session on 3/26/22. The scope has this wording as well. A change would have required a revision to the PAR.
b. Kept the following notes for a future joint(dual logo) revision of IEC 60214-1
    i. Section 6.1.15 Protection against access to hazardous parts - check if there is an equivalent designation in NEMA 250 for IP1X
        1. Based on investigation Chair found no identical designation in Nema 250.
    ii. Section 7.2.2 Temperature rise. Some discussion is warranted regarding the difference between maximum contact temperatures of OLTC and DETC along with defining contact test temperature methodology to normalize testing. This could include switch orientation, liquid volume and parameters you have to prevent unwarranted advantageous results.
    iii. Table 3 values for switching impulse test values
        1. Current IEEE and IEC standards do not list switching impulse values less than 100kV. Switching impulse values will be looked at for less than 100kV. 69kV was a value brought up in the 3/28/22 meeting.

6. NEW BUSINESS
    a. Ballot of Draft 1.2 of C57.131 dated March 2023. Draft is posted on PTSC site.
        i. Ballot invitation is open until April 6, 2023
        ii. Ballot can be joined on IEEE MyProject – sign in with IEEE signon info: (https://development.standards.ieee.org/my-site)
        iii. After signing in to myProject, go to Menu->Invitations/Ballots then click on the Open Invitations tab. Then click on All Invitations beside the Show: and you should find the PC57.131 available to join.
        iv. Email secretary (adamsewell@ieee.org) with questions/problems joining the ballot group
7. Next meeting: October 23, 2023 at Fall 2023 Transformers Committee Meeting scheduled for October 22-26, 2023, Kansas City, MO, USA.
8. Close of meeting – 9:47am
    a. Motion – T.Dauzat, 2nd – M. Ferreira. No opposition to unanimous approval. ADJOURNED

Submitted by: Craig A, Colopy Date: 3/25/2023____

Meeting Attendance 3/20/2023 (RM1 = Request Membership 1st time):

Last Name	First Name	Company (Affiliation)	Role
Arora	Kush	Maschinenfabrik Reinhausen	Guest
Beaster	Barry	H-J Family of Companies	Guest
Blaszczyk	Piotr	Specialty Transformer Components LLC	Member
Boettger	William	Boettger Transformer Consulting LLC	Guest
Bolar	Sanket	Oncor	Guest
Borck	Christopher	Eaton	Guest
Castro	Fidel	SDGE	Guest
Colopy	Craig	Consultant	Chair
Cruz Valdes	Juan Carlos	Prolec GE	Member
Dauzat	Thomas	AEP	Member
Dillon	Nikolaus	Dominion Energy	Guest
Dutta Roy	Samragni	Siemens Energy	Guest-RM1
Faur	Florin	Prolec GE Waukesha	Member
Ferreira	Marcos	Bridge View Resources	Member
Flores	Hugo	Hitachi Energy	Member
Gardner	James	Prolec GE Waukesha	Guest-RM1
Garza	Hector	Orto de Mexico	Guest
Gorzin	Allis	Black & Veatch	Guest
Gragert	Jeffrey	Xcel Energy	Guest
Gross	Detlev	Power Diag. Consult	Guest
Gupta	Ravi	Megger	Guest
Gustavsson	Niklas	Hitachi Energy	Member
Gyore	Attila	M&I Materials Ltd	Member
Kessler	Stacey	Ulteig Engineers	Guest-RM1
Lejay	Olivier	Huaming USA Corp.	Member
Mazzei	Kevin	Black & Veatch	Guest
Mills	Francis	Power Engineers	Guest
Mohamed	Marian	Xcel Energy	Guest
Munoz Molina	Martin	Orto de Mexico	Member
Mushili	Kevin	Ameren	Guest

Last Name	First Name	Company (Affiliation)	Role
Newbill	Mark	Hitachi Energy	Guest
Pruente	John	Prolec GE Waukesha	Member
Rehkopf	Sebastian	Maschinenfabrik Reinhausen	Member
Reiss	Tony	CMI	Guest
Rock	Patrick	American Transmission Company	Guest
Sarkar	Amitabh	Virginia Transformer Corp	Guest-RM1
Saudsten	Lina	Hitachi Energy	Guest-RM1
Schindler	Stefan	Maschinenfabrik Reinhausen	Member
Schleismann	Eric	Southern Company Services	Member
Schwartz	Dan	Quality Switch, Inc.	Member
Sewell	Adam	Quality Switch, Inc.	Secretary
Sewell	Jeremy	Quality Switch, Inc.	Member
Sewell	Russ	Quality Switch, Inc.	Guest
Solano	William	Maschinenfabrik Reinhausen	Guest-RM1
Som	Sanjib	Pennsylvania Transformer	Member
Stacey	Brad	Leeward Renewable Energy	Guest
Stank	Markus	Maschinenfabrik Reinhausen	Member
Stechschulte	Kyle	American Electric Power	Member
Szczechowski	Janusz	Maschinenfabrik Reinhausen	Guest
Tanaka	Troy	Burns & McDonnell	Guest
Tekle	Samuel	WEG TX USA	Guest
Thomas	Scott	Hitachi Energy	Guest
Tillery	Timothy	Howard Industries	Member
Uhlmann	Olivier	Reinhausen Canada	Guest
Viereck	Karsten	Maschinenfabrik Reinhausen	Guest
Waldrop	Mike	Memphis Light, Gas & Water	Member
Whitten	Christopher	Hitachi Energy	Member
Yang	Fei	Hitachi Energy	Guest
Zanwar	Anand	Siemens Energy	Guest

Attachment K 4.2

Title: TF Guide for Tank Rupture Mitigation C57.156
Time: 9:15 AM- 10;45 AM, Monday, March 20, 2023
Place: Hyatt Regency Milwaukee, WI

Meeting Minutes:

At 9:15 AM, Chair called the meeting to order.

Chair welcome the members and guests, followed with introductions.

This is the 2nd TF meeting. There were 68 participants, among which, 19 requested for membership. A quorum was reached.

Meeting minutes from Charlotte meeting was unanimously approved.

Chair briefed about the scope of the work for this TF, and progress made as to date.

Samuel Brodeur from Hitachi Energy provided a presentation: Oil Leak Risk Mitigation of Components.

Open floor discussions were carried out in completion of the new PAR as described below:

The TF completed the PAR study, followed with a motion made by Joe Watson, and seconded by Eduardo Garcia/Hakim Dulac, and voted unanimously to take the new PAR to the PTSC and request to form a working group to revise the document.

Meeting adjourned at 10:45AM.

Reported by:

Peter Zhao, P.Eng.

Chair of the TF

New PAR:

Title:

IEEE Guide for Tank Rupture Mitigation of Liquid-Immersed Power Transformers and Reactors

Scope

This guide describes measures that may be taken to help mitigate rupture and uncontrolled insulating liquid release from energized liquid-immersed power transformers' and reactors' tanks and components due to internal electrical faults.

Purpose

This guide describes the current state of knowledge of the relationship between tank rupture and such variables as arc energy level, hydraulic pressures, and tank pressure withstand. Also described are various measures that transformer users and manufacturers may take in system design, product design, monitoring devices, signaling devices, and insulating fluid choices that can help mitigate tank rupture.

Attendance List - Milwaukee Meeting - March 20, 2023		
Name	Affiliation	Membership requested (yes or no)
Alfons Schrammel	Siemens Energy	yes
Anastasia O'Malley	Con Edison NY	yes
Andy Steiuemau	Delta Star	no
Attila Gyore	M&I Materials	yes (S23)
Christoph Kerschenbauer	SE Transformers	no
Christopher Johnson	Oncor	no
Eduardo Garcia	Siemens Energy	yes
Emilio Norales-Cruz	Qualitro	yes
Ewald Schweiger	Siemens Energy	yes
Goran Plisic	Siemens Energy, KPT	no
Hakim Dulac	APT	yes (S23)
Jason Snyder	First Energy	no
Jeremiah Bradshaw	Bureau of Reclamation	yes
Joe Nims	Allen& Hoshall	no
Joe Watson	JDWatson & Associates	yes
Jose Luis Machain	Prolec GE	no
Joshua Yun	Virginia Transformer	yes
Juan Alfredo Carrizales	Prolec GE	no
Marc Foata	MR	yes
Michael Botti	Hyosung HICO	yes (S23)
Omar Mendez Zomors	Prolec	no
Peter Zhao	Hydro One	yes
Jerzy Kazmierczak	Hitachi Energy	yes (S23)
Junho Lee	Hyundai Electric	no
Soyoung Lee	Hyundai Electric	no
Zan Kiparizoski	Howard Industries	yes (S23)
Nick Walder	Eaton Corp.	no
Edwin Betancourt	Siemens Energy	no
Rodrigo Ronchi	WEG Transformers	no
Arup Chakraborty	Delta Star Inc	yes (S23)
Nick Jensen	Delta Star Inc	no
Krzysztof Kulasek	Delta Star Inc	yes (S23)
David Murray	TVA	yes (S23)
Andy Speegle	ENTERGY	NO
Chris Steineman	Delta Star Inc	no
Dipak Patel	ITEC	no
David Ward	ITEC	no
David Calitt	Siemens Energy	yes (S23)
Vivian Chan	Hitachi Energy	no
Rob Ghosh	GE	yes (S23)
Daniel Crocket	Ameren	no
Bill Griesacker	WGA	no
Robert mayer	Siemens Energy	yes (S23)
William Boettger	Boettger Transformer Consulting	yes (S23)
Eun young Cho	Hi-Co America	no
Risto Trifunoski	Trench Canada	yes (S23)
Rehan Ali	Siemens Enegry	no
Derek Hollrah	Burns&McDonnoll	no
Kevin juclem	Hitachi Energy	no
Samuel Brodeur	Hitachi Energy	yes (S23)
Sanjay Patel	Royal Smit	no
Tim Rocque	Prolec GE Waukesha	no
Marta Munoz	Hitachi Energy	no
Robert Middleton	RHM International	no
Cody Vanwyck	Commonwealth associates	yes (S23)
jos veens	smith transformers	no
Liolija Iuanic	siemens energy-KPT	no
Igor Persinec	siemens energy-KPT	no
Eric Schleismann	Southern Company	no
Samson Debass	EPRI	no
Corey Hanson	Advanced Power Technologies	no
Homer Portillo	Advanced Power Technologies	no
Stephen Antosz	Consultant	no
Muhammad Sohail	Trench Canada	yes (S23)
Jason Beauddin	Weidmann	no
Alahmed Alex	Energy	yes (S23)
Akash Joshi	Mott MacDonald	yes (S23)
Carlos H Alonso	Arteche	yes (S23)

PAR Study Group for revision of IEEE 638-2013 "Qualification of Class 1E Transformers for Nuclear Power Generating Stations"

MEETING MINUTES

Date: Monday, March 20 – 11:00 am to 12:15 pm.

The meeting was called to order at 11:00 am by Chair Craig Swinderman.

There were a total of 14 people present, 6 members and 8 guests. Attendance was taken with a paper roster. A quorum was reached. A list of attendees is included at the end of these minutes.

