



Transformers Committee

Chair: Bruce Forsyth **Vice Chair:** Ed teNyenhuis **Secretary:** David Wallach
Treasurer: Paul Boman **Awards Chair/Past Chair:** Sue McNelly
Standards Coordinator: Jim Graham

IEEE/PES
Transformers
Committee

Fall 2020 Meeting Minutes

Virtual Sessions
October 19-22, 2020

Unapproved

(These minutes are on the agenda to be approved at the next meeting in Spring 2021)

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- 6.0 Secretary’s Report – David Wallach
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ANNEXES – UNAPPROVED MINUTES OF TECHNICAL SUBCOMMITTEES

***NOTE:** The Annexes included in these minutes are **unapproved** by the respective subcommittees and are accurate as of the date the Transformers Committee meeting minutes were published. Readers are encouraged to check the Transformers Committee website (www.transformerscommittee.org) for the latest revision of the unapproved and the minutes of the next Transformers Committee meeting for final revisions prior to approval.*

- Annex A. Bushings SC – Eric Weatherbee
- Annex B. Dielectric Tests SC – Ajith Varghese
- Annex C. Distribution Transformers SC – Ed Smith
- Annex D. Dry Type Transformers SC – Casey Ballard
- Annex E. HVDC Converter Transformers & Reactors – Ulf Radbrandt
- Annex F. Instrument Transformers SC – Thomas Sizemore
- Annex G. Insulating Fluids SC – Scott Reed
- Annex H. Insulation Life SC – Sheldon Kennedy
- Annex I. Meetings SC – Tammy Behrens
- Annex J. Performance Characteristics SC – Rogerio Verdolin
- Annex K. Power Transformers SC – Bill Griesacker
- Annex L. Standards SC – Jerry Murphy
- Annex M. Underground Trans & Network Protectors SC – George Payerle

General Administrative Items

1 AGENDA

Opening Session

Monday, October 19: 8:00 am - 9:15 am

(Attendance recorded by RFID – attendance required to maintain Member status)

1. Welcome and Announcements Bruce Forsyth
2. Meeting Minute Tammy Behrens
3. Approval of Agenda Bruce Forsyth
4. Approval of Minutes from Fall 2019 Meeting Bruce Forsyth
5. Chair's Report & Administrative Subcommittee Report Bruce Forsyth
6. Vice Chair's Report Ed teNyenhuis
7. Secretary's Report David Wallach
8. Treasurer's Report Paul Boman
9. Standards Report Jim Graham
10. Liaison Representative Reports
 - 10.1. CIGRE Craig Swinderman
 - 10.2. IEC TC-14 Christoph Ploetner
 - 10.3. Standards Coordinating Committee, SCC4 (Electrical Insulation) Evanne Wang
 - 10.4. ASTM Tom Prevost
11. Hot Topics for the Upcoming Week Subcommittee
Chairs
12. New Business & Wrap-up Bruce Forsyth

Closing Session

Thursday, October 22, 2020: 11:00 am - 12:00 pm

1. Chair's Remarks and Announcements Bruce Forsyth
2. Meetings Planning Subcommittee Tammy Behrens
3. Reports from Technical Subcommittees (decisions made during the week)
 - 3.1. Power Transformers Bill Griesacker
 - 3.2. Standards Jerry Murphy
 - 3.3. Subsurface Transformers & Network Protectors George Payerle
 - 3.4. Bushings Eric Weatherbee
 - 3.5. Dielectric Tests Ajith Varghese
 - 3.6. Distribution Transformers Ed Smith
 - 3.7. Dry Type Transformers Casey Ballard
 - 3.8. HVDC Converter Transformers & Reactors Ulf Radbrandt
 - 3.9. Instrument Transformers Thomas Sizemore
 - 3.10. Insulating Fluids Scott Reed
 - 3.11. Insulation Life Sheldon Kennedy

- 3.12. Performance Characteristics Rogério Verdolin
- 4. Additional Report from Standards Coordinator (issues from the week) Jim Graham
- 5. New Business (continued from Monday) and Wrap-up Bruce Forsyth

2 ATTENDANCE

2.1 COMMITTEE MEMBER ATTENDANCE

The following table lists all Committee Members registered to attend the meeting. See section 2.2 for a list of non-Committee Members registered to attend the meeting.

Legend:

- CM Committee Member
- CM-LM Committee Member-IEEE Life Member
- CM-EM Committee Member-Emeritus

Committee Member Attendance

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
CM	Anderson	Gregory	GW Anderson & Associates, Inc.		X
CM	Antosz	Stephen	Stephen Antosz & Associates, Inc		X
CM	Arteaga	Javier	ABB Enterprise Software Inc	X	X
CM - LM	Ayers	Donald	Ayers Transformer Consulting	X	X
CM	Ballard	Robert	DuPont	X	X
CM - EM	Balma	Peter	Retired	X	
CM	Barrientos	Israel	Prolec GE	X	X
CM - LM	Beaster	Barry	H-J Enterprises, Inc.	X	X
CM	Beauchemin	Claude	TJH2b Analytical Services	X	X
CM	Betancourt	Enrique	Prolec GE	X	X
CM - LM	Binder	Wallace	WBBinder Consultant	X	X
CM - LM	Blackburn	Thomas	Gene Blackburn Engineering	X	X
CM	Blaydon	Daniel	Baltimore Gas & Electric	X	X
CM - LM	Boettger	William	Boettger Transformer Consulting LLC	X	X
CM	Boman	Paul	Hartford Steam Boiler	X	X
CM	Brown	Darren	Howard Industries	X	X
CM	Callsen	Thomas	Weldy-Lamont Associates	X	X
CM	Castellanos	Juan	Prolec GE	X	X
CM	Caverly	David	Trench Limited	X	X
CM	Cheema	Muhammad Ali Masood	Northern Transformer	X	
CM	Cheim	Luiz	Hitachi ABB Power Grids	X	
CM	Chiang	Solomon	The Gund Company	X	X

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
CM	Chrysler	Rhett	ERMCO	X	X
CM	Colopy	Craig	EATON Corporation	X	
CM	Dauzat	Thomas	General Electric	X	X
CM	Davis	Eric	Burns & McDonnell	X	X
CM	Del Rio	J. Arturo	Siemens Energy	X	X
CM	Denzer	Stephanie	Alliant Energy	X	X
CM	Digby	Scott	Duke Energy	X	X
CM	Dix	Larry	Quality Switch, Inc.	X	X
CM	Dorris	Don	Nashville Electric Service	X	X
CM	Ferreira	Marcos	Advisian-Worley Parsons		X
CM	Foata	Marc	Maschinenfabrik Reinhausen		
CM - LM	Foldi	Joseph	Foldi & Associates, Inc.	X	X
CM	Forsyth	Bruce	Bruce Forsyth and Associates LLC	X	X
CM	Franchek	Michael	Retired	X	X
CM	Frimpong	George	Hitachi ABB Power Grids	X	X
CM - LM	Ganser	Robert	Transformer Consulting Services, Co.		
CM	Gardner	James	SPX Transformer Solutions, Inc.	X	X
CM	Gaytan	Carlos	Prolec GE	X	X
CM	Ghafourian	Ali	H-J Enterprises, Inc.	X	X
CM	Ghosh	Saurahb	Transformers & Rectifiers (India) Ltd	X	X
CM - LM	Girgis	Ramsis	Hitachi ABB Power Grids	X	X
CM	Goulkhah	Monty	Kinectrics		
CM	Graham	James	Weidmann Electrical Technology	X	X
CM	Griesacker	Bill	Duquesne Light Co.	X	X
CM	Gyore	Attila	M&I Materials Ltd	X	X
CM	Haas	Michael	Instrument Transformers, LLC	X	X
CM	Hachichi	Said	Hydro-Quebec	X	X
CM	Hakim	Shamaun	WEG Transformers USA Inc.	X	X
CM	Harley	John	FirstPower Group LLC	X	X
CM - LM	Hayes	Roger	General Electric		
CM	Hernandez	Ronald	Doble Engineering Co.		
CM - LM	Herron	John	Raytech USA		X
CM	Hochanh	Thang	Surplec Inc.	X	X
CM	Hoffman	Gary	Advanced Power Technologies	X	X
CM - LM	Hopkinson	Philip	HVOLT Inc.	X	X
CM	Iman	Mohammad	MGM Transformer Company	X	X
CM	John	John	Virginia Transformer Corp.	X	X

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
CM - LM	Johnson	Charles	Hitachi ABB Power Grids	X	X
CM	Jordan	Stephen	Tennessee Valley Authority	X	X
CM	Joshi	Akash	Black & Veatch	X	X
CM	Kaineder	Kurt	Siemens Energy	X	X
CM - LM	Kennedy	Gael	GR Kennedy & Associates LLC		X
CM - LM	Kennedy	Sheldon	Niagara Transformer	X	X
CM	King	Gary	Howard Industries	X	X
CM	Kinner	Robert	FirstPower Group LLC	X	X
CM	Kiparizoski	Zan	Howard Industries	X	X
CM	Klaponski	Brian	Carte International Inc.	X	X
CM	Kornowski	Marek	Polycast International	X	X
CM	Kraemer	Axel	Maschinenfabrik Reinhausen	X	X
CM	Kulasek	Krzysztof	Hitachi ABB Power Grids		
CM	Kumaria	Deepak	Hitachi ABB Power Grids		X
CM	Kuppuswamy	Raja	Dynamic Ratings, Inc.	X	X
CM - LM	Lackey	John	PowerNex Associates Inc.		X
CM	Levin	Aleksandr	Weidmann Electrical Technology	X	X
CM	Li	Weijun	Braintree Electric Light Dept.	X	X
CM	Lopez-Fernandez	Xose	Universidade de Vigo	X	X
CM	Mai	Tim-Felix	Siemens Energy	X	X
CM	Malde	Jinesh	M&I Materials Inc.	X	X
CM	Mani	Kumar	Duke Energy	X	X
CM - LM	Marek	Richard	Retired	X	X
CM	Matthews	Lee	Howard Industries	X	X
CM	McNelly	Susan	Xcel Energy	X	X
CM	McTaggart	Ross	Trench Limited	X	X
CM	Mehrotra	Vinay	SPX Transformer Solutions, Inc.	X	X
CM	Melle	Thomas	HIGHVOLT		X
CM	Moleski	Hali	SDMyers, LLC.	X	
CM	Mulkey	Daniel	Mulkey Engineering Inc.		X
CM	Murphy	Jerry	Reedy Creek Energy Services	X	X
CM	Murray	David	Tennessee Valley Authority	X	X
CM	Musgrove	Ryan	Oklahoma Gas & Electric	X	X
CM	Naderian	Ali	Metsco	X	
CM	Nambi	Shankar	Bechtel	X	
CM	Narawane	Aniruddha	Power Distribution, Inc. (PDI)	X	X
CM	Parkinson	Dwight	EATON Corporation	X	X
CM - EM	Patel	Bipin	Consultant		X

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
CM	Patel	Poorvi	Electric Power Research Institute (EPRI)	X	X
CM	Patel	Sanjay	Royal Smit Transformers		X
CM	Payerle	George	Carte International Inc.	X	X
CM	Penny	Brian	American Transmission Co.	X	X
CM	Perjanik	Nicholas	Weidmann Electrical Technology	X	X
CM	Ploetner	Christoph	Hitachi ABB Power Grids	X	X
CM	Pointner	Klaus	Trench Austria GmbH	X	X
CM	Poulin	Bertrand	Hitachi ABB Power Grids	X	X
CM	Prevost	Thomas	Weidmann Electrical Technology	X	X
CM	Radbrandt	Ulf	Hitachi ABB Power Grids	X	X
CM	Rasor	Robert	SDMyers, LLC.	X	
CM	Rave	Martin	ComEd	X	X
CM	Ray	Jeffrey	JLR Consulting, Inc.		X
CM	Reed	Scott	MVA	X	X
CM	Riffon	Pierre	Pierre Riffon Consultant Inc.	X	X
CM	Robalino	Diego	Megger	X	X
CM	Roman	Zoltan	GE Grid Solutions	X	X
CM - LM	Sampat	Mahesh	EMS Consulting Inc.	X	X
CM	Sankarakurup	Dinesh	Duke Energy	X	X
CM - LM	Sarkar	Subhas	Virginia Transformer Corp.	X	X
CM	Sauer	Daniel	EATON Corporation	X	X
CM	Sbravati	Alan	Cargill, Inc.	X	X
CM	Schappell	Steven	SPX Transformer Solutions, Inc.	X	X
CM	Schroeder	Stephen	Hitachi ABB Power Grids		
CM	Schweiger	Ewald	Siemens Energy	X	X
CM	Selvaraj	Pugazhenth	Virginia Transformer Corp.	X	
CM	Sen	Cihangir	Duke Energy	X	X
CM	Sewell	Adam	Quality Switch, Inc.	X	X
CM	Sewell	Jeremy	Quality Switch, Inc.	X	X
CM - LM	Sharma	Devki	Entergy	X	X
CM	Sharp	Michael	Trench Limited	X	X
CM	Sharpless	Samuel	Rimkus Consulting Group	X	X
CM - LM	Shertukde	Hemchandra	University of Hartford		X
CM	Shull	Stephen	BBC Electrical Services, Inc.	X	X
CM	Sizemore	Thomas	ABB Inc.	X	X
CM - LM	Skinger	Kenneth	Scituate Consulting, Inc.	X	X
CM - LM	Smith	Edward	H-J Family of Companies	X	X

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
CM	Snyder	Steven	Hitachi ABB Power Grids		X
CM	Solano	William	Instrument Transformer Equip Corp	X	X
CM	Som	Sanjib	Pennsylvania Transformer	X	X
CM	Spitzer	Thomas	City Transformer Service Co.	X	
CM	Spurlock	Mike	Consultant	X	X
CM	Stank	Markus	Maschinenfabrik Reinhausen	X	X
CM	Stankes	David	3M	X	X
CM	Subramany	Shankar	KEMA Labs		
CM	Sweetser	Charles	OMICRON electronics Corp USA	X	X
CM	Swinderman	Craig	Mitsubishi Electric Power Products	X	
CM	Tanaka	Troy	Burns & McDonnell	X	X
CM - LM	Tendulkar	Vijay	Power Distribution, Inc. (PDI)		X
CM	teNyenhuis	Ed	Hitachi ABB Power Grids	X	
CM	Thibault	Michael	Pacific Gas & Electric	X	X
CM	Thompson	Ryan	Burns & McDonnell	X	X
CM	Tillery	Timothy	Howard Industries	X	X
CM	Tostrud	Mark	Dynamic Ratings, Inc.	X	X
CM	Traut	Alan	Howard Industries	X	X
CM	Trummer	Edgar	Transatlantic Transformer Consulting		
CM	VanderWalt	Alwyn	Public Service Co. of New Mexico	X	X
CM	Varghese	Ajith	SPX Transformer Solutions, Inc.	X	X
CM	Varnell	Jason	Doble Engineering Co.	X	X
CM	Vedante	Kiran	Ritz Instrument Transformers	X	X
CM	Verdell	Joshua	ERMCO	X	X
CM	Verdolin	Rogério	Verdolin Solutions Inc.	X	X
CM	Vijayan	Krishnamurthy	PTI Transformers	X	X
CM	Vir	Dharam	SPX Transformer Solutions, Inc.	X	X
CM - EM	Wagenaar	Loren	WagenTrans Consulting		X
CM - LM	Walia	Sukhdev	New Energy Power Co.	X	X
CM	Walker	David	MGM Transformer Company	X	X
CM	Wallace	David	Mississippi State University	X	X
CM	Wallach	David	Duke Energy	X	X
CM	Watson	Joe	JD Watson and Associates Inc.	X	X
CM	Weatherbee	Eric	PCORE Electric	X	X
CM	Webb	Bruce	Knoxville Utilities Board	X	X
CM	Welton	Drew	Intellirent	X	X
CM	Wicks	Roger	DuPont	X	X

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
CM - LM	Wilks	Alan	Consultant	X	X
CM - LM	Wright	Jeffrey	Duquesne Light Co.	X	X
CM	Yang	Baitun	R.E. Uptegraff	X	X
CM	Zhao	Peter	Hydro One	X	X
CM	Zibert	Kris	Allgeier, Martin and Associates	X	X
CM	Ziger	Igor	KONCAR - Instrument Transformers		
CM	Ziomek	Waldemar	PTI Transformers	X	X

Based upon the above attendance totals:

Quorum was achieved at Monday Opening Session (152/218=70%).

Quorum was achieved at Thursday Closing Session (156/218=72%).

2.2 GENERAL ATTENDANCE

The following table lists all non-Committee Members registered to attend the meeting. See section 2.1 for a list of Committee Members registered to attend the meeting.

Legend:

AP	Active Participant
AP-LM	Active Participant-IEEE Life Member
II	Interested Individual
II-LM	Interested Individual-IEEE Life Member
PCM	Past Committee Member
PCM-LM	Past Committee Life Member

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
II	Abbas	Mubarak	Siemens Industry	X	X
AP	Abbott	Scott	PPG	X	X
II	Acosta	Juan	Ergon, Inc.		
II	Adams	Kayland	SPX Transformer Solutions, Inc.	X	X
PCM	Ahuja	Raj	Raj Ahuja Consulting	X	X
AP	Allen	Jerry	Metglas, Inc.	X	X
II	Almeida	Nabi	Prolec GE USA LLC	X	X
AP	Alonso	Mario	Transformer Quality Consulting		
II	Amador	Angela	EATON Corporation	X	X
II	Amarasinghe	Dinu	Bruce Power	X	X
AP	Andrade Medina	Juan Pablo	Olsun Electrics Corporation	X	X
II	Anthony	Stephen	--	X	
II	Antosz Jr.	Stephen	Siemens Industry	X	X
II	Arevalo	Edmundo	Bonneville Power Administration		
II	Ashcraft	Stephen	Hitachi ABB Power Grids		
II	Avanoma	Onome	Transformer Consulting Services Inc.	X	X
II	Avila	Hugo	Hitachi ABB Power Grids	X	X
II	Babanna	Suresh	SPX Transformer Solutions, Inc.		X
AP	Bachand	Martin	Cloverdale Paint Inc.		
II	Banks	Darrell	Memphis Light, Gas & Water	X	X
AP	Bargone	Gilles	FISO Technologies Inc.	X	X
AP	Baumgartner	Christopher	We Energies	X	X
II	Bedoya	Duvier	Hitachi ABB Power Grids		
AP	Behrens	Tammy	SPX Transformer Solutions, Inc.	X	X

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
AP	Benach	Jeff	Weidmann Electrical Technology	X	X
II	Benedict	Ramon	SPX Transformer Solutions, Inc.	X	X
II	Benzler	Olle	Megger	X	X
AP	Bernesjo	Mats	Hitachi ABB Power Grids	X	X
AP	Berube	Jean-Noel	Rugged Monitoring Inc.	X	X
AP	Biggie	Kevin	Weidmann Electrical Technology	X	X
AP	Bigham	Lee	Instrument Transformer Equip Corp		
II	Bishop	Ryan	Minnesota Power	X	X
II	Blais	Nicolas	Nomos Systems		
AP	Blaszczyk	Piotr	Specialty Transformer Components LLC	X	X
AP	Bolar	Sanket	Megger		
AP	Bolliger	Alain	HV TECHNOLOGIES, Inc.		
AP	Bolliger, Ph.D.	Dominique	HV TECHNOLOGIES, Inc.	X	X
II	Bonfiglio	Susan	Western Area Power Admin.		X
II	Bonn	Mike	Soltex Inc.	X	X
II	Bosnjak	Bruno	Hyundai Electric Switzerland	X	X
AP	Botti	Michael	Hyosung HICO		
AP	Bradshaw	Jeremiah	Bureau of Reclamation		X
AP	Brafa	John	Hub City Consulting Services	X	X
AP	Brannen	Randy	Southern Company Services	X	X
AP	Brauer	Stephan	Morgan Schaffer	X	X
AP	Bray	Elizabeth	Southern Company Services	X	X
II	Brett	John	Delta-X Research Inc.		X
II	Brocilo	Drazena	Google		
II	Brzoznowski	Steven	Bonneville Power Administration	X	X
II	Buchgeher	Erich	Siemens Energy	X	X
AP	Calitz	David	Siemens Energy	X	X
II	Cantu de Leon	Jorge	SPX Transformer Solutions, Inc.	X	
II	Casserly	Edward	Ergon, Inc.		
AP	Castillo	Alonso	Aurtra Inc.	X	X
AP	Chambers	Stuart	Powertech Labs Inc.	X	X
AP	Chisholm	John	IFD Corporation	X	X
II	Chorzepa	Jaroslawa	ABB Inc.	X	X

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
AP	Christodoulou	Larry	Electric Power Systems, Inc.	X	X
AP	Corsi	Domenico	Doble Engineering Co.	X	X
AP	Craig	Douglas	Richards Manufacturing Co.		
PCM - LM	Crouse	John	Roswell Alliance	X	X
AP	Cruz	Jorge	PTI Transformers	X	X
II	Cruz Valdes	Juan Carlos	Prolec GE	X	X
AP	Dahlke	Michael	Central Moloney, Inc.	X	X
II	Das	Bhaba	Hitachi ABB Power Grids		
II	Davoudi	Pouneh	Delta Star Inc.	X	X
AP	Davydov	Valery	Mr. Valery Davydov		X
AP	Dennis	Scott	Hitachi ABB Power Grids	X	X
II	Dent	Brandon	Memphis Light, Gas & Water	X	X
II	Deverick	Jonathan	Dominion Energy		
AP	Dillon	Nikolaus	Dominion Energy	X	X
AP	Dinh	Huan	Hitachi ABB Power Grids	X	X
II	Doak	Eric	D4EnergySolutions LLC		
II	Door	Jeffrey	H-J Family of Companies	X	X
II	Doyle	Lee	Vaisala		
II	Draper	Zachary	Delta-X Research Inc.		
AP - LM	Dukarm	James	Delta-X Research Inc.	X	X
AP	Dulac	Hakim	Qualitrol Company LLC	X	X
II	Dutta Roy	Samragni	Siemens Energy	X	X
II	Eckroth	Megan	EATON Corporation	X	X
AP	Elliott	William	General Electric	X	X
II	Ellis	David	PSEG		
II	Ellis	Wayne	Memphis Light, Gas & Water	X	X
II	Ember Baciu	Daniela	Hydro-Quebec IREQ	X	X
II	Ermakov	Evgenii	Hitachi ABB Power Grids	X	X
II	Espindola	Marco	ABB Enterprise Software Inc.	X	X
AP	Euvrard	Eric	RHM International	X	
II	Fattal	Feras	Manitoba Hydro	X	X
AP	Faulkner	Mark	EATON Corporation		
AP	Faur	Florin	SPX Transformer Solutions, Inc.	X	X
AP	Fausch	Reto	RF Solutions	X	X
AP	Field	Norman	Teshmont Consultants LP	X	X
AP	Foschia	John	SPX Transformer Solutions, Inc.	X	X
AP	Franchitti	Anthony	PECO Energy Company	X	X

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
II	Frayne	Michael	Hammond Power Solutions		
II	Frazier	Raymond	Ameren	X	X
AP	Frotscher	Rainer	Maschinenfabrik Reinhausen	X	X
AP	Gamboa	Jose	H-J Family of Companies	X	X
AP	Gara	Lorne	Shermco	X	X
AP	Garcia	Benjamin	Southern California Edison		
AP	Gaun	Alexander	Coil Innovation GMBH		
II	Giraldo	Orlando	H-J Family of Companies		
II	Gomez-Hennig	Eduardo	Siemens Energy		
II	Goncin	Zoran	PTI Transformers	X	X
II	Gossett	Shawn	Ameren	X	X
AP	Gross	Detlev	Power Diagnostix	X	X
II	Guertin	Chris	Cloverdale Paint Inc.		
AP	Guner	Ismail	Hydro-Quebec	X	X
AP	Gustavsson	Niklas	Hitachi ABB Power Grids	X	X
II	Hall	Jane	Cloverdale Paint Inc.		
AP	Hamilton	Kendrick	Power Partners, Inc.	X	X
II	Hamoir	Didier	Transformer Protector Corp	X	X
AP	Hampton	Kenneth	Baltimore Gas & Electric	X	X
AP	Hanson	David	TJH2b Analytical Services	X	X
AP	Harden	Kenneth	Schneider Electric	X	X
II	Hazlett	Benjamin	Bruce Power	X	X
II	Hedlund	Roger	Hitachi ABB Power Grids	X	X
AP	Heiden	Kyle	EATON Corporation	X	X
II	Hernandez Cano	Sergio	Hammond Power Solutions	X	X
II	Hoffman	Saramma	PPL Electric Utilities	X	X
AP	Holden	Andrew	Ergon, Inc.	X	X
II	Holland	David	ExxonMobil	X	X
II	Hollrah	Derek	Burns & McDonnell	X	X
II	Holt	James	Memphis Light, Gas & Water	X	X
II	Huzmezan	Mihai	Power Diagnostix		
II	Issack	Ramadan	American Electric Power	X	X
AP	Jarman	Paul	University of Manchester	X	X
AP - LM	Jaroszewski	Marion	Delta Star Inc.		
II	Johnson	Anna	Arkema Inc.	X	X
II	Johnson	Jeremy	Intermountain Electronics	X	X
AP	Johnson	Toby	Pacificorp	X	X
II	Jonak	Ryan	Portland General Electric		

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
II	Kadar	Laszlo	Hatch	X	X
AP	Karas	Jon	SDMyers, LLC.	X	X
II	Kazmierczak	Jerzy	Hitachi ABB Power Grids	X	X
AP	Kessler	Stacey	Basin Electric Power Cooperative	X	X
AP	Kirchenmayer	Egon	Siemens Energy	X	X
AP	Kittrell	Brad	Consolidated Edison Co. of NY	X	X
AP	Klein	Ken	Grand Power Systems	X	X
AP	Kleine	Peter	US Army Corps of Engineers		X
II	Klempner	Dmitriy	Southern California Edison	X	X
II	Knappek	William	OMICRON electronics Corp USA	X	X
II	Knous	Kyle	EATON Corporation	X	X
AP	Konta	Ivan	KONCAR - Instrument Transformers	X	X
AP	Koshel	Anton	Delta Star Inc.		
AP	Kostich	Nicholas	Ameren		X
II	Kutzleb	Michelle	TJH2b Analytical Services	X	X
AP	Lachman	Mark	Doble Engineering Co.		
AP	Lamontagne	Donald	Arizona Public Service Co.	X	X
II	Larison	Andrew	Hitachi ABB Power Grids	X	X
AP	Larochelle	David	NDB Technologies	X	X
AP	Larzelere	William	Evergreen High Voltage	X	X
AP	Leal	Fernando	Prolec GE	X	X
AP	Lee	Moonhee	Hammond Power Solutions	X	X
II	Lejay	Olivier	Huaming USA Corp.	X	X
AP	Levi	Raka	Retired		
II	Li	Chao	EATON Corporation	X	X
II	Li	Yaquan (Bill)	BC Hydro	X	X
AP	Locarno	Mario	Doble Engineering Co.	X	X
AP	Lovins	Colby	Federal Pacific Transformer	X	X
II	Lucas	Tiffany	SPX Transformer Solutions, Inc.	X	X
AP	Lukenda	Nikola	Petro-Canada Lubricants Inc.	X	X
AP	Macdonald	Nigel	Trench Limited	X	X
II	Mangubat	Darrell	Siemens Power Operations Inc.	X	X
II	Mani	Balakrishnan	Virginia Transformer Corp.		

