Insulation Life Subcommittee

October 25, 2023
Kansas City, MO

Chair: Sam Sharpless
Vice-Chair: Jinesh Malde
Secretary: Anastasia O'Malley

The Insulation Life Subcommittee (ILSC) was called to order by the Chair on October 25, 2023, at 8:00 am CDT. The Chair introduced the subcommittee officers. Due to the size of the group, general introductions were not made. The Chair requested that each person state their name and affiliation when addressing the subcommittee.

H.1 Chair's Report/Remarks

The Chair emphasized the timely completion, technical accuracy, and usefulness of quality projects through the participation of working group leaders, subject matter experts and the general membership.

The Chair emphasized that the final document structure and goals should be established as soon as possible. Working groups and task forces need to avoid scope creep. If new information arrives late, it should be documented in the minutes for the next revision. Working groups should conduct on-line meetings in between regular Transformer Committee meetings to move projects along. Efforts need to be made to avoid PAR extensions. Online meeting minutes and attendance must be kept and included with Fall/Spring subcommittee meeting minutes.

The Chair showed the essential patent claim notice and requested that any person with knowledge of an essential patent that meets the requirements of any subcommittee standard to bring the issue forward for discussion. No one responded to this request.

The Chair reviewed guidelines for IEEE working group meetings reminding compliance with all applicable laws, including antitrust and competition laws.

The Chair displayed the copyright policy and advised the subcommittee that permission would be required from the authors or organizations for use of information.

The Chair discussed the membership requirements and welcomed new members: Kayland Adams, Camilo Casallas, Roberto DaSilva, Luis Gonzalez, Sergio Hernandez, Chao Li, Tiffany Lucas, Juliano Montanha, Emilio Morales-Cruz, Ion Radu, Michael Richardson, Cihangir Sen, Michael Sharp and Joshua Yun.

Former members Claude Beauchemin, Joseph Foldi, James Graham, Stacey Kessler, Mama Mbouombouo, Susan McNelly, Shankar Nambi, John Reagan, Oleg Roizman, Alwyn VanDerWald, Sukhdev Walia and Peter Zhao were moved to guest status.

H.2 Secretary's Report

The circulated attendance rosters reported that 91 out of 116 members were present in the meeting together with 131 guests. A quorum had been achieved. For the Fall 2023 Kansas City meeting, only paper rosters were used, supplemented by a hand count during the meeting. Participants requesting membership for the subcommittee were advised to reach out to the Chair, Vice-Chair or Secretary at the conference, through email or to note it on the paper roster. Twenty-five guests requested membership. A list of attendees is provided at the end of this report.

The Spring 2023 subcommittee meeting minutes had been provided to participants in advance of the meeting for review.

One correction was noted at the end of H.3 Task Force Reports H.3.1 Task Force C57.12.90 Clause 11, Temperature Rise Tests. The italicized sentence at the end of the motion had been omitted from the and shall be included as stated below.

> Dinesh Sankarakurup made a motion to approve the TF's recommendation for C57.12.90 Clause 11.3.2 as, "Liquid temperature rise is the difference between liquid temperature and ambient temperature. The stabilized liquid temperature rise above ambient shall be considered to be reached when the top liquid temperature rise does not vary more than 2.5% or 1ºC, whichever is greater during a 3 h period. *The stabilized liquid temperature rise determined at the end of the total loss run shall not be averaged over time.*" Ajith Varghese seconded the motion. There was no opposition to the motion. It passed by unanimous consent.

Ewald Schweiger made a motion to approve the corrected minutes. Tom Prevost seconded the motion. After hearing no objection from the attendees, the Spring 2023 meeting minutes were approved by unanimous consent.

The agenda for the meeting had been provided to participants in advance of the meeting for review. An updated agenda with changes highlighted was displayed. John John moved for approval of the agenda as shown. The approval of the agenda was seconded by Bruce Forsyth. After hearing no objection from the attendees, the meeting agenda was approved by unanimous consent.

H.3 Taskforce Reports

H.3.1 Task Force C57.12.90 Clause 11, Temperature Rise Tests – Dinesh Sankarakurup, TF Chair presented the meeting minutes

ILFC TF Continuous Revisions to IEEE C57.12.90 Clause 11

Temperature-rise Tests

October 24th, 2023, Kansas City, MO

TF - Temperature-rise Tests		
Chair: Dinesh Sankarakurup	**Vice-Chair: Ajith M. Varghese**	**Secretary: Cihangir John Sen**
Room: Century C	Date: October 24th, 2023	Time: 3:15 pm to 4:30 pm
Total TF Members: 25	Members present at the Quorum: 14	Attendance Per Roster: 46
Guests present: 26 (Table-2)	Membership requested: 14	Granted membership: 6
Status changed to Guest: 3		Final TF Members: **28** (Table-1)

Chair's Remarks

The meeting was called to order at 3:15 PM on October 24, 2023. The Chair welcomed members and guests to the Fall 2023 meeting.

Attendance rosters were circulated. There were 46 participants present (including the Chair, Vice Chair, and the Secretary) and 14 participants requested voting membership. 6 of the 14 requests were granted according to their participation records. 3 members' statuses have changed to guest. Per the Working Group Policies and Procedures, voting membership status will be effective as of the start of the next meeting in Spring 2024. Table 1 is the final list of the 28 members of this TF. Table 2 lists the guests present at this meeting.

Table-1: Final Membership List (after F23 Meeting)

	First Name	Last Name		First Name	Last Name
1	*Alex	Alahmed	**15**	Fernando	Leal
2	*Tauhid	Ansari	**16**	Gabriel	Mamede
3	Steve	Antosz	**17**	Jarrod	Prince
4	Gilles	Bargone	**18**	Dinesh	Sankarakurup
5	William	Boettger	**19**	*Ewald	Schweiger
6	Juan	Castellanos	**20**	Cihangir John	Sen
7	Thomas	Dauzat	**21**	*Abdulmajid	Shaikh
8	Samragni	Dutta Roy	**22**	Michael	Shannon
9	Bruce	Forsyth	**23**	Sam	Sharpless
10	Saramma	Hoffman	**24**	Valeriu	Tatu
11	Ramadan	Issack	**25**	Ajith	Varghese
12	*Qasim	Khan	**26**	Jason	Varnell

13	*Zan	Kiparizoski	**27**	Pragnesh	Vyas
14	Egon	Kirchenmayer	**28**	David	Wallach

*New members

Chair made the call for the patent and shared the IEEE SA slides on patent policy and copyright. The attendees were asked if there were any Patents and Copyrights relevant to the scope that the TF should be aware of. None were reported.

