

Insulation Life Subcommittee

November 17, 2021

Virtual Meeting

Chair: Sam Sharpless

Vice-Chair: Jinesh Malde

Secretary: Anastasia O'Malley

The Insulation Life Subcommittee (ILSC) was called to order by the Chair in the virtual meeting on November 17, 2021 at 8:01 AM CST. 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 encouraged working groups to conduct on-line meetings between the regular Transformer Committee Meetings to move projects along. Notice must be sent out to all members, attendance recorded, and minutes taken to be included within the subcommittee minutes. Any PAR extension requests need to be approved by the working group and documented in the minutes. The Chair reminded everyone that working groups must achieve a two-thirds majority to submit a document for Sponsor Ballot. The subcommittee must achieve a simple majority to submit a document for Sponsor Ballot.

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 recognized the following new members: Eric Doak, Samragini Dutta Roy, Anthony Franchitti, Rainer Frotscher, Carlos Gaytan, Ismail Gunner, Andy Holden, Parminder Panesar, John Reagan, Jeff Schneider, Jonathan Sinclair, Kenneth Skinger, Mike Waldrop, Evanne Wang and Waldemar Ziomek.

The Chair stated that the following members had been changed to guest status due to lack of regular attendance: Juan Acosta, Derek Baranowski, Arup Chakraborty, Dieter Dohnal, Joseph Foldi, Rob Ghosh, Michael Lau, Ryan MacMullin, Phillip McClure, Kent Miller, Verena Pellon, Pugazhenthir (Pugal) Selvaraj and Kevin Sullivan. Subsequent to the meeting, Kent Miller was reinstated to member status as his attendance to the prior two virtual subcommittee meetings was confirmed.

The Chair recognized C. Clair Claiborne in memoriam for his active participation and contributions.

H.2 Project Status Reports. The Chair reported the status of each project as follows:

H.2.1 C57.91 IEEE Guide for Loading Mineral-Oil-Immersed Transformers

C57.91 is valid until December 31st 2021. The Working Group Chair is David Wallach.

H.2.2 C57.100 IEEE Standard Test Procedure for Thermal Evaluation of Liquid-Immersed Distribution and Power Transformers

C57.100 is valid until December 31st 2022. The Working Group Chair is Roger Wicks.

H.2.3 C57.119 IEEE Recommended Practice for Performing Temperature Rise Tests on Oil-Immersed Power Transformers at Loads Beyond Nameplate Rating

C57.119 is valid until December 31st 2028. The former Working Group Chair is Gael Kennedy.

H.2.4 C57.154 Design, Testing and Application of Liquid-Immersed Transformers with High-Temperature Insulation

C57.154 is valid until December 31st 2022. The Working Group Chair is Richard Marek.

H.2.5 C57.162 Guide for the Interpretation of Moisture Related Parameters in Dry, Gas Insulated and Liquid Immersed Transformers and Reactors

C57.162 is a new document. The PAR for creating this document expires December 31, 2022. The working group Chair is Thomas Prevost.

H.2.6 C57.165 IEEE Guide for Temperature Measurements for Liquid Immersed Transformers and Reactors

PAR expires December 31, 2021. The working group Chair is Mark Tostrud.

H.2.7 PC57.169 replacing 1538 - IEEE Guide for Determination of Maximum Winding Temperature Rise in Liquid-Immersed Transformer

PAR valid till December 31st 2023. The working group Chair is Scott Digby

H.2.8 1276 Guide for the Application of High Temperature Insulation Materials in Liquid-Immersed Power Transformers

1276 expires Dec 31, 2030. The former working group Chair for this document is Roger C. Wicks. Kevin Biggie chairs a Task Force to consider Amendments to Annex B.

H.2.9 Task Force C57.12.90 Clause 11, Temperature Rise Tests – Dinesh Sankarakurup

The Task Force Chair is Dinesh Sankarakurup.

H.3 Secretary's Report

The attendance poll reported that 78 out of 119 members were present in the meeting along with 123 guests. A quorum had been achieved. For the Fall 2021 virtual meeting, only the poll roster was used. Participants requesting membership for the subcommittee were advised to request membership in the chat and to email the Chair, Vice-Chair or Secretary. Eleven guests requested membership. A list of attendees is provided at the end of this report.

The agenda for the meeting had been provided to participants in advance of the meeting for review. Since the Task Force for C57.12.00 Clause 5.11.1.4 had completed their work, item i. on the agenda had been stricken. Don Dorris made a motion to approve the agenda as shown and it was seconded by David Wallach. After hearing no objection from the attendees, the meeting agenda was approved. The Spring 2021 subcommittee meeting minutes had been provided to participants in advance of the meeting for review. Bruce Forsyth made a motion to approve the minutes. Marcos Ferreira seconded the motion. The Spring 2021 meeting minutes were approved after hearing no objection from the attendees.

H.4 Working Group (WG) and Task Force (TF) Reports:

H.4.1 Working group on C57.91 IEEE Guide for Loading Mineral-Oil-Immersed Transformers – David Wallach

Working Group PC57.91 Loading Guide Meeting Minutes

November 16, 2021, 3:45 PM – 5:00 PM (CST)

Virtual Webex Meeting

1. The Chair made the opening remarks and proposed a meeting agenda.
2. **Call for Patents:** The chair asked if anyone was aware of any patents and there were none claimed.
3. **Copyright Policy:** The IEEE copyright policy was reviewed.
4. Quorum was established with 32 members present out of membership of 53, with 82 guests.
5. Meeting agenda was approved by unanimous approval.
6. Minutes of Spring 2021 meeting were approved by unanimous approval.
7. Chair outlined the standard revision timeframe, indicating that a PAR extension is being requested until October 2023
8. The Annex A Task Force met on 5 occasions since the Spring 2021 meeting.
9. Oleg Roizman, the Chair of this task force presented the highlights of the work done by it:
 - A. In annex A, corrections were made to the bubble inception temperature and indicated the need to coordinate with WG C57.162 Interpretation of Moisture Related Parameters.

- B. Definitions were proposed for terms: “transformer insulation life”, “hotspot”, “relative aging rate”, “standard remaining useful life (RUL)”, “percent loss of life” and “overload”.
 - C. Background of existing thermal model and loading formulas was provided, pointing out the existing mathematical errors on these and the previous reports on the inaccuracies of tested values versus calculated values.
 - D. Annex G will be converted from discrete form algebraic equations into continuous form differential algebraic equations. Mathematical proof of new formulas was shown.
 - E. It was proposed to have a host computer code as an open source in IEEE SA, open community powered platform.
 - F. New method predicts higher overload hot spot temperatures for loads of short duration, and similar results with steady state loading conditions.
- 10.** Zack Draper presented the open-source initiative within IEEE SA Open to create program for the thermal model. This platform is intended to bridge the gap between standards developers and other open technical communities to enable nimble and creative technical solutions.
The objective is that anyone with an active IEEE account can join or create a project, open to other technical communities to enable nimble and creative technical solutions.
It is proposed to submit a revised PAR amending scope and purpose to include development and provision of open-source code, agree to licensing considerations determined by the Open Source Committee and appoint responsible members in WG C57.91 and Standards Committee.
- 11.** Chair indicated that it is necessary to consult with IEEE SA personnel on how to use the open-source option before revising the PAR.
- 12.** The next Task Force meeting will be a Webex meeting on December 8, 2021. All presentations made today will be posted on the Transformers Committee web site.
- 13.** The meeting was adjourned at 5:00 PM CST.

