

Working Group PC57.91 Loading Guide Meeting Minutes

December 8, 2021, 10:00 AM – 11:30 AM (EST)

Virtual Webex Meeting

1. The Chair made the opening remarks including introduction of officers.
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. The previously shared agenda was presented. In the absence of objection, the agenda was approved by consensus.
5. The WG membership list was shown, followed by a quorum poll. The meeting had a quorate group with 32 members present out of membership of 60, with 42 guests attending.
6. Technical Topic Discussion
 - a. Annex A -The latest draft of Annex A was shared prior to the Fall 2021 meeting. The hope is to get the Annex A draft stable and place it in the document to hold as we finish updates to other parts of the Guide. We received comments from three individuals so far. Most comments have been editorial.
 - i. Density of the liquid – kg/m^3 needs to be defined.
 - ii. C57.162 has plans to address bubble evolution as discussed at prior meetings. We cannot take credit for C57.162 content until it is published. We will need to continue to carry Annex A content for now with expectation that C57.162 will carry more in-depth review of the topic when published. We may be able to adjust how C57.91 and C57.162 work together assuming one heads for ballot ahead of the other in the next six months.
 - iii. Why the changes to Annex A? We won't review again at this meeting as we have covered the reasons at the Fall 2020 WG meeting with content posted on the Transformers Committee website.
 - iv. We will incorporate the latest comments in the Annex A and recirculate to the Working Group one more time then place the draft Annex A into the main document before the Spring 2022 meeting.
 - b. Thermal Model
 - i. We discussed placing the latest material discussing revision of Clause 7 and Annex G. Presentations were made at the last meeting but there was little time for feedback.
 - ii. Definitions – definitions should come early and should be a targeted discussion. Oleg is proposing changes to critical definitions that have not been included in the past. Four pages of definitions have been drafted and suggesting additional review before sending to C57.12.80.
 - iii. The definition of 'hotspot' was not previously defined. The terms of hotspot and hottest spot usage is inconsistent. Oleg proposes hotspot is the hottest spot temperature of the winding whereas it was discussed that hottest spot is the location of the hot spot. Oleg is defining it as a temperature. Multiple meeting attendees suggested that it is the location and the hotspot temperature is the temperature at that location. Attendees suggested changing 'hotspot' to 'hotspot temperature' using the definition that Oleg had proposed. C57.12.80-2010 already has definitions for hottest spot and hottest spot

temperature rise. The suggestion was made to use the definitions in C57.12.80 or suggest corrections if they need updated. Some of the definitions Oleg collected are from C57.12.80. We need to review again the hotspot definitions in C57.12.80 which says it sometimes is the temperature at a location but is stated as not recommended for use. Most of the community may use hotspot but as slang. The discussion continued that there are related definitions already defined in C57.12.80 but hottest spot is not defined. Oleg's point is we need to choose terms then be consistent with usage. Bruce suggested we could continue to work on definitions then, as needed, send to C57.12.80 when developed for consideration. Bruce suggested a TF to work on definitions. We can circulate the definitions after the TF has time to work on them. Bruce made a motion and was seconded by Jeff Wright to "form a TF to review the definition of hotspot and hottest spot and related terms and make recommendations to send to WG C57.12.80" to form a definition. The motion passed without opposition. Those who volunteered included: Oleg Roizman, Bruce Forsyth, Jeffrey Wright, Ryan Musgrove.

- iv. Oleg also suggested the definitions that also need work is 'overload', 'relative aging rate', and 'remaining useful life (RUL) of a transformer.'
- v. We have the presentation from the Fall 2020 meeting that has been posted on the WG website. We have not received comments. We have not yet circulated draft Clause 7 text. We need input from working group members. The chair brought up that as a user, the concern may be any impact to existing ratings. We are fixing errors in the first place. We need to discuss how fixing these errors could impact ratings. Doing nothing should not be an option in Oleg's opinion. There was no objection to fixing the Clause 7 equation errors when discussed at the Fall 2021 (F21) meeting. The impact to ratings was shown in the heat maps shown in the F21 meeting. We need input if these comparisons need more discussion. We also need to discuss how to deal with the extra parameters such as stray losses.
- vi. Jason Varnell inquired if we have a comparison of Clause 7-2011 to Clause 7 corrected. Tim Raymond shared that in 2003 there was consideration to update Clause 7 and calculations were done to fix Clause 7 equations to be based on temperatures and not temperature rises plus change in resistance and fluid viscosity. He added that as long we were not talking about directed forced oil, there were minimal impacts to resulting ratings. There were bigger changes with durations of <4 hours when Annex G came into play.
- vii. Jason Varnell submitted an email after the F21 meeting was calling into question the Annex G calculations looking at the elevated temperatures adjacent to the hot spot in the winding due to the local duct temperatures and if this was dependent on a certain technology? Do we need a level of conservatism if there are differences by manufacturers? Tim Raymond commented that the problem with the Clause 7 method is it is less conservative for a rapidly rising duct temperature. Annex G attempted to correct this shortcoming. If we continue as-is, we will run into trouble underestimating short term contingencies. Oleg was planning to respond to Jason's questions. The focus of Jason's email was 1) is there a justification to upgrade Clause 7? Yes, Annex G has been around since 1991 and the complaint then was it was 'too complex' which we hope to address with this revision. 2) The old Clause 7 was over simplified and was incorrect. Oleg pointed out there has not been much contribution on this topic from

transformer manufacturers.