Table-2: Guests present during F23 WG Meeting

	First Name	Last Name		First Name	Last Name
1	Donald	Ayers	14	Moses	Manzano
2	Michael	Butti	15	Ismail	Naja
3	Camilo	Casallas	16	Kris	Neild
4	Eunyoung	Cho	17	Joe	Nims
5	Everton	De Oliveira	18	George	Partyka
6	Luc	Dorpmanns	19	Sylvain	Plante
7	Hakim	Dulac	20	Klaus	Pointner
8	Shawn	Gossett	21	Bertrand	Poulin
9	Peter	Heinzig	22	Kabir	Sethi
10	Sergio	Hernández Cano	23	Sanjib	Som
11	Thomas	Holifield	24	Ryan	Thomson
12	Philip	Hopkinson	25	Yves	Vermette
13	Nathan	Katz	26	Matthew	Weisensee

Quorum, Approval of Minutes and Agenda

At the time of quorum 14 of the 25 members were present so quorum was achieved short after the meeting start. The Unapproved minutes from the Spring 2023, meeting was presented by Chair and approved by the TF (Saramma Hoffman, Juan Castellanos seconded).

The agenda for Fall 2023 meeting was also unanimously approved (Sam Sharpless, David Wallach seconded).

TF started to discuss about the old businesses since quorum was achieved.

Old/ Unfinished Businesses:

Items #1 and #2 from the last meeting were approved so they were not discussed during the Fall 23 meeting.

#1 Replacing the word "Ultimate" with "Stabilized" in C57.12.90 clause 11.3.2

The change of replacing the word "Ultimate" with "Stabilized" in C57.12.90 clause 11.3.2 was approved.

#2 Adding a sentence to section 11.3.2 to clarify stabilized liquid temperature rise shall not be averaged

It was approved to add a sentence to section 11.3.2 to clarify stabilized liquid temperature rise shall not be averaged.

#3 Chair presented the item that was brought up by Ewald Schweiger and Egon Kirchenmayer regarding the safety concern during Temp. Rise Test resistance measurements.

Ewald Schweiger (Siemens Energy) explained that the change request had been discussed in the TF and followed by the SC. The conclusion in the SC was that this topic will be handled by the "TF C57.12.90 Clause 11 Temperature Rise Tests ".

Egon Kirchenmayer (Siemens Energy) talked about the problem statement and the proposed change:

Problem Statement:

"C57.12.90 [clause 11] require achieving the as quickly as possible time between power shut-off at heat run end and installation of resistance measurement devices. Limits the period from finalization of heat run test to start of hot resistance measurement to 4min. Frequently are faced with requests to achieve transition times between both tests to below 4 minutes (supported by IEEE base "as quickly as possible" "short time" requirement)"

Proposed modifications:

- Integrate safety aspects into next revision of IEEE standard C57.12.90 clause 11 to help to establish an intrinsically safe testing process, including technical and engineering controls.
- Use the directly measured hottest-spot temperature based on fiber optics as a basis and calculate the winding temperature rise based on the measured hottest-spot temperature and on the measured oil temperatures. Required calculations are already in the newly published C57.169.
- Add a new paragraph 11.3 which allows this alternative method for determination of the winding rise in cases where the direct measurement of the hottest-spot temperature is possible. Describe the new procedure in detail.

Steve Antosz agreed on considering the alternate method of direct hot-spot measurement. However, the safety aspect could be beyond this Task Force's scope.

Ajith Varghese, mentioned about the different practices between manufacturers in how and where to install fiber optic probes in the windings that may create inconsistency.

Bertrand Poulin agreed with the point that the manufacturers use different varieties of measurement techniques with fiber optics. He also mentioned that significant information will not be available if the temperature curve not created at the end of the temperature rise test. However, he is supporting the idea of making the resistance measurement process safer by using the technology.

Juan Castellanos mentioned that the winding temperature rise is also a quality check for the contact resistance, aux. windings, regulating windings.

Sanjib Som said that the temperature rise test provides more information especially when there is an issue with the test.

Sylvain Plante pointed out the issue with installation of the fiber optic probes that can be loose, so it is mostly needed to install more probes than required because of the issues with the installation or probes.

Egon said the suggestion for using fiber optics is not either/or discussion. In fact, the suggestion is to open the opportunity for using the fiber optics as an alternative method.

Tauhid Ansari mentioned that the fiber optic measurement vs traditional method could give different results since f/o measure just one spot vs average temperature with the take off.

Steve Antosz made a motion to create a subtask force to study the subject and make a recommendation. Egon Kirchenmayer seconded. Motion carries.

Below Subtask Group Members volunteered to provide a suggestion on the subject until the next Spring 2024 meeting in Vancouver.

- Egon Kirchenmayer
- Ewald Schweiger
- Hakim Dulac
- Peter Heinzig
- Steve Antosz

#4 Hot spot rise calculation for OFAF /OFWF cooler transformer

Bertrand Poulin (Hitachi Energy) explained that there is a behavioral difference between OFAF transformers and ONAF transformers when it comes to evaluating the top oil. C57.119-2018 guide for overload tests shows typical profile, with differences in top oil temperature for OFAF and OFWF compared to ONAN and ONAF. Later in document shows calculations for difference, but in 12.90 there is no mention of the differences. Propose to ensure 12.90 makes this reference to difference between OFAF and others. It is suggested that the section should be a part of the test core (C57.12.90) rather than a guide (C57.119).
Bertrand Poulin clarified that by adding this information into C57.12.90 under, we will achieve a better representation of OFAF and OFWF top oil temperatures.

Chair suggested to circulate the suggested revision of the clause 11.3.2 to all group including the guests. TF agreed to review the revised section and provide feedback until the next meeting.

#5 Negative Altitude Correction (Transformers tested at factories located > 1000 m)

Egon Kirchenmayer (Siemens Energy) provided one formula that can be applicable to + or – altitude delta correction (works for both ways).
TF is very close to finalize the revised section; however, study group is expecting feedback from the manufacturers at higher altitudes such as Mexico City, Colombia, Idaho, etc.
Ajith made a motion to survey the text with the formula. Steve Antosz seconded. Motion passed.
Chair will survey the altitude correction section within the Task Force as well as in the ILSC to seek for technical feedback.