Attendees requesting membership (attending 2 of the last 3 meetings):

Luiz Cheim	Approved
Huan Dinh	Approved
Zack Draper	Approved
Curtiss Frazier	Approved
Mario Locarno	Approved
Anatoliy Mudryk	Approved
Patrick Picher	Approved
Alvaro Portillo	Needs to attend one more meeting
Jason Varnell	Approved

Chair: David Wallach

Vice-Chair: Javier Arteaga

Secretary: Kumar Mani

Attendance

Role	First Name	Last Name	Affiliation
Guest	Kayland	Adams	SPX Transformer Solutions, Inc.
Guest	Elise	Arnold	SGB
Vice-Chair	Javier	Arteaga	Hitachi Energy
Guest	Donald	Ayers	Ayers Transformer Consulting
Guest	Suresh	Babanna	SPX Transformer Solutions, Inc.
Guest	Jared	Bates	Oncor Electric Delivery
Guest	Olle	Benzler	Megger
Guest	Mats	Bernesjo	Hitachi Energy
Guest	Kevin	Biggie	Weidmann Electrical Technology
Member	Wallace	Binder	WBBinder Consultant
Member	Daniel	Blaydon	Baltimore Gas & Electric
Guest	William	Boettger	Boettger Transformer Consulting LLC
Guest	Jeremiah	Bradshaw	Bureau of Reclamation
Member	David	Calitz	Siemens Energy
Guest	Thomas	Callsen	Weldy-Lamont Associates
Guest	Juan Alfredo	Carrizales	Prolec GE
Member	Juan	Castellanos	Prolec GE

Annex H

Role	First Name	Last Name	Affiliation
Guest	Luiz	Cheim	Hitachi Energy
Member	Craig	Colopy	EATON Corporation
Guest	John	Crouse	Roswell Alliance
Guest	John	Crouse	Roswell Alliance
Guest	Juan Carlos	Cruz Valdes	Prolec GE
Guest	Eric	Davis	Burns & McDonnell
Guest	Valery	Davydov	Mr. Valery Davydov
Guest	Huan	Dinh	Hitachi Energy
Guest	Zachary	Draper	Delta-X Research Inc.
Guest	Thomas	Eagle	SPX Transformer Solutions, Inc.
Guest	William	Elliott	Prolec GE
Guest	Marco	Espindola	Hitachi Energy
Guest	Norman	Field	Stantec
Member	Bruce	Forsyth	Bruce Forsyth and Associates PLLC
Guest	Anthony	Franchitti	PECO Energy Company
Guest	Raymond	Frazier	Ameren
Member	George	Frimpong	Hitachi Energy
Member	Eduardo	Garcia Wild	Siemens Energy
Guest	Rob	Ghosh	General Electric
Guest	Bill	Griesacker	Duquesne Light Co.
Guest	Thomas	Hartmann	Pepco Holdings Inc.
Member	Roger	Hayes	General Electric
Member	Saramma	Hoffman	PPL Electric Utilities
Guest	Ryan	Hogg	Bureau of Reclamation
Guest	Philip	Hopkinson	HVOLT Inc.
Member	John	John	Virginia Transformer Corp.
Guest	Toby	Johnson	Hunt Electric
Guest	Stephen	Jordan	Tennessee Valley Authority
Guest	Laszlo	Kadar	Hatch
Guest	Kurt	Kaineder	Siemens Energy
Guest	Gael	Kennedy	GR Kennedy & Associates LLC
Member	Sheldon	Kennedy	Niagara Transformer
Member	Stacey	Kessler	TC Energy
Guest	Gary	King	Howard Industries
Member	Egon	Kirchenmayer	Siemens Energy
Guest	Dmitriy	Klempner	Southern California Edison
Guest	Anton	Koshel	Delta Star Inc.
Guest	Krzysztof	Kulasek	Hitachi Energy
Member	John	Lackey	PowerNex Associates Inc.
Guest	Donald	Lamontagne	Arizona Public Service Co.

Annex H

Role	First Name	Last Name	Affiliation
Member	Aleksandr	Levin	Weidmann Electrical Technology
Member	Weijun	Li	Braintree Electric Light Dept.
Guest	Mario	Locarno	Doble Engineering Co.
Guest	Tiffany	Lucas, P.E.	SPX Transformer Solutions, Inc.
Guest	Balakrishnan	Mani	Virginia Transformer Corp.
Guest	Richard	Marek	Retired
Member	Terence	Martin	MarVen
Member	Lee	Matthews	Howard Industries
Guest	Vinay	Mehrotra	SPX Transformer Solutions, Inc.
Guest	Timothy	Menter	Lincoln Electric System
Guest	Aaron	Meyers	EATON Corporation
Guest	Kent	Miller	T&R Electric Supply Co.
Guest	Rashed	Minhaz	Transformer Consulting Services Inc.
Guest	Paul	Morakinyo	PSEG
Member	Emilio	Morales-Cruz	Qualitrol Company LLC
Guest	Anatoliy	Mudryk	Camlin Power
Guest	Ryan	Musgrove	Oklahoma Gas & Electric
Guest	Rodrigo	Ocon	Industrias IEM
Guest	Anastasia	O'Malley	Consolidated Edison Co. of NY
Guest	Vinay	Patel	Consolidated Edison Co. of NY
Guest	Pranav	Pattabi	METSCO Energy Solutions Inc.
Guest	Patrick	Picher	Hydro-Quebec IREQ
Guest	Patrick	Picher	Hydro-Quebec IREQ
Guest	Chris	Pitts	Howard Industries
Guest	John	Poelma	NRG Energy
Guest	Adam	Polson	Arizona Public Service Co.
Guest	Alvaro	Portillo	Ing. Alvaro Portillo
Guest	Ion	Radu	Hitachi Energy
Guest	Jeffrey	Ray	JLR Consulting, Inc.
Member	Timothy	Raymond	Electric Power Research Institute (EPRI)
Guest	John	Reagan	RWE Renewables
Guest	Jonathan	Reimer	FortisBC
Guest	Afshin	Rezaei-Zare	York University
Guest	Tim	Rocque	SPX Transformer Solutions, Inc.
Member	Oleg	Roizman	IntellPower Pty Ltd
Member	Mickel	Saad	Hitachi Energy
Guest	Hakan	Sahin	Virginia/Georgia Transformer
Guest	Dinesh	Sankarakurup	Duke Energy
Member	Amitabh	Sarkar	Virginia Transformer Corp.
Guest	Anil	Sawant	Virginia Transformer Corp.