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
AP	Mansuy	Bruno	Trench France SAS	X	X
PCM	Marlow	Dennis	DenMar TDS Transformers	X	X
II	Martinez	Joaquin	Siemens Energy	X	X
II	Mattson	Trevor	OMICRON Electronics Corp USA		X
AP	Mayer	Robert	Siemens Energy		
AP	McBride	James	JMX Services, Inc.	X	X
II	McCloskey	Scott	Amran Inc.		
AP	McCullough	Douglas	Maxima / Hyundai		
II	McFadden	Matthew	Oncor Electric Delivery	X	X
II	McGrail	Anthony	Doble Engineering Co.		
AP	Mciver	James	Siemens Energy		X
AP	McNally	Mark	Kansas City BPU		
II	Mendez Zamora	Omar	Prolec GE	X	X
AP	Middleton	Robert	RHM International	X	X
II	Miller	Philip	Memphis Light, Gas & Water	X	X
II	Milojevic	Goran	DV Power Inc.		
AP	Montpool	Rhea	Schneider Electric	X	X
AP	Morales-Cruz	Emilio	Qualitrol Company LLC	X	X
AP	Morgan	Charles	Eversource Energy	X	
AP	Morgan	Michael	Duke Energy	X	
II	Mudryk	Anatoliy	Camlin Power	X	X
AP	Munoz Molina	Martin	Orto de Mexico	X	X
AP	Mushill	Paul	Ameren		
II	Nabi-Bidhendi	Hossein	ABB Inc.	X	X
AP	Natale	Anthony	HICO America	X	X
II	Neder	Frank	Trench Germany GmbH	X	X
AP	Neild	Kristopher	Megger	X	X
II	Nesvold	Brady	Xcel Energy	X	X
AP	Nims	Joe	Allen & Hoshall, Inc.	X	X
II	Niroula	Ashmita	Ergon, Inc.	X	X
II	Nunes, Jr	Jayme	Nynas AB	X	X
II	Nunn	Shawn	Hitachi ABB Power Grids	X	X
AP	Oakes	Stephen	WEG Transformers USA Inc.		
II	Ocon	Rodrigo	Industrias IEM	X	X
AP	Ogajanov	Rudolf	ABB Inc.	X	X
AP	O'Malley	Anastasia	Consolidated Edison Co. of NY	X	X

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
II	Orr	Paul	NEMA		
II	Pagliuca	Vincenzo	Hartford Steam Boiler	X	X
II	Panesar	Parminder	Virginia Transformer Corp.	X	X
AP	Partyka	George	PTI Transformers	X	X
II	Patel	Dipakkumar	Instrument Transformer Equip Corp	X	X
II	Patel	Nitesh	Hyundai Power Transformers USA	X	X
II	Patel	Vinay	Consolidated Edison Co. of NY	X	X
PCM - LM	Perkins	Mark	D4EnergySolutions LLC	X	X
II	Peterson	Caroline	Xcel Energy	X	X
II	Picher	Patrick	Hydro-Quebec IREQ		X
II	Pitts	Chris	Howard Industries	X	
II	Plante	Sylvain	Hydro-Quebec	X	X
AP	Plath	Cornelius	OMICRON Energy Solutions GmbH		
II	Podany	Nicholas	Bureau of Reclamation	X	X
AP	Portillo	Homero	Advanced Power Technologies	X	X
II	Powell	Chris	Intermountain Electronics	X	X
II	Prakash	Tejasvi	Schweitzer Engineering Labs		X
AP	Prince	Jarrod	ERMCO	X	X
AP	Pruente	John	SPX Transformer Solutions, Inc.	X	X
II	Quispe Cuadrado	Lesther Alex	EATON Corporation	X	X
AP	Radu	Ion	Hitachi ABB Power Grids	X	X
II	Rahmatian	Farnoosh	NuGrid Power Corp		
AP	Ramirez	Juan	CELECO	X	X
II	Rampersad	Shiva	Dow Chemical Company	X	X
II	Rapp	Kevin	Cargill, Inc.	X	X
AP	Rashid	Adnan	Measurement Canada / ISED	X	X
AP	Ratty	James	Electronic Technology Inc.		
PCM	Raymond	Timothy	Electric Power Research Institute (EPRI)	X	X
II	Reagan	John	Oncor Electric Delivery	X	X
II	Rebman	Larry	EMLS, Inc.		
II	Reed	Samuel	EATON Corporation	X	X
II	Reepe	Robert	Georgia Power Co.	X	X
II	Reimer	Jonathan	FortisBC	X	X
AP	Reiss IV	Clemens	Custom Materials, Inc.	X	X
II	Rezaei-Zare	Afshin	York University		

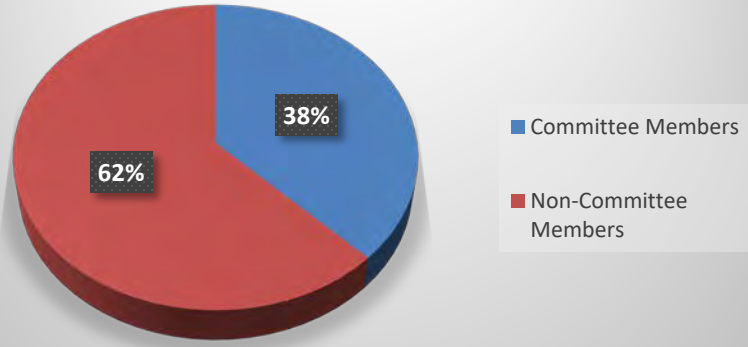
Member Type	Last Name	First Name	Company	Opening Session	Closing Session
II	Rincon	Diego	Electroporcelana Gamma	X	X
AP	Riopel	Sebastien	Electro Composites ULC		X
AP	Rock	Patrick	American Transmission Co.	X	X
II	Rocque	Tim	SPX Transformer Solutions, Inc.	X	X
AP	Rodriguez	Leopoldo	Transformer Testing Services LLC	X	X
AP	Roizman	Oleg	IntellPower Pty Ltd	X	X
II	Rosenstock	Steven	Edison Electric Institute		
AP	Rottenbacher	Andre	Ritz Instrument Transformers	X	X
AP	Saad	Mickel	Hitachi ABB Power Grids	X	X
AP	Sahin	Hakan	Independent	X	X
II	Saldivar	Fernando	Prolec GE	X	X
AP	Salgado	Pedro	Electronic Technology Inc.		
II	Sanchez	Albert	Knoxville Utilities Board	X	X
AP	Sauls	Roderick	Southern Company Services	X	X
II	Sawant	Anil	Virginia Transformer Corp.	X	X
AP	Schiessl	Markus	SGB	X	X
II	Schindler	Stefan	Maschinenfabrik Reinhausen	X	X
AP	Schleismann	Eric	Southern Company Services	X	X
AP	Schneider	Jeffrey	EATON Corporation	X	X
AP	Schrammel	Alfons	Siemens Energy	X	X
AP	Schwartz	Dan	Quality Switch, Inc.	X	X
II	Sewell	Nick	Alabama Power	X	X
AP	Shalabi	Jaber	VanTran Industries, Inc.	X	X
AP	Sheehan	David	HICO America		
II	Shepherd	Robert	Bruce Power	X	X
AP	Sheridan	Peter	SGB USA, Inc.	X	X
II	Shingari	Avijit	Pepco Holdings Inc.	X	X
II	Shukla	Kunal	PECO Energy Company	X	X
AP	Siebert-Timmer	Audrey	IFD Corporation	X	X
II	Silgado	Adrian	IFD Corporation	X	X
AP	Simonelli	Richard	SPX Transformer Solutions, Inc.	X	X
II	Sinclair	Jonathan	PPL Electric Utilities	X	X
AP	Singh	Kushal	ComEd		
AP	Slattery	Christopher	FirstEnergy Corp.	X	X
II	Smith	Adam	Commonwealth Associates, Inc.	X	X

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
AP	Sonnenberg	Brian	Instrument Transformers, LLC	X	X
II	Soto	Mauricio	Hitachi ABB Power Grids		
AP	Sparling	Brian	Dynamic Ratings, Inc.	X	X
AP	Spoone	Travis	EATON Corporation		
AP	Staley	Brad	Salt River Project		
II	Stechschulte	Kyle	American Electric Power	X	X
AP	Steeves	Gregory	Baron USA, LLC	X	X
AP	Stockton	David	H-J Family of Companies	X	X
II	Stretch	Kerwin	Siemens Energy	X	X
II	Strongosky	Neil	Memphis Light, Gas & Water		X
II	Su	Paul	FM Global	X	X
AP	Sullivan	Christopher	Westmark Partners	X	X
AP - LM	Sullivan	Kevin	Duke Energy	X	X
AP	Sundin	David	Engineered Fluids, LLC		
AP	Szczechowski	Janusz	Maschinenfabrik Reinhausen	X	X
II	Szewczyk	Radoslaw	Specialty Products Poland Sp. z o.o.	X	X
AP	Taylor	Marc	Cogent Power Inc.	X	X
AP	Tedesco	Joseph	Hitachi ABB Power Grids	X	X
AP	Tekin	Dervis	Meramec Instrument Transformer Co.	X	X
AP	Theisen	Eric	Metglas, Inc.	X	X
II	Tournoux	Daniel	SPX Transformer Solutions, Inc.	X	X
AP	Tozzi	Marco	Camlin Power		
II	Trifunoski	Risto	Trench Limited	X	X
AP	Tyler	Lee	Warco, Inc.	X	X
II	Upadhyay	Parag	ABB Inc.		
AP	Valentin	Reinaldo	Duke Energy		
AP	Van Horn	Jeremy	IFD Corporation	X	X
II	Vance	Ed	Ardry Trading Company, Inc.		
II	Vandermaar	John	BC Hydro		
II	Vanier	Jacques	Electro Composites (2008) ULC		
AP	Vartanian	John	National Grid	X	X
AP	Veens	Jos	SMIT Transformatoren B.V.	X	X
AP	Vermette	Yves	Electro Composites ULC		
AP	Villagran	Deniss	GE Grid Solutions		X
II	Vo	Duy	Central Maine Power (AVANGRID)	X	X

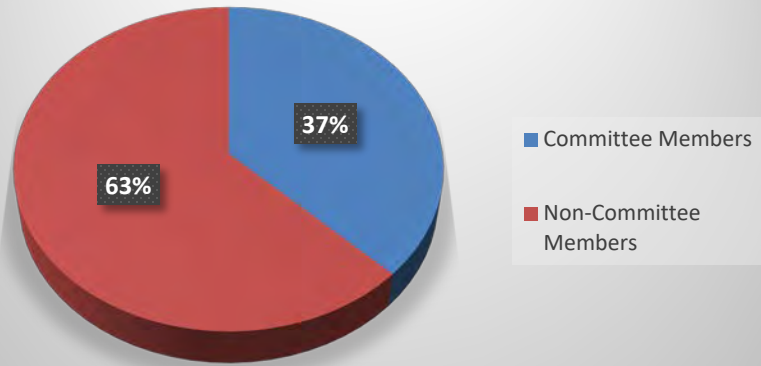
Member Type	Last Name	First Name	Company	Opening Session	Closing Session
AP	vonGemmingen	Richard	Dominion Energy	X	X
II	Vukovic	Dejan	Hitachi ABB Power Grids	X	X
II	Vyas	Pragnesh	Sunbelt-Solomon Solutions	X	X
II	Wagner	Dieter	Hydro One	X	X
II	Walder	Nicholas	EATON Corporation	X	X
II	Waldrop	Hugh	Memphis Light, Gas & Water	X	X
II	Wallace	Eric	Photon Control		
AP	Walters	Shelby	Howard Industries	X	X
AP	Wang	Evanne	DuPont	X	X
II	Wang	May	BC Hydro		X
II	Warntjes	Michael	American Transmission Co.	X	X
II	Washburn	Alan	Burns & McDonnell	X	X
II	Webb	Matthew	SPX Transformer Solutions, Inc.	X	X
AP	Weiss	Zachery	WEG Transformers USA Inc.	X	X
AP	Werelius	Peter	Megger	X	X
AP	Weyer	Daniel	Nebraska Public Power District	X	X
AP	Whitehead	William	Siemens Energy	X	X
II	Whitten	Christopher	Hitachi ABB Power Grids	X	X
AP	Williams	Trenton	Advanced Power Technologies	X	X
II	Wind	Rene	Siemens Energy		
AP	Winter	Dr. Alexander	HIGHVOLT Pruftechnik Dresden	X	X
PCM	Woods	Deanna	Alliant Energy	X	X
II	Wyatt	Hayes	ABB Inc.		
II	Yazdani	Mana	Trench Limited	X	X
AP	Zaman	Malia	IEEE	X	X
II	Zanwar	Anand	Siemens Energy	X	X
II	Zemanovic	Kyle	EATON Corporation	X	X
PCM	Zhang	Shibao	PCORE Electric	X	X
II	Zouaghi	Abderrahmane	Hitachi ABB Power Grids	X	X

In addition to the above totals, there were **387** of the total attendees that attended **both** the Monday and Thursday Sessions and **436** that attended **either** the Monday or the Thursday Session.

Monday



Thursday



Monday Opening Session

3 APPROVAL OF AGENDA AND PREVIOUS MINUTES – BRUCE FORSYTH

As part of opening remarks, the Chair asked Tammy Behrens, TF Meeting Planning, to present a “meeting minute.” Tammy recognized the Virtual Meeting planning Task Force. She shared registered attendance statistics. Tammy reviewed the future meeting schedule. There are on-demand presentations available on the PSAV site for Newcomers, Awards, Meeting SC. The website password will change on October 23rd (the password is not published in the minutes).

The Chair presented the Agenda that was sent out in advance and posted on the website. The Chair asked if there were any requested changes to the agenda. Hearing none, the agenda was considered approved.

The Fall 2019 minutes have been posted for some time. The Chair asked if there was any opposition to unanimous approval. Hearing none, the Fall 2019 minutes are approved.

4 CHAIR’S REMARKS & REPORT – BRUCE FORSYTH

Chair’s Remarks – Presented at the Monday General Session – Virtually - Fall 2020

4.1 IEEE PES TECHNICAL COUNCIL

The Technical Council of the IEEE Power Energy Society (PES) is composed of the Chairs of the PES Technical and Coordinating Committees, plus the Chairs of Standing Committees reporting to it. The full organizational structure of the PES is shown in the current version of the IEEE PES Organization Chart and Committee Directory (<https://www.ieee-pes.org/images/files/pdf/membership/protected/2020-PES-Org-Chart-V4.pdf>). The PES Technical Committees report to the Technical Council on matters concerning membership, recognition, technical publications, scope, and the coordination of the Power Energy Society generated standards. For standards relating to their technical scope, the Technical Committees work directly with the IEEE-SA Standards Board and the PES Standards Coordinating Committee. For further details on the Statement of Purpose and Scope of Activities for the PES Technical Council Please see; <http://www.ieee-pes.org/statement-of-purpose-and-scope-of-activities-for-the-pes-technical-council>.

4.2 TECHNICAL COUNCIL OFFICERS & MEMBERS

The officers and members of the Technical Council are listed below for your reference. Each individual listed here is the chair of that respective committee.

TECHNICAL COUNCIL OFFICERS 2020-2021

Chair Vijay Vittal (Arizona State University)
Vice Chair.....Hong Chen
SecretaryDiane Watkins (Xcel Energy)
Past Chair.....Farnoosh Rahmatian (Quanta Technology)

TECHNICAL COMMITTEES 2020

	Chair
Analytical Methods for Power Systems (AMPS).....	Kevin Schneider
Electric Machinery (EM).....	John Yagielski
Energy Development & Power Generation (EDPG).....	John B. Yale
Energy Storage & Stationary Battery (ESSB).....	Curtis Ashton

Insulated Conductors (IC).....	Henk Geene
Nuclear Power Engineering (NPE).....	Daryl Harmon
Power System Communications & Cybersecurity (PSCC)	Ken Fodero
Power System Dynamic Performance (PSDP)	Costas Vournas
Power System Instrumentation & Measurements (PSIM).....	Ernst Hanique
Power System Operation Planning & Economics (PSOPE).....	Fran Li
Power System Relaying & Control (PSR).....	Russ Patterson
Smart Buildings Loads & Customer Systems (SLCS)	Ron Melton
Substations (SUB)	Joe Gravelle
Surge Protective Devices (SPD).....	Steven Hensley
Switchgear (SWGR).....	Keith Flowers
Transformers (TRANS).....	Bruce Forsyth
Transmission and Distribution (T&D).....	Gary Chang

COORDINATING COMMITTEES 2020

Chair

Energy Internet Coordinating Committee.....	Hongbin Sun
Intelligent Grid & Emerging Technologies (IGETCC)	Doug Houseman
Marine Systems (MSCC).....	Dwight Alexander
Wind and Solar Power (WSPCC).....	Andrew Leon

STANDING COMMITTEES 2020-2021

Chair

Awards Committee.....	Farnoosh Rahmatian
Organization & Procedures Committee.....	Diane Watkins
Power and Energy Education Committee.....	Siddharth Suryanarayanan
Standards Coordination Committee.....	Ted Burse
Technical Sessions Committee.....	Hong Chen
Entity Proposal Management Committee (New).....	Farnoosh Rahmatian

4.3 PES TECHNICAL COUNCIL ACTIVITIES

The Technical Council meeting schedule for 2020 through January of 2021 is as follows:

- January 12, 2020 – JTCM – Jacksonville, FL
- May 14, 2020 – Web Meeting
- July 29, 2020 – Web Meeting
- November 12-13, 2020 – Annual Retreat – Web Meeting
- January 10, 2021 – JTCM – Web Meeting

4.4 ENTITY PROPOSAL MANAGEMENT COMMITTEE

A new standing committee – the Entity Proposal Management Committee (EPMC) – has been established and will begin its activities soon. The general role of the EPM will be to facilitate and manage the timely review of entity proposals. To this end, the EPMC will be the first point of contact within PES for entity proposals and will perform initial screening of proposals to ensure they meet general PES standards and expectations, and to assign the proposal to the most appropriate technical committee for review. The transformers committee has appointed Jim Graham to be our representative to the EPMC.

4.5 WEBEX ACCOUNTS FOR STANDARD DEVELOPMENT

To support remote technical meetings the IEEE-SA has made available WebEx accounts for use by volunteers involved in standards development activities. Activity leaders are free to use any other web

service available to them, but the WebEx service is available for those who do not have access to a suitable tool. Anyone needing access to the WebEx account is asked to contact any Officer or transformers@ieee.org to obtain specific details on how to access the account.

4.6 IEEE PES TRANSFORMERS SATELLITE COMMITTEE - CHINA

To coordinate transformer standards development activities globally and to allow the many engineers in China who want to participate in the standards development process, the IEEE PES Transformers Satellite Committee – China has been established. This is the outcome of many discussions and an agreement outlined during a meeting at the JTCM in January 2020. It is understood that the work performed by the Satellite Committee is subject to review and approval of the main Transformers Committee. To help facilitate this process the Satellite Committee –China has recently developed a Policy and Procedure Manual and an Organization and Procedures manual, both of which are based on the documents of the same name adopted by the main Transformers Committee. Further discussions are required to develop a process by which documents developed by the Satellite Committee will be reviewed and approved by the main Transformers Committee.

4.7 TRANSFORMERS COMMITTEE ACTIVITIES

4.7.1 Liaison Representatives - Appointed by Committee Chair.

- ASTM D27 – Tom Prevost
- CIGRE – Craig Swinderman
- IEC TC14 - Phil Hopkinson
- Standards Coordinating Committee, SCC No. 4 (Electrical Insulation) - Evanne Wang

4.7.2 Committee Schedule

The Fall 2020 Transformers Committee meeting was switched from an in-person meeting in Kansas City to a virtual meeting to protect the health and well-being of our members and their families. An audio-visual firm (PSAV) has been hired to assist with the issues related to setting up the meetings and managing the “behind the scenes” electronic issues. Our next meeting is scheduled to be an in-person meeting in Toronto, Canada.

4.7.3 Meeting App

Based on positive feedback from the Columbus meeting the Committee plans to continue using the new IEEE EventHub App for future in-person meetings.

4.7.4 Association Management System, 123 Signup

All WG’s must use AMS to track their membership and meeting attendance. The IEEE PES Technical Council’s Organization and Procedures Manual (March 2020) states the following in section 7.1.1:

“To be in compliance as a technical or coordinating committee of the IEEE PES Technical Council all technical and coordinating committees are required to keep accurate and up to date membership and meeting attendance records of their committees, subcommittees, working groups and task forces using the Association Management System selected by the IEEE PES Technical Council.”

All activity leaders are asked to ensure their groups are using AMS. In addition to using the AMS, a list of names and affiliations must be included in the meeting minutes.

4.7.5 Website Password Usage

The website password is not for public dissemination. It is for use by our meeting attendees (CM, AP, II) and associated work of the Transformers Committee. Access to the protected information on the Committee website is a benefit of attendance and participation. It may be used by meeting attendees and within attendees' immediate workplace, but not beyond that. A new password is generally implemented immediately after each fall meeting with an announcement made to share the new password during the closing session.

4.7.6 IEEE Copyright Policy

<https://standards.ieee.org/ipr/index.html>

During the fall 2019 meeting there were various discussions related to the application and compliance with the IEEE Copyright Policy. The key issue is that the Transformers Committee has an obligation comply with the IEEE Copyright Policy and thereby respect and protect the rights of copyright holders by preventing the inappropriate use of material protected by copyright laws.

Compliance with the Copyright Policy requires a certain amount of due diligence on the part of activity leaders, but it is not a daunting task. To assist activity leaders, a webinar was presented on October 5, 2020 that discussed the application of the Copyright Policy during Transformer Committee standards development processes. The presentation is available on the Committee website for those interested in further information.

4.7.7 Call for Patents (Essential Patent Claims)

<https://standards.ieee.org/about/sasb/patcom/patc.html>

A call for patents is required at every Working Group (WG) meeting. This is a reminder to all WG leaders to call for patents and record the results in the meeting minutes. Note it is not required to show the patent slides; it is only necessary to call for patents and record the response in the minutes. If there is a claim reported, the WG chair shall include in the minutes the name & affiliation of the individual asserting a patent claim. Here is what each WG Chair should ask at the beginning of each WG meeting. This applies only to WG's after the PAR is approved by the IEEE-SA Standards Board.

“If anyone in this meeting is aware of any patent claims that are potentially essential to implementation of the document under consideration by this WG, that fact should be made known to the WG and recorded in the meeting minutes.”

There should be no discussion of any patent claim identified, only that it be identified and recorded. Even if no patent claims are identified, the minutes are to indicate that the call for patents was made.

If a patent holder or patent applicant is identified, then the WG Chair (or designee) should ask the patent holder or patent applicant of a patent claim that might be or become an Essential Patent Claim to complete and submit a Letter of Assurance in accordance with Clause 6 of the IEEE-SA Standards Board Bylaws.

4.7.8 Letters of Assurance

A Letter of Assurance (LoA) is a document submitted to IEEE-SA by a patent holder which documents the submitter's position with regard to ownership, enforcement, or licensing of an Essential Patent Claim that may be incorporated into a specific IEEE document. As of September 30, 2020, the following twelve (12) existing Accepted Letters of Assurance pertain to our committee:

Std No.	Patent Owner	Contact for License	Patent Serial No. (if indicated)	Letter Date	Licensing Assurance Received	Date record entered or revised (if known)
C37.30.2	Southern Electrical Equipment Company Inc.	Andrew Panto - COO/Director of Engineering aspanto@seecoswitch.com	5,560,474 (US)	18 Oct 2011	yes	18 Oct 2011
C37.60	S&C Electric Company	Mark W. Stavnes-Vice President, Fuse Products and Polymer Products Division mstavnes@sandc.com	not indicated	29 Aug 2008	non-awareness statement	2 Sep 2008
C37.245	Schweitzer Engineering Laboratories, Inc.	Richard Edge, Legal ipmail@selinc.com	7,319,576 (US)	11 Apr 2014	yes	11 Apr 2014
C57.12.200	Megger Sweden AB	Niclas Wetterstrand, Product Management niclas.wetterstrand@megger.com	8,428,895 (US)	25 Sep 2019	yes	30 Sep 2019
C57.104	Arizona Public Service Company	John Finn - Director Venture Investment Management, Venture Investments john.finn@pinnaclewest.com	not indicated	12 Apr 2019	yes	16 Apr 2019
C57.127	ABB Technology Ltd.	Bjorn Dahlstrand, ABB AB, Legal Affairs and Compliance/IP bjorn.dahlstrand@seabb.com	6,340,890 (US)	31 Aug 2005	yes	6 Sep 2005
C57.127	General Electric Technology GmbH	Frank Landgraff-Executive Counsel, GE Power Legal Department frank.landgraff@ge.com	7,286,968B2 (US)	14 Aug 2018	yes	16 Aug 2018
C57.139	Maschinenfabrik Reinhausen GMBH	Stefanie Hofmeister-Counsel, Corporate Legal Services patents@reinhausen.com	not indicated	13 Jan 2013	yes	16 Jan 2013
C57.143	Roger Fenton	Roger Fenton, Principal Engineer, Fenton Solutions roger.a.fenton@gmail.com	15/371,085 (US)	9 Oct 2018	yes	12 Oct 2018
C57.147 and C57.155	Cooper Power Systems, LLC	Alan Yerges, Engineering - Power Systems Division IP alanpyerges@eaton.com	6,398,986 (US) 6,905,638 (US) 7,651,641 (US)	5 Apr 2017	yes, royalty-free	5 Apr 2017
C57.147 and C57.155	Cooper Power Systems, LLC	Alan Yerges, Engineering - Power Systems Division IP alanpyerges@eaton.com	PI 9612097-5	5 Apr 2017	NO	5 Apr 2017
C57.163	Advanced Power Technologies, LLC	Gary Hoffman - Managing Member grhoffmann@advpowertech.com	20130285671 (US)	5 May 2014	yes	5 May 2014

4.7.9 Transformers Committee Working Group Policies and Procedures (P&P) Update

The Individual Working Group P&P manual was reviewed and approved by AudCom at the June 01, 2020 AudCom meeting. The approved version, along with the Entity WG P&P, the Transformers Committee P&P, and the Transformers Committee O&P can be found on the Scope page of the Committee website at <https://www.transformerscommittee.org/scope/>.

