ANNEX A Bushings Subcommittee

Vancouver, BC Canada
March 13, 2024, 09:30 AM Central

Chair: Eric Weatherbee, PCORE Electric, Inc. / Hubbell Power Systems
Vice-Chair (presiding officer): Scott Digby, Duke Energy
Secretary: Fabian (Durand) Stacy, Hitachi Energy

A.1 Opening of the Meeting

A.1.1 Call to Order / Chairman's Opening Remarks

The Vice-Chair presented and reviewed the proposed agenda that was circulated to the SC members by the Chair prior to the meeting. There were no comments concerning the proposed agenda.

The Vice-Chair requested that each person use the microphone, state their name and affiliation when addressing the subcommittee.

The Vice-Chair reminded the WG chairs and secretaries that their meeting minutes need to be submitted to the Subcommittee officers no later than 15 days after their WG or TF meetings took place.

A.1.2 Reminders of IEEE policies

The requisite IEEE-SA information concerning the Call for Patents, the Copyright Policy, and the Individual Participation Guidelines had been transmitted to SG Members and Participants along with the meeting agenda prior to this meeting.

A.1.3 New Members

It was reported that 0 new members had been accepted into the Subcommittee.

A.1.4 Attendance

Participant rosters were circulated during the meeting for recording the meeting attendance. The Vice-Chair presented a list of the 71 current voting members to perform a quorum check. Quorum was achieved. Per subsequent review of the rosters the meeting had 127 attendees, of which 50 were members and 77 guests, with 14 guests requesting Membership. Refer to Appendix A for meeting participants, their affiliation, and voting member status.

Table 1 – Meeting Attendance

Total	127
Members – **Quorum Achieved**	50
Guests	77
Guests Requesting Membership*	14

*Review of the historical attendance records indicates that of the 14 guests requesting Membership, 5 meet the eligibility requirements (Gabriel Delgado, Derek Hollrah, Francis Mills, Richard vonGemmingen, Matthew Weisensee) and will be added to the membership roster effective at the next SC meeting.

A.1.5 Agenda Approval

As 50 of the 71 members were in attendance, a quorum was achieved. There were no comments to the proposed agenda. A motion was made by Sebastien Riopel and seconded by Hugo Flores to approve the agenda as proposed. This motion was carried by unanimous consent.

A.1.6 Previous Meeting's Minutes Approval

There were no comments to the minutes that had been posted. A motion was made by Hugo Flores and seconded by Robert Middleton to approve the minutes as posted. This motion carried by unanimous consent.

A.1.7 Status of Bushing Standards

The Vice-Chair presented the Standards Status Report for standards and guides under the Bushing SC, see Appendix B.

A.2 Working Group and Taskforce reports

A.2.1 WG C57.19.00-2023 – Peter Zhao, Chair; VACANT, Vice-Chair; Eric Weatherbee, Secretary

No meeting was held due to the publication of the new revision of the standard last year

A.2.2 WG C57.19.01-2017 – Dr. Shibao Zhang, Chair; VACANT, Vice-Chair;Dominic Pollaro, Secretary

The task force has voted to request permission to submit a PAR to start as a working group. Out of the 32 members, they received 26 votes, all of which were Yes. Chair Shibao Zhang made a motion to move to form a WG, and Hugo Flores seconded the motion with unanimous approval to move to WG. The formation of the WG is dependent on the approval of the PAR that was submitted to NesCom which should be granted before the next meeting.

A.2.3 WG C57.19.02 Distribution Transformer Bushings – Steven Shull, Chair; Ed Smith, Vice-Chair, Rhett Chrysler, Secretary

No meeting due to the status of the publication.

A.2.4 IEC/IEEE 65700-19-03 Bushings for DC Application – Eric Weatherbee (IEEE) and Lars Jonsson (IEC), Co-Chairs; Sami Debass, Vice-Chair; J. Arturo Del Rio, Secretary

See the complete WG minutes in Appendix C of this report.

The WG Secretary reported that WG did not meet. Art Del Rio reported they had a meeting online on December 5-6 from 8:00 to 10:00 AM Eastern time on both days. All of the work for the TF has been completed, and all the comments are resolved. The recommendation is to move to the CDC (comment draft committee) for voting. No additional meetings are scheduled at this time.

A.2.5 WG C57.19.04-2018 – Scott Digby, Chair; Rich vonGemmingen, Vice-Chair; Anthony Natale , Secretary

The TF had 34 attendees, with 23 requesting Membership. The TF had voted, and it was unanimously approved to request the SC approval to submit a PAR. As the acting SC chair, Scott Digby requested that a motion to submit the PAR that had been unanimously approved by the TF for approval. This motion was made by Sebastien Riopel and seconded by Hugo Flores. The motion was unanimously approved.

A.2.6 WG PC57.19.100-2012 – Tommy Spitzer, Chair; VACANT, Vice-Chair; Fabian (Durand) Stacy, Secretary

See complete WG minutes in Appendix D of this report.

The WG had asked for and did receive a PAR extension. We had 43 attendees, 32 guests, and 11 members present, so a quorum was achieved. At the beginning of the meeting, there were 7 open comments outstanding. Of which the group was able to resolve 4 of them during the meeting. The plan is to address the remaining 3 by email with the plan to go to balloting by this fall.

A.3 External Liaison Reports

A.3.1 IEC Bushing Standards Activity – Bruno Mansuy, IEEE/IEC Liaison

Mr. Kurt Kaineder presented. This summary report is included in Appendix E of this report. They are also looking for more volunteers to work on the application guide TC 14. Peter Zhao suggested that we have a liaison from the bushing SC to the IEC activity for the dimensional discussion.