Role	First Name	Last Name	Affiliation
Guest	Markus	Schiessl	SGB
Guest	Eric	Schleismann	Southern Company Services
Member	Samuel	Sharpless	Rimkus Consulting Group
Guest	Sanjib	Som	Pennsylvania Transformer
Member	Brad	Staley	Salt River Project
Guest	Kyle	Stechschulte	American Electric Power
Guest	Marc	Taylor	JFE Shoji Power Canada Inc.
Guest	Reza	Torabi Goodarzi	SMIT Transformatoren B.V.
Guest	Alan	Traut	Howard Industries
Guest	Jason	Varnell	Doble Engineering Co.
Guest	Jos	Veens	SMIT Transformatoren B.V.
Guest	Kannan	Veeran	Georgia Transformer
Member	Rogério	Verdolin	Verdolin Solutions Inc.
Guest	Yves	Vermette	Electro Composites ULC
Member	Sukhdev	Walia	New Energy Power Co.
Chair	David	Wallach	Duke Energy
Guest	Shelby	Walters	Howard Industries
Guest	Michael	Warntjes	American Transmission Co.
Guest	Alan	Washburn	Burns & McDonnell
Member	Bruce	Webb	Knoxville Utilities Board
Member	Roger	Wicks	DuPont
Member	Jeffrey	Wright	Duquesne Light Co.
Guest	Malia	Zaman	IEEE
Guest	Shibao	Zhang	PCORE Electric
Member	Peter	Zhao	Hydro One

H.4.2 C57.100 IEEE Standard Test Procedure for Thermal Evaluation of Liquid-Immersed Distribution and Power Transformers – Roger Wicks

WG C57.100: IEEE Standard Test Procedure for Thermal Evaluation of Insulation Systems for Liquid-Immersed Distribution and Power Transformers

Fall 2021 “Virtual” Meeting – 16 November 2021, 10:50 a.m. – 12:05 p.m. CST, Webex
 Chair: Roger Wicks, Secretary: Kevin Biggie

The Chair called the meeting to order at 10:50 p.m. and welcomed attendees. The meeting agenda was reviewed. A quorum poll was then taken indicating 27 members were present (of 56), thus a quorum was not initially achieved (28 needed). Essential Patent Claims information and copyright information were reviewed, and no comments were noted.

Shortly later, it was noticed that attendance had risen, thus another quorum poll was organized. This time, the poll indicated 32 members present (of 56), thus a quorum was achieved. With a quorum, the Fall 2021 meeting agenda and the Spring 2021 meeting minutes were approved unanimously (motion: Rob Ghosh, second: Mickel Saad).

As full attendance details were provided after the meeting by the Encore virtual meeting service, attendance was subsequently confirmed to be a total of 111 attendees, with 40 members and 71 guests present. As no guests requested membership, the total number of members remains 56, including the Chair and Secretary. Final attendance was recorded in AMS, and rosters are listed at the end of the minutes.

The Chair then proceeded with a review of a prepared meeting presentation, beginning with a Chair's introduction on the status, recent activities and next steps with the document. The Chair then reviewed a summary of the updates made and included in Draft 2 distributed on 3 Sept. 2021 to the WG. Only comment was Kevin Biggie clarifying that Annex D covers a proposed method for aging of enameled wires specifically in liquids.

The Chair continued with a review of additional information proposed to be added to Draft 2 regarding a thermally upgraded paper qualification test. This information was proposed as a new Annex H, and was included in an updated Draft (2.1) distributed with the Fall 2021 meeting agenda on 8 Nov. 2021. The qualification test proposal is due to the recent work being done to update the definition of TU paper in both IEEE C57.12.80 and in IEC, which includes a qualification test.

As supporting information to the proposed Annex H, the proposed updated definition of TU paper discussed both by IEEE C57.12.80 and within IEC was shared by the Chair for reference. Jim Graham commented that the version shown by Roger had a couple small differences from that discussed by IEEE C57.12.80. Bruce Forsyth added that although the 12.80 WG may have approved an update, that the document itself has yet to be updated allowing potential further updates to the TU paper definition. Alan Sbravati commented that perhaps Degree of Polymerization (DP) should be considered rather than 50% tensile strength retention for the qualification test, with a concern for potential low initial tensile values. Several return comments were made: the 50% tensile at 65k hours is only a qualification test and not a life test, it is a carryover from the current definition in C57.12.80 and has been used as a qualification criteria for decades, the major change in the new definition is the addition of retained nitrogen content, low tensile is prevented by new additional minimum tensile requirements in current Draft 2 Table 1, there is no short duration qualification test level established for DP (200 DP can't be used as it is a long term life aging value, not short qualification test level), and DP is not an application characteristic, while tensile strength is. Phil Hopkinson and Oleg Roizman also spoke in favor of DP as a parameter for testing. Roger concluded that in case the TU paper definition proposed for C57.12.80 changes, that the proposed TU paper qualification test (proposed Annex H) for C57.100 may have to change during the ballot process.

The Chair then reviewed the results of surveys conducted on the proposed initial moisture contents of solids and liquids in the aging test procedure in the latest Draft 2. In summary, the surveys indicated that both labs and OEMs/end users agree with the proposed levels. Valery Davydov commented additionally to include the statement that the starting liquid relative humidity levels indicated are measured at room temperature, as RH is affected by temperature. The Chair agreed to add this to the draft before balloting. Alan Sbravati then presented a summary of a proposed additional annex on an alternative data analysis method considering translation of test results to unit life. Comments from Sasha Levin that perhaps this could be considered for IEEE 1276 Annex B, and also it may be better for internal lab comparison of different tested parameters, rather than comparison of tests from different labs, which may not be recommended. Roger commented that it was suggested for Alan to update the proposed data analysis

annex with a generic example, rather than data specific to natural ester aging, and to clarify the way the analysis is conducted further. Alan offered to resubmit an updated annex with a generic example.

As time ran out for the meeting, the Chair concluded that the proposed Draft 2, the proposed addition of a TU paper qualification test annex, and the proposed addition of an alternative data analysis method will be brought up for a vote before the Spring 2022 meeting in order to progress towards a WG vote on a final draft to go to IEEE-SA ballot.

The virtual meeting was adjourned at 12:05 p.m. Next planned meeting is in the Spring of 2022.