4.7.10 Website

The Committee website has been transitioned to a new platform and reformatted to align with the websites of other PES Technical Committees. Susan McNelly continues to serve as primary webmaster and is assisted by Kris Zibert. Many thanks to both Sue and Kris for keeping the website in great shape.

Respectfully submitted,



Bruce Forsyth
Chair, IEEE PES Transformers Committee
Rev. 2, October 19, 2020

5 VICE CHAIR'S REPORT – ED TENYENHUIS

The Vice-Chair's Report was presented at the Monday General Session.

5.1 VICE-CHAIR'S REPORT – ED TENYENHUIS

The Vice-Chair's Report will be presented at the Monday General Session.

5.2 IEEE PES CALENDAR OF RECENT AND UPCOMING EVENTS

The following are recent and upcoming PES sponsored conferences and committee events. Please check the PES website at www.ieee-pes.org for further details, and additional events.

- [2020 IEEE PES Transmission and Distribution Exhibition and Conference](#)
[April 20-23, 2020, Chicago, IL, \(CANCELLED due to COVID-19 pandemic\)](#)
- [2020 IEEE PES General Meeting](#)
August 2-6, 2020, Montreal, QC **(REVISED to virtual meeting due to COVID-19 pandemic)**
- [2021 IEEE PES General Meeting](#)
July 18 – 22, 2021, Washington, DC
- [2022 IEEE PES Transmission and Distribution Exhibition and Conference](#)
[April 25 - 28, 2022, New Orleans, LA](#)

- [2022 IEEE PES General Meeting](#)
July 17 - 21, 2022, Denver, Colorado

5.3 2020 IEEE PES TRANSMISSION AND DISTRIBUTION CONFERENCE AND EXHIBITION CANCELLED

5.3.1 Conference Theme

The theme of the 2020 Transmission and Distribution Conference and Exhibition was to be *Electrifying the Future*.

5.3.2 Conference Paper Submittals

The 2020 Transmission and Distribution Conference and Exhibition paper submission period opened to authors on July 8, 2019 and closed on August 15, 2019. Papers were then distributed to various Technical Committees for peer review based upon the paper content. The peer review process ended on October 28, 2019. All Transformers Committee reviews were completed by October 26, 2019. A listing of the papers submitted to and reviewed by the Transformers Committee, and the status of each submission, is shown in Table 1.

Total Submissions..... 9
Accepted 7
Rejected 2

Table 1: Conference Papers Submitted

Paper	Title	Status
2020TD0103	Power transformers: Mitigate Environmental Impact and Fire Risk Reduction and be prepared for the Unexpected	Accepted
2020TD0210	Moving to Single-Phase Voltage Regulation Saves Utility Costs, Improves Power Quality for Industrials	Accepted
2020TD0216	Long-Term Behavior of Natural Ester Filled Power Transformers in Eletronorte Transmission System	Accepted
2020TD0246	Modeling the Winding Hot-Spot Temperature and Aging of Enclosed Vault Transformers using a Physics-Based Heat Transfer	Accepted
2020TD0248	Analytical Modeling of a Three-phase Magnetic Amplifier-based Continuously Variable Reactor	Accepted
2020TD0288	Environment friendly: Explosion-proof, oil-filled Station Service Voltage Transformers for Internal Arc Protection Class II	Rejected
2020TD0295	Potential Benefits of Natural Ester Fluid-Filled Transformers Expanding Substation Capability	Rejected
2020TD0298	New Dual Nameplate kVA for Distribution Transformers	Accepted
2020TD0325	Staged Investment for Intelligent Automatic Transformers Winding Manufacturing Lines	Accepted

5.3.3 Panel Sessions

There was to be one panel session related to Transformers Committee activities for the 2020 IEEE PES Transmission and Distribution Conference and Exhibition. The topic is “Discussion of New Dual Nameplate kVA for Distribution Transformers” (see related paper 2020TD0298). The panelists will be Phil Hopkinson (moderator), Dan Mulkey, Tom Callsen, Kevin Rapp, Al Traut, and Tom Prevost.

5.3.4 Tutorial Sessions

There were no tutorial submissions planned by the Transformers Committee.

5.4 2020 IEEE PES GENERAL MEETING AUGUST 2-6, 2020 (REVISED TO A VIRTUAL MEETING)

The theme for the 2020 IEEE PES General Meeting was “Are Big Data, Machine Learning and Electric Transportation Transforming the Grid?” Supersession topics related to this theme were

1. Big Data and Machine Learning Applications in Power Systems
2. Decarbonization Through Electrification
3. Energy Systems Integration
4. Facing the Changing Resource Mix

The window for paper submission began on October 10, 2019 and ended on November 7, 2019. Papers have been peer reviewed based upon the paper content. The review process began in early January 2020, and authors were notified of final acceptance or rejection decisions by March 1, 2020.

The 2020 IEEE PES General Meeting paper submission period opened to authors on October 10, 2019 and closed on November 7, 2019. Papers were then distributed to various Technical Committees for peer review based upon the paper content. The peer review process ended on February 13, 2020. All Transformers Committee reviews were completed by February 13, 2020. A listing of the papers submitted to and reviewed by the Transformers Committee, and the status of each submission, is shown in Table 2.

Total Submissions..... 12 (11 conference and 1 transaction)
 Accepted 7 (6 conference and 1 transaction)
 Rejected 5

Table 2: Conference and Transaction Papers Submitted

Paper	Title	Status
20PESGM0052 (Transaction)	Tank Current Measurement of Three-Phase Transformer: Its Resonance Behavior and Sensitivity to Detect Mechanical Faults	Accepted
20PESGM0647	Electrical and mechanical Fault identification in a three phase Transformer from its V-I characteristics	Accepted
20PESGM0710	Statistical Analysis of a Large Dataset Supporting the Updated IEEE C57.104 Dissolved Gas Analysis Guide	Rejected (Incomplete)
20PESGM0778	Optimal Accelerometer Placement for Online Vibro-Acoustic Measurement based Transformer Winding Condition Monitoring	Rejected
20PESGM0842	Oil-immersed transformer fault diagnosis method based on XGBoost optimized by GA	Rejected

Paper	Title	Status
20PESGM1040	Dynamic State Estimation Based Monitoring of High Frequency Transformer	Rejected
20PESGM1065	Evaluation of Thermal Impact of GIC on Tertiary Windings of Large Power Transformers	Accepted
20PESGM1183	Study of Skin and Proximity Effects of Conductors for MTL-Based Modeling of Power Transformers Using FEM	Accepted
20PESGM1333	Image Cognition-based Power Transformer Protection Scheme Using Convolutional Neural Network	Accepted
20PESGM1378	A Transformer Protection Scheme Based on The Deep Forest Algorithm	Accepted
20PESGM1517	Analysis of the Early Failure of Large Power Transformers	Rejected
20PESGM1573	Modeling of An Enhanced Three-phase Continuously Variable Reactor	Accepted

5.5 PAPER REVIEWER RECOGNITION

Reviewing conference papers is a valuable service to both the authors and the transformer industry. The efforts spent by those who volunteer their time is an essential part of ensuring the papers that are presented are of the highest quality. The time and effort spent reviewing papers often goes unrecognized. The Transformers Committee offers its thanks and gratitude to the following people who volunteered their time to review one or more of the papers submitted for the 2020 paper season.

5.5.1 2020 IEEE PES Transmission and Distribution Conference and Exhibition Paper Reviewers

Alan Sbravati	Alan Wilks	Alwyn VanderWalt
Axel Kramer	Bertrand Poulin	Clair Claiborne
Dan Mulkey	Dan Sauer	Daniel Blaydon
David Walker	Dharam Vir	Eduardo Garcia Wild
Enrique Betancourt	Ewald Schweiger	George K. Frimpong
George Payerle	Israel Barrientos	Jack Harley
Jason Varnell	Javier Arteaga	Jim Harlow
Jin Sim	Joe Watson	John Herron
John K. John	Krishnamurthy Vijayan	Kurt Kaineder
Mark Gromlovits	Michael Thibeault	Phil Hopkinson
Poorvi Patel	Ramsis Girgis	Sanjib Som
Sasha Levin	Scott Reed	Sheldon Kennedy
Tauhid Ansari	Waldemar Ziomek	Yang Baitun
Zan Kiparizoski		

5.5.2 2020 IEEE PES General Meeting Paper Reviewers

Alan Sbravati	Axel Kramer	Eduardo Garcia Wild
Enrique Betancourt	Ewald Schweiger	George K. Frimpong

Jason Varnell
Krishnamurthy Vijayan
Ramsis Girgis
Waldemar Ziomek

Jin Sim
Phil Hopkinson
Sanjib Som
Zan Kiparizoski

Joe Watson
Poorvi Patel
Tauhid Ansari

5.6 2020 FALL VIRTUAL MEETING TASK FORCE

A task force led by the Vice Chair was formed in June 2020 to contingency plan for a virtual fall meeting. After a few meetings it was decided that the in-person fall meeting would be cancelled and the virtual meeting was a go.

Here is a summary of the Task Force actions / decisions:

- Reviewed various options to host a virtual meeting using experience from other technical committees, IEEE SA etc. Based on this and the large size of our meeting, we decided it was too much to run the meeting on our own and that we should hire a professional company to manage the meetings, quorum, voting, attendance, technical issues etc so that our activity leaders could focus on standards development work.
- We decided that each meeting would have an AV expert to manage the meeting. This could mean there are 6 hired resources at one time to handle 6 concurrent WG meetings.
- We solicited proposals from 4 companies and had a meeting with each. We then selected 2 companies for more detailed review and selected PSAV for award.
- We decided to keep the meeting schedule close the normal in person schedule and keep the same dates planned. Some sessions like the Newcomers Orientation, Awards Luncheon etc were to be prepared for on-demand viewing.
- Registration was planned for \$130 for members, \$100 for life members and \$150 for non members to cover meeting costs.
- Participants will register through AMS and PSAV will send paid registrants a link to their platform for the meeting. In the platform they will go to whatever meeting they want. The meetings will all be Webex.
- Training to activity leaders will be provided ahead of the Fall meeting.

The task force met 10 times. The members of the TF were: Bruce Forsyth, Ed Smith, Tammy Behrens, Jerry Murphy, Casey Ballard, Jennifer Quandel, David Wallach and Ed teNyenhuis

Respectfully submitted,

Ed teNyenhuis
Vice-Chair
Oct 3, 2020

Please refer to Appendix 10 for the minutes from the Task Force for the Virtual Fall Meeting Planning chaired by Ed teNyenhuis.

6 SECRETARY'S REPORT – DAVID WALLACH

The Secretary's Report was presented at the Monday General Session.

6.1 MEMBERSHIP REVIEW

The Committee welcomes and encourages active participants to become Members of the Committee. Requirements and application forms can be found in the Organization and Procedures (O&P) Manual, accessible on the Committee website. A link to the Membership Application form can be found on the TransformersCommittee.org homepage in [Information](#) | Forms. Subcommittee Chairs are encouraged to recommend new members and to communicate the process of attaining membership through **active participation** and **contribution** at the WG and SC level. New member applications may be submitted to the Committee Secretary's attention at any time. Applications will be collected for review and approval in batches at each Administrative Subcommittee meeting.

6.1.1 New Committee Member Approvals

At the Summer 2020 (Virtual) Administrative Subcommittee meeting, six new committee member applications were reviewed. All six of the applications were approved. The new members are listed in the following table.

Name	Affiliation	Sponsor #1	Sponsor #2	Sponsor #3	Membership Category
Arup Chakraborty IEEE – Yes PES – Yes SA – Yes	Delta Star	Ajith Varghese Dielectric Test SC 3.5+ yr.	Sanjib Som WG PC57.21 4+ yr.	A. Nigerian WG PC57.113 3 yr.	Producer
Attila Gyore IEEE – Yes PES – Yes SA – Yes	M&I Materials Ltd	Sheldon Kennedy Insulation Life SC 2 yd	Thomas Prevost WG PC57.166 2+ yr.	Richard Marek WG PC57.154	Producer
Raja Kuppuswamy IEEE – Yes PES – Yes SA – Yes	Dynamic Ratings	Ajith Varghese Dielectric Test SC 4 yr	A. Naderian WG PC57.113 2+ yr.	Mike Spurlock WG PC57.143	Producer
Marek Kornowski IEEE – Yes PES – Yes SA – Yes	Polycast Int'l	Ross McTaggart Instrument Trf SC 2+ yr	S. Shull WG PC57.19.02 2 yr	Thomas Sizemore WG PC57.13.2 2 yr	Producer
Cihangir John Sen IEEE – Yes PES – Yes SA – Yes	Duke Energy	Ajith Varghese Dielectric Test SC 2 yr	G. Anderson WG C57.150 2 yr	Ramsis Girgis WG C57.12.90 2 yr	User
Bruce Webb IEEE – Yes PES – Yes SA – Yes	Knoxville Utilities Board	Ed Smith Distribution Trf SC 2 yr	Alan Traut WG PC57.12.20 2 yr	Bill Griesacker TF Rev to Low Freq Test 2 yr	User

6.1.2 New Member Applications

Zero new applications for Committee Membership have been received for consideration since the last Administrative Subcommittee meeting.

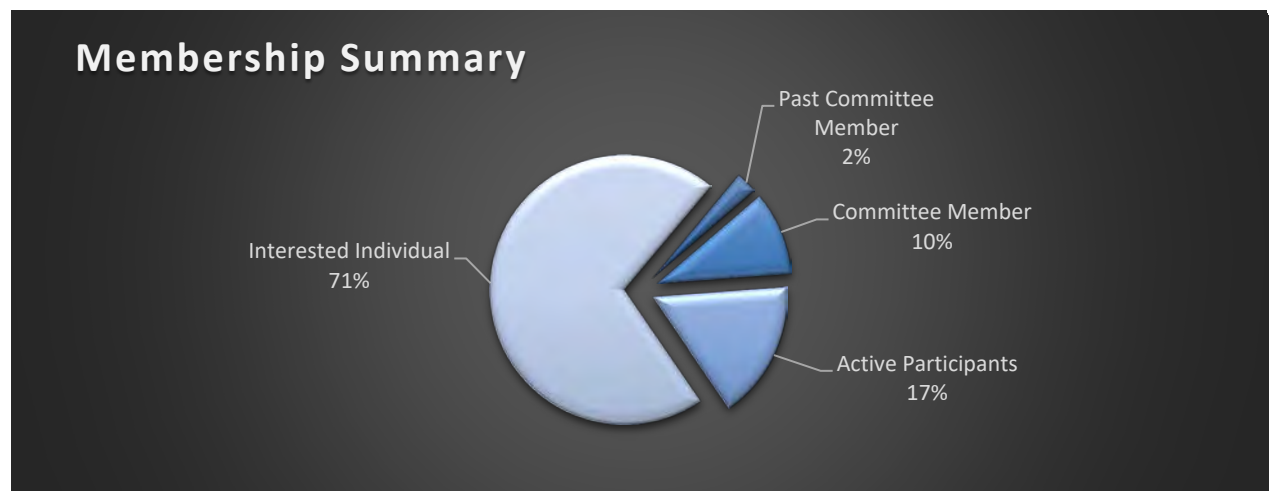
6.1.3 Association Management System (AMS) Database

The Transformers Committee AMS database of people currently has three general categories of participation in our activities. These are: **Interested Individual**, **Active Participant**, and **Committee Member**. In addition, the Committee Secretary maintains a list of **Past Committee Members**. Anyone can join the AMS 123 system as the system is designed for self-registration. A new participant will automatically be assigned the role of Interested Individual when they first sign up. It is the responsibility of each individual to keep his/her profile updated (except for the participant status). Based on the level of participation, the committee administrative staff will upgrade the participation status to “Active Participant” when appropriate. The Committee Member status however, can only be attained through a formal application with the sponsorship of a minimum of three WG or SC chairmanships, at least one of which must be a SC Chair. Details of the application requirements and approval process by the Administrative Subcommittee are outlined in our O&P manual.

The following table contains a count of the participants grouped by the four general categories (CM totals do not include those requesting membership at this meeting or Members to be moved to Past Member Status).

<i>Membership Status</i>	F15	S16	F16	S17	F17	S18	F18	S19	F19	S20	F20*
<i>Interested Individual</i>	1462	1471	1507	1554	1550	1552	1551	1582	1632	1579	1563
<i>Interested Individual - IEEE Life Member</i>	11	11	11	11	11	13	12	12	12	11	12
Total Interested Individuals	1473	1482	1520	1565	1561	1565	1563	1594	1644	1590	1575
<i>Active Participant</i>	240	242	258	275	302	321	324	349	362	365	362
<i>Active Participant - IEEE Life Member</i>	7	5	5	5	5	5	5	6	7	6	6
Total Active Participants	247	247	263	280	307	326	329	355	369	371	368
<i>Committee Member</i>	161	172	175	180	169	175	181	191	182	179	179
<i>Committee Member – Emeritus</i>	10	9	9	9	9	10	10	10	10	11	11
<i>Committee Member - IEEE Life Member</i>	23	25	27	29	28	33	33	33	32	33	33
Total Committee Members	194	206	211	218	206	216	224	234	224	223	223
<i>Past Committee Member</i>	28	32	31	30	42	38	38	38	50	48	48
<i>Past Committee Member - IEEE Life Member</i>	6	5	5	5	7	6	6	6	8	12	10
Total Past Committee Members	34	37	36	35	49	44	44	44	58	60	58
TOTAL IN AMS DATABASE	1948	1972	2028	2098	2123	2151	2160	2227	2295	2244	2224

*S20 data as of August 14, 2020



6.2 COMMITTEE, SUBCOMMITTEES, AND WORKING GROUP ROSTERS

In order to provide indemnification to working group and subcommittee members it is crucial that membership lists be maintained. The AM system has these functions built-in to ease these administration tasks. It is important that each subcommittee and working group chair keep the rosters updated so that this information can be provided to the IEEE SA.

A similar main committee roster has also been developed to track attendance for the Main Committee General Session meeting on Monday & Thursday. The data will be used to update participant's membership profile.

6.3 IEEE/PES AND IEEE/SA MEMBERSHIP REQUIREMENTS

As a reminder, all members of the Transformers Committee must also be members in good standing of the Power & Energy Society (IEEE/PES) and the Standards Association (IEEE/SA).

WG Chairs must be members in good standing of the sponsoring subcommittee SC as well as the Power & Energy Society (IEEE/PES) and the Standards Association (IEEE/SA).

6.4 COMMITTEE MEMBERSHIP MAINTENANCE

An attendance audit was performed in February 2020 prior to the planned Charlotte, NC Spring Meeting that was canceled due to the COVID-19 Pandemic. There are a few committee members to be contacted. This membership maintenance will take place after the Fall 2020 meeting along with the results of the biennial IEEE-SA and IEEE PES membership audit.

Note that Past Committee Members can be reinstated to Committee Members if their status changes and they are able to regularly participate within two years of being changed to Past Committee Member.

6.5 SENIOR MEMBERSHIP REMINDER

IEEE members are encouraged to apply for senior membership. Senior membership gains recognition by peers/management and better positions for fellow membership. The requirements are 10 years of experience and 3 references.

More details and application can be found at <https://www.ieee.org/membership/senior/> or under the "information tab" of the Transformer Committee website.

6.6 ESSENTIAL PATENT CLAIMS

All registrants were asked to agree with the following statement:

"I have read the Patent Claim notice on the following webpage, and I understand that if I am aware of any Essential Patent Claim related to issues being discussed or considered for inclusion in standards being developed by one or more Working Groups of the Transformers Committee, it is my responsibility to inform the Chair of the Working Group affected by such claim."

Working Group Chairs are asked to make a Call for Essential Patent at the beginning of each meeting and to record the results in the meeting minutes.

6.7 AFFILIATION

According to the IEEE Standards Board Bylaws, there is a requirement that participants of an IEEE meeting disclose their employer and affiliation. Consultants must state if they are sponsored or not. It is not

sufficient to simply announce "My name is John Smith, and I'm a consultant." If a consultant is sponsored by a client, it must be disclosed. If the consultant does not have a sponsor, the proper introduction is something such as "My name is John Smith, I am a consultant, and I represent myself at this meeting."

6.8 MEETING MINUTES

The minutes of the Fall 2019 meeting have been posted to the committee website. Thank you to everyone for submitting their minutes in a prompt fashion. The ADCOM will meet virtually on May 21, 2020 and the meeting minutes were compiled, approved, and posted from that meeting.

Subcommittee Chairs are asked to submit their respective subcommittee meeting minutes for the Fall 2020 Virtual meeting to the Committee Secretary no later **December 3, 2020**, which is **6 weeks** after the completion of the meeting. It is strongly recommended that meeting minutes be prepared at or just after the meeting while the activities are still fresh in members' minds. Doing so will help to ensure the activities and decisions made during the meeting are accurately reflected in the minutes.

Subcommittee meeting minutes should be submitted via e-mail to the Committee Secretary, David Wallach [David.Wallach@ieee.org], who will forward them on to the webmaster for posting on the Committee website. The submittal file should be saved as a Word document formatted like this document. Attendance, indication of quorum, names of members making any motion, seconding any motion, and the result of any votes (affirmative and negative count) for each SC, WG, and TF meeting shall be included in all minutes.

Respectfully submitted,

David Wallach
Secretary
IEEE/PES Transformers Committee
September 11, 2020

Please refer to Appendix 9 for the minutes of the May 2020 ADCOM meeting.

7 TREASURER'S REPORT – PAUL BOMAN

The Treasurer's Report was presented at the Monday General Session.

The Treasurer's Report is included as **Appendix 8**.

8 RECOGNITION AND AWARDS REPORT – SUE MCNELLY

8.1 RECOGNITION & AWARDS REPORT – SUSAN MCNELLY

THIS REPORT IS A COMBINATION OF THE SPRING 2020 CHARLOTTE, NC REPORT AND THE FALL 2020 KANSAS CITY REPORT DUE TO THE CANCELED MEETING IN CHARLOTTE.

8.2 IN MEMORIAM

8.2.1 John Sullivan



John served on the U.S.S. Bache and graduated from Georgia Institute of Technology in 1967. John worked for Tampa Electric Company for 35 years, and retired in 2002. He became a Transformers Committee member in 1992 and was active in the Distribution SC. John was an IEEE Life Member.

8.2.2 Ron Barker



Ronald “Ron” Lee Barker, passed away peacefully on Sunday, January 26, 2020 at the age of 77.

He is survived by his wife of 55 years, Phyllis Shelburne Barker; children, Ronald Dean Barker (Trude) and Joy Barker King; grandchildren, Cole, Cameron, Jordan and Will.

He was a member of the Institute of Electrical and Electronics Engineers (IEEE), a lifetime member of the Tuckahoe Volunteer Rescue Squad, a member of The Order of the Founders and Patriots of America and a member of First Baptist Church, 2709 Monument Ave. He graduated from Virginia Tech, where he co-oped at Virginia Power. Ron became a Transformers Committee Member in 1992. He retired from Virginia Power (Dominion) after 42 years as an electrical engineer. He spent his retirement years consulting, fishing, tinkering and traveling.

Tributes:

Don Fallon: "...I have very fond memories of the friendships established in my earliest days on the Committee, in the 1980's, and those included Ron, a perfect Southern gentleman who at the same time was also very down to earth and funny. Ron was totally competent and professional, but with a relaxed manner, and always with a smile. We will all miss him."

Cliff Thompson: "What a privilege to have known and worked with Ron for 40 yrs. He will be missed."

Mark Haas: "Gods Speed to our dear departed friend. He will be missed. We all have a lot of wonderful memories."

8.2.3 Anthony Jonnatti



Anthony J Jonnatti passed away on May 22, 2020. He was loved and cherished by many people including : his parent Palm Harbor; six children Mark, Susan, David, Sandy, Sharon and Stacy; and 7 grandchildren

Tributes:

Phil Hopkinson: "He was laid back BUT HIGHLY KNOWLEDGEABLE ABOUT Dry Type transformer issues. He had a super sense of humor in a Dry (pun) way. Tony was interested in people as well as technology. Many of us can remember Tony well as a great mentor. We also remember him as a guy that liked to try things to see what happens. He was also super-devoted to his wife, Barb."

Allan Bartek: "He was a friend and mentor to me when I was a young engineer at McGraw-Edison. Among many other things, he was responsible for the design of the 765kV HV test transformer located in Canonsburg, Pa at the site that is now called Pennsylvania Transformer Technologies. I learned a lot about transformer design from Tony. We have lost another giant in the transformer industry. It was Tony who first introduced me to the IEEE Transformers Committee when I was in my 30's. He would take me aside and say to me, Al you have to attend the Transformer Committee meetings and give a voice to the standards being developed. You owe it to the industry."

8.3 GENERAL SERVICE AWARDS

8.3.1 Meeting Host

The Spring 2020 Host Team Certificate of Appreciation was presented to Duke Energy. Even though this meeting was canceled due to COVID-19, there was significant work put into the planning and preparation for this meeting, as well as for the cancelations of events that had to be done. The following were on the host team:

Dave Wallach

Kumar Mani

Cihangir Sen

Reinaldo Valentin

Dinesh Sankarakurup

Scott Digby

Kevin Sullivan

Tyler Morgan

Special Certificate of Appreciation were presented to the Administrative Subcommittee Virtual Meeting Task Force:

TF Chair: Ed teNyenhuis

Members: Casey Ballard, Tammy Behrens, Jerry Murphy, Tom Prevost, Jennifer Quandel, Ed Smith, Dave Wallach

8.4 NEW MEMBERS OF THE TRANSFORMERS COMMITTEE

The Transformers Committee welcomes 6 new committee members. Each of the following people became members in the spring of 2020. Presentation as new members was delayed due to the cancelled meeting. They were welcomed to the Committee at the Monday General Session and provided with a membership certificate.

- | | |
|---------------------|---------------------------|
| 1. Arup Chakraborty | Delta Star Incorporated |
| 2. Attila Gyore | M&I Materials Ltd |
| 3. Marek Kornowski | Polycast International |
| 4. Raja Kuppuswamy | Dynamic Ratings, Inc. |
| 5. Cihangir J Sen | Duke Energy |
| 6. Bruce Webb | Knoxville Utilities Board |

8.5 EMERITUS MEMBER

As a long-standing member who has continued to contribute to the standards process and our Committee, Peter Balma was made an emeritus member in the Spring of 2020.

8.6 OUTSTANDING SERVICE AWARDS

For long-term commitment, dedication, and contributions to the Transformers Committee the following were awarded.

