Insulation Life Subcommittee

March 13, 2024
Vancouver, British Columbia, Canada

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

The Insulation Life Subcommittee (ILSC) was called to order by the Chair on March 13, 2024, at 8:00 am PDT. The Chair reviewed the agenda and then introduced the subcommittee officers. Due to the size of the group, general introductions were not made. The Chair requested that each person state their name and affiliation when addressing the subcommittee. The list of subcommittee members was displayed, and attendees were shown a QR code that could be scanned to enter attendance. In addition, the attendance rosters were circulated.

H.1 Chair's Report/Remarks

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

The Chair reviewed the requirement for activity leaders to maintain updated documents on the subcommittee webpage. He also reviewed administrative requirements for task force and working group chairs. The Chair showed the essential patent claim notice and requested that any person with knowledge of an essential patent that meets the requirements of any subcommittee standard to bring the issue forward for discussion. No one responded to this request.

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

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

The Chair discussed the membership requirements and welcomed new members:

Anthony Coker	Christopher Johnson
Evgenii Ermakov	Francis Mills
Marco Espindola	Mark Newbill
James Gardner	Rakesh Patel
Rob Ghosh	Vijay Tendulkar
Traci Hopkins	Krishnamurthy Vijayan
Saif Hossain	Joe White

Former member Ken Skinger (RIP) was removed.

H.2 Secretary's Report

For the Spring 2024 Vancouver meeting a QR scan code was used during the meeting for quick attendance polling and recording. The QR code was supplemented with circulated attendance rosters. The QR scan code indicated that a quorum had been achieved with 62 out of 120 members in attendance. The circulated attendance rosters reported that 89 out of 120 members were present in the meeting together with 123 guests. A quorum had been achieved. Participants requesting membership for the subcommittee were advised to reach out to the Chair, Vice-Chair or Secretary at the conference, through email or to note it on the paper roster. Twenty-eight guests requested membership. A list of attendees is provided at the end of this report.

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

Ed Casserly made a motion to approve the minutes. Hemchandra Shertukd seconded the motion. After hearing no objection from the attendees, the Fall 2023 meeting minutes were approved by unanimous consent.

The agenda for the meeting had been provided to participants in advance of the meeting for review. An updated agenda with one change highlighted was displayed. Amitabh Sarkar moved for approval of the agenda as shown. The approval of the agenda was seconded by Dave Wallach. After hearing no objection from the attendees, the meeting agenda was approved by unanimous consent.

H.3 Taskforce Reports

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

ILFC TF Continuous Revisions to IEEE C57.12.90 Clause 11 Temperature-rise Tests

March 12th, 2024, Vancouver, BC - Canada

TF - Temperature-rise Tests		
Chair: Dinesh Sankarakurup	**Vice-Chair: Ajith M. Varghese**	**Secretary: Cihangir John Sen**
Room: Regency C/D	Date: March 12th, 2024	Time: 3:15 pm to 4:30 pm
Total TF Members: 28	Members present at the Quorum: 17	Attendance Per Roster: 53
Guests present: 34 (Table-2)	Membership requested: 7	Granted membership: 2
Status changed to Guest: 3		Final TF Members: **27** (Table-1)

Chair's Remarks

The meeting was called to order at 3:15 PM on March 12, 2024. The Chair welcomed members and guests to the Spring 2024 meeting.

Attendance rosters were circulated. There were 46 participants present (including the Chair, Vice Chair, and the Secretary) and 7 participants requested voting membership. 2 of the 7 requests were granted according to their participation records. 3 members' statuses have changed to guest. Per the Working Group Policies and Procedures, voting membership status will be effective as of the start of the next meeting in Fall 2024. Table 1 is the final list of the 26 members of this TF. Table 2 lists the guests present at the Spring 2024 meeting.

Table-1: Final Membership List (after S24 Meeting)

	First Name	Last Name		First Name	Last Name
1	Alex	Alahmed	**15**	Bertrand	Poulin (N) (P)
2	Tauhid	Ansari	**16**	Jarrod	Prince
3	Steve	Antosz (P)	**17**	Dinesh	Sankarakurup (P)
4	Gilles	Bargone (P)	**18**	Ewald	Schweiger (P)
5	William	Boettger (P)	**19**	Cihangir John	Sen (P)
6	Juan	Castellanos (P)	**20**	Abdulmajid	Shaikh (P)
7	Samragni	Dutta Roy (P)	**21**	Michael	Shannon (P)
8	Bruce	Forsyth	**22**	Sam	Sharpless (P)
9	Saramma	Hoffman (P)	**23**	Sanjib	Som (N) (P)
10	Qasim	Khan	**24**	Valeriu	Tatu
11	Zan	Kiparizoski	**25**	Ajith	Varghese (P)
12	Egon	Kirchenmayer (P)	**26**	Jason	Varnell (P)
13	Fernando	Leal	**27**	David	Wallach (P)
14	Gabriel	Mamede (P)			

(P) Members Present, (N) New Member

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

Table-2: Guests present during S24 WG Meeting

	First Name	Last Name		First Name	Last Name
1	Mario	Alonzo	18	Mart	Munoz
2	Jean Noel	Berube	19	Kris	Neild
3	Eunyoung	Cho	20	Cuauhtemoc	Ortiz
4	Matt	Chu	21	George	Partyka
5	Luc	Dorpmanns	22	Juan	Reyes Perez
6	Hakim	Dulac	23	Amitabh	Sarkar
7	Joseph	Foldi	24	Alfons	Scrammel
8	Renjie	Fu	25	Jaber	Shalabi
9	Alireza	Gorzin	26	Mauricio	Soto
10	Ravi	Gupta	27	Scott	Thomas
11	Peter	Heinzig	28	Ryan	Thomson
12	Philip	Hopkinson	29	Rene	Wind
13	Chanmin	Jeong	30	Stefan	Wirth
14	Bill	Li	31	Fei	Yang
15	Luc	Loisellez	32	Asam	Yu
16	Robert	Mayer	33	Malia	Zaman
17	Francis	Mills	34	Kris	Zibert

Quorum, Approval of Minutes and Agenda

At the time of quorum 17 of the 28 members were present so quorum was achieved shortly after the meeting start. The Unapproved minutes from the Fall 2023, meeting was presented by Chair and approved by the TF (Sam Sharpless, Michael Shannon seconded).

The agenda for Spring 2024 meeting was also unanimously approved (David Wallach, Ewald Schweiger seconded).

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

Old/ Unfinished Businesses:

1) Hot spot rise calculation for OFAF /OFWF cooler transformer

TF continued to discuss the proposed changes by Bertrand Poulin and the comments from the circulation of these changes within the TF.

Bertrand propose to ensure 12.90 makes this reference to difference between OFAF and others when it comes to evaluating the top oil. It is suggested that the section should be a part of the test core (C57.12.90) rather than a guide (C57.119).

Bertrand shared with the group a draft of Clause 11 that shows the added section from C57.12.119.