Respectfully submitted,

Roger Wicks
Chair

Kevin Biggie
Secretary

Attendance WG C57.100 Fall 2021 Virtual Meeting:

Members (40)

Robert	Ballard	DuPont
Gilles	Bargone	FISO Technologies Inc.
Kevin	Biggie	Weidmann Electrical Technology
Erich	Buchgeher	Siemens Energy
Juan	Castellanos	Prolec GE
Samragani	Dutta Roy	Siemens Energy
Bruce	Forsyth	Bruce Forsyth and Associates LLC
George	Frimpong	Hitachi ABB Power Grids
Rob	Ghosh	GE
Attila	Gyore	M&I Materials Ltd
Saramma	Hoffman	PPL Electric Utilities
Kurt	Kaineder	Siemens Energy
Jon	Karas	SDMyers, LLC.
Sheldon	Kennedy	Niagara Transformer
Stacey	Kessler	Basin Electric Power Cooperative
Moonhee	Lee	Hammond Power Solutions
Aleksandr	Levin	Weidmann Electrical Technology
Jinesh	Malde	M&I Materials Inc.
Darrell	Mangubat	Siemens Power Operations Inc.
Richard	Marek	Retired
Terence	Martin	MarVen
Rogelio	Martinez	Georgia Transformer
Emilio	Morales-Cruz	Qualitrol Company LLC
Ashmita	Niroula	Ergon, Inc.
Kevin	Rapp	Cargill, Inc.
Jimmy	Rasco	Rasco Consulting LLC
Timothy	Raymond	Electric Power Research Institute (EPRI)
Afshin	Rezaei-Zare	York University

Mickel	Saad	Hitachi ABB Power Grids
Amitabh	Sarkar	Virginia Transformer Corp.
Alan	Sbravati	Cargill, Inc.
Steven	Schappell	SPX Transformer Solutions, Inc.
Samuel	Sharpless	Rimkus Consulting Group
David	Stankes	3M
Paul	Su	FM Global
Radoslaw	Szewczyk	Specialty Products Poland Sp. z o.o.
Mark	Tostrud	Dynamic Ratings, Inc.
Pragnesh	Vyas	Sunbelt-Solomon Solutions
Daniel	Weyer	Nebraska Public Power District
Roger	Wicks	DuPont

Guests (71)

Juan	Acosta	Ergon, Inc.
Rehan	Ali	Siemens Energy
Greg	Ante	Southern California Edison
Edmundo	Arevalo	BPA
Javier	Arteaga	Hitachi ABB Power Grids
Suresh	Babanna	SPX Transformer Solutions, Inc.
Jared	Bates	Oncor Electric Delivery
Mats	Bernesjo	Hitachi ABB Power Grids
William	Boettger	Boettger Transformer Consulting LLC
Jeremiah	Bradshaw	Bureau of Reclamation
Sudip	Chanda	Virginia Transformer
Valery	Davydov	Mr. Valery Davydov
Scott	Digby	Duke Energy
Huan	Dinh	Hitachi Energy
Zachary	Draper	Delta-X Research Inc.
Marco	Espindola	Hitachi ABB Power Grids
Thomas	Falkenburger	Coil Innovation USA, Inc.
Michael	Franchek	Retired
Rainer	Frotscher	Maschinenfabrik Reinhausen
Eduardo	García Wild	Siemens Energy
Orlando	Giraldo	H-J Family of Companies
Michael	Gonzales	Southern California Edison
James	Graham	Weidmann Electrical Technology
Thomas	Hartmann	Pepco Holdings Inc.
Giovanni	Hernandez	Virginia Transformer Corp.
Ronald	Hernandez	Doble Engineering Co.
Philip	Hopkinson	HVOLT Inc.
Paul	Jarman	University of Manchester
Nicholas	Jensen	Delta Star Inc.
László	Kádár	Hatch
Nathan	Katz	PacifiCorp

Gael	Kennedy	GR Kennedy & Associates LLC
Zan	Kiparizoski	Howard Industries
Dmitriy	Klempner	Southern California Edison
Donald	Lamontagne	Arizona Public Service Co.
Balakrishnan	Mani	Virginia Transformer Corp.
Vinay	Mehrotra	SPX Transformer Solutions, Inc.
Timothy	Menter	Lincoln Electric System
Rashed	Minhaz	Transformer Consulting Services Inc.
Anatoliy	Mudryk	Camlin Power
Martin	Munoz Molina	Orto de Mexico
Rodrigo	Ocon	Industrias IEM
Anastasia	O'Malley	Consolidated Edison Co. of NY
Dwight	Parkinson	Eaton Corp
Pranav	Pattabi	METSCO Energy Solutions
Chris	Pitts	Howard Industries
Klaus	Pointner	Trench Austria GmbH
Adam	Polson	Arizona Public Service Co.
Alvaro	Portillo	Ing. Alvaro Portillo
John	Reagan	Oncor Electric Delivery
Tim	Rocque	SPX Transformer Solutions, Inc.
Josue	Rodriguez	Prolec GE
Oleg	Roizman	IntellPower Pty Ltd
Albert	Sanchez	Knoxville Utilities Board
Anil	Sawant	Virginia Transformer Corp.
Markus	Schiessl	SGB
Sanjib	Som	Pennsylvania Transformer
Brad	Staley	Salt River Project
David	Sundin	Engineered Fluids, LLC
Marc	Taylor	JFE Shoji Canada
Reza	Torabi Goodarzi	Royal SMIT Transformer
Alan	Traut	Howard Industries
Rogelio	Verdolin	Verdolin Solutions Inc.
Shelby	Walters	Howard Industries
Michael	Warntjes	American Transmission Co.
Alan	Washburn	Burns & McDonnell
Bruce	Webb	Knoxville Utilities Board
Helena	Wilhelm	Vegoor Tecnologia Aplicada
Trenton	Williams	Advanced Power Technologies
Malia	Zaman	IEEE
Anand	Zanwar	Siemens Energy

H.4.3 C57.154 IEEE Standard for Liquid Immersed Transformers Designed to Operate at Temperatures Above Conventional Limits Using High-Temperature Insulation Systems – Richard Marek

This working group did not meet during the Fall 2021 Virtual Meeting. The Chair, Richard Marek provided a status update.

- No meeting was held since the document is in ballot
- 5 meetings were conducted in total
- PAR expiration date: 31 December 2022
- Invitation of ballot started on September 16, 2021 and closed on October 16, 2021
- The Ballot opened on October 19 and closes on November 18, 2021
- Current ballot status as of the morning of November 17:
 - Balloting ongoing on Draft 7 of the document
 - Ballot group members: 128
 - Approval rate: 98%
 - Disapprovals: 1
 - Total comments: 25
 - Return rate: 74% (75% required)

Subsequent to the virtual meeting, the Ballot closed on November 18:

- Ballot Group Members: 128
- Return Ballots: 111 (86%) - Minimum return rate must be 75%
- Abstentions: 4 (3%)
- Approval rate: 97% - Minimum approval rate must be at least 75%
- 104 approved and 3 disapproved with MBS comments
- 64 comments have been received
- Forming a balloting resolution group, which will be led by Kevin Biggie

Chair: Richard Marek Vice-Chair: Anastasia O’Malley Secretary: Ewald Schweiger

H.4.4 Working Group on C57.162 Guide for the Interpretation of Moisture Related Parameters in Dry, Gas Insulated and Liquid Immersed Transformers and Reactors – Tom Prevost

This working group did not meet during the Fall 2021 Virtual Meeting. The Secretary, Stephanie Denzer provided a status update.