#6 Tap Selection for Temp Rise Test:

Steve Antosz: Sub clauses 11.1.2.1 and 11.1.2.2 say, "*Transformer shall be tested with the combination of connections and taps that give the highest average winding temperature rise."*
This may be good for two-winding transformers, but (for example) for an autotransformer with a

loaded tertiary, there may be cases of allowable loading that produce higher total losses (and rises), such as arithmetic or Vectorial step-up and step-down loading cases, if specified.

a) Stipulate the measurement (determination) of maximum total losses for three-winding transformers which is dependent on the combination of connection, taps, and loading case. These losses would have to injected or adjusted for using corrections in sub clause 11.4.2.

b) For an autotransformer the maximum common winding current should be circulated (or adjusted) for the measured winding temperature gradient and winding rises to be determined. If the maximum current cannot be circulated, the results should be adjusted using corrections in sub clause 11.4.1

c) Temperature rise test tap selection. Once total losses are determined, the selection of a tap position for temperature rise test should allow the current to flow in as many as possible turns and windings to avoid any possible thermal issues in untested turns and cables. In some cases, this might apply to involve series and PA transformers, if provided

The subgroup worked on a revised section regarding the tap selection during temperature rise test. Jason Varnell edited and provided a final format of the document.

Ajith went through the revised section and explained what the recommended taps are depending on the type of the transformers. He made a motion to survey this three-page section within the TF as well as within the ILSC. Jason Varnell seconded.

#7 HS rise calculation using fiber optic probes

Ajith Varghese: Hotspot rise with fiberoptics during the total loss (LL+NLL) will be higher than what is expected. When it is reduced to one hour level (at rated current) the fiber optics reading will be lower than what it should be. Ajith said, he has seen reports that show the rated current measurement not including the NLL part of the total losses.

TF agreed that the concern is more related with the C57.169 (Determination of Maximum Winding Temperature Rise in Liquid-Immersed Transformers). Chair will forward the discussion to the C57.169 Chair for taking into consideration for the next revision.

No new business.

Meeting was adjourned at 4:30pm.

Minutes respectfully submitted by

Cihangir John Sen
Secretary

Dinesh Sankarakurup made a motion to survey the altitude correction section within the ILSC via email. Sanjib Som seconded the motion. There was no opposition to the motion. It passed by unanimous consent.

H.4 Technical Activity Reports:

H.4.1 WG IEEE 1276a IEEE Guide for the Application of High-Temperature Insulation Materials in Liquid Immersed Distribution, Power and Regulating Transformers, Amend Annex B – Kevin Biggie WG Chair presented meeting minutes

WG IEEE 1276a, Amend Annexes B&D – Meeting Minutes

IEEE 1276 - IEEE Guide for the Application of High-Temperature Insulation Materials in Liquid-Immersed Distribution, Power, and Regulating Transformers

Monday, 23 October 2023, 1:45pm – 3:00pm CDT – Fall 2023 Meeting, Kansas City, MO, USA

- Chairman: Kevin Biggie (Weidmann)
- Vice-chair: George Frimpong (retired)
- Secretary: Evanne Wang (DuPont)

The Chair called the meeting to order at 1:45pm CDT and welcomed attendees to the meeting. A total of fifty-three (53) attendees were present with twenty-three (23) members present including the Chair and Secretary. A quorum was achieved with 23 of 30 members present. Six (6) guests requested membership and three (3) guests met the requirement of attending two of the last three meetings. Thus, subsequent to the meeting, the WG welcomed new members: Vivek Bhatt, Rob Ghosh, and Timothy Raymond. Given this change, the new total number of members for the next meeting is thirty-three (33).

The Chair reviewed the purpose of the Working Group, which is to amend Annexes B and D of IEEE 1276. The meeting attendees introduced themselves. The Chair reviewed the IEEE Essential Patent Claims and copyright information, and no patent claims nor copyright items were noted. The minutes from the last WG meeting on March 20th, 2023 provided by the Chair prior to the meeting were unanimously approved by a motion from Stephen Oakes (WEG Transformers) and seconded by Jinesh Malde (M&I Materials). The proposed revised meeting agenda (Rev1) provided by the Chair prior to the meeting was reviewed in the meeting and was unanimously approved by a motion from Sam Sharpless (Rimkus Consulting) and seconded by Stu Chambers (SD Chambers Consulting).

The Chair then proceeded through the agenda using a prepared presentation. A summary of the last WG meeting (Spring 2023), including the established guidelines for what to include in the amendment, was reviewed. Then, a summary of the activities of the Task Force established to draft the amendment that have taken place since the last Working Group meeting was provided. The Chair noted that from a timing perspective, the Working Group needs to complete the amendment prior to 2025, which is the start of the normal cycle to open a PAR for the revision of the entire IEEE 1276 guide document (2020 version).

The Chair then proceeded to review the progress made by the “Draft Amendment” Task Force thus far, including: a review of existing material in Annex B vs. the agreed guidelines, a review of previously submitted aging examples vs. the agreed guidelines, and a review of potential new aging examples introduced to the TF since the last WG meeting. No comments from this review were received.

Per the agenda, the Chair then began a review of the current Draft D.4 of the document developed through the work of the Task Force. The following comments were received:

- B.1 Aramid Insulation System
  - Lance Lewand (Doble) commented that “Kraft” should not be capitalized.
- B.2 Ester Insulation System

    - Alan Sbravati (Hitachi Energy) commented that the initial intent for the ester insulation section was to have separate sections for different types of esters (natural and synthetic). The Chair responded that there is one aging example that includes both natural and synthetic esters, but there are no examples exclusive to synthetic ester. However, the organization of examples and potential changes can be considered by the Task Force.
- B.3 Example high temperature insulation system loading guide
    - The Chair noted that a comment was made that questions: "should a loading guide example be in IEEE 1276 or should it be in the loading guide (i.e. C57.91)?"
    - Timothy Raymond (EPRI) noted that the loading guide is currently describing mineral oil and that there should be a guide for alternative insulation systems.
- Tim Raymond requested that Draft 4 be distributed to the WG, and the Chair indicated that it will be sent to the group after the meeting along with the meeting minutes.

