ANNEX A Bushings Subcommittee

April 28, 2021, 09:25AM Central
Virtual Meeting

Chair (presiding officer):	Eric Weatherbee, Hubbell Power Systems / PCORE Electric
Vice-Chair (minutes author):	Scott Digby, Duke Energy
Secretary (not in attendance):	JD Brafa, Hub City Consulting Services

A.1 Opening of the Meeting

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

Chair requested attendees to (1) mute microphones, (2) if you wish to speak, identify yourself and affiliation, and (3) asked if anyone was not able to modify their WebEx ID so it indicated their name and affiliation, or was new to the meeting, or has had their affiliation change recently, to please note the same in the Chat window.

Chair advised the meeting would be recorded, but the recordings would be used exclusively for use in the preparation of the meeting minutes and would be destroyed in 30-days. Chair advised recording this meeting or taking screenshots is NOT permitted.

Chair reviewed the IEEE Senior member requirements.

Chair reviewed the eligibility requirements and application process for becoming a Main Committee member and presented the attendance requirements for becoming a SC member. The Chair noted that a lack of attendance can result in losing membership or being removed from the guest roster.

Chair advised that the circulation of physical sign-in rosters is being phasing out and that at the next in-person meeting the RFID system would be the basis of recording attendance.

A.1.2 Reminders of IEEE policies

Chair presented 2 slides which included hyperlinks to the following which detail the IEEE SA Copyright Policy. Slides advised those present that by participating in this meeting they agree to comply with the IEEE code of ethics, all applicable laws, and all IEEE policies and procedures, including the IEEE SA Copyright Policy.

A.1.3 New Members

The Chair reported that, per the SC Secretary, due to technical difficulties regarding the attendance records from the Fall-2020 SC meeting that there are no new members to report.

A.1.4 Attendance

The Chair presented a list of the 83 current voting members before polling the **139 attendees** (@9:31AM). Poll determined a quorum was unofficially achieved as 53 of 83 total members were present at that time (later review of the attendance records confirmed there were 54 of 83 total members in attendance). After the meeting the detailed attendance report of the virtual meeting was reviewed with the results documented in Table 1. Refer to Appendix A for meeting participants, their affiliation, and voting member status.

Table 1 – Virtual Meeting Attendance

Total	159
Members	54
Guests	105
Guests Requesting Membership*	17

*Review of the historical attendance records indicate that of the 17 guests requesting membership, 5 meet the eligibility requirements (Meri Mohamad, Sylvain Plante, Timothy Raymond, Brad Staley, and Krishnamurthy Vijayan) and will be added to the membership roster effective at the next SC meeting.

A.1.5 Agenda Approval

The Chair advised that the agenda that had been transmitted prior to the meeting had been revised to add an item of New Business and presented the revised agenda. A motion was made by David Geibel and Seconded by Sebastien Riopel to approve the agenda as presented with no verbal objections made and no written objections noted in the chat log, S21 agenda was approved.

A.1.6 Previous Meeting's Minutes Approval

The Chair presented the F20 minutes, which were also posted on the IEEE Transformer website. A motion as made by Thomas Spitzer and seconded by Hugo Flores to approve the minutes as presented. With no verbal objections made and no written objections noted in the chat log, the F20 meeting minutes were approved.

A.1.7 Status of Bushing Standards

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

The Chair reported that the Chair for C57.19.03 had stepped down.

A.2 Working Group and Taskforce reports

A.2.1 PC57.19.00-2004 – Peter Zhao, Chair; VACANT, Vice-Chair; David Stockton, Secretary (new)

See complete WG minutes in Appendix C of this report.

Par expires at the end of 2022. The WG Chair indicated plans to hold an intermediate meeting between the S21 and F21 meetings, with an objective being to have a document prepared for the F21 meeting to be able to vote on sending to balloting.

A.2.2 WG PC57.19.01-2017 – Dr. Shibao Zhang, Chair; VACANT, Vice-Chair; David Wallach, Secretary

With the published document expiring in 2027, the group held a virtual session to begin discussions about the next revision cycle of the document. Dr. Zhang is soliciting ideas and suggestions for revisions to the document, which including issuing such a letter request to the Bushing SC in January-2021.

Dr. Zhang stated that the group plans to meet at the F21 meetings to begin preparing PAR submittal documentation for submittal to and approval by the SC.

A.2.3 WG PC57.19.02 Distribution Transformer Bushings – Steven Shull, Chair; Ed Smith, Vice-Chair, Rhett Chrysler, Secretary

See complete WG minutes in Appendix D of this report.

PAR extension was granted with an expiration date of 12/2022. The WG Chair advised that the document is essentially ready, but that one more circulation to the WG will be done and that the expectation is to be voting in F21 to go to ballot.

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

See complete TF minutes in Appendix E of this report.

TF Secretary Mr. Del Rio presided over and reported on the TF meeting. The result of the TF discussion was that IEEE believes, as does IEC, that there are needed revisions to the document (see TF minutes for more detail).

The Bushing SC Chair will advise the IEC contact of the list of items that IEEE recommends be considered for revision, confirming IEEE's interest in working on a revision to the document.

The TF intends to work on preparing the PAR documentation to obtain SC approval to move to a WG.

Request was made for volunteers/nomination for a new Chair and Vice-Chair from the IEEE side.

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

No meeting held as the latest revision was recently published and is not due for revision again until closer to the document 2028 expiration date.

A.2.6 C57.19.100-2012 – Tommy Spitzer, Chair; VACANT, Vice-Chair; Jeff Benach, Secretary

See complete WG minutes in Appendix F of this report.

The WG Chair noted that Draft 1 would be sent out for review and comment in May and made a call for more input on the Guide. One item still being discussed within the WG is bushing overload capability, which prompted much discussion within the Bushing SC attendees during this WG report. The temporary recording of the discussion will be reviewed by the SC officers with the intent of providing the WG Chair with the details of that discussion to assist in the review of the topic by the WG.

The existing PAR expires at the end of 2023.

A.2.7 TF Dry Bushing Classification & Performance – J. Arturo Del Rio, Chair; VACANT, Vice-Chair; Chris Whitten, Secretary

See complete WG minutes in Appendix G of this report.

The TF Chair stated that the TF has identified that definitions need to be reviewed to incorporate technologies that might not be addressed. The TF Chair indication that several volunteers would be reviewing the various existing bushing standards and guides to report on potential gaps regarding these type bushings. The TF is considering recommending tutorial(s) to present applications and technology.

The TF intends to hold a virtual meeting in June.

A.3 External Liaison Reports

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

Mr. Mansuy presented the summary included in Appendix H of this report.

It was noted that the SC 36A draft report regarding possible bushing dimensional standardization within IEC has been finalized and submitted.

A.3.2 WG PC57.160 Guide for PD Meas. in Bushings and Inst. Trans. – Thang Hochanh, Chair

The Chair of this WG was not in attendance so there was no report.

A.3.3 PC57.12.200 Dielectric Frequency Response (DFR) Test for Bushings – TF Entity Ballot Oversight – Poorvi Patel

Dr. Patel stated that the scope of this task is to review the developments in China for this activity, reporting that the Guide is approximately 95% complete, is targeting balloting in Fall-2021, and completion in 2022. The next meeting is in May.

