

Annex G Insulating Fluids Subcommittee

March 13th, 2023 - 3:00 PM - 4:15 PM
Hyatt Regency, Vancouver, BC - Canada

Chair: Stephanie Mabrey
Vice-Chair: Jerry Murphy
Secretary: Alan Sbravati

1. Introductions, Roll Call of Members for Quorum, Meeting Agenda Approval, F23 Minutes Correction and Approval, and Chair's Comments

1.1 Chair's Opening Remarks:

- a. Meeting started at 3:00 PM
- b. Presentation of the Vice-Chair, Jerry Murphy, and the Secretary Alan Sbravati.
- c. Reminded that the SC minutes are due April 5th, 2024 - WG and TF meeting minutes are due for submittal to the Insulating Fluids Subcommittee (IFSC) Secretary Alan Sbravati due within 15 days of their meetings.

1.2 Roll Call of SC members: (Quorum requirement: 25 minimum)

- a. 36 Members signed in, from a total of 49 members. A quorum was achieved.
- b. Total of 90 attendees. A total of 54 guests, from which 13 requested membership, and three of them are eligible.
- c. Registered Attendance:

First Name	Last Name	Role
Edmundo	Arevalo	Guest
Jean-Noel	Berube	Guest
Kevin	Biggie	Member
William	Boettger	Member
Paul	Boman	Member
Jeremiah	Bradshaw	Member
John	Brett	Guest
Edward	Casserly	Member
Juan	Castellanos	Member
Stuart	Chambers	Member
Luiz	Cheim	Member
Gabriel	Delgado	Guest
Lee	Doyle	Guest
Zachary	Draper	Member
Jesse	Duffy	Guest
James	Dukarm	Guest
Florin	Faur	Member
Todd	Felton	Guest
Marcos	Ferreira	Member

Bruce	Forsyth	Member
Rainer	Frotscher	Member
Miguel	Garcia	Guest
James	Gardner	Guest
Carlos	Gaytan	Guest
Rob	Ghosh	Member
Orlando	Giraldo	Member
Luis	Gonzalez	Guest
Alireza	Gorzin	Guest
Attila	Gyore	Member
Didier	Hamoir	Guest
Florian	Hermann	Guest
Traci	Hopkins	Member
Patrycja	Jarosz	Guest
John	John	Member
Egon	Kirchenmayer	Guest
Donald	Lamontagne	Guest
Stefan	Lembacher	Guest
Samuel	Lewis	Guest

Eric	Li	Guest
Jinming	Li	Guest
Cesar	Lizcano	Guest
Luc	Loiselle	Guest
Tiffany	Lucas, P.E.	Member
Stephanie	Mabrey	Chair
Jinesh	Malde	Member
Gabriel	Mamede	Guest
Kumar	Mani	Guest
Robert	Mayer	Guest
Toni	Mellin	Guest
Yegor	Melo	Guest
Justin	Minikel	Guest
Gianetta	Morrow	Guest
Emma	Murowinski	Guest
Jerry	Murphy	Vice-chair
Anthony	Natale	Guest
Mark	Newbill	Guest
Dwight	Parkinson	Member
Nicholas	Perjanik	Guest
Thomas	Prevost	Member
John	Pruente	Member
Timothy	Raymond	Member
Scott	Reed	Member
Sebastian	Rehkopf	Guest
Yuri	Rossini	Guest

Mickel	Saad	Member
Alan	Sbravati	Secretary
Stephen	Shull	Guest
Jonathan	Sinclair	Member
Markus	Soeller	Guest
William	Solano	Guest
Brian	Sparling	Guest
Hampton	Steele	Guest
Gregory	Steeves	Member
David	Stockton	Guest
Ed	Tenyenhuis	Guest
Marko	Teofanovic	Guest
Ryan	Thompson	Member
Mark	Tostrud	Member
Alwyn	Van Der Walt	Member
John	Vandermaar	Guest
Karsten	Viereck	Guest
Mike	Waldrop	Guest
Evanne	Wang	Member
Zachery	Weiss	Guest
Drew	Welton	Guest
Paul	Weyandty	Guest
Kayla	Whitesel	Guest
Rene	Wind	Guest
Deanna	Woods	Member
Guang	Yuan	Guest

1.3 Agenda Approval:

- a. A motion for approval of the agenda was presented by Ed Casserly, and second by Marcos Ferreira. The agenda was unanimously approved.
- b. Stephanie presented some reminders:
 - a. The deadline for the submission of minutes is March 29th.
 - b. Request attendees to update their e-mail / contact information.
 - c. Informed the group that the creation of Sub-Task Forces requires voting.
 - d. The criterium for retaining membership is to attend 3 of last 5 meetings.
 - e. Clarification on requirements for becoming and keeping membership of the SC is to attend at least 3 of the last 5 meetings.

1.4 Approval of minutes from the F23 meetings:

- a. A motion for approval of the F23 minutes was presented by Traci Hopkins, second by John John. Minutes were unanimously approved.

2. WG & TF Reports Presented at the SC Meeting

2.1.1 IEEE C57.146 IEEE Guide for Interpretation of Gasses Generated in Silicone-Immersed Transformers

2.1.1.1 WG Chair: Paul Boman

- a. Attendance total 28, members 11, and 2 requested membership. Quorum was achieved and business could be conducted at this meeting.
- b. Call for essential patents – none at this time
- c. Agenda – no opposition to unanimous approval.
- d. Minutes from previous meeting accepted as presented.
- e. PAR extension will be requested from SC
- f. Issues raised by another WG brought up relating to the flow diagram in the standard.
- g. A request was made for the WG to review the latest draft and get all comments to chair for straw balloting

See *Appendix I* for the F23 Minutes (unapproved) of C57.146 WG Meeting as submitted.

2.1.2 IEEE C57.166 Consolidation of Insulating Liquids Guides (PAR Expiration: Dec 2024)

2.1.2.1 WG Chair: Tom Prevost

2.1.2.2 Although the WG Meeting did not meet, an update was presented at the IFSC meeting by the chair:

- a. Ballot ends on March 16th. Only 42% return till March 13th.
- b. Comments Resolution Group was already defined. They will work on the comments after the ballot. They were expected to be concluded before F24 meeting.
- c. Chair presented a claim for people who joined the ballot to effectively vote.