Bertrand Poulin explained with an example that the top oil and bottom oil temperatures are obtained by direct measurements, but the average winding and the top oil rise are calculated because they are well balanced inside the winding. This is not the case for OFAF and OFWF cooling method where there is no such correlation between temperatures.

Chair implemented all the comments from the circulation of the draft document, presented during the meeting and opened for discussion. The TF discussed about the top duct oil temperature in the OFAF cooling.

Several attendees mentioned that the temperature rise is not linear or uniform along the winding and fiber optics could give the most accurate HS measurement.

Bertrand Poulin mentioned that the f/o may not be as accurate as expected so we must be careful we say f/o is the true measurement for the HS temperature because it is one piece of information at one voltage. HS measurement with f/o could be the local heating information, Furthermore, HS calculation is based on the average calculation criteria that is not the case for f/o measurement method.

TF also discussed about the HS factor (being >1) and the ideal location of the fiber optic probes that are already covered under the new C57.169.2023 guide.

Chair suggested to circulate the revised clause 11.3.2 to all group including the guests after implementing the minor changes discussed during the meeting but the section has the approval of the TF and will be finalized until the next meeting in Fall 2024. TF agreed to review the revised section one more time and provide feedback until the next meeting.

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

Egon Kirchenmayer (Siemens Energy) provided one formula that can be applicable to + or – altitude delta correction (works for both ways).

It was decided to survey the altitude correction section including the formula within the Task Force as well as in the ILSC to seek for technical feedback during the Fall 2023 meeting. Survey was circulated and completed. Chair has shared the results during the Spring 2024 meeting. According to the results:

- 69 participants responded.
- 62 approved
- 5 abstain.
- 2 disapproved.

There was one comment that was resolved during the voting process. The section was approved as submitted with almost %90 approval rate.

It was noticed during the meeting that the surveyed paragraph is still not clearly stating that the formula can be applied to both >1000m and <1000m conversions. Steve Antosz volunteered to review the surveyed paragraph and provide a revised paragraph that will cover both conditions until the Fall 2024 meeting.

3) Tap Selection for Temp Rise Test:

In line with discussion and motion approved during Fall 23 meeting, a survey was circulated on the proposed additions to C57.12.90 Section 11 regarding Tap & Connection Selection during Temperature rise test.

The survey results were received as below:

- 54 participants responded.
- 49 approved
- 4 abstain.
- 1 disapproved.

The proposed revision on the Tap & Connection Selection during Temperature Rise Test was approved with %90 approval rate. However, TF did not have time to discuss the survey results.

No new business was identified.

Meeting was adjourned at 4:30pm.

Minutes respectfully submitted by
Cihangir John Sen
Secretary

H.4 Technical Activity Reports:

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

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

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

Monday, 11 March 2024, 11:00 am – 12:15 pm PDT – Spring 2024 Meeting (in-person)

- Chairman: Kevin Biggie (Weidmann)
- Vice-chair: George Frimpong (retired – not present)
- Secretary: Evanne Wang (DuPont)

Action items are in **bold** font.

The Chair called the meeting to order at 11:00 am PDT and welcomed attendees to the meeting. A quorum was achieved. The breakdown of attendees is shown below:

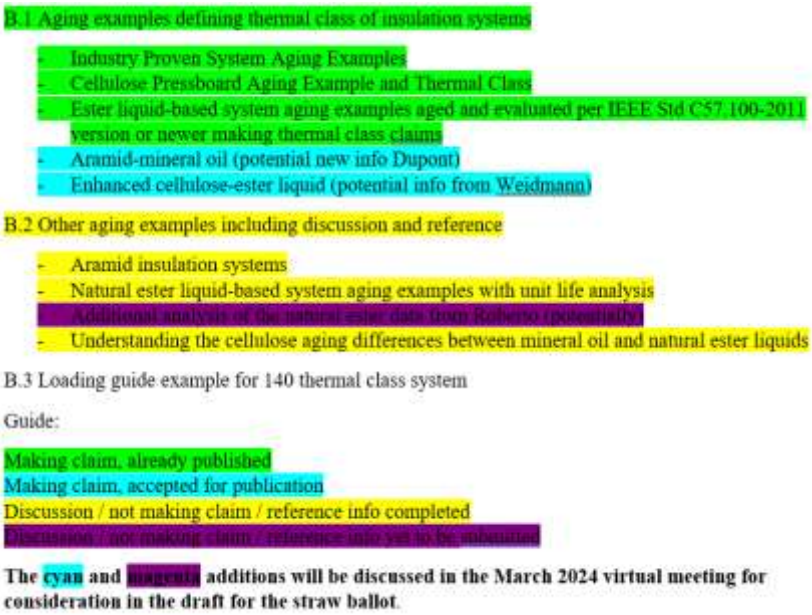
- Attendees present: Sixty-four (64)
- Members present: Nineteen (19) (of 33 Members - 17 required for quorum)
- Guests requesting membership: Ten (10)
- Guests requesting membership meeting membership requirements: Five (5)
- Members requesting Guest status: One (1)
- *New total number of Members: Thirty-seven (37)*

The Chair reviewed the purpose of the WG, which is to amend Annexes B&D of IEEE 1276. The group introduced themselves. The meeting agenda, Essential Patent Claims information, and copyright information were reviewed. No patent claims were noted.

Both the unapproved minutes from the last meeting and the proposed agenda were sent prior to the meeting to the members and guests of this Working Group. The minutes from the last meeting on October 23rd, 2023 were reviewed and unanimously approved with Phil Hopkinson (HVolt) making the motion and seconded by Stu Chambers (EPRI). The proposed agenda for this meeting was reviewed and unanimously approved with Mike Shannon (REA Magnet Wire) making the motion and seconded by Stephen Oakes (WEG Transformers).

The Chair then gave a short summary of the last full WG meeting (23 October 2023), as well as the last meeting of the Task Force drafting the amendment (14 December 2023). No comments were received from the WG on either of these topics.

The Chair then reviewed the progress of the TF drafting the amendment, including the latest proposed input aging examples and a proposed change to the structure of Annex B. The comments received from the WG on these topics are shown below, and a screenshot of the proposed structure change as discussed from the TF meeting in December 2023 is shown for reference:



- Bruce Forsyth (Cargill) commented that Roberto Ignacio (Cargill) analyzed existing data and determined it was inconclusive to draw any additional analysis from the previous data. Thus, he noted that there will not be any "Additional analysis of the natural ester data from Roberto (potentially)" to be added to the new Section B.2.
- Bruce Forsyth (Cargill) commented that the loading guide example information (Section B.3) is important and of value, but he is concerned that there are a lot of experts from the IEEE C57.91 main loading guide document that would have valuable input. He proposed that additional experts should be involved in this conversation. Alan Sbravati (Hitachi) commented that the loading guide example in IEEE 1276 is just an example and should be included. The Chair commented that the content in Section B.3 has been carried over from the recently approved IEEE 1276 and has not been changed. Tim Raymond (EPRI) mentioned that a study group should be formed to determine where this information should be located and what additional information should be included. Sasha Levin (Weidmann) agreed with Bruce that more experts need to be included if there is work to be done to update the loading guide example, but proposed that the loading guide example should be kept as-is for now, but **a strong disclaimer explaining that the loading guide is an example needs to be included or added to clarify this point**.