There was a request to change the title of the document from “Frequency Domain Spectroscopy Measurement of Transformer Bushings” to Dielectric Frequency Response Measurement of Transformer Bushings”, which Dr. Patel said would be discussed with our IEEE-SA Program Manager and subsequently recommended to the group in China.

A.4 Unfinished Business

A.4.1 C57.152 Transformer Field Test Guide, Section 7.3 Bushings – Mario Locarno

Mr. Locarno reported that this section 7.3 rewrite is still ongoing. More comprehensive content such as Dielectric Frequency Response, hot-collar and tip-up testing, and the use of IR for diagnostics has been added.

A.5 New Business

A.5.1 Continuous Revision to Low Frequency Dielectric Tests, Venting/PD in Bushings – Bill Griesacker

Mr. Griesacker provided a summary of a survey with proposed text concerning the practice of venting bushings during transformer Induced testing (with PD measurement) at the factory. The text does not have good acceptance based on the survey results. Comments received included that there could be commercial considerations involved (such as delays in or extended time for factory testing) and although there do not seem to be examples of field failures or issues tied to the practice there are unexplained field failures that have occurred. TF is recommending not to use the statement in IEEE test code documents.

There was some general discussion on the topic, with the conclusion being that it is recognized as a generally unresolved issue.

The survey summary is also planned to be reported at the Dielectric Test SC.

A.6 Adjournment

A.7 Next Meeting: Fall 2021, Milwaukee, Wisconsin – October 17-21, 2021

Annex A - Appendix A

Role	First Name	Last Name	Company
Chair	Eric	Weatherbee	PCORE Electric
Vice-Chair	Scott	Digby	Duke Energy
Member	William	Boettger	Boettger Transformer Consulting LLC
Member	David	Calitz	Siemens Energy
Member	Juan	Castellanos	Prolec GE
Member	J. Arturo	Del Rio	Siemens Energy
Member	Huan	Dinh	Hitachi ABB Power Grids
Member	Eric	Euvrard	RHM International
Member	Hugo	Flores	Hitachi ABB Power Grids
Member	John	Foschia	SPX Transformer Solutions, Inc.
Member	Eduardo	Garcia Wild	Siemens Energy
Member	David	Geibel	Hitachi ABB Power Grids
Member	Bill	Griesacker	Duquesne Light Co.
Member	Niklas	Gustavsson	Hitachi ABB Power Grids
Member	Roger	Hayes	General Electric
Member	Toby	Johnson	Pacificorp
Member	Kurt	Kaineder	Siemens Energy
Member	Stacey	Kessler	Basin Electric Power Cooperative
Member	Egon	Kirchenmayer	Siemens Energy
Member	Marek	Kornowski	Polycast International
Member	Axel	Kraemer	Maschinenfabrik Reinhausen
Member	Mario	Locarno	Doble Engineering Co.
Member	Nigel	Macdonald	Trench Limited
Member	Darrell	Mangubat	Siemens Power Operations Inc.
Member	Kumar	Mani	Duke Energy
Member	Bruno	Mansuy	Trench France SAS
Member	Matthew	McFadden	Oncor Electric Delivery
Member	Susan	McNelly	Xcel Energy
Member	Vinay	Mehrotra	SPX Transformer Solutions, Inc.
Member	Robert	Middleton	RHM International
Member	Poorvi	Patel	Electric Power Research Institute (EPRI)
Member	Ulf	Radbrandt	Hitachi ABB Power Grids
Member	Juan	Ramirez	CELECO
Member	Scott	Reed	MVA
Member	Pierre	Riffon	Pierre Riffon Consultant Inc.
Member	Sebastien	Riopel	Electro Composites ULC
Member	Amitabh	Sarkar	Virginia Transformer Corp.
Member	Steven	Schappell	SPX Transformer Solutions, Inc.
Member	Devki	Sharma	Entergy
Member	Stephen	Shull	BBC Electrical Services, Inc.

Member	Sanjib	Som	Pennsylvania Transformer
Member	Thomas	Spitzer	City Transformer Service Co.
Member	Fabian	Stacy	Hitachi ABB Power Grids
Member	David	Stockton	Stockton Consulting
Member	Troy	Tanaka	Burns & McDonnell
Member	Lee	Tyler	Warco, Inc.
Member	Ajith	Varghese	SPX Transformer Solutions, Inc.
Member	Jason	Varnell	Doble Engineering Co.
Member	Yves	Vermette	Electro Composites ULC
Member	Dharam	Vir	SPX Transformer Solutions, Inc.
Member	David	Wallach	Duke Energy
Member	Peter	Werelius	Megger
Member	Shibao	Zhang	PCORE Electric
Member	Peter	Zhao	Hydro One
Guest	Mubarak	Abbas	Siemens Industry
Guest	Kayland	Adams	SPX Transformer Solutions, Inc.
Guest	Elise	Arnold	SGB
Guest	Onome	Avanoma	MJ Consulting
Guest	Suresh	Babanna	SPX Transformer Solutions, Inc.
Guest	Christopher	Baumgartner	We Energies
Guest	Barry	Beaster	The H-J Family of Companies
Guest	Mats	Bernesjo	Hitachi ABB Power Grids
Guest	Ryan	Bishop	Minnesota Power
Guest	Thomas	Blackburn	Gene Blackburn Engineering
Guest	Daniel	Blaydon	Baltimore Gas & Electric
Guest	Joshua	Bohrn	PacifiCorp
Guest	Jeremiah	Bradshaw	Bureau of Reclamation
Guest	Steven	Brzoznowski	Bonneville Power Administration
Guest	Juan	Carrizales	Prolec GE
Guest	Juan Carlos	Cruz Valdes	Prolec GE
Guest	Brandon	Dent	Memphis Light, Gas & Water
Guest	Stephanie	Denzer	Alliant Energy
Guest	Jeffrey	Door	H-J Family of Companies
Guest	Don	Dorris	Nashville Electric Service
Guest	Thomas	Eagle	SPX Transformer Solutions
Guest	Evgenii	Ermakov	Hitachi ABB Power Grids
Guest	Marco	Espindola	Hitachi ABB Power Grids
Guest	Feras	Fattal	Manitoba Hydro
Guest	Anthony	Franchitti	PECO Energy Company
Guest	Raymond	Frazier	Ameren
Guest	Jose	Gamboa	H-J Family of Companies
Guest	Rob	Ghosh	GE
Guest	Orlando	Giraldo	H-J Family of Companies