Chair's Remarks

A call for essential patent claims was made. No patent claims were identified. The IEEE Copyright Policy was also shown.

Meeting Agenda

1. Welcome & Call to Order
2. Question, Essential Patent Issues, and IEEE Copyright Policy
3. Determination of Quorum (more than 3 of 6 members is necessary to have a quorum)
4. Review of IEEE 638-2013
5. New Business

Topics discussed:

The latest version of the IEEE 638-2013 document was reviewed with the group. It was highlighted to the group that IEEE 638 Standard is closely related to the other standards IEEE 323 and IEEE 344. Joe Krvavac informed the group that both of these standards are now dual logo standards with IEC: IEEE/IEC 6078-323 (2016) and IEEE/IEC 60980-344 (2020).

The proposed Title, Scope and Purpose of the IEEE 638 std. were updated to reflect this, as follows:

Title: IEEE 638 - Standard for Qualification of Class 1E Transformers for Nuclear Power Generating Stations

1.1 Scope
This standard provides requirements to demonstrate the adequacy of new Class IE transformers, located in a mild environment of a nuclear power generating station as defined in IEEE/IEC 60780-323, to perform their required safety functions under postulated service conditions. This standard applies to single- and three phase transformers rated 601 V to 15000 V for the highest voltage winding and up to 2500 kVA (base rating).

1.2 Purpose
The purpose of this standard is to provide specific qualification procedures for Class lE transformers to demonstrate their capability to meet the requirements of IEEE/IEC 60780-323. The transformer shall perform its intended function under all specified service conditions.

New Business
A motion to present the updated title, scope and purpose to the Power Transformers Subcommittee for a vote to proceed with obtaining a PAR for revision of IEEE 638 was made by Joe Krvavac of Sargent & Lundy and seconded by Thrinadha Katapalli of Virginia Transformer. The motion passed with unanimous approval of the 6 members present.

The was meeting adjourned at 12:00 pm with a motion by Joe Krvavac of Sargent & Lundy and seconded by Thrinadha Katapalli of Virginia Transformer. The group plans to meet as a WG at the Fall 2023 Meeting in Kansas City, MO.

Best regards,
Craig Swinderman
Chair – IEEE 638

List of Meeting Attendees at Spring ‘23 Meeting, including affiliation & voting member status.

Name	***Company***	***Role***
Craig Swinderman	Mitsubishi Electric Power Products, Inc.	Member
Scott Thomas	Hitachi Energy	Guest
Thrindadha Katapalli	Virginia Transformer	Member
Anil Saulant	Virginia Transformer	Guest
Viveh Blatt	Prolec GE Waukesha	Guest
Tommy Nunn	JST	Guest
Alexander Larysch	Siemens Energy	Guest
Eric Euvrard	RHM International	Guest
Robert Middleton	RHM International	Guest
Muhammad Abdullah Sohail	Trench Canada	Member
Jusuf (Joe) Krvavac	Sargent & Lundy	Member
Juan Alfredo Carmzales	Prolec GE	Guest
Ryan Musgrove	Oklahoma Gas & Electric	Member
Alex Alahmed	Evergy	Member

Power Transformers Subcommittee
Working Group PC57.135 Report

Document #: C57.12.135

Document Title: Guide for the Application, Specification , and Testing of Phase-Shifting Transformers

Chair: Ewald Schweiger **Vice-Chair** Open

Secretary Richard von Gemmingen

Current Draft Being Worked On: 1.0 **Dated:** NA

Meeting Date: 2023-03-20 **Time:** 1:45 PM – 3:00 PM

Attendance:		
	Members	**12**
	Guests:	**30**
	Total	**42**

Meeting Minutes of Working Group Meeting:

1. Meeting was called to order at 1:47 PM (CDT) with Welcome & Chair's remarks.
2. Quorum Check
   Quorum was achieved with 12 of 18 members present.
3. Approval of the Agenda
   Eric Davis made motion to approve Agenda, Ryan Musgrove provided second. Motion was carried unanimously with no objections or abstentions.
4. Approval of the Fall 2022 minutes
   Eric Davis made motion to approve Agenda, Marcus Stank provided second. Motion was carried unanimously with no objections or abstentions.
5. Call for Essential Patents
   A call for essential patents was made. No essential patents or issues were reported.
6. Copyright policy
   The IEEE copyright policy was reviewed. No issues were reported.
7. Update on status of C57.135 and IEC collaboration
   a. Joe Watson proposed this will be a dual logo document with IEC. IEEE is currently in process of preparing for Dual Logo.
   b. Kevin Juchem is representative of IEC for their side of Dual Logo. Kevin indicated that IEC needs to appoint the technical experts to get process moving from IEC side. In general there will need to be harmonization between the IEEE and IEC in that certain things such as the word "Guide" cannot appear in IEC documents, so the IEEE Par and Title may need to be revised. These are formalities and work can continue for review of the guide**.**
8. Joe Watson presented an update on identified changes needed.
   The only copy of the C57,135 Guide that Joe had is a Dual Logo reference.
   From this he presented his thoughts on Sections 5,6, and 12.

Section 5.1 is Usual Service Conditions with items A to F, however A seems to be performance requirements instead of service conditions.

Section 5.4 is more on protection and relays, recommends removing

Section 6 is full of words like “Shall” that cannot be used in Guides and will need to be reviewed and revised

Section 12 recommends adding a section on Specifying PST’s, or create a new section 13 dedicated to information on Specifying PST’s

Other Comments:

Section 9 is on control systems. Typically, this is outside the scope of the PST manufacture, and usually provided by the substation controls and protection coordinators. Should this be in the guide?

Section 4 some diagrams need correction

Section 5 other comments

Section 6 other comments

Section 7 construction of PST – review

Section 8 Short Circuit review

Section 9 recommends removing

Section 10 on testing need to get input from manufacture testing specialists

Section 11 review tolerances

Section 12 the check list is missing

9. Call for Volunteers to begin review of C57.135 document
   - Section 5 - Eric Davis volunteered to review
   - Sections 3, 5, 6 and 12 – Sanjay Patel and Joe Watson volunteered to review
   - Section 4 – Alfons Schrammel volunteered to review
   - Section 4 and 6 – Sebastian Rehkopf volunteered to review
   - Section 7 – Joe Watson and Rich von Gemmingen will look at
   - Section 8 – Thrinada Katapalli will review
   - Section 9 – this is usually done by substation controls systems experts. Should it stay in document.
   - Section 10 and 11 – Jos A.M. Veens will review
   - Section 12 – Ryan Musgrove agreed to review.

10. Sanjay Patel initiated additional question working in parallel with IEC. Kevin Juchem addressed this and explained that after IEC experts are nominated, they will proceed with review and recommendations at IEC in similar manner as IEEE.

11. New business

    No new business was introduced.

12. Motion to adjourn meeting was issued by Markus Stank and seconded by Sanjay Patel. The meeting was adjourned at 2:45 PM (CDT)

13. List of attendees for this meeting:

Name	**Last name**	**Given name**	S2023 Milwaukee **BEFORE Status**
Arritt Robert	Arritt	Robert	G
Bonfigllo Susan	Bonfigllo	Susan	G
Brodeur Samuel	Brodeur	Samuel	G
Calitz David	Calitz	David	G
Chan Vivian	Chan	Vivian	G
Colopy Craig	Colopy	Craig	G
Davis Eric	Davis	Eric	M
Fedor Ken	Fedor	Ken	G
Gupta Ravi	Gupta	Ravi	G
Gustavsson Niklas	Gustavsson	Niklas	M
Hanson Corey	Hanson	Corey	G
Heiden Kyle	Heiden	Kyle	G
Hoffman Saramma	Hoffman	Saramma	G
Katapalli Thrinadha	Katapalli	Thrinadha	G
Kevin Juchem	Juchem	Kevin	G
Kaineder Kurt	Kaineder	Kurt	M
Mazzei Kevin	Mazzei	Kevin	G
Mendez Zamora Omar	Mendez Zamora	Omar	G
Mohamed Marian	Mohamed	Marian	G
Montanha Juliano	Montanha	Juliano	G
Musgrove Ryan	Musgrove	Ryan	M
Orozco Eduardo Polo	Ozorzco	Eduardo	G
Patel Sanjay	Patel	Sanjay	M
Reed Scott	Reed	Scott	G

Rehkopf Sebastian	Rehkopf	Sebastian	M
Rock Patrick	Rock	Patrick	G
Sandsten Lina	Sandsten	Lina	G
Schindler Stefan	Schindler	Stefan	G
Schrammel Alfons	Schrammel	Alfons	M
Schweiger Ewald	Schweiger	Ewald	M
Scott Thomas	Scott	Thomas	G
Stank Markus	Stank	Markus	M
Stechschulte Kyle D	Stechschulte	Kyle D	M
Tarango Erivil	Tarango	Erivil	G
Jos A.M. Veens	Veens	Jos A.M.	G
Viereck Karsten	Viereck	Karsten	G
vonGemmingen Richard	vonGemmingen	Richard	M
Washburn Alan	Washburn	Alan	G
Watson Joe	Watson	Joe	M
Weyer Daniel	Weyer	Daniel	G
White Joe	White	Joe	G
Williams Trenton	Williams	Trenton	G

14. Guests requesting: membership

Of the 30 guests, 11 requested membership. Of these 11 guests, 4 are working on tasks or have attended both sessions of this working group.
Recommendation is to accept these 4 as new members, (Williams Trenton, Mendez Zamora Omar, Kevin Juchem and Thrinada Katapalli). If others who requested membership return at next meeting, then they will also be granted membership.

Next meeting – October 2023 in Kansas City

Submitted by: Secretary Richard von Gemmingen
Date: 03/28/2022

C57.143 – IEEE Guide for Transformer Monitoring
Monday, March 20, 2023
Minutes of WG Meeting

The meeting was called to order at 3:15 PM by Chair Mike Spurlock. Vice-Chair Poorvi Patel was present. Secretary Elizabeth Bray (writer of Minutes) was also present.

There were 52 of 96 members present. There were 62 guests, and 15 guests requesting membership. A membership quorum was achieved. The attendance for this meeting was as follows:

- Number of Members in Activity = 96
- Number of Members Present = 53
- Percentage of Members Present = 54%
- Number of attendees = 114
- Attendees requesting Membership = 15

List of Meeting Attendees is provided below.