- The PAR expires on December 31, 2022
- The document is in the final editing stages in preparation to go out for the balloting process

Chair: Tom Prevost Vice-Chair: Valery Davydov Secretary: Stephanie Denzer

H.4.5 Working group on C57.165 IEEE Guide for Temperature Measurements for Liquid Immersed Transformers and Reactors – Mark Tostrud

Unapproved Meeting Minutes

PC57.165 WG Guide for Temperature Measurements for Liquid Immersed Transformers and Reactors

Minutes from Fall 2021 Virtual Meeting

Officers

Chair – Mark Tostrud

Vice Chair/Secretary – Zan Kiparizoski

1. Meeting Date and Time: 11/16/2021 at 9:25-10:40am CST

Meeting started at 9:25am

2. Call for essential patents

The patent slides were shared on screen and a request for any known patents that were essential to the work of the Working Group was made. There were no responses to the request.

2. Reviewed IEEE-SA Copyright Policy

The copyright policy slides were shared on screen and a request for any known copyright issues was made. One member has previously submitted copyright document for his work.

3. Chairs remarks

Proposed revision of the document does not have a purpose statement as a part of the document. Working group members had voted to add a purpose statement several meetings ago to help clarify the reason for the document when we were discussing what content should be added. Adding or changing the purpose statement will require PAR revision. Since the document is in its final stages, add It is not required to have purpose statement in the document. Since the document is in its final stages, adding now doesn't make sense. Members agreed with this position during the meeting.

4. Attendance

There were 49 attendees in the meeting

9 members

26 guest

3 guests requested membership

14 attendees did not identify as a member/guest

Quorum check

Quorum was not achieved

The first poll showed 9 of 27 members were present

The second poll was performed about 10 minutes into the meeting, 10 of 27 members were present for the second poll.

The third poll was performed about 1 hour into the meeting, 9 of 27 members were present for the third poll.

6. Approval of the agenda and minutes

Due to lack of quorum, meeting agenda and the minutes from the previous meeting were not approved. Minutes of the Spring meeting will be sent via e-mail to all participants for their approval

7. Old Business

Chair presented changes in the latest revision of the guide:

Normative references have been updated

Portions of section 4.7 moved in section 4.2

Section 4.1. – Ambient Temperature Measurement

Fiber optic temperature sensor have been added to the list of instruments to measure ambient temperature

Section 4.2. – Liquid Temperature Measurement

Added information related to OLTC liquid temperature measurements

Changes in 4.2.3.1, additional information about mixing sensor types, and main tank/OLTC temperature differential measurements.

Section 4.2.3.3., clarifications related to the oil temperature measurement in the oil ducts have been added.

Section 4.5 – Tank wall Temperature Measurements:

Changes in 4.5.2 Location of Sensors

Annex A - Types of Temperature Sensors

Review of several minor changes

Annex B - Types of Winding Temperature Thermometers

Review of several minor changes

Section 3. Definitions

Juan Catellanos proposed revision to section 3. Definitions, to add definitions for various acronyms. Oleg Rozman accepted the task.

8. New Business

The chair proposed to:

Proceed without purpose statement in the guide.

Send e-mail to the group and request acceptance of all the changes in the present draft of the guide and in a same time request permission to proceed to do a straw ballot.

Schedule virtual meeting to discuss the straw ballot.

9. The meeting adjourned at 10:40

10. Minutes

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

WG PC57.165 – Participation List, Virtual Fall 2021 Meeting			
Member	Gilles	Bargone	FISO Technologies Inc.
Member	Juan	Castellanos	Prolec GE
Member	Hakim	Dulac	Qualitrol Company LLC
Member	Zan	Kiparizoski	Howard Industries
Member	Martin	Munoz Molina	Orto de Mexico
Member	Ryan	Musgrove	Oklahoma Gas & Electric
Member	Samuel	Sharpless	Rimkus Consulting Group
Member	Mark	Tostrud	Dynamic Ratings, Inc.
Member	Trenton	Williams	Advanced Power Technologies
Guest	Kayland	Adams	SPX Transformer Solutions, Inc.
Guest	Rehan	Ali	Siemens Energy
Guest	Edmundo	Arevalo	Bonneville Power Administration
Guest	Jeff	Benach	Megger
Guest	William	Boettger	Boettger Transformer Consulting LLC
Guest	Randy	Brannen	Southern Company Services
Guest	Zachary	Draper	Delta-X Research Inc.
Guest	Edmund	Feloni	CEG Forensics LLC
Guest	Roger	Fenton	Fenton Solutions
Guest	James	Gardner	SPX Transformer Solutions, Inc.
Guest	Orlando	Giraldo	H-J Family of Companies
Guest	Thomas	Hartmann	Pepco Holdings Inc.
Guest	Gary	Hoffman	Advanced Power Technologies
Guest	Bates	Jared	
Guest	Laszlo	Kadar	Hatch
Guest	Gael	Kennedy	GR Kennedy & Associates LLC
Guest	Dmitriy	Klempner	Southern California Edison
Guest	Donald	Lamontagne	Arizona Public Service Co.
Guest	Balakrishnan	Mani	Virginia Transformer Corp.
Guest	Lee	Matthews	Howard Industries
Guest	Zachary	Millard	Great River Energy

Guest	Manoj Kumar	Mishra	ASAsoft (Canada) Inc
Guest	Rodrigo	Ocon	Industrias IEM
Guest	Anastasia	O'Malley	Consolidated Edison Co. of NY
Guest	Matthew	Pinard	Weidmann Electrical Technology
Guest	Alvaro	Portillo	Ing. Alvaro Portillo
Guest	Homero	Portillo	Advanced Power Technologies
Guest	Jeffrey	Ray	JLR Consulting, Inc.
Guest	Jonathan	Reimer	FortisBC
Guest	Oleg	Roizman	IntellPower Pty Ltd
Guest	Albert	Sanchez	Knoxville Utilities Board
Guest	Stefan	Schindler	Maschinenfabrik Reinhausen
Guest	Adrian	Silgado	IFD Corporation
Guest	Mauricio	Soto	Hitachi Energy
Guest	Brad	Staley	Salt River Project
Guest	Katrina	Swanson McLeod	Southern Nuclear
Guest	Jos	Veens	SMIT Transformatoren B.V.
Guest	Rogério	Verdolin	Verdolin Solutions Inc.
Guest	Hugh	Waldrop	Memphis Light, Gas & Water
Guest	Anand	Zanwar	Siemens Energy

H.4.6 Working group on C57.169 Maximum Winding Temperature Rise in Liquid-Filled Transformers (PC57.169 replacing IEEE 1538) – Scott Digby

This working group did not meet during the Fall 2021 Virtual Meeting due to the status of the document. The Chair, Scott Digby provided a status update.