A.3.2 Amendment to IEEE 693, Recommended Practice for the Seismic Design of Substations - Durand Stacy

Mr. Stacy reported that, according to the IEEE 693 working group chair, a complaint had been filed with REVCOM. The current expectation is that the document will be sent back to the WG to resolve this complaint, but at this time, it has not been sent back, so the document is no longer moving forward. It is also not back at the WG. Ryan Musgrove informed the SC that the substation standards committee is seeking the interest of the transformer committee to co-sponsorship this document, and they are encouraging any bushing or transformer manufacturers to become active participants in the WG. Malia Zaman stated it is no longer at REVCOM and it is in the appeals process.

A.4 Unfinished Business

A.4.1 Venting/PD in OIP Bushings during FAT

Ajith Varghese reported that RFLT agreed upon the text displayed, Appendix F, to submit to the DTSC to forward for insertion into the next revision of C57.12.90. Additional details can be found in the minutes of the DTSC meeting minutes.

A.5 New Business

A presentation on Transformer Bushing Seismic Resilience was made by Jon Binder

A.6 Adjournment

A.7 Next Meeting: Fall 2024, St Louis, Missouri – October 27 – 31, 2024

Last Name	First Name	Role	Employer or Affiliations	eMail Address
Abbas	Mubarak	M	Siemens Energy	mubarak.abbas@siemens-energy.com
Adams	Kayland	M	Prolec-GE Waukesha	kayland.adams@prolec.energy
Allison	Rebert	G	Dominion Energy	Robert.L.Allison@Dominionenergy.com
Arnold	Elise	G	SGB	elise.arnold@sgb-smit.group
Avanoma	Onome	M	MJ Consulting	o.avanoma@outlook.com
Beaster	Barry	M	H-J Family of Companies	blbeaster@ieee.org
Betancourt	Enrique	G	Prolec GE	ebetanco@ieee.org
Boettger	William	M	Boettger Transformer Consulting LLC	weboettger@aol.com
Bolar	Sanket	G	Oncor Electric Delivery	sanket.bolar@oncor.com
Carr	Deniss	G	GE Grid Solutions	deniss.carr@ge.com
Castellanos	Juan	M	Prolec GE	juangonzalo.castellanos@prolecge.com
Cruz Valdes	Juan Carlos	M	Prolec GE	juancarlos.cruz@prolecge.com
Debass	Samson (Sami)	M	EPRI	sdebass@epri.com
Del Rio	J. Arturo	M	Siemens Energy	a.delrio@ieee.org
Delgado	Garbriel	G	Invenergy	gdelgado@invenergy.com
Dinh	Huan	M	Hitachi Energy	huan.m.dinh@hitachienergy.com
Doutrelepont	Alexander	G	Siemens Energy	alexander.doutrelepont@hspkoeln.com
Duffy	Jesse	G	Nashville Electric Service	jduffy@nespower.com
Ermakov	Evgenii	M	Hitachi Energy	evgenii.ermakov@hitachienergy.com
Euvrard	Eric	M	RHM International	eric.euvrard@rhmintl.com
Flores	Hugo	M	Hitachi Energy	hafg@dusty.tamiu.edu
Frazier	Raymond	M	Ameren	rfrazier@ameren.com
Fuith	Justin	G	Pro-Tech Power	jfuith@pro-techpower.com
Gamboa	Jose	M	H-J Family of Companies	joseg@h-j.com

Garcia Wild	Eduardo	M	Siemens Energy	eduardo.garcia@ieee.org
Guner	Ismail	M	Hydro-Quebec	ismailguner@ieee.org
Hernandez	Ronald	M	Doble Engineering Co.	rhernandez@doble.com
Hollrah	Derek	G	Burns & McDonnell	dhollrah@burnsmcd.com
Johnson	Christopher	G	Oncor	christopher.johnson@oncor.com
Kaineder	Kurt	M	Siemens Energy	kurt.kaineder@siemens-energy.com
Kazmierczak	Jerzy	M	Hitachi Energy	jerzy.kazmierczak@hitachienergy.com
Kessler	Stacey	G	TC Energy	stacey.kessler@ulteig.com
Kirchenmayer	Egon	M	Siemens Energy	egon.kirchenmayer@siemens-energy.com
Kornowski	Marek	M	Polycast International	mkornowski@polycast.ca
Koshel	Anton	G	Delta Star Inc.	akoshel@deltastar.com
Lange	Nathan	G	Siemens Energy, Inc.	nathan.lange@siemens-energy.com
Lee	Junho	G	Hyundai Electric	junho.lee@hd.com
Mani	Kumar	M	Duke Energy	kumar.mani@duke-energy.com
Martinez Mares	Alberto	G	WEG Transformers USA	martineza@weg.net
Middleton	Robert	M	RHM International	bob.middleton@rhmintl.com
Mills	Francis	G	POWER Engineers Inc.	f-mills@alumni.northwestern.edu
Montanha	Juliano	G	Siemens Energy	juliano.montanha@siemens-energy.com
Morales-Cruz	Emilio	M	Qualitrol Company LLC	emorales@qualitrolcorp.com
Murray	David	G	Tennessee Valley Authority	dbmurray@tva.gov
Musgrove	Ryan	G	Oklahoma Gas & Electric	ryan.musgrove@ieee.org
Natale	Anthony	G	HICO America	anatale@hicoamerica.com
O'Malley	Anastasia	G	Consolidated Edison Co. of NY	omalleya@coned.com
Patel	Monil	G	PG&E	
Plante	Sylvain	M	Hydro-Quebec	plante.sylvain.3@hydro.qc.ca
Pollaro	Dominic	G	NASS	d.pollaro@nassusa.com