Last Name	First Name	Status
Almeida	Nabi	Member
Alonso	Carlos	Guest
Arora	Kush	Guest
Arritt	Robert	Guest
Bargone	Gilles	Member
Berube	Jean-Noel	Member
Bolar	Sanket	Guest
Bonfiglio	Susan	Guest
Bradshaw	Jeremiah	Member
Bray	Elizabeth	Member
Calitz	David	Member
Cantu de Leon	Jorge	Guest
Carrizales	Juan Alfredo	Guest
Casey	Cole	Guest
Castellanos	Juan	Guest
Chambers	Stuart	Member
Cheatham	Jonathan	Member
Colopy	Craig	Guest
Craven	Michael	Guest
Da Silva	Roberto Ignacio	Guest
Debass	Sam	Guest
Delgado Zamora	Gabriel	Guest
Draper	Zachary	Guest
Dulac	Hakim	Member
Ermakov	Evgenii	Guest
Espindola	Marco	Member
Farreira	Marcos	Guest

Faur	Florin	Member
Fazlic	Zlatan	Member
Felton	Todd	Guest
Foata	Marc	Guest
Frimpong	George	Member
Gara	Lorne	Member
Gaun	Alexander	Guest
Gross	Detlev	Member
Guner	Ismail	Member
Gustavsson	Niklas	Member
Gyore	Attila	Guest
Hanson	Corey	Guest
Harley	John	Member
Hayes	Roger	Member
Heiden	Kyle	Member
Hoffman	Saramma	Member
Hollrah	Derek	Member
Hopkins	Traci	Guest
Jacob	Nathan	Guest
jPiecevil	Urog	Guest
Kessler	Stacey	Member
Klempner	Dmitriy	Member
Kulasek	Krzysztof	Member
Lachance	Mathieu	Guest
Lewand	Lance	Guest
Mabrey	Stephanie	Member
Machain	Jose Luis	Guest
Mani	Kumar	Member
Mayer	Robert	Member
McBride	James	Member
Mellin	Toni	Guest
Mendez	Omar	Guest
Morales-Cruz	Emilio	Member
Munoz Molina	Martin	Member
O'Malley	Anastasia	Member
Pappas	Michael	Guest
Patoyga	Jarosz	Guest
Patel	Poorvi	Member
Portillo	Homero	Guest
Pruente	John	Member
Radbrandt	Uif	Guest
Reed	Scott	Member
Reeder	Perry	Guest

Rehkopf	Sebastian	Guest
Richardson	Michael	Guest
Robalino	Diego	Guest
Rock	Patrick	Guest
Rocque	Tim	Guest
Rossini	Yuri	Guest
Rutledge	Chris	Guest
Saad	Mickel	Member
Sawicki	Mike	Guest
Schindler	Stefan	Guest
Schweiger	Ewald	Guest
Shteyh	Ibrahim	Guest
Sinclair	Jonathan	Member
Snodgrass	Jonathan	Guest
Soeller	Markus	Guest
Soto	Mauricio	Member
Sparling	Brian	Member
Spurlock	Mike	Member
Staley	Brad	Member
Stank	Markus	Member
Stechschulte	Kyle	Member
Steigen	Ethan	Guest
Steineman	Christopher	Guest
Sullivan	Christopher	Guest
Syed	Ali	Guest
Szczechowski	Janusz	Member
Sze	Matthew	Guest
Tolcachir	Eduardo	Guest
Tostrud	Mark	Member
Trifunoski	Risto	Guest
Uhlmann	Olivier	Guest
Veeran	Kannan	Guest
Waldrop	Hugh	Member
Wang	Evanne	Guest
Watson	Joe	Member
Webb	Matthew	Member
Welton	Drew	Member
White	Elliott	Guest
White	Joe	Guest
Whitehead	William	Member
Williams	Trenton	Member
Woods	Deanna	Member
Wright	Jeffrey	Member

Yeboah	Kwasi	Guest
Zanwar	Anand	Guest

Agenda

1. Welcome & Introduction
2. Call for Patent Disclosure/Review Copyright Policy/Review Individual Participation Process
3. Chair Remarks
4. Quorum Check
5. Approval of Agenda
6. Approval of Fall 2022 Meeting Meetings
7. Status of MEC Review/Ballot for the final draft
8. Discussion/entertain motions.
9. Next Steps
10. New Business

Chair Mike Spurlock asked of a call for patents disclosure was made and no patent claims were reported.

Chair Mike Spurlock reviewed the IEEE Copyright policy and the individual participation as to act and vote based on your individual expertise.

Chair Mike Spurlock gave a history of the effort over the last few years as well as get the team up to speed on recent activities and upcoming dates. January 31, 2023, an email ballot to request to move the draft guide to ballot was approved by the C57.143 WG with an 82% response rate and 99% approval rate. The Power Transformers Subcommittee (PTSC) on March 3, 2023 approved a motion to move the draft guide to ballot with a 78% response rate and 100% approval rate.

A Quorum check was conducted and a count of 53 members raised their hands. This count was double checked. Quorum was achieved.

A motion to approve the Spring 2023 agenda was made by Trent Williams and seconded by Kumar Mani. There were no objections.

A motion to approve the Fall 2022 meeting minutes was made by Scott Reed and seconded by Trent Williams. There were no objections.

The ballot invitation was sent out March 18, 2023 and closes April 17th. If you have not received the ballot email let Chair Mike Spurlock know since there were several emails not correct in the system several did not receive the invite.

In order to cast your ballot you must be a SA member. You can join if not a member of SA. Members and guest of this working group are allowed to contribute comments to this document.

The draft is available for review if you need a copy please bring this to the attention of Chair Mike Spurlock. It was stated in the meeting that the C57.143 link was not functioning at the time of the meeting. This was addressed after the meeting.

We need a 75% return of ballots with a 75% approval rate. The challenge is to meet the PAR deadline by the end of the year. This will be determined by the number of comments received. There was discussion of a comment resolution group.

A motion to create a comment resolution group was made by Jeremiah Bradshaw seconded by Trent Williams and everyone agreed. There was a call for volunteers to resolve comments and those were asked to come forward at the end of the meeting to collect names.

A question was raised about worry about the PAR extension. Mike responded it will depend on the number of comments. Joe Watson added that a PAR extension would be automatic since we are in the balloting phase.

Chair Mike Spurlock then asked if there was any new business. The discussion was around the conclusion of this working group and how to turn this work into a tutorial after the guide is published. Rugged Monitoring has offered to assist with the tutorial. Discussion around the amount of material as well as the balance of commercial interest. Brian Sparling shared his experience with the Cigre presentation on the same topic and will present that presentation to this team.

A motion to form a study group to discuss how to present the tutorial was made by Drew Welton and seconded by Bill Whitehead. Volunteers were asked to come forward after the meeting to sign up to assist with this study group. The motion unanimously passed. This study group will report during the fall meeting. Sammy Debass and Brian Sparling volunteered to lead this study group.

Chair Mike Spurlock signed into MyProject to show how to accept a ballot invite. Key takeaway if you do not have your preferences set up you will need to search for C57.143. Join ballot, select affiliation, and submit.

A motion to adjourn was made by Jeremiah Bradshaw and seconded by Bill Whitehead. The motion passed with unanimous approval. The meeting adjourned at 4:08pm.

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**	**30%**

Current Draft Being Worked On: **1.0** **Dated:** **n/a**

PAR Expiration Date: **December 31, 2025**

Meeting Date: **20 March 2023** **Time:** **4:45pm – 6:00pm**

Location: **Milwaukee, WI, USA**

Attendance:	**Members**	**26 of 38**
	Guests	**79**
	Guests Requesting Membership	**17**
	Total*	**105**

*** 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 20, 2023.

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. Expected Date of submission of draft to the IEEE SA for Initial Standards Committee Ballot: May 2024. 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. 38 members and 20 were counted as present. QUORUM ACHIEVED
   ii. Attendance sheets after meeting completed showed 26 members attended.
   iii. Members are expected to attend and stay in the meeting so business can be conducted.

g. Approvals of previous documents needed but not made due to lack of quorum previously:
   i. Approval of the agenda
   ii. Approval of the Fall_21 unapproved meeting minutes
   iii. Approval of the Spring_22 unapproved meeting minutes
   iv. Approval of the Fall_22 unapproved meeting minutes
   v. Motion to approve all shown – W.Binder, 2nd – E.Garcia
      1. No objection to unanimous approval – ALL APPROVED

2. Old Business

a. Review the changes proposed for Section 4.2 Investigation flow chart
   i. Task force leader – E.Morales-Cruz, Task Force members – S.Chambers, R. Hernandez

Current Document:

4.2 Investigation flow chart

For many companies, it may be desirable to perform selected tests. Figure 1 has been developed to aid in the determination and investigation of a transformer failure. This flowchart forms the basis for this guide. The two starting points for this flowchart are (1) transformer tripped or malfunctioned, and (2) routine tests show deviation from past. Routine tests include those listed in Table 4 and Table 5.

The paths in the flowchart lead either to scrapping or returning to service. Prior to returning to service, it may be desirable to perform selected tests to verify suitability for service that includes the commissioning tests described in IEEE Std C57.152. Following return to service, it is suggested that the transformer be monitored by periodic electrical tests and tests that include insulating liquid sampling for dissolved gas Analysis. If a transformer is to be scrapped, it is suggested that the degree of polymerization (DP) and moisture content tests be performed on samples from the transformer in accordance with the recommendations found in IEEE Std C57.140.

1.

   ii. Discussions were made on the above highlighted sentence to add “Oil quality”, on top of dissolved gas analysis. Chair will finalize proposal via off site meeting, and email to working group for approval before Fall 2023 meeting

b. Review the changes proposed for Section 5.3.6.3 Testing under vacuum. This old business is related to the testing under vacuum being unsafe and not recommended.
   i. Task force leader- Ed teNyenhuis, Task force member-Akash Joshi worked on the change and proposed that testing under vacuum is strongly not recommended.

Current Document:

5.3.6.3 Testing under vacuum

~~Some users have a practice of performing dc winding resistance measurements under vacuum while performing dry outs to determine the insulation temperature. Caution shall be used when tests are performed on the transformer while the equipment is under vacuum. The dielectric strength of the system is significantly reduced under these conditions; only sufficiently low voltage should be used, and users should consult with the manufacturer to obtain recommended voltage level or actions.~~

testing under vacuum is not recommended Because vacuum significantly reduces dielectric strength.

ii. Motion was made to replace the wording in Section 5.3.6.3 Testing under vacuum with this wording: "Testing under vacuum is not recommended because vacuum significantly reduces dielectric strength."
    1. Motion-B.Forsyth, 2nd-S.Chambers
    2. 17 YES votes - APPROVED

c. Review the changes proposed for Table-2
    i. Task force leader – James Cross – not in attendance at this meeting
    ii. There was general agreement to add switches, breakers, fuses to table.
    iii. Chair will work with TF leader and group via emails to follow up before Fall 2023 meeting

d. Review the changes proposed for Table 4 – Electrical tests
    i. Task force leader – H.Sahin
    ii. Vice Chair-T.Melle assumed duties of Chair.
    iii. Motion was made to add to Table-4 as presented:

Table 4—Electrical tests

		Probable areas of concern				
		Major insulation—electrical	Minor insulation—electrical	Mechanical damage (short-circuit forces, etc.)—mechanical	May indicate problem location	Indicates electrical path from core to ground
√	**Common field tests**					
	Insulation resistance					
	Winding to winding	X			X	
	Winding to ground	X			X	
	All windings to ground	X			X	
	Core to ground					X
	Core Clamp to ground *			X		