The Chair then reviewed the latest draft (Draft D.5) in further detail:

- No comments received on updates to the new Section B.1.
- In the new Section B.2.1 (aramid insulation systems aging examples), **Roger Wicks (DuPont) offered to provide graphs and additional clarifying notes based on the recently published paper on dual-temperature aging, which may have info that applies to section B.1 also.**
- In the new Section B.2.2 (natural ester aging examples with unit life analysis), the Chair noted that Alan Sbravati (Hitachi) had submitted updated graphs and wording to this section. Jinesh Malde (Midel) asked for clarification as to what the update entailed. The Chair responded that new data points in the graphs and clarifying wording were the specific updates. Jinesh recommended that any new aging data from testing performed to the IEEE C57.100 method should be added to a different section of the document, and the information in the new Section B.2.2 be stated to be historic information that shall not be updated with further new data. Jinesh made a motion: *That* ***Section B.2.2 should only be for historical references and should be noted as such, and this note should be included in the introduction of Section B.2.2.*** *Moving forward, the current version of IEEE C57.100 should be used to determine a thermal class of an insulation system.* Sasha Levin (Weidmann) seconds this motion. This motion was unanimously approved by the WG. Roger Wicks (DuPont) commented that a similar problem with the aramid ESSERCO data is that the testing did not follow any of the current test methods, and that despite having useful data the test method is outdated.

Given the three additional change topics discussed in this meeting, the Chair noted that **a Draft D.6 will be prepared to incorporate the changes discussed today, and will be circulated to the WG voting members for an "up/down" vote via email prior to the Fall 2024 meeting to decide if the draft is ready for IEEE-SA ballot**. The goals for the Fall 2024 meeting would then be to approve a draft to go to IEEE-SA ballot, and also form the Comment Resolution Group (CRG).

No additional input or comments were received, and the meeting was adjourned at 12:18 pm PDT.

Respectfully submitted,

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

Attendance WG IEEE 1276a Annex B & D Meeting (3/11/2024):

- Attendees present: Sixty-four (64)
- Members present: Nineteen (19) (of 33 Members - 17 required for quorum)
- Guests requesting membership: Ten (10)
- Guests requesting membership meeting membership requirements: Five (5)
- Members requesting Guest status: One (1)
- *New total number of Members: Thirty-seven (37)*

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

Last/Family/ Surname	**First/Given Name**	**Affiliation / Company Name**	**Status / Role**
Bargone	Gilles	FISO Technologies Inc.	Guest
Beaster	Barry		Guest
Berube	Jean-Noel	Rugged Monitoring	Guest
Biggie	Kevin	Weidmann Electrical Technology	Chair
Burk	Griffin	Ergon Inc.	Member
Casserly	Edward	Ergon	Member
Chambers	Stuart	EPRI	Member
Chiang	Solomon	The Gund Company	Guest
Cho	Eunyoung	Hico-America	Guest
Cruz Valdes	Juan Carlos	Prolec GE Mty	Guest
Door	Jeffrey	The H-J Family of Companies	Member
Farwaha	Sanjeev	Snopud	Guest
Forsyth	Bruce	Cargill	Member
Ghosh	Rob	GE	Member
Gonzalez	Luis	Canduct Industries	Member
Gorzin	Alireza	Black & Veatch	Guest
Gyore	Attila	Midel & MiVolt Fluids LTD	Member
Hermann	Florian	Trench France	Guest
Hernandez	Ronald	Doble Engineering	Guest
Hoffman	Saramma	PPL	Member
Hollrah	Derek	Burns & McDonnell	Guest
Hopkinson	Philip	HVolt	Member
Jarosewski	Marion	Delta Star	Guest
Jensen	Nick	Delta Star	Guest
Jeong	Chanmin	HD Hyundai Electric	Guest
Kaineder	Kurt	Siemens Energy	Member
Kennedy	Sheldon	Sheldon P. Kennedy Engineering PLLC	Guest
Larison	Andrew	Hitachi Energy	Guest
Lee	Junho	HD Hyundai Electric	Guest
Levin	Aleksandr (Sasha)	Weidmann	Member
Malde	Jinesh	M&I Materials	Member
Mayer	Robert	Siemens Energy	Guest
McBride	Brian	Cargill	Member
Mikulecky	Filip	Siemens Energy, KPT	Guest
Montpool	Rhea	Schneider Electric	Guest
Morales-Cruz	Emilio	Qualitrol	Member
Naja	Ismael	Eaton	Guest
Oakes	Stephen	WEG Transformers	Member
Olan	David	BC Hydro	Guest

O'Malley	Anastasia	Consolidated Edison	Guest
Orozco	Eduardo	GE Vernova Grid Solutions	Guest
Raymond	Tim	EPRI	Member
Reeder	Perry	GE Vernova	Guest
Reiss	Tony	Custom Materials Inc.	Member
Sabin	Hakan	Virginia Transformer	Guest
Sarkar	Amitabh	Virginia Transformer	Guest
Sarkinen	Garret	Xcel Energy	Guest
Sbravati	Alan	Hitachi Energy	Member
Schwartz	Dan	Quality Switch	Guest
Shannon	Michael	REA Magnet Wire	Member
Sharp	Michael (Mike)	Trench LTD	Guest
Sharpless	Samuel	Rimkus Consulting	Member
Steele	H. Allen	TVA	Guest
Steineman	Andrew	Delta Star	Guest
Stockton	David	Stockton Business Consulting	Guest
Tirado	Fernando	Prolec GE	Guest
Tostrud	Mark	Dynamic Ratings	Guest
Vir	Dharam	Prolec GE	Guest
Wang	Evanne	DuPont	Secretary
Webb	Matthew	GE Vernova	Guest
Wicks	Roger	DuPont	Guest
Wind	Rene	Siemens Energy	Guest
Young	Fei	Hitachi Energy	Guest
Zaman	Malia	IEEE SA	Guest

H.4.2 WG PC57.91 Guide for Loading Mineral-Oil-Immersed Transformers – David Wallach, WG Chair presented the update

Chair: David Wallach
Vice-Chair: Javier Arteaga
Secretary: Kumar Mani

No meeting was held in Vancouver. The ballot opened on January 16, 2024, and successfully closed on February 15, 2024. The ballot group had 141 members. One hundred and twelve (112) ballots were returned, exceeding the 75% minimum. There were two abstentions. The approval rate was 90%, exceeding the 75% minimum. There are 448 comments with 308, as approve and 140, as disapprove. Seventy-one (71) comments are technical and the remaining balance are general or editorial. A comment resolution group has been formed to resolve the comments. The PAR expires on December 31, 2025.