The Chair then addressed the path ahead:

- The Chair would like to target completion of a draft for WG straw ballot by the Spring 2024 WG meeting, as the cutoff date for data submission was agreed as the end of 2023. In order to continue progress towards that target, the Chair proposed to schedule another Task Force meeting for early December 2023, which the group agreed. The need for subsequent TF meetings can then be determined by the TF.
- Evanne Wang (DuPont) provided a verbal update on a new aging example data submission from DuPont per Roger Wicks (DuPont) regarding dual-temperature aging of aramid insulation in mineral oil. She noted that this information is being submitted in a paper for the INSULEC conference within the next week. The conference will be taking place in February 2024.
    - Jinesh Malde commented that this is potentially an important document that needs to be included in the aging examples.
    - Sam Sharpless (Rimkus Consulting) commented that a change to agreed data submission deadline should be that "… the paper needs to be accepted for publishing by the end of 2023". Stu Chambers noted that some journals will publish online versions of papers prior to in-person presentations, which should count as having a published paper. Jinesh Malde recommended bringing this issue up during the Subcommittee meeting.
    - Sam Sharpless made a motion that "aging example submissions should be accepted for publishing by the end of the year (2023)." This was seconded by Juan Castellanos (GE Prolec). The motion passed unanimously.

The meeting was adjourned at 3:04pm CDT.

Additional comments from the Secretary:

- Subsequent to the meeting, Chao Li (Eaton), Tiffany Lucas (Prolec GE) and Griffin Burk (Ergon) volunteered to participate in the "Draft Amendment" Task Force.

Respectfully submitted,

Kevin Biggie, Chair
George Frimpong, Vice-Chair
Evanne Wang, Secretary

Attendance WG IEEE 1276a Annex B & D Meeting (10/23/2023):

- Attendees: 53
- Members present: 23
- Guests requesting membership: 6
- Guests granted membership: 3

The following attendees were present, with status current as of after the meeting:

Annex H

Last/Family/ Surname	First/Given Name	Affiliation / Company Name	Status / Role
Bargone	Gilles	FISO Technologies Inc.	Guest
Bhatt	Vivek	Prolec Energy	Member
Biggie	Kevin	Weidmann Electrical Technology	Chair
Botti	Michael	Hyosung Hico	Guest
Burk	Griff	Ergon Inc.	Guest
Castellanos	Juan	Prolec GE	Member
Chambers	Stuart	SD Chambers Consulting	Member
Da Silva (Ignacio)	Roberto	Cargill	Member
Door	Jeffrey	The H-J Family of Companies	Member
Espindola	Marco	Hitachi Energy	Guest
Forsyth	Bruce	Cargill	Guest
Frazier	Raymond	Ameren	Guest
Ghosh	Rob	GE	Member
Ghosh	Kablouh	Hitachi Energy	Guest
Gonzalez	Luis	Canduct Industries	Member
Gyore	Attila	M&I Materials	Member
Harper	Robert	Soltex	Guest
Hoffman	Saramma	PPL	Guest
Hoffman	Gary	Advanced Power Technologies	Guest
Hopkinson	Philip	HVolt	Member
Huang	Eduard	Fortune Electric	Guest
Kaineder	Kurt	Siemens Energy	Member
Kennedy	Sheldon	Sheldon P. Kennedy Engineering PLLC	Guest
Kulasek	Krzysztof	Delta Star Inc.	Guest
Lewand	Lance	Doble	Member
Li	Chao	Eaton	Member
Loiselle	Luc	Tetra Tech	Guest
Lucas	Tiffany	Prolec GE Waukesha	Member
Malde	Jinesh	M&I Materials	Member
Mani	Balakrishnan	ITEC	Member
McBride	Brian	Cargill	Member
Mikulecky	Filip	Siemens Energy, KPT	Guest
Morales-Cruz	Emilio	Qualitrol	Member
Mushill	Paul	Ameren	Guest
Oakes	Stephen	WEG Transformers	Member
O'Malley	Anastasia	Consolidated Edison	Guest
Owen	John	Powertech Labs	Guest
Prevost	Tom	Weidmann	Guest
Raymond	Tim	EPRI	Member
Reiss	Tony	Custom Materials Inc.	Member
Sbravati	Alan	Hitachi Energy	Member

Shannon	Michael	REA Magnet Wire	Member
Sharpless	Samuel	Rimkus Consulting	Member
Spitzer	Tommy	City Transformer	Guest
Tabakovic	Dragan	Hubbell Power Systems	Guest
Traut	Alan	Howard Industries	Guest
Vaagensmith	Bjorn	Idaho National Laboratory	Guest
Verdolin	Rogerio	Verdolin Solutions	Guest
Wang	Evanne	DuPont	Secretary
Weatherbee	Eric	Pcore Electric	Guest
Weiss	Zachery	WEG Transformers	Member
Wiesel	Devora	Con Edison	Guest
Zaman	Malia	IEEE SA	Guest

H.4.2 WG PC57.91 Guide for Loading Mineral-Oil-Immersed Transformers – David Wallach WG Chair presented meeting minutes

IEEE PES Transformer Committee
Working Group PC57.91 Loading Guide
Fall 2023 Meeting Minutes

Oct 24, 2023, 8:00-9:15 PM (CST)

Westin Hotel, Kansas City, MO

1. Call to Order
2. The Chair presented the meeting agenda.
3. Chair reiterated the following IEEE-SA Policies:
   A. Call for Essential Patents
   B. Copyright
   C. Antitrust
   D. Code of Ethics
4. Establishment of quorum: Members in Attendance-34; Total Members-44; Total Attendees-119. Quorum was established at 77.3%.
5. The chair asked for a unanimous approval of this meeting's agenda (after establishing quorum), and it was so approved, with no objections. Sanjib Som proposed a motion to approve the agenda and John K John seconded it, with none opposing it.
6. The chair asked for a motion for approval of the March 20, 2023, Milwaukee WG Meeting minutes (after establishing quorum). Amitabh Sarkar moved the motion to approve the minutes and Edgardo Garcia seconded it, with none opposing it.
7. The Chair provide a status update for the guide:
   A. The PAR expires at the end of Dec 2023, and so an extension request until 2025 has been submitted to NESCOM.

B. A straw ballot with Draft Version 7 was polled and 27 editorial and 4 technical comments were received. A CRG with Stuart Chambers resolved the comments and Draft 8 has been since posted to the TC website.
C. Some late straw ballot comments were received from Alexandr Levin and Tim Raymond. The Chair asked Tim R and Alexander Levin if they were okay holding their comments pending their resolution by a Comments Resolution Group (CRG).