- The document is ready to go to sponsor ballot
- The Chair had solicited a vote of the working group via email to recommend the document move to sponsor ballot
- 23 of the 36 working group members responded, achieving a quorum, and voted unanimously in favor of moving to sponsor ballot
- The working group for this document approved recommending to the subcommittee that the current draft of the document be sent for sponsor ballot
- The PAR expires December 31, 2023

Chair: Scott Digby Secretary: Cihangir John Sen

H.4.7 1276 Guide for the Application of High Temperature Insulation Materials in Liquid-Immersed Power Transformers

This document is valid until December 31, 2030. The former working group Chair is Roger Wicks. Kevin Biggie chairs a related Task Force that was formed to consider an amendment of IEEE 1276 Annex B and develop a corresponding PAR if merited.

The task force met virtually on September 16 and reviewed proposed changes that could be addressed if an amendment was opened up for IEEE 1276 Annex B. The task force also met on November 15 from 12:55 – 2:10 CST. The task force completed its work and voted to recommend opening a PAR to Annex B of 1276.

On behalf of the task force, Kevin Biggie made a motion to authorize a PAR to amend IEEE 1276 Annexes B and D, with the following amendment title: “Updates to Annex B and corresponding references in Annex D,” and the following project scope: “The amendment is adding updated and new insulation system aging examples and other additional related information to Annex B, and corresponding references in Annex D.”

The motion was seconded by Bruce Forsyth. There was no discussion or opposition to the motion. The motion passed.

H.4.8 Task Force C57.12.90 Clause 11, Temperature Rise Tests – Dinesh Sankarakurup

TF C57.12.90 Continuous Revision to Test Code – Clause 11 Temperature Rise Tests

Virtual Meeting – November 16, 2021 at 12:55pm CST

Chair: Dinesh Sankarakurup
Vice Chair: Ajith Varghese
Secretary: John Reagan

Attendance

45 Total Attendees
19 Members

Discussion

1. No quorum was reached so no Approvals of Agenda and Previous Meeting Minutes were possible.
2. No essential patent claims or copyright violations were noted.
3. Old Business - Jason Varnell’s comment on the use of “Ultimate Temperature” in Clause 11.3.2 and a need to clarify what Ultimate means.
 - a. Dinesh suggested the use of “Stabilize” instead of the use of “Ultimate” and “Final”.
 - b. A survey will be used to get input from TF.
4. Second Quorum vote was taken but was still not met.
5. Jason had also asked to clarify that the final temperature is not to be Averaged.
 - a. Discussion about adding “The stabilized liquid temperature rise determined at the end of the total loss run shall not be averaged over time”.
 - b. Joe brought up we typically say what we should do and not what we shouldn’t do.
 - c. Decision was to use a survey to determine if this addition is actually needed.
6. Jason’s 2nd comment: Subclauses 11.4.1 and 11.4.2 do not provide indication for which exponent to use for K or L insulating fluids associated with the cooling class designation per C57.12.00-2015 Subclause 5.1 (KNAN or KNAF).
 - a. There was discussion on how manufacturers have been handling different liquids, but nobody present had data for m and n exponents to know what a realistic value would be.

- b. A survey will be sent out to ask for experience with this from the Insulation Subcommittee. If there is enough information, the suggestion is to add information for the K and L type liquids. If there is no need to add specific information, the suggestion is to update C57.12.90 to be more general when referring to the cooling type.
- 7. New Business - Bertrand Poulin had new business regarding C57.119-2018, but he was not present. TF wanted him present to clarify what he was proposing. This will be added to the agenda for the next meeting.
- 8. New Business - Steve Antosz brought up issue with Clause 11.4.3, Testing above 1000m. He brought up that the standard does not address if the testing is occurring at over 1000m.
 - a. Steve will write up his proposal and send to Dinesh.
- 9. Steve Antosz brought up issue with Subclause 11.1.2.1 and 11.1.2.2, “transformer shall be tested with the combination of connections and taps that give the highest average winding temperature rise.”. This works for two-winding transformers, but for an autotransformer with a loaded tertiary, there may be cases of allowable loading that produce higher total losses.
 - a. Steve is raising the issue and is looking for input from others.
 - b. Hakan volunteered to provide information.
 - c. TF agreed this was an issue and asked for volunteers with experience with this issue to get together to discuss/collect data.
 - i. Steve Antosz
 - ii. Hakan Sahin
 - iii. Anthony Franchetti
 - iv. Ajith Varghese
 - v. Dinesh Sankarakurup
 - vi. Polo Rodriguez
- 10. Ajith had more new business, but time was up.
- 11. Meeting was adjourned on time.

Attendance Roster:

COUNT	LAST	FIRST	MEMBERSHIP	AFFILIATION
1	Antosz	Steve	Request	Stephen Antosz & Associates, Inc
2	Baciu	Daniela Ember	Guest	Hydro-Quebec IREQ
3	Bargone	Gilles	Member	FISO Technologies Inc.
4	Bedoya	Duvier	Guest	Hitachi Energy
5	Boettger	William	Member	Boettger Transformer Consulting LLC
6	Brzoznowski	Steve	Guest	Bonneville Power Administration
7	Buchgeher	Erich	Guest	Siemens Energy
8	Castellanos	Juan	Member	Prolec GE
9	Chorzepa	Jaroslaw	Guest	ABB Inc.
10	Digby	Scott H	Guest	Duke Energy
11	Eagle	Tommy	Member	SPX Transformer Solutions, Inc.
12	Forsyth	Bruce	Member	Bruce Forsyth and Associates PLLC
13	Franchitti	Anthony	Member	PECO Energy Company
14	Frazier	Curtiss	Guest	Ameren
15	Hachichi	Said	Member	Hydro-Quebec
16	Hartmann	Thomas	Guest	Pepco Holdings Inc.

17	Hoffman	Saramma	Guest	PPL Electric Utilities
18	John	John K	Member	Virginia Transformer Corp.
19	Katz	Nathan	Guest	PacifiCorp
20	Kennedy	Sheldon	Member	Niagara Transformer
21	Kennedy	Gael	Guest	GR Kennedy & Associates LLC
22	Kessler	Stacey	Guest	TC Energy
23	King	Gary	Member	Howard Industries
24	Kumaria	Deepak	Guest	Applied Materials
25	Mudryk	Anatoliy	Guest	Camlin Power
26	Musgrove	Ryan	Member	Oklahoma Gas & Electric
27	Neild	Kris	Guest	Megger
28	O'Malley	Anastasia	Guest	Consolidated Edison Co. of NY
29	Powell	Paulette Payne	Guest	Retired
30	Prince	Jarrold	Member	ERMCO
31	Reagan	John	Secretary	RWE Renewables
32	Reimer	Jonathan	Guest	FortisBC
33	Rocque	Tim	Guest	SPX Transformer Solutions, Inc.
34	Dutta Roy	Samraghi	Request	Siemens Energy
35	Sahin	Hakan	Member	Virginia/Georgia Transformer
36	Sankarakurup	Dinesh	Chair	Duke Energy
37	Sauls	Rod	Guest	Southern Company Services
38	Schwartz	Dan	Guest	Quality Switch, Inc.
39	Sen	Cihangir John	Member	Duke Energy
40	Sharpless	Sam	Member	Rimkus Consulting Group
41	Steele	Hampton Allen	Guest	Tennessee Valley Authority
42	Swanson	Katrina	Guest	Southern Nuclear
43	Taylor	Marc	Member	JFE Shoji Power Canada Inc.
44	Varghese	Ajith	Vice-Chair	SPX Transformer Solutions, Inc.
45	Warntjes	Mike	Guest	American Transmission Co.