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

Chair: Tom Prevost
Secretary: Deanna Woods

No meeting was held in Vancouver. The comment resolution group is meeting virtually to resolve over 800 comments. A recirculation ballot is expected before the end of Spring. A PAR extension was received and expires on December 31, 2024.

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

Chair: Mark Tostrud
Vice Chair/Secretary: Zan Kiparizoski

No working group meeting was held in Vancouver. The comments were resolved and the document is being reviewed and will then be recirculated for ballot.

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

Recommended Practice for Performing Temperature Rise Tests on
Liquid-Immersed Power Transformers at Loads Beyond Nameplate Ratings

1) Meeting took place at 9:30 AM (PDT) on Monday March 11th, 2024
2) This was the first on site meeting as Study Group – A virtual meeting took place on January 31st, 2024
   Here in Vancouver 85 attended our first on site the meeting.
3) The objective of our Study Group is to provide the Insulation Life Subcommittee (ILSC) with a recommendation whether the document needs revision
4) Call for patents & Copyright statement
   a) The slides on essential patents from IEEE have been uploaded on the internet and were presented during the meeting. A call for essential patents was made.
      → No essential patents or issues were reported.
   b) The slides on IEEE copyright policy from IEEE have been uploaded on the internet and were presented during the meeting. A call for essential patents was made.
      → No issues were reported.
5) Establish quorum
   - A quorum was achieved since this was the first on site meeting.
6) Approval of agenda
   a) No comments from the group
   b) The agenda was unanimously approved (1st motion by Bertrand Poulin and 2nd Steve Antosz)
7) Approval of meeting minutes of the previous virtual meeting on January 31st, 2024
   a) No comments from the group
   b) The meeting minutes were unanimously approved (1st motion by Bertrand Poulin and 2nd Steve Antosz)
8) Bertrand Poulin gave a presentation with the title:

   Establishment of the winding exponent for overload calculations

9) Discussion based on feedback from review of C57.119 and next steps
   a) Feedback was collected about the requirements for revisions (like Errors, clarifications, improvements, updates, etc)
   b) The feedback and discussion indicated clearly that a revision of the current document is needed
      e.g. Title:
      - Guide instead of recommended practice (in order to provide options)
      - The title gives the impression that the procedure of the temperature rise test is the main content of the standard document while the purpose is to predict the overload capabilities and consequently the loss of life of the transformers if operated beyond nameplate rating

10) Bertrand Poulin made the motion to recommend to the ILSC to revise C57.119. Steve Antosz provided second.
    - Motion was carried unanimously with no objections or abstentions.
11) Steve Antosz made the motion to form a PAR Study Group (in case the ILSC accepts our recommendation to revise C57.119). Betrand Poulin provided second.
    - Motion was carried unanimously with no objections or abstentions.
12) After the motion passed the Study Group collected thoughts and ideas on the title, scope and related to the content.
13) Therefore we will raise the motion to form a PAR Study Group to work on the title and scope of C57.119 during the meeting of the ILSC on Wednesday, March 13th, 2024
14) The meeting was adjourned at 10:40 AM (PDT)
15) Next on virtual meeting – to be scheduled before October 2024 in St Louis
    Next on site meeting – October 2024 in St Louis, MO

Respectfully submitted,

Ewald Schweiger
Study Group Chair

List of attendees for this meeting:

Name	Last name	Given name	Affiliation
Isaac Abdalla	Abdalla	Isaac	HICO America Sales & Technology, Inc.
Kayland Adams	Adams	Kayland	Prolec GE Waukesha
Steve Antosz	Antosz	Steve	Stephen Antosz & Associated
Edmundo Arevalo	Arevalo	Edmundo	Bonneville Power Administration
Elise Arnold	Arnold	Elise	SGB
Gilles Bargone	Bargone	Gilles	FISO
Jason Beaudoin	Beaudoin	Jason	Weidmann
Jean-Noel Berube	Berube	Jean-Noel	Rugged Monitoring Quebec Inc
Piotr Blaszczyk	Blaszczyk	Piotr	Specialty Transformer Components LLC.
Daniel Blaydon	Blaydon	Daniel	Baltimore Gas & Electric
W Boettger	Boettger	W	Boettger Transformer Consulting LLC
Georges Bouty	Bouty	Georges	Delta Satar INC
Juan Alfredo Carrizales	Carrizales	Juan Alfredo	PROLEC
Juan G. Castellanos	Castellanos	Juan G.	Prolec
Vivian Chan	Chan	Vivian	Hitachi Energy
Michael Craven	Craven	Michael	Qualus Power Services
Marcos Czernorucki	Czernorucki	Marcos	HITACHI ENERGY
Scott Digby	Digby	Scott	Duke Energy
Nikolaus Dillon	Dillon	Nikolaus	Dominion Energy
Jesse Duffy	Duffy	Jesse	Nashville Electric Service
Eric Elson	Elson	Eric	San Diego Gas and Electric
Joseph Foldi	Foldi	Joseph	Foldi & Associates, Inc.
Raymond Frazier III	Frazier III	Raymond	Ameren
Richard Frye	Frye	Richard	Eaton
Dragana Gasic	Gasic	Dragana	KONCAR D&ST
Saurabh Ghosh	Ghosh	Saurabh	GE
Stephen Gilbert	Gilbert	Stephen	IFD Technologies
Luis Gonzalez	Gonzalez	Luis	Canduct Industries
Saramma Hoffman	Hoffman	Saramma	PPL
Ryan Hogg	Hogg	Ryan	Bureau of Reclamation
Nick Jensen	Jensen	Nick	Delta Star
Chan Min Jeong	Jeong	Chan Min	HD Hyundai