1. Tom A. Prevost
2. Edward J. Smith

8.7 2020 CIGRE TECHNICAL COMMITTEE AWARD

Michel Duval has been awarded the 2020 CIGRE Technical Council Award for the A2 – Power Transformers and Reactors. The Transformer Committee congratulates Michel on this most deserving award.

8.8 IEEE STANDARDS ASSOCIATION STANDARDS BOARD WORKING GROUP AWARDS

In addition to the Committee Awards above, the IEEE SA SB presents its own Award to the WG Chair upon publication of a new or revised document and offers the WG Chair the opportunity to nominate significant contributors to the project for an IEEE SA SB Certificate of Appreciation.

1. IEEE Std C57.12.32™-2019 – IEEE Standard for Submersible Equipment – Enclosure Integrity
WG Chair: Dan Mulkey
WG Vice Chair: Jerry Murphy
WG Secretary: Jeremy Van Horn
Outstanding Contributors: Scott Abbott, Darren Brown, Carlos Gaytan, Brian Klaponski, Giuseppe Termini, Mike Thibault, Al Traut, and Alan Wilks
2. IEEE Std C57.123™-2019 – IEEE Guide for Transformer Loss Measurement
WG Chair: Ed TeNyenhuis
WG Secretary: Tony Franchitti
Outstanding Contributors: Tauhid Ansari, Reto Fausch, Ramsis Girgis, Mark Perkins, Bertrand Poulin, Andy Steineman, Craig Stiegemeier, and Ajith Varghese
3. IEEE 1277™-2020 – General Requirements and Test Code for Dry-Type and Oil-Immersed Smoothing Reactors and for Dry-Type Converter Reactors for DC Power Transmission
WG Chair: Klaus Pointner
WG Technical Editor: Pierre Riffon
WG Secretary: Ulf Radbrandt
Outstanding Contributors: David Caverly, Solomon Chiang, Domenico Corsi, Eric Davis, Alexander Gaun, Monty Goulkhah, Peter Heinzig, John John, Klaus Papp, Christoph Ploetner, Leslie Recksiedler, Alan Sbravati, Michael Sharp, Waldemar Ziomek

8.9 OTHER AWARDS

See the Awards Guidebook on our website <http://www.transformerscommittee.org/> for other award opportunities. The guidebook provides a reference for the awards that are available to the PES Technical Committees volunteers each year. The intent is to provide one reference point to assist the PES Technical Committees in recognizing the volunteers who donate their time and expertise to the betterment of the industry and society overall. This is meant to supplement, not replace the PES Awards web page: <https://www.ieee-pes.org/pes-communities/awards>.

Respectfully submitted,

Susan J. McNelly

Chair, Recognition & Awards Subcommittee
IEEE PES Transformers Committee

Oct 9, 2020

9 ADMINISTRATIVE SUBCOMMITTEE – BRUCE FORSYTH

The Administrative Subcommittee met virtually on October 13, 2020. The following are the unapproved minutes of that meeting.

9.1 INTRODUCTION OF MEMBERS AND GUESTS

The Chair called the meeting to order and attendees were recognized by their identification in the Webex attendee list. Introductions were made of guests.

Members and Guests Present:

Chair	Bruce Forsyth
Vice-Chair	Ed teNyenhuis
Secretary	David Wallach
Treasurer	Paul Boman
Standards Coordinator.....	Jim Graham
Awards/Past Chair.....	Sue McNelly
Bushings	Eric Weatherbee
Dielectric Tests	Ajith Varghese
Distribution Transformers	Ed Smith
Dry Type Transformers	Casey Ballard
HVDC Converter Transformers & Reactors.....	Ulf Radbrandt
Instrument Transformers.....	Thomas Sizemore
Insulating Fluids	Scott Reed
Insulation Life	Sheldon Kennedy
Performance Characteristics	Rogério Verdolin
Power Transformers	Bill Griesacker
Standards	Jerry Murphy
Underground Transformers & Network Protectors	George Payerle
Meetings.....	Tammy Behrens
Guests: Malia Zaman, Steve Shull	

9.2 APPROVAL OF PREVIOUS MEETING MINUTES

The Fall 2020 minutes were approved at the May 2020 ADCOM meeting. The May 2020 ADCOM meeting minutes were approved by email ballot, so no meeting minute approvals were necessary at this meeting.

9.3 ADDITIONS TO AND/OR APPROVAL OF THE AGENDA

The Chair noted item 1.2 revised to include prior minutes are approved. There were no objections to the revised agenda, therefore the below agenda was approved.

Approved Agenda:

1.	Administrative Topics	1:00
1.1.	Introduction of Members and Guests (:10).....	All
1.2.	Review of status of meeting minutes Fall 2019 and Spring 2020 (:03).....	Bruce Forsyth
1.3.	Approval of the Agenda (:02).....	Bruce Forsyth
2.	Officer Reports	1:15
2.1.	Chair's Report (:15).....	Bruce Forsyth
2.2.	Vice Chair's Report (:05)	Ed teNyenhuis
2.3.	Secretary's Report & New Committee Membership Approval (:15)	David Wallach

2.4.	Treasurer’s Report (:05)	Paul Boman	
2.5.	Recognition & Awards Report (:05)	Sue McNelly	
2.6.	Standards Report (:15)	Jim Graham	
3.	IEEE Report		2:15
3.1.	IEEE Staff Update (:10)	Malia Zaman	
4.	Meeting Planning Report		2:25
4.1.	Meeting Planning Report (:10)	Tammy Behrens	
4.2.	F20 Meeting Format Discussion (:25)	Tammy Behrens	
5.	Subcommittee Reports		3:00
5.1.	Bushings (:03)	Eric Weatherbee	
5.2.	Dielectric Test (:03)	Ajith Varghese	
5.3.	Distribution Transformers (:03)	Ed Smith	
5.4.	Dry Type Transformers (:03)	Casey Ballard	
5.5.	HVDC (:03)	Ulf Radbrandt	
5.6.	Instrument Transformers (:03)	Thomas Sizemore	
5.7.	Insulating Fluids (:03)	Scott Reed	
5.8.	Insulation Life (:03)	Sheldon Kennedy	
5.9.	Performance Characteristics (:03)	Rogério Verdolin	
5.10.	Power Transformers (:03)	Bill Griesacker	
5.11.	Standards (:03)	Jerry Murphy	
5.12.	Subsurface Transformers & Network Protectors (:03)	George Payerle	
6.	Old Business		3:36
6.1.	Copyright Compliance Update (:14)	Ed teNyenhuis	
7.	New Business (:05)		3:50
8.	Wrap Up & Adjournment		3:55
8.1.	Wrap Up (:05)	Bruce Forsyth	
8.2.	Adjourn		

9.4 CHAIR’S REPORT – BRUCE FORSYTH

Refer to Section 4.0 of the Main Minutes for a complete “Chair’s Report.”

9.5 VICE CHAIR’S REPORT – ED TENYENHUIS

Refer to Section 5.0 of the Main Minutes for a complete “Vice Chair’s Report.”

9.6 SECRETARY’S REPORT – DAVID WALLACH

Refer to Section 6.0 of the Main Minutes for a complete “Secretary’s Report.”

9.7 TREASURER’S REPORT – PAUL BOMAN

Refer to Section 7.0 of the Main Minutes for a complete “Treasurer’s Report.”

9.8 RECOGNITION & AWARDS REPORT – SUSAN MCNELLY

Refer to Section 8.0 of the Main Minutes for a complete “Recognition & Award’s Report.”

9.9 STANDARDS REPORT AND NEW PAR REQUESTS – JIM GRAHAM

Refer to Section 10.0 of the Main Minutes for a complete “Standards Report.”

9.10 IEEE STAFF UPDATE – MALIA ZAMAN

Refer to **Appendix 7** of the Main Minutes for the full PowerPoint presentation.

9.11 MEETING PLANNING REPORT – TAMMY BEHRENS

- 9.11.1 We will hold Toronto hotel reservation link sharing on the website until late in 2020 to check the status of a Spring 2021 meeting.
- 9.11.2 F20 Meeting Format Discussion: We have training scheduled this week and those links have gone out. PSAV will run the meeting logistics. Tammy ran through a PowerPoint with PSAV screens. We will get attendance reports but PSAV will not establish quorum. Quorum could be established by displaying members on the screen and using the chat feature or a hand raise to check quorum. PSAV will record the meetings for the use of minutes only but will be deleted. We need to notify attendees the meetings will be recorded.

9.12 SUBCOMMITTEE REPORTS/HOT TOPICS

Brief reports were received from all the subcommittee chairs.

- 9.12.1 Bushings [Eric Weatherbee]: nothing to add
- 9.12.2 Dielectric Test [Ajith Varghese]: Continuing previous discussions.
- 9.12.3 Distribution Transformers [Ed Smith]: One Entity PAR for OLTC will be discussed.
- 9.12.4 Dry Type Transformers [Casey Ballard]: Two primary documents 12.91 and 12.01 are complete. Four new TFs will be meeting. No updates on the solid-state transformer discussion. Casey has reached out to IEC to gauge their interest.
- 9.12.5 HVDC Converter Transformers & Reactors [Ulf Radbrandt]: IEEE 12.77 published this year. The SC will discuss presenting 1-2 tutorials. The SC scope may need to be reviewed updated to include converter reactors.
- 9.12.6 Instrument Transformers [Thomas Sizemore]: Continuing ongoing work. C57.13.2 surveyed draft to send to SC. 6245 dual logo work continues with first CD.
- 9.12.7 Insulating Fluids [Scott Reed]: Getting ready to launch four new TF for Guides that will expire in 2024.
- 9.12.8 Insulation Life [Sheldon Kennedy]: Phil McClure has retired and C57.165 is now chaired by Mark Tostrud. C57.12.90 chaired by Bob Thompson has retired and is now chaired by Dinesh Sankarakurup. Sheldon will be stepping down after the Fall 2020 meeting and a new chair will be announced.
- 9.12.9 Performance Characteristics [Rogerio Verdolin]: WG PC57.105 met since May in comment resolution. Updating PAR. Rogerio brought up the AMS email glitch where his email was sent

repeatedly. We don't have a solution particularly on the weekends when 123Signup has no weekend support. Sue asked if we are big enough as IEEE to request an after-hours support.

- 9.12.10 Power Transformers [Bill Griesacker]: One new WG will meet. C57.116 will meet this next session. C57.131 is being sorted since it was pulled back from the dual logo process. There is a question about copyright material that may be in the document with dual logo development.
- 9.12.11 Standards [Jerry Murphy]: C57.12.00 and C57.12.90 are ready for ballot. Four other WG are moving along. Jerry Murphy will be stepping down after the Fall 2020 meeting and a new chair will be announced.
- 9.12.12 Subsurface Transformers & Network Protectors [George Payerle]: TF for corrosion is doing some interesting work.

Bruce reinforced the message when the draft schedule is sent out for review that no meetings should be canceled after approval.

9.13 OLD BUSINESS

- 9.13.1 Copyright Compliance Update: we had training recently. The session was recorded and can be replayed.

9.14 NEW BUSINESS

- 9.14.1 Jim Graham brought up an issue related to the activity leader distribution list. If groups are not active, they should not be on a distribution list. We also need to maintain the myProject roles and let the Standards Coordinator know when changes occur. Jim Graham will send out a document for review next week. Sue asked that SC chairs look at their Website pages for updates. Active and inactive groups need to be updated.

9.15 ADJOURNMENT

The meeting was adjourned at 4:55 PM.

Submitted by:

David Wallach,
Secretary, Transformers Committee

October 18, 2020

10 STANDARDS REPORT – JIM GRAHAM

The Standard Report was presented at the Monday General Session.

The semi-annual Standards Report is included as **Appendix 2**.

11 LIAISON REPORTS

11.1 CIGRE – CRAIG SWINDERMAN

Craig Swinderman prepared a presentation which is shown in **Appendix 3**.

11.2 IEC TC-14 – CHRISTOPH PLOETNER

Christoph Ploetner presented an overview of TC14 activities. His presentation is available in **Appendix 4**.

11.3 STANDARDS COORDINATING COMMITTEE NO. 4 (ELECTRICAL INSULATION) – EVANNE WANG

IEEE PES Transformers Committee

Liaison Report for General Session Meeting – October 19, 2020 Standards Coordinating Committee on Electrical Insulation – SCC 04

Standards Coordinating Committee 04 oversees development of standards for Electrical Insulation that span the scope of multiple Technical Committees and Societies (e.g., Dielectric and Electrical Insulation, and Power Engineering) within IEEE.

1. SCOPE:

- To formulate guiding principles for the evaluation of insulation materials and systems for electrical and electronic applications.
- To formulate principles for the identification of insulation materials and systems based on functional tests and/or experience.
- To coordinate the preparation of standards for functional test programs and diagnostic methods for the evaluation of insulation materials and systems.

2. STANDARDS:

- **IEEE 1-2000 (R2011)** Recommended Practice – General Temperature Limits in the Rating of Electrical Equipment and for the Evaluation of Electrical Insulation
- **IEEE 98-2016** Standard for the Preparation of Test Procedures for the Thermal Evaluation of Solid Electrical Insulating Materials
- **IEEE 99-2019** Recommended Practice for the Preparation of Test Procedures for the Thermal Evaluation of Insulation Systems for Electrical Equipment

3. CURRENT ACTIVITIES:

- **IEEE 1** – Standard expires 12/31/2021. Document review in progress.
- **IEEE 99** – Published 7/17/2020.

For those interested in joining SCC04 or WG for revision of IEEE 1, please contact the WG Chair of IEEE 1, Brad Greaves (brad.greaves@weidmann-group.com).

Respectfully submitted, Evanne Wang

11.4 ASTM – TOM PREVOST

ASTM did not meet so there is no report.

12 HOT TOPICS FOR THE UPCOMING WEEK

The Subcommittee Chairs gave brief updates on topics of special importance being addressed during the week.

13 OPENING SESSION ADJOURNMENT

The meeting adjourned at 9:02 AM CDT.

Thursday Closing Session

14 CHAIR'S REMARKS AND ANNOUNCEMENTS

The Chair called the meeting to order at 11:00 AM CDT.

15 MEETINGS PLANNING SC MINUTES & REPORT – TAMMY BEHRENS

See Appendix 6.

16 REPORTS FROM TECHNICAL SUBCOMMITTEES (DECISIONS MADE DURING THE WEEK)

Reports from each Technical SC were presented. The complete unapproved minutes for each Subcommittee are included in full in the attached Annexes.

16.1 POWER TRANSFORMERS BILL GRIESACKER

The Power Transformers Subcommittee met on Wednesday afternoon at 1:55pm.

A quorum was established by Webex Poll, which is provided in summary below:

Attendance	
	Webex (To Be Verified)
Total Attendees	217
Total # Of Members	114
Members Present	71
Quorum Present	62.3 %

The Agenda was approved by unanimous consent.

The minutes from the Spring 2019 and Fall 2019 PTSC meetings were approved by unanimous consent.

The following Working Group and Task Force reports were provided by the respective leaders:

Working Group and Task Force Reports

PAR Study Group for C57.116 GSU Transformers - W. Li

The WG for revising C57.116 met for the first time on Monday. A motion was approved to form 4 task forces to review sections of C57.116 and identify changes that should be made. Members volunteered for each of the task forces. The V/Hz task force is preparing a section on a recommended practice for creating a V/Hz curve for new transformers under C57.116 to be added to the document.

WG 60214-1 (C57.131) - Tap Changers - Craig Calopy

A joint review creating a revision of 60214-1 (2014) by IEC and IEEE is currently under consideration. A review report will be issued by the IEC TC14 Secretary at the end of the maintenance review and will be circulated to the member countries before the TC 14 plenary meeting in September 2020. It is anticipated that a joint review for revising 60214-1 (2014) will be initiated after this meeting.

IEC 60214-1 and C57.131 standards were originally going to be developed into a dual logo standard. Due to approval rejection with the European Standards Organization (CENELEC), it was decided that the revision of C57.131 would proceed without dual logo status and so the Working Group has submitted a PAR that will be reviewed at the December NESCOM meeting. The goal of this working group is to complete this effort within a couple years.

WG C57.143 Guide for Application of Monitoring Equipment to Liquid-Immersed Transformers and Equipment - Mike Spurlock

This Working Group met on Monday but did not have a quorum present. One patent claim was recorded and the party will be working on a letter of assurance. Six task forces were formed, each to focus on a different area of the guide and progress continues on the guide mostly outside the meetings. The latest draft version is posted on the committee webpage, which is estimated to be about 45% complete. A new Annex F on data analysis methods for online DGA, may be outside the scope of the document, and therefore they will be evaluating whether it should be in a different guide. New topics included online thermal imaging, online FRA, and online insulation power factor. The cutoff date for submission of the revision is February 22nd, so that the draft can go to ballot in March, the PAR expires at the end of 2021. If this date cannot be met, a par extension will be filed.

WG Revision of C57.148 Guide for Control Cabinets for Power Transformers - Joe Watson

The working group did not meet since the guide was approved at the October RevCom meeting. Publication is expected in later 2020 or 2021. This group's work is complete, and the working group has been disbanded. The chair noted that the work started 5 years before the expiration and almost needed a PAR extension to complete the work which is a reminder for everyone to start work on revisions early. The chair expressed his thanks for everyone who worked on and contributed to the guide.

WG Revision of C57.150 Guide for the Transportation of Transformers and Reactors Rated 10,000 kVA or Larger – Greg Anderson

This group did not meet. They are no longer taking new material and are focusing on creating an initial draft document to share with the working group. They intend to send the first draft to the Working Group within the next couple of weeks and have a straw vote in February so that they can deliver the document to the PTSC in April, before the Spring meeting. The PAR expires at the end of 2021.

WG C57.170 Condition Assessment Guide– K. Mani

This group met on Tuesday and achieved a quorum. A task force was setup to look at the CIGRE 761 technical bulletin to see how it could be incorporated into their document. A motion was accepted to develop the guide into 9 chapters and 3 annexes. Task forces were setup to review the new chapters and start developing material. They are seeking volunteers to lead these task forces and will begin working on the new chapters at the Spring meeting.

TF on V/Hz Curve – Joe Watson:

This group did not meet. No progress has been made since the last meeting. Ramsis Girgis and Kipp Yule are going to write a document and present the draft to the WG C57.116 IEEE Guide for Transformers Directly Connected to Generators by the next meeting.

Par Status for C57.17 Arc Furnace Transformers: Peter Balma

No update on this effort was provided at the subcommittee meeting.

Liaison to PC57.93a – Installation and Maintenance Guide: Scott Reed

This past January a request was made to open up a PAR for an amendment to the document for cold start of natural ester filled transformers. The PAR was approved in March and the first meeting was held in Beijing, China with Scott Reed participating as a liaison. The primary goal is to develop a cold start procedure for natural ester filled transformers.

Old Business

There was no old business.

New Business

Wallace Binder, WBBinder Consultant, provided the following motion for consideration of the subcommittee:

In the capacity as (designated) WG Chair for PC57.125, I wish to make the following motion: Move that the Power Transformer SC establish a Task Force to prepare a PAR for revision of C57.125-2015, IEEE Guide for Failure Investigation, Documentation, Analysis, and Reporting for Power Transformers and Shunt Reactors meet at the time of the next meeting, establish a WG to accomplish this task, and find a Chair to conduct the revision.

This motion was seconded by Tom Melle, Hi Volt.

During the discussion, it was stated it would be good to review what additional technologies can be introduced, how to rearrange the document, and to review the data reporting portion which has been adopted by EPRI and DOBLE. Both of these entities have established data bases and there is a desire for them to share a portion of the data to prove value of capturing this information.

Gary Hoffman called the question. There was no objection to unanimous approval to call the question.

There was no objection to unanimous approval of the motion.

There was no further new business.

The meeting adjourned at 2:55pm

16.2 STANDARDS JERRY MURPHY

The SC met on Wednesday with 182 in attendance. Quorum was met. Agenda was approved along with minutes. C57.12.00 and C57.12.90 were approved by the Subcommittee to move to ballot. C57.12.70 has been published. C57.12.80 met under leadership of Jim Graham with a lot of good information exchanged and discussed. C57.152 WG met and are incorporating work by the task forces in the WG. C57.163 WG are making good progress to update topics in the Guide. IEC/IEEE Cross-reference work continues. Jerry Murphy is stepping down as chair after five years and Dan Sauer will be replacing Jerry as chair.

16.3 SUBSURFACE TRANSFORMERS & NETWORK PROTECTORS GEORGE PAYERLE

Ken Hampton requested membership in at F19 meeting and is now a member.

C57.12.24 Ben Garcia chaired the meeting on 10/20/2020

The Chair noted that work on the PAR was begun at the S19 Anaheim meeting. The PAR will expire December 31, 2023. We have 4 working meetings to finalize the draft and get it to review and resolve comments.

Old business: - Revision of table 6 which concerns minimum material thickness was delayed until the Spring 2020 Toronto (or Virtual) meeting.

There was a discussion on Section 4.1 Cooling air temperature limit. After much discussion, members voted on an amended motion made by Brian Klaponski and seconded by George Payerle to add the words “for any 15-minute period” after the words “shall not exceed 50 degrees C”. The motion was carried with 15 votes for and 6 votes against.

Will Elliott and Tom Dauzat presented their findings from salt spray testing samples for 1000 and 3000hours. Details of the presentation will be posted on the website.

There was also discussion on section 2 Normative references specifically how IEEE C57.12.00-2015 is referenced. All the other standards are referenced without date and it is expected that the user will look for the most recent version of the standard. It was decided that this is correct and that to make the standard more correct, table 2 from C57.12.40 should be included in C57.12.24.

C57.12.40 Secondary network transformers. Dan Schwartz presided. Quorum was not achieved at this meeting

It was determined that Corrosion and Cathodic Protection should be addressed as separate items in the future revision. Both were requested to be inserted as informative annexes in the future revision along with addressing any required items within the standard as well.

John Vartanian (National Grid) and Brad Kittrell (Consolidated Edison) agreed to present on Cathodic Protection initiatives (during the next meeting) at each respective company to provide some background on CP.

Brian Klaponski agreed to develop wording and scoping on standardized tank and throat sizing in the standard for the group to review at the next meeting.

Brian Klaponski agreed to develop wording and scoping on improved bushing standardization in the standard for the group to review at the next meeting.

John Vartanian and Brad Kittrell agreed to present at the next meeting on their respective company’s primary switch location methodology regarding safety and operational requirements.

Dan Schwartz agreed to review C57.12.24 compared to C57.12.40 to identify any discrepancies between the two standards. He will also communicate with Ben Garcia (Chair of C57.12.24) to discuss findings.

Brian Klaponski (Carte) and Will Elliott (GE Prolec) agreed to review Tables 7 (up to 600 V), 8, and 9 to update them for current practical requirements.

Type testing for arc withstand was tabled until future meetings due to intellectual property concerns of each manufacturer and if that type of test can be developed.

It was discussed that there needs to be some clarification of the testing required on primary switches pertaining to Section 6. Cory Morgan agreed to review the section and provide input on points of clarification that should be addressed.

C57.12.44 Secondary Network Protectors Mark Faulkner chaired the meeting on Oct 19, 2020.

Focus of the meeting was a review of new 600V table and other changes in draft

Discussed and agreed to removing manufacturer references from fuses/connectors Revised 8.3 a) from Copper to Copper link for clarity and consistency through document. Both small stud and spade terminal amperage range were set to 800-2000 where previously one had 800-1875 and the other had 800-2000. Clarified verbiage on 11.5.3 to make less ambiguous. Remove footnotes referencing manufacturer model numbers. Add figure 9 to terminator pads, remove OD of pads as bolt circle diameter is the key dimension. Fixed several grammatical, spelling, and format errors

A motion was placed to accept the edits and send out revised draft for further review by Doug Craig, 2nd Cory Morgan. No opposition, motion passed

PAR expiration confirmed to be 12/31/2021

C57.167 Guide for Monitoring Distribution Transformers working group. Gary Hoffman chaired their meeting on Oct 20, 2020.

Gary summarized his meeting in the Dist SC but highlighted that the survey on load tap changers was conducted and several meetings have been held in 2020. There are plans for a January 2021 Google poll to STNP and DIST

Task force: Corrosion Effects on Subsurface Transformers, Will Elliott chaired the meeting on Oct 20, 2020.

Will Elliott reviewed field corrosion measurement procedure that was followed during testing.

Will Elliott reviewed 1500 and 3000 hrs results from Salt-Spray testing

Test procedure was based on the new 1500 salt-spray test for BARE enclosure material (substrate) in C57.12.32-2019 with a few modifications. Details on test method is included in report that will be posted on the website.

Will Elliott reviewed results from material compatibility testing

Test procedure involved creating galvanic cells using various hardware materials and copper cathode combinations.

Hardware components included bolts, washers and weld-nuts with the following materials: 304 Stainless Steel, Carbon-Steel, 303Se Stainless Steel, Silicon-Bronze and Galvanized Steel as a bonus.

Further details on test procedure can be found in the report which will be posted on the website.

Will Elliott requested group input on the next steps / next test procedure:

Tom Dauzat volunteered to build boxes with pipe flanges for further testing

Jane Hall volunteered to contribute in developing the test plan.

Zoran Goncin mentioned he would provide comments to Will Elliott.

Bob Kinner volunteered to contribute.

Brad Kittrell from ConEd volunteered to provide some information.

The 7 attendees requested membership and will be added to membership for the Spring 2021 meeting.

SC Meeting adjourned at 12:25 CT. Next meeting scheduled for Toronto, Ontario in April 2021.

Submitted on 10/24/2020 by George Payerle, Chair STNP SC

16.4 BUSHINGS ERIC WEATHERBEE

The Bushing Subcommittee met virtually yesterday morning, at the time of the quorum check there were 136 attendees with 47 of 83 members in attendance and therefore a quorum was reached.

The Bushing Subcommittee has 3 active PARS with 5 active groups that held meetings during this conference, and all were able to obtain quorums except the new TF as it held its first meeting.

The following are just a few items to note from the week.

57.19.01 – Standard for Performance and Dimension – The WG did not meet but the Chair stated he will issue a survey following the conference to obtain feedback on any areas that may need to be addressed. If you have anything you believe requires attention, please email the Chair of the WG. Notice was sent to the Transformer Committee that he plans to start holding meetings at the 2021 Spring Conference, if this changes due to the results of the survey he will update the Transformer Committee accordingly.

57.19.02 – Standard for Distribution Bushings – As this is a new standard there is a considerable amount work, research and discussion taking place. As such they sought a PAR extension which was granted and expires at the end of 2022. They believe this will be adequate to complete their work.

65700-19-03 – Dual Logo Standard for DC Bushings – IEC has confirmed the need to revise this document and the Chair is working with his IEC counterpart to establish a matching PAR for submittal. They foresee considerable work occurring electronically prior to the next conference. If any virtual meetings take place, they will be posted on TC website beforehand. Keep an eye out for this although it may occur at odd times to coordinate with IEC.