See *Appendix II* reserved for the Meeting Minutes not submitted.

2.1.3 TF PAR C57.104 IEEE Guide for the Interpretation of Gases Generated in Mineral Oil-Immersed Transformers

2.1.3.1 TF Chair: Ed teNyenhuis

- a. First meeting of the TF.
- b. Title, scope and purpose were revised.
- c. A motion was presented by Luiz Cheim to apply for a PAR. Seconded by Mickel Saad.
- d. Ed will submit a PAR.

Appendix III for the S24 Minutes (unapproved) of C57.104 TF Meeting as submitted.

2.1.4 C57.637 – Guide for the Reclamation of Mineral Insulating Oil and Criteria for Its Use

2.1.4.1 WG Chair: Stephanie Mabrey

- a. The meeting was called to order at 10:59 am by Chair Stephanie Mabrey.
- b. The Working Group (WG) was attended by 25 guests. The Working Group (WG) has 29 members and 19 were present so quorum was reached.
- c. A proposed timeline for the conclusion of the standard was presented.

See *Appendix IV* for the S24 Minutes (unapproved) of C57.637 WG Meeting as submitted.

2.1.5 C57.155 – Guide for Interpretation of Gases Generated in Natural and Synthetic Ester Liquid Type Transformers

2.1.5.1 WG Chair: Alan Sbravati

- a. There were 23 of 37 members present during the meeting. There were 46 guests, 16 membership requests. The quorum was achieved.
- b. No patent claim nor copyright issue were presented.
- c. Activities after F23 meeting were presented for all Task Forces.
- d. Chair confirmed almost 10k records were submitted to IEEE SA. An example of the anonymized process was shared.
- e. Process of data collection will be reopened till June/24.
- h. Good progress with the other task force activities.

See *Appendix V* for the S24 Minutes (unapproved) of C57.155 WG Meeting as submitted.

2.1.6 Working Group C57.139 – Guide for the Interpretation of Gases generated in Liquid Type Load Tap Changers

2.1.6.1 WG Chair: Rainer Frotscher

- a. Total: 70, Members: 24, Guests: 46, with 15 requesting membership. Quorum was achieved.
- b. F23 Meeting Minutes - unanimous approval
- c. Essential patent claims: none stated; Copyright requirements were shown.
- d. Task force leaders reported the progress.
- e. Good progress from all task forces.
- f. Chair asked the Task Forces to complete their work before the Fall Meeting 2024, so that a 1st Draft can be compiled until end of this year. This will then be distributed as Straw Ballot for comments by the WG. The official ballot process shall be initiated in Spring 2025
- i. Meeting adjourned 6:00 pm

See *Appendix VI* for the S24 Minutes (unapproved) of C57.139 WG Meeting as submitted.

2.1.7 Working Group C57.130 – Guide for the Use of Dissolved Gas Analysis Applied to Factory Temperature Rise Tests for the Evaluation of Mineral Oil-Immersed Transformers and Reactors

2.1.7.1 WG Chair: Bruce Forsyth

- a. Quorum requirement for the meeting was 20 out of 38 members. 17 members were present, so quorum not met.
- b. The agenda and meeting minutes presented to the attendees was not approved as quorum was not met. Prior to the Fall 2024 meeting, the minutes from Fall 2022, Spring 2023, and Fall 2023 meetings will be forwarded to members for approval through email. Minutes will be added to the IEEE C57.130 section on the website and they will be available in the subcommittee meeting minutes.
- c. The scope and purpose were shown in the meeting and the Chair mentioned that the scope and purpose will include esters if data is collected and analyzed by the working group (WG).
- d. WG milestones were presented. Substantive work needs to be completed by Spring 2025 so that the guide can be submitted for ballot in the Fall of 2025. See Appendix VII for the F23 Minutes (unapproved) of C57.130 WG Meeting as submitted.

2.1.8 Task Force – Development of a test method to determine the maximum continuous operating temperature of insulating liquids

2.1.8.1 TF Chair: Ahmed Gamil

- a. Neither the chair nor the secretary attended the meeting.
- b. Due to the absence of volunteers to assume the position of chair, the task force was disbanded.

See *Appendix VIII* no minutes were submitted.

3. Old Business

- a. The Task Force to define continuous operating temperatures for insulating liquids was not able to meet again, since neither the chair nor the secretary were able to attend the meeting. Both positions need to be replaced.
A request for volunteers to assume the positions was presented and failed to find a new chair and a new secretary.
A motion to disband the TF was presented by Bruce Forsyth and second by Scott Reed. The motion passed.
A second motion was presented by Bruce Forsyth to form a Study Group to confirm the interest in the work and define a title, scope and purpose. Motion failed.
Ed Casserly makes a motion to form a SG to write a paper summarizing the work that was made. Second by Brian Sparling. Motion failed.

4. New Business

- a. No new business.

5. Next IFSC Meeting:

Oct 27th, 2024 – St Louis, MO

6. Adjournment

The meeting was adjourned at 4:17 p.m.

Respectively Submitted, Alan Sbravati, Secretary IFSC

Unapproved Minutes from the F23 IFSC WG and TF meetings

Appendix I

Working Group C57.146 IEEE Guide for DGA in Silicone

Monday, March 11, 2024

11:00 AM to 12:15 PM

Hyatt, Regency, Vancouver, BC - Canada

Minutes of Working Group Meeting

Chair: Paul Boman (HSB)

Vice Chair: Lance Lewand (Doble)

Secretary: Tiffany Lucas (Prolec GE - Waukesha)

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

There were 11 of 13 members present during the meeting. There were 17 guests, 0 membership requests.
The quorum was achieved.