Posadas	Daniel	M	Prolec St de CV	daniel.posadas@celeco.com.mx
Radbrandt	Ulf	M	Hitachi Energy	ulf.radbrandt@ieee.org
Raymond	Timothy	M	Electric Power Research Institute (EPRI)	tc.raymond@ieee.org
Reed	Scott	M	MVA	sreed@mvadiagnostics.com
Reimer	Jonathan	G	FortisBC	jonathan.reimer@fortisbc.com
Reiss IV	Clemens	G	Custom Materials, Inc.	treiss@custommaterials.com
Richardson	Michael	G	Ameren	mrichsrdson@ameren.com
Riopel	Sebastien	M	Electro Composites ULC	sriopel@hubbell.com
Robalino	Diego	M	Megger	diego.robalino@megger.com
Rocque	Tim	G	SPX Transformer Solutions, Inc.	tim.rocque@prolec.energy
Sankarakurup	Dinesh	G	Duke Energy	dinesh.sankarakurup@duke-energy.com
Schiessl	Markus	G	SGB	markus.schiessl@sgb-smit.group
Schleismann	Eric	M	Southern Company Services	eschleis@ieee.org
Schrammel	Alfons	G	Siemens Energy	alfons.schrammel@siemens-energy.com
Schweiger	Ewald	M	Siemens Energy	ewald.schweiger@ieee.org
Sen	Cihangir	M	Duke Energy	cihangir.sen@duke-energy.com
Sohn	Yong Tae	G	Hyosung HICO	ytsohn@hyosung.com
Solano	William	M	Reinhausen Manufacturing	wjsolano@aol.com
Som	Sanjib	M	Pennsylvania Transformer	ssom@patransformer.com
Spitzer	Thomas	M	City Transformer Service Co.	t.spitzer@sbcglobal.net
Staley	Brad	M	Leeward Renewable Energy	brad.staley@leewardenergy.com
Stechschulte	Kyle	G	American Electric Power	kdstechschulte@aep.com
Steele	Hampton	G	Tennessee Valley Authority	hasteele@tva.gov
Stockton	David	G	Stockton Consulting	david@stockton-consulting.com
Sweetser	Charles	G	OMICRON electronics Corp USA	charles.sweetser@omicronenergy.com

Sze	Matthew	G	OMICRON electronics Canada Corp.	matthew.sze@omicronenergy.com
Tanaka	Troy	M	Burns & McDonnell	ttanaka@burnsmcd.com
Thomas	Scott	G	Hitachi Energy	
Tostrud	Mark	G	Dynamic Ratings, Inc.	mark.tostrud@dynamicratings.com
Van Der Walt	Alwyn	M	Electrical Consultants, Inc.	alwyn.vanderwalt@eciusa.com
Varghese	Ajith	M	Prolec-GE Waukesha	ajith.varghese@prolec.energy
Varnell	Jason	M	Doble Engineering Co.	jason.r.varnell@ieee.org
Vermette	Yves	M	Electro Composites ULC	yvermette@hubbell.com
Vir	Dharam	M	Prolec GE Waukesha Inc	dharam.vir@prolec.energy
vonGemmingen	Richard	G	Dominion Energy	rgemmingen@aol.com
Waldrop	Hugh	M	Memphis Light, Gas & Water	mwaldrop@mlgw.org
Wallach	David	M	Duke Energy	david.wallach@duke-energy.com
Weisensee	Matthew	G	PacifiCorp	matthew.weisensee@pacificorp.com
White	Joe	G	POWER Engineers Inc.	f-mills@alumni.northwestern.edu
Whitten	Christopher	M	Hitachi Energy	christopher.l.whitten@hitachienergy.com
Wimberly	Barrett	G	GE Grid Solutions	barrett.wimberly@ge.com
Wright	Jeffrey	G	Duquesne Light Co.	jwright@duqlight.com
Yang	Fei	G	Hitachi ABB Power Grids	faye-fei.yang@hitachi-powergrids.com
Zaman	Malia	G	IEEE	m.zaman@ieee.org
Zhang	Shibao	M	PCORE Electric	shibao.zhang@ieee.org
Zhao	Peter	M	Hydro One	peter.zhao@hydroone.com
Elson	Eric	G	SDGE	eelson@sdge.com
Bender	Jon	G	WE Gundy & Associates	jbender@wegai.com
Jeong	Chanmin	G	HD Hyundai	chanmin.jeong@hd.com
Vaagensmith	Bjorn	G	Idaho National Laboratory	bjorn.vaagensmith@INL.gov
Wagner	John	G	AEP	jgwagner@aep.com

Ortiz	Cuauhtemoc	G	Niagara	cuautemoc.ortiz@gmail.com
Fu	Yao	G	BC Hydro	yao.fu@bchydro.com
Brodeur	Samuel	G	Hitachi Energy	samuel.s.brodeur@hitachienergy.com
Chen	Binzhan	G	BC Hydro	binzan.chen@bchydro.com
Bray	Elizabeth	G	Southern Company	ebbray@southernco.com
Hermann	Florian	G	Trench France	florian.hermann@trench-group.com
Abdalla	Isaac	G	HICO America	iabdalla@hicoamerica.com
Hampton	Kevin	G	Siemens Energy	kevin.hampton@siemens-energy.com
Arevalo	Edmundo	G	BPA	erarevalo@bpa.gov
Rezvan	Arash	G	Delta Star Inc.	arezvan@deltastar.com
Davoudi	Pouneh	G	Delta Star Inc.	pdavoudi@deltastar.com
Lewis	Samuel	G	Hitachi Energy	samuel.lewis@hitachienergy.com
White	Joe	G	POWER Engineers Inc.	joe.white@powereng.com
Tan	Jonathan	G	Northern Transformer	jtan@northerntransformer.com
Li	Jinming	G	BC Hydro	jinming.li@bchydro.com
Melo	Yegor	G	BC Hydro	yegor.melo@bchydro.com
Gorzin	Alireza	G	Black & Veatch	gorzina@bv.com
Sekhon	Harmanpreet	G	PTI Transformers	hsekhon@ptitransformers.com
Gardner	James	G	Prolec-GE Waukesha	jmgardner@ieee.org
Sharp	Michael	G	Trench Limited	mike.sharp@trench-group.com
Foster	Patrick	G	Next Era Energy	patrick.foster@nee.com
Teofanovic	Marko	G	Ontario Power Generation	marko.teofanovic@opg.com
Li	Eric	G	BC Hydro	eric.li@bchydro.com
Watson	Joshua	G	Nebraska Public Power District	jwatson@nppd.com
Wong	Terry	G	Trench Limited	terry.wong@trench-group.com
Hossain	Saif	G	Trench Limited	saif.hossain@trench-group.com

