Dielectric Tests Subcommittee

April 28th, 2021
Virtual meeting

Dielectric Tests Subcommittee		
Chair: Ajith M. Varghese	**Vice-Chair: Thang Hochanh**	**Secretary: Poorvi Patel (not present)**
Room: Virtual	Date: April 28th 2021	Time: 11:00 am to 12:15 pm
Total DTSC Members: 155	Members present at the meeting: 109	Attendance according AMS: 204
Guests present: 95	Membership requested: 3	Membership accepted:2

B.1 Chair's Remarks

The Chair welcomed members and guests to the Fall 2021 virtual meeting. The Chair briefly highlighted the requirement that while introducing one need to state their employer/ company and sponsor if the difference from the company. This is especially important in a virtual setting. The chair also reminded that IEEE and transformer committees are non-commercial organizations and standards shall focus only on developing performance and functional requirement and not design and construction details. The following three points should be kept in mind for all WG/TF leaders:

- No Commercial activities or discussions of Cost, T&C, patent claims, etc. should be discussed in the meetings
- Discussions should only be of pure technical nature
- Diversity in important – thus Chair, secretary and Vice-chair should not be from the same company.

The Unapproved minutes from the Spring 2021 meeting and the agenda for Fall 2021 meeting was sent out to members and guests 14 days before the Fall virtual meeting, and it's also posted on the website.

All TF and WG **MUST** record the attendance in the AM System (no expectations that the meeting was held in an virtual setting) - The WG/TF minutes do need to include the list of attendees. The attendance for the virtual meetings should be recoded with the Poll feature in Webex and WG/TFs are urged to keep website information current. Any presentation presented during the meetings should be posted.

All attendees should have updated information, such as email address in the AM system, as for all correspondence, this system is used.

The Chair reminded the WG/TF leaders that if a PAR extension is needed – this should have a WG approval before proceeding. However, the WG should try to complete the revision/guide within the given timeline. If the document is almost complete and new information comes to attention, in that case the WG-leader makes the call to include it or if the new information could wait until the next revision.

To keep the PAR timeline it is also recommended to have on-line meetings between the scheduled Fall and Spring meetings- to get the revision work moving. The on-line working meeting agenda should be posted before the meeting as well as minutes and attendance should be recorded.

The Chair reminded the WG and TF leaders to submit their minutes from the meetings within **15 days** to the SC chair and secretary. Since the Fall meeting was moved the SC Secretary then must submit the SC minutes by December 15th 2021. To minimize revision and errors in the sub-committee level and transformer committee level minutes, please send the final version of your minutes.

The Chair advised the WG/TF leaders to in advance before the DTSC meeting to submit any important motions or new Agenda to be discussed and approved during the DTSC meeting to the Chair. Motion could also be posted on the chat during the meeting.

The Chair reminded WGs that call of the patent is required a during every WG meetings including on-line/Teleconference meeting. If there are any patent claim, it shall be noted but not discussed at the working group meetings. Calls for Patents is not required for TF.

Highlights from ADCOM- There is a concern of increasing request of PAR extensions, and many may not get extended.
PAR Extensions- before the PAR is requested to be extended please consider the following:

- Focus on timely completion and plan to avoid extensions.
- Encourage Offline meetings – Agenda, Quorum and Minutes are needed
- Avoid scope creep and last minutes additions
- WG should get opportunity to discuss and shall approve extension
- Same shall be documented in minutes

AM Systems will no longer be available from **31st of December 2021**:

- WF/TF leaders and secretary please make sure to backup past information
- AM System MUST be used for attendance tracking for now until it goes away.

Per new guidelines from IEEE, Audio/Video recording or photography is not allowed during SC, WG and TF meetings. In this virtual setting the sessions will be recorded and sent to the secretary for assisting in writing the minutes of meeting. The recording will be deleted after the use.

The Chair shared details of upcoming PES sponsored meeting as well as details of next transformer committee. The Spring committee meeting will be held in Denver, CO on the 27th -31th of March 2022. Fall 2022 meeting will be held in Charlotte, NC on the 16th -20th of October 2022 and Spring 2023 Transformer meeting is planned to be March 19th -23th in Milwaukee, WI.

The Current Status of PARs was presented by The Chair.

- C57.127 Guide for the Detection of Acoustic Emissions from Partial Discharges in Oil-Immersed Power Transformers was published in 2019. Next revision 2028. Currently is inactive.

- C57.160 Guide for the Elec. Measurement of PD in HV Bushing and Instrument Transformers is in ballot resolution. The guide expired in 2020. Par is exteded to 2022.

- C57.113 Recommend Practice for Partial Discharge Measurement Power - Par expires 2021. The guide expired in 2020. The WG approved a motion to apply for PAR extension to December 2023.

- C57.98 Guide for Transformer Impulse Tests. The Guide expires 2021 and Par expires in 2022. No major changes needed, so should be in good shape.

- C57.138 Recommended Practice for Routine Impulse Tests for Distribution Transformers. Par for initiating a WG meeting needs to be established as the guide expire until 2026. There is an opening for Chair and secretary- if you are interested contact DTSC chair or secretary.

- C57.161 Guide for DFR Measurements is approved and published 2018. There is no activity on as the guide as it does not expire until 2028.

- C57.168 Low-Frequency Test Guide is a new guide; PAR expires 2022.

- C57.200 Bushing Frequency Domain Spectroscopy Guide (ENTITY WG) is a new guide. PAR expires in 2022.

If PAR extension is needed the last date for that next year is **13 October 2022**.

The chair reminded the WG on attendance requirement for membership and the continuation and the requirement to have attendance updated in AM system, i.e., to attend two out of last three meetings or three out of five last meetings.

If you want to request a membership- please email the secretary 3 guest email requested membership and 2 were granted membership and no members were moved to guest status. The total membership of the Dielectric Subcommittee is today 161 members. To obtain Quorum 80 members is required.

B.2 Quorum, Approval of Minutes and Agenda

In this virtual meeting the quorum was performed with the WebEx pooling system. According to the poll results total attendance were 204. Members attendance was 109. And 25 requested membership and 23 members were granted.

Attendance Summary

	Webex
Total Attendees	204
Total # Of Members	161
Members Present	109
Quorum Present	YES (68%)

The virtual DTSC meeting had quorum.

The chair presented the agenda. Pierre Riffon and Dan Sauer moved a motion for approval of the fall agenda. The Agenda was unanimously approved.

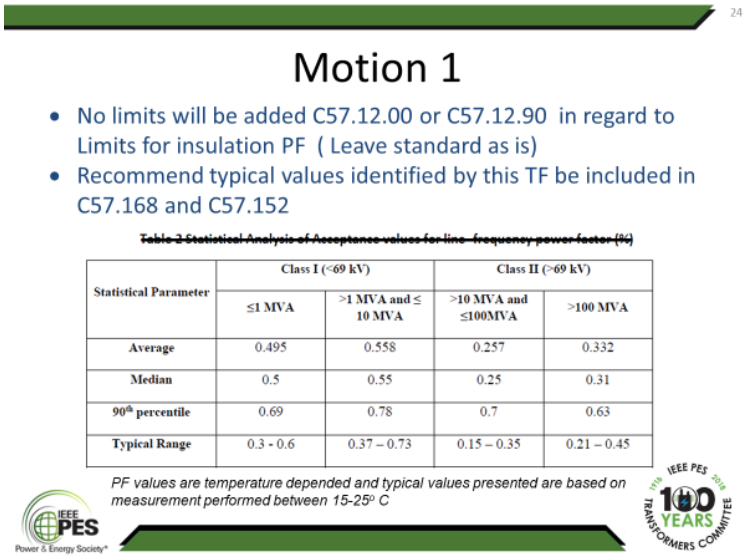
The minutes of the Fall 2020 Virtual meeting was presented. Dan Sauer and Hugo Flores made motion to move the minutes for approval. The Spring 2021 minutes was approved unanimously.

B.3 SC Discussions and Motion passed.

In the Fall meeting old business was discussed prior to WG/TF reports. During the meeting there was no time to go over the highlights from all the WG/TF.

The Task force for Winding Insulation Power Factor & Winding Insulation Resistance Limits had brought five motions for approval to the DTSC. A lot of discussion were around the three first motions. Motion 4 and 5 will be brought up in the next DTSC as old business as there was no time to discuss these motions during the Fall 2021 DTSC meeting.

Motion 1



Diego made a motion – No limit will be added in regards of limits of PF but include recommendation typical values in C57.168 and C57.152. Ali Naderian second of the motion. There were some discussions. Bruce Forsyth made a motion to amend the wording to "Recommend typical value identified by this task force to be included in C57.168 and C57.152. Dan Sauer second this amendment. Amended Motion was passed through a poll:

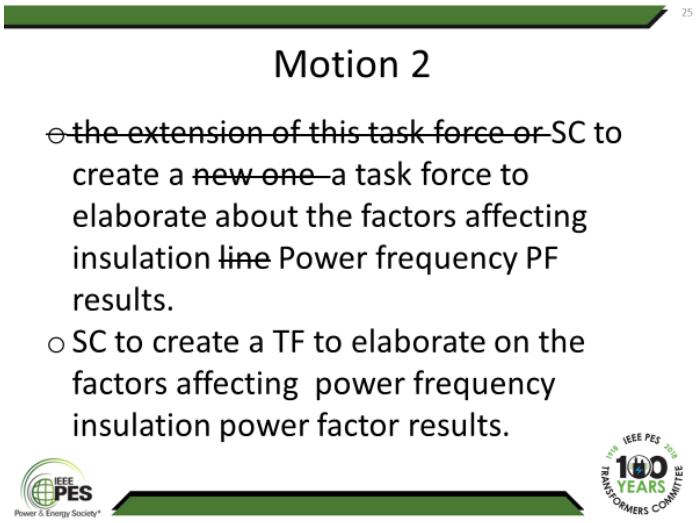
A.For 54/198 (27%)
B.Against 7/198 (4%)
C.Abstain 15/198 (8%)
No Answer 122/198 (62%)

The Main motion – No limits will be added C57.12.00 or C57.12.90 in regard to Limits for insulation PF (Leave standard as is). Recommend typical values identified by this TF be included in C57.168 and C57.152. Including table. Motion was passed through a poll.

A.For 57/199 (29%)
B.Against 9/199 (5%)
C.Abstain 15/199 (8%)

No Answer 118/199 (59%)

Motion 2



Diego made a motion 2- Recommend the extension of this task force or create a new one to elaborate about factors affecting insulation line frequency PF results. Don Dorris second the motion. Discussions- the motion is unclear. Dan Sauer amended the motion to state- SC to create a new TF to elaborate on the factors affecting line frequency insulation power factor results. Hugo Flores second this amendment. Mario Locarno made amendment to Dan Sauersto state Power frequency instead of Line Frequency. Tony Franchetti second that amendment. Dave Geibel suggested to table the main motion to create a new motion. Dan Sauer second that. No opposition on Table the main motion. New wording. SC to create a new TF to elaborate on the factors affecting line frequency insulation power factor results. Dan Sauer motion 1 – Mario Locarno second motion– no opposition – motion approved to create a new TF.

Motion 3

Motion was made by Diego to vote for Motion 3 electronically and park Motion 4 and Motion 5 to the next DTSC meeting. Dave Murrey second that motion. No opposition. Motion was approved. An email will be sent out for Motion 3.

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Motion 3

- Modify section 10.10.2 of C57.12.90 and section 9.7.6.4 of C57.15-2018 related to instrumentation accuracy as below:

> **10.10.2 Instrumentation**
>
> The insulation power factor may be measured by special bridge circuits or by the voltampere-watt method. The accuracy of measurement should be within ± 0.25% insulation power factor, and the measurement should be made at or near a frequency of 60 Hz.

a. Proposed IEEE C57.12.90 Section 10.10.2.

10.10.2 Instrumentation
The insulation line-frequency power factor or dissipation factor may be measured by special bridge circuits or by the voltampere-watt method. The accuracy of the measurement instrumentation at or near rated frequency should be:
- **For Insulation Power Factor (DF) Below 1%: ±2% of reading ± 0.05% absolute**
- **For Insulation Power Factor (DF) Above 1%: ±5% of reading ± 0.05% absolute**

b. Proposed IEC 60076-21 / IEEE C57.15-2018 Section 9.7.6.4

9.7.6.4 Instrumentation
The insulation line-frequency power factor or dissipation factor (DF) may be measured by special bridge circuits or by the voltampere-watt method. The accuracy of the measurement instrumentation at or near rated frequency should be:
- **For Insulation Power Factor (DF) Below 1%: ±2% of reading ± 0.05% absolute**
- **For Insulation Power Factor (DF) Above 1%: ±5% of reading ± 0.05% absolute**

Motion was passed to vote on this electronically

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Planned Motion 4

- No limits will be added to C57.12.00 or C57.12.90 in regard to Limits for insulation Resistance (Leave standard as is)

Due to shortage of time this was not discussed during SC

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Planned Motion 5

- Recommend extending this task force or creating a new TF / WG as appropriate to develop a best testing practices for IR testing on transformers including factors affecting IR results.

