WG C57.169 - WG for Determination of Maximum Winding Temperature Rise in Liquid-Immersed Transformers

12:55 to 2:10 PM (Central Time), October 20, 2020

Unapproved Meeting Minutes

The Working Group for Determination of Maximum Winding Temperature Rise in Liquid-Immersed Transformers met on Tuesday, October 20, 2020. This was the third meeting of this WG. This document will be replacing the existing IEEE Std. 1538 that will be expiring in 2021.

The Chair presented slides regarding 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, so the poll was opened by the PSAV admin to see the membership status in the meeting after the Chair presented the members list. According to the first poll results the quorum wasn't established so it was decided to open another poll later in the meeting.

The meeting continued with the review of the activities since Fall-2019 meeting. Draft D3 and a summary document of previous comments had been circulated for review to the WG participants back in February 2020. The Chair presented the 5 editorial comments that were received from the reviewers after the circulation of the Draft D3 document. All changes/corrections were editorial and were agreed upon by the members of the WG. The Draft D4 of the document has been started to incorporate these comments.

There were two other prior comments that had requested revision of the content. One of them was regarding a conflict in the definition of the maximum eddy loss location in Figures 2a and 2b. The other comment was suggesting some changes in the last paragraph of Section 4.1.3.1 that describes how to specify the number of probes and their locations based on the transformer sizes; large, medium and small. This section was originally adopted from a CIGRE document, however, the figures in this section with the associated paragraph seemed to be confusing and unclear to some other participants too.

Sheldon Kennedy (Niagara Transformers) asked if the document defines large, medium and small size transformers. The Chair responded "yes" and presented the section 4.1.2 of the document that defines each category based on the total maximum leakage flux per phase at rated current.

Sanjay Patel (Royal Smit Transformers) asked if the figures are representing the probe installation in the windings with axial cooling ducts only, referring to windings where there are no radial spacers used and the cooling is achieved with the axial ducts. The Chair responded and confirmed that those types are also covered in the proceeding sections of the document.

Sanjay Patel had another comment about the definition of the “winding with full rating” in the last paragraph (line 6 in Page 6 of D3) of Section 4.1.3.1. He mentioned that the full rating in the sentence is unclear.

Javier Ateaga (Hitachi-ABB) commented about the full rating and referred to the section 4.1.2 that says full rating is the top MVA per phase.

Nitesh Patel (Hyundai Power Transformers, USA) commented about the Figure-2 that shows winding A and winding B. He mentioned that the maximum eddy current is dependent on the winding arrangement so the figure may not be a representation of some type of transformers.

Jean Noel Berube commented about the number of probes shown as dots in Figure 2. He mentioned that the IEC and the CIGRE defines the number of probes as the total number of sensors in 3 phase (For example; 6 probes mean 1 probe per phase per winding) and added that the representation of the probes in the Figure -2 is not clear.

Bruce Forsyth agreed that not only this section but also several other sections are also confusing so suggested the group to spend some time and look at the wording for rephrasing the unclear sections. He also suggested simplifying the section by referencing “one winding” instead of winding A and winding B in the calculations and in the figures.

Oleg Roizman who was a part of the previous working group for IEEE Std 1538 suggested to use the resources and the participant’s knowledge to review and revise the section since the author of the CIGRE document, Hasse Nordman, is now retired and may not be available for discussing about the document.

Jason Varnell (Doble Engineering) said the sections that were adapted from CIGRE Report A2_307_2010 have some important explanatory information missing so the context is incomplete.

As a result of the discussion on the adopted sections from the CIGRE report, the WG agreed to review the original CIGRE document to help with the clarification of the section. Gary Hoffman (Advance Power Technologies) and Jason Varnell volunteered to review the CIGRE document to see what type of contextual information is missing that could add more clarity on the adopted sections. They agreed to target providing their feedback by early in January 2021.

The Chair presented the incomplete format of the ANNEX-D document that was rewritten by Jean Noel Berube with the content that describes more modern probe insertion techniques such as anchoring disc method.

Gary Hoffman commented that the content is capturing only one of the several different probe installation methods.