Name	Last name	Given name	Affiliation
Ryan Jonak	Jonak	Ryan	Portland General Electric
Quamar Jutt	Jutt	Quamar	Kruger Products Inc
Kurt Kaineder	Kaineder	Kurt	Trench Austria
Thrinadha Katapalli	Katapalli	Thrinadha	VA Transformer
Gael R Kennedy	Kennedy	Gael R	GR Kennedy & Associates LLC
Yeounsoo Kim	Kim	Yeounsoo	Mitsubishi Electric Power Products
Matija Koprivnjak	Koprivnjak	Matija	KONČAR D&ST
Donald Lamontagne	Lamontagne	Donald	Arizona Public Service Co.
JINMING LI	LI	JINMING	BC HYDRO
David Lin	Lin	David	IFD Technologies
Gabriel Mamede	Mamede	Gabriel	Siemens Energy
Alberto Martinez Mares	Martinez Mares	Alberto	WEG Transformers USA
Robert Mayer	Mayer	Robert	Siemens Energy
Brian McBride	McBride	Brian	Cargill
Juliano Montanha	Montanha	Juliano	Siemens-Energy
Anthony Natale	Natale	Anthony	HICO America
David Olan	Olan	David	BC Hydro
Anastasia O'Malley	O'Malley	Anastasia	Consolidated Edison Co. of NY
Eduardo Orozco	Orozco	Eduardo	GE Grid Solutions
Joel Pacas	Pacas	Joel	IFD Technologies
Caroline Peterson	Peterson	Caroline	Xcel Energy
sylvain plante	plante	sylvain	Hydro-Québec
Miguel Plascencia	Plascencia	Miguel	Pacific Gas & Electric
Goran Plisic	Plisic	Goran	Koncar Power Transformers Ltd. A Joint Venture of Siemens Energy and Koncar
Bertrand Poulin	Poulin	Bertrand	Hitachi Energy
Jonathan Reimer	Reimer	Jonathan	FortisBC
Juan Reyes Perez	Reyes Perez	Juan	HITACHI ENERGY
Michael Richardson	Richardson	Michael	Ameren
Timothy Rocque	Rocque	Timothy	Prolec GE Waukesha
Rodrigo Ronchi	Ronchi	Rodrigo	WEG Transformers
Hakan Sahin	Sahin	Hakan	GA Transformers
Hakan Sahin	Sahin	Hakan	Virginia Transformer Corporation
Dinesh Sankarakurup	Sankarakurup	Dinesh	Duke Energy
Garret Sarkinen	Sarkinen	Garret	Xcel Energy
Markus Schiessl	Schiessl	Markus	SGB
Alfons Schrammel	Schrammel	Alfons	Siemens Energy
Ewald Schweiger	Schweiger	Ewald	Siemens Energy
Cihangir Sen	Sen	Cihangir	Duke Energy
AbdulMajid Shaikh	Shaikh	AbdulMajid	Delta Star Inc.
Samuel Sharpless	Sharpless	Samuel	Rimkus Consulting Group, Inc.
Muhammad Abdullah Sohail	Sohail	Muhammad Abdullah	Trench Limited
Yong Sohn	Sohn	Yong	HYOSUNG HICO
Kyle Stechschulte	Stechschulte	Kyle	American Electric Power
Scott Thomas	Thomas	Scott	Hitachi Energy
Risto Trifunoski	Trifunoski	Risto	Trench Group
Cole Van Dreel	Van Dreel	Cole	American Transmission Company
AJohn Vandermaar	Vandermaar	AJohn	BC Hydro
John Wagner	Wagner	John	AEP
Matthew Weisensee	Weisensee	Matthew	PacifiCorp
Drew Welton	Welton	Drew	Intellirent

Name	Last name	Given name	Affiliation
Malia Zaman	Zaman	Malia	IEEE SA
Kris Zibert	Zibert	Kris	Allgeier Martin & Associates
Thomas Zuiderveen	Zuiderveen	Thomas	IFD Technologies

Ewald Schweiger made a motion to form a PAR Study Group to develop a title and scope of a PAR for the revision of C57.119. Juan Castellanos seconded the motion. There was no opposition to the motion. It passed by unanimous consensus.

C57.119 Study Group Recommended Practice for Performing Temperature Rise Tests on Liquid-Immersed Power Transformers at Loads Beyond Nameplate Ratings

Virtual meeting held on January 31, 2024, 10:30am – 12:00 pm EST

Attendance: Members: 5
Guests: --
Total: 5

1) Meeting was called to order at 10:30 AM (EST) with Welcome & Chair's remarks
   a) <u>About this Study Group:</u>
   In Kansas City F23 meeting, it was decided to start a Study Group for the C57.119 *Recommended Practice for Performing Temperature Rise Tests on Liquid-Immersed Power Transformers at Loads Beyond Nameplate Ratings*.

   The objective our Study Group is to provide the
   Insulation Life Subcommittee (PTSC) with a recommendation whether the document needs revision.
2) Call for patents & Copyright statement
   c) The slides on essential patents from IEEE have been uploaded on the internet and were presented during the meeting. A call for essential patents was made.
   → No essential patents or issues were reported.
   d) The slides on IEEE copyright policy from IEEE have been uploaded on the internet and were presented during the meeting. A call for essential patents was made.
   → No issues were reported.
3) Study Group Members
      i. The list of members is at the end of the minutes
4) Establish quorum
   - A quorum was not achieved - 5 of 11 members present.
5) Approval of agenda
   c) No comments from the group
   d) Because no quorum was established the agenda could not been approved
6) Presentation from Bertrand Poulin on *Temperature rise test on power transformers – Determination of winding hottest spot exponent m*
   followed by a discussion:
   a) In the current standard document C57.119-2018 includes three methods for the "Winding hottest spot temperature rise determination" – clause 9.8.3.1, 9.8.3.2 and 9.8.3.3

   → Bertrand presented another, alternative method based on his experience
   The determination of winding exponent based on winding gradient, defined as the difference between the average temperature of a winding and the average temperature of the fluid.

Bertrand presented the determination of a parameter A – which is closely related to the winding gradient and can be used to determinate errors in measurements (e.g between phases, duplicate units)

Further Bertrand plans to join the meeting in Vancouver, BC and present more details.

b) Juan started the discussion about the title of the document:
The current title of C57.119 *Recommended Practice for Performing Temperature Rise Tests on Liquid-Immersed Power Transformers at Loads Beyond Nameplate Ratings* gives the impression that the procedure of the temperature rise test is the main content of the standard document.

The title of the document should be more precise, to mention that the purpose is to predict the overload capabilities and consequently the loss of life of the transformers if operated beyond nameplate rating.

7) Next steps

a) The chair requested the group to continue to review (Document is posted at ILSC internet site)

b) Collection of the feedback (via email before S24 meeting)

c) On site meeting is scheduled in Vancouver, BC
Monday, March 11th from 9:30am-10:45am – Regency A (3rd Floor)

d) In Vancouver: Present the collected feedback and follow up presentation from Bertrant Poulin

e) Discussion about the feedback / recommendation

f) Check if further discussions are needed and timeline about next steps (e.g. voting)

8) Adjournment of meeting
- Meeting was adjourned at 12:00 PM EST.

9) Next meeting will be in Vancouver S24
→ Invitation will follow

Respectfully submitted,

Ewald Schweiger
Study Group Chair

List of attendees for this virtual meeting:

Name	**Last name**	**Given name**	**Affiliation**	**Status**
Castellanos Juan G.	Castellanos	Juan G.	Prolec	M
Kennedy Gael R	Kennedy	Gael R	GR Kennedy & Associates LLC	M
Poulin Bertrand	Poulin	Bertrand	Hitachi Energy	M
Schrammel Alfons	Schrammel	Alfons	Siemens Energy	M
Schweiger Ewald	Schweiger	Ewald	Siemens Energy	M

H.4.6 Task Force – Test Degradation of Cellulose in Liquid Type Transformers – Lance Lewand Chair

Chair: Lance Lewand
Vice Chair/Acting Secretary: Stuart Chambers

Unapproved Meeting Minutes
IEEE TF – Tests for Degradation of Cellulose in Liquid Filled Transformers

Monday, March 11, 2024

13:45 - 17:00

Vancouver, British Columbia, Canada

Chairman:	Lance Lewand
Vice Chair:	Stuart Chambers
Secretary:	Currently vacant

The meeting was called to order at 13:45 by the Chair.