* Applicable for isolated core clamps only

iv. Core Clamp to ground *Applicable for isolated core clamps only with Mechanical damage (short-circuit forces, etc.)-mechanical as probable area of concern.
    1. Motion-H.Sahin, 2nd-B.Forsyth
    2. No objections to unanimous approval – APPROVED
v. T.Melle returned to duty as Vice Chair

e. Review the changes proposed for Table 7-Field test interpretation
    i. Task force leader-A.Sarkar, Task force members-W.Li, A.Joshi

ii. Motion was made to add “Core Clamp heating” to the table 7 under Suspected problem category with “Abnormal gas analysis” as First priority and “Abnormal oil quality and particle count” as Second priority as presented.
    1. Motion-A.Sarkar, 2nd-P.Panesar
    2. No objections to unanimous approval – APPROVED

Table 7—Field test interpretation

Suspected problem category	Significant test data		
	First priority	Second priority	Third priority
Shorted winding turn (minor insulation)	Abnormal gas analysis[k] Increase in excitation[c] Out of tolerance ratio[bi]	Abnormal open circuit FRA[l]	Abnormal winding resistance[e]
Open winding circuit	Out of tolerance ratio[bj]	Higher resistance[e]	Abnormal FRA[l]
Moisture	High insulation power factor[d]	Insulating liquid tests low dielectric, high moisture[f]	Low insulation resistance[a]
Damage to major insulation	High insulation power factor[d]	Low insulation resistance[a]	Abnormal FRA[l]
Through-fault mechanical damage	Abnormal FRA[l]	Higher impedance[g]	Change in winding capacitance (PF/CAP test)[d]
Core heating	Abnormal gas analysis[k]	Low core ground resistance[h]	Increase in excitation[c]
NOTE—Refer to the standard/clause listed in the footnotes for help in interpreting the results of each test.			

Core Clamp heating **Abnormal gas analysis** **Abnormal oil quality and particle count**

f. Review the changes proposed for Table 8-Internal inspection-main tank
    i. Task force leader-T.Raymond, Task force member-S.Chambers
    ii. These changes will be worked on via email before Fall 2023 meeting
g. Review the changes proposed for Section 6.3.3.3 Troubleshoot a winding failure
    i. Task force leader-H.Sahin
    ii. No change is required. This is under 6.3.3 Winding failure modes for shell form transformers. Layer windings are clearly covered under 6.3.2 Electrical winding failure modes for core form transformers
    iii. Close this old business with no further action required
h. Review the changes proposed for Introduction section
    i. Task force leader-H.Sahin
    ii. W.Binder discussed that historical description of how the guide standards are created are typically put in the introduction if space allows.
    iii. Chair will finalize proposal for Introduction section and email before Fall 2023 meeting.

3. New Business
    a. B.Forsyth brought forward several proposals for changes in the Definitions section. After the meeting, Bruce emailed his proposals, which are as follows:

“Proposed changes are shown in red with proposed deletions shown with a line through the text to be deleted. I ask that you consider presenting these comments to the WG for discussion at our next meeting. I would suggest these be handled one at a time, since some may be accepted, some may be rejected, and some may be accepted with modifications.

Item 1: compressive force

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

Proposed Change: (A) The force that presses the inside coil toward the core.
(B) The force ~~attraction~~ that presses coils wound in opposite directions together in a set of pancake coils.
(C) The axial force applied to pre-compress core form windings to prevent uncontrolled axial movement in service.

Justification: a) The word “attraction” seems out of place or is possibly missing the word “of” in front of it.
b) Item (C) provides a definition of an important compressive force that is not described elsewhere.

Item 2: hoop compression / buckling

Existing Definition: There is no current definition.

Proposed Change: The radially inward force that acts on a coil.

Justification: Hoop compression (buckling) is a common failure mode and contrasts with hoop tension, which is already defined.

Item 3: main tank

Existing Definition: The steel container for the main coil and insulating liquid (liquid or gas).

Proposed Change: The ~~steel~~ metallic container for the main core and coil assembly and insulating liquid (liquid or gas).

Justification: a) While rare, some tanks are aluminum.
b) The phrase “core and coil assembly” is a more thorough description of what goes in the tank.

Item 4: spiral winding (transformer winding)

Existing Definition: Many insulated conductors in parallel, often two strands wide and many (6 to 20) strands high, spirally wound on an insulating cylinder from one end to the other. Continuously transposed cable may also be used. The spiral winding resembles a spring coil. *Syn*: **helical winding**.

Proposed Change: Many insulated conductors in parallel, often two strands wide and many ~~(6 to 20)~~ strands high~~,~~ (typically from 6 to 20), spirally wound on an insulating cylinder from one end to the other. Continuously transposed cable may also be used. The spiral winding resembles a spring coil. *Syn*: **helical winding**.

Justification: This guide should not imply absolute limits.

Item 5: strap-wound coils (transformer winding)

Existing Definition: Single or multiple layer conductors, from 25 mm to 75 mm wide, spirally wound around an insulating form, with a layer of insulation between conductors. The conductors can be aluminum or copper. This type of winding can consist of two or

more groups electrically connected in parallel. Typically used in low-voltage windings.

Proposed Change: Single or multiple layer conductors, typically from 25 mm to 75 mm wide, spirally wound around an insulating form, with a layer of insulation between conductors. ~~The conductors can be aluminum or copper.~~ This type of winding can consist of two or more groups electrically connected in parallel. Typically used in low-voltage windings.

Justification: a) This guide should not imply absolute limits.
b) The conductor material is not necessary for the definition.

Item 5: strip-wound coils (transformer winding)

Existing Definition: Single conductors, typically 75 mm to 250 mm wide, spirally wound around an insulating form, with a layer of insulation between conductors. The conductors can be aluminum or copper. This type of winding can consist of two or more groups electrically connected in parallel. Typically used in low-voltage windings.

Proposed Change: Single conductors, typically 75 mm to 250 mm wide, spirally wound around an insulating form, with a layer of insulation between conductors. ~~The conductors can be aluminum or copper.~~ This type of winding can consist of two or more groups electrically connected in parallel. Typically used in low-voltage windings.

Justification: The conductor material is not necessary for the definition.

Item 6: user

Existing Definition: The owner of the transformer.

Proposed Change: The ~~owner~~ operator of the transformer.

Justification: Not every owner of a transformer is the user.

i. Chair will work via emails with members before the Fall-23 meeting.

4. Membership changes
   a. Officers will look at attendance of members and change membership based on attendance before Fall 2023 meeting. Guest-RM2 will be reviewed for membership.
5. Next meeting: October 23, 2023 at the Fall 2023 Transformer Committee Meeting scheduled for October 22-26, 2023, Kansas City, MO, USA.
6. Close of meeting
   a. Meeting adjourned at 6:00pm
      i. Motion-S.Som, 2nd-W.Binder

Submitted by: Hakan Sahin Date: 4/8/23

3/20/2023 Meeting Attendance (RM = Request Membership):

Last Name	First Name	Company (Affiliation)	Role
Alahmed	Alex	Energy-Wolfcreek	Guest
Bargone	Gilles	FISO Technologies Inc.	Guest
Beaster	Barry	H-J Family of Companies	Guest
Betancourt	Enrique	Prolec GE	Member
Binder	Wallace	WBBinder Consultant	Member
Boettger	William	Boettger Transformer Consulting LLC	Member
Bolar	Sanket	Oncor	Member
Bonfiglio	Susan	WAPA	Guest
Borck	Christopher	EATON Corporation	Guest
Bradshaw	Jerimiah	Bureau of Reclamation	Guest
Bray	Elisabeth	Southern Company	Guest
Cantu	Jorge	Alliant Energy	Guest
Casey	Cole	Invenergy	Guest
Castro	Fidel	SDGE	Guest
Chambers	Stuart	Powertech Labs	Member
Craven	Michael	Qualus Power Serv.	Guest
Crochett	Daniel	Ameren	Guest-RM1
DaSilva	Roberto	Cargill, Inc.	Guest
Debass	Samson	EPRI	Guest-RM1
Delgado Zamora	Gabriel	Invenergy	Guest
Demir	Yasm	Prolec GE	Guest
Dillon	Nikolaus	Dominion Energy	Guest-RM2
Dolloff	Paul	East Kentucky Power	Guest
Draper	Zachary	Delta-X Research	Guest-RM1
Dulac	Hakim	Advanced Power Technologies	Guest
Euvrard	Eric	RHM International	Guest
Faur	Florin	Prolec GE Waukesha	Guest-RM2
Flores	Hugo	Hitachi Energy	Guest-RM1
Forsyth	Bruce	Bruce Forsyth and Associates PLLC	Member
Frye	Richard	EATON Corporation	Guest
Garcia Wild	Eduardo	Siemens Energy	Member
Gardner	James	Prolec GE Waukesha	Guest
Gorzin	Allis	Black & Veatch	Guest
Gragert	Jeffrey	Xcel Energy	Guest
Gustavsson	Niklas	Hitachi Energy	Guest
Hernandez	Carlos	Delta Star Inc	Guest-RM1
Hernandez	Ronald	Doble Engineering Co.	Member
Hoffman	Saramma	PPL	Guest
Ivanic	Lidija	Siemens Energy	Guest
Jacob	Nathan	Camlin Energy	Guest-RM1
Jarosz	Patrycia	IEEE	Guest
Johnson	Christopher	Oncor	Guest
Kazmierczak	Jerzy	Hitachi Energy	Guest
Kerschenbouer	Christoph	Siemens Energy	Guest
Kessler	Stacey	Ulteig Engineers	Guest-RM1
Khan	Qasim	NEETRAC-GT	Guest
Klempner	Duritriy	Southern California Edison	Guest
Knapp	Evan	EATON Corporation	Guest
Kowalski	Rafal	Hitachi Energy	Guest
Kulasek	Krzysztot	Delta Star Inc	Guest
LaBean Jr	Bernard	Consumers Energy	Guest
Lachance	Mathieu	Omicron	Guest
Lee	Junho	Hyundai Electric	Guest
Leigl	Angela	EATON Corporation	Guest
Li	Weijun	Braintree Electric Light Dept.	Member
Mazzei	Kevin	Black & Veatch	Guest
Melle	Tom	Highvolt	ViceChair
Middleton	Robert	RHM International	Guest
Mills	Francis	Power Engineers	Guest
Montanha	Juliano	Siemens Energy	Guest
Morales-Cruz	Emilio	Qualitrol	Guest-RM2
Munoz	Marta	Hitachi Energy	Guest
Murray	David	TVA	Guest-RM2
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
Patel	Sanjay	Smit Transformer	Member
Pellon	Verena	FPL	Guest
Persivec	Igor	Siemens Energy	Guest
Plecevic	Uros	Invenergy	Guest
Plisic	Goran	Siemens Energy	Guest
Pruente	John	Prolec GE Waukesha	Member
Rodriguez	Leopoldo	Transformer Testing Services LLC	Guest-RM2
Saad	Mickel	Hitachi Energy	Member
Sahin	Hakan	Virginia Transformer Corp.	Chair
Sarkar	Amitabh	Virginia Transformer Corp.	Member
Scardazzi	Alaor	Siemens Energy	Guest
Schrammel	Alfons	Siemens Energy	Guest
Schwartz	Dan	Quality Switch, Inc.	Member
Selvaraj	Pugal	Virginia Transformer Corp.	Member
Sewell	Adam	Quality Switch, Inc.	Secretary
Sohail	Muhammad	Trench Canada	Guest-RM1
Solano	William	Maschinenfabrik Reinhausen	Guest
Som	Sanjib	Pennsylvania Transformer	Guest-RM1
Soyoung	Lee	Hyundai Electric	Guest
Stechschulte	Kyle	AEP	Guest
Steineman	Chris	Delta Star Inc	Guest
Szczechowski	Janusz	Maschinenfabrik Reinhausen	Member
Sze	Matthew	Omicron	Guest
Talbert	Chris	JST	Guest
Tanaka	Troy	Burns & McDonnell	Member
Thielbar	Jacob	WAPA	Guest
Thomas	Scott	Hitachi Energy	Guest
Tuli	Subhash	ET & DA	Guest
Veens	Jos	SMIT Transformatoren B.V.	Guest
Veeran	Kannan	Georgia Transformer	Guest
Vir	Dharam	Prolec GE Waukesha	Guest-RM2
vonGemmingen	Richard	Dominion Energy	Member
Washburn	Alan	Burns & McDonnell	Member
Whitten	Christopher	Hitachi Energy	Guest
Woods	Deanna	Alliant Energy	Member
Yuan	Guang	Hitachi Energy	Guest-RM1
Yun	Joshua	Virginia Transformer Corp.	Guest-RM2
Zibert	Kris	Allgeier Martin	Guest