Jean Noel Berube responded that he will need supplementary documents such as pictures and sketches for different types of probe installation and fiber routing to capture different types of installation methods in the Annex-D. Gary Hoffman and Gilles Bargone (Fiso Technologies) accepted to send some materials, pictures to support the section.

Gilles Bargone mentioned that the disk installation should be the method that we need to promote because of it is advantage of less probe damages during installation.

Jean Noel Berube asked if we should be covering shell type transformers.

ANNEX-D will be circulated among the participants for further review and feedback, so the volunteers agreed to target finalizing the revision of the ANNEX-D by early January and submit the final document to the Chair for circulation.

The quorum was established with 20 of the 40 WG members' presence towards the end of the meeting. Chair asked for any opposition to the approval of the minutes of the last meeting. No opposition was heard so the minutes were approved.

The participation report that was provided by the PSAV system after the meeting was the incorrect list that belongs to another working group. Therefore, the membership poll results were used for the Fall 2020 meeting, C57.169 WG participant list.

According to the second poll results, 86 participants were present in the meeting. The meeting attendance list is included at the end of this report.

11 participants requested membership. Based on their attendance in two consecutive meetings, 7 participants became the new members of the Working Group.

Guests Requested Membership in Fall-2020 meeting			
	First Name	**Last Name**	**Affiliation**
1	Onome	Avanoma	Transformer Consulting Services Inc.
2	Hugo	Avila	Hitachi ABB Power Grids
3	Jean-Noel	Berube	Rugged Monitoring Inc.
4	Norman	Field	Teshmont Consultants LP
5	Stacey	Kessler	Basin Electric Power Cooperative
6	Yaquan (Bill)	Li	BC Hydro
7	Nitesh	Patel	Hyundai Power Transformers USA
8	Brad	Staley	Salt River Project
9	Hugh	Waldrop	Memphis Light, Gas & Water
10	Matthew	Webb	SPX Transformer Solutions, Inc.
11	William	Whitehead	Siemens Energy

New Members (Fall 2020)			
	First Name	**Last Name**	**Affiliation**
1	Jean-Noel	Berube	Rugged Monitoring Inc.
2	Eric	Davis	Burns & McDonnell
3	Anatoliy	Mudryk	Camlin Power
4	Afshin	Rezaei-Zare	York University
5	Brad	Staley	Salt River Project
6	Pragnesh	Vyas	Sunbelt-Solomon Solutions
7	Matthew	Webb	SPX Transformer Solutions, Inc.

Draft D4 will be circulated once the comments regarding the CIGRE Section review and the ANNEX-D revision are received.

No new businesses were requested at the end of the meeting and the meeting adjourned at 2:05pm (CT).

The next meeting will be during the Spring-2021 Transformers Committee meeting currently scheduled for April 25-29, 2021 in Toronto, Canada.

WG C57.169 – WG Participants List, Virtual, Fall 2020 Meeting			
Role	**First Name**	**Last Name**	**Affiliation**
Member	Javier	Arteaga	ABB Enterprise Software Inc
Member	Suresh	Babanna	SPX Transformer Solutions, Inc.
Member	Gilles	Bargone	FISO Technologies Inc.
Member	Juan	Castellanos	Prolec GE
Chair	Scott	Digby	Duke Energy
Member	Hakim	Dulac	Qualitrol Company LLC
Member	Bruce	Forsyth	Bruce Forsyth and Associates LLC
Member	Sheldon	Kennedy	Niagara Transformer
Member	Egon	Kirchenmayer	Siemens Energy
Member	Matthew	McFadden	Oncor Electric Delivery
Member	Emilio	Morales-Cruz	Qualitrol Company LLC
Member	Martin	Munoz Molina	Orto de Mexico
Member	Ryan	Musgrove	Oklahoma Gas & Electric
Member	Oleg	Roizman	IntellPower Pty Ltd
Member	Dinesh	Sankarakurup	Duke Energy
Member	Steven	Schappell	SPX Transformer Solutions, Inc.
Secretary	Cihangir	Sen	Duke Energy
Member	Jason	Varnell	Doble Engineering Co.
Member	Sukhdev	Walia	New Energy Power Co.