As this was a new task force, all attendees were eligible for membership.
There were 71 attendees during the meeting.

1. Attendance list:

1	Mario	Alonso
2	Gilles	Bargone
3	Barry	Beaster
4	Kevin	Biggie
5	Piotr	Blaszczyk
6	Sanket	Bolar
7	Jeremiah	Bradshaw
8	Samuel	Brodeur
9	Griffin	Burk
10	Ed	Casserly
11	Juan	Castellanos
12	Stuart	Chambers
13	Luiz	Cheim
14	Anthony	Coker
15	Liam	Conway
16	Mike	Craven
17	Lee	Doyle
18	Zack	Draper
19	Florin	Faur
20	Todd	Felton
21	JD	Fraser
22	Yas	Fu
23	Luis	Gonzalez
24	Brad	Greaves
25	Attila	Gyore
26	Florian	Hermann
27	Andy	Holden
28	Derek	Hollrah
29	Christopher	Johnson
30	Quamar	Jutt
31	Stacey	Kessler
32	Don	Lamontagne
33	Lance	Lewand
34	Jinming	Li
35	Cesar	Lizcano

40	Gabriel	Mamede
41	Toni	Mellin
42	Yegor	Melo
43	Filip	Mikulecky
44	Emilio	Morales-Cruz
45	Mirna	Olic
46	Eduardo	Orozco
47	Joel	Pacas
48	Munil	Parel
49	Pedro	Pedro
50	Goran	Plisic
51	Thomas	Prevost
52	John	Pruente
53	Tim	Raymond
54	Perry	Reddek
55	Jonathan	Reimer
56	Tony	Reiss
57	Juan	Reyes
58	Michael	Richardson
59	Mickel	Saad
60	Garret	Sarkinen
61	Sam	Sharpless
62	Mounano	Silo
63	Harmanpreet	Singh
64	Steven	Small
65	H. Allen	Steele
66	Marko	Teofanovic
67	Mark	Tostrud
68	John	Vandermaar
69	Matthew	Webb
70	Shuzhen	Xu
71	Waldemar	Ziomeh

2. Welcome and introductions of the chair and vice chair were made. A call for a secretary was made, but no volunteers came forward at this time.

3. The guidelines of IEEE meetings were presented to the group

4. The chair presented the patent disclosure slide and made a call for patent disclosure
   i. Don Lamontagne from Arizona Public Service for the estimation of DP from carbon oxide levels

5. Chair presented the copyright policy slides
   - No copyright issues were presented

6. The proposed topic of the TF was presented by the chair to the group
   "Guide for the Use and Interpretation of Tests used to Assess the Degradation of Cellulosic Materials"

7. The proposed purpose of the document was presented to the group by the chair
   "To provide users with a reference document concerning paper aging processes in a transformer, what tests to use, as well as when and how to interpret those results" and "provide aid for determining the life expectancy of a transformer with the long-range goal of fleet asset management."

8. The chair reiterated that the document would be a guide, was not intended to include aramid solid insulation (but could if the group decided it should be), and will be a consolidation.

9. The chair provided a presentation of the proposed outline of the 15 possible sections of the document
    i. Introduction
    ii. Discussion of cellulose materials inside a transformer
    iii. Discussion of aging mechanisms and the stressors involved
    iv. How the paper is mechanically changed and what byproducts are produced due to the aging process
    v. Tests to determine the condition of the cellulosic insulation
    vi. Analysis in mineral oil and non-mineral oil insulating liquids
    vii. How the oil quality affects the tests
    viii. Transformer preservation systems
    ix. Partitioning of oil soluble aging markers
    x. Interpretation of Results
    xi. Impact of oil processing
    xii. Calculations
    xiii. Minimizing Cellulosic Insulation Degradation in Transformers
    xiv. Bibliography
    xv. Annexes

10. Discussion
    a) Jinesh Malde (Midel and Mivolt Fluids) asked if particle count could be included in the document. The chair said it could be and it was noted.
    b) Barry Beaster (HJ Family of Companies) asked if PD is affected by paper degradation and should be added. The chair said PD is not significantly impacted or a measure for cellulose health.
    c) Jinming Li (BC Hydro) asked if the vapor phase process affects the paper quality and if so, could it be discussed in the document. The chair said it could be and it was noted.
    d) Tim Raymond (EPRI) started by making the comment that there is lot of information proposed as the scope. He continued by asking can guidance be given to testing results interpretation (i.e., furans) in the document. The chair said it could be and it was noted for further discussion at the next meeting.
    e) Tom Prevost (Weidmann) mentioned a paper was made about 12 years ago that looked into if furans were reliable to provide health assessments of cellulose. At that time the answer was “no”. He continued to ask if there was enough technical info to create a guide and the scope at this point looked too big and would need to reduce to not include research. The chair said there was enough info in his opinion and that it would be discussed further on ways to reduce the scope.
    f) Luis Cheim (Hitachi) commented that looking at more than furans for cellulose is good by in his opinion a daunting task. Perhaps many items could be appendixes instead of in the main body/scope of the text. The chair said it could be and it was noted for further discussion at the next meeting.
    g) James Garner (GE) asked if can degrade further after being generated and if furans were dynamic in a transformer. The chair said yes to both items and furans could be discussed in the document if wanted. It was noted for further discussion at the next meeting.
    h) Tim Raymond (EPRI) commented he though that the science was not at the stage to provide guidance. The chair and vice-chair provided feedback indicating there should be.
    i) Quamar Jutt (Kruger) made the comment that there are no guides to give end-of-life of a transformer and could it be in the scope. The chair responded by saying the guide will not provide a solid “yes/no” to be considered end-of-life as there are too many variables for each system.
    j) Sam Sharpless (Rimkus) asked if this topic was a crossover from C57.162. Tom Prevost commented that the two topics were different. The chair then commented that we do not want to reinvent writings that are already present, and the aim would be to be new with just referencing other documents.
    k) Shuzhen Xu (FM Global) commented about the title not including bushings and asked if bushing could be included in the document. The chair said it could be and it was noted for further discussion at the next meeting.
    l) Luis Cheim (Hitachi) mentioned it would be good to include a section on lab vs. on-site/field results in the document. This was noted for further discussion at the next meeting.

11. The chair mentioned again that that all attendees could be made members as this was the first meeting. However, the attendance sheets did not provide a space for members to indicated this. The vice-chair said he would reach out to every attendee that provided an email address in the summer to see if they would

want member status. Those that respond would have member status at the next meeting.

12. An informal vote was held to see from the discussion if there was enough interest in the topic and that another meeting in St Louis in the fall should be held to refine the scope. The vote was unanimous that there was interest and further discussion should happen at the next meeting.

13. Another mention of looking for a volunteer for the TF (and potential later working group) made and the group informed they could email the Chair or Vice Chair if interested in volunteering.

14. Next meeting at Fall 2024, St Louis, Missouri, USA

15. The meeting was adjourned at 14:58

Stuart Chambers, Vice Chair
(acting secretary)
Lance Lewand, Chair

H.5 Old Business

None.