Guest	Shawn	Gossett	Ameren
Guest	Jeffrey	Gragert	Xcel Energy
Guest	Detlev	Gross	Power Diagnostix
Guest	Ismail	Guner	Hydro-Quebec
Guest	Michael	Hardin	H-J Enterprises, Inc.
Guest	Thomas	Hartmann	Pepco Holdings Inc.
Guest	John	Herron	Raytech USA
Guest	Saramma	Hoffman	PPL Electric Utilities
Guest	Ryan	Hogg	Bureau of Reclamation
Guest	Derek	Hollrah	Burns & McDonnell
Guest	Steve	Holsomback	Southern Company Services
Guest	George	Jalhoum	PPl
Guest	Stephen	Jordan	Tennessee Valley Authority
Guest	Akash	Joshi	Black & Veatch
Guest	Suleman	Khan	Ontario Power Generation
Guest	Peter	Kleine	US Army Corps of Engineers
Guest	Dmitriy	Klempner	Southern California Edison
Guest	William	Knapek	OMICRON electronics Corp USA
Guest	John	Lackey	PowerNex Associates Inc.
Guest	Donald	Lamontagne	Arizona Public Service Co.
Guest	Yaquan (Bill)	Li	BC Hydro
Guest	Balakrishnan	Mani	Virginia Transformer Corp.
Guest	Dennis	Marlow	DenMar TDS Transformers
Guest	Rogelio	Martinez	Georgia Transformer
Guest	James	McBride	JMX Services, Inc.
Guest	Zachary	Millard	Great River Energy
Guest	Rashed	Minhaz	Transformer Consulting Services Inc.
Guest	Meri	Mohamad	Siemens Industry
Guest	Paul	Morakinyo	PSEG
Guest	Emilio	Morales-Cruz	Qualitrol Company LLC
Guest	David	Murray	Tennessee Valley Authority
Guest	Ryan	Musgrove	Oklahoma Gas & Electric
Guest	Anthony	Natale	HICO America
Guest	Anastasia	O'Malley	Consolidated Edison Co. of NY
Guest	Parminder	Panesar	Virginia Transformer Corp.
Guest	Dipakkumar	Patel	Instrument Transformer Equip Corp
Guest	Nitesh	Patel	Hyundai Power Transformers USA
Guest	Rakesh	Patel	Hitachi-Powergrid
Guest	Sylvain	Plante	Hydro-Quebec
Guest	Timothy	Raymond	Electric Power Research Institute (EPRI)
Guest	Larry	Rebman	EMLS, Inc.
Guest	Jonathan	Reimer	FortisBC
Guest	Clemens	Reiss IV	Custom Materials, Inc.

Guest	Diego	Rincon	Electroporcelana Gamma
Guest	Diego	Robalino	Megger
Guest	Andre	Rottenbacher	Ritz Instrument Transformers
Guest	Hakan	Sahin	Virginia and Georgia Transformers
Guest	Dinesh	Sankarakurup	Duke Energy
Guest	Roderick	Sauls	Southern Company Services
Guest	Markus	Schiessl	SGB
Guest	Eric	Schleismann	Southern Company Services
Guest	Ewald	Schweiger	Siemens Energy
Guest	Cihangir	Sen	Duke Energy
Guest	David	Sheehan	HICO America
Guest	Peter	Sheridan	SGB USA, Inc.
Guest	Jonathan	Sinclair	PPL Electric Utilities
Guest	Kushal	Singh	ComEd
Guest	Christopher	Slattery	FirstEnergy Corp.
Guest	William	Solano	Instrument Transformer Equip Corp
Guest	Brian	Sparling	Dynamic Ratings, Inc.
Guest	Arthur	Speegle	Entergy Services, Inc.
Guest	Brad	Staley	Salt River Project
Guest	Kyle	Stechschulte	American Electric Power
Guest	Jacques	Vanier	Electro Composites (2008) ULC
Guest	Rogerio	Verdolin	Verdolin Solutions Inc.
Guest	Krishnamurthy	Vijayan	PTI Transformers
Guest	Loren	Wagenaar	WagenTrans Consulting
Guest	Dieter	Wagner	Hydro One
Guest	Hugh	Waldrop	Memphis Light, Gas & Water
Guest	Michael	Warntjes	American Transmission Co.
Guest	Daniel	Weyer	Nebraska Public Power District
Guest	William	Whitehead	Siemens Energy
Guest	Christopher	Whitten	Hitachi ABB Power Grids
Guest	Malia	Zaman	IEEE
Guest	Waldemar	Ziomek	PTI Transformers
Corresponding Member	Kris	Zibert	Allgeier, Martin and Associates

Annex A - Appendix B

S21 Unofficial Standards Status Report

Standard Project	Title	WG Chair	Pub Year Rev. Due Date	PAR Issue Par Expiration	Comments
PC57.19.00	IEEE Standard General Requirements and Test Procedure for Power Apparatus Bushings	P. Zhao	2004 12/2020	2018 12/2022	WG Draft Development Considered not active but is still available
C57.19.01	IEEE Standard Performance Characteristics and Dimensions for Outdoor Apparatus Bushings	S. Zhang	2017 12/2027		
PC57.19.02	Standard for the Design and Performance Requirements of Bushings Applied to Liquid Immersed Distribution Transformers	S. Shull	New	2016 12/2022	WG Draft Development
65700-19-03	IEC/IEEE International Standard -- Bushings for DC application	L. Recksiedler TBD	2014 12/2024	Develop PAR with IEC	Following the S21 meeting need to reaffirm the status with IEC
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		
PC57.19.100	IEEE Guide for Application of Power Apparatus Bushings	T. Spitzer	2012 12/2022	2019 12/2023	WG Draft Development

Annex A - Appendix C

PC57.19.00 - WG for the Revision of IEEE Standard General Requirements and Test Procedure for Power Apparatus Bushings

10:45 AM to 12:00 PM CST on Monday, April 26, 2021
On-Line Virtual Meeting

Unapproved Meeting Minutes

WG Chair Peter Zhao presided over the meeting, with David Stockton as the Secretary.

Member list was displayed, and a live poll was performed confirming there was a quorum present. Official attendance was generated from the information provided following the meeting from the PSAV meeting hosting service.

Total Attendance	88
Members in Attendance	24 out of 44 members, quorum attained
Guests in Attendance	64
Guests Requesting Membership	12

The WG Chair presented the agenda with the call for patents, none were received, and that copyright information can be found on the Transformer Committee website. The Secretary noted that the F20 minutes need to be approved and the agenda as well. The Chair asked if there were any objections or comments regarding the F20 minutes and none were received so they were noted as approved (motion by Jeff Benach, second by Shibao Zhang).

The remaining meeting time focused on review of the comments received from the review group with the attendees. The following is a summary of those discussions and resulting disposition or follow up action to be taken:

Review Section: 7. Test Procedure: Section 7.4.2 – S Zhang clarified comments.

Discussion, disposition, and/or follow up action:

- Accepted

Review Section: 7. Test Procedure –Proposed Change: Scott Digby proposed to add dry switching impulse testing.

Discussion, disposition, and/or follow up action:

- Need verbiage and help from testers; Dave Geibel to take lead (dmgeibel@yahoo.com).

Review Section: 3, Page 3, Section 3.6, line 11 – S We should clear up the notion that this requires a second capacitor to form a proper divider. **Proposed Change**: A connection to one of the capacitance layers which divides the layers into sections C1 and C2 such that the capacitance graded internal insulation forms a voltage divider.

Discussion, disposition, and/or follow up action:

- Revised: D Geibel and S Zhang to develop proposed verbiage.
- The following is some of the discussion that took place regarding this proposal:
  - Must have capability for C2 to operate in an ungrounded mode with continuous voltage (D Geibel and Sebastien Riopel discussion).
  - S Zhang questioned whether we should define continuous operating voltage for C2 voltage taps; agreed it would be valuable, but bushing OEMs are not ready to put that into values today without testing and design reviews.
  - Bruno Mansuy noted that monitoring devices typically require approx. 100 V; D Geibel noted that bushing potential devices require 6 to 8 kV.