S24 Unofficial Standards Status Report

Standard Project	Title	WG Chair	Pub Year Rev. Due Date	PAR Issue Par Expiration	Comments
C57.19.00	IEEE Standard General Requirements and Test Procedure for Power Apparatus Bushings	P. Zhao	2023 2033		Not Active
C57.19.01	IEEE Standard Performance Characteristics and Dimensions for Outdoor Apparatus Bushings	S. Zhang	2017 12/2027		Held TF meeting
C57.19.02	Standard for the Design and Performance Requirements of Bushings Applied to Liquid Immersed Distribution Transformers	S. Shull	2023 2033		Not Active
P65700-19-03	IEC/IEEE International Standard -- Bushings for DC application	Eric Weatherbee	2014 12/2024	2021 12/2025	Comment Resolution Process Recirculation in March/April
C57.19.04	Standard Performance Characteristics and Dimensions for High Current Power Transformer Bushings with Rated Continuous Current in Excess of 5000 A in Bus Enclosures	S. Digby	2018 12/2028		Held TF meeting
PC57.19.100	IEEE Guide for Application of Power Apparatus Bushings	T. Spitzer	2012 12/2022	2019 12/2025	WG Draft Development PAR Ext. Granted

IEEE PES TRANSFORMER COMMITTEE

SPRING 2024 MEETING MARCH 10 TO MARCH 14

HYATT REGENCY VANCOURVER; VANCOUVER, BRITISH COLUMBIA, CANADA

S24 IEEE TF REQUIREMENTS FOR BUSHING C57.19.01

Chair: Shibao Zhang

Secretary: Dominic Pollaro

MEETING MINUTES

3/12/24, 9:30 AM – 10:45 AM

Attendees	Member Status	Attendees	Member Status
Shibao Zhang	Y	Bjorn Vaegensmith	N
J. Arturo Del Rio	Y	Eric Euvrard	N
Scott Digby	Y	Bryan Deb	N
Mario Locarno	Y	Levent Baser	N
Anthony Natale	Y	Monil Patel	N
Dominic Pollaro	Y	Patrick Foster	N
Eric Schleismann	Y	Fei Yang	N
Cihangir Sen	Y	Bob Middleton	N
Tommy Spitzer	Y	David Stockton	N
Durand Stacy	Y	Kurt Kaineder	N
Juan Carlos Cruz Valdez	Y	Chris Whitten	N
Gabriel Delgado	Y	Mike Waldrop	N
Jeffrey Door	Y	Filip Mikulelky	N
Hugo Flores	Y	Alex Doutrelepont	N
Orlando Giraldo	Y	Stefan Lembacker	N
Daniel Posadas	Y	Saif Hossain	N
Sebastien Riopel	Y	Terry Wong	N
Troy Tanaka	Y	Eric Elgon	N
Yves Vermette	Y	Michael Sharp	N
Eunyoung Cho	N	Camilo Casallas	N
Junho Lee	N	Douglas Craig	N
Jon Bender	N	Sanford Fong	N
Alfons Schrammel	N	John Fraiser	N
Florian Hermann	N	Craig Tennant	N
Sami Debass	N	Ronald Hernandez	N
Jose Gamboa	N	Issac Abdoulls	N
William Solano	N	Jose Zambrano	N
Vinjay Patel	N	Mubark Abbas	N
Joshua Watson	N	Nathan Lange	N
Mama Mbouombous	N	Samuel Lewis	N

1. **Introducton & Opening Statements**
    a. Shibao Zhang (Chair) started the meetng 0930.
    b. Sign – In Sheets Passed Out
    c. Noted: If your name is printed on the Sign – In Sheet, you are a member
    d. Chair: We stll have a Task Force C57.19.01 to review and we need to get bushing subcommitee approval to submit a PAR.

2. **Establishment of Quorum**
    a. 31 Members listed on Sign- In Sheet
    b. 19 Members Present
    c. Quorum Reached
    d. Total Atendance = 60

3. **Agenda**
    a. Zhang (Chair) presented Agenda to Group
    b. Motion to Approve_ Hugo Flores
    c. Second_ Durand Stacy
    d. Agenda Approved

4. **Copyright Reach Out_ No Report of Copyright**
5. **Professionalism Reminder**
    a. Chair reminded the group that all correspondence be Professional.

6. **Approval of Previous Minutes**
    a. Chair presented minutes of TF meeting of Oct 2024 in Kansas City, Missouri
    b. Chair presented minutes of our Online Meetng of January 9, 2024, 12 PM EST.
    c. Motion to Approve_ Hugo Flores
    d. Second_ Sebastian Riopel
    e. Minutes Approved

7. **Current Status_ Opening Statements**
    a. Chair opened with start of discussion of "Real Situation", namely the TF responsibility to begin to revise the C57.19.01 Standard (shown to group). He indicated the FIRST STEP is to submit a PAR to the bushing subcommitee.
    b. Current Status: We have submited a PAR to NASCOM, and this has been circulated through all members on January 12th & January 19th.

c. OPEN Queston is in regard the description of bushings as "Liquid Immersed" Or "Liquid Type". There seems to have been some confusion and Chair opened this question to the group.
d. Scot Digby_ indicated that "it looks like we need to use Liquid Immersed" – we will revise the PAR and tomorrow bring this subject up in the Bushing Sub Commitee to obtain NASCOM approval before St. Louis meeting. This will be the first request of the WG.

8. Timeline (As discussed by Chair)

a. The Chair presented the Timeline to the Group.
b. "Our PAR will end in 2027."
c. When we form the WG we can further discuss & vote.
d. Plan is to have DRAFT completed for Ballot & Review before 2026.
e. In the beginning of 2027, we are going to circulate the ballot
f. Spring 2027: Form Resolution Group to resolve problems.
g. Mid-Year 2027 will be the last meeting to finalize documents
h. End 2027 WG will be completed.
i. Any Issues with Timeline?
j. None

Mike Sharp: "When is the last date to Submit?"