8. Other Discussions:

a. The Chair stated that during the Spring 2023 meeting in Milwaukee that volunteers were requested to form the CRG and also authorize the CRG to make necessary revisions based upon comments received and move the draft to SA Ballot. Both of these motions had been approved. The chair asked if there were any additional volunteers to add to those who volunteered previously. Stuart Chambers requested to participate.
b. The following members between the Spring 2023 and this meeting agreed to volunteer on the CRG (in addition to the officers of the working group): Saramma Hoffman, Zack Draper, Kayland Adams, Stuart Chambers, Tom Raymond and John K John.
c. The Chair mentioned that he will seek approval from the Insulation Life Committee tomorrow (was subsequently approved by the SC) to send the Draft 8 after revisions to IEEE SA Ballot.

9. There was no unfinished business.

10. There was no new business.

11. Next Meeting: The chair announced that the next meeting, if needed based on ballot status, will be scheduled on March 24, 2024 at Vancouver, Canada.

12. Adjournment

***Chair**:* David Wallach ***Secretary**:* Kumar Mani

Attendee List:

First Name	Last Name	Role	Company	Requested Membership
Kayland	Adams	Member	GE Prolec	
Alex	Alahmed	Guest	Evergy	
Maadh	Al Saad	Guest	Evergy	
Daniel	Alexandrowkz	Guest	Hitachi Energy	
Edmundo	Arevalo	Guest	BPA	
Gilles	Bargone	Member	FISO Technologies Inc.	
Jared	Bates	Member	Oncor Electric Delivery	
Vivek	Bhat	Guest	GE Prolec Waukesha	
Kevin	Biggie	Guest	Weidmann	
Wallace	Binder	Member	WB Binder Consultant	

Piotr	Blaszczyk	Guest	Specialty Transformer Corp	
William	Boettger	Guest	Boettger Transformer Consulting LLC	
Wilerson	Calil	Guest	Hitachi Energy	
David	Calitz	Member	Siemens Energy	
Thomas	Callsen	Guest	Weldy Lamont Associates	
Juan	Castellanos	Member	Prolec GE	
Stuart	Chambers	Member	Powertech Labs	
Vivian	Chan	Guest	Hitachi Energy	
Stuart	Chambers	Member	Powertech Labs Inc.	
Noan	Chesser	Guest	Oncor Electric Delivery	
Craig	Colopy	Guest	Retired	
Janet	Croket	Guest	Fayetteville PWC	
Marcos	Czernorucki	Guest	Hitachi Energy	
Thomas	Dawzat	Guest	AEP-SWEPCO	
Pooneh	Davoodi	Guest	Delta Star	
Everton	De Oliveira	Guest	Siemens Energy	
Roberto	Da Silva	Guest	Cargill	
Paul	Dolloff	Member	East Kentucky Power	
Luc	Dormanns	Guest	Royal SMIT	
Jaslo	Dzodan	Guest	Koncar D&ST	
Zachary	Draper	Member	Delta-X Research Inc.	
Hakim	Dulac	Guest	Advanced Power Technologies	
Evengii	Ermakov	Guest	Siemens Energy	
Marco	Espindola	Member	Hitachi Energy	
Raymond	Frazier	Member	Ameren	
Xose	Lopez Fernandez	Guest	Universidade Vigo	
Eduardo	Garcia Wild	Member	Siemens Energy	
Dragana	Grasic	Guest	D&ST	
Orlando	Geraldo	Guest	H J Family of Companies	
Luis	Gonzalez	Guest	Canduct Industries Ltd	
Luke	Grandbois	Guest	IFD Technologies	
Ravi	Gupta	Guest	Megger	
Gioyanni	Hernandez	Guest	Virginia Transformer Corp	
Gary	Hoffman	Guest	APT Technologies	
Saramma	Hoffman	Member	PPL Electric Utilities	
Ryan	Hogg	Guest	Bureau of Reclamation	
Edward	Huang	Guest	Fortune Electric	
John	John	Member	Virginia Transformer Corp	
Christopher	Johnson	Guest	Oncor	
Jerzy	Kazmeirczak	Guest	Hitachi Energy	
Qasim	Khan	Guest	NEETRAC- Georgia Tech	
Rafal	Kowalski	Guest	Hitachi Energy	
Sheldon	Kennedy	Member	Niagara Transformers	

Stacey	Kessler	Member	Ulteig Engineers	
Egon	Kirchenmayer	Member	Siemens Energy	
Hatija	Koprivnjak	Guest	D&ST	
Andrew	Larison	Guest	Hitachi Energy	
Junho	Lee	Guest	Hyundai Electric	
Weijun	Li	Member	Braintree Electric Light Dept.	
Jacky	Lin	Guest	Fortune Electric	
Luc	Loiselle	Guest	Tetra Tech	
Jose Luis	Machain	Guest	GE Prolec	
Kumar	Mani	Secretary	Duke Energy	
Kevin	Mazzei	Guest	Black & Veatch	
Darrell	Manubhat	Member	Siemens Energy	
Lee	Matthews	Member	Howard Industries	
Brian	Mcbride	Guest	Cargill	
Tim	Menter	Guest	Lincoln Electric System	
Filip	Mikulecky	Guest	Siemens Energy	
Emilio	Moarles Cruz	Guest	Qualitrol Corp	
Hugo	Murillo	Guest	H-J Family of Companies	
Annatasia	O'Malley	Guest	ConEd of NY	
Tihomir	Pandza	Guest	Siemens Energy	
Nilesh	Patel	Guest	Hyundai AL	
Poorvi	Patel	Guest	EPRI	
Verena	Pellon	Guest	Nextera	
Migrel	Plascencia	Guest	PG&E	
Homar	Portillo	Member	Advanced Power Tech	
Bertrand	Poulin	Guest	Hitachi Energy	
Adrian	Rashid	Guest	Measurement Canada	
Tim	Raymond	Member	EPRI	
Jonathan	Reimer	Guest	MR-Germany	
Michael	Richardson	Guest	Ameren	
Tim	Rocque	Guest	GE Prolec Waukesha	
Fernando	Salinas	Guest	Power Partners	
Dinesh	Sankarakurup	Guest	Duke Energy Inc	
Amitabh	Sarkar	Member	Virginia Transformer Corp.	
Henry	Sherto	Guest	WHART	
Stephan	Schindler	Guest	MR-Germany	
Alfons	Schrammel	Guest	Siemens Energy	
Samuel	Sharpless	Member	Rimkus Consulting Group	
Jimmy	Smith	Guest	Howard Industries	
Yong Tae	Sohn	Guest	Hyosung HICO	
Sanjib	Som	Member	Pennsylvania Transformer	
Fabian	Stacy	Guest	Hitachi Inc	