S24 Attendance List

Role	First Name	Last Name	Attend 3/11/2024	Request membership
Chair	Paul	Boman	X	
Vice-chair	Lance	Lewand	X	
Secretary	Tiffany	Lucas	X	
Member	Stephanie	Mabrey	X	
Guest *	Zachary	Draper	X	Ask Zach
Member	Florin	Faur	X	
Member	Rainer	Frotscher	X	
Member	Traci	Hopkins	X	
Member	Nick	Perjanik	X	
Member	John	Pruente	X	
Member	Scott	Reed	X	
Guest *	Mauricio	Soto	X	Ask Mauricio
Member	Greg	Steeves	X	
Guest	Randy	Cox	X	

Guest	James	Dukarm	X	
Guest	Todd	Felton	X	
Guest	Miguel	Fernandez	X	
Guest	Nathan	Jacob	X	
Guest	Mathieu	Lachance	X	
Guest	Donald	Lamontagne	X	
Guest	Weijun	Li	X	
Guest	Cesar	Lizcano	X	
Guest	Emma	Murowinski	X	
Guest	Marilia	Ribeiro	X	
Guest	Jonathan	Sinclair	X	
Guest	Brian	Sparling	X	
Guest	Marko	Teofanovic	X	
Guest	Patrycja	Jarosz	X	

Note to ask Zach Draper and Mauricio Soto if they would like to become members due to attendance.

1. Agenda for approval
 - Welcome
 - Approval of Agenda
 - Membership / Quorum
 - Call for Patent Claims / IEEE SA Copyright Policy
 - Approval of Meeting Minutes F23
 - PAR Extension Discussion

- Review Draft 1Guide
 - New Business Straw Ballot
 - Adjourn Meeting
2. Chair posted the Patent Claim. No claims were made.
 3. Chair presented the copyright policy slides.
 4. The agenda of the meeting was presented by the chair.
 5. Agenda for Spring 2024 was approved unanimously with no objections.
 6. Fall 2023 Minutes was approved, motion: Scott Reed with 2nd by Traci Hopkins
 7. Chair proposed PAR extension for 2 years. Concerns voiced that there isn't time for a straw ballot and balloting before the PAR would expire. Straw ballot (initial ballot) before MEC review is within the WG. Approval from the SC would be to move forward with formal balloting and resolution committees related to balloting.
 - a. 11 in favor of PAR extension, 0 against, and 0 abstain. PAR extension will be requested from SC
 8. Issues raised by another WG brought up relating to the flow diagram in the standard. Discussions around appropriate wording of flow diagram related to over flagging and over testing units with a baseline that is over first criteria. Language on flow diagram will be addressed with corrected language and circulated for comments.
 9. Continued discussion on normal distribution and confidence intervals. Alternatives to calculating confidence intervals with non-normal distributions was debated.
 10. Further review of online DGA monitoring needed and requested.
 11. Potential patent claim brought up in relation to a figure, but the figure had been removed based on comments so the patent claim should not be an issue.
 12. A request was made for the WG to review the latest draft and get all comments to chair for straw balloting.
 - a. Unanimous approval of staw ballot of PC57.146, 11 approve, 0 objections, 0 abstentions.
 13. New Business/Other Items for Discussion: No new business.
 14. Next meeting at Fall 2024, St Louis, Missouri, USA
 15. The meeting was adjourned at 12:15 with unanimous approval

Tiffany Lucas, Secretary
Paul Boman, Chair
Lance Lewand, Vice-Chair

Appendix II

Working Group for Acceptance and Maintenance of Insulating Liquids PC57.166

No meeting minutes.

Appendix III

Task Force PAR Study Group for C57.104 Interpretation of Gas Generated in Mineral Oil Immersed Transformers Vancouver, BC – Mar 12th, 2024

**Tuesday, March 12th, 2024
13:45 – 15:00, Vancouver, BC
Minutes of Task Force Meeting**

Chairman: Ed teNyenhuis
Vice Chair: Luiz Cheim
Secretary: Sami Debass

The meeting was called to order at 13:48 by the Chair.

There were 105 persons in attendance (see list below). There were 65 persons initially requesting membership, 29 guests, 10 with no comment and 1 person later requested membership which was granted. Since this was the first meeting, quorum was reached.

16. Attendance list:

Last Name	First Name	Role
teNyenhuis	Ed	Member
Luiz	Cheim	Member
Debass	Sami	Member
Girgis	Ramsis	Member
Verdolin	Rogério	Member
LI	Jinming	Member
Welton	Drew	Member
Mellin	Toni	Member
Fernandez	Miguel	Member
Jarosewski	Marion	Member
Felton	Todd	Member
SOHN	Yong Tue	Member
Mabrey	Stephanie	Member
Hopkins	Traci	Member
Patel	Vinay	Member
Tillery	Tim	Member
Dulac	Hakim	Member
Alonso	Mario	Member
Soto	Mauricio	Member

Gardner	James	Guest*
Gonzalez	Luis	Member
Rossini	Yuri	Member
Gagne	Zach	Guest
Lin	David	Guest
Pedro	Pedro	Guest
Chen	Kezmen	Guest
O'Malley	Anastasia	Guest
Cox	Randy	Member
Cheatham	Mark	Member
Ferreira	Marcus	Member
Soeller	Markus	Guest
Lizcand	Cesar	Guest
Lamontagne	Donald	Member
Lewand	Lance	Member
Casserly	Edward	Member
Delgado	Gabriel	Member
Vanderwalt	Alwyn	Member
Castellanos	Juan	Member
Brodeur	Samuel	Guest
Burk	Griffin	Guest

Holden	Andy	Member
Sinclair	John	Member
Radu	Ion	Member
Smith	Jimmy	Guest
Espindola	Marco	Member
Saad	Mickel	Member
Baser	Levent	Guest
Mbouombouo	Mama	Guest
Panesar	Parminder	Member
Hernandez	Giovanni	Member
Newbill	Mark	Member
Gorzin	Alireza	Member
Hernandez-Mejia	Jean Carlos	Guest
Reeder	Perry	Guest
Lucas	Tiffany	Guest
Garcia	Miguel	Member
Hernandez	Ronald	Guest
Thompson	Ryan	Member
Tanaka	Troy	Member
Murray	David	Member
Klempner	Dmitriy	Member
Plisic	Goran	Guest
Faur	Florin	Member
Van Dreel	Cole	Member
Prliente	John	Member
Frotscher	Rainer	Guest
Chambers	Stuart	Member
Duffy	Jesse	Member
Jonas	Ryan	Guest
Jarosz	Patrycja	Guest
Gyore	Attila	Guest
Malde	Jinesh	Guest
Rezvan	Arash	Member