Due to shortage of time this was not discussed during SC

B.4 Taskforce and Working Group Reports

B.4.1 Working Group Low-Frequency Dielectric Testing for Distribution, Power and Regulating Transformers

Unapproved Meeting Minutes
Virtual - WebEx | November 16th, 2021 | 9:25 – 10:40 AM CDT

Chair: Dan Sauer
Vice Chair: -
Secretary: -

Meeting Attendance
The working group met at 9:25AM CST. There were 88 attendees and 18/36 members present. Quorum was not achieved (one short).

Attendance

	WebEx
Total Attendees	88
Total # Of Members	36
Members Present	18
Quorum Present	50%

Membership
Three guests requested membership, two met the qualifications and will be moved to membership. One volunteered to be our new secretary**:** Serigo Herandez Cano – thanks & welcome.

Discussions
- No essential patent claims noted.
- The IEEE copyright policy was shown, no objections were noted.
- The chair noted that the WG is currently seeking a secretary.

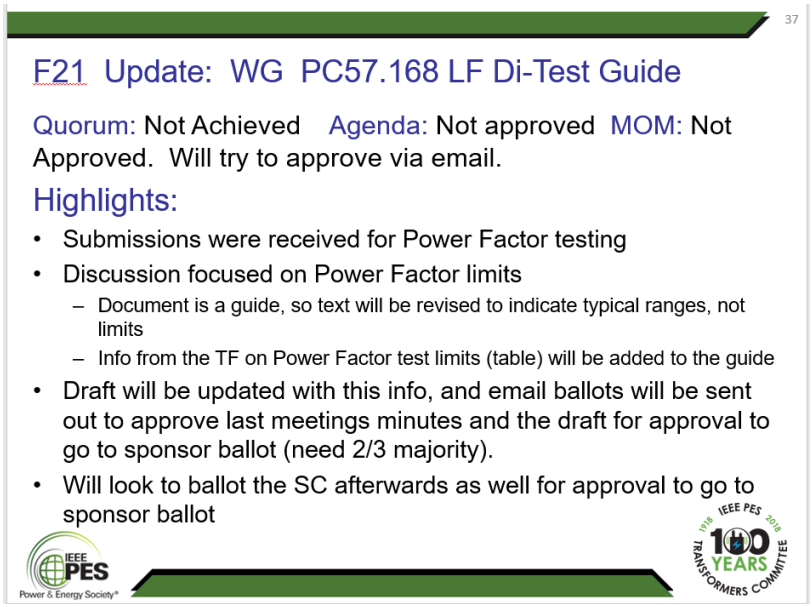
Old Business
- Section 7 – Insulation Power Factor Testing
  - Change “limits” to typical ranges since document is a guide
  - Values from the TF on Insulation Power Factor will be forwarded to us. Diego Robalino volunteer to assist in the rewrite of that section and to include the new values from his TF

New Business
- The chair mentioned that the PAR is valid until December 2022

- Since quorum was not achived, the previous minutes will be circulated for email approval and the final draft of the document will be circulated for approval to go to ballot.

Meeting ended after the discussion since there was no quorum.

Dan Sauer



Attendee List:

Name	Company
Stephen Antosz	Stephen Antosz & Associates, Inc
Wallace Binder	WBBinder Consultant
William Boettger	Boettger Transformer Consulting LLC
Sanket Bolar	Megger
Dominique Bolliger, Ph.D.	HV TECHNOLOGIES, Inc.
Jeffrey Britton	Phenix Technologies, Inc.
Jagdish Burde	Virginia Transformer Corp
David Calitz	Siemens Energy
Kurt Carlson	V&F Transformer
Juan Alfredo Carrizales	Prolec GE
Sudip Chanda	Virginia Transformer Corp.
John Crouse	Roswell Alliance
Eric Davis	Burns & McDonnell
Sami Debass	Electric Power Research Institute (EPRI)
Thomas Eagle	SPX Transformer Solutions, Inc.
Marco Espindola	Hitachi Energy
Feras Fattal	Manitoba Hydro
Reto Fausch	RF Solutions
Lorne Gara	Shermco
Eduardo Garcia Wild	Siemens Energy
Rob Ghosh	General Electric
Detlev Gross	Power Diagnostix Consult GmbH
Sergio Hernandez Cano	Hammond Power Solutions
Philip Hopkinson	HVOLT Inc.
Stephen Jordan	Tennessee Valley Authority
Gary King	Howard Industries
Alexander Kraetge	OMICRON electronics Deutschland GmbH
David Larochelle	NDB Technologies
Moonhee Lee	Hammond Power Solutions
Mario Locarno	Doble Engineering Co.
J. Benjamin Lopez	--
Xose Lopez-Fernandez	Universidade de Vigo
Richard Marek	Retired
Robert Mayer	San Diego Gas & Electric
Matthew McFadden	Oncor Electric Delivery
Manoj Kumar Mishra	ASAsoft (Canada) Inc
David Murray	Tennessee Valley Authority
Brady Nesvold	Xcel Energy

Rodrigo Ocon	Industrias IEM
Robert Page	EATON Corporation
Rakesh Patel	Hitachi Energy
Pranav Pattabi	METSCO Energy Solutions Inc.
Harry Pepe	Phenix Technologies, Inc.
Adam Polson	Arizona Public Service Co.
Alvaro Portillo	Ing. Alvaro Portillo
Bertrand Poulin	Hitachi Energy
Ion Radu	Hitachi Energy
Diego Robalino	Megger
Tim Rocque	SPX Transformer Solutions, Inc.
Amitabh Sarkar	Virginia Transformer Corp.
Daniel Sauer	EATON Corporation
Jeffrey Schneider	Power Partners/Spire Power Solutions
Cihangir Sen	Duke Energy
Hemchandra Shertukde	University of Hartford
Christopher Slattery	FirstEnergy Corp.
Mike Spurlock	Spurlock Engineering Services, LLC
Fabian Stacy	Hitachi Energy
Kyle Stechschulte	American Electric Power
Hampton Steele	Tennessee Valley Authority
Janusz Szczechowski	Maschinenfabrik Reinhausen
Ajith Varghese	SPX Transformer Solutions, Inc.
Jos Veens	SMIT Transformatoren B.V.
Loren Wagenaar	WagenTrans Consulting
David Wallach	Duke Energy
Alan Washburn	Burns & McDonnell
Peter Werelius	Megger
Malia Zaman	IEEE
Shibao Zhang	PCORE Electric
Waldemar Ziomek	PTI Transformers

B.4.2 WG C57.113 - Recommended Practice for PD Testing,

Ali Naderian – Chair, Janusz Szczechowski – Vice Chair
John Foschia – Secretary
VIRTUAL MEETING | November 15th, 2021 | 12:55 pm – 13:51 pm CT

Chair: Ali Naderian

Vice Chair/Secretary: Janusz Szczechowski

Meeting Attendance

The working group met virtually at 12:55 pm CT (7:55 pm CET). There were 63 attendees, and 10 members present. Quorum was achieved at 56 %.

Discussions

- The essential patent slides were shown, and no patent claims were noted.
- The copyright policy and important links to additional document were shown.
- Agenda of the meeting (Motion for approval 1. Amitabh Sarkar and 2. Ajith Varghese) and the Spring 2021 Meeting Minutes (Motion for approval 1. Detlev Gross and 2. Reto Fausch) were approved anonymously.
- The chair explained situation with vacant position for working group secretary and asked for volunteers.
- The presentation of Annex A: Coupling methods and circuits was held by Detlev Gross. Basic capacitive coupling circuit was presented with additional information regarding cable connection and impedance matching as well as inductive coupling methods. After presentation there was a short discussion regarding calibration of the circuit.
- Update on the IEC60207 working progress was given to the audience by Detlev Gross. Estimated finalizing of the document during 2022.
- Detlev Gross recommended that chapters 4 and 5 of C57.113 may be useful for inclusion into the IEEE document regarding partial discharge measurements of dry type transformers. Members and the chair agreed to this recommendation.
- Short discussion regarding calibration of the (performance check) of the measuring devices.*'*
- No new businesses were recorded.
- The meeting was adjourned (Motion 1. Detlev Gross and 2. Reto Fausch) at 01:51 pm CT (08:51 pm CET).

Janusz Szczechowski (11.16.2021)

Role	First Name	Last Name	Company
Guest	Joe	Watson	JD Watson and Associates Inc.
Guest	Steven	Snyder	Hitachi Energy
Guest	Bertrand	Poulin	Hitachi Energy
Guest	Gary	King	Howard Industries
Guest	Jeffrey	Britton	Phenix Technologies, Inc.
Guest	Alain	Bolliger	HV TECHNOLOGIES, Inc.
Guest	Allan	Bartek	Spruce Run Engineering LLC
Member	Reto	Fausch	RF Solutions
Guest	Marnie	Roussell	Entergy
Guest	Waldemar	Ziomek	PTI Transformers
Guest	Ross	McTaggart	Trench Limited
Guest	Mike	Spurlock	Spurlock Engineering Services, LLC
Guest	Alexander	Kraetge	OMICRON electronics Deutschland GmbH
Guest	Rodrigo	Ocon	Industrias IEM
Guest	Hakan	Sahin	Virginia/Georgia Transformer
Guest	Mark	Tostrud	Dynamic Ratings, Inc.
Member	Ajith	Varghese	SPX Transformer Solutions, Inc.
Guest	Baitun	Yang	R.E. Uptegraff
Member	Harry	Pepe	Phenix Technologies, Inc.
Chair	Ali	Naderian	METSCO Energy Solutions Inc.
Guest	Leopoldo	Rodriguez	Transformer Testing Services LLC
Member	Fernando	Leal	Prolec GE
Guest	Eric	Schleismann	Southern Company Services
Guest	William	Solano	Instrument Transformer Equip Corp
Member	Detlev	Gross	Power Diagnostix Consult GmbH
Member	David	Larochelle	NDB Technologies
Member	Amitabh	Sarkar	Virginia Transformer Corp.
Guest	Anthony	Franchitti	PECO Energy Company
Guest	Jeffrey	Gragert	Xcel Energy
Guest	Arup	Chakraborty	Delta Star Inc.
Guest	Peter	Sheridan	SGB USA, Inc.
Guest	Jorge	Cruz	PTI Transformers
Member	Dr. Alexande	Winter	HIGHVOLT Pruftechnik Dresden
Guest	Daniela	Ember Baciu	Hydro-Quebec IREQ
Guest	Feras	Fattal	Manitoba Hydro
Member	Dominique	Bolliger, Ph.D	HV TECHNOLOGIES, Inc.
Vice-Chair	Janusz	Szczechowsk	Maschinenfabrik Reinhausen
Guest	Brady	Nesvold	Xcel Energy
Guest	Deepak	Kumaria	Applied Materials
Member	Dan	Schwartz	Quality Switch, Inc.
Member	Dervis	Tekin	Meramec Instrument Transformer Co.
Guest	David	Calitz	Siemens Energy
Guest	Dmitriy	Klempner	Southern California Edison
Guest	Kyle	Stechschulte	American Electric Power
Guest	Shawn	Gossett	Ameren
Guest	Matthew	McFadden	Oncor Electric Delivery
Guest	Jeffrey	Door	H-J Family of Companies
Guest	Risto	Trifunoski	Trench Limited
Guest	Brandon	Dent	Memphis Light, Gas & Water
Guest	Jaroslaw	Chorzepa	ABB Inc.
Guest	Michael	Warntjes	American Transmission Co.
Guest	Jacques	Vanier	Electro Composites (2008) ULC
Guest	Taylor	Gray	Portland General Electric (PGE)
Guest	Kannan	Veeran	Georgia Transformer
Guest	Hampton	Steele	Tennessee Valley Authority
Guest	Juan Alfredo	Carrizales	Prolec GE
Guest	Markus	Soeller	Power Diagnostix
Guest	Evan	Knapp	EATON Corporation
Guest	Nathan	Katz	PacifiCorp
Guest	Sudip	Chanda	Virginia Transformer Corp.

F21 Update: WG C57.113 PD Measurement Guide

Quorum: achieved 56% (10 members)
MOM & Agenda: approved

Highlights:

- Vacant position for secretary
- Chair shared the PAR extension approval of 2 years
- Updates to Annex A was presented by Detlev Gross, proposing to add other sensor technologies such as RFCT.
- Discussion was held regarding the latest development of IEC 60270 and considering harmonization regarding Calibration.

B.4.3 Working Group for Impulse Guide – PC57.98

WG Secretary: John Foschia; WG Chair: Thang Hochanh; WG Vice Chair: Reto Fausch

VIRTUAL MEETING | November 15th, 2021 | 2:20pm – 3:35pm CT

Chair: Thang Hochanh

Vice Chair: Reto Fausch

Secretary: Vacant

Meeting Attendance

The working group met at 2:20pm CT. There were 48 attendees and 12/20 members present. Quorum was met.