Review Section: 3, Page 3, Subclause 3.10, line 22 – We need to distinguish between the high quality epoxy casting and, for example, the traditional polymer concrete, or bulk epoxy. **Proposed Change**: Geibel, Ryan Musgrove, Kyle Stechschulte, Raymond Curtiss Frazier, Hugo Flores to meet and provided revised definition(s) within 2 months. Direction seems to be leave composite definition as-is, and add definition for dry-type bushings which is consistent with TF Dry Bushings and HVDC standard.

Discussion, disposition, and/or follow up action:

- Revised: D Geibel to lead TF mentioned above to provide revised definition(s) within 2 months.
- The following is some of the discussion that took place regarding this proposal:
    - Extensive conversation back and forth about the definition of "composite bushing." It seems that the term was coined from composite insulators, i.e. silicone sheds, and has evolved into the term composite bushings. End users Anthony Franchitti and Raymond Curtis Frazier confirmed their expectation of a composite bushing refers to no porcelain outer insulator.
    - Devki Sharma noted that the IEC definition is the same as IEEE.
    - Art del Rio noted that we need to be consistent with the HVDC references.

Meeting was adjourned, 12:15pm. Motion by Dave Geibel, second by Durand Stacy

Respectfully Submitted,
WG Secretary David Stockton

Recorded Attendance as provided by PSAV data following the virtual meeting

Role	First Name	Last Name	Company
Chair	Peter	Zhao	Hydro One
Secretary	David	Stockton	H-J Family of Companies
Member	Jeff	Benach	Weidmann Electrical Technology
Member	Barry	Beaster	H-J Enterprises, Inc.
Member	Stephen	Jordan	Tennessee Valley Authority
Member	Devki	Sharma	Entergy
Member	Richard	vonGemmingen	Dominion Energy
Member	Scott	Digby	Duke Energy
Member	Thomas	Spitzer	City Transformer Service Co.
Member	J. Arturo	Del Rio	Siemens Energy
Member	Shibao	Zhang	PCORE Electric
Member	Sebastien	Riopel	Electro Composites ULC
Member	Eric	Weatherbee	PCORE Electric
Member	Mario	Locarno	Doble Engineering Co.
Member	Troy	Tanaka	Burns & McDonnell
Member	Egon	Kirchenmayer	Siemens Energy
Member	Marek	Kornowski	Polycast International
Member	Eric	Schleismann	Southern Company Services
Member	William	Solano	Instrument Transformer Equip Corp
Member	Eric	Euvrard	RHM International
Member	Niklas	Gustavsson	Hitachi ABB Power Grids
Member	Bruno	Mansuy	Trench France SAS
Member	Robert	Middleton	RHM International
Member	Raja	Kuppuswamy	Dynamic Ratings, Inc.
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Guest	Dennis	Marlow	DenMar TDS Transformers
Guest	William	Boettger	Boettger Transformer Consulting LLC
Guest	Juan	Castellanos	Prolec GE
Guest	Javier	Arteaga	ABB Enterprise Software Inc
Guest	Dinesh	Sankarakurup	Duke Energy
Guest	Philip	Hopkinson	HVOLT Inc.
Guest	Christopher	Baumgartner	We Energies
Guest	Gael	Kennedy	GR Kennedy & Associates LLC
Guest	Ewald	Schweiger	Siemens Energy
Guest	Rogerio	Verdolin	Verdolin Solutions Inc.
Guest	Gary	Hoffman	Advanced Power Technologies
Guest	Neil	Strongosky	Memphis Light, Gas & Water
Guest	John	Brafa	Hub City Consulting Services
Guest	Shamaun	Hakim	WEG Transformers USA Inc.

Recorded Attendance as provided by PSAV data following the virtual meeting

Guest	Jose	Gamboa	H-J Family of Companies
Guest	Poorvi	Patel	Electric Power Research Institute (EPRI)
Guest	Juan Carlos	Cruz Valdes	Prolec GE
Guest	Daniel	Sauer	EATON Corporation
Guest	Anthony	Natale	HICO America
Guest	Huan	Dinh	Hitachi ABB Power Grids
Guest	Krishnamurthy	Vijayan	PTI Transformers
Guest	Ryan	Musgrove	Oklahoma Gas & Electric
Guest	Jos	Veens	SMIT Transformatoren B.V.
Guest	David	Murray	Tennessee Valley Authority
Guest	John	John	Virginia Transformer Corp.
Guest	Steven	Brzoznowski	Bonneville Power Administration
Guest	Christopher	Whitten	Hitachi ABB Power Grids
Guest	Kurt	Kaineder	Siemens Energy
Guest	Orlando	Giraldo	H-J Family of Companies
Guest	Kristopher	Neild	Megger
Guest	Jason	Varnell	Doble Engineering Co.
Guest	Jonathan	Reimer	FortisBC
Guest	Anthony	Franchitti	PECO Energy Company
Guest	Diego	Rincon	Electroporcelana Gamma
Guest	Yves	Vermette	Electro Composites ULC
Guest	Kris	Zibert	Allgeier, Martin and Associates
Guest	Raka	Levi	Retired
Guest	Wayne	Ellis	Memphis Light, Gas & Water
Guest	William	Whitehead	Siemens Energy
Guest	Anastasia	O'Malley	Consolidated Edison Co. of NY
Guest	Feras	Fattal	Manitoba Hydro
Guest	Peter	Kleine	US Army Corps of Engineers
Guest	Malia	Zaman	IEEE
Guest	Brady	Nesvold	Xcel Energy
Guest	George	Partyka	PTI Transformers
Guest	Nitesh	Patel	Hyundai Power Transformers USA
Guest	Jorge	Cantu de Leon	SPX Transformer Solutions, Inc.
Guest	Juan	Ramirez	CELECO
Guest	John	Reagan	Oncor Electric Delivery
Guest	Kyle	Stechschulte	American Electric Power
Guest	Yaquan (Bill)	Li	BC Hydro
Guest	Matthew	McFadden	Oncor Electric Delivery
Guest	Jeffrey	Door	H-J Family of Companies
Guest	Tim	Rocque	SPX Transformer Solutions, Inc.
Guest	Stefan	Schindler	Maschinenfabrik Reinhausen
Guest	Raymond	Frazier	Ameren
Guest	Onome	Avanoma	Transformer Consulting Services Inc.