H.6 New Business

Tim Raymond raised the potential need for a loading guide for transformers that utilize non-C57.91 systems that do not use mineral oil and cellulose insulation. Roger Wicks recommended to consider IEEE 1276 as a starting document. Rainer Frotscher suggested to also consider C57.154.

Tim Raymond made a motion to form a study group to consider transformer loading characteristics for insulation systems that are not covered by C57.91. Dave Wallach seconded the motion. There was no opposition to the motion. It passed by unanimous consensus.

The meeting adjourned at 9:15am PDT.

Attendance:
89 Members
123 Guests

Role	Last	First	Affiliation
Member	Adams	Kayland	Prolec Energy
Guest	Amin	Mihir	Eaton Corp.
Guest	Arash	Rezvan	Delta Star Inc.
Member	Arteaga	Javier	Hitachi Energy
Member	Avanoma	Onome	MJ Consulting
Member	Ayers	Donald E.	Ayers Transformer Consulting
Member	Ballard	Casey	Dupont
Member	Bargone	Gilles	FISO Technologies Inc.
Guest	Baser	Levent	Hitachi Energy
Member	Beaster	Barry	H-J Family of Companies

Guest	Beaudoin	Jason	Weidmann
Guest	Bender	Jon	WE Gundy & Asoociates
Guest	Berube	Jean-Noel	Rugged Monitoring
Member	Biggie	Kevin	Weidmann
Member	Boettger	William	Boettger Transformer Consulting LLC
Guest	Bolar	Sanket	Oncor
Guest	Bouty	Georges	Delta Star
Guest	Bradshaw	Jeremiah	Bureau of Reclamation
Guest	Cai	Jim	JSHP Transformers
Guest	Carrizales	Juan Alfredo	Prolec GE
Member	Casallas	Camilo	Trench
Member	Casserly	Edward	Ergon
Member	Castellanos	Juan	Prolec Energy
Member	Chambers	Stuart	ERPI
Member	Cheim	Luiz	Hitachi Energy
Member	Chiang	Solomon	The Gund Company
Guest	Cho	Ennyoung	HICO-America
Member	Coker	Anthony	MIDEL/Shell
Guest	Colopy	Craig	retired from Eaton
Guest	Czernoracki	Marcos	Hitachi Energy
Guest	Davoudi	Pouneh	Delta Star Inc.
Guest	Debass	Sami	EPRI
Guest	Delgado Zamora	Gabriel	Invenergy
Member	Digby	Scott	Duke Energy
Guest	Dillon	Nikolaus	Dominion Energy
Guest	Door	Jeffrey	H-J Family of Companies
Guest	Draper	Zachary	Delta-X Research
Guest	Duffy	Jesse	Nashville Electric Power
Member	Dulac	Hakim	Advanced Power Technologies
Member	Dutta Roy	Samragni	Siemens Energy
Guest	Elson	Eric	SDGE
Member	Ermakov	Evgenii	Hitachi Energy
Member	Espindola	Marco	Hitachi Energy
Guest	Fernandez	Miguel	Braintree Electric Light Dept.
Member	Ferreira	Marcos	Quanta Technology
Guest	Foldi	Joseph	F&A
Member	Forsyth	Bruce	Cargill
Guest	Foster	Patrick	Florida Power and Light
Guest	Frazier	Raymond	Ameren
Member	Frotscher	Rainer	Reinhausen
Guest	Fu	Yao	BC Hydro
Guest	Garcia	Miguel	Hitachi Energy

Member	Garcia Wild	Eduardo	Siemens Energy
Member	Gardner	James	Prolec GE Waukesha
Member	Ghosh	Rob(Saurabh)	GE
Member	Giraldo	Orlando	H-J Family of Companies
Member	Gonzalez	Luis	Canduct
Guest	Gorzin	Alireza	Black & Veatch
Guest	Grandbois	Luke	IFD Technologies
Guest	Greaves	Brad	Weidmann
Member	Griesacker	William	William Griesacker & Associates
Guest	Guner	Ismail	Hydro Quebec
Member	Gyore	Attila	Midel &Mivolt Fluids
Guest	Hamoir	Didier	Transformer Protector Corp
Guest	Hampton	Kevin	Siemens Energy
Guest	Heinzig	Peter	Weidmann Group
Guest	Hermann	Fenian	Trench
Guest	Hernandez	Ronald	Doble Engineering
Member	Hernandez	Sergio	Howard Power Solutions
Guest	Hernandez-Mejia	Jean Carlos	Georgia Tech Neetrac
Member	Hoffman	Saramma	PPL Electric Utilities
Guest	Hollrah	Derek	Burns & McDonnel
Member	Hopkins	Traci	H2scan
Guest	Hopkinson	Philip	HVOLT, Inc.
Member	Hossain	Saif	Trench
Guest	Hrkac	Miljenko	Hitachi Energy
Member	Issack	Ramadan	American Electric Power
Guest	Jaroszewski	Marion	Delta Star
Guest	Jensen	Nick	Delta Star Inc.
Guest	Jeong	chanmin	HD Hyundai
Member	John	John	Virginia Transformer
Member	Johnson	Christopher	Oncor
Guest	Jutt	Quamar	Kruger Products
Member	Kazmierczak	Jerzy	Hitachi Energy
Member	Kennedy	Sheldon	Sheldon P. Kennedy Engineering, LLC.
Guest	Kim	Yeoundoo	MEPPI
Member	Kirchenmayer	Egon	Siemens Energy
Guest	Klempner	Dmitriy	SCE
Guest	Lamontagne	Donald	Arizona Public Service
Guest	Larison	Andrew	Hitachi Energy
Guest	Leal	Fernando	Prolec GE
Guest	Lee	Junho	HD Hyundai
Member	Lee	Moonhee	Hammond Power Solutions
Guest	Leigl	Angela	Eaton

Guest	Lembacher	Stefan	Siemens Energy
Member	Levin	Aleksandr	Weidmann
Guest	Lewis	Samuel	Hitachi Energy
Member	Li	Weijun	Braintree Electric Light Dept.
Guest	Lizcano	Cesar	Shell USA Inc.
Guest	Loiselle	Luc	Tetra Tech
Guest	Lopes	Ricardo	Efacec
Member	Lucas	Tiffany	Prolec GE - Waukesha
Member	Mabrey	Stephanie	Weidmann
Vice Chair	Malde	Jinesh	MIDEL/Shell
Guest	Mamede	Gabriel	Siemens Energy
Guest	Machain	Jose Luis	Prolec GE
Member	Mani	Kumar	Duke Energy
Guest	Martinez	Alberto	WEG USA
Guest	Mayer	Robert	Siemens Energy
Guest	Mbouombouo	Mama	Hitachi Energy
Member	McBride	Brian	Cargill
Guest	Mellin	Toni	Vaisala
Guest	Mendez	Omar	Prolec Energy
Member	Mills	Francis	Power Engineers
Guest	Minkel	Justin	Eaton Corp.
Member	Montanha	Juliano	Siemens Energy
Member	Morales-Cruz	Emilio	Qualitrol Corp.
Guest	Mulkey	Daniel	Mulkey Engineering Inc.
Member	Murray	David	TVA
Guest	Naja	Ismael	Eaton Corp.
Guest	Narawane	Aniruddha	Eaton
Member	Newbill	Mark	Hitachi Energy
Guest	Nyanteh	Yaw	
Secretary	O'Malley	Anastasia	Consolidated Edison Co. of NY
Guest	Ortiz	Amlerb	Siemens Energy
Guest	Ortiz	Cuauhtemoc	Niagara Transformer
Guest	Panesar	Parminder	Virginia Transformer
Member	Parkinson	Dwight	Eaton Corp.
Guest	Patel	Monil	PG&E
Guest	Patel	Dipeshkumar	Eaton
Guest	Pepe	Harry	Doble Engineering
Guest	Plascencia	Miguel	PG&E
Guest	Pollaro	Dominic	NASS
Member	Posadas	Daniel	Prolec Energy
Member	Pointner	Klaus	Trench
Guest	Pollaro	Dominic	NASS