Discussions

- An updated membership list was presented based on attendance.
- Through WebEx, a poll was conducted to determine member attendance and requests for membership. Quorum was met with 12/20 members present.
- No copyright or patent concerns were brought to the attention of the WG.
- It was confirmed with the TF on Impulse Test C57.12.90 (Pierre Riffon) that the limitation of 10% on the k-Factor as per Std-4 2013, is resolved.
- The wording of 2 new sections 4.1.,2.1.1 *Test voltage factor procedure when performing chopped waves and 4.1.2.1.2 Test factor and presentation of test results* were discussed within the WG. These clauses will be part of the new revision.
- Some impulses waves which highlight the importance of voltage correction VS the high frequency and high β' of the oscillation of the impulse wave peak, were presented by the chair, Reto Fausch and Jim McBride.

Adjournment

The meeting was adjourned, with a motion by Jim McBride and seconded by Peter Kleine.

Text discussed at the meeting:

4.1.2.1 The transformer effect on the waveshape

……
…… .

4.1.2.1.1 Test voltage factor procedure when performing chopped wave

In general, for liquid immersed transformers the chopped wave is 110% of the full wave, while in Dry-type transformers, the chopped wave is 100%. The test voltage procedure evaluation of a chopped wave of 110% of the wave, should give a peak value of 110% of the full wave.

When the test voltage procedure digital calculation of Vt is inconsistent, the following steps are recommended:

a) Front chopped wave lightning impulse:
There is no correction and Vt is equal to Ve.

b) Tail chopped lightning impulse:
Voltage reduction ratio Method (IEEE Std 4™ 2013, Annex A)

- Apply a reduced full wave (RFW)
- The test voltage procedure provides the test voltage Vt and the peak value Ve of the original recorded curve.
- If Ve is not available, Ve can be determined graphically on the recorded oscillogram
- Calculate the voltage reduction ratio Rv= Vt / Ve
- Apply a full voltage chopped wave, having a recorded voltage V'e.
  The calculate V't is defined as:
  V't= Rv * V'e

c) The value of front time T1 of the reduced full wave (RFW) is used to determine the T1 value of the chopped wave.

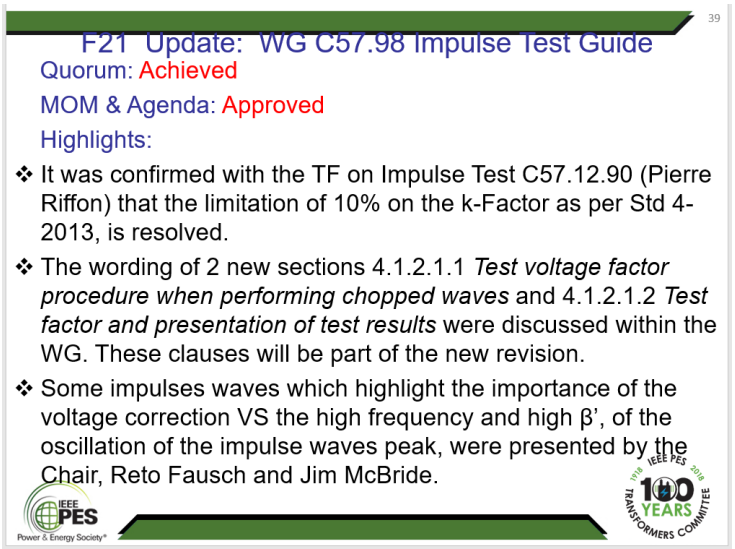
4.1.2.1.2 Test voltage factor procedure and presentation of test results

When the test voltage procedure is enabled, the following test results should be displayed:

- Vt is the test voltage
- ß' is the relative overshoot magnitude

The following optional value should be available for display:

- Ve the peak value of the original noise free recorded curve.



	Members for Fall 2021 meeting		
1	Active	Ajith	Varghese
2	Active	Arup	Chakraborty
3	Active	Babanna	Suresh
4	Active	David	Calitz
5	Active	Deepak	Kumaria
6	Active	Dominique	Bolliger, Ph.D.
7	Active	Dr. Alexander	Winter
8	Active	Eric	Davis
9	Active	Everton	De Oliveira
10	Active	Fernando	Leal
11	Active	James	McBride
12	Active	Jeffrey	Britton
13	Active	Leopoldo	Rodriguez
14	Active	Moonhee	Lee
15	Active	Peter	Kleine
16	Active	Pierre	Riffon
17	Active	Reto	Fausch
18	Active	Sergio	Hernandez Cano
19	Active	Sylvain	Plante
20	Active	Thang	Hochanh

Members	20
Memb. present	12
Quorum	**60%**

Attendance F2021 - C57.98	M.present	Guest	total	Quorum
	12	36	48	12/20=60%
Aaron Meyers		1	1	
Ajith Varghese SPX, Waukesha	1		1	
Alain Bolliger		1	1	
Alan Traut		1	1	
Alan Washburn		1	1	
Alan Wilks		1	1	
Amitabh Sarkar		1	1	
Antonio Ceballos		1	1	
Arup Chakraborty	2		1	
Barrett Wimberly		1	1	
Carlos Gaytan		1	1	
DANIELA EMBER BACIU		1	1	
David Holland		1	1	
deepak kumaria	3		1	
Dejan Vuković		1	1	
Dominique Bolliger	4		1	
Ed Van Vooren		1	1	
Eric Davis	5		1	
Esuardo García		1	1	
Feras Fattal		1	1	
Fernando Leal	6		1	
Hampton Allen Steele		1	1	
Hemchandra Shertukde		1	1	
Jaroslaw Chorzepa		1	1	
Jim McBride	7		1	
John K John		1	1	
Juan Alfredo Carrizales Baaldua		1	1	
Kannan Veeran, GTC		1	1	
Kevin Franklin		1	1	
Mahesh Sampat		1	1	
Malia Zaman IEEE SA		1	1	
Mark Perkins		1	1	
Mike Waldrop		1	1	
Parminder Panesar		1	1	
Patrick Rock		1	1	
Paul Morakinyo		1	1	
Peter Kleine	8		1	
Pierre Riffon	9		1	
Reto Fausch	10		1	
Reza Torabi		1	1	
Ross McTaggart		1	1	
Sergio Hernandez Cano	11		1	
sudip chanda		1	1	
Susan McNelly		1	1	
Tammy Behrens SPX Transformer Solutions		1	1	
Terry Wong		1	1	
Thang Hochanh	12		1	
William Boettger		1	1	

B.4.4 Working Group for PD in bushings, PTs and CTs – PC57.160, WG Secretary: Reto Fausch; WG Chair: Thang Hochanh -Meeting Minutes: VIRTUAL MEETING | November 16th, 2021 | 3:45pm - 5:00pm CT

Meeting Attendance

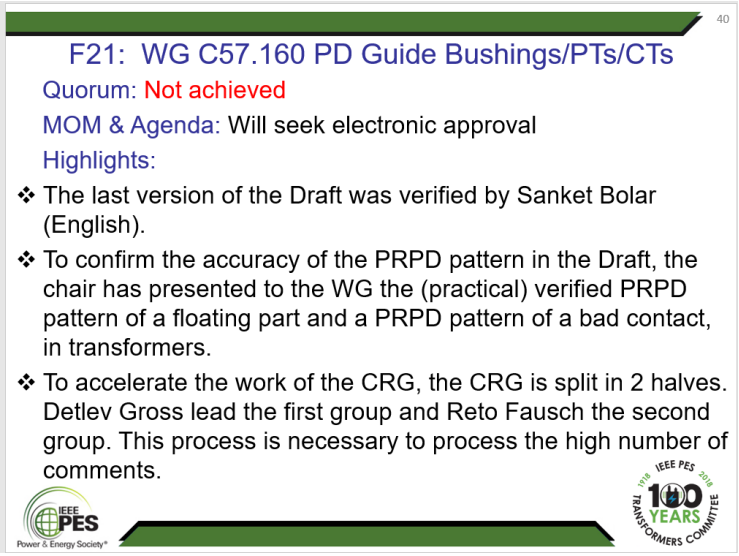
The working group met at 3:45pm CT. There were 34 attendees and 8/20 members present. Quorum was not met.

Discussions

- An updated membership list was presented.
- IEEE Copyright and Patent claim slides were presented. No Copyright or Patent concerns were brought to the attention of the working group.
- The chair mentioned that the Draft was verified by Sanket Bolar (English language).
- To confirm the accuracy of the PRPD patterns mentioned in the Draft, the chair has presented the practical/verified PRPD patterns of a floating part and a bad contact in transformers.
- To accelerate the work of the CRG (Comments Resolution Group), the CRG is split in 2 halves. Detlev Gross accept to lead the first group and Reto Fausch, the second group. This process is necessary to advance quickly in resolving the high number of comments.

Adjournment

The meeting was adjourned, without a motion.



PC 57.160 - MEMBERS FALL 2021		
	First Name	Last Name
1	Bill	Whitehead
2	Daniel	Weyer
3	David	Wallace
4	Deepak	Kumaria
5	Detlev	Gross
6	Eric	Weatherbee
7	Jacques	Vaniier
8	Januz	Szczechowski
9	Jonathan	Cheatham
10	Juan Jose	Ramirez Gomez
11	Lee	Bigham
12	Marcos	Ferreira
13	Pierre	Riffon
14	Reto	Fausch
15	Robert	Middleton
16	Stephen	Oakes
17	Steven	Snyder
18	Thang	Hochanh
19	Thomas	Sizemore
20	Zoltan	Roman

PC 57.160 - MEMBERS & Guests		Members		QUORUM
VIRTUAL MEETING - FALL 2021		20		8/20=40%
First Name	Last Name	Members present	Guest	Attendees
	Count =>	8	26	34
Alain	Bolliger		1	1
Alexander	Kraetge		1	1
Brandon	Dent		1	1
Daniel	Huenger		1	1
David	Wallace	1		1
David	Larochelle		1	1
David	Ellis		1	1
Deepak	Kumaria	1		1
Detlev	Gross	1		1
Dipak	Patel		1	1
Dominique	Bolliger		1	1
Fabian	Stacy		1	1
Feras	Fattal		1	1
Fernando	Leal		1	1
Hampton	Steele		1	1
Jacques	Vanier	1		1
Jaroslaw	Chorzepa		1	1
Jim	McBride		1	1
Jose	Gamboa		1	1
Juan Jose	Ramirez Gomez	1		1
Loren	Wagenaar		1	1
Marek	Kornowski		1	1
Mike	Waldrop		1	1
Muhammad	Abdullah Sohail		1	1
Orlando	Giraldo		1	1
Reto	Fausch	1		1
Risto	Trifunoski		1	1
Rogelio	Martinez		1	1
Rogerio	Verdolin		1	1
Ross	McTaggart		1	1
Sanket	Bolar		1	1
Thang	Hochanh	1		1
Thomas	Sizemore	1		1
William J	Solano		1	1

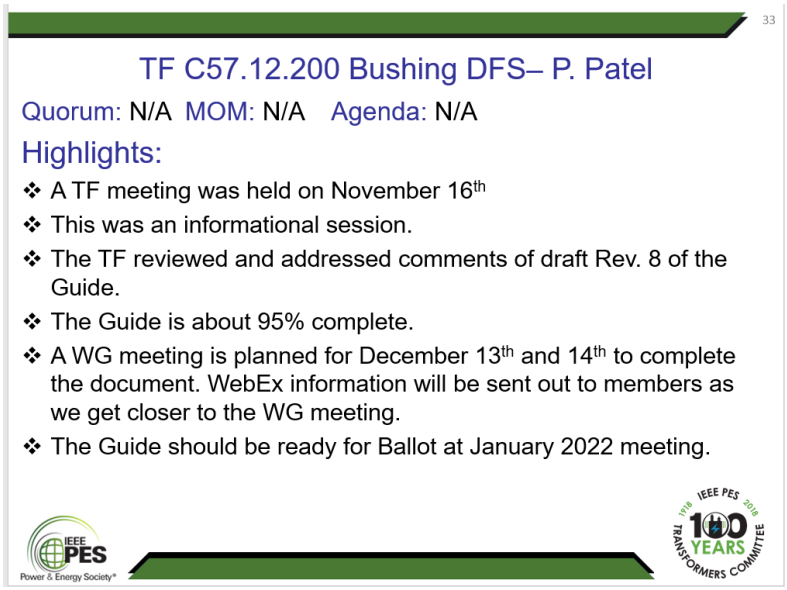
B.4.5 Task Force for Bushing DFR – PC57.12.200, TF Secretary: Diego Robalino; TF Chair: Poorvi Patel; TF Vice Chair: Charles Sweetser.

VIRTUAL MEETING | November 16th, 2021 | 2.20pm – 3.35pm CT

Meeting initiated by Vice Chairperson Sweetzer at 2:20 PM Central time.

- Attendance verified with the system poll, counted 24 attendees at the beginning of the meeting
- The Vice-Chair presented the agenda and went through the Chairs remark.
- The TF reviewed and addressed editorial comments of draft Rev. 8 of the Guide- presented by Mario Locarno and Mikel Saad.
- The Guide is about 95% complete.
- A WG meeting is planned for December 13th and 14th to complete the document. WebEx information will be sent out to members as we get closer to the WG meeting.
- The Guide should be ready for Ballot at January 2022 meeting.
- Meeting was adjourned at 3.35 pm Central time.