Chair: "December 2027 in PAR- last meeting is usually in OCT".

9. Task Force Discussion_ Chair: Should we Continue?

a. Because we are not in the first working group meeting, we remain in Task Force only. Although we cannot begin discussions of WG until one is established, we have a choice to STOP, or begin some discussion on general ideas.

Mario Locarno: "I am hearing important changes in this Revision". "What do we think will be the biggest challenges to geting this revision completed?"

Dry Type Bushing Discussion:

Cihangir Sen: John indicated he thought of a couple big challenges, namely RIS Technology for Dry Types and subsequent Data Collection Challenges , "especially for PD."

Chair: "OK"

Sami Debass_EPRI: "…. challenges right now are regarding Dry Type Bushings."

Chair: Acknowledged

Standardized Test Taps Discussion:

Duran Stacy: Duran introduced the challenge in standardization of TEST TAPS. As several different variations exist among manufacturers, to standardize dimensions on test taps "would be huge".

Chair requested Duran Stacy take the lead and reach out to bushing manufacturing companies to obtain bushing test tap dimensional information such that we can "reveal what is considered Standard

Dimensions".

Noted was the importance of bushing manufacturers to work together.

Sebastian Riopel: Sebastian asked for a more specific understanding of what test tap dimensions we are considering. Are we simply talking about external dimensions for interchangeability of bushing monitors or "ground shield access to pin, or internal dimensions?".

J. Auturo Del Rio: He suggested the purpose for this information is to move bushing adapters from one bushing to another. The suggested dimensions needed are as follows; Thread size, Stem Size, Depth, Cap Dims – to help monitoring companies to have an adapter ready for installation.

Sebastian Riopel: " …we are talking about interchangeability…."

Durand Stacy: "We have a mixed Bag" in the Industry…

J.Auturo Del Rio: " …all the reason to have standard dimensions.."

Further discussions between multiple members continued with the basic goal of developing a plan of action which encompasses all shareholders within the community of bushings as it relates to Test Tap Inquiry. Much was discussed regarding the legacy population of bushings currently either in use or in stock, and how potential changes to a universal test tap design could affect both style number of these legacy styles and overall interchangeability of bushing monitors going forward.

Affect on Style Number was discussed and the potential of "new model" of bushings would need to be created to accommodate changes in Test Taps.

In general comment, it was discussed that it would be the intent of the working group to determine if manufacturers can agree on the same interface to the bushing monitors with no change to the bushing internals.

Eric Nelson: Emphasized the importance of standardization, stating standardization was accomplished previously - what's the problem now?

Others provided some insight into this challenge, stating that there are simply more stakeholders/suppliers in the industry today, namely more bushing manufacturers with various dimensional differences - as compared to years past, historical IEEE discussions regarding Test Tap Standardization when only three or four bushing manufacturers were available in the industry.

Further insight was provided as to the which apparatus is in the lead – in other words, are we to change a bushing to fit a bushing monitor or vice versa?

A comparative discussion was provided by Chair; suggesting driver for past standardization was to apply Potential Device to bushings taps; similarly, bushing monitoring connections could be the driver for standardization in future. We initially had Type A and Type B and eventually eliminated Type B.

Eric Nelson: If you begin in the Standards, there will be a trickle effect into the industry.

Chair: Yes, this is the purpose of this discussion and formation of a WG. One-dimension fits all will be a challenge especially with existing bushings & retrofit solutions.

Eric Nelson: You can make 10 different types but then the user can specify and force that we are only going to accept certain types.

The Chair posed this as a "possible solution " but it will be up to the Working Group.

Hugo Flores reminded the members that if existing designs are changed, this could cause a new style formation (or Revision) adding new part numbers to the utility interchangeability systems.

Final discussion related to this topic; one member (Cihangir Sen) stated that he has under his responsibility over 2000 transformers with standardized bushings (specifically selected for interchangeability) ; if one manufacturer indicates due to test tap design revision - these styles become " obsolete" this could cause a lot of problems with existing fleet
- he suggested that " looks like a favor to the bushing manufacturers if we simply allow the bushing monitor companies to find an adapter to fit
- this may be the simplest solution."

Chris Whiten: This would give the bushing monitoring manufacturers the ability to make adapters.

Duran Stacy: This is the process today; we provide outline drawings to the interested parties, and they design an adapter to fit – in advance. What you negotiate with end user is up to you.

Chair: This is what we (HUBBEL) do as well.

One member, a representative from TRENCH, indicated "similar like you" we have legacy spare bushings residing at utilities and its very difficult at times to keep the right bushings in stock.

Sami Debass: Requested we circle back and close the loop. "…on the dimensions we are talking about – so basically we are going to collected dimensions from manufacturers?" and end users? And make recommendations?

Duran Stacy: Manufacturers only, we only have so much time (3 years).

Chair:

Step 1: get the existing dimensions to see how many we have (10,5,3) – to know where we are. Step 2: to see if

we can come up with a compromise throughout manufacturers.

A general discussion regarding path going forward was presented; with the understanding that the path is not yet defined – but the fundamental point at this time is to simply obtain the information.

Duran Stacy indicated that he would provide his email such that parties included in these minutes could reach directly to him regarding test tap dimensions. With Subject Line.
Scot Digby asked if there was someone from the bushing monitoring market segment (a manufacturer) as part of this TF.

Mario Locarno indicated that he has taken notes and will bring this up for discussion back at Doble.

Looking for information on existing on how a monitor will plug into a bushing? Or one particular provider has for adapters, or both?

Scot Digby: Not 100% certain, just wanted to make sure we had representation.