Weyer	Daniel	Member
Xu	Shuzhen	Member
Raymond	Tim	Member
Forsyth	Bruce	Member
Reed	Scott	Member
Sparling	Brian	Member
Li	Weijun	Member
Staley	Brad	Member
Emilio	Morales - Cruz	Member
Loiselle	Luc	Member
John	John	Member
Woods	Deanna	Member
Steeves	Greg	Member
Nims	Joe	Guest
Brett	John	Guest
Doyle	Lee	Member
Draper	Zachary	Member
Dukarm	James	Member
Schmitt	Wolfgang	Guest
Jakob	Karl	Guest
Gara	Lorne	Guest
Reimer	Jonathan	Guest
Vir	Dharam	Member
Teofanovic	Marko	Guest
Murowinski	Emma	Member
Chu	Matt	Guest
Hamoir	Didier	Guest
Dillon	Nikolaus	Guest
Vu	Nguyen	Guest
Pacas	Joel	Guest
Zuiderveen	Thomas	Guest
Perjanik	Nick	Guest

- The task force met Mar 12, 2024 at 13.45 in the Regency C/D (3) room at the Vancouver Hyatt Regency Hotel. This was the first meeting of the task force PAR study group. The guide was published in 2019 and expires in 2029.

- The Chair, Ed teNyenhuis, led the meeting. The Chair introduced the Vice-Chair, Luis Cheim, and the Secretary, Sami Debass who recorded the attendance and meeting minutes.
- There were 105 persons in attendance (see list below). There were 65 persons initially requesting membership, 29 guests, 10 with no comment and 1 person later requested membership which was granted. Since this was the first meeting, quorum was reached.
- The Meeting Agenda was reviewed. A motion to approve the agenda was made by Scott Reed and seconded by Donald Lamontagne. The agenda was unanimously approved.
- Title was discussed and suggestion for comment was initiated. There was no comment or suggested changes from the attendees.
- The scope was discussed -
 - There was a comment by Donald Lamontagne to remove the word “combustible.”
 - A suggestion was made for (a) to include “Dissolved Gasses formation in a transformer from the insulation material.”
 - Mike Saad suggested to state the “Dissolved Gas Analysis” in (b).
 - Scott Reed proposed to remove Roger’s ratios from (b). Mike Saad seconded the motion made by Scott Reed. Hakim Dulac made a comment about the scope paragraph to stop at the diagnostic technologies. The statement was then amended by Scott to state “various diagnostic technique.” The motion passed.
- The purpose was discussed -
 - Bruce Forsyth made a motion to change “gasses” to “gas” and to add “in-service”. The motion was seconded by Lance Lewand. The motion passed.
- Luis Cheim commented that online DGA was not covered in the 2019 revision of the guide.
 - There is no information in the guide that explains how to calculate the DGA trend.
 - “We do not have any information that correlate here in this guide.”
 - Luis Cheim suggested to collect online data from the end users as well as the various oil analysis laboratories.
 - Is there any international data from CIGRE?
 - There needs to be an assessment between offline and online DGA data.
- Jim Dukarm asked – should this working group be doing research?
 - Shouldn’t this be developed outside the working group?
 - If we do is done outside the working group, then that would elevate data collection research and interpretation of the data.
 - Luis Cheim commented - If we separate the collection and interpretation of the data out of this working group to do the statistical analysis, then that would create deviation.

- Donald Lamontagne asked – how is the data utilized?
 - What to do with the data not the interpretation?
 - How do you analyze these data, there are over millions of data. It is a monumental task to manage this data.
- Brian Sparling made a statement – there are over 55 DGA analyzers in the market and these analyzers vary from one to another (3, 5 or 8 gas). This would be immense task.
 - Luis Cheim stated that gas analyses from 3, 4, 5 or more gas type monitors are available.
- Luis Cheim made a reference to the IEC table 3 and followed with a question where did they come from? There were 4 utilities who donated the DGA data...
 - IEC and CIGRE have these DGA data, but what do we have in IEEE?
 - What is their sampling rate? We do not have any guideline in this regard.
- Mike Saad asked what the standard/guide includes in terms for solar or hydro transformers?
- Gabriel Delgado stated there are brochures that have some information on the Solar/Hydro transformers. He recommends the working group review brochures.
 - Gabriel Delgado has also suggested that the study group can do the trend analysis to keep the online and offline analysis data referencing the brochures. However, how to handle the online data is going to be a challenging task.
 - Lance Lewand made a statement for consideration to perhaps to develop a second document separate from this guide that provide information as to how to evaluate the specific assessment.
 - Stuart Chamers suggested including this in the Appendix, but we need this guidance.
- Juan Castellanos brought up a separate discussion on the section “b” and “f” to state as following:
 - “B” Interpretation
 - “F” Evaluation of the DGA data
- Luiz Cheim made a statement “We moved away from the discussion of condition of the transformer. This discussion is not about the condition of the transformer. Rather it is about the DGA.”
- Lance Leward asked whether the guide include reactors. Donald Lamontagne stated the original guide started out with reactors. Why was it dropped?
- Bruce Forsyth asked whether the appropriate term is “oil immersed”, or “oil filled”?
 - The Chair responded both terms are acceptable.
- Traci Hopkins suggested to add “in-service” transformers to the scope.
- Mickel Saad suggested to keep the scope as developed during the meeting.

- Jim Dukarm made a motion to accept the scope as was presently edited.
- Scott Reed seconded the motion.
- There was no objection to the motion.
- Motion passed (see final version below)

- Bruce Forsyth asked the Chair if he was going to make a motion to submit the PAR to NESCOM during the subcommittee meeting on Wednesday.
 - The Chair responded with “yes”

- There was one comment from an attendee not clearly identified who had several comments about some mistakes on the guide.
 - Update must be made to the Duval triangle T2 & T3
 - Pentagon 2 and 3 must be revised to include the latest versions.
 - Additional wording change to the online monitoring section of the guide.

- Ramsis Girgis asked a question - Has the generation of Hydrogen and Methane ratio been revised in C57-104 2019 guide as C57-1200 reference the potential for gas generation due to thin film heating of the oil between core laminations? He made a remark that it was not added to the guide.

- Mike Saad commented – Formal IEEE guidance for online gas monitoring is needed and it should be considered either to be added on this guide or to a new guide.

- Stephene Mabrey commented – we would like to have a discussion on the flowchart status 3 key gasses are high and that she is being challenged by her customers.
 - Mike Saad has also suggested to revise the status of three case studies.

- Rainer Frotscher suggested to review table 4 of the guide and make the necessary revision for an update.