The IEC Bushing Liaison reported several topics one to note is that their work on a draft report of TC14/36A which is being finalized regarding the feasibility for the dimensional standard for IEC bushings rated 72.5kV-500kV. This will cover OIP, RIS, and RIP technologies. 500-600 designs were submitted for review. At this time, they are not considering IEEE dimensions.

New TF for Classification and Performance of Dry Bushings – This TF was formed at the F19 meeting, as such this is the first meeting that has been held. the Chair reported that they had 18 people requesting membership.

We do have several members assisting other groups with bushing related topics, and additional WG and liaison reports so please see the minutes that will be hosted on the TC website for additional information.

16.5 DIELECTRIC TESTS AJITH VARGHESE

- DTSC Met virtually on 10/21. Had quorum. Passed prior meeting minutes and Agenda
- Chair presented summary of DTSC approved changes that can go in upcoming revision of C57.12.00 and C57.12.90.
- From WG/TF Report
 - o Working Group Low-Frequency Dielectric Guide PC57.168 is in process of collecting information of new guide

- o Working Group On revision of C57.113 Recommended practices for PD Testing – Discussed update to Section 4 and 5
- o Working Group for Revision Impulse Guide – PC57.98 - Discussed Section for providing some clarification on K factor for Chop Wave Impulse
- o Working Group for PD in bushings, PTs and CTs – PC57.160 - Guide is in ballot resolution stage
- o Task Force for Liaison with Bushing DFR WG – PC57.12.200 – TF did not meet but Provided an update on standard development. Guide is 80% complete and Revision 5 is send to TF for review
- o TF on Continuous Revision of Low-Frequency Tests – TF under this TF passed a motion to adapt Class II PD Testing method and limits per C57.12.00-2015 for Class I, when test is requested
- o Task Force Winding Insulation Power Factor & Winding Insulation Resistance Limits – Presented information collected from factory and field for PF limits and passed a motion to come up with recommendation and report to Dielectric SC during next meeting
- New Item : Chair asked for option of DTSC if C57.138 Recommended guide for Impulse Testing (Distribution transformers) can be incorporated in to C57.98 which is Recommended guide for Impulse Testing Power transformers. There was no string opinion. Chair is looking for feedback from Distribution SC.

16.6 DISTRIBUTION TRANSFORMERS ED SMITH

The Distribution Transformer Subcommittee met yesterday at 9:25.

We had 147 participants in our virtual meeting.

At the time we took the attendance poll we had a total of 124 participants. Out of 70 DTSC Members, we had 42 in attendance, so a quorum was met.

70 members with 36 needed for quorum.

- 42 members present
- 56 guests
- 15 guests requesting membership

- A. The chair welcomes the group and called the meeting to order. To allow for late arrival, the chair opened with several generic comments including:
 - a. Virtual meeting courtesies
 - b. Reminder of the meeting being recorded for the purpose of the minutes
 - c. Reminder to WG and TF Chairs to keep the website status up to date.
 - d. Affiliation disclosure (Included an example)
- B. We put up a slide of the DTSC members and conducted the membership poll to establish a quorum – Again, out of 70 members, we had 42 participate so a quorum was established.
- C. We then moved to approval of the agenda

- a. the agenda was approved with unanimous approval.
- D. Moving to approval of the Spring 2019 Meeting Minutes
 - a. The minutes were approved with unanimous approval
- E. Josh Verdell then gave a secretary's report that recognized one new member – Audrey Siebert-Timmer from IFD Corporation
- F. We then moved to our working group and task force reports. We had 6 working groups and 1 task force meet during our Fall 2020 Virtual Meeting

Included Work

- C57.167 Distribution Transformer Monitoring
 - Chair – Gary Hoffman
- C57.12.20 Overhead Distribution Transformer
 - Chair – Al Traut
- C57.12.28,29,30,31, &32 Enclosure Integrity
 - Chair – Dan Mulkey (Jeremy Van Horn)
- C57.12.35 Barcoding Distribution Transformers
 - Chair – Rhett Chrysler
- C57.12.34 Three Phase Transformers
 - Chair – Steve Shull
- C57.12.38 Single Phase Pad Mount Distribution Transformers
 - Chair – Ali Ghafourian
- Task force on transformer efficiency and loss evaluation including DOE update.
 - Chair – Phil Hopkinson

The detailed minutes for each of these meetings will be posted to the website for your review. No significant issues or hot topics were brought forward for review.

During our C57.12.20 Meeting Bruce Webb asked if we should add temperature rise limits for “touch temperatures” There were several suggestions made, however, the topic was tabled due to time restraints. This will be one of the interests to watch for.

During our task force meeting on transformer efficiency there were several interesting reports you may want to review. A report was given by:

Kevin Rapp on Insulation Thermal Class
 Tom Prevost on Thermally Upgraded Kraft Paper
 Casey Ballard on Thermally Upgraded Solid Material Nomax
 Al Traut on Dual Nameplate Designs
 Steve Rosenstock (EEI) on Future Utility Outlook

- G. We then moved to the next topic
 - a. There was no Old Business

H. Moving to New Business

- a. The DTSC was requested to review an entity PAR for consideration of being sponsored by the subcommittee. We formed an ADHOC group chaired by Jerry Murphy to review and recommend. The ADHOC group sent a page and a half of questions for answer. After review of the response from the originator, The ADHOC group recommended that the DTSC establishes a task force to sponsor a recommended practice for the on-load capacity regulating distribution power transformers.
- b. A motion was made and seconded for approval.
- c. An amendment was made to remove the word “Power.” A motion was made & seconded and the vote was taken and passed with:

35 For
1 Against
6 Abstain
Out of 42 members, Passed

- d. The original motion with the amendment was then voted on with:

26 For
1 Against
4 Abstain
Motion Passed

- I. We then ran out of time and then the meeting was adjourned.

16.7 DRY TYPE TRANSFORMERS CASEY BALLARD

The Dry Type Subcommittee met and had a quorum. The two main documents of Dry Type General Requirements C57.12.01 (Chair Casey Ballard) and Dry-Type Test Code C57.12.91 (Chair David Walker) have completed the SA ballot process and are with the editors at this time.

Since our last meeting the MV Dry-Type Thermal Aging document C57.12.60 was published (Chair Roger Wicks). The WG for Dry-Type Air Core Reactors C57.16 (Chair Art del Rio) is revising the annexes and will not complete their work by the end of 2021 and will submit a PAR extension.

The WG for Dry-Type Partial Discharge C57.124 (Chair Tom Prevost) reviewed feedback from TF 2 (Chair Detlev Gross) and agreed to submit for a two-year PAR extension.

The WG for Sealed Dry-Type C57.12.52 (Chair Joseph Tedesco) reviewed proposals for revision to the main body of the document.

The TF for LV Dry-Type Thermal Aging 259 (Chair Dave Stankes) has submitted a PAR and the TF compiled a list of topics to be addressed once the WG is formed.

The TF for Dry-Type Hottest Spot Determination C57.135 (Chair Colby Lovins) completed their Title, Scope, and Purpose and will submit a PAR.

The TF for the Dry-Type Loading Guide C57.96 (Chair Aniruddha Narawane) completed their Title, Scope, and Purpose and will submit a PAR.

Old Business - continued discussion on the proposal to transfer NEMA ST-20 from NEMA to IEEE. No motions were made as we are awaiting a formal reply from NEMA.

New Business - a straw poll was conducted to see if there was interest in completing the transition of NEMA C57.12.55 to an IEEE document with a 10-year revision requirement. No motions were made.

Please check the full minutes for additional details.

16.8 HVDC CONVERTER TRANSFORMERS & REACTORS ULF RADBRANDT

- The HVDC Converter Transformers and Smoothing Reactors Subcommittee met on Monday
- There were 12 members and 13 guests present. 2 new requests for membership was received. Quorum was achieved.
- Working Group Reports
 - WG IEEE 1277 - Dry-Type and Oil-Immersed Smoothing Reactors and Dry-Type Converter Reactors
 - The WG chair, Klaus Pointner, gave an update of the status of the standard.
 - The standard has been approved and published this year.
 - We are planning to do two HVDC Tutorials
 - We have been offered two HVDC tutorial time slots, one at Spring 2021 and one at Fall 2021.
 - We decided to accept that offer.
 - Name of this Sub Committee
 - Our standard IEEE 1277 does now also cover converter reactors for VSC applications.
 - The name of this SC does not include converter reactors and the scope of the SC does not either.
 - The winning alternative was B) TRANSFORMERS AND REACTORS FOR HVDC APPLICATIONS
 - The scope of the subcommittee should also be adjusted in line with IEEE 1277.
 - This will be presented to the officers of the Transformers Committee for decision.
- The meeting was adjourned at 4:47 pm.

16.9 INSTRUMENT TRANSFORMERS THOMAS SIZEMORE

The ITSC met Wednesday morning.

A quorum of members was present, so the agenda and previous meeting minutes were approved.

A reminder was made that the patent and copyright slides are to be displayed for all Working Group and Task Force online meetings between the Fall and Spring meetings.

Working group and Task Force reports were presented.

C57.13.9 IEEE Standard for Power-Line Carrier Coupling Capacitors and Coupling Capacitor Voltage Transformers – Sections devoted to the instrument transformer aspects have been completed in the draft. Communications aspects of the standard are to be coordinated with the PSCC. Conversations were held

regarding PD levels and dielectric specifications. Online meetings are being planned to complete the document so it can enter the sponsor ballot phase early next year.

IEC-IEEE 63245-57.13.8 –A new draft has been created for the second CD. It is expected that the new CD will be issued in November with the goal of having comments back on it by late December or perhaps the middle portion of January 2021. Comment resolution will then begin again. The meeting on Tuesday featured a status update and presentations by multiple manufacturers regarding a proposed heat run method.

TF IT accuracy –A presentation was made displaying and discussing results of testing VTs at various burdens. An outline was presented of what this task force might propose to the ITSC for possible inclusion in the next version of the C57.13 standard. Planning for an informative annex was also discussed and contributors sought. An online meeting is tentatively planned for November.

Survey results were presented for C57.13.2 the conformance standard. This standard has been approved to enter the SA ballot process.

Two items were discussed under new business.

In C57.13 section 8.1.1 part A has two statements regarding the uncertainty of the measurement system for instrument transformer accuracy. These statements appear to conflict with one another. A group of ITSC members will review this section and determine what if any changes are needed.

In C57.13 Table 10 note it was identified that a change was made in the 2016 standard regarding CTs with outputs rated other than 5 Amperes. The basis is now in terms of impedance instead of power. An effort is being made as to why this change was made. Once the reasons for the change are understood then a determination of the next actions will be made.

16.10 INSULATING FLUIDS SCOTT REED

Met Wednesday and quorum was achieved and approved the agenda and minutes. C57.166 continues to make progress and will form an ad hoc task force to work on voltage class separations for the tables. C57.146 met and looking at making two modifications to the Guide to adopt the condition status similar to C57.104 and also incorporate the Duval Triangle. TF C57.104 next revision met to document the shortcomings from the last revision and how to deal with the data from for the guide. Under new business, Task Forces will be form to consider revision of C57.155, C57.130, C57.139, and C57.637. The Insulating Fluids SC meeting adjourned on time.

16.11 INSULATION LIFE SHELDON KENNEDY

-Meeting called at 8:00 am on Oct 21st 2020 for the virtual meeting.

- Sheldon recognized and thanked Barry Beaster who stepped down from being ILSC Vice-Chair under Bruce Forsyth and Sheldon.

- Sheldon provided update on dates and locations for upcoming meetings

- Sheldon congratulated Sam Sharpless for accepting role of ILSC Vice-Chair.

- Call for Patents made. No response received from group.

- Showed the new copyright slides and advised that the new requirements are more stringent and need to be abided by.

- 73 out of 103 members were present in the meeting so quorum was met. 1 new member request was approved, and 11 members were moved to guest. 38 guests have requested membership. The roster will be updated for membership prior to next meeting

- Agenda for the virtual meeting and minutes from the Fall 2019 meeting were approved.

-Project Status updates:

- a) C57.162 – Guide for interpretation of moisture related parameters – Tom Prevost
 - Quorum was not met.
 - Chair will be requesting for extension of PAR for 2 years.
 - Since the scope has changed for the document, the title needs to be revised and approved
 - The Chair will send out a meeting invitation to all TF chairs to compile the document to be ready for draft by spring 2021.
 - Oleg Roizman presented on Bubble Evolution and proposed TF 10 be put into section 2 of the document.
 - A question was asked by a member on where the material on bubble formation should reside since it is also applicable to the loading guide C57.91 as well.
 - Chair request ILSC to provide guidance on whether information on bubble formation should be in C57.162 and/or C57.91.
- b) 1276 – Application of High Temperature Materials – Roger Wicks
 - Guide is published.
 - Susan will work with Roger to get the recognition for the work
- c) C57.100 – Thermal Evaluation of Liquid Immersed Transformers – Roger Wicks
 - Held virtual meeting in May. Quorum was achieved in the May meeting. Following the meeting, survey took place on some items related to rearranging of sections, verbiage changes, etc.
 - New draft presented to the members prior to the Fall virtual meeting had the changes based on the survey results.
 - All the task forces reported on their work. Major portion was spent on Sealed tube ageing test.
 - A new taskforce will be formed to add information in the Annex on a test method to determine the thermal endurance of enamel wires. Chair requested volunteers for the TF.
- d) C57.91 – Loading Guide – Dave Wallach
 - Quorum was met and minutes from 4 meetings were approved.
 - Discussions took place with regards to overload limits.
 - Discussions took place about bubble formation and the use of differential equations for the loading guide..
 - There are many updates being requested by the members and guests so the Chair will have offline discussions on whether to extend the PAR or approve the current document and open a new PAR.
- e) C57.169 – Maximum Winding Temperature Rise in Liquid Filled Transformers – Scott Digby
 - Quorum was met.
 - Draft 3 was circulated, and mostly editorial changes were being proposed. Discussion took place on some figures and requires clarity on where they came from.
 - WG is adding information on placing of fiber optic cables and is asking for pictures and guidance.
- f) C57.165 – Guide for Temperature Measurements for Liquid Immersed Transformers – Mark Tostrud
 - Phil Mclure and Bob Thompson retired. Mark, who was secretary, became Chair.
 - Zan Kiparizoski agreed to be Vice-Chair. No secretary will be assigned as the WG is about to complete the work.

- Plan is to get the document out to ballot by Spring of 2021
 - WG is requesting help from the Bushing standards with regards to measuring temperature in bushings.
- g) C57.154 – Design, Testing and Application of Liquid Immerse Transformers with High Temp Insulation – Rick Marek
- Quorum was met
 - TF1 provided update on the testing being done to determine the thermal limit for of different insulating liquids
 - TF2 discussed on changes to clauses and tables. Some changes made:
 - Only makes use of the term ‘insulation system’ thermal class, rather than the terms ‘solid’ and ‘liquid’ thermal classes
 - Removes design specific recommendations that are contained in IEEE Std 1276, and instead just makes simple descriptions of ‘hybrid’ and ‘high-temperature’ insulation systems
 - It was proposed in the meeting to add upper limits for top liquid temperature in Table 3 as well as provide a table with typical liquid temperatures with various material.
 - The chair suggested that a table with material information should belong to 1276 along with Annex B
 - The chair’s proposal was to establish a TF to discuss modification of Annex B of that document will be made at the next ILSC meeting. It would be possible to include the table for material
 - Motion was made by the chair to create a TF under 1276 to incorporate Annex B and add new material followed by opening a PAR in 1276. Motion was seconded by Gary Hoffman and the motion passed.
- h) TF on Rises of Metallic Parts other than Windings C57.12.00, Clause 5.11.1.4 – Toby Johnson
- Task was to recommend wording on Clause 5.11.1.4 in C57.12.00 about the 130 C core temperature limit. The sentence is under the clause for temperature “rises”.
 - The rewording was presented to the ILSC members and guest and there were discussions on the maximum average daily ambient temperature. Since time was running out, a motion was made by Bruce Foresyth to have a second meeting in Spring 2021 to complete the work. Akash Joshi seconded motion. The motion carried.

Only one new business was discussed and motion was made (Create TF for 1276). Other new business was not discussed in the meeting but Sheldon will send email out to discuss them prior to next meeting in Spring 2021.

Sheldon is stepping down from the Chair role as of January 2021 and Sam Sharpless will move to Chair position and Jinesh Malde will move to Vice-Chair. Sheldon suggested that the secretary position will be open so if anyone is interested, they can reach out to him, Sam or Jinesh.

The new items that were not addressed:

- 1) Subclause 11.1.2.2.c indicates that the liquid temperature rises taken at the end of the total loss run should be performed according to Subclause 11.3.2. Subclause 11.3.2 refers to the “ultimate liquid temperature rise” as being the value recorded at the end of stabilization. Based on observations on how a few transformer manufacturers have interpreted these subclauses for the purposes of guaranteeing temperature rises, I recommend that Subclause 11.3.2 be expanded to define what is meant by “ultimate liquid temperature rise.” The term is not found elsewhere in C57.12.90 or in C57.12.80 or C57.12.00. I believe that the intent of Subclause 11.3.2 is to define the top oil temperature rise, which is used to compare to the rated/guaranteed liquid temperature rise as defined in C57.12.00-2015 Subclause 5.11.1.5 (i.e. 65 °C). I recommend that the first paragraph in subclause 11.3.2 add the following sentence at the end of the paragraph: The ultimate liquid temperature rise,

taken at the end of the total loss run, shall be recorded in the certified test report according to IEEE Standard C57.12.00-2015 Subclause 8.7.c.6 and compared to the liquid temperature rise according to IEEE Standard C57.12.00-2015 Subclause 5.11.1.5.

- 2) C57.162 and C57.91 - Both Guides could contain the bubble evolution model. Most seem to agree that we should maintain in one place and have one refer to the other. Which guide should be home to the bubble model?
- 3) Con Edison like other utilities is assessing the impact of climate change on our transformer capabilities, both ratings and life. This may be a topic to discuss and incorporate into relevant guides and standards. Thank you.
- 4) Given the current COVID19 situation that does not indicate resolution soon (before summer next year according to many experts) I propose the next meeting in Toronto be a hybrid meeting. Face to face + virtual.

16.12 PERFORMANCE CHARACTERISTICS ROGERIO VERDOLIN

Performance Characteristics Subcommittee - PCS F20 Meeting Summary

- The PCS meeting was called to order on Wednesday, October 21, 2020, at 2:10PM Central Time.
- We had quorum with 77 members, out of 119 members.
- 26 guests requested membership.
- Total attendance was 198.
- The agenda and last-minute meetings were approved.
- The status of Active PAR's was discussed.
- Technical activity from 7 WGs and TFs were presented.
- **WG Guide for FRA for Liquid Filled Transformers C57.149:**
- There were discussion regarding:
 - Grounding Influence and Technique;
 - Connection Diagram
 - Analysis & Interpretation
- **TF PCS Continuous Revisions to Test Code C57.12.90:**
 - There were discussions regarding the review of the survey results.
- **TF PCS Audible Sound Revision to Clause 13 of C57.12.90:**
- It was discussed the revisions to Clause 13 of C57.12.90. A motion was made and seconded to create a PAR for the Revision of C47.136.
 - There were discussions and the motion eventually passed with a vote of 69 to 1 in favor of the motion with 11 abstentions.
 - The total number of votes was greater than the members present at quorum. The motion was carried.
- **TF for Continuous Revision of C57.12.00:**
- Old Business from Fall 2019 meeting was discussed.
- **WG Shunt Reactors C57.21:**
 - The WG is in Comment Resolution phase.
- **WG for Revision of C57.142:**

- IEEE Transaction Paper was developed by the TF under the WG C57.142 WG and has been published and is now available under the IEEE digital library. The title of the paper is: The Investigation of the Interaction between Substation Transients and Transformers in HV and EHV Applications.
- **WG Short Circuit Withstand Design Criteria C57.164:**
 - The first straw ballot for C57.164 is complete and resulted in Draft 4 and the WG just started the 2nd straw ballot.
- The Subcommittee had no old business and no further new business came before the Subcommittee.
- The meeting was adjourned at 3:27PM.

17 NEW BUSINESS

No new business items were brought up. One member provided accolades to the Virtual Meeting Planning team for hosting a great virtual meeting.

18 CLOSING SESSION ADJOURNMENT

The meeting was adjourned at 12:10 PM CDT.

APPENDIX 1

Meeting Schedule

KEY

Note: A PC projector will be furnished in each meeting room. Arrive early to ensure equipment operates/syncs correctly.

> = activity continued into another session / from another session

++ = not a Transformers Committee activity

TBD = To Be Determined

TRACK LEGEND

Admin	Administrative SC	Ins Life	Insulation Life SC
Bush	Bushings SC	Instr TR	Instrument Transformers SC
DiTests	Dielectric Tests SC	Mtgs	Meetings Planning SC
Distr	Distribution Transformers SC	PCS	Performance Characteristics SC
Dry Type	Dry Type Transformers SC	Power	Power Transformers SC
HVDC	HVDC Converter Transfs. and Smoothing Reactors SC	STNP	Submersible Transf. & Network Protectors SC
IF	Insulating Fluids SC	Stds	Standards SC

STATUS LEGEND

N	New
I	In-Progress
NC	Near Completion
B	Ballot Stage
C	Complete
E	Entity

TUESDAY, OCTOBER 13

TIME	ACTIVITY	TRACK	MTG CHAIR	STATUS	ROOM (FLOOR)
1:00 PM – 4:00 PM	Administrative Subcommittee - Closed meeting, by invitation only	Admin	B. Forsyth	-	Session 1

MONDAY, OCTOBER 19

TIME	ACTIVITY	TRACK	MTG CHAIR	STATUS	ROOM (FLOOR)
On – demand	Newcomers Orientation		E. teNyenhuis	–	Pre-recorded
8:00 AM – 9:00 AM	Opening Session		B. Forsyth	-	Session 1
	- All registered meeting participants are encouraged to attend - See separate document on website for meeting agenda - Attendance required to maintain Committee Member status				
9:00 AM – 9:10 AM	Break				
9:10 AM – 10:35 AM	WG Dry Type Reactors PC57.16	Dry Type	A. Del Rio	I	Session 1
9:10 AM – 10:35 AM	WG Guide of FRA for Liquid Filled Transf. C57.149	PCS	C. Sweetser	I	Session 2
9:10 AM – 10:35 AM	WG Partial Discharge Test - C57.113	DiTests	A. Naderian	I	Session 3
9:10 AM – 10:35 AM	WG Std Transf. Terminology C57.12.80	Stds	J. Graham	I	Session 4
9:10 AM – 10:35 AM	TF Transf Efficiency & Loss Evaluation (DOE Activity)	Distr	P. Hopkinson	I	Session 5
9:10 AM – 10:35 AM					Session 6
10:35 AM – 10:45 AM	Break				
10:45 AM – 12:00 PM	WG Overhead Distr. Transf. C57.12.20	Distr	A. Traut	I	Session 1
10:45 AM – 12:00 PM	WG Control Cabinets PC57.148 WILL NOT MEET	Power	J. Watson	C	Session 2
10:45 AM – 12:00 PM	WG Bushings Gen. Require. C57.19.00	Bush	P. Zhao	I	Session 3
10:45 AM – 12:00 PM	TF PC57.12.52 PAR Development	Dry Type	J. Tedesco	I	Session 4
10:45 AM – 12:00 PM	WG Moisture in Insulation PC57.162	Ins Life	T. Prevost	I	Session 5
10:45 AM – 12:00 PM	TF Guide for DGA in Silicone C57.146	IF	J. Karas	N	Session 6
12:00 PM – 12:55 PM	Lunch Break				
12:55 PM – 2:10 PM	WG 1-ph Padmount Dist Transf. C57.12.38	Distr	A. Ghafourian	I	Session 1
12:55 PM – 2:10 PM	WG C57.116 Guide for Trfs Direct Connect to Generators	Power	W. Li	N	Session 2
12:55 PM – 2:10 PM	WG PC57.152 Guide for Field Testing	Stds	M. Ferreira	I	Session 3
12:55 PM – 2:10 PM	WG Transformer Impulse Test Guide PC57.98	DiTests	T. Hochanh	I	Session 4
12:55 PM – 2:10 PM	TF Audible Sound Revision to Test Code	PCS	R. Girgis	I	Session 5
12:55 PM – 2:10 PM	WG High Temp Liquid Transformers C57.154	Ins Life	R. Marek	I	Session 6
2:10 PM – 2:20 PM	Break				
2:20 PM – 3:35 PM	WG 3-ph Padmount Dist Transf. C57.12.34	Distr	S. Shull	I	Session 1
2:20 PM – 3:35 PM	WG Transformer Monitoring C57.143	Power	M. Spurlock	I	Session 2
2:20 PM – 3:35 PM	TF IEEE-IEC Cross Reference	Stds	V. Mehrotra	–	Session 3
2:20 PM – 3:35 PM	TF C57.134 Guide for Hottest-spot in Dry-type	Dry Type	C. Lovins	I	Session 4
2:20 PM – 3:35 PM	WG Bushing Applicat. Guide C57.19.100	Bush	T. Spitzer	I	Session 5
2:20 PM – 3:35 PM	TF PCS Cont. Revisions to C57.12.00	PCS	T. Ansari	I	Session 6
3:35 PM – 3:45 PM	Break				
3:45 PM – 5:00 PM	WG Sec. Network Protectors C57.12.44	STNP	M. Faulkner	I	Session 1
3:45 PM – 5:00 PM	TF Dry Bushing Class and Perf.	Bush	A. Del Rio	N	Session 2
3:45 PM – 5:00 PM	TF Partial Discharge Tests for Class I Transformers	DiTests	D. Ayers	I	Session 3
3:45 PM – 5:00 PM	TF Next Revision to C57.104 Guide for DGA in Mineral Oil	IF	C. Beauchemin	N	Session 4
3:45 PM – 5:00 PM	TF IEEE 259 Test for Eval of Insulation for Dry-Type Transfs	Dry Type	D. Stankes	I	Session 5
3:45 PM – 5:00 PM	SC HVDC Converter Transfs & Smoothing Reactors	HVDC	U. Radbrandt	-	Session 6