Guest	Poulin	Bertrand	Hitachi Energy
Member	Prevost	Thomas	Weidmann
Member	Prince	Jarrod	ERMCO
Member	Radu	Ion	Hitachi Energy
Member	Raymond	Timothy	EPRI
Member	Reed	Scott	MVA Diagnostics
Guest	Reepe	Robert	Georgia Power
Guest	Reimer	Jonathan	FortisBC
Guest	Reyes Perez	Juan	Hitachi Energy
Member	Richardson	Michael	Ameren
Guest	Reiss	Tony	Custom Materials Inc.
Guest	Rocque	Timothy	Prolec Energy
Guest	Ronchi	Rodrigo	WEG Transformers USA
Member	Saad	Mickel	Hitachi Energy
Member	Sahin	Hakan	Virginia Transformer
Member	Sankarakurup	Dinesh	Duke Energy
Member	Sarkar	Amitabh	Virginia Transformer
Member	Sbravati	Alan	Hitachi Energy
Guest	Schrammel	Alfons	Siemens Energy
Member	Schweiger	Ewald	Siemens Energy
Guest	Sekhon	Harmanpreet Singh	PTI Transformers
Member	Sen	Cihangir	Duke Energy
Guest	Shalabi	Jaber	Vantran
Member	Sharp	Michael	Trench
Chair	Sharpless	Samuel	Rimkus Consulting Group
Member	Shertukde	Hemchandra	Hartford University
Guest	Shull	Stephen	BBC Electric Services
Guest	Simons	Andre	JFE Shoji Power
Member	Sinclair	Jonathan	Black & Veatch
Guest	Sohn	YongTae	Hyosung
Member	Som	Sanjib	Pennsylvania Transformer
Guest	Soto	Mauricio	Hitachi Energy
Guest	Stacy	Fabian	Hitachi Energy
Member	Staley	Brad	Leeward Renewable Energy
Guest	Stechschulte	Kyle	American Electric Power
Guest	Steele	Hampton (Allen)	TVA
Guest	Steineman	Andrew	Delta Star Inc.
Guest	Sweetser	Charles	Omicron Energy
Guest	Sze	Matthew	Omicron Energy
Guest	Tade	Sachin	PTI Transformers
Guest	Tan	Jonathan	Northern Transformer
Member	Tanaka	Troy	Burns & McDonnell

Guest	Taylor	Marc	JFE Shoji Power
Member	Tendulkar	Vijay	Eaton
Guest	Teofanovic	Marko	Ontario Power Generation
Guest	Thiede	Andreas	High Volt
Guest	Thomas	Scott	Hitachi Energy
Guest	Tillery	Tim	Howard Industries
Guest	Tirado	Fernando	Prolec GE
Member	Tostrud	Mark	Dynamic Ratings
Member	Traut	Alan	Howard Industries
Guest	Vaagensmith	Bjorn	Idaho National Laboratory
Guest	Van Dreel	Cole	American Transmission Co. LLC
Guest	Vanderwalt	Alwyn	Electrical Consultants, Inc.
Member	Varnell	Jason	Doble Engineering
Member	Verdolin	Rogerio	Verdolin Solutions Inc.
Member	Vir	Dharam	Prolec Energy
Guest	Von Gemmingen	Richard	Dominion Energy
Member	Vyas	Pragnesh	Dunbelt-Solomon
Guest	Wagner	John	American Electric Power
Guest	Waldrop	Mike	MLGW
Member	Wallach	David	Duke Energy
Member	Wang	Evanne	Dupont
Guest	Washburn	Alan	Burns & McDonnell
Guest	Webb	Bruce	Knoxville Utilities Board
Guest	Weisensee	Matt	Pacific Corp.
Member	Weiss	Zachery	WEG Transfomrers USA
Guest	Weyandt	Paul	Schneider Electric
Guest	Wicks	Roger	Dupont
Guest	Wind	Rene	Siemens Energy
Guest	Wong	Terry	Trench
Guest	Wright	Jeffrey	Duquesne Light Co.
Guest	Xu	Shuzhen	PM Global
Guest	Yang	Fei	Hitachi Energy
Guest	Yuan	Guang	Hitachi Energy
Member	Yun	Joshua	Virginia Transformer

28 Guests requested membership:

Guest	Arash	Rezvan	Delta Star Inc.
Guest	Debass	Sami	EPRI

Guest	Delgado Zamora	Gabriel	Invenergy
Guest	Door	Jeffrey	H-J Family of Companies
Guest	Gorzin	Alireza	Black & Veatch
Guest	Hopkinson	Philip	HVOLT, Inc.
Guest	Machain	Jose Luis	Prolec GE
Guest	Mbouombouo	Mama	Hitachi Energy
Guest	Naja	Ismael	Eaton Corp.
Guest	Narawane	Aniruddha	Eaton
Guest	Panesar	Parminder	Virginia Transformer
Guest	Patel	Dipeshkumar	Eaton
Guest	Plascencia	Miguel	PG&E
Guest	Pollaro	Dominic	NASS
Guest	Ronchi	Rodrigo	WEG Transformers USA
Guest	Shalabi	Jaber	Vantran
Guest	Sohn	YongTae	Hyosung
Guest	Soto	Mauricio	Hitachi Energy
Guest	Stacy	Fabian	Hitachi Energy
Guest	Stechschulte	Kyle	American Electric Power
Guest	Sze	Matthew	Omicron Energy
Guest	Tade	Sachin	PTI Transformers
Guest	Thomas	Scott	Hitachi Energy
Guest	Vanderwalt	Alwyn	Electrical Consultants, Inc.
Guest	Von Gemmingen	Richard	Dominion Energy
Guest	Waldrop	Mike	MLGW
Guest	Weisensee	Matt	Pacific Corp.
Guest	Yuan	Guang	Hitachi Energy

Respectfully submitted,

Anastasia O'Malley
Secretary, Insulation Life Subcommittee