- viii. Plans are for the definition task force to work on the definitions and circulate.
- ix. Joshua Gay, IEEE Staff, shared a few slides from a presentation that he can share. He reviewed what open source is. IEEE SA Open is available for open source projects that provides a platform and support. IEEE SA has a getting started guide. There are projects that have already used this platform. We can reference open source and either normative or informative. Undated normative references are possible. A request must be submitted to get the process started. If we think we will use open source, we should designate a lead and submit the request if we decide to use open source. It is a convenient way to deliver code to the community. There is no cost to use this platform for us. How do we maintain code if we don't have a PAR? The Transformers Committee would provide a lead to act as a point of contact. The latest P&P has policy to allow this and can be incorporated next time we update our P&P. Does the code have to be balloted with the document? Yes, it gets submitted as part of the myProject information for the ballot. The document PAR does not have to be updated to include open source – the open source request covers that. Joshua Gay will schedule a meeting with us to review the Open Source request.
- x. Action items: Annex A will be recirculated. The definition TF will do their work. We will circulate more information on the model.

7. The meeting was adjourned at 11:30 AM EST.

Zero attendees requested membership at this meeting.

Chair: David Wallach

Vice-Chair: Javier Arteaga

Secretary: Kumar Mani

Attendance:

Role	First Name	Last Name ↑	Affiliation
Guest	Kayland	Adams	SPX Transformer Solutions, Inc.
Vice-Chair	Javier	Arteaga	Hitachi Energy
Guest	Suresh	Babanna	SPX Transformer Solutions, Inc.
Member	Gilles	Bargone	FISO Technologies Inc.
Guest	Jared	Bates	Oncor Electric Delivery
Guest	Claude	Beauchemin	TJH2b Analytical Services
Member	Wallace	Binder	WBBinder Consultant
Member	Daniel	Blaydon	Baltimore Gas & Electric
Member	David	Calitz	Siemens Energy
Guest	Scott	Digby	Duke Energy
Member	Huan	Dinh	Hitachi Energy
Member	Eric	Doak	D4EnergySolutions LLC
Guest	Don	Dorris	Nashville Electric Service
Member	Zachary	Draper	Delta-X Research Inc.

Role	First Name	Last Name ↑	Affiliation
Guest	Marco	Espindola	Hitachi Energy
Guest	Hugo	Flores	Hitachi Energy
Member	Bruce	Forsyth	Bruce Forsyth and Associates PLLC
Member	George	Frimpong	Hitachi Energy
Member	Eduardo	Garcia Wild	Siemens Energy
Guest	James	Graham	Weidmann Electrical Technology
Guest	Bridget	Havens	Ameren
Member	Roger	Hayes	General Electric
Member	Saramma	Hoffman	PPL Electric Utilities
Guest	Philip	Hopkinson	HVOLT Inc.
Member	John	John	Virginia Transformer Corp.
Guest	Laszlo	Kadar	Hatch
Member	Stacey	Kessler	TC Energy
Guest	Gary	King	Howard Industries
Member	Egon	Kirchenmayer	Siemens Energy
Guest	Dmitriy	Klempner	Southern California Edison
Guest	Donald	Lamontagne	Arizona Public Service Co.
Member	Weijun	Li	Braintree Electric Light Dept.
Member	Mario	Locarno	Doble Engineering Co.
Guest	Tiffany	Lucas, P.E.	SPX Transformer Solutions, Inc.
Guest	Tim-Felix	Mai	Siemens Energy
Member	Darrell	Mangubat	Siemens Energy SAE
Secretary	Kumar	Mani	Duke Energy
Guest	Balakrishnan	Mani	Virginia Transformer Corp.
Guest	Richard	Marek	Retired
Member	Terence	Martin	MarVen
Member	Lee	Matthews	Howard Industries
Guest	Rashed	Minhaz	Transformer Consulting Services Inc.
Member	Emilio	Morales-Cruz	Qualitrol Company LLC
Member	Anatoliy	Mudryk	Camlin Power
Guest	Ryan	Musgrove	Oklahoma Gas & Electric
Member	Ali	Naderian	METSCO Energy Solutions Inc.
Guest	Anastasia	O'Malley	Consolidated Edison Co. of NY
Guest	Patrick	Picher	Hydro-Quebec IREQ
Guest	Alvaro	Portillo	Ing. Alvaro Portillo
Guest	Ion	Radu	Hitachi Energy
Member	Timothy	Raymond	Electric Power Research Institute (EPRI)
Guest	John	Reagan	RWE Renewables
Guest	Jonathan	Reimer	FortisBC
Member	Oleg	Roizman	IntellPower Pty Ltd
Guest	Dinesh	Sankarakurup	Duke Energy
Guest	Alan	Sbravati	Cargill, Inc.

Role	First Name	Last Name ↑	Affiliation
Guest	Steven	Schappell	SPX Transformer Solutions, Inc.
Guest	Devki	Sharma	Entergy
Guest	Igor	Simonov	Toronto Hydro
Guest	Sanjib	Som	Pennsylvania Transformer
Guest	Fabian	Stacy	Hitachi Energy
Guest	Kyle	Stechschulte	American Electric Power
Guest	Andrew	Steineman	Delta Star Inc.
Guest	Alwyn	Van Der Walt	Electrical Consultants, Inc.
Member	Jason	Varnell	Doble Engineering Co.
Guest	Jos	Veens	SMIT Transformatoren B.V.
Member	Rogério	Verdolin	Verdolin Solutions Inc.
Guest	Yves	Vermette	Electro Composites ULC
Chair	David	Wallach	Duke Energy
Member	Bruce	Webb	Knoxville Utilities Board
Guest	Zachery	Weiss	WEG Transformers USA Inc.
Member	Jeffrey	Wright	Duquesne Light Co.
Guest	Malia	Zaman	IEEE
Guest	Shibao	Zhang	PCORE Electric
Guest	Joshua	Gay	IEEE Staff-Open Source Contact

Draft