Brad	Staley	Member	Leeward Renewable Energy	
H Allen	Steele	Guest	TVA	
Shull	Stephen	Guest	BBC Electrical Services	
Ali	Syed	Guest	ConED	
Mike	Thibault	Guest	PG&E	
Scott	Thomas	Guest	Hitachi Energy	
Ryan	Thompson	Guest	Burns & McDonnell	
Tim	Tillery	Guest	Howard Industries	
Mark	Tostrud	Member	Dynamic Ratings Inc	
Jason	Varnell	Member	Doble Engineering Inc	
Roger	Verdolin	Guest	Verdolin Solutions	
Kannan	Veeran	Guest	Virginia Transformers	
Yves	Vermette	Guest	Electro Composites	
Karsten	Viereck	Guest	MR-Germany	
Krishnaswamy	Vijayan	Guest	PTI Canada	
Samuel	Young	Guest	Hitachi Energy	
Joshua	Yun	Guest	Virginia Transformer Corp	
David	Wallach	Chair	Duke Energy	
Joe	White	Guest	Power Engineers	
Bruce	Webb	Member	Knoxville Utilities Board	
Zach	Weisss	Guest	WEG Transformers	
Matt	Weisensee	Guest	PacificCorp	
Trent	Williams	Guest	Advanced Power Technologies	
Jeffrey	Wright	Member	Duquesne Light Co.	

Dave Wallach requested approval from the Insulation Life Subcommittee to send Draft 8 PC57.91 after revisions by the Working Group to IEEE SA for Sponsor Ballot. There were no objections to unanimous approval.

H.4.3 PC57.162 Guide for the Interpretation of Moisture Related Parameters in Liquid Immersed Transformers and Reactors – Tom Prevost WG Chair presented update

Chair: Tom Prevost
Secretary: Deanna Woods

No meeting was held in Kansas City as the ballot resolution committee is meeting virtually to resolve many comments. The PAR expires on December 31, 2023. A request has been submitted to NesCom to extend the PAR.

H.4.4 PC57.165 IEEE Guide for Temperature Measurements for Liquid Immersed Transformers and Reactors – Mark Tostrud WG Chair presented update

Chair: Mark Tostrud
Vice Chair/Secretary: Zan Kiparizoski

No working group meeting was held in Kansas City as the document is completed and ready for recirculation ballot. The PAR expires on December 31, 2023.

H.4.5 C57.119 Study Group IEEE Recommended Practice for Performing Temperature Rise Tests on Liquid-Immersed Power Transformers at Loads Beyond Nameplate Ratings – Ewald Schweiger Chair

Chair: Ewald Schweiger

This study group has been established and will review the document to determine whether any revisions or improvements are needed. The study group will meet virtually and prepare recommendations for the next meeting. Interested participants should email Ewald Schweiger.

H.5 Old Business

None.

H.6 New Business

Stuart Chambers presented a proposal from Lance Lewand for a new document: Guide to the Interpretation of Direct and Indirect Tests for the Degradation of Cellulosic Materials in Oil-Immersed Transformers.

DISCUSSION

1. This guide is proposed as a new "guide" not a standard
2. Currently it does not fit in well with any existing standard or guide
3. It would only cover cellulose insulating materials and not aramid insulation or any other synthetic insulation
4. Some of tests are mentioned in other guides and standards but not explored in detail
5. I would offer to be the Chair if accepted

BACKGROUND

The longtime life of the transformer is based on the condition of the cellulosic insulation and how long it lasts. There are of course incipient fault conditions that can cause the transformer to fail early but it really is the condition of the cellulosic insulation that dictates the life of the unit.

There is a really good IEEE paper published in 1992 by Bill McNutt that covers some of the topics, but it is dated, and it was not made into guide for folks to use. Also, there was a later paper released by the committee on furanic compounds, but nothing arose from it.

PURPOSE

Currently, the guide is envisioned as follows with 9 proposed sections:

1. In-depth description of the cellulose aging mechanism that occurs in a transformer and the stressors involved with that degradation
    a. Different type of cellulose insulation
    b. Impact of preservation systems
2. What compounds are formed as result of cellulosic insulation degradation
3. Tests to determine the condition of the cellulosic insulation
    a. Direct Tests on the Paper (provide a sampling guide)
    b. Indirect Tests through the Use of Insulating Liquid analysis
4. Direct Tests
    a. Degree of Polymerization
    b. Tensile Strength
    c. FT-IR
    d. How and where to take samples including microsamples for DP
5. Indirect Tests (Chemical Markers)
    a. Furanic compounds (how and when to use, correction factors, rate of accumulation, computation of estimated DP, etc.)
    b. Methanol and Ethanol analysis (same as 5a for topics to cover)
    c. Other chemical markers such as water, acid, carbon oxides, acetone (from the oil as well)
    d. How different types of insulation affect the production of chemical markers
6. Analysis performed in non-mineral oil insulating liquids
7. Interpretation of Results
8. Minimizing Cellulosic Insulation Degradation in Transformers
9. Bibliography

Mario Locarno made a motion to form a Task Force to evaluate this topic and to study tests for the degradation of cellulosic material. Sanjib Som seconded the motion. There was no opposition to the motion. It passed by unanimous consent.

The meeting adjourned at 9:15am CDT.

Attendance:
91 Members
131 Guests

Role	Last Name	First Name	Company
Member	Adams	Kayland	Prolec GE Waukesha
Member	Antosz	Stephen	Stephen Antosz & Associates, Inc.
Member	Avanoma	Onome	MJ Consulting
Member	Ayers	Donald	Ayers Transformer Consulting
Member	Ballard	Robert	DuPont