Recorded Attendance as provided by PSAV data following the virtual meeting

Guest	Roger	Hedlund	Hitachi ABB Power Grids
Guest	Kayland	Adams	SPX Transformer Solutions, Inc.
Guest	Susan	Bonfiglio	Western Area Power Admin.
Guest	Edmundo	Arevalo	Bonneville Power Administration
Guest	Nicholas	Podany	Bureau of Reclamation
Guest	Brandon	Dent	Memphis Light, Gas & Water
Guest	Mubarak	Abbas	Siemens Industry
Guest	Dipakkumar	Patel	Instrument Transformer Equip Corp
Guest	Didier	Hamoir	Transformer Protector Corp
Guest	Olle	Benzler	Megger
Guest	Michael	Warntjes	American Transmission Co.
Guest	Jacques	Vanier	Electro Composites (2008) ULC
Guest	Derek	Hollrah	Burns & McDonnell
Guest	Nick	Sewell	Alabama Power
Guest	Jonathan	Deverick	Dominion Energy

Annex A - Appendix D

Distribution Transformer Subcommittee
Task force / Working Group Report

Document #: PC57.19.02

Document Title: Standard for Design and Performance Requirements for Bushings Applied to Liquid Immersed Distribution Transformers

Chair: Steve Shull **Vice-Chair** Ed Smith

Secretary Rhett Chrysler **Percent Complete** 60

Current Draft Being Worked On: D1.7 **Dated:** March 2020

Meeting Date: April 27, 2021 **Time:** 10:50 am – 12:05 pm

Attendance:

NAME	Affiliation	M or G
Adrian Sligardo	IPD Corporation	G
Alan Traut	Howard Industries	M
Alan Wilks	Consultant	M
Albert Sanchez	Knoxville Utilities Board	G
Ali Ghafourian	H-J Enterprises, Inc.	M
Andrew Larison	Hitachi ABB Power Grids	G
Angela Amador	EATON Corporation	G
Barry Beaster	The H-J Family of Companies	M
Carlos Gaytan	Prolec GE	M
Chris Pitts	Howard Industries	G
Christopher Whitten	Hitachi ABB Power Grids	G
Clemens Reiss IV	Custom Materials, Inc.	M
Darren Brown	Howard Industries	M
David Geibel	Hitachi ABB Power Grids	M
David Stockton	Stockton Consulting	M
Diego Rincon	Electroporcelana Gamma	G
Duy Vo	Central Maine Power (AVANGRID)	G
Edward Smith	H-J Family of Companies	VCHR
Eric Weatherbee	PCORE Electric	M

Name	Affiliation	M or G
Fabian Stacy	Hitachi ABB Power Grids	M
Gary King	Howard Industries	G
George Partyka	PTI Transformers	G
Giovanni Hernandez	Virginia Transformers Corporation	G
Hamid Sharifnia	Consultant	G
Huan Dinh	Hitachi ABB Power Grids	M
Jacques Vanier	Electro Composites (2008) ULC	G
Javier Arteaga	Hitachi ABB Power Grids	M
Jeffrey Door	H-J Family of Companies	G
Jerry Murphy	Reedy Creek Energy Services	M
Jose Gamboa	H-J Family of Companies	M
Joshua Verdell	ERMCO	M
Joshua Yun	Virginia Transformer Corporation	M
Juan Ramirez	CELECO	M
Kendrick Hamilton	Power Partners, Inc.	G
Kunal Shukla	PECO Energy Company	G
Lee Matthews	Howard Industries	G
Lee Tyler	Warco, Inc.	M
Marek Komowski	Polycast International	M

Name	Affiliation	M or G
Martin Rave	ComEd	M
Michael Dahlke	Central Moloney, Inc.	M
Michael Morgan	Duke Energy	M
Mubarak Abbas	Siemens Industry	G
Orlando Giraldo	H-J Family of Companies	G
Parminder Panesar	Virginia Transformer Corp.	G
Paul Gabriel Florida	Howard Industries, Inc.	G
Poorvi Patel	Electric Power Research Institute (EPRI)	M
Pragnesh Vyas	Sunbelt-Solomon Solutions	M
Ramadan Issack	American Electric Power	M
Rhett Chrysler	ERMCO	SEC
Robert Reepe	Georgia Power Co.	G
Ryan Hogg	Bureau of Reclamation	G
Said Hachichi	Hydro-Quebec	M
Shelby Walters	Howard Industries	M
Stefan Schindler	Maschinenfabrik Reinhausen	G
Stephen Shull	BBC Electrical Services, Inc.	CHR
Timothy Tillery	Howard Industries	M
Weijun Li	Braintree Electric Light Dept.	M
Yves Vermette	Electro Composites ULC	M

Meeting Minutes:

The chair called the meeting to order at 10:50 am. A quorum was established via WebEx poll with 32/59 (54%) members participating.

Chair presented the agenda. A motion was made to approve by Jerry Murphy, second by David Geibel with unanimous approval.

A motion was made to approve the Fall 2020 minutes (Virtual) by Marty Rave, second by Jerry Murphy with unanimous approval.

The Chair presented the IEEE SA slides for Essential Patent Claims. The Chair asked for any patents that need to be called to the attention of the working group. None were stated. The chair showed the copyright policy for the group and explained its requirements.

Distribution Transformer Subcommittee
Working Group Report

Old Business

Taskforce report – Table 4 – Lee Tyler

- Table 4 draft includes minimum creep distances for light and heavy contamination distribution bushings for nominal system voltages 1.2 kV through 34.5 kV
- Draft included creep distance comparisons between various IEEE standards including C37.100.1, C57.12.20, C57.19.01, and C57.15
- 18 kV class bushings were removed due to inconsistent findings
- Minimum creep values were proposed using 28 mm/kV for light duty and 44 mm/kV for heavy duty applications
- There was a good discussion which included topics such as potential impact on bushing manufacturers, overall transformer height, and basis for various standard recommendations. It was also noted that IEEE requirements differ from IEC requirements where IEEE states an absolute minimum creep distance where IEC states a nominal minimum creep distance.
- A proposal was made to copy the Proposed Maximum Line to Ground Bushing Rating and Nominal System Voltage columns to the minimum creep light and heavy duty requirements respectively. These values would represent the creep inch requirements. These values are also consistent with C57.19.01 creep requirements and methodology.
- A motion was made by David Geibel, second by Lee Tyler to accept these minimum creep values:

Nominal System Voltage	BIL	MINIMUM CREEP DISTANCE	
(kV)	(kV)	Light Contamination mm (in)	Heavy Contamination mm (in)
1.2	30	(24) 1	(30) 1.2
2.5	45	(50) 2	(64) 2.5
5.0	60	(100) 4	(127) 5
8.7	75	(165) 6.5	(220) 8.7
15	95	(254) 10	(381) 15
15	110	(254) 10	(381) 15
25	125	(405) 16	(635) 25
25	150	(405) 16	(635) 25
34.5	150	(560) 22	(880) 35
34.5	200	(560) 22	(880) 35

- The motion passed with 27 for, 2 against, and 3 abstained.
- Chair advised that the draft document will be updated with Table 4 including this data. This would be posted on the webpage for final review. It was requested that everyone review this before the next meeting and be prepared to discuss it at the next meeting.

New business

No new business was brought forward.

Meeting was adjourned at 11:56 am.

Next meeting is scheduled for the Fall 2021 Transformer Committee meeting.