TUESDAY, OCTOBER 20

TIME	ACTIVITY	TRACK	MTG CHAIR	STATUS	ROOM (FLOOR)
8:00 AM – 9:15 AM	TF Rises other than windings C57.12.00, Clause 5.11.1.4	Ins Life	T. Johnson	I	Session 1
8:00 AM – 9:15 AM	WG Encl Int C57.12.28, C57.12.29, C57.12.31, C57.12.32	Distr	D. Mulkey	I	Session 2
8:00 AM – 9:15 AM	WG Station Service Volt. Transf. C57.13.8	Instr TR	D. Wallace	I	Session 3
8:00 AM – 9:15 AM	WG Dry Type PD Detection PC57.124	Dry Type	T. Prevost	I	Session 4
8:00 AM – 9:15 AM	TF on Winding Insulation PF	DiTests	D. Robalino	I	Session 5
8:00 AM – 9:15 AM	TF PCS Cont. Rev. to Test Code C57.12.90	PCS	H. Sahin	I	Session 6
9:15 AM – 9:25 AM	<i>Break</i>				
9:25 AM – 10:40 AM	WG Low Frequency Test Guide PC57.168	DiTests	D. Sauer	I	Session 1
9:25 AM – 10:40 AM	WG Submersible Transf. C57.12.24	STNP	B. Garcia	I	Session 2
9:25 AM – 10:40 AM	TF Instrument Transf. Accuracy	Instr TR	I. Ziger	I	Session 3
9:25 AM – 10:40 AM	WG Temp Measurement PC57.165	Ins Life	M. Tostrud	I	Session 4
9:25 AM – 10:40 AM	WG Condition Assessment Guide PC57.170	Power	K. Mani	I	Session 5
9:25 AM – 10:40 AM	WG Shunt Reactors C57.21	PCS	S. Som	I	Session 6
10:40 AM – 10:50 AM	<i>Break</i>				
10:50 AM – 12:05 PM	WG Distrib. Transf. Bushings PC57.19.02	Bush	S. Shull	I	Session 1
10:50 AM – 12:05 PM	WG Liquid-immersed Sec. Network TRs C57.12.40	STNP	D. Blew	I	Session 2
10:50 AM – 12:05 PM	WG PLC Caps & CCVTs PC57.13.9	Instr TR	Z. Roman	I	Session 3
10:50 AM – 12:05 PM	WG PC57.163 Geomagnetic Disturbances	Stds	D. Blaydon	N	Session 4
10:50 AM – 12:05 PM	IEC TC-14 Technical Advisory Group		P. Hopkinson	-	Session 5
10:50 AM – 12:05 PM					Session 6
12:05 PM – 12:55 PM	Lunch Break Awards Presentation - prerecorded for viewing at a time of your choosing.				Pre-recorded
12:55 PM – 2:10 PM	WG Consolidation Insulating Fluid Guides PC57.166	IF	T. Prevost	I	Session 1
12:55 PM – 2:10 PM	TF Bar Coding for Distr Transf. C57.12.35	Distr	R. Chrysler	I	Session 2
12:55 PM – 2:10 PM	TF Cont. Revision to Low Frequency Tests	DiTests	B. Griesacker	I	Session 3
12:55 PM – 2:10 PM	TF Guide for Loading Dry Type Transformers C57.96	Dry Type	A. Narawane	I	Session 4
12:55 PM – 2:10 PM	WG Determine Max Winding Temp Rise PC57.169	Ins Life	S. Digby	I	Session 5
12:55 PM – 2:10 PM					Session 6
2:10 PM – 2:20 PM	<i>Break</i>				
2:20 PM – 3:35 PM	Freq Domain Spec Bush C57.12.200 - WILL NOT MEET	DiTests	P. Patel	E/A	Session 1
2:20 PM – 3:35 PM	TF Effects of Corrosion on Transformers	STNP	W. Elliott	I	Session 2
2:20 PM – 3:35 PM	WG Thermal Evaluation C57.100	Ins Life	R. Wicks	I	Session 3
2:20 PM – 3:35 PM	TF Volts per Hertz	Power	J. Watson	I	Session 4
2:20 PM – 3:35 PM	WG Sw Transients Ind by TR/Bkr Interaction PC57.142	PCS	J. McBride	I	Session 5
2:20 PM – 3:35 PM	WG Bushings IEC/IEEE 65700.19.03 Dual Logo	Bush	L. Recksiedler	I	Session 6
3:35 PM – 3:45 PM	<i>Break</i>				
3:45 PM – 5:00 PM	WG Guide for PD Measure HV Bushings & Inst Trf C57.160	DiTests	T. Hochanh	NC	Session 1
3:45 PM – 5:00 PM	WG Guide for Monitoring Distr Transf PC57.167	Distr	G. Hoffman	I	Session 2
3:45 PM – 5:00 PM	WG Short Circuit Withstand PC57.164	PCS	S. Patel	I	Session 3
3:45 PM – 5:00 PM	WG Loading Guide PC57.91	Ins Life	D. Wallach	I	Session 4
3:45 PM – 5:00 PM					Session 5
3:45 PM – 5:00 PM					Session 6

WEDNESDAY, OCTOBER 21

TIME	ACTIVITY	TRACK	MTG CHAIR	STATUS	ROOM (FLOOR)
On – demand	SC Meetings Planning - All interested individuals welcome	Mtgs	T. Behrens	–	Pre-recorded
8:00 AM – 9:15 AM	SC Instrument Transformers	Instr TR	T. Sizemore	–	Session 1
8:00 AM – 9:15 AM	SC Insulation Life	Ins Life	S. Kennedy	–	Session 2
9:15 AM – 9:25 AM	<i>Break</i>				
9:25 AM – 10:40 AM	SC Distribution Transformers	Distr	E. Smith	–	Session 1
9:25 AM – 10:40 AM	SC Bushings	Bush	E. Weatherbee	–	Session 2
10:40 AM – 10:50 AM	<i>Break</i>				
10:50 AM – 12:05 PM	SC Submersible Transf. & Network Protectors	STNP	G.Payerle	–	Session 1
10:50 AM – 12:05 PM	SC Dielectric Test	DiTests	A. Varghese	–	Session 2
12:05 PM – 12:55 PM	<i>Lunch Break</i>				
12:55 PM – 2:10 PM	SC Dry Type Transformers	Dry Type	C. Ballard	–	Session 1
12:55 PM – 2:10 PM	SC Power Transformers	Power	B. Griesacker	–	Session 2
2:10 PM – 2:20 PM	<i>Break</i>				
2:20 PM – 3:35 PM	SC Insulating Fluids	IF	S. Reed	–	Session 1
2:20 PM – 3:35 PM	SC Performance Characteristics	PCS	R. Verdolin	–	Session 2
3:35 PM – 3:45 PM	<i>Break</i>				
3:45 PM – 5:00 PM	SC Standards	Stds	J. Murphy	–	Session 1

THURSDAY, OCTOBER 22

TIME	ACTIVITY	TRACK	MTG CHAIR	STATUS	ROOM (FLOOR)
8:00 AM – 9:15 AM	Technical Presentation 1 Update of C57.104 Guide to DGA chaired by Claude Beachemin - See flyer on website for details **	Tutorial			Session 1
9:15 AM – 9:30 AM	<i>Break</i>				
9:30 AM – 10:45 AM	Technical Presentation 2 Guide to Specifying Transformer sound levels chaired by Ramsis Girgis - See flyer on website for details **	Tutorial			Session 1
10:45 AM – 11:00 AM	<i>Break</i>				
11:00 AM – 12:00 PM	Closing Session - All attendees are encouraged to attend - See separate document on website for meeting agenda		B. Forsyth		Session 1

** Contact Tom Prevost (tprevost@ieee.org) if you are interested in making a technical presentation at a future meeting.

FUTURE COMMITTEE MEETINGS

- Spring 2021:** Toronto, Ontario, Canada, April 25-29, 2021
- Fall 2021:** Milwaukee, Wisconsin USA, October 17-21, 2021
- Spring 2022:** Denver, Colorado USA, March 27 – 31, 2022
- Fall 2022:** Charlotte, North Carolina USA, October 16 – 20, 2022

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IEEE PES TRANSFORMERS COMMITTEE

SUBCOMMITTEE MEETING LIST

FALL 2020 MEETING: OCTOBER 19 TO OCTOBER 22

On-Line Meeting; Virtual, Central Time Zone USA

Date	Time Start	Time End	Session Title	Track	Chair	Room/Location
10/13/2020	1:00 PM	4:00 PM	Administrative Subcommittee - Closed meeting, by invitation only	Admin	B. Forsyth	Session 1
10/19/2020	10:45 AM	12:00 PM	WG Bushings Gen. Require. C57.19.00	Bush	P. Zhao	Session 3
10/19/2020	2:20 PM	3:35 PM	WG Bushing Applicat. Guide C57.19.100	Bush	T. Spitzer	Session 5
10/19/2020	3:45 PM	5:00 PM	TF Dry Bushing Class and Perf.	Bush	A. Del Rio	Session 2
10/20/2020	10:50 AM	12:05 PM	WG Distrib. Transf. Bushings PC57.19.02	Bush	S. Shull	Session 1
10/20/2020	2:20 PM	3:35 PM	WG Bushings IEC/IEEE 65700.19.03 Dual Logo	Bush	L. Recksiedler	Session 6
10/21/2020	9:25 AM	10:40 AM	SC Bushings	Bush	E. Weatherbee	Session 2
10/19/2020	9:10 AM	10:35 AM	TF Transf Efficiency & Loss Evaluation (DOE Activity)	Distr	P. Hopkinson	Session 5
10/19/2020	10:45 AM	12:00 PM	WG Overhead Distr. Transf. C57.12.20	Distr	A. Traut	Session 1
10/19/2020	12:55 PM	2:10 PM	WG 1-ph Padmount Dist Transf. C57.12.38	Distr	A. Ghafourian	Session 1
10/19/2020	2:20 PM	3:35 PM	WG 3-ph Padmount Dist Transf. C57.12.34	Distr	S. Shull	Session 1
10/20/2020	8:00 AM	9:15 AM	WG Encl Int C57.12.28, C57.12.29, C57.12.31, C57.12.32	Distr	D. Mulkey	Session 2
10/20/2020	12:55 PM	2:10 PM	TF Bar Coding for Distr Transf. C57.12.35	Distr	R. Chrysler	Session 2
10/20/2020	3:45 PM	5:00 PM	WG Guide for Monitoring Distr Transf PC57.167	Distr	G. Hoffman	Session 2
10/21/2020	9:25 AM	10:40 AM	SC Distribution Transformers	Distr	E. Smith	Session 1
10/19/2020	7:00 AM	7:50 AM	Distribution & STNP SC Leaders Coordination - Closed breakfast meeting, by invitation only	Distr/STNP	E. Smith/G. Payer	Not meeting
10/19/2020	9:10 AM	10:35 AM	WG Partial Discharge Test - C57.113	DiTests	A. Naderian	Session 3
10/19/2020	12:55 PM	2:10 PM	WG Transformer Impulse Test Guide PC57.98	DiTests	T. Hochanh	Session 4
10/19/2020	3:45 PM	5:00 PM	TF Partial Discharge Tests for Class I Transformers	DiTests	D. Ayers	Session 3
10/20/2020	8:00 AM	9:15 AM	TF on Winding Insulation PF	DiTests	D. Robalino	Session 5
10/20/2020	9:25 AM	10:40 AM	WG Low Frequency Test Guide PC57.168	DiTests	D. Sauer	Session 1
10/20/2020	12:55 PM	2:10 PM	TF Cont. Revision to Low Frequency Tests	DiTests	B. Griesacker	Session 3
10/20/2020	2:20 PM	3:35 PM	Freq Domain Spec Bush C57.12.200 - WILL NOT MEET	DiTests	P. Patel	Session 1
10/20/2020	3:45 PM	5:00 PM	WG Guide for PD Measure HV Bushings & Inst Trf C57.160	DiTests	T. Hochanh	Session 1
10/21/2020	10:50 AM	12:05 PM	SC Dielectric Test	DiTests	A. Varghese	Session 2
10/19/2020	9:10 AM	10:35 AM	WG Dry Type Reactors PC57.16	Dry Type	A. Del Rio	Session 1
10/19/2020	10:45 AM	12:00 PM	TF PC57.12.52 PAR Development	Dry Type	J. Tedesco	Session 4
10/19/2020	2:20 PM	3:35 PM	TF C57.134 Guide for Hottest-spot in Dry-type	Dry Type	C. Lovins	Session 4
10/19/2020	3:45 PM	5:00 PM	TF IEEE 259 Test for Eval of Insulation for Dry-Type Transfs	Dry Type	D. Stankes	Session 5
10/20/2020	8:00 AM	9:15 AM	WG Dry Type PD Detection PC57.124	Dry Type	T. Prevost	Session 4
10/20/2020	12:55 PM	2:10 PM	TF Guide for Loading Dry Type Transformers C57.96	Dry Type	A. Narawane	Session 4
10/21/2020	12:55 PM	2:10 PM	SC Dry Type Transformers	Dry Type	C. Ballard	Session 1
10/19/2020	3:45 PM	5:00 PM	SC HVDC Converter Transfs & Smoothing Reactors	HVDC	U. Radbrandt	Session 6
10/19/2020	10:45 AM	12:00 PM	TF Guide for DGA in Silicone C57.146	IF	J. Karas	Session 6
10/19/2020	3:45 PM	5:00 PM	TF Next Revision to C57.104 Guide for DGA in Mineral Oil	IF	C. Beauchemin	Session 4
10/20/2020	12:55 PM	2:10 PM	WG Consolidation Insulating Fluid Guides PC57.166	IF	T. Prevost	Session 1
10/21/2020	2:20 PM	3:35 PM	SC Insulating Fluids	IF	S. Reed	Session 1
10/19/2020	10:45 AM	12:00 PM	WG Moisture in Insulation PC57.162	Ins Life	T. Prevost	Session 5
10/19/2020	12:55 PM	2:10 PM	WG High Temp Liquid Transformers C57.154	Ins Life	R. Marek	Session 6
10/20/2020	8:00 AM	9:15 AM	TF Rises other than windings C57.12.00, Clause 5.11.1.4	Ins Life	T. Johnson	Session 1
10/20/2020	9:25 AM	10:40 AM	WG Temp Measurement PC57.165	Ins Life	M. Tostrud	Session 4
10/20/2020	12:55 PM	2:10 PM	WG Determine Max Winding Temp Rise PC57.169	Ins Life	S. Digby	Session 5
10/20/2020	2:20 PM	3:35 PM	WG Thermal Evaluation C57.100	Ins Life	R. Wicks	Session 3
10/20/2020	3:45 PM	5:00 PM	WG Loading Guide PC57.91	Ins Life	D. Wallach	Session 4
10/21/2020	8:00 AM	9:15 AM	SC Insulation Life	Ins Life	S. Kennedy	Session 2
10/20/2020	8:00 AM	9:15 AM	WG Station Service Volt. Transf. C57.13.8	Instr TR	D. Wallace	Session 3
10/20/2020	9:25 AM	10:40 AM	TF Instrument Transf. Accuracy	Instr TR	I. Ziger	Session 3
10/20/2020	10:50 AM	12:05 PM	WG PLC Caps & CCVTs PC57.13.9	Instr TR	Z. Roman	Session 3
10/21/2020	8:00 AM	9:15 AM	SC Instrument Transformers	Instr TR	T. Sizemore	Session 1
10/21/2020	On	demand	SC Meetings Planning - All interested individuals welcome	Mtgs	T. Behrens	Pre-recorded

SUBCOMMITTEE MEETING LIST

FALL 2020 MEETING: OCTOBER 19 TO OCTOBER 22

On-Line Meeting; Virtual, Central Time Zone USA

Date	Time Start	Time End	Session Title	Track	Chair	Room/Location
10/19/2020	9:10 AM	10:35 AM	WG Guide of FRA for Liquid Filled Transf. C57.149	PCS	C. Sweetser	Session 2
10/19/2020	12:55 PM	2:10 PM	TF Audible Sound Revision to Test Code	PCS	R. Girgis	Session 5
10/19/2020	2:20 PM	3:35 PM	TF PCS Cont. Revisions to C57.12.00	PCS	T. Ansari	Session 6
10/20/2020	8:00 AM	9:15 AM	TF PCS Cont. Rev. to Test Code C57.12.90	PCS	H. Sahin	Session 6
10/20/2020	9:25 AM	10:40 AM	WG Shunt Reactors C57.21	PCS	S. Som	Session 6
10/20/2020	2:20 PM	3:35 PM	WG Sw Transients Ind by TR/Bkr Interaction PC57.142	PCS	J. McBride	Session 5
10/20/2020	3:45 PM	5:00 PM	WG Short Circuit Withstand PC57.164	PCS	S. Patel	Session 3
10/21/2020	2:20 PM	3:35 PM	SC Performance Characteristics	PCS	R. Verdolin	Session 2
10/19/2020	10:45 AM	12:00 PM	WG Control Cabinets PC57.148 WILL NOT MEET	Power	J. Watson	Session 2
10/19/2020	12:55 PM	2:10 PM	WG C57.116 Guide for Trfs Direct Connect to Generators	Power	W. Li	Session 2
10/19/2020	2:20 PM	3:35 PM	WG Transformer Monitoring C57.143	Power	M. Spurlock	Session 2
10/20/2020	9:25 AM	10:40 AM	WG Condition Assessment Guide PC57.170	Power	K. Mani	Session 5
10/20/2020	2:20 PM	3:35 PM	TF Volts per Hertz	Power	J. Watson	Session 4
10/21/2020	12:55 PM	2:10 PM	SC Power Transformers	Power	B. Griesacker	Session 2
10/19/2020	9:10 AM	10:35 AM	WG Std Transf. Terminology C57.12.80	Stds	J. Graham	Session 4
10/19/2020	12:55 PM	2:10 PM	WG PC57.152 Guide for Field Testing	Stds	M. Ferreira	Session 3
10/19/2020	2:20 PM	3:35 PM	TF IEEE-IEC Cross Reference	Stds	V. Mehrotra	Session 3
10/20/2020	10:50 AM	12:05 PM	WG PC57.163 Geomagnetic Disturbances	Stds	D. Blaydon	Session 4
10/21/2020	3:45 PM	5:00 PM	SC Standards	Stds	J. Murphy	Session 1
10/19/2020	3:45 PM	5:00 PM	WG Sec. Network Protectors C57.12.44	STNP	M. Faulkner	Session 1
10/20/2020	9:25 AM	10:40 AM	WG Submersible Transf. C57.12.24	STNP	B. Garcia	Session 2
10/20/2020	10:50 AM	12:05 PM	WG Liquid-immersed Sec. Network TRs C57.12.40	STNP	D. Blew	Session 2
10/20/2020	2:20 PM	3:35 PM	TF Effects of Corrosion on Transformers	STNP	W. Elliott	Session 2
10/21/2020	10:50 AM	12:05 PM	SC Submersible Transf. & Network Protectors	STNP	G.Payerle	Session 1

APPENDIX 2

Semi-Annual Standards Report



IEEE / PES /TRANSFORMERS COMMITTEE

Standards Report

To: Members of Transformers Committee October 19, 2020

From: Jim Graham, Standards Coordinator

Executive Summary

This report covers Transformers Committee Standards activity from March 22, 2020 through September 18, 2020. During this time five revisions and one amendment to existing standards were approved by the Standards Association Board.

During this same period, the Standards Association Board approved one PAR for revision; and four PAR extensions.

PC57.21, which expired in 2018, is in comment resolution and will be submitted to RevCom later this year. C57.18.10 expired in 2019 and is also in comment resolution. PC57.124 expired in 2019 but is still in draft development.

Ten standards expire in 2020. Two of these standards are in ballot comment resolution and five are in draft development. One standard (259) has a pending PAR for revision. Two standards (C57.13.6 and C57.144) will be intentionally allowed to expire.

There are currently 52 active PARs. Five PARs are scheduled to expire in 2020. Two of these activities are in ballot comment resolution, and three are in draft development.

In this Report:

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- II. PARs approvedpg. 2
- III. Standards Board 2017 Meeting Schedulepg. 3
- IV. Transformer Committee Ballot Statuspg. 4
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- VI. Transformer Standards Status.....pg. 11- 21
- Appendix A Transformers Committee Organization Chart
- Appendix B IEEE Standards Association Meeting Schedule – 2021

I. Standards Approved *(since September 18, 2020)*

[Approved New Transformer Standards](#) *(None)*

[Approved Revisions to Transformer Standards](#) *(All expire 31 Dec 2030)*

P1277 Standard General Requirements and Test Code for Dry-Type and Oil-Immersed Smoothing Reactors and for Dry-Type Converter Reactors for DC Power Transmission

PC57.12.01 Standard for General Requirements for Dry-Type Distribution and Power Transformers

PC57.12.70 Standard for Standard Terminal Markings and Connections for Distribution and Power Transformers

PC57.12.91 Standard Test Code for Dry-Type Distribution and Power Transformers

PC57.148 Standard for Control Cabinets for Power Transformers

[Approved Standards Amendments & Corrigenda](#) *(None)*

PC57.32a Standard for Requirements, Terminology, and Test Procedure for Neutral Grounding Devices Amendment: Neutral Grounding Resistors Section

[Standard Approvals Pending – \(02 Dec 2020 RevCom Agenda\)](#)

PC57.12.30 Standard for Pole-Mounted Equipment--Enclosure Integrity for Coastal Environments

PC57.12.31 Standard for Pole-Mounted Equipment--Enclosure Integrity

II. PARs Approved *(since September 18, 2020)*

[Approved PARs – Withdrawals](#) *(None)*

[Approved PARs for New Projects](#) *(None)*

[Approved PARs for Revision of Standards](#) *(All expire as noted)*

C57.146 Guide for Interpretation of Gases Generated in Silicone-Immersed Transformers **(expires 2024)**

[Approved PAR Extensions](#) *(All expire as noted)*

PC57.12.34 Standard Requirements for Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers, 10 MVA and Smaller; High-Voltage, 34.5 kV Nominal System Voltage and Below; Low-Voltage, 15 kV Nominal System Voltage and Below **(expires 2022)**

PC57.19.02 Standard for the Design and Performance Requirements of Bushings Applied to Liquid Immersed Distribution Transformers **(expires 2022)**

PC57.160 Guide for the Electrical Measurement of Partial Discharges in High Voltage Bushings and Instrument Transformers **(expires 2022)**

PC57.164 Guide for Establishing Short Circuit Withstand Capabilities of Liquid Immersed Power Transformers, Regulators, and Reactors **(expires 2022)**

[Approved PAR Modifications](#) *(None)*

- P259** Standard Test Procedure for Evaluation of Systems of Insulation for Dry-Type Specialty and General-Purpose Transformers (**revision**)
- PC57.21** Standard Requirements, Terminology, and Test Code for Shunt Reactors Rated Over 500 kVA (**extension**)
- PC57.18.10** Standard Practices and Requirements for Semiconductor Power Rectifier Transformers (**extension**)
- PC57.16** Standard for Requirements, Terminology, and Test Code for Dry-Type Air-Core Series-Connected Reactors (**extension**)
- PC57.105** Guide for Application of Transformer Connections in Three-Phase Electrical Systems - Corrigendum 1: Update Table 1—Application characteristics of connections (**Corrigendum**)
- PC57.131** Standard Performance Requirements and Test Methods for Tap-changers (**revision**)
- PC57.162** Guide for the Interpretation of Moisture Related Parameters in Dry, Gas Insulated and Liquid Immersed Transformers and Reactors (**extension**)

III. IEEE Standards Board Meeting Schedule

The Standards Board normally has four board meetings per year and three teleconference meetings. The IEEE 2021 Standards Association meetings schedule is appended to this report.

Deadlines for 2021 Standards Board Submissions:

Standards Board Meetings	Submission Deadline
January 26, 2021 (teleconference)	11 December, 2020
March 23-25, 2021	12 February, 2021
April 28, 2021 (NesCom/RevCom teleconference)	18 March, 2021
June 15, 2021 (NesCom/RevCom teleconference)	6 May, 2021
September 21-23, 2021	13 August, 2021
October 22, 2021	10 September, 2021
December 06-08, 2021	18 October, 2021

Please Note: The next submission deadline is 11 December, 2020 for the January 2021 NesCom /RevCom teleconference agendas.