Near the end of the meeting, the Chair requested if there was any last discussion on the final agreed version of the title, scope, and purpose (see below).

- Jim Dukarm made a motion to accept the title as developed in the meeting which was “IEEE Guide for the Interpretation of Gases Generated in Mineral Oil-Immersed Transformers.”
 - Donald Lamontagne second the motion
 - Motion passed.

- Jim Dukarm made a motion to accept the scope as developed during the meeting and shown below.
 - Scot Reed second the motion
 - Motion passed.

- Jim Dukarm made motion to accept the purpose as developed during the meeting and shown below.

- Donald Lamontagne second the motion
- Motion passed.

- A motion to submit a PAR to NESCOM will be made at the SC meeting by the Chair with the task force approved Title, Scope, and Purpose as written below.
- There was no new business to discuss.
- The meeting was adjourned at 15.00.

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The following title, purpose and scope was approved by the Task Force:

Title = IEEE Guide for the Interpretation of Gases Generated in Mineral Oil-Immersed Transformers is this the title purpose and scope as approved at the end of the meeting?

Scope = This guide applies to in-service mineral oil-immersed transformers and addresses:

- a) The theory of gas generation in a transformer
- b) The interpretation of dissolved gas analysis
- c) Suggested operating procedures
- d) Various diagnostic techniques
- e) Case studies and examples
- f) Evaluation criteria and guidelines
- g) A bibliography of related literature

Purpose = The purpose of this document is to provide a guide for evaluating dissolved gas analysis results from in-service mineral oil-immersed transformers

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Appendix IV

Working Group C57.637 Guide for the Reclamation of Mineral Insulating Oil and Criteria for Its Use

**Tuesday March 12, 2024
11:00 AM – 12:15 PM
Vancouver, BC – Canada**

Minutes of Working Group Meeting

The meeting was called to order at 10:58 am by Chair Stephanie Mabrey.

Attendees & Members:

The meeting was attended by 25 guests.

The Working Group (WG) has 29 members and 19 were present so quorum was reached.

- | | | |
|----------------------|----------------------|-----------------------|
| 1. Kevin Biggie | 8. Rainer Frotscher | 15. Mickel Saad |
| 2. Jeremiah Bradshaw | 9. Andy Holden | 16. Jonathan Sinclair |
| 3. Ed Casserly | 10. Ismail Gunar | 17. Greg Steeves |
| 4. Stuart Chambers | 11. Lance Lewand | 18. Ed teNyenhuis |
| 5. Jesse Duffy | 12. Stephanie Mabrey | 19. Deanna Woods |
| 6. Todd Felton | 13. Jinesh Malde | |
| 7. Marc Foata | 14. Scott Reed | |

Chair's Remarks:

Chairwoman Mabrey (SM) made officer introductions. The Chair then reviewed with the Task Force (TF) the IEEE's copyright policy and a call for patents, of which no comments were made.

Quorum:

Quorum was confirmed by Secretary Andy Holden (AH). 19 members were present.

Approval of Minutes:

A motion to approve the Fall 2023 minutes by unanimous consent was made by Lance Lewand and it was seconded by Stuart Chambers. The motion carried with no objections or abstentions.

Approval of Agenda:

A motion to approve the meeting agenda by unanimous consent was made by Ed Casserly and it was seconded by Lance Lewand. The motion carried with no objections or abstentions.

Agenda

- 1) Introduction
- 2) Review Call for Patents

- 3) Review Copyright IEEE SA Notification
- 4) Obtain Quorum
- 5) Approval of prior minutes
- 6) Present proposed next steps & timeline
- 7) Conclude

Approval of Ballot Resolution Committee:

A motion to provide the Ballot Resolution Committee (BRC) with authority to make changes to the draft document without requiring approval from the general working group was made by Jeremiah Bradshaw and it was seconded by Deanne Woods. The motion carried with no objections or abstentions.

The BRC is tasked with returning a draft document to the general working group before the Fall 2024 meeting. The intent is to pass that document to the Insulating Fluids subcommittee after the Fall 2024 meeting.

Ballot Resolution Committee Membership:

- 1) Stephanie Mabrey (Chair)
- 2) Scott Reed (Vice-Chair)
- 3) Andy Holden (Secretary)
- 4) Jeremiah Bradshaw (editor)
- 5) Mike Bonn
- 6) Ed Casserly
- 7) Stuart Chambers
- 8) Jinesh Malde
- 9) Jonathan Sinclair
- 10) Ed teNyenhuis
- 11) Deanna Woods
- 12) Gabriel Zamora

Proposed Next Steps & Timeline:

SM shared this timeline with the general working group.

- **Spring 2024**
 - Initial Ballot resolution Committee meeting
 - Continued virtual meetings
- **Fall 2024**
 - Present DRAFT document for ballot
 - Bring to subcommittee for ballot
 - MEC Review / Ballot Group
- **Spring 2025**
 - Ballot Resolution / Recirculation

Conclusion:

The meeting was concluded at 11:11pm by SM.

Appendix V

Working Group C57.155 – Guide for Interpretation of Gases Generated in Natural Ester and Synthetic Ester-Immersed Transformers

**Monday, March 11, 2024
09:30 – 10:45, Vancouver, BC, Canada
Minutes of Working Group Meeting**

Chairman: Alan Sbravati
Vice Chair: Lance Lewand
Secretary: Attila Gyore

The meeting was called to order at 09:30 by the Chair.

There were 23 of 37 members present during the meeting. There were 46 guests, 16 membership requests.
The quorum was achieved.