Submitted by: Rhett Chrysler

Date: 4/27/2021

Page 2 of 2

Annex A - Appendix E

IEC/IEEE 65700_19_03 DC Bushings TF

Minutes of 2021 Spring Meeting – Virtual Meeting
Tuesday, April 27, 2021 Session 6 2:20 – 3:35PM Central time

Vacant – Chair

Vacant – Vice Chair **J. Arturo Del Rio – Secretary**

The task force for the proposed revision of 65700.19.03 met virtually in WebEx on Tuesday April 27, 2021, at 2:20 PM

1. **Welcoming and Call for Patents, Copyrights**
   - The meeting was called to order at 2:20 PM by the TF Secretary Arturo Del Rio.
   - Due to personal reasons, the TF Chair Leslie Recksiedler has resigned. The Task Force is looking for a volunteer to fill this roll. Leslie is planning to return in 2022.
   - Currently, the positions for Chair and Vice Chair are vacant and looking for volunteers for the rolls.
   - The TF Secretary did a call for potentially essential patents and copyrights issues as slides sent in advance in meeting invite. None were reported.
2. **Verification of Quorum**
   - The virtual attendance was checked with a Poll from Webex Encore
   - There was a total of 20 participants: 5 Members and 15 Guests out of which 2 guests requested membership, not granted based on meeting attendance guidelines
   - 5 of the current 8 TF Members were present and quorum to carry out business was met.
   - The agenda for the meeting which was circulated by email among members and guests on April 19, 2021, was presented to the participants.
   - There were no objections, and the agenda was approved unanimously.
3. **Approval of the minutes of the October 20, 2020, virtual meeting**
   - The minutes from the F20 virtual meeting, which were circulated on April 19, 2021 by email, were presented to the participants.
   - There were no objections or comments and the minutes were approved unanimously.
4. **Discussion and Review**

The minutes from the previous Fall 2020 Virtual meeting contained the lists of items and topics from the IEC and IEEE sides that have been identified needing revision or updating. For convenience, the list from the IEC survey is included below.

Mr. Lars Jonsson, IEC Chairperson- IEC survey results:
Proposal for the revision has covered as following, but not limited to:

1) Alignment of IEC/IEEE 65700-19-03 with IEC 60137
    - Altitude correction is now inconsistent, and there may also be a need for clarification whether site conditions or test conditions shall be the base.
    - Creepage distance calculation to be clarified
    - The consequences of some of the cross references between the two documents should be reviewed, and clarifications added. Areas where different interpretations from different stakeholders have been noted concerns cantilever testing and impulse testing.
    - Clarification regarding calculations of equivalent currents.
2) Take in consideration the possibility to decouple the two standards,
3) Necessity to provide a different variable name for the rated voltage for bushings for combined voltage application
4) Review the necessity of possible extension of qualifying DC tests

The maintenance procedure of IEC / IEEE dual logo standard can refer to the document "Guide to IEC/IEEE cooperation". If both organizations agreed to revise the mentioned standard, the procedure for maintenance of a joint IEC/IEEE International Standard is the same as the procedure for joint development.

From the IEEE side, the major areas needing standard revision are listed below:

- **Current Title**: IEEE 65700-19-03-2014 - IEC/IEEE International Standard -- Bushings for DC application, IEEE need to be completed by 2024. IEC by 2022
- VSC to be moved from Annex to inside standard
- 800 kV DC and 1100 kV DC bushings to be included – Any changes to the standard to accommodate
- Resin Impregnated Synthetic (RIS) Bushings to be included. The bushing's core is wound with synthetic fabrics
- Hybrid Insulation Bushings if required
- Extended DC polarity reversion test to conform with the revised test in the converter Transformers standard

Each of these topics was briefly discussed among the participants and it was agreed that these topics could be address by the task force/working group. Only pending for clarification is the context of 'hybrid insulation bushing' used by the Chair in previous meetings.

5. New Business

- Major areas of the standard needing revision to be identified. Volunteers required to review sections.
- PAR to be created to move from Task Force to Working Group in conjunction with IEC– Title, Scope and Purpose, once the revision timeline with IEC is coordinated.

- The Bushings Subcommittee Chair, Eric Weatherbee, will be contacting Mr. Lars Jonsson for coordinating the PAR submission activity prior to the IEC General Meeting taking place in June 2021.

6. Meeting Adjournment @ 3:15 pm

Next Meeting is planned to take place in Milwaukee, Wisconsin, on October 17-21, 2021.

Submitted respectfully,

Art Del Rio (a.delrio@ieee.org)
TF Secretary

Meeting Attendance and Membership standing.

Role	First Name	Last Name	Company	City	State
Guest	Mubarak	Abbas	Siemens Industry	Raleigh	NC
Secretary	J. Arturo	Del Rio	Siemens Energy	Raleigh	NC
Guest	Eric	Euvrard	RHM International	Brookline	MA
Guest	David	Geibel	Hitachi ABB Power Grids	Murray	KY
Member	Kurt	Kaineder	Siemens Energy	Leonding	Other
Guest	John	Lackey	PowerNex Associates	Longford Mills	ON
Guest	Bruno	Mansuy	Trench France SAS	Saint Louis	Other
Guest	Nitesh	Patel	Hyundai Power Tr	Montgomery	AL
Guest	Dipakkumar	Patel	Instrument Transformer	Matthews	NC
Member	Ulf	Radbrandt	Hitachi ABB Power Grids	Ludvika	Other
Guest	Juan	Ramirez	CELECO	Apodaca	Other
Guest	Stefan	Schindler	Reinhausen	Regensburg	Other
Guest	William	Solano	Instrument Transformer	Monroe	NC
Guest	Brian	Sparling	Dynamic Ratings, Inc.	Surrey	BC
Member	Fabian	Stacy	Hitachi ABB Power Grids	Alamo	TN
Guest	Troy	Tanaka	Burns & McDonnell	Kansas City	MO
Guest	Yves	Vermette	Electro Composites ULC	St-Jerome	QC
Member	Eric	Weatherbee	PCORE Electric	LeRoy	NY
Guest	William	Whitehead	Siemens Energy	Raleigh	NC
Guest	Christopher	Whitten	Hitachi ABB Power Grids	Alamo	TN

Annex A - Appendix F

C57.19.100 Bushing Application Guide Meeting Minutes

4/26/2021 Spring Virtual Meeting

Tommy Spitzer Chair **Jeff Benach Secretary**

The meeting was called to order at 2:22 CST with xx people present, 19 members 16 guests with 4 requests for membership. Quorum was achieved.

After introductions, a request for patent disclosures was made and none were presented.

Motion to approve the Agenda by Dave Geibel, 2nd by Eric Wetherbee

Minutes from the Fall 2020 meeting minutes were approved by Eric Weatherbee, 2nd by David Stockton

All copied or used information must be copyrighted and referenced in all releases of distributed documents.

Review of the changes to the guide were posted by the chair. The Chair would like to get the changes reviewed so it can go to ballot by the next meeting.

Discussion was held on how to specify the temperature rating of bushings, some suggested that the guide should state that the bushing ratings should be rated by the bushing manufacturer. Others felt that the guide should state that bushings should be selected by choosing one that is rated 20% above the transformer over load rating.

Further discussion was held on whether this should apply to just OIP bushings.