Attachment K4.8

IEEE PES Transformers Committee

Working Group PC57.170 Condition Assessment Guide

Spring 2023 Meeting Minutes

- **Meeting Date: March 21, 2023, 8:00-9:15 AM (CST)**
- **Venue: Hotel Hyatt Regency, Milwaukee, WI**

Total Attendees: 101; Total Members Present: 40 (out of 50); Guests Present: 61
Guest Requesting Membership: 16; Quorum: 80%.

1. The chair outlined the IEEE Patent disclosure policy, and no disclosure was noted.
2. The chair outlined the IEEE Copyright Policy.
3. A membership quorum was polled, and a quorum was established.
4. A motion for adoption of this Spring 2023 meeting's agenda was moved: Approved unopposed.
5. A motion for adoption of Fall 2022 Meeting Minutes was moved: Approved unopposed.
6. The Chair informed the working group that a guide draft had been circulated to members prior to this meeting. The Chair threw open the floor for questions on the draft guide content for Task forces #1, #2 and #3 and task force updates were provided by:
   6.1. Emilio (subbed for TF#1 Leader) and Brian Sparling for Chapters 4 and 5. They reported that these sections were complete and in stable condition. The editorial review for these chapters is ongoing. A suggestion was made by Evgenii from Hitachi about including guidance on how to use the guide.
   6.2. Saramma Hoffman (TF#2 Leader) for Chapters 6, 7 and 8. The chapters are complete and in stable condition. The editorial review for these chapters is ongoing.
   6.3. Jonathan Sinclair for (TF#3 Leader) for Chapters 9, 10 and 11. Jonathan reported that their task force had made excellent progress on these chapters. Marcos Ferreira offered to help add some additional information for the OLTC section. Poorvi, Jonathan and Diego are working on adding some new information to the section related to bushings. The editorial review for these chapters is ongoing.
7. The chair gave an update on the PAR expiration date of 12/31/2023. Going by the progress of the guide so far, he remarked that a PAR extension will be required until Dec 31, 2025.
   A motion was made for extending the PAR until Dec 31, 2025, by Hemchandra and it was seconded by Poorvi Patel from EPRI with none opposed.
8. The Chair then opened the floor for comments and questions:
   - Poorvi Patel has suggested adding a flow chart on how to use the guide in Chapter 4 or 5.
   - Brian Sparling spoke about papers that have been written about how using different methodologies can result in different conclusions and the guide list many methodologies and it for the asset owners to select the methodology that suits them the most.
   - Hemchandra Shertukde commented that all Normative references should be in the body while the Informative references should be in the Annexes.
9. The Chair announced that James Gross will help Stephanie Mabry with the editing of document going forward while Brain Sparling will examine the flow of the guide after editing

is completed and will make technical editorial suggestions. He added that draft document was in good shape, and that we are planning to send the draft guide after editing for a straw ballot to the working group for comments before May 15, 2023.

10. The meeting was adjourned at 09:15 am.

Kumar Mani	James Cross	Akash Joshi
Chair	Vice Chair	Secretary

List of Attendees:

Alex	Alahmed	Evergy	G
Elise	Arnold	SGB-SMIT	G
Kush	Arora	Reinhausen	G
Gilles	Bargone	Fiso	G
Jean-Noel	Berube	Rugged Monitoring	G
Enrique	Betancourt	Prolec GE	M
William	Boettger	Boettger Transformer Consulting LLC	M
Sanket	Bolar	Oncor Electric Delivery	G
Jeremiah	Bradshaw	Bureau of Reclamation	M
Elizabeth	Bray	Southern Company Services	G
Jorge	Cantu	Alliant Energy	G
Juan Alfredo	Carrizales	Prolec GE	G
Robersto	Da Silva	Cargill, Inc.	G
Samson	Debass	EPRI	G
Scott	Digby	Duke Energy	G
Nikolaus	Dillon	Dominion Energy	G
Paul	Dolloff	ekpc	G
Zachary	Draper	Delta-X Research Inc.	M
Jesse	Duffy	Nashville Electric Service	G
Hakim	Dulac	Advanced Power Technologies	M
William	Elliott	AEP	G
Evgenii	Ermakov	Hitachi Energy	M
Marco	Espindola	Hitachi Energy	M
Marcos	Ferreira	Bridge View Resources	M
Marc	Foata	MR	G
Bruce	Forsyth	Bruce Forsyth and Associates PLLC	M
George	Frimpong	Hitachi Energy	M
Lorne	Gara	Shermco	G
Miguel	Garsia	Hitachi energy	G
Ismail	Guner	Hydro-Quebec	M
Ravi	Gupta	Megger	G
Niklas	Gustavsson	Hitachi Energy	M
Attila	Gyore	M&I Materials Ltd	M
Corey	Hanson	Advaced Power Tech	G
Kyle	Heiden	EATON Corporation	M
Jean	Hernandez	Georgia tech	G
Saramma	Hoffman	PPL Electric Utilities	M
Paeryeja	Jarosz	IEEE SA	G
Stacey	Kessler	TC Energy	G

Dmitriy	Klempner	Southern California Edison	G
Rafel	Kowlaski	Hitachi Energy	G
Mathew	Lachavce	Omnicron	G
Weijun	Li	Braintree Electric Light Dept.	M
Mario	Locarno	Doble Engineering Co.	G
Jose	Machain	Prolec GE	G
Jinesh	Malde	M&I Materials Inc.	M
Robert	Mayer	Siemens Energy	G
Brian	McBride	Cargill, Inc.	G
Toni	Mellin	Vaisala	G
Marian	Mohamed	Xcel Energy	G
Emilio	Morales-Cruz	Qualitrol Company LLC	M
Ryan	Musgrove	OG&E	G
Paul	Mushill	Ameren	G
Joe	Nims	Allen & Hoshall, Inc.	M
Anastasia	O'Malley	Consolidated Edison Co. of NY	G
Mendez	Omar	Prolec	G
Ervardo	orozco	GE	G
Poorvi	Patel	Electric Power Research Institute (EPRI)	M
Sanjay	Patel	Smit Transformer	G
Monil	Patel	PG&E	G
Verena	Pellon	fpl	G
Nick	Perdanik	Weidmann Electrical Technology	G
John	Pruente	prolec energy	M
Chris	Ratledge	Dynamic Ratings, Inc.	G
Scott	Reed	MVA	M
Michael	Richardson	Ameren Corp	G
Diego	Robalino	Megger	G
Tim	Rocque	Prolec Waukesha	M
Mickel	Saad	Hitachi Energy	M
Amitabh	Sarkar	Virginia Transformer Corp.	M
Alan	Sbravati	Hitachi energy	M
Alaor	Scardazy	Siemens Energy	G
Ewald	Schweiger	Siemens Energy	G
Salahuddin	Shaikh	Hitachi Energy	G
Mike	Sharp	Trench Ltd	G
Rich	Simonali	GE grid solution	G
Jonathan	Sinclair	PPL Electric Utilities	M
Markus	Soe.essl	SGB-SMIT	G
Markus	Soeller	Power Diagnostix	M

Mauricio	Soto	Hitachi Energy	M
Brian	Sparling	Dynamic Ratings, Inc.	G
Thomas	Spitzer	City Transformer Service Co.	G
Brad	Staley	Leeward renewable energy	M
Charles	Sweetser	OMICRON electronics Corp USA	M
Matthew	Sze	Omnicorn eletronics	M
Ed	teNyenhuis	Hitachi Energy	M
Felton	Todd	MVA	G
Mark	Tostardo	Dynamic Ratings, Inc.	G
Olivier	Uhlmann	Reinhausen Canada Inc.	G
Dharam	Vir	GE prolec	G
Pragnesh	Vyas	Sunbelt-Solomon Solutions	M
Alan	Washburn	Burns & McDonnell	M
Matthew	Webb	GE Prolec	G
William	Whitehead	H2scan Corporation	M
Trenton	Williams	Advanced Power Technologies	M
Dranna	Woods	Alliant Energy	G
Jeffrey	Wright	Duquesne Light Co.	M
Kwasi	Yeboah	GE Energy Management	M
Joshua	Yun	Virginia Transformer	G
Malia	Zaman	IEEE SA	G
Peter	Zhao	Hydro One	M

Power Transformers Subcommittee
Task Force Report

Document #:	**C57.157**
Document Title:	**Guide for Conducting Functional Life Tests on Switch Contacts Used in Insulating Liquid-Immersed Transformers**

Chair:	**Adam M. Sewell**	**Vice-Chair**	**N/A**
Secretary	**Piotr Blaszczyk**	**Percent Complete**	**N/A**

Current Draft Being Worked On: **N/A** **Dated:** **N/A**

PAR Expiration Date: **NO PAR - std expires 12/31/2025**

Meeting Date: **21 March 2023** **Time:** **8:00am-9:15am**

Location: **Milwaukee, WI, USA**

Attendance:		
	Members	**13 of 16**
	Guests	**16**
	Guests Requesting Membership	**5**
	Total*	**29**

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

Meeting Minutes / Significant Issues / Comments:

1. Meeting was called to order at 8:00am, March 21, 2023 at Hyatt Regency; Milwaukee, WI USA - Gilpatrick (1st floor) room.
2. Presentation of Agenda
3. Presentation of IEEE Standards Slides
    a. Call for Patent Claims & Copyright Notice
    b. No comments from task force about any patent claims or copyright notice
4. Distribution of attendance sheets
    a. Please send an email to adamsewell@ieee.org with the subject: C57.157 EMAIL to be added to the C57.157 TF email list
5. Checking the Quorum - 16 members so 9 members needed for quorum
    a. 13 out of 16 members were in attendance of that meeting so quorum was achieved.
6. Approval of the Meeting Minutes from Charlotte Fall 2022 and Agenda for Spring 2023.
    a. Motion was made by Florin Faur and seconded by Dan Schwartz to approve Fall 2022 minutes and Spring 2023 Agenda.
    b. No opposition to unanimous approval of the motion - APPROVED

7. Chair announcements
    a. Current guide standard is set to expire December 31, 2025
    b. This task force is to determine work needed for this guide standard and create a PAR for revision if needed
8. 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 Transformers Subcommittee pages
    b. Members of this task force were tasked to review current guide standard and previous presentations before Spring 2023 meeting and make suggestions as to what recommendations they have for this guide standard.
9. New Work
    a. During the meeting the Chair presented the following title, scope, and purpose of a PAR to revise C57.157-2015, that would include:
        - **Title:** Conducting Functional Life Tests on Switch Contacts Used in Insulating Liquid Filled Transformers.
        - **Scope:** This guide is intended for use in establishing a methodology to evaluate expected longterm performance of infrequently operated switch contacts used within insulating liquid– immersed transformers. These switch contacts are typically found in de-energized tapchangers, dual voltage switches, reversing switches, on-load tapchangers, and step-voltage regulators, but the test might possibly be used to evaluate any contact that is used in insulating liquids with similar operating characteristics and within similar environments.
        - **Purpose:** This guide outlines a test method to simulate long-term life (minimum 30 years) of a de-energized tapchanger in a period of 30 test days by using a combination of elevated liquid temperatures in conjunction with cyclically elevated load currents. The test is performed on specific switch bodies with specific contact materials, geometries, and contact pressures in liquid baths so as to closely parallel conditions found in actual operation. The variable that provides the accelerated life simulation is the switch contact temperature.
            i. Motion was made by Dan Schwartz and seconded by Tim Tillery to create a PAR for updating C57.157-2015 with the presented wording.
                1. No opposition to unanimous approval of this motion - APPROVED
                2. This motion will be presented to the Power Transformers Subcommittee at the March 22, 2023 meeting.
10. Next meeting: October 24 at Fall 2023 Transformers Committee Meeting scheduled for October 22-26, 2023, Kansas City, MO, USA.
11. Close of meeting
    a. Meeting adjourned at 8:45am

Submitted by: Adam Sewell Date: March 24, 2023

Meeting Attendance 3/21/2023 (RM1 = Request Membership 1st time):

Last Name	First Name	Company (Affiliation)	Role
Ali	Rehan	Siemens Energy	Guest-RM1
Bhatt	Viveh	Prolec GE	Guest-RM1
Blaszczyk	Piotr	Specialty Transformer Components LLC	Secretary
Castellanos	Juan	Prolec GE	Member
Cruz Valdes	Juan Carlos	Prolec GE	Member
Dutta Roy	Samragni	Siemens Energy	Member
Faur	Florin	Prolec GE Waukesha	Member
Gonzalez	Luis	Canduct Industries	Member
Lejay	Olivier	Huaming USA Corp.	Member
Matthews	Lee	Howard Industries	Guest
Posadas	Daniel	Prolec GE	Guest
Rehkopf	Sebastian	Maschinenfabrik Reinhausen	Member
Saudsten	Lina	Hitachi Energy	Guest-RM1
Schindler	Stefan	Maschinenfabrik Reinhausen	Guest
Schleismann	Eric	Southern Company Services	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
Solano	William	Maschinenfabrik Reinhausen	Member
Tillery	Timothy	Howard Industries	Member
Whitten	Christopher	Hitachi Energy	Guest-RM1
Newbill	Markus	Hitachi Energy	Guest
Gamboa	Jose	H-J Family of Companies	Guest
Hopkinson	Phil	Hvolt Inc	Guest
White	Joe	Power Engineers	Guest
Rainbolt	Bradley	Eaton	Guest
Murillo	Hugo	H-J Family of Companies	Guest-RM1
Harley	Jack	First Power Group LLC	Guest

Attachment K4.10

PC57.150 – IEEE Guide for Transportation of Transformers and Reactors
Tuesday, March 21, 2023; 9:30 am- 10:45 am
Hyatt Regency Milwaukee, WI USA; Executive Ballroom (2)
Unapproved Minutes of Working Group Meeting

The meeting was called to order at 9:30 am by Chair Greg Anderson.
Vice-Chair Ewald Schweiger and Secretary Marnie Roussell (writer of minutes) were also present.

There was a total of 46 people present, including 18 members and 28 guests. Attendance was taken on paper rosters passed around during the meeting. A quorum was not reached. A list of meeting attendees is included at the end of these minutes.

Chairs Remarks

A call for essential patent claims was made. No patent claims were identified. The IEEE Copyright Policy was also shown.

Meeting Agenda
1. Welcome & Call to Order
2. Question, Essential Patent Issues, and IEEE Copyright Policy
3. Determination of Quorum (more than 24 of 48 members is necessary to have a quorum)
4. Approval of the Minutes from F22 in Charlotte, NC
5. Old Business
6. New Business

The Chair reviewed the timeline for the PAR expiring December 2023.

Completed Tasks:
- March '22: Collected WG Member comments to D2
- Sept-Oct '22: WG Member "Straw Vote" of D3
- Oct '22 at WG Meeting: Formed Comment Resolution Group (CRG), and the WG authorized the CRG to resolve comments during SA Ballot process.
- Oct '22 at PTSC Meeting: Received Vote of Confidence of SC
- March 8: Sent invitation to form Ballot Group (closes April 7)
- March 9: Completed Mandatory Editorial Coordination (MEC) review of D4.

Remaining Tasks:
- April 7: Document proceed to ballot (closes ~May 7)
- May-June: CRG resolves comments
- June-July: Recirculate Ballot & resolve any additional comments
- late-Summer '23: Submit the final document to RevCom

Stephen Shull advised the working group to consider the option for a PAR extension after Balloting started.

Old Business
The Chair will circulate the Fall 22 minutes for approval via email.

New Business

New business was not conducted since this meeting had not reached a quorum.

The working group has agreed to authorize the CRG to resolve all comments during the SA Ballot process.

The following people are on the CRG:

LAST_NAME	FIRST_NAME	COMPANY_NAME
Anderson	Gregory	GW Anderson & Associates, Inc.
Ferreira	Marcos	Bridge View Resources
Kazmierczak	Jerzy	Hitachi Energy
Lawless	Andrew	Potencia Partners
Marnie	Roussell	Entergy
Nunn	Kraig	ShockWatch
Rathi	Rakesh	Virginia Transformer Corp.
Skinger	Kenneth	Scituate Consulting, Inc.
Van Der Walt	Alwyn	Electrical Consultants, Inc.
Vijayan	Krishnamurthy	PTI Transformers

The meeting was adjourned at 10:10 am.

Immediately after the meeting was adjourned, Mr. Andy Burnes with Capital City Group gave an interesting presentation entitled "Top Current Issues in Transformer Transportation Logistics."

The WG does not plan to meet at the Fall 2023 Meeting in Kansas City, Missouri.

Greg Anderson
WG Chair

Ewald Schweiger
WG Vice Chair

Marnie Roussell
WG Secretary

C57.150 WG: List of Meeting Attendees at Spring '23 Meeting, including affiliation and voting member status.

Count	LAST_NAME	FIRST_NAME	COMPANY_NAME	Status
1	Ali	Rehan	Siemens Energy Inc	Guest
2	Anderson	Gregory	GW Anderson & Associates, Inc.	Chair
3	Basel	Cheryl	WEG Transformer USA	Guest
4	Bhatt	Vivek	Prolec GE Waukesha	Guest
5	Boettger	William	Boettger Transformer Consulting LLC	Member
6	Bradshaw	Jeremiah	Bureau of Reclamation	Member
7	Brodeur	Samuel	Hitachi Energy	Guest
8	Brown	Chris	San Diego Gas and Electric	Guest
9	Burns	Andrew	Bay Crane/Capital City	Guest
10	Castro	Fidel	San Diego Gas and Electric	Guest
11	Cruz Valdes	Juan Carlos	Prolec GE	Guest
12	Dolloff	Paul	East Kentucky Power	Member

Count	LAST_NAME	FIRST_NAME	COMPANY_NAME	Status
13	Fedor	Ken	SMIT Transformer Sales, Inc.	Guest
14	Ferreira	Marcos	Bridge View Resources	Member
15	Garcia Wild	Eduardo	Siemens Energy	Member
16	Grooms	Brad	Native American Trans	Guest
17	Hayes	Roger	GE Grid Solutions	Guest
18	Hollrah	Derek	Burns & McDonnell	Guest
19	Hossain	Saif	Trench Limited	Guest
20	Kazmierczak	Jerzy	Hitachi Energy	Member
21	Kowalski	Rafal	Hitachi Energy	Guest
22	Mayer	Robert	Siemens Energy	Guest
23	Mellin	Toni	Vaisala Oyi	Guest
24	Mohamed	Marian	Xcel Energy	Guest
26	Nambi	Shankar	Bechtel	Member
25	Natale	Anthony	HICO America	Guest
27	Nims	Joe	Allen & Hoshall, Inc.	Guest
28	O'Malley	Anastasia	Consolidated Edison Co.	Guest
29	Pappas	Michael	Roechling Industrial	Guest
30	Roussell	Marnie	Entergy	Secretary
31	Sarkar	Amitabh	Virginia Transformer Corp.	Member
32	Schrammel	Alfons	Siemens Energy	Member
33	Schweiger	Ewald	Siemens Energy	Vice-Chair
34	Sharpless	Samuel	Rimkus Consulting Group	Member
35	Shull	Steve	BBC Electrical Services Inc.	Guest
36	Simons	Andre	JFE Shoji Power Canada	Member
37	Skinger	Kenneth	Scituate Consulting, Inc.	Member
38	Snyder	Jason	FirstEnergy Corp.	Guest
39	Spitzer	Thomas	City Transformer Services, LLC	Guest
40	Tanaka	Troy	Burns & McDonnell	Guest
41	Thielbar	Jacob	Western Area Power Admin	Guest
42	Veens	Jos	SMIT Transformatoren B.V.	Guest
43	Wallach	David	Duke Energy	Member
44	Watson	Joe	JD Watson and Associates Inc.	Member
45	Weyer	Daniel	Monolith	Member
46	Zibert	Kris	Allgeier, Martin and Associates	Member

Attachment K4.11

Task Force Meeting for IEEE Standard PC57.17

Milwaukee, Wisconsin Meeting – March 21, 2023 11:00-12:15 pm CDT
Chair: Dom Corsi
Secretary: Jason Varnell