Member	Bargone	Gilles	FISO Technologies Inc.
Member	Bigee	Kevin	Weidmann Electrical Technology
Member	Blaszczyk	Piotr	Specialty Transformers
Member	Boettger	William	Boettger Transformer Consulting LLC
Member	Botti	Michael	Hyosung HICO
Member	Calitz	David	Siemens Energy
Member	Casallas	Camilo	Trench Ltd
Member	Castellanos	Juan	Prolec GE
Member	Cheim	Luiz	Hitachi Energy
Member	Chambers	Stuart	SD Chambers Consulting
Member	Chiang	Solomon	The Gund Company
Member	DaSilva	Roberto	Cargill, inc.
Member	Digby	Scott	Duke Energy
Member	Dulak	Hakim	Advanced Power Technologies
Member	Dutta Roy	Samragni	Siemens Energy
Member	Ferreira	Marcos	
Member	Forsyth	Bruce	Cargill
Member	Frotscher	Rainer	Maschinenfabrik Reinhausen
Member	Garcia Wild	Eduardo	Siemens Energy
Member	Gaytan	Carlos	Prolec GE
Member	Gonzalez	Luis	Canduct Industries
Member	Gyore	Attila	M&I Materials Ltd
Member	Hayes	Roger	GE
Member	Hernandez	Sergio	Howard Power Solutions
Member	Hoffman	Saramma	PPL Electric Utilities
Member	John	John	Virginia Transformer Corp.
Member	Kaineder	Kurt	Trench Austria
Member	Kazmierczak	Jerzy	Hitachi Energy
Member	Kennedy	Gael	GR Kennedy & Associates LLC
Member	Kennedy	Sheldon	Sheldon P. Kennedy Engineering, LLC
Member	King	Gary	Howard Industries
Member	Kiparizoski	Zan	Howard Industries
Member	Kirchenmayer	Egon	Siemens Energy
Member	Lee	Moonhee	Hammond Power Solutions
Member	Levin	Aleksandr	Weidmann Electrical Technology
Member	Li	Chao	EATON Corporation
Member	Li	Weijun	Braintree Electric Light Dept.
Member	Locarno	Mario	Doble Engineering
Member	Lucas	Tiffany	SPX Transformer Solutions, Inc.
Member	Mabrey (Denzer)	Stephanie	Weidmann
Vice-Chair	Malde	Jinesh	M&I Materials
Member	Mani	Kumar	Duke Energy

Member	McBride	Brian	Cargill, inc.
Member	Montanha	Juliano	Siemens Energy
Member	Morales-Cruz	Emilio	Qualitrol Corp.
Member	Murray	David	Tennessee Valley Authority
Secretary	O'Malley	Anastasia	Consolidated Edison Co. of NY Inc
Member	Patel	Poorvi	Electric Power Research Institute
Member	Parkinson	Dwight	EATON Corporation
Member	Pointner	Klaus	Trench Austria GnbH
Member	Posadas	Daniel	Prolec GE
Member	Prevost	Thomas	Weidmann Electrical Technology
Member	Prince	Jarrod	ERMCO
Member	Radu	Ion	Hitachi Energy
Member	Raymond	Timothy	Electric Power Research Institute
Member	Reed	Scott	MVA
Member	Richardson	Michael	Ameren
Member	Saad	Mickel	Hitachi Energy
Member	Sahin	Hakan	Georgia Transformer
Member	Sankarakurup	Dinesh	Duke Energy
Member	Sarkar	Amitabh	Virginia Transformer Corp.
Member	Sbravati	Alan	Hitachi Energy
Member	Schiessl	Markus	SGB
Member	Schweiger	Ewald	Siemens Energy
Member	Sen	Cihangir	Duke Energy
Member	Sharp	Michael	Trench Limited
Chair	Sharpless	Samuel	Rimkus Consulting Group
Member	Shertukde	Hemchandra	University of Hartford
Member	Sinclair	Jonathan	Black & Veatch
Member	Som	Sanjib	Pennsylvania Transformer
Member	Staley	Brad	Leeward Renewable Energy
Member	Szczechowski	Janusz	Maschinenfabrik Reinhausen
Member	Tanaka	Troy	Burns & McDonnell
Member	Tostrud	Mark	Dynamic Ratings, Inc
Member	Varghese	Ajith	Prolec Energy
Member	Varnell	Jason	Doble Engineering
Member	Verdolin	Rogerio	Verdolin Solutions Inc.
Member	Vir	Dharam	Prolec GE Waukesha
Member	Vyas	Pragnesh	Sunbelt-Solomon
Member	Wallach	David	Duke Energy
Member	Wang	Evanne	DuPont
Member	Weiss	Zachery	WEG Transformers USA Inc.
Member	Welton	Drew	Intellirent
Member	Whitehead	William	H2scan Corporation
Member	Yun	Joshua	Virginia Transformer Corp.
Member	Ziomek	Waldemar	PTI Transformers

Annex H

Guest	Alahmed	Alex	Energy Wolfcreek
Guest	Anderson	Gregory	GW Anderson & Associates Inc.
Guest	Barker	Sean	Hitachi Energy
Guest	Beaudoin	Jason	Weidmann Electrical Technology
Guest	Bhardwaj	Rahul	Burns & McDonnell
Guest	Bhatt	Viveh	Prolec GE Waukesha
Guest	Binder	Wallace	WBBinder Consultants
Guest	Britton	Jeffrey	Phenix Tech. Div. of Doble Engineering
Guest	Carrizales	Juan Alfredo	Prolec GE
Guest	Catugas	Marcelo	Neil Services
Guest	Chan	Vivian	Hitachi Energy
Guest	Cho	EunYoung	Hico America
Guest	Colopy	Craig	Retired - general interest
Guest	Coker	Anthony	M&I Materials Inc
Guest	Cox	Paul (Randy)	GE
Guest	Crockett	Janet	FayettevillePWC
Guest	Cruz Valdes	Juan Carlos	Prolec GE
Guest	Dahlke	Scott	Central Maloney, Inc.
Guest	Dappen	Tim	Cargill, inc.
Guest	Davoudi	Pouneh	Delta Star
Guest	Delgado	Gabriel	Invenergy
Guest	De Oliveira	Everton	Siemens Energy
Guest	DeRouen	Craig	ERMCO
Guest	Dillon	Nikolaus	Dominion Energy
Guest	Dix	Larry	Quality Switch
Guest	Door	Jeffrey	The H-J Family of Companies
Guest	Draper	Zachary	Delta-X Research
Guest	Ermakov	Evgenii	Hitachi Energy
Guest	Espindola	Marco	Hitachi Energy
Guest	Faur	Florin	Prolec GE Waukesha
Guest	Fitzgerald	Sean	Com Ed
Guest	Frye	Richard	EATON Corporation
Guest	Fu	Renjic	Ermco/V&F Transformer
Guest	Fyrer	Bob	Dupont
Guest	Gara	Lorne	Shermco
Guest	Gardner	James	Prolec GE Waukesha
Guest	Ghosh	Rob	GE
Guest	Gorzin	Alireza	Black & Veatch
Guest	Gossett	Shaun	Ameren Illinois
Guest	Gragert	Jeffrey	Xcel Energy
Guest	Heinzig	Peter	Weidmann Electrical Technology