Motion to adjourn by Fabian Durand Stacy, 2nd by Eric Weatherbee

The meeting was adjourned at 3:35 PM CST

Attendance:
1.Quorum
A.Member 19/44 (43%)
B.Guest 16/44 (36%)
C.Requesting Membership 4/44 (9%)
No Answer 5/44 (11%)

	A	B	C
Jeff Benach	X		
Timothy Raymond		X	
Diego Rincon			
Sebastien Riopel	X		
Bob Middleton	X		
Jacques Vanier		X	
William Boettger		X	
Gene Blackburn	X		
Toby Johnson			
yvermette@hubbell.com	X		
Devki Sharma	X		

Tommy Spitzer	X			
Diego Robalino			X	
David Stockton	X			
Hugo Flores			X	
Troy Tanaka		X		
Juan Carlos Cruz Valdes		X		
Barry Beaster		X		
Fabian Durand Stacy				
Andrea Glynn				
Susan		X		
Mario Locarno	X			
Eric Schleismann		X		
ieee349200	X			
Loren Wagenaar		X		
Javier Del Rio	X			
Christopher Whitten		X		
Scott Digby	X			
Mubarak abbas		X		
Michael Hardin	X			
Tony Reiss		X		
Afshin Rezaei-Zare			X	
David Geibel	X			
Dan Schwartz		X		
Anthony Natale	X			
Eric Euvrard		X		
Shibao Zhang	X			
Orlando Giraldo		X		
Eric Weatherbee	X			
Thomas Hartmann				
Peter Werelius		X		
bruno mansuy	X			
Egon Kirchenmayer	X			
Kurt Kaineder			X	

Annex A - Appendix G

IEEE/PES TRANSFORMERS COMMITTEE

Bushings Subcommittee

TF Classification and Performance of Dry Type Bushings

Virtual

Monday, April 26, 2021

The Task Force group met virtually on WebEx on Monday April 26, 2021, at 3:45 PM session 2. This was the second meeting of this TF.

1. Welcome

2. Welcoming and Call for Patents

- The meeting was called to order at 3:45 PM by the TF Chair Art Del Rio.
- The TF Chair, Art Del Rio, did a call for potentially essential patents and copyrights issues. None were reported.

3. Verification of Quorum

- The TF Chair called for a quorum poll were 13 out of 20 members were present.
- In attendance was 12 guests and 7 requesting membership with 1 attendee not answering the poll.
- There was a total of 33 participants out of which were 13 members. Membership list and status attached in these minutes.

4. Approval of Agenda

- There were no objections to approving the agenda.

5. Approval of the minutes of the October 19, 2020 meeting

- There were no objections to approving the previous minutes.

6. Definitions in existing bushing standards.

- The Bushing SC has indicated that the TF should be looking at the definitions and the different standards. Previous discussions have taken place prior to this meeting, for instance, Peter Zhao's WG on C57.19.00. Some definitions as simply as "Composite Bushing" has implications to different users and manufacturers.
- Examples of "Terms and definitions" were presented and should be reviewed.
    - IEC/IEEE 65700-19-03:2014 (stated in section 3)
    - C57.19.04-2018 (the only definition found is in section 6)
    - C57.19.100-2012 (definitions in section 3 – all related to OIP technology)
    - C57.19.00-2004 (more extensive number of definitions in section 3)
- Art Del Rio (TF Chair) opened the floor to discussion on any particular definition. How do the users or manufacturers use or view the terms? Summary of the discussion below:

- Dry type/composite type bushings have not been addressed. Performance has not been addressed, particularly overloading capability. For example, under C57.19.00 and C57.19.100 we don't have a clear format of framework to start. We should review all documents to shape our work. Should there be two types, oil type and dry type? We need to develop something, since there is a need.
- The priorities for the TF were restated. For instance, C57.19.00-2004 has resin-bonded paper definitions (3.35), but no resin-impregnated synthetic definition. These definitions are going to be the basis if we decide to go ahead with a new document, guide, or extension of existing documents.
- We would like to avoid specific construction or materials. Use the performance levels to address issues if possible. There is a lot of new technology and we should invite the most appropriate experts into the discussions.
- A new dry type standard approach could be difficult to get through the SC. We should try to fit the work into the existing standards.
- There are some specific differences between Oil filled vs dry type bushings. Discussions of these differences should take place, specifically related to performance. PF correction and operational limits are some examples to be discussed and captured. Classification and performance are not captured anywhere.
- General PF temp correction is not available due to manufacturer's design and different materials used.
- Maybe listing the common dry type related industry questions can be the driving motivation behind this TF work.

7. Scope of TF. Discussion based on draft scope/purpose.

- Based on the last meetings, the chair came up with the following immediate scope and secondary draft TF scope. This was presented again here at the current meeting.
    - Immediate scope as per Bushing Subcommittee request: Review and revise as needed the definitions for "composite" transformer bushings (dry type) related to their use and applicability in the C57.19 series bushing standards, specifically C57.19.00 and C57.19.100 (application guide) currently under revision.
    - Draft TF Scope: Review existing IEEE power transformer and reactor bushing standards, guides and practices (based on C57.19 series) and determine the industry need for a new standard, guide or technical report for dry-type technologies used in liquid-filled transformer bushings. Such document should determine the classification and performance requirements for dry type transformer bushings and allow the transformer OEMs and end-users to select a dry-type bushing technology. The task force will report their findings to the Bushings Subcommittee with a recommendation on next steps.
- Are we aware of anything specifically in 19.01 that needs to be revised related to dry type bushings? Comparing the IEC with 19.01, RIS is not there. Users might appreciate insulator type information, in an annex for example.
- C57.12.00 has some performance characteristics for less than 34.5kV. These would include some dry type bushings and can be found in table 9 of the 2015 revision.

C57.19.01 currently starts from 25kV. In the past the lowest voltage was only 15kV. Table 9 specifies from 1.2kV to 34.5kV. Many of them fall together with the distribution transformers. We may need to consider C57.19.01 and C57.19.02.

- Table 9 of C57.12.00 mentions C57.19.01 in the table title. Previously the recommendation was made to add C57.19.04 to that table title.
- Maybe we should ask for volunteers from dry type bushing manufacturers and users to review 19.00 and 19.100. They will be the most familiar with the areas that need to be updated. It may or may not be possible to address areas before these go to ballot.
- During the C57.19.00 meeting this morning, a small group was put together to review the definitions in that documents, specifically talking about composite bushings. Should we reach out to this group and partner with them? As they do overlap and we should reach out to Dave Geibel to get some input from them. During the C57.19.00 meeting, there were several others topics related to definitions that where not addressed. They only made it to the Dave's comments on the definition of composite bushings.
- IEC already has the definition of RIS. Can we simply add the definition to IEEE? We need to reach a consensus if we need to move in this direction.
- Defining a dry bushing is a difficult task. The need for a functional comparison exists. The end user needs a list of functions of the RIP/RIS/etc and how they are applicable (different from OIP). From a user standpoint this information would be useful.
- As a standard, we cannot get into the detailed comparison of bushing technology performance. The standard sets the performance requirements that all bushings must meet. Setting performance characteristics for bushings is the goal of the standards, not to set different requirements for different manufactured bushings.
- The TF was established to determine classification and performance requirements for dry type bushings. IEC approach uses a simply table. We can take a look at IEC, CSA, existing tables. It would be good for manufacturers and users to look at the tables to see what we should do.
- Maybe we can have a meeting in June or July to look at C57.19.00 and C57.19.100 to see what could be added or updated. We should review the documentation. It may be that we respond to the SC and indicate there is no need for new documents, if that is the case. Is there any other information that users would like to see in the standards or guides?
- It would be useful to know the advantages of LSR vs HTV technology. Also, it would be good to go through the documents and look for gaps. Maybe dry type information could be added before C57.19.00 and C57.19.100 goes to ballot. The timeline for C57.19.100 is next year.