Anything that expires at the end of 2021 must be submitted to Standards Board (PARs to NESCOM, standards to REVCOM) by 18 October, 2021

IV. Transformers Committee Ballot Status (as of Sep 18, 2020)

PAR Number	Project Type	PAR Approval	PAR Expiration	Invitation Close	Ballot Close	Project Status
Dielectric Test						
PC57.160	New	15 Jun 2017	31 Dec 2022	30 Nov 2018	09 Jan 2019	SA Ballot: Comment Resolution
Distribution Transformers						
PC57.12.30	Revision	08 Feb 2019	31 Dec 2023	15 Jan 2020	10 Sep 2020	RevCom Agenda (02 Dec 2020)
PC57.12.31	Revision	08 Feb 2019	31 Dec 2023	15 Jan 2020	10 Sep 2020	RevCom Agenda (02 Dec 2020)
Performance Characteristics						
PC57.18.10	Revision	30 Jun 2016	31 Dec 2020	21 Mar 2020	01 Jul 2020	SA Ballot: Comment Resolution
PC57.21	Revision	21 Aug 2014	31 Dec 2020	19 Dec 2018	30 Aug 2020	SA Ballot: Comment Resolution

V. Transformers Committee Active PAR Status

(as of Sep 18, 2020)

PAR Number	WG Chair	Project Type	Project Title	PAR Approval	PAR Expiration	Project Status
Bushings						
PC57.19.00	Peter Zhao	Revision	Standard General Requirements and Test Procedure for Power Apparatus Bushings	15 Feb 2018	31 Dec 2022	Draft Development
PC57.19.02	Stephen Shull	New	Standard for the Design and Performance Requirements of Bushings Applied to Liquid Immersed Distribution Transformers	05 Feb 2016	31 Dec 2022	Draft Development
PC57.19.100	Thomas Spitzer	Revision	Guide for Application of Power Apparatus Bushings	21 May 2019	31 Dec 2023	Draft Development
PAR Number	WG Chair	Project Type	Project Title	PAR Approval	PAR Expiration	Project Status
Dielectric Test						
PC57.113	Ali Naderian	Revision	Recommended Practice for Partial Discharge Measurement in Liquid-Filled Power Transformers and Shunt Reactors	06 Dec 2017	31 Dec 2021	Draft Development
PC57.12.200	Jun Deng	New	Guide for the Frequency Domain Spectroscopy Measurement of Transformer Bushings	27 Sep 2018	31 Dec 2022	Draft Development
PC57.160	Thang Hochanh	New	Guide for the Electrical Measurement of Partial Discharges in High Voltage Bushings and Instrument Transformers	15 Jun 2017	31 Dec 2022	SA Ballot: Comment Resolution
PC57.168	Daniel Sauer	New	Guide for Low Frequency Dielectric Testing for Distribution, Power and Regulating Transformers	14 Jun 2018	31 Dec 2022	Draft Development
PC57.98	Thang Hochanh	Revision	Guide for Transformer Impulse Tests	27 Sep 2018	31 Dec 2022	Draft Development

PAR Number	WG Chair	Project Type	Project Title	PAR Approval	PAR Expiration	Project Status
Distribution Transformers						
PC57.12.20	Alan Traut	Revision	Standard for Overhead-Type Distribution Transformers 500 kVA and Smaller; High Voltage, 34 500 V and Below; Low Voltage, 7970/13 800Y V and Below	08 Feb 2019	31 Dec 2023	Draft Development
PC57.12.28	Daniel Mulkey	Revision	Standard for Pad-Mounted Equipment--Enclosure Integrity	05 Mar 2020	31 Dec 2024	Draft Development
PC57.12.29	Daniel Mulkey	Revision	Standard for Pad-Mounted Equipment--Enclosure Integrity for Coastal Environments	05 Mar 2020	31 Dec 2024	Draft Development
PC57.12.30	Daniel Mulkey	Revision	Standard for Pole-Mounted Equipment--Enclosure Integrity for Coastal Environments	08 Feb 2019	31 Dec 2023	RevCom Agenda (02 Dec 2020)
PC57.12.31	Daniel Mulkey	Revision	Standard for Pole-Mounted Equipment--Enclosure Integrity	08 Feb 2019	31 Dec 2023	RevCom Agenda (02 Dec 2020)
PC57.12.34	Stephen Shull	Revision	Standard Requirements for Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers, 10 MVA and Smaller; High-Voltage, 34.5 kV Nominal System Voltage and Below; Low-Voltage, 15 kV Nominal System Voltage and Below	22 Sep 2016	31 Dec 2022	Draft Development
PC57.12.35	Rhett Chrysler	Revision	Standard for Information Coding for Distribution Transformers and Step-Voltage Regulators	13 Jun 2019	31 Dec 2023	Draft Development
PC57.12.38	Ali Ghafourian	Revision	Standard for Pad-Mounted-Type, Self-Cooled, Single-Phase Distribution Transformers 250 kVA and Smaller: High Voltage, 34 500 GrdY/19 920 V and Below; Low Voltage, 480/240 V and Below	28 Sep 2017	31 Dec 2021	Draft Development
PC57.167	Gary Hoffman	New	Guide for Monitoring Distribution Transformers	14 Jun 2018	31 Dec 2022	Draft Development

PAR Number	WG Chair	Project Type	Project Title	PAR Approval	PAR Expiration	Project Status
Dry Type Transformers						
PC57.12.52	Joseph Tedesco	Revision	Standard for Sealed Dry-Type Distribution and Power Transformers	05 Mar 2020	31 Dec 2024	Draft Development
PC57.124	Tom Prevost	Revision	Recommended Practice for the Detection of Partial Discharge and the Measurement of Apparent Charge in Dry-Type Transformers	15 Jun 2017	31 Dec 2021	Draft Development
PC57.16	J. Arturo Delrio	Revision	Standard for Requirements, Terminology, and Test Code for Dry-Type Air-Core Series-Connected Reactors	05 Feb 2016	31 Dec 2020	Draft Development
Insulating Fluids						
PC57.146	Jon Karas	Revision	Guide for Interpretation of Gases Generated in Silicone-Immersed Transformers	05 Mar 2020	31 Dec 2024	Draft Development
PC57.166	Tom Prevost	New	Guide for Acceptance and Maintenance of Insulating Liquids in Transformers and Related Equipment	08 Mar 2018	31 Dec 2022	Draft Development
Insulation Life						
PC57.100	Roger Wicks	Revision	Standard Test Procedure for the Thermal Evaluation of Insulation Systems for Liquid-Immersed Distribution, Power and Regulating Transformers	30 Oct 2018	31 Dec 2022	Draft Development
PC57.154	Richard Marek	Revision	Standard for Liquid-Immersed Transformers Designed to Operate at Temperatures Above Conventional Limits Using High-Temperature Insulation Systems.	27 Sep 2018	31 Dec 2022	Draft Development
PC57.162	Tom Prevost	New	Guide for the Interpretation of Moisture Related Parameters in Dry, Gas Insulated and Liquid Immersed Transformers and Reactors	23 Aug 2013	31 Dec 2020	Draft Development
PC57.165	Mark Tostrud	New	Guide for Temperature Measurements for Liquid Immersed Transformers and Reactors	17 Feb 2017	31 Dec 2021	Draft Development
PC57.169	Scott Digby	Revision	Guide for Determination of Maximum Winding Temperature Rise in Liquid-Immersed Transformers	21 Mar 2019	31 Dec 2023	Draft Development
PC57.91	David Wallach	Revision	Guide for Loading Mineral-Oil-Immersed Transformers and Step-Voltage Regulators	28 Sep 2017	31 Dec 2021	Draft Development

PAR Number	WG Chair	Project Type	Project Title	PAR Approval	PAR Expiration	Project Status
Instrument Transformers						
PC57.13-2016 /Cor 1	Ross McTaggart	Corrigendum	Standard Requirements for Instrument Transformers - Corrigendum 1	21 Mar 2019	31 Dec 2023	Draft Development
PC57.13.2	Thomas Sizemore	Revision	Standard for Conformance Test Procedure for Instrument Transformers	06 Dec 2017	31 Dec 2021	Draft Development
P63253-5713-8	David Wallace	New	Standard Requirements for Station Service Voltage Transformers	21 Mar 2019	31 Dec 2021	Draft Development
PC57.13.9	Zoltan Roman	New	Standard for Power-Line Carrier Coupling Capacitors and Coupling Capacitor Voltage Transformers	23 Mar 2017	31 Dec 2021	Draft Development
Performance Characteristics						
PC57.142	James McBride	Revision	Guide to Describe the Occurrence and Mitigation of Switching Transients Induced by Transformers, Switching Device, and System Interaction	23 Mar 2017	31 Dec 2021	Draft Development
PC57.149	Charles Sweetser	Revision	Guide for the Application and Interpretation of Frequency Response Analysis for Oil-Immersed Transformers	14 Jun 2018	31 Dec 2022	Draft Development
PC57.164	Sanjay Patel	New	Guide for Establishing Short Circuit Withstand Capabilities of Liquid Immersed Power Transformers, Regulators, and Reactors	30 Jun 2016	31 Dec 2022	Draft Development
PC57.18.10	Sheldon Kennedy	Revision	Standard Practices and Requirements for Semiconductor Power Rectifier Transformers	30 Jun 2016	31 Dec 2020	SA Ballot: Comment Resolution
PC57.21	Sanjib Som	Revision	Standard Requirements, Terminology, and Test Code for Shunt Reactors Rated Over 500 kVA	21 Aug 2014	31 Dec 2020	SA Ballot: Comment Resolution
PC57.32.10	Lijie Ding	New	Guide for the Selection of Neutral-Grounding Devices for High Voltage Direct Current (HVDC) Converter Transformers	30 Oct 2018	31 Dec 2022	Draft Development

PAR Number	WG Chair	Project Type	Project Title	PAR Approval	PAR Expiration	Project Status
Power Transformers						
P60214-1-57-131 (PC57.131)	Craig Colopy	New	Standard Requirements for Tap Changers	07 Dec 2016	31 Dec 2020	Draft Development
PC57.116	Weijun Li	Revision	Guide for Transformers Directly Connected to Generators	07 Nov 2019	31 Dec 2023	Draft Development
PC57.143	P. Michael Spurlock	Revision	Guide for Application of Monitoring Equipment to Liquid-Immersed Transformers and Components	17 Feb 2017	31 Dec 2021	Draft Development
PC57.150	Greg Anderson	Revision	Guide for the Transportation of Transformers and Reactors Rated 10,000 kVA or Higher	23 Mar 2017	31 Dec 2021	Draft Development
PC57.170	Kumar Mani	New	Guide for the Condition Assessment of Liquid Immersed Transformers, Reactors and Their Components	05 Sep 2019	31 Dec 2023	Draft Development
PC57.93a	Wei Yao	Amendment	IEEE Approved Draft Guide for Installation and Maintenance of Liquid-Immersed Power Transformers Amendment: Cold Start of Power Transformers filled with Natural Ester Fluids	05 Mar 2020	31 Dec 2024	Draft Development
Standards						
PC57.12.00	Steve Snyder	Revision	Standard for General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers	17 Feb 2017	31 Dec 2021	Draft Development
PC57.12.90	Stephen Antosz	Revision	Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers	06 Dec 2017	31 Dec 2021	Draft Development
PC57.12.80	James Graham	Revision	Standard Terminology for Power and Distribution Transformers	23 Mar 2017	31 Dec 2021	Draft Development
PC57.152	Marcos Ferreira	Revision	Guide for Diagnostic Field Testing of Liquid-Filled Power Transformers, Regulators, and Reactors	13 Jun 2019	31 Dec 2023	Draft Development
PC57.163	Daniel Blaydon	Revision	Guide for Establishing Power Transformer Capability while under Geomagnetic Disturbances	05 Mar 2020	31 Dec 2024	Draft Development

PAR Number	WG Chair	Project Type	Project Title	PAR Approval	PAR Expiration	Project Status
Subsurface Transformers & Network Protectors						
PC57.12.24	Benjamin Garcia	Revision	Standard for Submersible, Three-Phase Transformers, 3750 kVA and Smaller: High Voltage, 34 500 GrdY/19 920 Volts and Below; Low Voltage, 600 Volts and Below	08 Feb 2019	31 Dec 2023	Draft Development
PC57.12.40	David Blew	Revision	Standard for Network, Three-Phase Transformers, 2500 kVA and Smaller; High Voltage, 34 500 V and Below; Low Voltage, 600 V and Below; Subway and Vault Types (Liquid Immersed)	21 May 2019	31 Dec 2023	Draft Development
PC57.12.44	Mark Faulkner	Revision	Standard Requirements for Secondary Network Protectors	26 Mar 2015	31 Dec 2021	Draft Development

VI. Transformers Committee Standards Status

(as of Sep 18, 2020)

Standard Expired	2018-2019	3
Standard /PAR expires	2020	10
Standard /PAR expires	2021	7

Standard Number	Year	Project Title	SASB Date	Notes
Bushings		SC Chair: Eric Weatherbee email: eweatherbee@hubbell.com phone: +1 585-768-1272		
C57.19.00	2004	IEEE Standard General Requirements and Test Procedure for Power Apparatus Bushings	31 Dec 2020	Draft Development
C57.19.01	2017	IEEE Standard for Performance Characteristics and Dimensions for Power Transformer and Reactor Bushings	31 Dec 2027	No active PAR
65700-19-03	2014	IEC/IEEE International Standard -- Bushings for DC application	31 Dec 2024	No active PAR
C57.19.04	2018	IEEE Standard for Performance Characteristics and Dimensions for High Current Power Transformer Bushings with Rated Continuous Current in Excess of 5000 A in Bus Enclosures	31 Dec 2028	No active PAR
C57.19.100	2012	IEEE Guide for Application of Power Apparatus Bushings	31 Dec 2022	Draft Development

Standard Number	Year	Project Title	SASB Date	Notes
Dielectric Test		SC Chair: Ajith Varghese email: ajith.varghese@spx.com phone: +1 262-442-7197		
C57.113	2010	IEEE Recommended Practice for Partial Discharge Measurement in Liquid-Filled Power Transformers and Shunt Reactors	31 Dec 2020	Draft Development
C57.127	2018	IEEE Guide for the Detection, Location and Interpretation of Sources of Acoustic Emissions from Electrical Discharges in Power Transformers and Power Reactors	31 Dec 2028	No active PAR
C57.138	2016	IEEE Recommended Practice for Routine Impulse Tests for Distribution Transformers	31 Dec 2026	No active PAR
C57.161	2018	IEEE Guide for Dielectric Frequency Response Test	31 Dec 2028	No active PAR
C57.98	2011	IEEE Guide for Transformer Impulse Tests	31 Dec 2021	Draft Development
Distribution Transformers		SC Chair: Ed Smith email: edsmith@h-jenterprises.com phone: +1 636-677-3421 Ext 324		
C57.12.20	2017	IEEE Standard for Overhead-Type Distribution Transformers 500 kVA and Smaller; High Voltage, 34 500 V and Below; Low Voltage, 7970/13 800Y V and Below	31 Dec 2027	Draft Development
C57.12.28	2014	IEEE Standard for Pad-Mounted Equipment--Enclosure Integrity	31 Dec 2024	Draft Development
C57.12.29	2014	IEEE Standard for Pad-Mounted Equipment--Enclosure Integrity for Coastal Environments	31 Dec 2024	Draft Development
C57.12.30	2010	IEEE Standard for Pole-Mounted Equipment--Enclosure Integrity for Coastal Environments	31 Dec 2020	RevCom Agenda (02 Dec 2020)
C57.12.31	2010	IEEE Standard for Pole-Mounted Equipment--Enclosure Integrity	31 Dec 2020	RevCom Agenda (02 Dec 2020)

Standard Number	Year	Project Title	SASB Date	Notes
Distribution Transformers		SC Chair: Ed Smith email: edsmith@h-jenterprises.com phone: +1 636-677-3421 Ext 324		
C57.12.32	2019	IEEE Standard for Submersible Equipment--Enclosure Integrity	31 Dec 2029	No active PAR
C57.12.34	2015	IEEE Standard Requirements for Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers, 10 MVA and Smaller; High-Voltage, 34.5 kV Nominal System Voltage and Below; Low-Voltage, 15 kV Nominal System Voltage and Below	31 Dec 2025	Draft Development
C57.12.35	2013	IEEE Standard Bar Coding for Distribution Transformers and Step-Voltage Regulators	31 Dec 2023	Draft Development
C57.12.36	2017	IEEE Standard Requirements for Liquid-Immersed Distribution Substation Transformers	31 Dec 2027	No active PAR
C57.12.37	2015	IEEE Standard for the Electronic Reporting of Distribution Transformer Test Data	31 Dec 2025	No active PAR
C57.12.38	2014	IEEE Standard for Pad-Mounted-Type, Self-Cooled, Single-Phase Distribution Transformers 250 kVA and Smaller: High Voltage, 34 500 GrdY/19 920 V and Below; Low Voltage, 480/240 V and Below	31 Dec 2024	Draft Development
C57.12.39	2017	IEEE Standard for Requirements for Distribution Transformer Tank Pressure Coordination	31 Dec 2027	No active PAR
C57.15	2017	IEEE Approved Draft Standard Requirements, Terminology, and Test Code for Step-Voltage Regulators	31 Dec 2027	No active PAR

Standard Number	Year	Project Title	SASB Date	Notes
Dry Type Transformers		SC Chair: Casey Ballard email: robert.c.ballard@ieee.org phone: +1 804-383-2473		
259	1999	IEEE Standard Test Procedure for Evaluation of Systems of Insulation for Dry-Type Specialty and General-Purpose Transformers	31 Dec 2020	NesCom agenda (02 Dec 2020)
C57.12.01	2020	IEEE Approved Draft Standard for General Requirements for Dry-Type Distribution and Power Transformers	31-Dec-2030	No active PAR
C57.12.51	2019	IEEE Guide for Mechanical Interchangeability of Ventilated Dry-Type Transformers	31 Dec 2029	No active PAR
C57.12.52	2012	IEEE Standard for Sealed Dry-Type Power Transformers, 501 kVA and Higher, Three-Phase, with High-Voltage 601 to 34500 Volts, Low-Voltage 208Y/120 to 4160 Volts--General Requirements	31 Dec 2022	Draft Development
C57.12.58	2017	IEEE Guide for Conducting a Transient Voltage Analysis of a Dry-Type Transformer Coil	31 Dec 2027	No active PAR
C57.12.59	2015	IEEE Guide for Dry-Type Transformer Through-Fault Current Duration	31 Dec 2025	No active PAR
C57.12.60	2020	IEEE Standard for Thermal Evaluation of Insulation Systems for Dry-Type Power and Distribution Transformers	31 Dec 2030	No active PAR
C57.12.91	2020	IEEE Approved Draft Standard Test Code for Dry-Type Distribution and Power Transformers	31-Dec-2030	No active PAR
C57.124	1991	IEEE Recommended Practice for the Detection of Partial Discharge and the Measurement of Apparent Charge in Dry-Type Transformers	31 Dec 2019	Draft Development
C57.134	2013	IEEE Guide for Determination of Hottest-Spot Temperature in Dry-Type Transformers	31 Dec 2023	No active PAR
C57.16	2011	IEEE Standard for Requirements, Terminology, and Test Code for Dry-Type Air-Core Series-Connected Reactors	31 Dec 2021	Draft Development
C57.94	2015	IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers	31 Dec 2025	No active PAR
C57.96	2013	IEEE Guide for Loading Dry-Type Distribution and Power Transformers	31 Dec 2023	No active PAR

Standard Number	Year	Project Title	SASB Date	Notes
HVDC Converter Transformers & Smoothing Reactors		SC Chair: Ulf Radbrandt email: ulf.radbrandt@se.abb.com phone: +46 70 360 6190		
1277	2020	IEEE Standard General Requirements and Test Code for Dry-Type and Oil-Immersed Smoothing Reactors and for Dry-Type Converter Reactors for DC Power Transmission	31 Dec 2030	No active PAR
60076-57-129	2017	IEC/IEEE International Standard - Power transformers--Part 57-129: Transformers for HVDC applications	31 Dec 2027	No active PAR
Insulating Fluids		SC Chair: Scott Reed email: sreed@mvadiagnostics.com phone: +1 330 498 6255 x130		
C57.637	2015	IEEE Guide for the Reclamation of Mineral Insulating Oil and Criteria for Its Use	31 Dec 2025	No active PAR
C57.104	2019	IEEE Guide for the Interpretation of Gases Generated in Mineral Oil-Immersed Transformers	31 Dec 2029	No active PAR
C57.106	2015	IEEE Guide for Acceptance and Maintenance of Insulating Mineral Oil in Electrical Equipment	31 Dec 2025	No active PAR
C57.130	2015	IEEE Guide for the Use of Dissolved Gas Analysis Applied to Factory Temperature Rise Tests for the Evaluation of Mineral Oil-Immersed Transformers and Reactors	31 Dec 2025	No active PAR
C57.139	2015	IEEE Guide for Dissolved Gas Analysis in Transformer Load Tap Changers	31 Dec 2025	No active PAR
C57.146	2005	IEEE Guide for Interpretation of Gasses Generated in Silicone-Immersed Transformers	31 Dec 2021	Draft Development
C57.147	2018	IEEE Guide for Acceptance and Maintenance of Natural Ester Insulating Liquid in Transformers	31 Dec 2028	No active PAR
C57.155	2014	IEEE Guide for Interpretation of Gases Generated in Natural Ester and Synthetic Ester-Immersed Transformers	31 Dec 2024	No active PAR

Standard Number	Year	Project Title	SASB Date	Notes
Insulation Life		SC Chair: Sheldon Kennedy email: skennedy@niagaratransformer.com phone: +1 716-896-6500		
1276	2020	IEEE Guide for the Application of High-Temperature Insulation Materials in Liquid-Immersed Distribution, Power, and Regulating Transformers	31 Dec 2030	No active PAR
1538 (PC57.169)	2000	IEEE Guide for Determination of Maximum Winding Temperature Rise in Liquid-Filled Transformers	31 Dec 2021	Draft Development
C57.100	2011	IEEE Standard Test Procedure for Thermal Evaluation of Insulation Systems for Liquid-Immersed Distribution and Power Transformers	31 Dec 2021	Draft Development
C57.119	2018	IEEE Recommended Practice for Performing Temperature Rise Tests on Liquid-Immersed Power Transformers at Loads Beyond Nameplate Ratings	31 Dec 2028	No active PAR
C57.154	2012	IEEE Standard for the Design, Testing, and Application of Liquid-Immersed Distribution, Power, and Regulating Transformers Using High-Temperature Insulation Systems and Operating at Elevated Temperatures	31 Dec 2022	Draft Development
C57.91	2011	IEEE Guide for Loading Mineral-Oil-Immersed Transformers and Step-Voltage Regulators	31 Dec 2021	Draft Development

Standard Number	Year	Project Title	SASB Date	Notes
Instrument Transformers		SC Chair: Thomas Sizemore email: thomas.sizemore.us@ieee.org phone: +1 252-827-3235		
C57.13	2016	IEEE Standard Requirements for Instrument Transformers	31 Dec 2026	No active PAR
C57.13.2	2005	IEEE Standard for Conformance Test Procedure for Instrument Transformers	31 Dec 2020	Draft Development
C57.13.5	2019	IEEE Standard for Performance and Test Requirements for Instrument Transformers of a Nominal System Voltage of 115 kV and Above	31 Dec 2029	No active PAR
C57.13.6	2005	IEEE Standard for High Accuracy Instrument Transformers	31 Dec 2020	will intentionally expire
C57.13.7	2018	IEEE Standard for Current Transformers with Maximum Milliampere Secondary Current of 250 mA	31 Dec 2028	No active PAR
Performance Characteristics		SC Chair: Rogerio Verdolin email: roger.verdolin@shaw.ca phone: +1 403 850 4304		
60076-16	2018	IEC/IEEE International Standard - Power transformers - Part 16: Transformers for wind turbine applications	31 Dec 2028	No active PAR
C57.105	2019	IEEE Guide for Application of Transformer Connections in Three-Phase Electrical Systems	31 Dec 2029	No active PAR
C57.109	2018	IEEE Guide for Liquid-Immersed Transformers Through-Fault-Current Duration	31 Dec 2028	No active PAR
C57.110	2018	IEEE Recommended Practice for Establishing Liquid Immersed and Dry-Type Power and Distribution Transformer Capability when Supplying Nonsinusoidal Load Currents	31 Dec 2028	No active PAR
C57.120	2017	IEEE Guide for Loss Evaluation of Distribution and Power Transformers and Reactors	31 Dec 2027	No active PAR
C57.123	2019	IEEE Guide for Transformer Loss Measurement	31 Dec 2029	No active PAR

Standard Number	Year	Project Title	SASB Date	Notes
Performance Characteristics		SC Chair: Rogerio Verdolin email: roger.verdolin@shaw.ca phone: +1 403 850 4304		
C57.142	2010	IEEE Guide to Describe the Occurrence and Mitigation of Switching Transients Induced by Transformers, Switching Device, and System Interaction	31 Dec 2020	Draft Development
C57.149	2012	IEEE Guide for the Application and Interpretation of Frequency Response Analysis for Oil-Immersed Transformers	31 Dec 2022	Draft Development
C57.158	2017	IEEE Guide for the Application of Tertiary and Stabilizing Windings in Power Transformers	31 Dec 2027	No active PAR
C57.159	2016	IEEE Guide on Transformers for Application in Distributed Photovoltaic (DPV) Power Generation Systems	31 Dec 2026	No active PAR
C57.18.10	1998	IEEE Standard Practices and Requirements for Semiconductor Power Rectifier Transformers	31 Dec 2019	SA Ballot: Comment Resolution
C57.21	2008	IEEE Standard Requirements, Terminology, and Test Code for Shunt Reactors Rated Over 500 kVA	31 Dec 2018	SA Ballot: Comment Resolution
C57.32	2015	IEEE Standard for Requirements, Terminology, and Test Procedures for Neutral Grounding Devices	31 Dec 2025	No active PAR
Power Transformers		SC Chair: Bill Griesacker email: wgriesacker@duqlight.com phone: +21 412-916-6446		
638	2013	IEEE Standard for Qualification of Class 1E Transformers for Nuclear Power Generating Stations	31 Dec 2023	No active PAR
60076-57-1202	2016	IEC/IEEE International Standard Power transformers --Part 57-1202: Liquid immersed phase-shifting transformers	31 Dec 2026	No active PAR
60214-2	2019	IEEE Draft Standard for Tap-Changers - Part 2: Application Guide	31 Dec 2029	No active PAR
C57.116	2014	IEEE Guide for Transformers Directly Connected to Generators	31 Dec 2024	Draft Development

Standard Number	Year	Project Title	SASB Date	Notes
Power Transformers		SC Chair: Bill Griesacker email: wgrisesacker@duqlight.com phone: +21 412-916-6446		
C57.12.10	2017	IEEE Standard Requirements for Liquid-Immersed Power Transformers	31 Dec 2027	No active PAR
C57.125	2015	IEEE Guide for Failure Investigation, Documentation, Analysis, and Reporting for Power Transformers and Shunt Reactors	31 Dec 2025	No active PAR
C57.131	2012	IEEE Standard Requirements for Tap Changers	31 Dec 2022	NesCom agenda (02 Dec 2020)
C57.135	2011	IEEE Guide for the Application, Specification, and Testing of Phase-Shifting Transformers	31 Dec 2021	No active PAR
C57.140	2017	IEEE Guide for Evaluation and Reconditioning of Liquid Immersed Power Transformers	31 Dec 2027	No active PAR
C57.143	2012	IEEE Guide for Application for Monitoring Equipment to Liquid-Immersed Transformers and Components	31 Dec 2022	Draft Development
C57.148	2020	IEEE Approved Draft Standard for Control Cabinets for Power Transformers	31 Dec 2030	No active PAR
C57.150	2012	IEEE Guide for the Transportation of Transformers and Reactors Rated 10 000 kVA or Higher	31 Dec 2022	Draft Development
C57.153	2015	IEEE Guide for Paralleling Regulating Transformers	31 Dec 2025	No active PAR
C57.156	2016	IEEE Guide for Tank Rupture Mitigation of Liquid-Immersed Power Transformers and Reactors	31 Dec 2026	No active PAR
C57.157	2015	IEEE Guide for Conducting Functional Life Tests on Switch Contacts Used in Insulating Liquid-Immersed Transformers	31 Dec 2025	No active PAR
C57.17	2012	IEEE Standard Requirements for Arc Furnace Transformers	31 Dec 2022	No active PAR
C57.93	2019	IEEE Approved Draft Guide for Installation and Maintenance of Liquid-Immersed Power Transformers	31 Dec 2029	No active PAR

Standard Number	Year	Project Title	SASB Date	Notes
Standards		SC Chair: Jerry Murphy email: jerry.murphy@ieee.org phone: +1 407-824-4194		
C57.12.00	2015	IEEE Standard for General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers	31 Dec 2025	Draft Development
C57.12.90	2015	IEEE Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers	31 Dec 2025	Draft Development
C57.12.70	2020	IEEE Standard for Standard Terminal Markings and Connections for Distribution and Power Transformers	31 Dec 2030	No active PAR
C57.12.80	2010	IEEE Standard Terminology for Power and Distribution Transformers	31 Dec 2020	Draft Development
C57.144	2004	IEEE Guide for Metric Conversion of Transformer Standards	31 Dec 2020	No active PAR
C57.152	2013	IEEE Guide for Diagnostic Field Testing of Fluid-Filled Power Transformers, Regulators, and Reactors	31 Dec 2023	Draft Development
C57.163	2015	IEEE Guide for Establishing Power Transformer Capability while under Geomagnetic Disturbances	31 Dec 2025	Draft Development