Guest	Hernandez	Jean	Georgia Tech NEETRAC
Guest	Holifield	Thomas	Howard Industry
Guest	Hollrah	Derek	Burns & McDonnell
Guest	Hopkins	Traci	H2scan
Guest	Hossain	Saif	Trench Limited
Guest	Johnson	Christopher	Oncor
Guest	Katapalli	Thrinadha	Virginia Transformer
Guest	Katz	Nathan	PacifiCorp
Guest	Kessler	Stacey	TC Energy
Guest	Khan	Qasim	Georgia Tech NEETRAC
Guest	Kiernan	Paul	WL Core
Guest	Koeck	Klaus	Trench Austria
Guest	Larison	Andrew	Hitachi Energy
Guest	Leal	Fernando	Prolec GE
Guest	Lee	Junho	Hyundai Electric
Guest	Loiselle	Luc	Tetra tech
Guest	Machain	Jose Luis	Prolec GE
Member	Mangubat	Darrell	Siemens Energy
Guest	Manzano	Moses	Hyosung HICO
Guest	Martin	Andrew	WL Core
Guest	Martinez	Daniel	JFE Shoji Power Canada Inc.
Guest	Mellin	Toni	Vaisala
Guest	Miller	Mike	Siemens Energy
Guest	Mills	Francis	Power Engineers
Guest	Minikel	Justin	Eaton
Guest	Munoz	Marta	Hitachi Energy
Guest	Mushill	Paul	Ameren
Guest	Naderian	Ali	BBA
Guest	Naja	Ismael	EATON
Guest	Nambi	Shankar	Bechtel
Guest	Narawane	Aniruddha	EATON Corporation
Guest	Neild	Kris	Megger
Guest	Newbill	Mark	Hitachi Energy
Guest	Ortega	Agustin	Siemens Energy
Guest	Parenti	Tyler	Cargill, inc.
Guest	Park	Hoony	Iljin Electric
Guest	Patel	Nitesh	Hyundai Power Transformers USA
Guest	Patel	Rakesh	Hitachi Energy
Guest	Pepe	Harry	Phenix Technologies Inc.
Guest	Pidcock	Jay	Ameren
Guest	Plascencia	Miguel	PG&E
Guest	Portillo	Homero	Advanced Power Technologies
Guest	Poulin	Bertrand	Hitachi Energy
Guest	Pousset	Baptiste	Transformer Protector

Guest	Rasco	Jimmy	Rasco Consulting LLC
Guest	Reimer	Jonathan	FortisBC
Guest	Reyes	Juan	Hitachi Energy
Guest	Rocque	Tim	Prolec GE Waukesha
Guest	Ronchi	Rodrigo	WEG Transformer
Guest	Rubio	Vinecius	Hitachi Energy
Guest	Salinas	Fernando	Power Partners
Guest	Schindler	Stefan	Machinenfabrik Reinhausen
Guest	Schleismann	Eric	Southern Company
Guest	Schrammel	Alfons	Siemens Energy
Guest	Sethi	Kabir	Hitachi Energy, Germany
Guest	Shull	Stephen	BBC Electrical Services, Inc.
Guest	Simons	Andre	JFE Shoji Power Canada Inc.
Guest	Singh	Kushal	Com Ed
Guest	Sohn	Yong Tae	Hyosung HICO
Guest	Spurlock	Mike	Spurlock Engineering Services, LLC
Guest	Stacy	Fabian	Hitachi Energy
Guest	Stankes	David	3M
Guest	Steele	H. Allen	TVA
Guest	Sweetser	Charles	Omicron Electronics Corp USA
Guest	Syed	Ali	Com Ed
Guest	Sze	Matthew	Omicron Electronics
Guest	Tarango	Erik	Olsun Electric
Guest	Taylor	Marc	JFE Shoji Power Canada Inc.
Guest	Tendulkar	Vijay	Eaton
Guest	Thiede	Andreas	Highvolt Dresden
Guest	Tillery	Tim	Howard Industries
Guest	Tirado	Fernando	Prolec GE
Guest	Tledukoulov	Anar	Qualitrol
Guest	Tong	Lin	TK Transformer & Switchgear
Guest	Uhlmann	Olivier	Reinhausen Canada Inc
Guest	Vaagensmith	Bjorn	Idaho National Lab
Guest	Van Der Walt	Alwyn	Electrical Consultants, Inc.
Guest	Van Dreel	Cole	American Transmission Co.
Guest	Vijayan	Krishnamurthy	PTI Transformers
Guest	vonGemminger	Richard	Dominion Energy
Guest	Walters	Shelby	Howard Industries
Guest	Webb	Bruce	Knoxville Utilities Board
Guest	Weisensee	Matthew	PacifiCorp
Guest	White	Joe	Power Engineers
Guest	Wilerton	Carl	Hitachi Energy
Guest	Wong	Terry	Trench Limited
Guest	Yeboah	Kwasi	GE Grid
Guest	Yuan	Guang	Hitachi Energy

Guest	Zaman	Malia	IEEE
Guest	Zhao	Peter	Hydro One

25 Guests requesting membership:

Guest	Alahmed	Alex	Energy Wolfcreek
Guest	Coker	Anthony	M&I Materials Inc
Guest	Delgado	Gabriel	Invenergy
Guest	DeRouen	Craig	ERMCO
Guest	Ermakov	Evgenii	Hitachi Energy
Guest	Espindola	Marco	Hitachi Energy
Guest	Gardner	James	Prolec GE Waukesha
Guest	Ghosh	Rob	GE
Guest	Gorzin	Alireza	Black & Veatch
Guest	Hopkins	Traci	H2scan
Guest	Hossain	Saif	Trench Limited
Guest	Johnson	Christopher	Oncor
Guest	Mills	Francis	Power Engineers
Guest	Narawane	Aniruddha	EATON Corporation
Guest	Newbill	Mark	Hitachi Energy
Guest	Parenti	Tyler	Cargill, inc.
Guest	Patel	Nitesh	Hyundai Power Transformers USA
Guest	Patel	Rakesh	Hitachi Energy
Guest	Rubio	Vinecius	Hitachi Energy
Guest	Salinas	Fernando	Power Partners
Guest	Sethi	Kabir	Hitachi Energy, Germany
Guest	Tendulkar	Vijay	Eaton
Guest	Vijayan	Krishnamurthy	PTI Transformers
Guest	White	Joe	Power Engineers
Guest	Wilerton	Carl	Hitachi Energy

Respectfully submitted,

Anastasia O'Malley
Secretary, Insulation Life Subcommittee