8. New Business

- Consensus was made to review the existing documents.
- Durand Stacy and Poorvi Patel volunteered to review C57.19.100
- Sebastien Riopel, Art Del Rio, and Eric Euvrard volunteered to look at C57.19.00

IEEE/PES TRANSFORMERS COMMITTEE

Bushings Subcommittee

****

9. Adjournment

- The Webex meeting was adjourned at 5:00 PM.

Next Meeting is planned to take place in Milwaukee, Wisconsin, on **October 17-21**, 2021.

Respectfully submitted,
Chair: Art Del Rio (a.delrio@ieee.org)
Secretary: Chris Whitten (christopher.l.whitten@hitachi-powergrids.com)

IEEE/PES TRANSFORMERS COMMITTEE

Bushings Subcommittee

Attendance and membership status

Role	First Name	Last Name	Company	City	State	Country
Guest	Javier	Arteaga	Hitachi ABB Power Grids	Raleigh	NC	USA
Guest	Suresh	Babanna	SPX Transformer Solutions, Inc.	Goldsboro	NC	USA
Guest	Jeremiah	Bradshaw	Bureau of Reclamation	Denver	CO	USA
Chair	J. Arturo	Del Rio	Siemens Energy	Raleigh	NC	USA
Member	Jonathan	Deverick	Dominion Energy	Richmond	VA	USA
Member	Scott	Digby	Duke Energy	Raleigh	NC	USA
Guest	Huan	Dinh	Hitachi ABB Power Grids	Lexington	KY	USA
Guest	Jeffrey	Door	H-J Family of Companies	High Ridge	MO	USA
Member	Eric	Euvrard	RHM International	Brookline	MA	USA
Guest	Reto	Fausch	RF Solutions	Monterey	CA	USA
Guest	Hugo	Flores	Hitachi ABB Power Grids	Alamo	TN	USA
Member	Raymond	Frazier	Ameren	Arnold	MO	USA
Guest	Jose	Gamboa	H-J Family of Companies	High Ridge	MO	USA
Guest	Ali	Ghafourian	H-J Enterprises, Inc.	Athens	GA	USA
Guest	Ryan	Hogg	Bureau of Reclamation	Denver	CO	USA
Guest	Stephen	Jordan	Tennessee Valley Authority	Chattanooga	TN	USA
Member	Kurt	Kaineder	Siemens Energy	Leonding	Other	Austria
Guest	Marek	Kornowski	Polycast International	Winnipeg	MB	Canada
Member	Mario	Locarno	Doble Engineering Co.	Marlborough	MA	USA
Member	Bruno	Mansuy	Trench France SAS	Saint Louis	Other	France
Guest	Vinay	Mehrotra	SPX Transformer Solutions, Inc.	Waukesha	WI	USA
Guest	Parminder	Panesar	Virginia Transformer Corp.	Roanoke	VA	USA
Guest	George	Partyka	PTI Transformers	Regina	SK	Canada
Guest	Poorvi	Patel	Electric Power Research Institute (EPRI)	Ballwin	MO	USA
Guest	Juan	Ramirez	CELECO	Apodaca	Other	Mexico
Guest	Jonathan	Reimer	FortisBC	Kelowna	BC	Canada
Member	Sebastien	Riopel	Electro Composites ULC	St-Jerome	QC	Canada
Guest	Eric	Schleismann	Southern Company Services	Forest Park	GA	USA
Guest	Stephen	Shull	BBC Electrical Services, Inc.	Joplin	MO	USA
Member	William	Solano	Instrument Transformer Equip Corp	Monroe	NC	USA
Guest	Fabian	Stacy	Hitachi ABB Power Grids	Alamo	TN	USA
Guest	Hampton	Steele	TVA	Hixson	TN	USA
Member	David	Stockton	Stockton Consulting	Arnold	MO	USA
Guest	Jacques	Vanier	Electro Composites (2008) ULC	St-Jerome	QC	Canada
Guest	Yves	Vermette	Electro Composites ULC	St-Jerome	QC	Canada
Guest	Loren	Wagenaar	WagenTrans Consulting	Marysville	OH	USA

TF Requirements for Dry Type bushings
S21, Virtual
April 26, 2021

IEEE/PES TRANSFORMERS COMMITTEE

Bushings Subcommittee

Member	Eric	Weatherbee	PCORE Electric	LeRoy	NY	USA
Secretary	Christopher	Whitten	Hitachi ABB Power Grids	Alamo	TN	USA
Member	Shibao	Zhang	PCORE Electric	LeRoy	NY	USA
Member	Peter	Zhao	Hydro One	Toronto	ON	Canada

Annex A - Appendix H

SPRING 2021 MEETING OF IEEE TRANSFORMER BUSHINGS

Location: VIRTUAL Meeting

Date: April 26-29, 2021

BUSHINGS SUBCOMMITTEE WORKING GROUP AND TASK FORCE MEETINGS

Liaison Reports - IEC Bushing Standardization Activities

INTERNATIONAL ELECTROTECHNICAL COMMISSION
TECHNICAL COMMITTEE No.36A: Insulated Bushing

Revision of IEC 60599	Revision of IEC60599 (Mineral oil-filled electrical equipment in service – Guidance on the interpretation of dissolved and free gases analysis) on going. Discussions next virtual meeting on June 15th, 2021. Main change: revision of Annex A.5 on bushings, at the request of SC36A, in order to transfer to 60599, the corresponding contents of TR 61464 of SC36A on DGA in bushings. Also, to transfer the new information on DGA in bushings available in CIGRE Technical Brochure # 771 (2019)
Revision of IEC 60475 **Method of sampling Insulating Fluids**	Revision of IEC60475 (Method of sampling Insulating Fluids) on going Main change: addition of new Annex C on sampling of oil from bushings, at the request of SC36A, in order to transfer to 60475 the corresponding contents of TR 61464 of SC36A on oil sampling from bushings.
SC 36A Bushing dimensional standardization	A draft report has been finalized summarizing the possible standardization of LV (< 1 kV) , MV (1 to 52 kV) and HV (72.5 to 500 kV) transformer bushings. It is covering OIP, RIP and RIS technology. Discussions planned during next virtual meeting on June 15th, 2021
Guide of application for power apparatus bushings	Study the feasibility of this document. Discussions next virtual meeting on June 15th, 2021.

IEC 60137 Insulated bushings for alternating voltages above 1kV	Evaluation of the necessity to propose a revision of this document to take in consideration suggestion and request of amendment or improvement received until now.
Dual logo IEC/IEEE 65700-19-03 "Bushings for DC application"	Evaluation whether revision is needed. Discussions next virtual meeting on June 15th, 2021.