H.5 Old Business

As discussed under section H.4.7 The task force report for 1276 Guide for the Application of High Temperature Insulation Materials in Liquid Immersed Power Transformers, the Task Force for IEEE 1276 Annex B made a motion to authorize a PAR to amend IEEE 1276 Annexes B and D with the following amendment title: “Updates to Annex B and corresponding references in Annex D,” and the following project scope: “The amendment is adding updated and new insulation system aging examples and other additional related information to Annex B, and corresponding references in Annex D.” The motion was seconded and passed.

H.6 New Business

There were no new business items brought forward for discussion.

H.7 Adjournment

The meeting was adjourned at 9:09 AM CST.

Post-Meeting Notes

Following the fall meeting, the Subcommittee Chairman appointed Kevin Biggie of Weidmann Group as Working Group Chairman of the newly re-formed IEEE 1276 Working Group. Mr. Biggie subsequently appointed George Frimpong of Hitachi Energy as WG Vice-Chair and Evanne Wang of DuPont as WG Secretary.

Attendance Roster

Name	Membership	Affiliation
Kayland Adams	Guest	SPX Transformers
Raj Ahuja	Guest	
Nabi Almeida	Guest	Prolec GE USA
Stephen Antosz	Member	Stephen Antosz & Associates, Inc
Edmundo Arevalo	Guest	BPA
Elise Arnold	Guest	SGB
Javier Arteaga	Member	Hitachi Powergrids
Donald Ayers	Member	Ayers Transformer Consulting
Juan Alfredo Carrizales Baaldua	Guest	Prolec GE
Suresh Babanna	Member	SPX Transformers
(Robert) Casey Ballard	Member	DuPont
Gilles Bargone	Member	FISO
Bates, Jared	Guest	Oncor Electric Delivery
Barry Beaster	Member	H-J
Claude Beauchemin	Member	TjH2b
Tammy Behrens	Guest	SPX
Kevin Biggie	Member	Weidmann Electrical Technology
Gene Blackburn	Guest	
Piotr Blaszczyk	Guest	Transformer Components
William Boettger	Member	Boettger Transformer Consulting LLC
Sanket Bolar	Guest	Megger
Alain (Dominique) Bolliger	Requesting	HV Technologies
Jeremiah Bradshaw	Guest	Bureau of Reclamation
Darren Brown	Guest	Howard Industries
David Calitz	Member	Siemens Energy
Sergio Hernandez Cano	Guest	Hammond Power Solutions
Kurt Carlson	Guest	
Edward Casserly	Member	Ergon Inc
Juan Castellanos	Member	Prolec GE
Antonio Ceballos	Requesting	Georgia Transformer

Arup Chakraborty	Requesting	Delta Star Inc.
Sudip Chanda	Requesting	Virginia Transformer
Muhammad Ali Masood Cheema	Requesting	Northern Transformer Corp.
Luiz Cheim	Member	Hitachi Energy
Solomon Chiang	Member	Gund Co.
Larry Christodoulou	Guest	Electric Power Services
Rhett Chrysler	Guest	ERMCO
Craig Colopy	Guest	Eaton Corp
Domenico corsi	Guest	Doble Engineering Co.
John Crouse	Guest	Roswell Alliance
Jorge Cruz	Member	PTI Transformers
Eric Davis	Guest	Burns & McDonald
Valery Davydov	Guest	Mr. Valery Davydov
Denzer, Stephanie	Requesting	Alliant Energy
Digby, Scott H	Member	Duke Energy
Larry Dix	Guest	Quality Switch
Don Dorris	Member	Nashville Electric Service
Hakim Dulac	Requesting	Qualitrol Corp
Samraghi Dutta Roy	Member	Siemens Energy
Tommy Eagle	Guest	SPX Transformer Solutions
Wayne Ellis	Guest	Memphis Gas, Light & Water
Evgenii Ermakov	Guest	Hitachi Energy
Marco Espindola	Guest	Hitachi Energy
Ed Feloni	Guest	CEG Forensics
Marcos Ferreira	Member	Bridge View Resources
Norman Field	Guest	Stantec
Joseph Foldi	Guest	
Bruce Forsyth	Member	Bruce Forsyth and Associates
Michael A. Franchek	Member	Retired
Anthony Franchitti	Member	PECO Energy Co.
Curtiss Raymond Frazier	Guest	Ameren
George Frimpong	Member	Hitachi Powergrids
Rainer Frotscher	Member	Reinhausen
Eduardo Garcia	Member	Siemens Energy
Carlos Gaytan	Member	Prolec GE
Orlando Giraldo	Guest	H-J Family of Co.
Shawn Gossett	Guest	Ameren
Jeff Gragert	Guest	Xcel Energy
Jim Graham	Guest	Weidmann Electrical Technology
Taylor Gray	Guest	PGE
Bill Griesacker	Member	Duquesne Light Co.
ISMAIL GUNER	Member	HydroQ
Attila Gyore	Member	M&I Materials Inc.

Ken Hampton	Guest	BGE
Thomas Hartmann	Member	Pepco Holdings Inc.
Roger Hayes	Member	GE
Giovanni Hernandez	Guest	VA Transformer
Thang Hoчанh	Guest	Surplec
Gary Hoffman	Member	Advanced Power Technologies
Saramma Hoffman	Member	PPL Electric Utilities
Andy Holden	Member	Ergon
David Holland	Guest	Exxon Mobile
Philip Hopkinson	Requesting	HVOLT Inc.
Paul Jarman	Guest	Manchester Univ.
Nicholas Jensen	Guest	Delta Star
John K John	Member	Virginia Transformer
Toby Johnson	Guest	Hunt Electric
Steve Jordan	Member	TVA
László Kádár	Guest	Hatch
Kurt Kaineder	Member	Siemens Energy
Gael R Kennedy	Member	GR Kennedy & Associates
Sheldon Kennedy	Member	Niagara Transformer
Stacey Kessler	Member	TC Energy
Gary King	Member	Howard Industries
Zan Kiparizoski	Member	Howard Industries
Dmitriy Klempler	Guest	Southern California Edison
Axel Kraemer	Guest	Reinhausen
Michelle Kutzleb	Guest	TJH2b Analytical Services
John Lackey	Guest	PowerNex Associates Inc.
Don Lamontagne	Guest	Arizona Public Service
Andrew Larison	Guest	Hitachi Energy USA
Fernando Leal	Guest	
Moonhee Lee	Member	Hammond Power Solutions
Aleksandr Levin	Member	Weidmann Electrical Technology
Weijun Li	Member	Braintree Electric Light Dept.
Mario Locarno	Member	Doble Engineering Co.
Tiffany Lucas	Guest	Prolec GE- Waukesha
Alejandro Macias	Guest	Centerpoint Energy
Jinesh Malde	Member	M&I Materials Inc.
Balakrishnan Mani	Guest	Virginia Transformer
Richard Marek	Member	Retired
J.Dennis Marlow	Guest	DenMar TDS Transformers
Robert Mayer	Guest	Siemens Energy
Susan McNelly	Member	Xcel Energy
Vinay Mehrotra	Member	SPX Transformers
Tim Menter	Guest	Lincoln Electric System