****



Attendee list

First Name	Last Name	Company
Peter	Zhao	Hydro One
Charles	Sweetser	OMICRON electronics Corp USA
J. Arturo	Del Rio	Siemens Energy
Shibao	Zhang	PCORE Electric
John	Herron	Raytech USA
Peter	Werelius	Megger
Mario	Locarno	Doble Engineering Co.
Diego	Robalino	Megger

Fernando	Leal	Prolec GE
Hugo	Flores	Hitachi Energy
William	Solano	Instrument Transformer Equip Corp
Ronald	Hernandez	Doble Engineering Co.
Christopher	Whitten	Hitachi Energy
Alvaro	Portillo	Ing. Alvaro Portillo
Christopher	Slattery	FirstEnergy Corp.
Matthew	Weisensee	PacifiCorp
Ismail	Guner	Hydro-Quebec
Sanket	Bolar	Megger
Wesley	Schrom	Carolina Dielectric Maint & Testing Co.
Mickel	Saad	Hitachi Energy
Evgenii	Ermakov	Hitachi Energy
Olle	Benzler	Megger
Jacques	Vanier	Electro Composites (2008) ULC
Rakesh	Patel	Hitachi Energy
Giovanni	Hernandez	Virginia Transformer Corp.
Daniel	Huenger	PCORE Electric
Cole	Van Dreel	American Transmission Co.

B.4.6 TF on Revision of Low-Frequency Tests

Virtual Meeting – November 16th , 2021 12:55-2:10PM CT,
Chair: Bill Griesacker, Vice Chair: Daniel Blaydon (acting secretary), Secretary: Myron Bell (not present).

1. The meeting was called to order at 12:56 PM.

2. A poll was conducted via Webex to determine whether a quorum was present. Based on the preliminary results, a quorum was achieved.

   Attending members were counted and quorum was verified by the Webex Report, which is provided in summary below:

Attendance

	Webex
Total Attendees	71
Total # Of Members	58
Members Present	33
Quorum Present	57%

3. The chair requested the working group to approve the the meeting agenda. There were no objections to unanimous approval of the agenda.

4. The chair requested the working group to approve the meeting minutes from the Spring 2021 Transformers Committee meeting held virtually. There were no objections to unanimous approval of the meeting minutes.

5. Task Force on PD Testing of Class 1 Power Transformers report by Don Ayers (Appendix A – Meeting Minutes)

   Don provided a summary report on the Task Force meeting that occurred on Monday, November 16th. Proposed wording changes to PD testing requirements in C57.12.00 have been developed. This will require changes to Table 4 to include lower voltage classes not presently in the table. It was discussed that completing all columns of this table (including BIL, applied voltage test, etc) would be outside the scope of this TF. Proposed changes to the PD testing procedures have also been developed for C57.12.90. It was noted that due to the new PD limits introduced in the new standard revision, it will be suggested to split out the PD limits for Class I transformers into a different section with potentially different limits.

Additional discussion took place on insertion of Class I transformers into Table 4 of C57.12.00. The Chair suggested that this TF develop further recommendations on how to incorporate this.

The Chair suggested that a survey be conducted within the RLFTF to determine the level of acceptance of the recommendations.

A suggestion was offered to provide more than two options for Class I PD testing. Now there is no test, a Class II type test and it was questioned if a third short PD test would be appropriate for high volume production environments, such as a 5 minute PD test.

6. PD In Bushings During Factory Testing

The chair provided a summary of the past surveys on this topic and update on current status. At the last meeting, the topic was given back to the Dielectric test and Bushing Subcommittees. This topic is no longer being discussed within this TF.

7. Study Group – Factory PD Limits (Appendix B – Meeting Minutes

The chair provided a summary of the past TF actions on this topic. A summary of the study group's proposal was presented, which at a high level has the objective that no dectable PD be present at maximum system voltage following the 1 hour test. The proposed PD limit at this test level is 100 pC, which is based on the IEC standard for PD testing. Also included are some revisions to the current test procedure such as making measurements every 3 minutes.

The Task Force offered various comments on this proposal, focused on the proposed test levels and durations. The details of this proposal will be sent out for comment and the results will be reviewed during the next meeting.

8. Old business

C57.12.90 Ballot Resolution Group

Comments from the balloting of this standard relating to low frequency tests were reviewed by members of this task force and the resolution to these comments was incorporated into the new C57.12.90 standard. This resolution group work is completed.

9. New business

A comment was brought before the TF that there are inconsistencies in the multipication factors applied in the Table 4 PD test levels. It was noted that these inconsistenices are recognized as the current industry practice and there has not been interest in revising these factors.

10. The meeting was adjourned at 2:12 p.m.

Appendix A

Minutes for Task Force on PD Testing of Class 1 Power Transformers
Document: Partial Discharge Testing of Class 1 Power Transformers
Chair: Don Ayers
Vice Chair: Javier Arteaga
Secretary: Israel Barrientos
Meeting Date: Monday 19th of October 2020
Time: 15:45

Attendance:

Members:	19
Guests:	43
Guests Requesting membership:	11
No answer:	03
Total attendance:	76

The meeting was called to order at 15:45 and attendance was recorded via a Poll.
As the Member attendance reached 19, Quorum (>18) was attained.
At this time, the TF heard notice of the recent decease of Member Jitka Fuhr.

The Patent and Copyright Slides were presented, no comments were made.
The Agenda was presented and approved as submitted.
The Ohio Meeting Minutes as published were presented and approved.
A name correction of the minutes was requested (Foscia -> Foschia).

The Bushing Subcommittee help had been requested and the attendance of Stephen Shull (Chair of the WG PC57.19.02 Standard for the Design and Performance Requirements of Bushings Applied to Liquid Immersed Distribution Transformers) was gratefully acknowledged.

When asked for help with the question of Bushing Ratings, Stephen requested some clarification on the Class I Power Transformer Definition.

D. Sauer, P. Hopkinson, D. Ayers, B. Poulin, D. Gross participated in a lively discussion that ensued. No conclusion was reached on this item.

A. Joshi indicated that Black & Veatch tests PD in transformers in a one-per-batch basis and assumes the same performance for the batch.
D. Sauer indicated his concern that the Transformer Components can produce high levels of PD and do not represent a test failure for the transformer.
Z. Weiss indicated that he sees customer requests for PD testing requesting Class II method but carried out at 130% Voltage and 150 pC as limits. And having a 115% Extinction Level.
D. Gross questioned what happened to nuisance trips of PD-affected fuses.

J. Arteaga indicated that the components are manufactured to meet standards other than transformers, and that in particular to PD, they do not meet Transformer PD requirements.
D. Sauer indicated that Load Break Switches are not damaged by fairly high levels of PD´s.
B. Forsythe indicated that the goal of the TF has been to have a procedure to test a transformer with, in case a PD test is specified for Class I PT´s.
A. Varghese indicated that due to the Induced test at 1.8 times the Voltage, this PD test will require a 2x times test time. And he would rather change the Induced Test spec.
D. Ayers indicated that this was outside of our scope but may need to be investigated by others.
O. Avanoma, J. Arteaga, D. Sauer and P. Hopkinson debated over the Class I definition
L. Dix questioned why not use 5001 kVA as a lower limit for Class I Power Transformer Definition.

A. Varghese made the following motion:

> When PD testing is specified for Class I Power Transformer, this test should be carried out as defined in C57.12.00-2015

D. Gross seconded the motion.

Discussion:

> D. Ayers questioned O. Avanoma how was the transformer excited during testing, and if modifications were needed.
> O. Avanoma indicated that the unit was excited thru LV and measured on HV, with no modifications.
> J. Foschia requested the following friendly amendment to A. Varghese earlier Motion.
> "PD limits shall be as stated in C57.12.90-2015."
> A. Varghese, agreed to this request for amendment.
>
> The motion was then rephrased:
> When PD testing is specified for Class I Power Transformer, this test should be carried out as defined in C57.12.00-2015, and the PD limit shall be as stated in C57.12.90-2015.
>
> When no further discussion was made, a vote was held.

Motion PASSED 16 votes in favor, 2 opposed, and 7 abstentions.

Discussion started on the topic of which terminals to test.

J. Foschia made a Motion:

> "Measure PD on the Primary Terminals only"

S. Hernandez seconded the motion:

Discussion:

> B. Forsythe requested a more formal definition of Primary Terminals and argued that they are usually the ones connected to the supply of power and could be lower voltage terminals.

D. Ayers indicated that John perhaps was referring to the HV terminals.
D. Gross indicated that if the LV terminals have a high enough voltage, they should be tested too.
J. Foschia amended his earlier Motion to:
"Measure PD only on the Terminals with the Highest Voltage rating"

D. Gross then proposed measuring all terminals.
D. Sauer did question how do we measure them all.
D. Sauer then questioned the definition of Class I PT again.
P. Hopkinson proposed to do a write-up.

After no further discussion, a vote on the motion was held.

The motion carried with 16 votes in favor, 1 against and 6 abstentions.

At 17:00 P. Hopkinson moved to adjourn the meeting.
O. Avanome seconded.

A request for those against was made, and the motion carried unanimously

The meeting was adjourned at 17:02.

Respectfully submitted
Israel Barrientos
TF Secretary.

Appendix B

IEEE/PES TRANSFORMERS COMMITTEE

Partial Discharge Study Group

- PRELIMINARY MEETING MINUTES -

B.4.7 Virtual Meeting – October 20, 2021

Chair: Bill Griesacker

The Partial Discharge Study Group held its first meeting at 1:00 p.m. US Eastern Daylight Time on October 20, 2021. There were 8 attendees, as listed:

B.5

B.6 Steve Antosz

Bill Griesacker
Thang Hochanh
Alexander Kraetge
Mark Perkins
Markus Schiessl

Hemchandra Shertukde
Ajith Varghese

The following agenda was presented and there were no objections to unanimous approval of it:

Agenda

- Call to order
- Determine quorum (1st meeting, quorum achieved by definition)
- Approval of Agenda, Approval of previous meeting minutes
- Brief review of PD changes in C57.12.00-?2021 and C57.12.90-?2021
- Review Bertrand Poulin's proposal
- Suggestions for other proposals, needed improvements
- Adjournment

The chair stated that the objective of the Study Group is to provide recommendations on revisions to partial discharge (PD) test procedures and acceptance criterial in C57.12.00 and C57.12.90. The recommendations will be submitted to the Task Force for Continuous Revisions to Low Frequency Dielectric Tests.

The group reviewed and discussed Bertrand Poulin's offered proposal:

- **Importance**: verify no detectable PD at max system voltage after the 1 hour induced voltage test
  - Raise the voltage from zero to maximum system voltage. Record PD level.
  - Increase to one hour test and hold for 5 min. Record PD voltage at the beginning and end of this 5 min.
  - Increase to enhanced voltage level. Hold for 7200 cycles. Record PD at beginning and end of enhanced.
  - Lower to one hour test level. Hold for one hour. Record PD every 3 min.
  - Decrease to max system voltage. Record PD.
  - Decrease voltage to zero.
- The criteria shall be as in the latest document with the following addition:
  - There shall be no evidence of pd activity at maximum system voltage at the end of the test. Any evidence of pd activity shall be investigated before the test can be accepted as successful.
- Recommendation:
  - "If possible, I would also encourage the introduction of continuous (or nearly continuous) pd monitoring during the test in graphic format as the technology is available today."

The following comments and discussion of the proposal are noted:

IEC induced voltage test procedure specifies that voltage is raised to 1.2 x Rated Voltage and PD measured. Since IEEE procedure follows maximum system voltage, which is 1.1 x Rated Voltage, it was proposed to amend the proposal with 1.1 x Max System Voltage to be in line

with IEC. It was recognized that the proposed "no evidence of PD" criteria needs to be defined so it was proposed to impose a PD limit of 150 pC at this voltage level.

If PD is detected at 1.1 Max System Voltage then steps should be taken to ensure it is not external.

Since PD levels are expected to be low at the new proposed test levels, should there be a maximum background PD level requirement? IEC requires background PD to be no more than 50% of PD acceptance criteria.

The recommendation to have continuous recording of PD will not be possible for laboratories that do not have equipment with this capability. What specifically would be required to display, monitor and record if this is a requirement?

It is important to have requirements so that all laboratories are measuring PD on the same bases, and any comparisons can be made on an equal basis. IEC 6270 provides information on how to achieve apparent charge, gives performance tests and calibration tests.

The suggestion to record PD at 3 min. intervals rather than the existing 5 min. requirement was generally accepted but the acceptance criteria of no rising trends in the last 20 minutes should probably be changed to the last 21 minutes so the measuring points fall at the beginning and end of this period.

The 5 min hold at the 1-hour level prior to the enhanced voltage test should not be changed. The 5 min hold should also be applied to recording PD at the proposed Max System Voltage level at the beginning of the test.

It was stated that it was preferable to keep Max System Voltage, not 1.1 x Max System Votage, for the proposed PD check point since there is interest to prove a transformer is PD free at operating voltage.