17. Attendance list:

1	Levent	Baser	Guest
2	Paulo	Bautista	Guest
3	Paul	Boman	Member
4	Jeremiah	Bradshaw	Member
5	Griffin	Burk	Guest
6	Edward	Casserly	Member
7	Oscar	Castanon Barragan	Guest
8	Jonathan Mark	Ceatham*	Guest
9	Stuart	Chambers	Member
10	Luiz	Cheim	Member
11	Anthony	Coker	Guest
12	Randy	Cox	Guest
13	Pouneh	Davoudi	Guest
14	Bryan	Deb	Guest
15	Lee	Doyle	Guest
16	Zack	Draper	Member
17	James	Dukarm	Member
18	Marco	Espindola	Guest
19	Florin	Faur	Guest
20	Todd	Felton	Member
21	Bruce	Forsyth*	Guest
22	Rainer	Frotscher	Member
23	Miguel	Garcia	Member
24	Alireza	Gorzin*	Guest
25	Bill	Griesacker	Guest
26	Attila	Gyore	Secretary
27	Kevin	Hampton	Guest
28	Florian	Hermann	Guest
29	Traci	Hopkins	Member
30	Miljenko	Hrkac*	Guest
31	Patrycja	Jarosz	IEEE Staff
32	Marion	Jaroszewski	Guest
33	Egon	Kirchenmayer*	Guest

34	Stefan	Lembacher	Guest
35	Lance	Lewand	Vice-Chair
36	Eric	Li	Guest
37	Caser	Lizcano*	Guest
38	Tiffany	Lucas*	Guest
39	Stephanie	Mabrey*	Guest
40	Jinesh	Malde	Member
41	Kumar	Mani*	Guest
42	Mama	Mbouombouo*	Guest
43	Brian	McBride*	Guest
44	Toni	Mellin	Member
45	Stephen	Oakes	Guest
46	Cuauhtemoc	Ortiz	Guest
47	Nick	Perjanik	Member
48	Dominic	Pollaro*	Guest
49	Timothy	Raymond	Member
50	Scott	Reed	Member
51	Arash	Rezvan*	Guest
52	Yuri	Rossini*	Guest
53	Mickel	Saad*	Guest
54	Amitabh	Sarkar	Member
55	Alan	Sbravati	Chair
56	Jonathan	Sinclair	Guest
57	Steven	Small	Guest
58	William	Solano*	Guest
59	Mauricio	Soto	Member
60	Bradley	Staley	Guest
61	Greg	Steeves	Guest
62	Charles	Sweetser	Guest
63	Jonathan	Tan	Guest
64	Marko	Teofanovic	Guest
65	Evanne	Wang	Member
66	Rene	Wind	Guest
67	Deanna	Woods	Member

68	Jeffrey	Wright	Guest
69	Fei	Yang	Guest

*membership requested

18. Agenda for approval

- A. Welcome & Introduction
- B. Attendance and Establishment of Quorum
- C. Call for Patent Disclosure
- D. IEEE Copyright Policy
- E. Approval of Fall 2024 Minutes
- F. Working Group Activities
 - 1. Task Force 1, Statistical Analysis of Database, Annex A
 - 2. Task Force 2, Development of NEI parameters for Ester liquids
 - 3. Task Force 3, Draft of the revised document, PC57.155/D1, Annex G (References)
 - 4. Task Force 4, Reviewing Annexes B-F
 - Collecting case studies
- G. Discussions:
- H. Other Items for Discussion
- I. Adjournment

19. Chair posted the Patent Claim. No claims were made.

20. Chair presented the copyright policy slides.

21. The agenda of the meeting was presented by the chair.

22. Agenda for Spring 2024 was approved, motion: Scott Reed, second: Ed Casserly

23. Fall 2023 Minutes was approved, motion: Ed Casserly, second: Traci Hopkins

24. Discussions on Task Forces' work

- a. TF1 Statistical Analysis of Database, TF Leader: Lance Lewand, Doble
 More than 9900 records were sent. Thank you!
 Sample of anonymization and handling were presented.
 More records needed, submission will be reopened, new records will be accepted by end of June (extra 3 months)
 The data used for the actual standard will be resubmitted by the chair.
 Please send them to c57data@ieee.org, subject: PC57.155 Revision
 IEEE anonymize the data and then forward them back to the working group.
 Chair showed a section of anonymized data and then circulated.
 IEEE will have kept the data for 10 years
- b. TF2 Normalized Energy Index, TF Leader: Alan Sbravati, Hitachi Energy
 NEI works on natural and synthetic esters were presented.
 NEI number would be used if there would not be enough data to create increase of gas values within certain time like Table 3 and 4 in IEEE C57.104.
 We need to differentiate between natural esters based on their base oil
 Alan Sbravati presented Kevin Writz's work on NEI for natural esters
 Attila Gyore presented a though process of Russell Martin where mineral oil parameters were used for synthetic ester records. Conclusion was that any calculated NEI number would give us an indication of any fault only.
- c. TF3 Revision of the Document TF Leader: Stuart Chambers, EPRI International
 The revision of the main text was started, so far ~80 changes
- d. TF4 Reviewing Annexes TF Leader: Jinesh Malde, MIDEL & MIVOLT Fluids
 New structure of Annexes was presented
 New case studies are needed

25. New Business/Other Items for Discussion: No new business.

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

27. The meeting was adjourned at 10:45, on time, motion: Jinesh Malde, second: Stuart Chambers

Attila Gyore, Secretary
Alan Sbravati, Chair

Appendix VI

WG C57.139 – Guide for Interpretation of Gases Generated in Liquid Type Load Tap Changers

**Tuesday, March 12, 2024
4:45 PM to 6:00 PM
Vancouver, BC, Canada**

Chair Rainer Frotscher
Vice Chair John Prunte
Secretary Paul Boman
Meeting: Vancouver, BC, Canada, Tue March 12 2024, 4:45 – 6:00 PM
Attendance record: Total: 70, Members: 24, Guests: 46, with 15 requesting membership.

Attendees list:

First Name	Name	Status/ Membershi p Request
Paul	Boman	Secretary
Elizabeth	Bray	Guest
John	Brett	Guest
Edward	Casserly	Member
Juan	Castellanos	Guest
Randy	Cox	Guest *)
Sami	Debass	Guest *)
Lee	Doyle	Guest
Zachary	Draper	Member
James	Dukarm	Guest
Hakim	Dulac	Guest
Evgenii	Ermakov	Guest *)
Florin	Faur	Member
Zhatan	Fazlic	Guest *)
Todd	Felton	Member
Marcos	Ferreira	Guest *)
Hugo	Flores	Member
Joseph	Foldi	Guest
Rainer	Frotscher	Chair
James	Gardner	Guest *)