1. The meeting was called to order at 11:00 AM CDT.
2. There were 33 active participants present. Since PAR was not yet approved and this was a task force meeting then the 14 participants that requested membership will be granted membership once the WG meets at the Fall 2023 Transformers Committee Meeting.
3. The chair reviewed the IEEE patent slides and the group made no patent claims.
4. The chair reviewed the copyright policy with the group.
5. The chair requested volunteers to help updating the standard on a clause-by-clause basis. The following participants are responsible for reviewing the sections prior to the next working group meeting and prepare to discuss recommended changes or edits.
    a. Definitions section – Jerzy Kazmierczak from Hitachi Energy volunteered for this section.
    b. Ratings section – Dan Sauer from Eaton Corporation and Sheldon Kennedy from Niagara Transformer
    c. Connections section – Sanjib Som from Pennsylvania Transformer volunteered for this section.
    d. Testing section – Dom Corsi from Doble and Jason Varnell from Doble volunteered for this section.
    e. Construction section – Sanjib Som from Pennsylvania Transformer volunteered for this section.
    f. Annex A – DC Arc Furnace section – Dan Sauer from Eaton Corporation and Jerzy Kazmierczak from Hitachi Energy volunteered for this section. The chair will seek additional volunteers from manufacturers (Tamini, Koncar, and Transformers and Rectifiers Limited)
    g. Annex B – IEEE Guide for Arc-Furnace Protection section – No volunteers came forward. This section remains open for volunteers and all participants are encouraged to review the entire document and bring forward recommendations to this section. The chair will continue to seek out volunteers for this section.
    h. Annex C – Replacement and Remanufacturing of Low Voltage Bus Bars – Jason Beaudoin from Weidmann volunteered for this section. The group will need to decide if the section should remain in the standard. Additional volunteers are needed.
    i. Annex D – Bid Document Checklist section - No volunteers and open for chair to find volunteers. The group will need to decide if the section should remain in the standard.
    j. New Section on High Temperature Insulation Application (including Fiber Optics) Section – Group agreed that there was a need for the section. Gilles Bargone from FISO and Emilio Morales from Qualitrol volunteered. Need additional assistance from manufacturers.
    k. New Section on DGA Interpretation given some of the differences in hydrogen and acetylene generation – There was discussion on the need for this section; however, some participants were concerned with the scope was too large and the experts needed for this section are in other working groups that deal specification with DGA interpretation. Other participants stated that the existing interpretation guides are useful and applicable. It was determined to be too much for the working group to consider and therefore will not be accepted as a new section.
6. The chair will request from IEEE SA that the latest draft to be provided in the latest IEEE format and template. Then the chair will upload the current working draft to the IEEE Transformers Committee website.
7. The next working group meeting will be in Kansas City, MO during the Fall 2023 Transformers Committee Meeting.
8. The meeting adjourned at 12:00 CDT.

Attendance Record:

Status as of 3/30/2023	Last Name	First Name	Affiliation
Member	ALAHMED	ALEX	EVERGY
Guest	BARGONE	GILLES	FISO
Guest	BEAUDOIN	JASON	WEIDMANN
Guest	BINDER	WALLACE	WBBINDER CONSULTANT
Guest	BOETTGER	WILLIAM	BOETGER TRANSFOMER CONSULTING LLC
Member	CARRIZALES	JUAN ALFREDO	PROLEC-GE
Guest	CHAKRABORTY	ARUP	DELTA STAR INC
Guest	COKER	ANTHONY	M&I MATERIALS
Guest	COLOPY	CRAIG	CONSULTANT
Member	CORSI	DOMENICO	Doble Engineering Co.
Guest	DEBASS	SAMSON	EPRI
Guest	DOOR	JEFFREY	THE H-J FAMILY OF COMPANIES
Chair	DUGAN	ROGER	EPRI
Guest	GRIESACKER	BILL	WILLIAM GRIESACKER AND ASSOC.
Member	GUSTAUSSON	NIKLAS	HITACHI ENERGY
Guest	HIPCHEN	JOHN	COPPER DEVELOPMENT ASSOC.
Guest	KAPKA	SERGIUR	HITACHI ENERGY
Guest	KAZMIERCZAK	JERZY	HITACHI ENERGY
Guest	KENNEDY	SHELDON	NIAGARA TRANSFORMER
Guest	MORALES-CRUZ	EMILIO	QUALITROL
Guest	MUSGROVE	RYAN	OG&E
Guest	NEWBILL	MARK	HITACHI ENERGY
Guest	REHKOPF	SEBASTIAN	MR GERMANY
Member	SANDSTEN	LINA	HITACHI ENERGY
Guest	SAUER	DAN	EATON
Guest	SAWANT	ANIL	VIRIGINA TRANSFORMER
Guest	SNYDER	JASON	FIRST ENERGY CORP
Guest	SOM	SANJIB	PTTI
Guest	VARNELL	JASON	Doble Engineering Co.
Guest	VIERECK	KARSTEN	MR GERMANY
Member	WEYER	DANIEL	MONOLITH CORP
Member	WILLIAMS	TRENTON	ADVANCED POWER TECHNOLOGY
Guest	WHITTEN	CHRISTOPHER	HITACHI ENERGY

Attachment K4.12

WG – C57.107
IEEE / PES Transformers Committee

Recommended Practice for Developing Short-Term Overexcitation V/Hz Curves for Transformers Directly Connected to Generators

Tuesday, March 21, 2023, 1:45PM – 3:00PM, CDT
Hyatt Regency Milwaukee Regency B

Joe Watson – Chair Ramsis Girgis – Vice Chair Drew Welton – Secretary

The meeting started at 1:45PM.

There were 17 of 24 members and 34 guests present and signing the roster, allowing for a Quorum. Following the meeting 2 guests who requested membership were added as members.

The group unanimously approved the agenda and minutes of the Fall 2022 meeting that had been sent out to members and guests with the meeting notice.

The Patent and Copyright issues were discussed and no concerns were raised.

Chair's Remarks

The focus of the meeting was final resolution of the editorial and technical comments on the straw ballot for Draft 2 of the document. A summary of the comments was prepared by Drew Welton and presented by the chairman to the WG. The objective was to approve the final draft in preparation to submit to the subcommittee.

Areas of Discussion

There were 5 main areas of discussion.

Page 1,1.1 Scope, line 8, For consistency and clarity, the phrase, "…duration increases in the voltage and/or frequency levels", was proposed to change to "…duration increases in the V/Hz ratio". This was unanimously approved by the group, pending approval of changing the scope. After discussions with IEEE SA, this will be modified to "…duration increases in the Voltage per Hertz (V/Hz) ratio."

Page 1, 1.2 Purpose, line 7,8 a change was recommended to include the word, "directly connected to generators." Unanimously approved by the group.

Page 4, Procedure for developing short-term overexcitation criteria for power transformers, lines 28-32, shall remain as stated.

In reference to recommended changes to update the references to NERC PRC-24-2 and other NERC documents, the group unanimously decided to remove the -2, as NREC will at times change the revision number, but should not affect the purpose of the reference for this document.

After some discussion, it was decided not to add general Transformer design formulas, or a new subsection on reducing the risk of failure due to overexcitation, to this document since the main purpose of the document is to specify a general technical procedure of producing the right V/Hz curves for a Transformer Design.

The WG voted unanimously to request approval from the PTSC to move the document, with the above noted editorial changes, to IEEE SA for MEC review and balloting.

New Business

A motion to form a comment resolution group was made by Ryan Hogg, and seconded by David Murry. The motion was unanimously approved.

Meeting Adjournment

A motion to adjourn the meeting was raised by Eduardo Garcia and seconded by Emilio Morales-Cruz. The meeting adjourned at 3:00 PM.

Next Meeting

The WG hopes to complete the balloting process before the next meeting, but we should plan on meeting in Kansas City to either summarize the ballot process or resolve any pending comment resolutions.

List of meeting attendees

Name	Affiliation	Status
Adams, Kayland	Prolec/GE	Member
Alahmed, Alex	Evergy	Guest
Alonso, Carlos H.	Arteche	Guest
Arritt, Bob	EPRI	Guest
Baldua, Juan Alfredo Carrizales	Prolec/GE	Guest
Bernesjo, Mats	Hitachi Powergrids	Member
Boettger, William	Boettger Transformer Consulting	Guest
Bratu, Lorin	Trench	Guest
Colopy, Craig	Retired	Guest
Cruz Valdes, Juan Carlos	Prolec/GE	Member
Dinh, Huan	Hitachi Energy	Member
Garcia, Eduardo	Siemens Energy	Member
Ghosh, Rob	Power System Asset Management Solutions	Guest
Girgis, Ramsis	Hitachi Energy	Co-chair
Gorzin, Ahreza	Black and Veach	Guest
Hernandez, Giovanni	Virginia Transformer	Member
Hogg, Ryan	Bureau of Reclamation	Member
Jensen, Nicholas	Delta-Star	Member
Joshi, Akash	Mott MacDonald	Guest
Kapka, Sergion	Hitachi Energy	Guest
Kerschenbauer, Christoph	Siemens Energy	Guest
Kessler, Stacey	Ulteig Engineers	Guest
Knapp, Evan	Eaton Corp.	Guest

Koshel, Anton	Delta-Star	Guest
Krvavac, Jusuf	Sargent and Lundy	Guest
Li, Weijun	Braintree Electric Light Department	Guest
Mani, Kumar	Duke Energy	Guest
Montanha, Juliano	Siemens Energy	Guest
Morales-Cruz, Emilio	Qualitrol	Member
Murray, David	Tennessee Valley Authority	Member
Newbill, Mark	Hitachi Energy	Guest
Patel, Sanjay Y.	Royal Smit Transformers	Member
Radu, Ion	Hitachi Energy	Guest
Rocque, Tim	Prolec GE	Guest
Sanchez, Albert	Knoxville Utilities Utilities	Guest
Sankarakurup, Dinesh	Duke Energy	Guest
Sarkar, Amitabh	VA Transformer	Member
Schrammel, Alfons	Siemens	Guest
Schweiger, Ewald	Siemens Energy	Guest
Speegle, Andy	Entergy	Guest
teNyenhuis, Ed	Hitachi Powergrids	Member
Thomas, Scott	Hitachi	Guest
Van Dreel, Cole	American Transmission	Guest
Veens, Jos	SGB-Smit	Guest
Watson, Joe	JD Watson and Associates	Chair
Webb, Bruce	Knoxville Utiities Board	Member
Webb, Matthew	GE	Guest
Welton, Drew	Intellirent	Secretary
White, Joe	Power Engineers	Guest
Yang, Fei	Hitachi Energy	Guest
Zamora, Omar Mendel	Prolec	Guest

Attachment K4.13

Task Force for Installation and Maintenance of Power Transformers C57.93
Tuesday, March 21, 2022
3:15 – 4:30 PM
Hyatt Regency
Milwaukee, WI

Chairman: Scott Reed
Vice Chairman: Alwyn VanderWalt
Secretary: Kyle Stechschulte

The meeting was called to order at 3:15 pm by Chair Scott Reed. This is the third meeting for this Task Force. The PAR for this Task Force expires 12/31/29

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

There were 63 guests in attendance. 10 of the 18 members were needed for a quorum. 11 members were present therefore a quorum was achieved. 11 guests, who attended fall 2022 and spring 2023 meetings, asked for membership and membership was granted after the TF meeting. 2 members have not attended Fall 2022 and Spring 2023 TF meetings and are therefore moved to guest status.