Another suggested acceptance criteria at the Max System Voltage test level would be to measure PD at this level before and after the test and limit the post test measured PD value at Max System Voltage "not to exceed the pre test Max System Voltage measured value". There could be some tolerance added to this criterial of maybe 5 or 10%.

The importance of PD measurement before and after the enhanced and 1 hour period of the induced voltage test, is to ensure that any PD that is excited during the test, will extinguish at operating voltage.

Can background PD be measured at say 10%, 50% and 100%? If it is in the test equipment it may follow with the test levels. IEC requires checking background PD at 0.4 X Rated Voltage.

The last step of the proposed procedure should be "Decrease voltage to zero. Record PD.".

Propose to write information on PD troubleshooting and resolution, common procedures, techniques developed over the years that could be beneficial in a guide.

Should changes be made to C57.113?

A meeting will be scheduled to be held in the next week or two to continue the discussion and to come to a final recommendation.

The meeting adjourned at about 2:00 pm.

IEEE/PES TRANSFORMERS COMMITTEE

Partial Discharge Study Group

- PRELIMINARY MEETING MINUTES -

B.6.1 Virtual Meeting – November 9, 2021

Chair: Bill Griesacker

The Partial Discharge Study Group held its second meeting at 1:00 p.m. US Eastern Daylight Time on November 9, 2021. There were 5 attendees, as listed:

B.7 Steve Antosz

Bill Griesacker
Thang Hochanh
Alexander Kraetge
Markus Schiessl

The following agenda was presented:

Agenda

- Call to order
- Previous meeting minutes
- Determine quorum
- Approval of Agenda, Approval of previous meeting minutes
- Review Bertrand Poulin's proposal
- Review comments and discussion notes
- Discussion
- Adjournment

The comments and discussion to Bertrand's proposal were reviewed and discussed.

It was preferred to perform the proposed PD measurement before the enhanced level and after the 1 hour test at the "maximum system voltage" since it is close to the nominal operating voltage. The preferred language was at "maximum system voltage" since this term matches C57.12.00 Table 4 terminology and so no changes would be needed to Table 4.

It was commented that since IEC has a higher voltage level, 1.2 nominal system voltage and an acceptance level of 100 pC, then the proposed PD acceptance limit at "maximum system voltage" (which is 1.05 times) after the 1 hour induced voltage test should be 100 pC and not 150 pC as was offered in the PDSG first meeting.

A requirement for PD background level was discussed and it was preferred to leave the 100 pC limit as a form of background limit. This was seen as a practical approach since there could be other ways to introduce a background limit. This simple approach was seen as a way to attain broad acceptance.

It was stated that a simple numeric limit for the new PD measurement would probably be the easiest to accept by all because it is simple and straight forward. Other approaches were offered in the first meeting and these were reviewed and a simple limit was the best chance for acceptance.

A 5 minute wait period at the new "maximum system voltage" PD test level before the enhanced voltage level was proposed but not seen to add significant value in the factory production floor environment.

Adding a requirement to investigate any evidence of PD activity was discussed and it would not likely be accepted very well because of the burden that it would place on manufacturers.

Calibration concerns are addressed in C57.113.

The chair will make revisions to the proposal and send to the Study Group and present it at the next RLFT TF meeting. PD Study Group members are requested to review and provide any further comments if they wish.

The meeting adjourned at about 1:45 p.m.

Meeting Attendance:

First Name	Last Name	Company	Member?
Raj	Ahuja	Raj Ahuja Consulting	Yes
Stephen	Antosz	Stephen Antosz & Associates, Inc	Yes
Edmundo	Arevalo	Bonneville Power Admnistration	
Elise	Arnold	SGB-Smit	
Javier	Arteaga	Hitachi Energy	
Donald	Ayers	Ayers Transformer Consulting	Yes
Chris	Baumgartner	We Energy	Yes
Wallace	Binder	WBBinder Consultant	

Daniel	Blaydon	Exelon BGE	Yes
William	Boettger	Boettger Transformer Consulting LLC	Yes
Sanket	Bolar	Megger	
Alain	Bolliger	HV Technologies	
Jeff	Britton	Phenix Technologies	Yes
David	Calitz	Siemens Energy	Yes
Arup	Chakraborty	Delta Star, Inc	
Marco	Espindola	Hitachi Energy	
Feras	Fattal	Manitob Hydro	
Hugo	Flores	Hitachi Energy	Yes
Michael	Franchek	Retired	
Shawn	Gossett	Ameren	Yes
Bill	Griesacker	Duquesne Light Co.	Yes
Detlev	Gross	Power Diagnostix	Yes
Sergio	Hernandez Cano	Hammond Power Solutions	Yes
Philip	Hopkinson	HVOLT Inc.	Yes
Paul	Jarman	University of Manchester	
Steve	Jordan	Tennessee Valley Authority	Yes
Alexander	Kraetge	Omicron	
Deepak	Kumaria	Applied Materials	
Fernando	Leal	Prolec GE	Yes
Weijun	Li	BC Hydo	Yes
Mario	Locarno	Doble Engineering	
Jim	McBride	JMX Transformer Solutions, Inc.	
Vinay	Mehrotra	SPX Transformer Solutions	Yes
Zach	Millard	Great River Energy	
Kris	Neild	Megger	
Brady	Nesvold	Xcel Energy	
Joe	Nims	Allen & Hoshall, Inc.	
Harry	Pepe	Phenix Technologies	Yes
Sylvain	Plante	Hydro Quebec	
Adam	Polson	Arizona Public Service Co.	
Bertrand	Poulin	Hitachi Energy	Yes
Ulf	Radbrandt	Hitachi Energy	
Pierre	Riffon	Pierre Riffon Consultant Inc.	
Dan	Sauer	Eaton Corp.	Yes
Markus	Schiessl	SGB-Smit	Yes
Eric	Schleismann	Southern Company Services	

Jeff	Schneider	Power Partners/Spire Power Solutions	Yes
Devki	Sharma	Entergy	
Kushal	Singh	Exelon Comed	
Chris	Slattery	FirstEnergy Corp	Yes
Sanjib	Som	Pennsylvania Transformer	Yes
Mike	Spurlock	Spurlock Engineering Services, LLC	Yes
Kyle	Stechschulte	American Electric Power	Yes
Andy	Steineman	Delta Star, Inc	
Neil	Strongosky	Allen & Hoshall, Inc.	
Janusz	Szczechowski	Maschinenfabrik Reinhausen	Yes
Ajith	Varghese	SPX Transformer Solutions	Yes
Jason	Varnell	Doble Engineering	
Jos	Veens	SGB-Smit	
Krishnamurthy	Vijayan	PTI Transformers	Yes
Loren	Wagenaar	WagenTrans Consulting	
Dieter	Wagner	Hydro One	
Mike	Waldrop	MLGW	
Alan	Washburn	Burns and McDonald	
Eric	Weatherbee	PCORE Electric	
Peter	Werelius	Megger	
Dr. Alexander	Winter	HIGHVOLT Pruftechnik Dresden	Yes
Anand	Zanwar	Siemens Energy	
Michael	Zarnowski	Carte International	
Shibao	Zhang	PCORE Electric	Yes
Kris	Zibert	Allgeier, Martin and Associates	Yes

****

F21 Update: TF Revision to Low Frequency Test

Quorum: Achieved MOM: Approved Agenda: Approved

- TF Class I PD Test – Propose to using Class II procedure and Current C57.12.90 Limits
  - Revisions to C57.12.00, 12.00 Table 4, C57.12.90
- Factory PD Limits – Propose operating volt test
  - Pre, Post Induced volt test at 1.1 times, 100 pC limit

B.7.1 Task Force for Impulse Guide – PC57.98

TF Chair: Pierre Riffon
VIRTUAL MEETING | November 16th, 2021 | 10.50 am – 12.05 CET

The TF met on November 16, 2021, from 10:50 am to 12:05 pm (CET). Twenty-one (22) members and sixty-nine (69) guests attended the meeting (see attached attendance list). Eight (8) guests requested membership but only 3 are eligible having attended at least two meetings. The meeting was chaired by Pierre Riffon, Chair of the TF. Mr. Daniel Sauer was the vice-chair.

Meeting has been called to order by the Chair at 10:50 am (CET).

Attendance has been recorded in the AM system.

Required quorum was met, presence of at least 21 members was required. The TF membership roster has been reviewed after the S21 virtual meeting and five (5) members who did not attend one of the last three meetings have been moved as guests. Guests who have not attended one of the last five meetings have been removed from the TF roster. Twenty-two (25) guests have been removed from the TF roster. Four (4) new members have been added since the last meeting.

The meeting agenda has been approved unanimously. Motion has been made by Sylvain Plante and was seconded by Mike Spurlock.

The S21 virtual meeting minutes have been approved unanimously. Motion has been made by Ajith Varghese and was seconded by John John.

The first item of business was related to the review of a proposal made by Daniel Sauer for modification to clause 10.3.2.2 concerning impulse tests on series or multiples winding connections transformers rated 15 kV and below. The actual text is requesting distribution transformers to be type tested only with the series connections while all connections shall be tested during routine impulse tests as stated in clause 10.4.4. Generally, type tests shall be, at least equally or more stringent than routine tests and not the other way around as actually stated in the current edition of IEEE C57.12.90.

D. Sauer proposal is requiring to test all connections during type tests and only the series connection during routine tests on distribution transformers unless otherwise specified.
In addition, the same situation applies to transformers that can be connected in Y or Δ and shall also be considered.

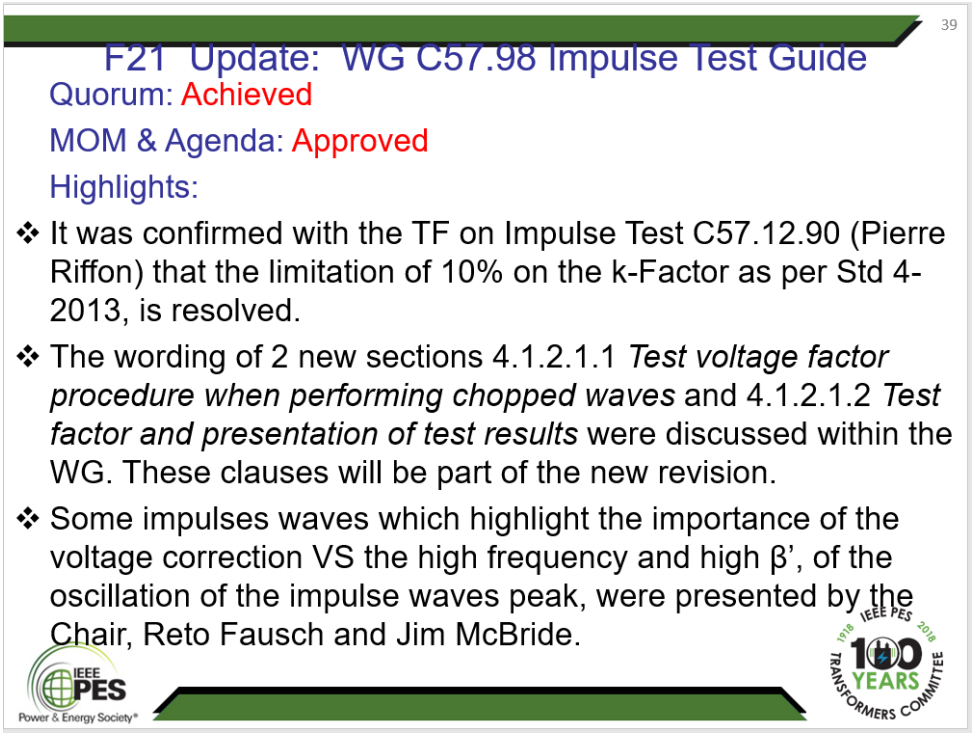
D. Sauer wording supplemented with a similar wording applicable to transformers that can be connected in Y or Δ will be surveyed within the TF membership prior to next meeting. Motion was made by D. Sauer and was seconded by J. McBride.
On the New Business, Steve Antosz mentioned that the new edition of C57.12.90 has been approved on November 9, 2021 and will be published soon. Several modifications have been made to the impulse

testing sections and he does encourage all individuals to have a look on the changes made in the impulse test sections and to see if any other changes or improvements are necessary for the next edition.

Virtual meeting. Fall 2021; Unapproved meeting minutes; Task Force on Revision of Impulse Tests.

Also as a New Business, the Chair propose to have a new text regarding the use of tolerances on the applied voltage during impulse tests. This subject was somewhat controversial. The Chair will prepare a text as a starting point for discussion at the next meeting.
The meeting adjourned at 12:45 am on November 16, 2021.
The next meeting is planned to be held in Denver, Colorado, on March 29, 2022.