10. Moving 25 kV out of the ANNEX Discussion

David Stockton: David wanted to make sure " All (voltages)are back in the body of the ANNEX" including the upper (voltage) ranges. "Are we updating the upper ranges as well."

Durand Stacy: "I think they are back" in lieu of the 25 kV question.

Chair: "Yes, 25 kV is already there. It might be 15 kV you are thinking about". And – " we do not have the dimensions for 765 kV, dimension wise only up to 500 kV – we will probably go back to the MFG

Scot Digby asked that the scope be reviewed. Chair posted the Scope to all members.

11. 46 kV Bushing Discussion

The standing question is "how do we dimension."

To do Lists:

a. Duran Stacy; Accumulation of Bushing Test Tap dimensions from Bushing Manufacturers
b. Mario Locarno: Provide information regarding Bushing Monitoring Test Tap Connections & Adapters

Chair: Motion to Adjourn?

Motion to Adjourn: Hugo Flores

Second: Duran Stacy Chair:

Any Objections?

None

Adjourned 10:16 am PST

Task Force C57.19.04
Standard Requirements for Bushings
above 5000A in Bus Enclosures
March 12, 2024 1:45-3:00 PM
Vancouver, BC Canada
UNAPPROVED MINUTES

1. Welcome

Meeting was called to order at 1:46PM by Chair Scott Digby. Minutes recorded by Secretary Anthony Natale. Vice Chair is Rich von Gemmingen.

2. Membership

As this is the first meeting of this TF, no prior membership list exists. 34 people attended, of which 23 requested membership.

Last Name	First Name	Company Name	Member
Abbas	Mubarak	Siemens Energy - HSP	
Abdalla	Isaac	HICO America	
Bautista	Paulo	Enmax	
Beaster	Barry	H-J Family of Companies	Yes
Bradshaw	Jeremiah	Bureau of Reclamation	
Brown	Duane	Measurements International	
Cruz Valdes	Juan Carlos	Prolec GE Internacional	Yes
DelRio	Arturo	Siemens Energy	Yes
Digby	Scott	Duke Energy	Chair
Door	Jeffrey	H-J Family of Companies	Yes
Flores	Hugo	Hitachi Energy	Yes
Fu	Yao	BC Hydro	
Gamboa	Jose	H-J Family of Companies	Yes
Ghafourian	Ali	H-J Enterprises	
Hermann	Florian	Trench France	Yes
Kaineder	Kurt	Trench Austria	Yes
Lange	Nathan	Siemens Energy - HSP	
Locarno	Mario	Doble Engineering Co	Yes
Mani	Kumar	Duke Energy	Yes
Mikulecky	Filip	Koncar Power Transformers - Siemens	Yes
Natale	Anthony	HICO America	Secretary
Pollaro	Dominic	NASS	Yes
Posadas	Daniel	Prolec GE	
Riopel	Sebastien	Electro Composites Inc.	Yes
Spitzer	Tommy	City Transformer Service Co	Yes
Stacy	Fabian	Hitachi Energy	Yes
Stockton	David	Stockton Business Consulting	Yes
Thomas	Scott	Hitachi Energy	Yes

Vermette	Yves	Electro Composites Inc.	Yes
vonGemmingen	Richard	Dominion Energy	Vice-Chair
Webb	Matthew	GE Vernova	Yes
Whitten	Christopher	Hitachi Energy	Yes
Zambrano	Jose	Siemens Energy - HSP	
Zhang	Gigi	HICO America	

3. Agenda

Agenda was presented.

4. Approval of Minutes

There are no prior meeting minutes to approve.

5. Call for Patents, IEEE Copyright Policy, Member Behavior

Slides were shown. No essential patents were identified.

6. Document History

The Chair reviewed the history of the document.

7. Title, Scope, and Purpose Discussion

- The Chair noted that the previous working group had agreed on a request to change "in" to "located within" in the document title but it the change was never made so should be made now.
- Sebastien Riopel asked whether the title needed a reference to "liquid-immersed" power transformers. Ultimately it was deemed unnecessary since it's included in the Scope
- "Liquid-filled" will be changed to "liquid-immersed" in the Scope
- Sebastien Riopel recommended that "thermal" be added to the list of electrical, dimensional, and related requirements since that's one of the main reasons the documents was created.
- Hugo Flores recommended it be placed second in the list between electrical and dimensional.
- The document does not currently have a Purpose and was deemed unnecessary.
- A motion was made by Hugo Flores to use the revised Title and Scope wording to request permission from the Bushing Subcommittee to submit a PAR.

Motion: That the Bushing SC approve the work of the TF and provide the TF Chair consent to proceed with submittal of the PAR with the Title and Scope as unanimously approved by the TF and as stated below:

Title:

IEEE Standard for Performance Characteristics and Dimensions for High Current Power Transformer Bushings with Rated Continuous Current in Excess of 5000 A located within Bus Enclosures

Scope:

This standard covers the electrical, thermal, dimensional, and related special requirements for high current rating power transformer bushings located within bus enclosures that have rated continuous current in excess of 5000 A. Bushings covered by this standard are intended for use as components of liquid-immersed transformers including, but not limited to, generator step-up (GSU) transformers.

- Seconded by Kumar Mani.
- Motion carries with unanimous approval.

8. General Discussion

- Question was asked by Art DelRio whether any reference to new technology bushings like RIF or RIS needs to be included. The Chair stated that 19.04 does not address bushing technologies and the question should be referred to 19.00

9. Next Steps

- Develop Agenda for Fall 2024 in St. Louis
- Feedback from bushing manufacturers or their purchasers and utilities specifying the standard are needed.

- The TF Chair indicated that he would facilitate the requisite motion at the upcoming Bushing SC meeting to obtain approval of the SC to proceed with PAR submittal as recommended by the TF.

10. Adjournment

- Meeting was adjourned at 2:33 pm.