Member	Mana	Yazdani	Trench Limited
Guest	Mubarak	Abbas	Siemens Industry
Guest	Kayland	Adams	SPX Transformer Solutions, Inc.
Guest	Onome	Avanoma	Transformer Consulting Services Inc.
Guest	Hugo	Avila	Hitachi ABB Power Grids
Guest	Darrell	Banks	Memphis Light, Gas & Water
Guest	Jean-Noel	Berube	Rugged Monitoring Inc.
Guest	Ryan	Bishop	Minnesota Power
Guest	Thomas	Blackburn	Gene Blackburn Engineering
Guest	Susan	Bonfiglio	Western Area Power Admin.
Guest	Drazena	Brocilo	Google
Guest	Erich	Buchgeher	Siemens Energy
Guest	Jaroslaw	Chorzepa	ABB Inc.
Guest	Domenico	Corsi	Doble Engineering Co.
Guest	Eric	Davis	Burns & McDonnell
Guest	Huan	Dinh	Hitachi ABB Power Grids
Guest	Samragni	Dutta Roy	Siemens Energy
Guest	Evgenii	Ermakov	Hitachi ABB Power Grids
Guest	Marco	Espindola	ABB Enterprise Software Inc.
Guest	Norman	Field	Teshmont Consultants LP
Guest	Curtiss	Frazier	Ameren
Guest	Ali	Ghafourian	H-J Enterprises, Inc.
Guest	Thang	Hochanh	Surplec Inc.
Guest	Saramma	Hoffman	PPL Electric Utilities
Guest	James	Holt	Memphis Light, Gas & Water
Guest	Paul	Jarman	University of Manchester
Guest	Ryan	Jonak	Portland General Electric
Guest	Laszlo	Kadar	Hatch
Guest	Stacey	Kessler	Basin Electric Power Cooperative
Guest	Dmitriy	Klempner	Southern California Edison
Guest	Yaquan (Bill)	Li	BC Hydro
Guest	Darrell	Mangubat	Siemens Power Operations Inc.
Guest	Ross	McTaggart	Trench Limited
Guest	Anatoliy	Mudryk	Camlin Power
Guest	Shankar	Nambi	Bechtel
Guest	Nitesh	Patel	Hyundai Power Transformers USA
Guest	Sanjay	Patel	Royal Smit Transformers
Guest	Vinay	Patel	Consolidated Edison Co. of NY
Guest	Jarrod	Prince	ERMCO
Guest	Shiva	Rampersad	Dow Chemical Company
Guest	John	Reagan	Oncor Electric Delivery
Guest	Jonathan	Reimer	FortisBC
Guest	Afshin	Rezaei-Zare	York University

Guest	Tim	Rocque	SPX Transformer Solutions, Inc.
Guest	Roderick	Sauls	Southern Company Services
Guest	Anil	Sawant	Virginia Transformer Corp.
Guest	Samuel	Sharpless	Rimkus Consulting Group
Guest	Adrian	Silgardo	IFD Corporation
Guest	Brad	Staley	Salt River Project
Guest	Eric	Theisen	Metglas, Inc.
Guest	Timothy	Tillery	Howard Industries
Guest	Jacques	Vanier	Electro Composites (2008) ULC
Guest	Jos	Veens	SMIT Transformatoren B.V.
Guest	Yves	Vermette	Electro Composites ULC
Guest	Richard	vonGemmingen	Dominion Energy
Guest	Pragnesh	Vyas	Sunbelt-Solomon Solutions
Guest	Dieter	Wagner	Hydro One
Guest	Hugh	Waldrop	Memphis Light, Gas & Water
Guest	May	Wang	BC Hydro
Guest	Michael	Warntjes	American Transmission Co.
Guest	Alan	Washburn	Burns & McDonnell
Guest	Bruce	Webb	Knoxville Utilities Board
Guest	Matthew	Webb	SPX Transformer Solutions, Inc.
Guest	Zachery	Weiss	WEG Transformers USA Inc.
Guest	William	Whitehead	Siemens Energy
Guest	Trenton	Williams	Advanced Power Technologies
Guest	Malia	Zaman	IEEE

Respectfully submitted,

Scott Digby – Chair

Cihangir John Sen – Secretary