Niklas Gustavsson and Christopher Whitten presented on LTC inspection and maintenance. The presentation will be provided to the TF via the website. The flow chart table on the last slide was discussed as being incorporated into the maintenance portion of our document.

There was a discussion on the safety aspect of any maintenance activity we add to the guide, and whether qualified personnel are doing the work. The discussion to counter this argument was to keep any maintenance sections generic in nature and direct the audience to the appropriate OME manual.

There was discussion on removing the maintenance section since it is mostly covered by other standards such as C57.140. A few in the room suggested to leave the maintenance section in the guide and reference the other standards, or maintain the section and include more information.

There was a motion to accept the meeting agenda by Ewald Schweiger. Second was by Ryan Musgrove. The motion carried unanimously.

There was a motion to approve the fall meeting minutes by Evgenii Ermakov. Second was Mickel Saad. The motion carried unanimously.

There was a motion to adjourn at 4:30 p.m. by Brian Sparling. Second was Ewald Schweiger. The motion carried unanimously.

First name	Last name	Affiliation	Membership Status
Alex	Alahmed	Evergy	Guest
Greg	Anderson	GWAnderson & Assoc. Inc	Member

Vivek	Bhatt	Prolec GE	Guest (Membership Granted after meeting)
Wallace	Binder	WBBinder Consultant	Guest
Sanket	Bolar	Oncor	Guest
Samuel	Brodeur	Hitachi Energy	Guest
Jorge	Canto	Alliant Energy	Guest
Cole	Casey	Invenergy	Guest
Eanyoung	Cho	HICO America	Guest
Craig	Colopy	Retired	Guest
Juan Carlos	Cruz Valdes	Prolec GE	Guest
Gabriel	Delgado Zamora	Invenergy	Guest
Paul	Dolloff	East Kentucky Power	Guest
Jesse	Duffy	Nashville Electric Service	Guest (Membership Granted after meeting)
Evgenii	Ermakov	Hitachi Energy	Member
Joe	Faherty	OTC Services	Guest
Marc	Foata	Reinhausen	Guest
Lorne	Gara	Shermco	Member
Eduardo	Garcia	Siemens-Energy	Guest
Brad	Grooms	NTS	Guest
Niklas	Gustavsson	Hitachi Energy	Member
Roger	Hayes	GE Grid Solutions	Guest (Membership Granted after meeting)
Jean Carlos	Hernandez	GT - NEETRAC	Guest (Membership Granted after meeting)
Ronald	Hernandez	Doble	Guest
Ryan	Hogg	Bureau of Reclamation	Guest
Derek	Hollrah	Burns & McDonnell	Guest
Ismail	Guner	Hydro Quebec	Guest (Membership Granted after meeting)
Nathan	Jacob	Camlin Energy	Guest
Christoph	Kerschenbauer	Siemens-Energy	Guest
Rafal	Kowalski	Hitachi Energy	Guest
Bernard	LaBean	Consumers Energy	Guest
Weijun	Li	Braintree Electric Light Dept	Guest (Membership Granted after meeting)
Mario	Locarno	Doble	Guest (Membership Granted after meeting)
Stephanie	Mabrey	Weidmann	Guest (Membership Granted after meeting)
Kumar	Mani	Duke Energy	Guest
Marian	Mohamed	xcel Energy	Guest
Ryan	Musgrove	OG&E	Member
Paul	Mushill	Ameren	Guest
Anthony	Natale	HICO America	Guest
Mark	Newbill	Hitachi Energy	Guest
Joe	Nims	Allen & Hoshall	Guest
Miguel	Plascencia	Pacific Gas & Electric	Guest
Uros	Plecevic	Invenergy	Guest

Daniel	Posadas	Prolec GE	Guest
John	Pruente	Prolec GE Waukesha	Guest
Bradley	Rainbolt	Eaton	Guest
Scott	Reed	MVA	Member
Perry	Reeder	GE	Member
Michael	Richardson	Ameren	Guest
Diego	Robalino	Megger	Guest
Patrick	Rock	American Transmission Co	Guest (Membership Granted after meeting)
Christopher	Rutledge	Dynamic Ratings	Guest
Mickel	Saad	Hitachi Energy	Member
Albert	Sanchez	Knoxville Utilities Board	Guest
Alaor	Scardazzi	Siemens-Energy	Guest (Membership Granted after meeting)
Ewald	Schweiger	Siemens Energy	Member
Steve	Shull	BBC Electgrical Service Inc.	Guest
Rich	Simonelli	Prolec	Guest
John	Sinclair	PPL Electric	Guest
Jason	Snyder	First Energy	Guest
William	Solano	Reinhausen	Guest (Membership Granted after meeting)
Brian	Sparling	Dynamic Ratings	Member
Tommy	Spitzer	City Transformer Service Co.	Guest
Bradley	Staley	Leeward Renewable Energy	Guest
Kyle	Stechschulte	AEP	Member
Charles	Sweetser	OMICRON electronics Corp USA	Guest
Troy	Tanaka	Burns & McDonnell	Guest
Olivier	Uhlmann	Reinhausen Canada	Guest
Matthew	Webb	GE	Guest
Daniel	Weyer	NPPD	Guest
Elliot	White	SDMyers	Guest
William	Whitehead	H2Scan	Guest
Christopher	Whitten	Hitachi Energy	Guest

Attachment K4.15

Unapproved Meeting Minutes

PC57.153 TF Guide for Paralleling Regulating Transformers

Minutes from Spring 2023, Milwaukee 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 21,2023

2. Chairs Remarks

2.1 Essential Patent Claims

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

2.2 Copyright Policy

The Chair showed and briefly reviewed the IEEE slides related to Copyright Policy. There were no comments.

2.3 Participant Behavior

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

3. Attendance

- There were 25 attendees in the meeting
    - 7 members
    - 18 guest
    - 8 guests requested membership
- Quorum check
    - Quorum was achieved

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

4.1. Proposed Meeting Agenda

- Welcome and call to order
- Distribution of sign-up rosters
- Call for Essential Patents
- Review of IEEE-SA Copyright policy
- Chairs Remarks
- Review and approval of the meeting agenda
- Review and approval of the minutes from the fall meeting
- Review results and comments from the straw ballot
- Old Business - None
    - Next Meeting(s)
        - Virtual meeting(s) - TBD
        - October 24, 2023 – Kansas City MO
- Adjourn

Motion was passed to approve the meeting agenda

- Motion – Markus Stank
- 2nd – Dan Sauer
- Unanimous approval

4.2 Approval of the minutes from the last meeting

Motion was passed to approve the minutes from the last meeting

- Motion – Markus Stank
- 2nd – Patrick Rock
- Unanimous approval

5. Old Business

The Chair reviewed the results of the straw ballot of the existing guide. 17 people responded on the straw ballot, 14 votes to approve no changes, 1 vote abstain and two ballotters provided comments:

Submitted Comments:

1. Is any interest to make this document dual logo IEEE/IEC document.
   Discussion: Craig Colopy shared information about possibility of making the document a dual logo document. Markus Stank commented that IEC may not have interest of creating dual logo document but it is something it needs to be investigated.

2. Change “LTC” to “OLTC” throughout the document.
   Discussion: IEEE/IEC Dual logo guides use OLTC. LTC was the appropriate term when the guide was approved in 2015. Working group will follow recommendation from Transformers Committee on whether LTC or OLTC should be used.
3. Update references to the current version of the standards. In many cases the standards which are referenced have been replaced with dual logo standards
4. Update language, figures, and diagrams in several places with content from the newer dual logo standards
5. Concept of Apparent Circulating Current in Annex C should be rewritten. Existing wording and equations could be simplified to make it easier to understand.
6. Add section which addresses paralleling transformers with reverse power flow.
   Discussion: This wasn’t an issue when the guide was first developed but is something which users see on a regular basis today. A new section should be added to cover this topic. All attendees agreed this would be an improvement to the guide.

6. New Business

- The Chair called for a motion to request a PAR from the Power Subcommittee to revise the existing Guide for Paralleling Regulating Transformers
  - Motion – Dan Sauer
  - 2nd – Markus Stank

  Discussion
  Ryan Musgrove posed a question about the need to revise the document title, scope and purpose. Markus Stank elaborated the need of adding section for paralleling transformers with reverse power flow.
  - After short discussion the motion to approve was passed with unanimous vote.

- Motion was made the PAR for the revision document to have the same title as the existing document “Guide for Paralleling Regulating Transformers”.
  - Motion – Dan Sauer
  - 2nd – Patrick Rock
  - Unanimous approval

- The chair presented existing document scope, and motion was made to accept the existing document scope as the scope for the new document.
  - Motion – Dan Sauer
  - 2nd – Patrick Rock
  - Unanimous approval

- The chair presented existing document purpose, and motion was made to accept the existing document purpose as the purpose for the new document.

    - Motion – Markus Stank
    - 2nd – Dan Sauer
    - Unanimous approval

7. The meeting adjourned at 5:15 PM

This was the last TF meeting.

8. Minutes

The minutes were recorded by Zan Kiparizoski – Secretary and reviewed by Mark Tostrud – Chair

TF C57.153 – Participation List, Milwaukee Spring 2023			
Secretary	Zan	Kiparizoski	Howard Industries
Member	Ryan	Musgrove	Oklahoma Gas & Electric
Member	Patrick	Rock	American Transmission Company
Member	Dan	Sauer	Eaton
Vice-Chair	Cihangir	Sen	Duke Energy
Member	Markus	Stank	Reinhausen
Chair	Mark	Tostrud	Dunamic Ratings, Inc.
Guest	Kayland	Adams	Prolec GE
Guest	Edwin	Betancourt	Siemens Energy
Guest	Vivek	Bhatt	Prolec Energy
Guest	Michael	Butti	Hyogung Hico
Guest	Craig	Colopy	
Guest	Viereck	Ikarsten	Reinhausen
Guest	Stacey	Kessler	Ulteig-Engineers
Guest	Bernard	LaBean Jr.	Consumers Energy
Guest	Weijun	Li	Braintree Electric Light Dept.
Guest	Luis	Machain	Prolec GE
Guest	Kevin	Mazzei	Black & Veatch
Guest	Kent	Miller	
Guest	Francis	Mills	Power Engineers
Guest	Frank	Nedev	Trench
Guest	Ismael	Nojo	Eaton
Guest	Rodrigo	Ronchi	WEG Transformers
Guest	Yuri	Rossini	Siemens Energy
Guest	Marnie	Roussell	Entergy
Guest	Stefan	Schindler	Reinhausen
Guest	Brian	Sparling	Dynamic Ratings, Inc.
Guest	Mike	Spurlock	Spurlock Engineering Services
Guest	Jacob	Thielbar	WAPA