Annex H

Aaron Meyers	Guest	Eaton Corp
Zach Millard	Guest	
Kent Miller (USER)	Member	T&R Electric Supply Co.
Ronnie Minhaz	Guest	Transformer Consulting Services Inc.
Manoj Mishra	Guest	ASAssoft Canada
Hali Moleski	Guest	SD Myers
Rhea Montpool	Guest	Schneider Electric
Emilio Morales-Cruz	Guest	Qualitrol Corp
David Murray	Member	TVA
Ryan Musgrove	Guest	Oklahoma Gas & Electric
Ali Naderian	Guest	
Kris Neild	Guest	Megger
Ashmita Niroula	Guest	Ergon
Jayme Nunes	Guest	NYNAS AB
Rodrigo Ocon	Guest	Industrias IEM
Anastasia O'Malley	Member	Consolidated Edison Co NY
Rajkumar Padmawar	Guest	ASAssoft Canada
Parminder Panesar	Member	VA Transformer
Dwight Parkinson	Member	Eaton Corp
Vinay Patel	Guest	Consolidated Edison Co NY
Rakesh Patel	Guest	Hitachi Energy
Harry Pepe	Guest	Doble Engineering Co.
Matt Pinard	Guest	Weidmann Electrical Technology
JOHN POELMA	Guest	NRG Energy
Klaus Pointner	Member	Trench Austria GmbH
Adam Polson	Guest	Arizona Public Service
Alvaro Portillo	Guest	Ing Alvaro Portillo
Homer Portillo	Guest	Advanced Power Technologies
Chris Powell	Guest	Intermountain Electronics
Jarrood Prince	Guest	ERMCO
John Prunte	Guest	SPX Transformer Solutions
Donnie Rackley	Guest	RESA Power
Jimmy M Rasco	Member	Rascoe Consulting LLC
Jeff Ray	Member	JLR Consulting Inc.
Raymond, Timothy	Member	EPRI
John Reagan	Member	RWE Renewables
Scott Reed	Member	MVA
Jonathan Reimer	Guest	Fortis BC
Tony Reiss	Guest	Custom Materials
Rob	Guest	
Tim Rocque	Guest	SPX Transformers
Josue Rodriguez	Requesting	Prolec GE
Oleg Roizman	Member	IntellPower

Annex H

Mickel Saad	Member	Hitachi Energy
Hakan Sahin	Guest	Virginia & Georgia Transformer
Mahesh Sampat	Guest	
Albert Sanchez	Guest	Knoxville Utilities Board
Sankarakurup, Dinesh	Member	Duke Energy
Amitabh Sarkar	Member	Virginia Transformer
Rod Sauls	Guest	Southern Co.
Alan Sbravati	Member	Cargill
Markus Schiessl	Requesting	SGB
Stefan Schindler	Guest	Reinhausen
Jeff Schneider	Member	Power Partners
Dan Schwartz	Guest	Quality Switch
Ewald Schweiger	Member	Siemens Energy
Pugal Selvaraj	Guest	Virginia Transformer
Cihangir John Sen	Guest	Duke Energy
Devki Sharma	Guest	Entergy
Sam Sharpless	Member	Rimkus Consulting Group
Dr. Shertukde	Member	Hartford University
Avijit Shingari	Guest	Pepco Holdings Inc.
Jonathan Sinclair	Member	PPL Electric Utilities
Kenn Skinger	Member	Scituate Consulting
Chris Slattery	Guest	First Energy
Sanjib Som	Member	Pennsylvania Transformer
Mike Spurlock	Guest	Spurlock Engineering Services
Fabian "Durand" Stacy	Guest	Hitachi Energy
Brad Staley	Member	Salt River Project
Dave Stankes	Guest	3M
Kyle D Stechschulte	Guest	AEP
Hampton Allen Steele	Guest	TVA
Andy Steineman	Guest	Delta Star
Paul Su	Guest	FM Global
David Sundin	Requesting	Engineered Fluids Inc.
Babanna Suresh	Member	SPX Transformers
Charles Sweetser	Guest	Omicron Energy
Radek Szewczyk	Guest	DuPont
Troy Tanaka	Member	Burns & McDonald
Marc Taylor	Guest	JFE Shoji Power Canada Inc.
Ed teNyenhuis	Guest	Hitachi Energy
Reza Torabi	Guest	SGB-SMIT
Mark Tostrud	Member	Dynamic Ratings
Wilson Trantum	Guest	Siemens Energy
Alan Traut	Member	Howard Industries
Cole Van Dreel	Guest	American Transmission Co.

Alwyn Van der Walt	Member	ECI
Ajith Varghese	Member	SPX Waukesha
Jason Varnell	Member	Doble Engineering Co.
Rogério Verdolin	Member	Verdolin Solutions Inc.
K.Vijayan	Guest	PTI Transformers
Dejan Vuković	Guest	Hitachi Energy
Pragnesh Vyas	Member	Sunbelt Solomon
Loren Wagenaar	Guest	
Sukhdev Walia	Member	New Energy Power LLC
Wallach, David	Member	Duke Energy
Mike Warntjes	Guest	American Transmission Co.
Alan Washburn	Guest	Burns & McDonald
Joe Watson	Guest	JD Watson & Assoc.
Bruce Webb	Guest	Knoxville Utilities Board
Zachery Weiss	Guest	WEG
Drew Welton	Member	Intelirent
Bill Whitehead	Member	H2scan Inc.
Roger Wicks	Member	DuPont
Trenton Williams	Guest	Advanced Power Technologies
Baitun Yang	Member	
Joshua Yun	Guest	Virginia Transformer
Malia Zaman	Guest	IEEE SA
Anand Zanwar	Guest	Siemens Energy
Peter Zhao	Member	Hydro One
Waldemar Ziomek	Member	PTI Transformers

Guests Requesting Membership

Dominique Bolliger
Antonio Ceballos
Arup Chakraborty
Sudip Chanda
Muhammad Ali Masood Cheema
Stephanie Denzer
Hakim Dulac
Phillip Hopkinson
Josue Rodriguez
Markus Schliessl
David Sundin

Respectfully submitted,

Anastasia O'Malley
Secretary, Insulation Life Subcommittee