IEEE C57.19.100

Guide for Application of Power Apparatus Bushing WG

Minutes of the 2024 Spring Meeting
Monday, March 11, 2023- 3:15-4:30 PM
Hyatt Regency; Vancouver, BC Canada Regency E/F (BR)

Tommy Spitzer– Chair **Durand Stacy – Secretary**

The WG met on Monday, March 11, 2023, at 3:15 PM in the Regency E/F (BR)

1. **Welcoming and Call for Patents, Copyrights**
   - The meeting was called to order at 3:15 PM by the WG Chair.
   - The call for potentially essential patents and copyright issues was made, and none were reported.
2. **Quorum**
   - A total of 44 participants: 11 members and 33 guests.
   - 11 Members of the 21 WG Members were present, and a quorum was reached.
3. **Call for approval of agenda.**
   3.1. The motion was made by Sebastien Riopel Electro Composites ULC and seconded by Brad Staley.
   3.2.
4. **Call for approval of the Fall Kansas City MO meeting minutes**
   4.1. The motion was made by Brad Staley and seconded by Mario Locarno Doble Engineering Co.
5. **Reconsolidation document**
   - Document “CommentProposalForm Spr 2024 - R1.xls”
     - 4 of the 7 comments were accepted
     - 3 of the 7 comments will need additional information. Please see “CommentProposalForm Spr 2024 - R3”
6. **New business:**
   6.1. Mathew Weisensee PacifiCorp raised the concern that the guide does not address the rise in temperature of the cover/ turret and other objects attached to the bushing during overload conditions. He stated that he observed the cover/ turret area around the bushing reaching temperatures as high as 135°C during the overload test. It was suggested to add a list of areas to consider when evaluating overload conditions as they relate to bushing selection and transformer design. Tommy Spitzer has agreed to put together some thoughts and to circulate them with the group.
7. **Call to Adjourn the meeting.**

7.1. The motion was made by Sebastien Riopel Electro Composites ULC and seconded by Shibao Zhang PCORE Electric.

8. The meeting was adjourned at 4:30 PM.

Next IEEE WG Meeting
Fall 2024 – ST LOUIS, MISSOURI, USA, OCTOBER 27 – 31, 2024

Respectfully submitted,
Chair: Tommy Spitzer (t.spitzer@sbcglobal.net)
Secretary: Durand Stacy (durand.stacy@hitachienergy.com)

First Name	Last Name	Company	Member
Mubarak	Abbas	Siemens Energy	
Robert	Allison	Dominion	
Barry	Beaster	H-J Family of Companies	
Jon	Bender	W.E. Gundy	
Juan Carlos	Cruz Valdes	Prolec GE	
Pouneh	Davoudi	Delta Star	
Sami	Dubass	EPRI	
J. Arturo	Del Rio	Siemens Energy	X
Jeffrey	Door	H-J Family of Companies	
Jesse	Duffy	Nashville Electric	
Eric	Euvrard	RHM International	X
Patrick	Foster	Siemens Energy	
John	Fragor	IFD Technologies	
Orlando	Giraldo	H-J Family of Companies	
Jose	Gamboa	H-J Family of Companies	
Ismall	Guner	Hydro-Quebec	
Kevin	Hampton	Siemens Energy	
Florieu	Herman	Trench	
Kurt	Kaineder	Siemens Energy	
Egon	Kirchenmayer	Siemens Energy	X
Mavel	Kovnaoski	Polycast	
Nathan	Lange	Siemens Energy	
Mario	Locarno	Doble Engineering Co.	X
Robert	Middleton	RHM International	X
Kelly	Naunton	BC Hydro	
Ivan	Novno	Konear	
David	Olan	BC Hydro	
Giraldo	Orlando	H-J Family of Companies	

Secretary: Durand Stacy (durand.stacy@hitachienergy.com)

Attendance and status:

Annex A, Appendix D

First Name	Last Name	Company	Status
Murarak	Abbas	Siemens Energy	Guest
Alex	Alahmed	Evergy	Guest
Barry	Beaster	H-J Family of Companies	Guest
Edwin	Betancourt	Siemens Energy	Guest
Vivek	Bhatt	Prolec GE	Guest
Juan Carlos	Cruz Valdes	Prolec GE	Guest
Samson	Debass	EPRI	Guest
Yasiu	Demip	Prolec GE	Guest
J. Arturo	Del Rio	Siemens Energy	Member
Scott	Digby	Duke Energy	Member
Huan	Dinh	Hitachi Energy	Guest
Jeffrey	Door	H-J Family of Companies	Guest
Jesse	Duffy	Nashville Electric	Guest
Salih	Durmus	Siemens Energy	Guest
Hassum	Elkussem	Siemens Energy	Guest
Eric	Euvrard	RHM International	Member
Essedoik	Ferdjallah	Siemens Energy	Guest
Jose	Gamboa	H-J Family of Companies	Guest
Andrew	Gregory	ITEC	Guest
Jean	Hernandez-Mejia	GT-NEETRAC	Guest
Kurt	Kaineder	Siemens Energy	Guest
Chrisloph	Kerschemboer	Siemens Energy	Guest
Nathan	Lange	Siemens Energy	Guest
Junho	Lee	Hyundai	Guest
Soyoung	Lee	Hyundai	Guest
Mario	Locarno	Doble Engineering Co.	Member
Tiffany	LUCAS	Prolec GE	Guest

1

BUSHING SC MEETING

IEC Liaison Report - Spring 2024

IEEE PES TRANSFORMERS COMMITTEE
Location: VANCOUVER

Kurt Kaineder

1

TC 36A Team and Working Groups

Role	Name	Term Of Office	NC
Chair	Mr Lars Jonsson	2026-12-31	SE
Secretary	Mrs Laura De Fina		IT
Former Secretary	Mr Gianfranco Giorgi		IT