Hector	Garza	Guest
Attila	Gyore	Member
Florian	Hermann	Guest
Traci	Hopkins	Guest *)
Nathan	Jacob	Guest *)
Christopher	Johnson	Guest
Yeounsoo	Kim	Guest *)
Matthieu	Lachance	Guest
Angela	Leigl	Guest
Cesar	Lizcano	Guest *)
Luc	Loiselle	Guest
Stephanie	Mabrey	Member
Jinesh	Malde	Guest
Toni	Mellin	Member
Martin	Munoz	Member
Emma	Murowinski	Guest
Ali	Naderian	Guest
Mark	Newbill	Guest *)
Anastasia	O'Malley	Guest
Cuauhtemur	Ortiz	Guest
Parminder	Panesar	Guest
Nick	Perjanik	Member
John	Prunte	Vice-Chair

Tim	Raymond	Guest *)
Scott	Reed	Member
Perry	Reeder	Member
Sebastian	Rehkopf	Member
Jonathan	Reimer	Guest
Mickel	Saad	Member
Alan	Sbravati	Guest
Alfons	Schrammel	Guest
Steve	Shull	Guest
Jonathan	Sinclair	Member
Jimmy	Smith	Guest
William	Solano	Member
Brian	Sparling	Guest *)
Brad	Staley	Guest *)
Janusz	Szczechowski	Guest

Matthew	Sze	Guest
Marko	Teofanovic	Guest
Tim	Tillery	Guest
Cole	Van Dreef	Member
Robert	Vary	Guest
David	Wallach	Guest
Matthew	Webb	Member
Daniel	Weyer	Guest *)
Christopher	Whitten	Member
Deanna	Woods	Member
Jeffrey	Wright	Guest
Joshua	Yun	Member

*) : requesting membership

Agenda

- Welcome
- Membership / Quorum
- Approval of Agenda
- Call for Patent Claims / IEEE SA Copyright Policy
- Approval of Meeting Minutes F23
- Revision of C57.139 – Report of Task Forces TF1 - TF4
- Discussions
- New Business
- Adjourn Meeting

Minutes

- The WG met Tue, Mar 12, 4:45 pm. Chair showed membership list containing 31 members, with an initial count of 22 attending => Quorum was achieved.
- Chair asked for approval of the agenda; motion by Hugo Flores, 2nd by Stephine Mabrey => agenda was unanimously approved.
- Chair asked for Essential Patent Claims => none stated.
- IEEE Copyright Policy was shown.
- Fall 2023 Meeting Minutes: motion to approve by Stephanie Mabrey, 2nd by Marcos Ferreira => No corrections, unanimous approval.
- Task Force Reports:

TF1: LTC DGA Data evaluation (in collaboration with IEEE SA Tools and Data Group) – Zachary Draper

- DGA records for Guide now count 170,000 records, after receiving another 50,000 records from a utility. Another 10,000 records have been directly delivered to IEEE, and are currently anonymized.

- Only 3,000 records show operation counts, which only allow for a general idea on using this parameter in the analysis. Need more for being meaningful.
- Data of 84 documented LTC failures were processed to determine the most effective parameters. The Inter Quartile Range in combination with Annex B methods seems to be indicative to flag LTCs. Respective graphs for selected LTC classes and utilities were shown and explained.
- Performance of the method was confirmed by using ROC curves.
- Data analysis is expected to be finished by end of the year. Various statistical techniques will be applied which go beyond the methods which are currently in the guide.

TF2: Revision of Chapter 1–4 (General Section) – Florin Faur

- Edits on Scope, Purpose, References and Definitions are nearly completed.
- Chapter 4 (Nature, purpose and basis for DGA for LTCs) was significantly extended:
 - several paragraphs with general information moved from Chapters 5 and 6 to Chapter 4;
 - description of tap-changer architectures added;
 - list of gas-generating elements, their typical gas patterns and determining parameters added;
 - influencing factors on gas generation, retention, dissipation edited;
 - influence of stray-gassing added;
 - LTC faults and their fault gas pattern added;
 - section on gas ratios moved to Chapter 5.
- To be checked: “Types of Samples” (shifted from Ch. 6 to Ch. 4) wording should be aligned with C57.104.

TF3: Revision of Chapter 5 (Rules for LTC DGA interpretation) – Deanna Woods

- Classification scheme of LTC types moved from Annex A to main body => now normative;
- Discussion on LTC Classification scheme:
 - 5th letter added to distinguish between “on-tank” and “in-tank models
 - several improvements in wording for more clarity
 - Note to be added with reference to C57.131, where switching principles (reactor, resistor) are explained
- Section on gas ratios integrated from Chapter 4
- Chart “Combustible gases vs. Temperature” added for more clarity
- Table of LTC models and their classification added as new Annex; Discussion:
 - Table is regarded as very useful.
 - Tap-changer manufacturers shall not be mentioned, because they are considered commercial in nature. => column with tap-changer manufacturers will be deleted.
 - Information on OEM is regarded as useful nevertheless and will be made available somewhere else.
- Chapter 5 shows many open topics, a lot of work is to be done => call for experts to strengthen TF3; Nick Perjanik (AVO Diagnostics) and Marcos Ferreira (Quanta Technology) volunteered as additional members of TF3.

TF4: Revision of Chapter 6 (Interpretation of LTC DGA Data) – William Solano

- Purpose of this chapter is to describe how to apply the interpretation methods developed by TF1.
- Scope of chapter 6 was extended to also include recommendations, but should avoid any diagnosis.
- Table with condition codes shall be revised:
 - avoiding a diagnosis (e.g. “weak/strong indication of a fault”)
 - adding a 4th result code “Alarm”, to identify dangerous conditions; recommendation could be: “stop operation / arrange instant maintenance”
- Annex D requires further modification (wording for description of Triangle zones, population example)
- Data to be validated in order to determine triangle’s zones certainty.
- Emma Murowinski (DeltaX Research) volunteered to help and was added as new member of TF4.

- Chair asked the Task Forces to complete their work before the Fall Meeting 2024, so that a 1st Draft can be compiled until end of this year. This will then be distributed as Straw Ballot for comments by the WG. The official ballot process shall be initiated in Spring 2025.
- Meeting was adjourned at 6:00 pm.