Minutes wrote by:
Pierre Riffon P. Eng.
TF Chair



November 16, 2021 Role	Participation Status	First Name	Last Name	Company	City	State
Guest	Active	Susan	McNelly	Xcel Energy	Minneapolis	MN
Guest	Active	William	Boettger	Boettger Transformer Consulting LLC	Danville	CA
Guest	Active	Bill	Griesacker	Duquesne Light Co.	Coraopolis	PA
Member	Active	Eduardo	Garcia Wild	Siemens Energy	Guanajuato	Other
Guest	Active	Steven	Snyder	Hitachi Energy	Versailles	KY
Guest	Active	Raj	Ahuja	Raj Ahuja Consulting	Fremont	CA
Member	Active	Bertrand	Poulin	Hitachi Energy	Varennes	QC
Guest	Active	Stephen	Jordan	Tennessee Valley Authority	Chattanooga	TN
Member	Active	Stephen	Antosz	Stephen Antosz & Associates, Inc	Pittsburgh	PA
Guest	Active	Loren	Wagenaar	WagenTrans Consulting	Marysville	OH
Guest	Active	Donald	Ayers	Ayers Transformer Consulting	Waxhaw	NC
Guest	Active	Wallace	Binder	WBBinder Consultant	New Castle	PA
Guest	Active	Jeffrey	Britton	Phenix Technologies, Inc.	Accident	MD
Guest	Active	Christopher	Baumgartner	We Energies	Milwaukee	WI
Member	Active	Alain	Bolliger	HV TECHNOLOGIES, Inc.	Manassas	VA
Guest	Active	Sanjay	Patel	Smit Transformer	Summerville	SC
Guest	Active	Gael	Kennedy	GR Kennedy & Associates LLC	York	NE
Member	Active	Reto	Fausch	RF Solutions	Monterey	CA
Chair	Active	Pierre	Riffon	Pierre Riffon Consultant Inc.	Longueuil	QC
Guest	Active	Robert	Ganser	Transformer Consulting Services, Co.	N. Canton	OH
Guest	Active	Waldemar	Ziomek	PTI Transformers	Winnipeg	MB
Guest	Active	Mohammad	Iman	MGM Transformer Company	Commerce	CA
Guest	Active	Hemchandra	Shertukde	University of Hartford	W. Hartford	CT
Guest	Active	Robert	Mayer	San Diego Gas & Electric	San Diego	CA
Guest	Active	Don	Dorris	Nashville Electric Service	Nashville	TN
Guest	Active	David	Wallach	Duke Energy	Charlotte	NC
Guest	Active	Roger	Hayes	General Electric	Ayr	ON
Member	Active	Mike	Spurlock	Spurlock Engineering Services, LLC	Columbus	OH
Member	Active	James	McBride	JMX Services, Inc.	Fayetteville	GA
Member	Active	Hakan	Sahin	Virginia/Georgia Transformer	Cary	NC
Guest	Active	Juan Carlos	Cruz Valdes	Prolec GE	Apodaca	Other
Guest	Active	Xose	Lopez-Fernandez	Universidade de Vigo	Vigo	Other
Vice-Chair	Active	Daniel	Sauer	EATON Corporation	Waukesha	WI
Guest	Active	Pugal	Selvaraj	Virginia Transformer Corp.	Roanoke	VA
Member	Active	Ajith	Varghese	SPX Transformer Solutions, Inc.	Hartland	WI
Guest	Active	Baitun	Yang	R.E. Uptegraff	Scottdale	PA
Guest	Active	Eduardo	Tolcachir	Tubos Trans Electric S.A.	Cordoba	Other
Guest	Active	Harry	Pepe	Phenix Technologies, Inc.	Accident	MD
Guest	Active	Jeffrey	Schneider	Power Partners/Spire Power Solutions	Athens	GA
Guest	Active	Ryan	Musgrove	Oklahoma Gas & Electric	Oklahoma City	OK
Guest	Active	Jos	Veens	SMIT Transformatoren B.V.	Nijmegen	Other
Guest	Active	Jagdish	Burde	Virginia Transformer Corp	Pocatello	ID
Guest	Active	Roderick	Sauls	Southern Company Services	Birmingham	AL
Member	Active	Leopoldo	Rodriguez	Transformer Testing Services LLC	Rincon	GA
Member	Active	David	Murray	Tennessee Valley Authority	Chattanooga	TN
Guest	Active	John	Poelma	NRG Energy	Henderson	NV
Member	Active	Fernando	Leal	Prolec GE	Apodaca	Other
Guest	Active	Hugo	Flores	Hitachi Energy	Alamo	TN
Member	Active	John	John	Virginia Transformer Corp.	Roanoke	VA
Member	Active	Steven	Brzoznowski	Bonneville Power Administration	Vancouver	WA
Member	Active	Jarrod	Prince	ERMCO	Dyersburg	TN
Guest	Active	Kerwin	Stretch	Siemens Energy	Erlangen	Other
Guest	Active	Kushal	Singh	ComEd	Oakbrook Terrace	IL
Member	Active	Amitabh	Sarkar	Virginia Transformer Corp.	Roanoke	VA
Guest	Active	Markus	Schiessl	SGB	Regensburg	Other
Guest	Active	Thomas	Hartmann	Pepco Holdings Inc.	Potomac	MD
Member	Active	Christopher	Slattery	FirstEnergy Corp.	Akron	OH
Guest	Active	Jason	Varnell	Doble Engineering Co.	Marlborough	MA
Guest	Active	Jonathan	Reimer	FortisBC	Kelowna	BC
Guest	Active	Anthony	Franchitti	PECO Energy Company	Elverson	PA
Guest	Active	Arup	Chakraborty	Delta Star Inc.	Saint-Jean-sur-Richelieu	QC
Member	Active	Kris	Zibert	Allgeier, Martin and Associates	Joplin	MO
Guest	Active	Tim-Felix	Mai	Siemens Energy	Kirchheim	Other
Member	Active	Dr. Alexander	Winter	HIGHVOLT Pruftechnik Dresden	Dresden	Other
Guest	Active	Joshua	Yun	Virginia Transformer Corp.	Roanoke	NH
Guest	Active	Daniela	Ember Baciu	Hydro-Quebec IREQ	Varennes	QC

B.7.2 Task Force Winding Insulation Power Factor & Winding Insulation Resistance Limits, Diego Robalino (Chair) and Aniruddha Narawane (Secretary) at the meeting

Minutes of Meeting held on 11.16.2021: 8.00 am-9.15 am CT -Virtual Meeting via WebEx

AMS registered attendance:
MEMBERS = 26
GUESTS = 70

1. The meeting was called to order at 8.00 am by Chairman Diego Robalino
2. Quorum established = 22 members out of 41 listed
3. Number of attendees = 102
4. Chairman checked for any patents and copyrights and there were none.
5. The agenda for F21 and Minutes from S21 were approved unanimously.
6. This was an informative meeting to discuss the recommendations of this TF to the DTSC.
7. Chairman shared the documents from TF work and the comments from DTSC.
8. One attendee asked if C57.168 group was consulted relative to interlaminar values for PF/IR. Chairman mentioned that the TF scope was to provide recommendations. It would require a separate action regarding if and where the recommendations should be included.
9. A total of 5 motions were presented and moved by members and seconded (Annex A). There were additional discussions on the wording of motions and some of the wordings were altered based on discussions. The chairman explained that all these motions are recommendations from TF to DTSC and the decision to accept/reject these will be left to DTSC.
10. Chairman thanked all those who contributed and made a special mention of IEEE team members for helping in data analysis.
11. Meeting adjourned at 9.15 am.

ANNEX A

1. The TF revised the text to elevate 5 motions to the DTSC:
    a. Motion 1:
    - No limits will be added C57.12.00 or C57.12.90 in regard to Limits for insulation PF (Leave standard as is)
    - Include typical values identified by this TF in C57.168 and C57.152

Table 2 Statistical Analysis of Acceptance values for line -frequency power factor (%)

Statistical Parameter	Class I (<69 kV)		Class II (>69 kV)	
	≤1 MVA	>1 MVA and ≤ 10 MVA	>10 MVA and ≤100MVA	>100 MVA
Average	0.495	0.558	0.257	0.332
Median	0.5	0.55	0.25	0.31
90th percentile	0.69	0.78	0.7	0.63
Typical Range	0.3 - 0.6	0.37 – 0.73	0.15 – 0.35	0.21 – 0.45

    b. Motion 2:

- Recommend the extension of this task force or create a new one to elaborate about the factors affecting insulation line frequency PF results.

c. Motion 3:

- Modify section 10.10.2 of C57.12.90 and section 9.7.6.4 of C57.15-2018 related to instrumentation accuracy as below:

    - **IEEE C57.12.90-2015 Section 10.10.2.**

      10.10.2 Instrumentation

      The insulation line-frequency power factor or dissipation factor may be measured by special bridge circuits or by the voltampere-watt method. The accuracy of the measurement instrumentation at or near rated frequency should be:

      For Insulation Power Factor (DF) Below 1%: ±2% of reading ± 0.05% absolute

      For Insulation Power Factor (DF) Above 1%: ±5% of reading ± 0.05% absolute

    - **IEC 60076-21 / IEEE C57.15-2018 Section 9.7.6.4**

      9.7.6.4 Instrumentation
      The insulation line-frequency power factor or dissipation factor (DF) may be measured by special bridge circuits or by the voltampere-watt method. The accuracy of the measurement instrumentation at or near rated frequency should be:
      For Insulation Power Factor (DF) Below 1%: ±2% of reading ± 0.05% absolute
      For Insulation Power Factor (DF) Above 1%: ±5% of reading ± 0.05% absolute

d. Motion 4:

- No limits will be added to C57.12.00 or C57.12.90 in regard to Limits for insulation Resistance (Leave standard as is)

e. Motion 5:

- Recommend extending this task force or creating a new TF / WG as appropriate to develop a best testing practices for IR testing on transformers including factors affecting IR results.

****

- Meeting was called to order at 8.00 am by Chairman Diego Robalino
  - Quorum established = 22 members out of 41 listed
  - Number of attendees = 85
- Agenda for F21 and Minutes from S21 were approved unanimously.
- This was an informative meeting to discuss the recommendations of this TF to the DTSC.

Role	First Name	Last Name	Company
Chair	Diego	Robalino	Megger
Guest	Susan	McNelly	Xcel Energy
Guest	Joe	Nims	Allen & Hoshall, Inc.
Guest	Eduardo	Garcia Wild	Siemens Energy
Guest	Lee	Matthews	Howard Industries
Guest	Bertrand	Poulin	Hitachi Energy
Guest	Stephen	Antosz	Stephen Antosz & Associates, Inc
Guest	Loren	Wagenaar	WagenTrans Consulting
Guest	Donald	Ayers	Ayers Transformer Consulting
Guest	Sheldon	Kennedy	Niagara Transformer
Guest	Michael	Franchek	Retired
Guest	Reto	Fausch	RF Solutions
Guest	Andrew	Steineman	Delta Star Inc.
Guest	Robert	Ganser	Transformer Consulting Services, Co.
Guest	Waldemar	Ziomek	PTI Transformers
Guest	Clemens	Reiss IV	Custom Materials, Inc.
Guest	Shibao	Zhang	PCORE Electric
Guest	Terence	Martin	MarVen
Guest	George	Frimpong	Hitachi Energy
Guest	Hakan	Sahin	Virginia/Georgia Transformer
Guest	Eduardo	Tolcachir	Tubos Trans Electric S.A.
Guest	Jos	Veens	SMIT Transformatoren B.V.
Guest	Roderick	Sauls	Southern Company Services
Guest	Parminder	Panesar	Virginia Transformer Corp.
Guest	Leopoldo	Rodriguez	Transformer Testing Services LLC
Guest	John	Poelma	NRG Energy
Guest	Donnell	Rackley	RESA Power
Guest	Anil	Sawant	Virginia Transformer Corp.
Guest	Kushal	Singh	ComEd
Guest	Markus	Schiessl	SGB
Guest	Kevin	Biggie	Weidmann Electrical Technology
Guest	Anthony	Franchitti	PECO Energy Company
Guest	Jeffrey	Gragert	Xcel Energy
Guest	Arup	Chakraborty	Delta Star Inc.
Guest	Piotr	Blaszczyk	Specialty Transformer Components LLC
Guest	Anand	Zanwar	Siemens Energy
Guest	Feras	Fattal	Manitoba Hydro
Guest	Martin	Munoz Molina	Orto de Mexico
Guest	Brady	Nesvold	Xcel Energy
Guest	Zachery	Weiss	WEG Transformers USA Inc.