Type	Label	Description	Scope	Creation Date
Joint Maintenance Teams	JMT 9	DLMT: HVDC Bushings	To jointly revise the document IEC/IEEE 65700-19-03 “Bushings for DC application” with IEEE 	2021-12-15
Joint Working Groups	JWG 7	Dimensional bushing standardization	To prepare the working draft of a Technical Report with the title LV-MV and HV Transformer bushings dimensional standardization.	2019-03-01
Joint ad-Hoc Groups	JAHG 8	Bushing Application Guide	To define a table of contents (or outlines) to be used as a starting point of a NP for an International standard document. 	2021-10-05
Working Group	JWG 10	Bushing application guide	To develop an International Standard on bushing application guide	2024-01-11
Maintenance Teams	**MT 5**	MT for the revision of **IEC 60137**: Insulated bushings for alternating voltages above 1kV.	Revision of the standard IEC 60137 with review of the contents and extension of tables to cover new market technical requirements where necessary and possible. 	2008-07-25
Maintenance Teams	**MT 6**	Bushings seismic qualification	**IEC TS 61463**:2016	2012-03-26

It was decided during the last Plenary Meeting that both **MT5** and **MT6** will submit a **call for expert late 2024** and start revision of the concerned documents during 2025

1

Work Program

Std.	Init.	Fcst. Publ. Date	Next Stage	Comment
IEC TS 63493-1 ED1 Transformer bushings dimensional standardization - Part 1: Medium voltage and low voltage bushings	2024-01	2025-12	CD	Changed from TR to TS
IEC TS 63493-2 ED1 Transformer bushings dimensional standardization - Part 2: High voltage bushings.	2024-01	2025-12	CD	Changed from TR to TS
IEC 63548 ED1 Bushing application guide Part 1: Bushing selection and installation	2024-01	2027-12	CD	Details on next slides New JWG 10
IEC/IEEE 65700-19-03 ED2 Bushings for DC application	2022-07	2025-06	2CD	See on next slides

A **Technical Specification (TS)** approaches an international standard in terms of detail and completeness but has not yet passed through all approval stages, either because consensus has not been reached or because standardization is seen to be premature.

Technical Reports (TR) focus on a particular subject and contain for example data, measurement techniques, test approaches, case studies, methodologies and ….

IEEE PES Power & Energy Society

IEEE

1

IEC 63548 ED1
Bushing application guide Part 1: Bushing selection and installation

- Questionnaire sent out: Establishment of new joint working group JWG10 - Bushing application guide with TC 14, and nomination of convenor

Result:

- Established **JWG 10** with TC 14 with an agreed title and task. The existing member of JAHG 8 will be transferred to JWG 10.
- The nomination of **Mr. Jean Christophe Riboud** as a convenor of SC 36A/JWG10 for the period of 2024-02-26 to 2027-02-25 has been approved by a simple majority of the P-Members voting.

IEEE PES Power & Energy Society

IEEE

IEC/IEEE 65700-19-03 ED2
Bushings for DC application

- CD was sent out last Summer and comments collected in IEC and IEEE.
- CD resulted in 180 highly appreciated comments which since then has been dealt with by the working group and incorporated in the CDV document

Result:

- The CDV as well as the revised compilation of comments (CC) was submitted to the IEC central office last week and will subsequently be officially submitted to all IEC National Committees as well as IEEE for voting shortly. I.e. the working group has done its part for now and will wait for the results.

Appreciation from Lars Johnson - Please forward my sincere thanks for the valuable contribution to IEEE!

1

Revision to Low Frequency Tests (RLFT) – Ajith M. Varghese

Quorum: Achieved MOM: Approved Agenda: Approved

1 PD in bushing & Venting during Induce test

- Revised text (addition to C57.12.90 Section 10.8.5) permitting venting of bushing when PD is suspected during induce was surveyed within Dielectric Test SC and RLFT during Q4'2023.
- Survey returned with 82 % approval rate.
- Comments were reviewed, voted and surveyed text was modified.
  - ❖ Minor changes to note 1
  - ❖ Moved note 3 to main body
  - ❖ Retained note 4, 5 and 6.
  - ❖ Deleted note 7
- TF approved modified text to move to Dielectric Test SC for addition to next revision of C57.12.90.

2

Motion

- The motion is for Dielectric Test SC approval for addition of text related to venting of bushing to next revision of C57.12.90 (Section 10.8.5)

Text approved by TF -RLFT 3/12/2024

If the partial discharge is measured during the Induced-voltage testing of the transformer and is suspected to be generated within an OIP (oil-impregnated-paper) bushing(s), it is permissible to "vent" the bushing(s) exhibiting partial discharge to the atmosphere using the bushing manufacturer's instructions.

Unless agreed between manufacturer and purchaser, bushings shall not be vented proactively prior to dielectric testing. The Induced-voltage test shall be entirely repeated after venting the bushing and a note shall be added to the certified test report indicating bushing(s) were vented during the induced-voltage test.

Cont'd ....

..Contd.

Notes:

1) Partial discharge intended to be addressed by venting the bushing, is a low energy discharge arising from partial vacuum (pressure below atmosphere) created in the expansion chamber and/or gas bubbles generated during the Temperature Rise test and the cooling down afterwards. Partial vacuum is created in the expansion chamber due to absorption of nitrogen or air into oil, and gas bubbles are formed due to saturation of nitrogen or air. Partial discharges from these cases may be resolved by venting the bushing. If continuous gas bubble generation or elevated partial discharge remains after the venting, additional investigations are required.
2) If there are concerns of gas generation from the temperature rise test causing bushing failure during impulse or applied voltage test, an induced-voltage test can be performed before impulse testing for diagnostic purposes. A complete induced-voltage test shall be performed as the last dielectric test, as specified in subclause 10.1.5.1 for dielectric test sequence.
3) Not all OIP bushings exhibit these conditions, so bushing design can be a factor.
4) The same condition of gas bubble formation or partial vacuum may occur in service during normal operation of load and overload cycles
5) Re-establishment of the bushing gas space blanket and resealing of the bushing must also be performed in accordance with the bushing manufacturer's instructions. The internal integrity of the bushing may be compromised by venting, by allowing in oxygen and moisture or by not reestablishing proper conditions.