Appendix VII

Working Group C57.130 – Guide for the Use of Dissolved Gas Analysis Applied to Factory Temperature Rise Tests for the Evaluation of Mineral Oil-Immersed Transformers and Reactors

**Tuesday, March 21, 2023
8:00 – 9:15 am
Hyatt, Vancouver, BC, Canada
Minutes of Working Group Meeting**

Chair: Bruce Forsyth
Vice Chair/Secretary: Jinesh Malde

Meeting Attendance:

Last Name	First Name	Status
Forsyth	Bruce	Chair
Malde	Jinesh	Vice-Chair
Alonso	Mario	Guest
Baser	Levent	Guest
Beaster	Barry	Guest
Berube	Jean-Noel	Guest
Boettger	William	Member
Bouty	Georges	Guest
Bradshaw	Jeremiah	Guest
Cai	Jim	Guest
Castellanos	Juan	Member
Cho	Eunyoung	Guest
Chu	Matt	Guest
Czernorucki	Marcos	Guest
Debass	Samson	Member
Digby	Scott	Guest
Dillon	Nikolaus	Guest
Dorpmanns	Luc	Guest
Draper	Zachary	Member
Fazlic	Zlatan	Guest
Felton	Todd	Member
Ferreira	Marcos	Guest
Foata	Marc	Guest
Foldi	Joseph	Guest

Last Name	First Name	Status
Gorzin	Ali	Guest
Griesacker	Bill	Guest
Gunge	Zach	Guest
Gyore	Attila	Guest
Hampton	Kevin	Guest
Hermann	Florian	Guest
Hernandez	Ronald	Guest
Hernandez-Mejia	Jean Carlos	Guest
Hollrah	Derek	Guest
Hopkinson	Phil	Guest
Hrkac	Miljenko	Guest
Jarosz	Patrycja	Guest
Jaroszewski	Marion	Guest
Jensen	Nick	Guest
Kennedy	Sheldon	Guest
Kirchenmayer	Egon	Member
Klempner	Dmitriy	Guest
Lamontagne	Donald	Guest
Lembacher	Stefan	Guest
Lewand	Lance	Member
Lizcano	Cesar	Guest
Mabrey	Stephanie	Guest
Mayer	Robert	Guest
Mbouombouo	Mama	Guest

Last Name	First Name	Status
Panesar	Parminder	Guest
Perjanik	Nick	Member
Puente	Pedro	Guest
Reed	Scott	Member
Rezvan	Arash	Guest
Ronchi	Rodrigo	Guest
Sankarakurup	Dinesh	Guest
Sarkar	Amitabh	Member
Sbravati	Alan	Guest
Schmitt	Wolfgang	Guest
schweiger	ewald	Guest
Sohn	Yougtné	Guest
Soto	Mauricio	Guest
Staley	Brad	Member
Thompson	Ryan	Member
Vanderwalt	Alwin	Guest
Vanderwalt	Alwyn	Guest
Verdolin	Rogério	Guest
Vir	Dharam	Member
Weiss	Zachory	Guest
Welton	Drew	Guest
White	Joe	Guest
Wright	Jeffrey	Guest
Yan	Patrick	Guest

Foster	Patrick	Guest
Frotscher	Rainer	Guest
Fu	Yao	Guest
Garcia	Eduardo	Guest
Gilbert	Stephen	Guest
Gonzalez	Luis	Guest

Mcbride	Brian	Guest
Morales-Cruz	Emilio	Member
Murowinski	Emma	Guest
Oakes	Stephen	Guest
Olan	David	Guest
O'Malley	Anastasia	Guest

Yang	Fei	Guest
Yun	Joshua	Member
Zhao	Peter	Guest
Ziomek	Waldemar	Guest

Quorum requirement for the meeting was 20 out of 38 members. 17 members were present, so quorum not met. The membership list was updated prior to the meeting to ensure that members had either attended 2 consecutive meeting of 3 out of 5 meetings. The membership list will be reviewed again.

The Chair requested the attendees to check and update their email to prevent bounce backs from the servers.

The Chair showed the IEEE patent and copyright policies and asked the participants if there are any claims that should be reported regarding these policies. There were no claims brought up by attendees in the meeting.

The agenda and meeting minutes presented to the attendees was not approved as quorum was not met. Prior to the Fall 2024 meeting, the minutes from Fall 2022, Spring 2023, and Fall 2023 meetings will be forwarded to members for approval through email. Minutes will be added to the IEEE C57.130 section on the website and they will be available in the subcommittee meeting minutes.

The scope and purpose were shown in the meeting and the Chair mentioned that the scope and purpose will include esters if data is collected and analyzed by the working group (WG).

WG milestones were presented. Substantive work needs to be completed by Spring 2025 so that the guide can be submitted for ballot in the Fall of 2025.

Participants discussions:

- Lance Lewand (taskforce leader) presented the list of companies and individuals who volunteered to provide data and the volunteers who would analyze the data.
- The Chair mentioned that it is important for the users to provide data on mineral oil and ester liquids, and it will be anonymized by IEEE. The data could be used for current draft revision as well as future revisions of the guide. Only IEEE will hold the data once guide is published.
- Amitabh Sarkar has requested the WG to look at the work being done in IEEE C57.155 to make sure that there is coordination between the guides. The Chair mentioned that that will be part of the review process for the document.
- Peter Zhou asked the attendance whether the limits for DGA in the guide work. The Chair mentioned that there were no comments on the data, so the assumption was that the data was good.
- Dharam Vir mentioned that end users are not requesting DGA for factory acceptance test. He has not seen a specification where limits are requested. Data is mainly for internal analysis.
- Peter Zhou mentioned that there should be relation between rate of rise and absolute limits. Joe Foldi mentioned that utility specs do not have DGA info in there, but rate of rise would be important information.
- Rainer Frotscher said that IEC standard mentions that there are differences in stray gassing behavior of the different types of liquids. That should be in the guide. Furthermore, data should be requested from IEC for the guide. Lance will request data from IEC (IEC use non thermally upgraded Kraft compared to thermally upgraded Kraft so the values may not match).
- The Chair and Secretary will review the guide and update it with new information prior to the next meeting.
- Juan Castellanos volunteered to look at the references section of the guide.

Meeting adjourned at 9:15 am

Respectfully submitted,

Jinesh Malde, Secretary

Date of Submission: April 2nd 2024

Appendix VIII

Task Force – Development of a test method to determine the maximum continuous operating temperature of insulating liquids

Tuesday, Oct 24, 2023

3:15 PM – 4:30 PM

Vancouver, BC - Canada

Minutes of Task Force Meeting

No minutes were prepared.

TF disbanded.