Guest	Deepak	Kumaria	Applied Materials
Guest	Israel	Barrientos	Prolec GE
Guest	Brad	Staley	Salt River Project
Guest	Muhammad Ali Masood	Cheema	Northern Transformer
Guest	Duvier	Bedoya	Hitachi Energy
Guest	Dejan	Vukovic	Hitachi Energy
Guest	Sergio	Hernandez Cano	Hammond Power Solutions
Guest	Moonhee	Lee	Hammond Power Solutions
Guest	Hugh	Waldrop	Memphis Light, Gas & Water
Guest	Shawn	Gossett	Ameren
Guest	Manish	Saraf	Hammond Power Solutions
Guest	Raymond	Frazier	Ameren
Guest	Kayland	Adams	SPX Transformer Solutions, Inc.
Guest	Jared	Bates	Oncor Electric Delivery
Guest	Kyle	Zemanovic	EATON Corporation
Guest	Balakrishnan	Mani	Virginia Transformer Corp.
Guest	Vinay	Patel	Consolidated Edison Co. of NY
Guest	Suresh	Babanna	SPX Transformer Solutions, Inc.
Guest	Taylor	Gray	Portland General Electric (PGE)
Guest	Nicholas	Jensen	Delta Star Inc.
Guest	Rakesh	Patel	Hitachi Energy
Guest	Giovanni	Hernandez	Virginia Transformer Corp.
Guest	Kannan	Veeran	Georgia Transformer
Guest	Hampton	Steele	Tennessee Valley Authority
Guest	Juan Alfredo	Carrizales	Prolec GE
Guest	Thomas	Eagle	SPX Transformer Solutions, Inc.
Guest	Timothy	Menter	Lincoln Electric System
Guest	Livia	Neeson	Entergy
Guest	Adam	Polson	Arizona Public Service Co.
Guest	John	Tranum	Siemens Energy
Guest	Sudip	Chanda	Virginia Transformer Corp.
Member	William	Boettger	Boettger Transformer Consulting LLC
Member	Charles	Sweetser	OMICRON electronics Corp USA
Member	Don	Dorris	Nashville Electric Service
Member	David	Wallach	Duke Energy
Member	Roger	Hayes	General Electric
Member	John	Herron	Raytech USA
Member	Peter	Werelius	Megger
Member	Zan	Kiparizoski	Howard Industries
Member	Sanjib	Som	Pennsylvania Transformer

Member	Daniel	Sauer	EATON Corporation
Member	Ajith	Varghese	SPX Transformer Solutions, Inc.
Member	Baitun	Yang	R.E. Uptegraff
Member	Mario	Locarno	Doble Engineering Co.
Member	Krishnamurthy	Vijayan	PTI Transformers
Member	Rob	Ghosh	General Electric
Member	Fernando	Leal	Prolec GE
Member	John	John	Virginia Transformer Corp.
Member	Kristopher	Neild	Megger
Member	Lorne	Gara	Shermco
Member	Rhea	Montpool	Schneider Electric
Member	Jorge	Cruz	PTI Transformers
Member	Sanket	Bolar	Megger
Member	Cihangir	Sen	Duke Energy
Member	David	Calitz	Siemens Energy
Secretary	Aniruddha	Narawane	EATON Corporation

B.7.3 Task Force Transient Failure Mitigation (WG PC57.142), WG to Investigate the Interaction between Substation Transients, Jim McBride (Chair), Xose Lopez-Fernandez (Vice Chair) and Tom Melle (Secretary)

Minutes of Meeting held on 4.27.2021: Virtual Meeting via WebEx 2.30-3.35 PM CT

Meeting called to order at 2:20 PM Central Time.
Welcome and Chair's Remarks

2) 83 Attendees were present (50 Guests) 33 of 56 Members present

Quorum was achieved. Because of quorum miss count, the Spring Minutes was approved by email.

3) IEEE Patent Policy Slides and Copyrights slides (NO essential patent claims or copyright issues)

4) Approval of Agenda and Minutes from Last Meeting.
Quorum was not achieve. Therefore, the Spring Minutes will be sent by e-mail for approving.

5) Switchgear Liason Task Force Update – Dave Caverly
The Switchgear Task Force met on OCTOBER 21, 2021, but there is nothing new this time.

6) Status of Current Draft 9B and Comments – Jim McBride
Some editorial changes made to Draft 9B before submitting to MEC which corrected errors in the TOC and references. The document from the Transformers website highlights in blue all changes to the C57.142-2010 Guide. And the focus now will be on Mitigation Methods for the upcoming meeting.

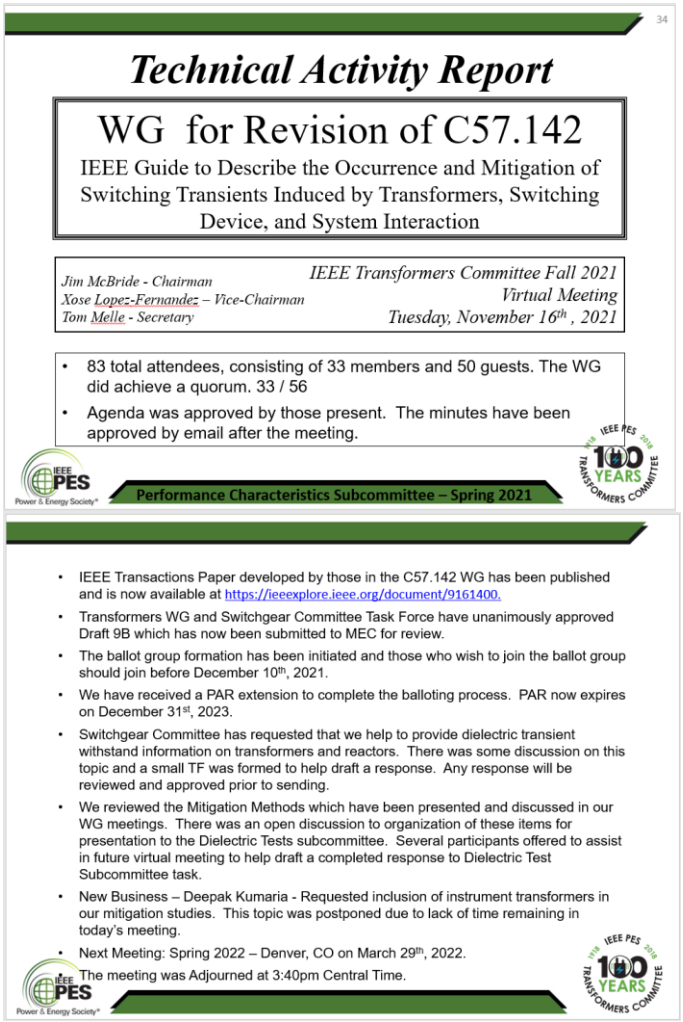
7) Request to Proceed to Ballot with Draft 9B – Jim McBride
The Formation of Ballot Group has been initiate and the invitation to join the ballot group for C57.142 logging into the myProject, Close Date is December 10, 2021. The track changes version of Draft 9B can download from the Transformers Committee Website.

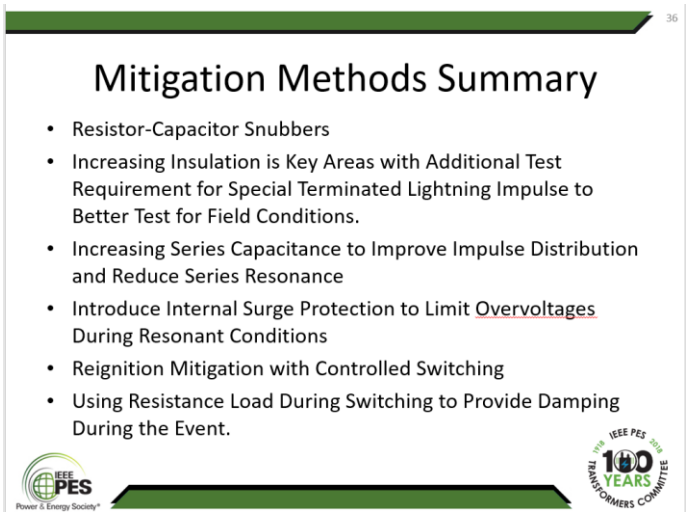
8) Mitigation Methods
Jim made a summary about the mitigation methods discussed in previous meetings.
Switchgear Committee has requested that we help to provide dielectric transient withstand information on transformers and reactors. A short discussion was stablished among Phil Hopkinson, Pierre Riffon, Egon Kirchenmayer and Jim about switching reignitions and prestrikes due to circuit breakers operation with reactors and sometimes with transformers, which not always are covered by standard factory acceptance tests. Pierre Riffon quoted C57.21 IEEE Standard Requirements, Terminology, and Test Code for Shunt Reactors Rated Over 500 kVA, which stablishes limits of chopping waves in percent. A group was formed by Pierre Riffon, Bertrand Poulin and Jim McBride to work on a response to Switchgear Committee which may include references to Clause B.6 of Std C57.21

Mitigation methods discussion was open to brainstorming additional options. Discussion on use of internal arresters was stablished as a mitigation method, which not always is well accepted by the users. A presentation will be expected to made on it in next meetings. Finally, discussion was focused to additional factory tests. In this respect volunteers were request to work on a recommendation of voltages classes and dielectric tests requirements. Initially offered Phil Hopkinson, K. Vjayan, Amitbh Sakar, Deepak Kumaria. And all interest to join this group could email to Jim McBride.
9) New Business – Deepak Kumaria asked about possibly including the study of transients on instrument transformers in our WG. Due to the lack of remaining time for today's meeting, this topic was postpone until our next meeting.

10) Next Meeting (Spring 2022 – Denver (Hyatt Regency, Conv. Center), Colorado USA, March 27 – 31, 2022)

11) Motion to Adjournment made by Phil Hopkinson / 2nd by Mike Spurlock
Meeting was adjourned at 3:38 PM without objection.





Meeting Attendance Role	First Name	Last Name	Company	11/16/2021
Chair	James	McBride	JMX Services, Inc.	X
Vice-Chair	Xose	Lopez-Fernandez	Universidade de Vigo	X
Member	Enrique	Betancourt	Prolec GE	X
Member	William	Boettger	Boettger Transformer Consulting LLC	X
Member	Jeffrey	Britton	Phenix Technologies, Inc.	X
Member	David	Caverly	Trench Limited	X
Member	Huan	Dinh	Hitachi Energy	X
Member	Eduardo	Garcia Wild	Siemens Energy	X
Member	Sergio	Hernandez Cano	Hammond Power Solutions	X
Member	Philip	Hopkinson	HVOLT Inc.	X
Member	John	John	Virginia Transformer Corp.	X
Member	Egon	Kirchenmayer	Siemens Energy	X
Member	Deepak	Kumaria	Applied Materials	X
Member	Moonhee	Lee	Hammond Power Solutions	X
Member	Weijun	Li	Braintree Electric Light Dept.	X
Member	Colby	Lovins	Federal Pacific	X
Member	Ross	McTaggart	Trench Limited	X
Member	Vinay	Mehrotra	SPX Transformer Solutions, Inc.	X
Member	Aniruddha	Narawane	EATON Corporation	X
Member	Harry	Pepe	Phenix Technologies, Inc.	X

Member	Klaus	Pointner	Trench Austria GmbH	X
Member	Bertrand	Poulin	Hitachi Energy	X
Member	Ulf	Radbrandt	Hitachi Energy	X
Member	Pierre	Riffon	Pierre Riffon Consultant Inc.	X
Member	Marnie	Roussell	Entergy	X
Member	Amitabh	Sarkar	Virginia Transformer Corp.	X
Member	Michael	Sharp	Trench Limited	X
Member	Thomas	Sizemore	ABB Inc.	X
Member	Steven	Snyder	Hitachi Energy	X
Member	Mike	Spurlock	Spurlock Engineering Services, LLC	X
Member	Shankar	Subramany	KEMA Labs	X
Member	Rogerio	Verdolin	Verdolin Solutions Inc.	X
Member	Sukhdev	Walia	New Energy Power Co.	X

B.8 Liaison Reports

IEEE High-Voltage Testing Techniques Subcommittee
Liaison Report to Dielectric Tests Subcommittee of IEEE Transformers Committee
Submitted by Jeff Britton (HVTT Subcommittee Chair)
Virtual Meeting 10st of January 2021.

- The There was no HVTT Subcommittee update this time, since the Subcommittee has not met since the spring DTSC meeting. The next HVTT meeting is scheduled for January 2022, as part of the IEEE PES Joint Technical Committee Meeting.
  If anyone has an questions for HVTT, they can contact me at jbritton@doble.com.

B.9 Old/ Unfinished Business

In last meeting a question was brought to attention by Ronnie Minhaas -should standard adopt a limit for Insulation resistance between core and Frame? Should this value be 1000 megaohm minimum during final factory acceptance test. As time did not allow the discussion of this topic in the last meeting. It was bought up in this meeting as old business. Today there is some information in the following documents.

- **Core to Ground Insulation Resistance**:

  C57.12.00 - Included in Table 17 as routine test for Class I and Class II and as other test for distribution transformers. No limits are specified

  C57.12.90 - No reference to Core to ground Insulation

  C57.152 - Typical values for New and aged transformers are provided.

- **Frame to ground Insulation Resistance** :

  Not covered in any standards

19

- C57.12.00

Table 17—Routine, design, and other tests for liquid-immersed transformers

Tests	Distribution transformers			Class I Power transformers			Class II Power transformers			Comments
	Routine	Design	Other	Routine	Design	Other	Routine	Design	Other	
Performance										
Core insulation resistance			*	*			*			The insulation resistance between the core(s) and ground shall be measured after complete assembly of the transformer at a level of at least 500 V dc, for a duration of 1 min.

- C57.152 Field Testing Guide

Table 9—Typical insulation resistance ranges for various conditions of core insulation

Type of equipment	Core insulation resistance (MΩ)	Condition of insulation
New	> 500	Manufacturer to be consulted for values less than 500 MΩ for proper course of action.
Service aged	> 100	Normal
	10 to 100	Indicative of insulation deterioration
	< 10	Needs to be investigated

Discussion was opened. The question came up if there is something in the IEC-standard.
A comment came up if we need a limit and, in that case, where does it belong? Is there a need for pass/fail criteria? Possibly to incorporate this with the insulation resistance TF.
In Spring 2022 maybe a TF or study group will be formed to come with a recommendation to DTSC on the topic of core ground insulation resistance and frame to ground insulation resistance. Please reach out to DTSC chair or secretary if you are interested in joining this TF or Study group.

B.10 New Business

No new Business

B.11 Adjournment

Meeting adjourned 12.20 PM.

Thanks you Ajith for serving 5 years as DTSC chair. From 2022 Poorvi Patel will be the new DTSC Chair.

Minutes respectfully submitted by:
Poorvi Patel
Secretary DTSC.

DSTC Attendee List- November 17th 2021- INCLUDING NEW MEMBERS

Role	First Name	Last Name	Company
Guest	Mubarak	Abbas	Siemens Energy
Guest	Kayland	Adams	SPX Transformer Solutions, Inc.
Member	Stephen	Antosz	Stephen Antosz & Associates, Inc
Member	Elise	Arnold	SGB
Member	Javier	Arteaga	Hitachi Energy
Member	Donald	Ayers	Ayers Transformer Consulting
Guest	Israel	Barrientos	Prolec GE
Member	Christopher	Baumgartner	We Energies
Guest	Barry	Beaster	H-J Family of Companies
Member	Enrique	Betancourt	Prolec GE
Guest	Wallace	Binder	WBBinder Consultant
Member	Daniel	Blaydon	Baltimore Gas & Electric
Member	William	Boettger	Boettger Transformer Consulting LLC
Guest	Alain	Bolliger	HV TECHNOLOGIES, Inc.
Guest	Jeremiah	Bradshaw	Bureau of Reclamation
Member	Jeffrey	Britton	Phenix Technologies, Inc.
Guest	Darren	Brown	Howard Industries
Guest	Steven	Brzoznowski	Bonneville Power Administration
Guest	Erich	Buchgeher	Siemens Energy
Guest	Jagdish	Burde	Virginia Transformer Corp
Member	David	Calitz	Siemens Energy
Guest	Juan Alfredo	Carrizales	Prolec GE
Guest	Edward	Casserly	Ergon, Inc.
Member	Juan	Castellanos	Prolec GE
Member	Arup	Chakraborty	Delta Star Inc.
Guest	Sudip	Chanda	Virginia Transformer Corp.
Guest	Larry	Christodoulou	Electric Power Systems
Guest	Rhett	Chrysler	ERMCO
Member	Craig	Colopy	EATON Corporation
Member	Jorge	Cruz	PTI Transformers
Guest	Michael	Dahlke	Central Moloney, Inc.
Member	Eric	Davis	Burns & McDonnell
Guest	Sami	Debass	Electric Power Research Institute (EPRI)
Guest	Brandon	Dent	Memphis Light, Gas & Water
Member	Huan	Dinh	Hitachi Energy
Member	Don	Dorris	Nashville Electric Service
Member	Samragni	Dutta Roy	Siemens Energy
Guest	Daniela	Ember Baciu	Hydro-Quebec IREQ
Member	Evgenii	Ermakov	Hitachi Energy

Guest	Marco	Espindola	Hitachi Energy
Member	Feras	Fattal	Manitoba Hydro
Member	Reto	Fausch	RF Solutions
Guest	Norman	Field	Stantec
Member	Hugo	Flores	Hitachi Energy
Member	Bruce	Forsyth	Bruce Forsyth and Associates PLLC
Member	Michael	Franchek	Retired
Member	Anthony	Franchitti	PECO Energy Company
Guest	Raymond	Frazier	Ameren
Member	George	Frimpong	Hitachi Energy
Guest	Jose	Gamboa	H-J Family of Companies
Member	Eduardo	Garcia Wild	Siemens Energy
Member	David	Geibel	--
Member	Rob	Ghosh	General Electric
Member	Jose Antonio	Gonzalez Ceballos	Georgia Transformer
Member	Shawn	Gossett	Ameren
Guest	Jeffrey	Gragert	Xcel Energy
Member	James	Graham	Weidmann Electrical Technology
Member	Bill	Griesacker	Duquesne Light Co.
Member	Detlev	Gross	Power Diagnostix Consult GmbH
Guest	Ismail	Guner	Hydro-Quebec
Guest	Attila	Gyore	M&I Materials Ltd
Member	John	Harley	FirstPower Group LLC
Guest	Thomas	Hartmann	Pepco Holdings Inc.
Member	Roger	Hayes	General Electric
Guest	Ronald	Hernandez	Doble Engineering Co.
Guest	Giovanni	Hernandez	Virginia Transformer Corp.
Member	Sergio	Hernandez Cano	Hammond Power Solutions
Member	John	Herron	Raytech USA
Vice-Chair	Thang	Hochanh	Surplec Inc.
Member	Saramma	Hoffman	PPL Electric Utilities
Guest	Ryan	Hogg	Bureau of Reclamation
Guest	David	Holland	ExxonMobil
Member	Philip	Hopkinson	HVOLT Inc.
Guest	Daniel	Huenger	PCORE Electric
Guest	Paul	Jarman	University of Manchester
Guest	Nicholas	Jensen	Delta Star Inc.
Member	John	John	Virginia Transformer Corp.
Member	Toby	Johnson	Hunt Electric
Member	Stephen	Jordan	Tennessee Valley Authority
Guest	Laszlo	Kadar	Hatch

Member	Kurt	Kaineder	Siemens Energy
Guest	Nathan	Katz	PacifiCorp
Member	Sheldon	Kennedy	Niagara Transformer
Guest	Gael	Kennedy	GR Kennedy & Associates LLC
Member	Stacey	Kessler	TC Energy
Guest	Dmitriy	Klempner	Southern California Edison
Guest	Anton	Koshel	Delta Star Inc.
Member	Axel	Kraemer	Maschinenfabrik Reinhausen
Member	Alexander	Kraetge	OMICRON electronics Deutschland GmbH
Member	Deepak	Kumaria	Applied Materials
Guest	Donald	Lamontagne	Arizona Public Service Co.
Guest	Andrew	Larison	Hitachi Energy
Member	David	Larochelle	NDB Technologies
Guest	Fernando	Leal	Prolec GE
Member	Moonhee	Lee	Hammond Power Solutions
Member	Aleksandr	Levin	Weidmann Electrical Technology
Member	Weijun	Li	Braintree Electric Light Dept.
Member	Mario	Locarno	Doble Engineering Co.
Guest	Xose	Lopez-Fernandez	Universidade de Vigo
Member	Tim-Felix	Mai	Siemens Energy
Member	Darrell	Mangubat	Siemens Energy SAE
Guest	Balakrishnan	Mani	Virginia Transformer Corp.
Guest	Richard	Marek	Retired
Guest	Lee	Matthews	Howard Industries
Guest	Robert	Mayer	Siemens Energy
Member	James	McBride	JMX Services, Inc.
Guest	Matthew	McFadden	Oncor Electric Delivery
Guest	James	Mciver	Siemens Energy
Guest	Susan	McNelly	Xcel Energy
Member	Vinay	Mehrotra	SPX Transformer Solutions, Inc.
Guest	Timothy	Menter	Lincoln Electric System
Guest	Aaron	Meyers	EATON Corporation
Guest	Philip	Miller	Memphis Light, Gas & Water
Guest	Manoj Kumar	Mishra	ASAsoft (Canada) Inc
Guest	Rhea	Montpool	Schneider Electric
Member	Emilio	Morales-Cruz	Qualitrol Company LLC
Member	David	Murray	Tennessee Valley Authority
Guest	Ryan	Musgrove	Oklahoma Gas & Electric
Member	Ali	Naderian	METSCO Energy Solutions Inc.
Guest	Kristopher	Neild	Megger
Member	Rodrigo	Ocon	Industrias IEM

Guest	Rudolf	Ogajanov	ABB Inc.
Guest	Anastasia	O'Malley	Consolidated Edison Co. of NY
Member	Parminder	Panesar	Virginia Transformer Corp.
Member	Dwight	Parkinson	EATON Corporation
Guest	Sanjay	Patel	Smit Transformer
Member	Harry	Pepe	Phenix Technologies, Inc.
Guest	Caroline	Peterson	Xcel Energy
Guest	Timothy	Peterson	N. American Substation Services
Member	Sylvain	Plante	Hydro-Quebec
Guest	Cornelius	Plath	OMICRON Energy Solutions GmbH
Guest	John	Poelma	NRG Energy
Guest	Alvaro	Portillo	Ing. Alvaro Portillo
Member	Bertrand	Poulin	Hitachi Energy
Guest	Chris	Powell	Intermountain Electronics
Member	Jarrod	Prince	ERMCO
Guest	Donnell	Rackley	RESA Power
Member	Ulf	Radbrandt	Hitachi Energy
Guest	Shiva	Rampersad	Dow Chemical Company
Guest	Jimmy	Rasco	Rasco Consulting LLC
Guest	John	Reagan	RWE Renewables
Guest	Scott	Reed	MVA
Guest	Jonathan	Reimer	FortisBC
Guest	Afshin	Rezaei-Zare	York University
Member	Pierre	Riffon	Pierre Riffon Consultant Inc.
Member	Diego	Robalino	Megger
Guest	Tim	Rocque	SPX Transformer Solutions, Inc.
Guest	Leopoldo	Rodriguez	Transformer Testing Services LLC
Guest	Zoltan	Roman	GE Grid Solutions
Member	Mickel	Saad	Hitachi Energy
Member	Hakan	Sahin	Virginia/Georgia Transformer
Guest	Dinesh	Sankarakurup	Duke Energy
Member	Amitabh	Sarkar	Virginia Transformer Corp.
Member	Daniel	Sauer	EATON Corporation
Guest	Roderick	Sauls	Southern Company Services
Guest	Anil	Sawant	Virginia Transformer Corp.
Member	Alan	Sbravati	Cargill, Inc.
Member	Markus	Schiessl	SGB
Member	Jeffrey	Schneider	Power Partners/Spire Power Solutions
Member	Ewald	Schweiger	Siemens Energy
Member	Pugal	Selvaraj	Virginia Transformer Corp.
Guest	Cihangir	Sen	Duke Energy

Member	Devki	Sharma	Entergy
Member	Hemchandra	Shertukde	University of Hartford
Guest	Stephen	Shull	BBC Electrical Services, Inc.
Member	Jonathan	Sinclair	PPL Electric Utilities
Guest	Christopher	Slattery	FirstEnergy Corp.
Member	Sanjib	Som	Pennsylvania Transformer
Member	Mike	Spurlock	Spurlock Engineering Services, LLC
Member	Fabian	Stacy	Hitachi Energy
Member	Brad	Staley	Salt River Project
Member	Kyle	Stechschulte	American Electric Power
Guest	Hampton	Steele	Tennessee Valley Authority
Member	Andrew	Steineman	Delta Star Inc.
Member	Babanna	Suresh	Southwest Electric Co.
Member	Charles	Sweetser	OMICRON electronics Corp USA
Member	Janusz	Szczechowski	Maschinenfabrik Reinhausen
Member	Troy	Tanaka	Burns & McDonnell
Guest	Marc	Taylor	JFE Shoji Power Canada Inc.
Guest	Dervis	Tekin	Meramec Instrument Transformer Co.
Guest	Ed	teNyenhuis	Hitachi Energy
Member	Alwyn	Van Der Walt	Electrical Consultants, Inc.
Guest	Jacques	Vanier	Electro Composites (2008) ULC
Chair	Ajith	Varghese	SPX Transformer Solutions, Inc.
Member	Jason	Varnell	Doble Engineering Co.
Member	Rogerio	Verdolin	Verdolin Solutions Inc.
Guest	Dejan	Vukovic	Hitachi Energy
Member	Pragnesh	Vyas	Sunbelt-Solomon Solutions
Guest	Loren	Wagenaar	WagenTrans Consulting
Guest	Dieter	Wagner	Hydro One
Member	Hugh	Waldrop	Memphis Light, Gas & Water
Member	David	Wallach	Duke Energy
Guest	Alan	Washburn	Burns & McDonnell
Member	Bruce	Webb	Knoxville Utilities Board
Guest	Drew	Welton	Intellirent
Member	Peter	Werelius	Megger
Member	Daniel	Weyer	Nebraska Public Power District
Member	Dr. Alexander	Winter	HIGHVOLT Pruftechnik Dresden
Guest	Jeffrey	Wright	Duquesne Light Co.
Member	Baitun	Yang	R.E. Uptegraff
Guest	Malia	Zaman	IEEE
Member	Peter	Zhao	Hydro One
Member	Kris	Zibert	Allgeier, Martin and Associates

Member	Waldemar	Ziomek	PTI Transformers