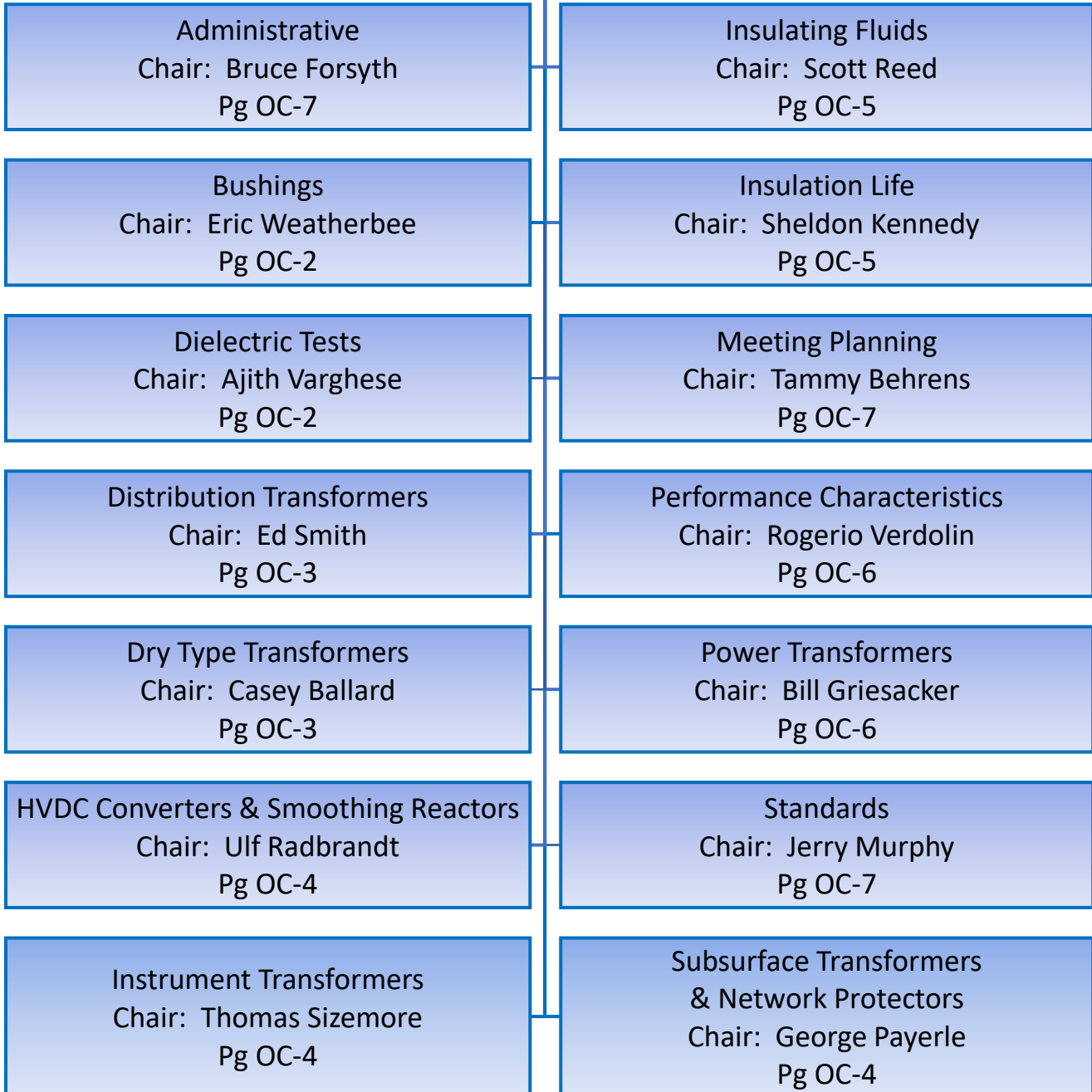
Standard Number	Year	Project Title	SASB Date	Notes
Subsurface Transformers & Network Protectors		SC Chair: George Payerle email: gpayerle@roadrunner.com phone: +1 330-908-0418		
C57.12.23	2018	IEEE Standard for Submersible Single-Phase Transformers:250 kVA and Smaller; High Voltage 34 500 GrdY/19 920 V and Below; Low Voltage 600 V and Below	31 Dec 2028	No active PAR
C57.12.24	2016	IEEE Standard for Submersible, Three-Phase Transformers, 3750 kVA and Smaller: High Voltage, 34 500 GrdY/19 920 Volts and Below; Low Voltage, 600 Volts and Below	31 Dec 2026	Draft Development
C57.12.40	2017	IEEE Standard for Network, Three-Phase Transformers, 2500 kVA and Smaller; High Voltage, 34 500 V and Below; Low Voltage, 600 V and Below; Subway and Vault Types (Liquid Immersed)	31 Dec 2027	Draft Development
C57.12.44	2014	IEEE Standard Requirements for Secondary Network Protectors	31 Dec 2024	Draft Development

IEEE PES Transformers

Chair: Bruce Forsyth

Vice Chair: Ed teNyenhuis Secretary: David Wallach Treasurer: Paul Boman

Past Chair: Susan McNelly Standards Coordinator: James Graham



**Bushings
Chair - Eric Weatherbee**

**Dielectric Tests
Chair - Ajith Varghese**

C57.19.00
Gen. Requirements
Bushings
Peter Zhao

C57.19.01
Perform Characteristics
Outdoor Bushings
Shibao Zhang

C57.19.02
Perform Characteristics
Dist Xfmr Bushings
Srephen Shull

65700-19-03
Requirements & Testing
DC Bushings
Leslie Recksieler

C57.19.04
Perform Characteristics
GSU Bushings
Scott Digby

C57.19.100
Bushing
Application Guide
Thomas Spitzer

C57.98
Impulse Tests Guide
Thang Hochanh

C57.113
PD Measurement
Ali Naderian

C57.127
Acoustic PD Guide
Detlev Gross

C57.138
Dist Xfmrs Impulse Test
(OPEN)

C57.160
PD Measurement
Bushings & Instr Xfmrs
Thang Hochanh

C57.161
DFR Test Guide
Ali Naderian

C57.168
Low Freq Test Guide
Daniel Sauer

C57.12.200 (Entity)
Freq Domain Spectroscopy
- Bushings
Jun Deng

Task Force
Low Freq Tests
Cont Revision
Bill Griesacker

Task Force
Impulse Tests
Cont Revision
Pierre Riffon

**Distribution Transformers
Chair - Ed Smith**

C57.12.20
OH Distribution Xfmrs
Alan Traut

C57.12.34
Gen Requirements
3-PH Pad Mount
Stephen Shull

C57.12.36
Dist Sub Xfmrs
Jerry Murphy

C57.12.38
1-PH Pad Mount
Self-cool <2500 KVA
Ali Ghafourian

C57.15
Voltage Regulators
Craig Colopy

TF - DOE Activity
Distr Xfmr
Efficiency & Loss
Phil Hopkinson

C57.12.28, C57.12.29
C57.12.30, C57.12.31
& C57.12.32
Enclosure Integrity
Dan Mulkey

C57.12.35
Bar Coding
Rhett Chrysler

C57.12.37 / IEEE 1388
Elec Rpt of Test Data
Thomas Callsen

C57.12.39
Dist Tank Pressure
Carlos Gaytan

C57.167
Dist Xfmrs
Monitoring Guide
Gary Hoffman

**Dry Type Transformers
Chair - Casey Ballard**

C57.12.01
Gen Requirements
Dry Type Xfmrs
Casey Ballard

C57.12.52
Gen Requirements
Sealed > 500 KVA
Joseph Tedesco

C57.12.59
Dry Type Through Fault
Current Duration
Paulette Payne Powell

C57.12.91
Test Code
Dry Type Xfmrs
David Walker

C57.94
Dry Type Xfmrs
OP & Maint Guide
David Stankes

C57.124
Dry Type PD &
Apparent Charge
Thomas Prevost

IEEE 259
Eval - Dry Type Xfmrs
Insulation Systems
David Stankes

C57.12.51
Gen Requirements
Vented 3-PH > 500 KVA
Sanjib Som

C57.12.58
Transient Analysis
Roger Wicks

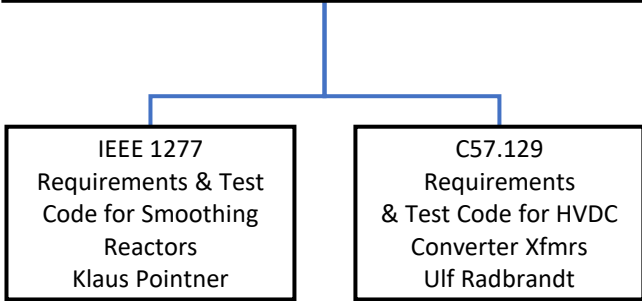
C57.12.60
Thermal Eval of
Dry Type Xfmrs
Roger Wicks

C57.16
Dry Type
Air Core Reactors
Arturo Del Rio

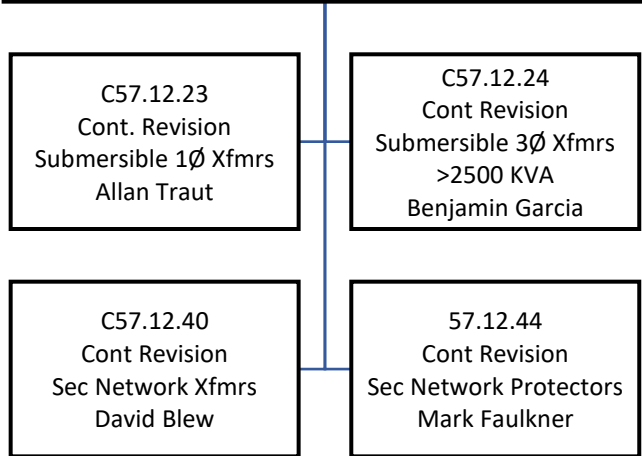
C57.96
Loading Guide
Dry Type Xfmrs
Rick Marek

C57.134
Dry Type Xfmrs
Hottest Spot
Paulette Payne Powell

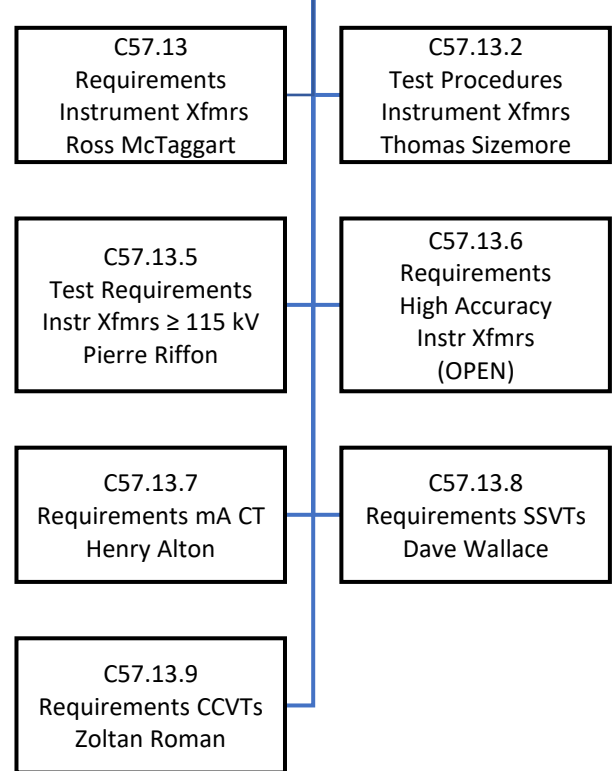
**HVDC Converter Transformers
& Smoothing Reactors
Chair - Ulf Radbrandt**

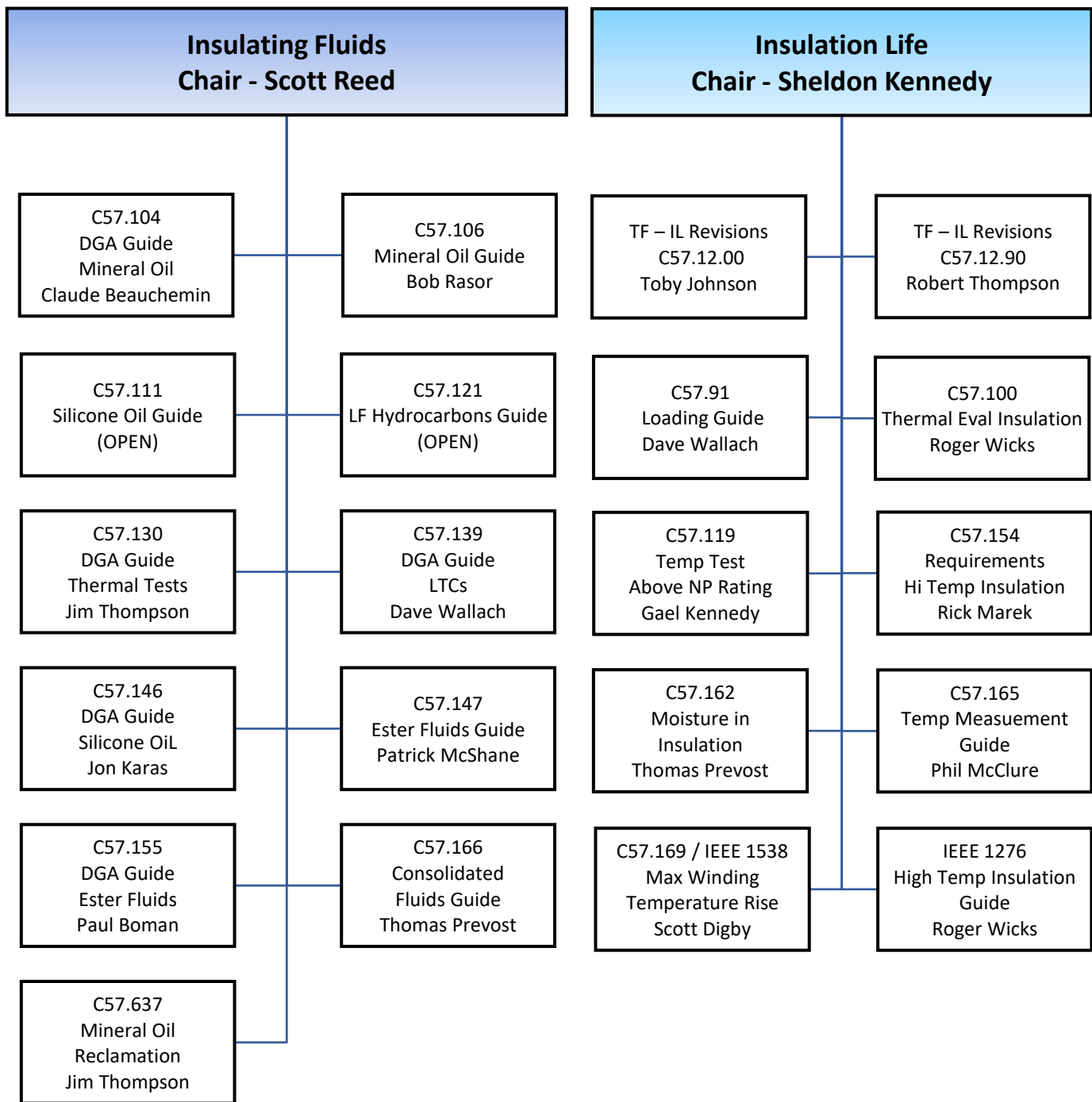


**Subsurface Transformers
& Network Protectors
Chair - George Payerle**



**Instrument Transformers
Chair - Thomas Sizemore**





**Performance Characteristics
Chair - Rogerio Verdolin**

TF-PCS Revisions C57.12.00 Tauhid Ansari	TF-PCS Revisions C57.12.90 Hakan Sahin
C57.18.10 Semicon Rectifier Xfmrs Sheldon Kennedy	C57.21 Req & Test Code Reactors >500 KVA Sanjib Som
C57.32 Neutral Gnd Devices Sheldon Kennedy	C57.105 Xfmr Connections Guide Rogerio Verdolin
C57.109 Through Fault Current Duration Vinay Mehrota	C57.110 Nonsinusoidal Load Currents Rick Marek
C57.120 Loss Evaluation Guide Rogerio Verdolin	C57.123 Xfmr Loss Measurement Ed teNyenhuis
C57.133 Short Ckt Testing Thomas Prevost	C57.136 Sound Level Abatement Stephen Antosz
C57.142 Sw Transients CB/Xfmr Jim McBride	C57.149 FRA for Oil Immersed Xfmrs Charles Sweetser
C57.158 Tert & Stabilizing Windings Enrique Betancourt	C57.159 DPV Grid Xfmrs Hem Shertukde
C57.164 Short Ckt Withstand Sanjay Patel	60076-16 Wind Farm Xfmrs Phil Hopskinson
C57.32a (Amend) Neutral Gnd Devices Sergio Panetta	C57.32.10 (Entity) HVDC Neutral Devices Hua Zhang

**Power Transformers
Chair - Bill Griesacker**

C57.12.10 Req -Power Xfmrs Gary Hoffman	C57.17 Arc Furnace Xfmrs Robert Ganser
C57.93 Installation Guide (OPEN)	C57.116 Direct Connect GSU Weijun Li
C57.125 Failure Investigations Wally Binder	C57.135 Phase-Shift Xfmrs Raj Ahuja
C57.140 Reconditioning Power Xfmrs Paul Boman	C57.143 Monitoring Guide Michael Spurlock
C57.148 Cont Cabinet Guide Joe Watson	C57.150 Transportation Guide Greg Anderson
C57.153 Paralleling Guide (OPEN)	C57.156 Tank Rupture Guide Peter Zhao
C57.157 Functional Life Tests - Switch Contacts Phil Hopkinson	C57.170 Xfmr Condition Assessment Kumar Mani
60214-1-57-131 Gen Requirements Tap Changers Craig Colopy	60214-2 Application Guide Tap Changers Craig Colopy
60076-57-1202 Requirements - Phase Shifters Raj Ahuja	IEEE 638 1E Xfmrs at Nuclear Stations Craig Swinderman
C57.93a (Amend) Cold Start - Esters Wei Yao	

**Standards
Chair - Jerry Murphy**

57.12.00
Cont Revision
Steve Snyder

C57.12.90
Cont Revision
Stephen Antosz

C57.12.70
Terminal Markings
& Connections
Jason Varnel

C57.12.80
Terminology
James Graham

C57.144
Metric Conversion
(OPEN)

C57.152
Field Testing Guide
Marcos Ferreira

C57.163
Xfmrs GMD Guide
Daniel Blaydon

TF IEEE-IEC
Cross-References
Vinay Mehrota

**Meeting Planning
Chair - Tammy Behrens**

Jennifer Quandrel
Planning Asst
(Contractor)

Educational
Development
Thomas Prevost

RFID
Kris Zibert

Break Refreshments
Ed Smith

Web Site
Development
Sue McNelly
Kris Zibert

Committee History
Peter Balma

**Administrative
Chair – Bruce Forsyth**

IEEE Standards Association Governance Meetings Schedule

2021

JANUARY	JULY	January	February	March
21-22: BOG meeting, (Osaka or Tokyo) Japan		S M T W TH F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	S M T W TH F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28	S M T W TH F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
26: NesCom/RevCom teleconferences	AUGUST			
FEBRUARY	SEPTEMBER	April	May	June
17-22: IEEE BOD series, Henderson, NV, USA		S M T W TH F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	S M T W TH F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	S M T W TH F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
MARCH	21-23: SASB series, TBD	July	August	September
23-25: SASB series, virtual meetings only	29-30: CAG meeting, (Silicon Valley, CA or Austin, TX) USA	S M T W TH F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	S M T W TH F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	S M T W TH F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
APRIL	OCTOBER	October	November	December
21-22: CAG meeting, (Munich or Frankfurt) Germany	22: NesCom/RevCom teleconferences	S M T W TH F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	S M T W TH F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	S M T W TH F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
28: NesCom/RevCom teleconferences	NOVEMBER			
MAY	17-22: IEEE BOD series, Washington, DC, USA			
05-06: BOG meeting, (Paris) France or (Brussels) Belgium	DECEMBER			
JUNE	01-02: CAG meeting, Piscataway, NJ, USA			
15: NesCom/RevCom teleconferences	03-04: BOG meeting, Piscataway, NJ, USA			
16: SASB teleconference	05: IEEE SA Awards Ceremony, New Brunswick, NJ, USA			
23-28: IEEE BOD series, Toronto, ON, Canada	06-08: SASB series, Piscataway, NJ, USA			

NesCom/RevCom Submittal

Deadlines:

- 11 December 2020
- 12 February 2021
- 18 March 2021
- 06 May 2021
- 13 August 2021
- 10 September 2021
- 18 October 2021

APPENDIX 3

CIGRE Liaison Report



CIGRÉ

International Council on Large Electric Systems

Liaison Report on SCA2 Transformers for
IEEE Transformers Committee-

Fall 2020 Meeting

October 19, 2020

Prepared by Craig Swinderman

Study Committees

SC A1: Rotating Electrical Machines

SC A2: Transformers

SC A3: High Voltage Equipment

SC B1: Insulated Cables

SC B2: Overhead Lines

SC B3: Substations

SC B4: HVDC and Power Electronics

SC B5: Protection and Automation

SC C1: System Development and Economics

SC C2: System Operation and Control

SC C3: System Environmental Performance

SC C4: System Technical Performance

SC C5: Electricity Markets and Regulation

SC C6: Distribution Systems and Dispersed Generation

SC D1: Materials and Emerging Test Techniques

SC D2: Information Systems and Telecommunication

Recent Publications

- **Brochure 783: DGA Monitoring Systems**
 - From Joint Working Group D1/A2-47
 - Brochure published November 2019

SC A2 WG Activities

No.	Working Group	Topic	Status
1	A2.45	Transformer Failure Investigation	Active
2	A2/D1.51	PD Measurements	Active
3	A2/C4.52	HF Transformer and Reactor Models	Active
4	A2.53	FRA Interpretation	Active
5	A2.54	Audible Sound Requirements	Active
6	A2.55	Transformer Life Extension	Active
7	A2.56	Transformer Efficiency	Active
8	A2.57	Effects of DC Bias	Active
9	A2.58	Site Installation and Pre-commissioning of Power Transformers and Shunt Reactors	Active

SC A2 WG Activities

No.	Working Group	Topic	Status
10	A2.59	On-site assembly, On-site Rebuild, and On-site Testing of Power Transformers	Active
11	A2.60	Dynamic Thermal Performance of Power Transformers	Active
12	A2.61	Best Practices for On-Load Tap Changers (OLTC)	Active
13	A2.62	Analysis of AC Transformer Reliability	Active
14	A2.63	Transformer Impulse Testing	Active
15	A2.64	Condition of Cellulose Insulation in Oil Immersed Transformers After Factory Acceptance Tests	Active

TF and AG activities

- Task Force (TF) Activities
 - Insulation Condition at End of Life: reference paper
 - Published in August 2020
- Advisory Group (AG) Activities
 - Green Book A2.6: Transformer Procurement Process
 - Developed for Users of Power Transformers
 - Specification Development
 - Factory Qualification
 - Design Review
 - Transportation
 - Site Installation
 - Publication by 2021

Upcoming New Working Groups

- **D1/A2-77: Liquid Tests for Electrical Equipment**
 - Completion February 2023
 - WG approved 3/24/2020.

If interested in contributing, please contact your appropriate CIGRÉ National Committee Representative.

Upcoming Events

- **CIGRÉ US Committee 2020 Grid of the Future**
 - Providence, RI, November 1-4, 2020
 - Hosted by National Grid
- **CIGRÉ A2/B3 Study Committee Colloquium**
 - Ljubljana, Slovenia, June 1-4, 2021
 - Paper synopsis due by October 16, 2020
 - Full papers submission by February 26, 2021
- **CIGRÉ Centennial Session 2021**
 - Paris, France, August, 2021



IEEE Liaison Report



THANK YOU!

APPENDIX 4

IEC TC14 Liaison Report

**U.S. National Committee of the International Electro technical Commission,
A Committee of the American National Standards Institute
Technical Advisory Group for IEC TC 14**

TAG Administrator:
National Electrical Manufacturers Association
1300 North 17th Street, Suite 900, Rosslyn, VA 22209
Tel: 703-841-3227

PLACE OF MEETING: Virtual;

DATE AND TIME: Session 5, Tuesday Oct. 20, 2020 from 10:50 am-12:05 pm CST

PRESIDING OFFICER: P. Hopkinson, Technical Advisor

SECRETARY: Paul Orr, NEMA

1 Call to Order (Hopkinson)

Call to order, review meeting guidelines, and record attendance. Introductions and welcoming remarks.

2 Approval of the Agenda (Hopkinson)

Review and approve the agenda. Members are requested to submit proposals for new business. No new business requested. Agenda approved as submitted.

3 Approval of Previous Minutes

The minutes of the October 30, 2019 meeting are submitted for approval. No comments were made on the minutes and they were approved as submitted.



Minutes-ustag-tc14
-10-30-2019.docx

4 USTAG TC14 MEMBERSHIP

The USTAG TC14 roster (members and guests) was circulated for attendance. The ANSI dues paying members are listed below. Please inform the secretary if you believe you are a voting member and your name is not included.



Membership USTAG
TC14 March 2019.doc

5 Review of IEC TC14 Activities

IEC TC14 Chair, Christoph Ploetner, and USTAG TC 14 Chair, Phil Hopkinson, are invited to report on the activities of IEC TC14.

Mr. Ploetner noted that the last meeting was Sept 2019 in Paris. TAG is Maintaining 40 documents and has 261 registered experts.

Kevin Rapp spoke about IEC TR 60076-26 which was published March 2020. Chris Ploetner noted that IEC 60076-24 Voltage Regulating Distribution Transformers was Published July 2020.

Highlights of Major revisions in progress

- **IEC 60076-1 General**
 - First CD expected in 2021
- **IEC 60076-2 Temperature rise**
 - 3rd meeting held in January 2020. Document on hold to see what is going on with IEC 60076-1. This IEC 60076-2 document will deal with testing.
- **IEC 60076-4 Guide to LI and SI testing**
 - CD published – closing date for comments 2020, Dec 12th It was noted that the changes are not too significant. Mostly updated the document to included digital test equipment.
- **IEC 60076-5 Ability to withstand short circuit**
 - Major revision – 12 meetings held so far. Stuck on mock-up test. Dealing with the annexes.
 - First CD expected 2021. Next Virtual meeting December 2020.
- **IEC 60076-6 Reactors**
 - First CD expected 2021. Not a major re including dielectrics testing.

Highlights of New Documents in Development

- **IEC 60076-25 Neutral Grounding Resistors**
 - Preparation of 2nd CD ongoing – circulation end 2020
- **IEC 60076-22-8 Transformer and Reactor Fittings - Electronic monitoring equipment**
 - CDV published – closing date for comments 2020, Nov 27th
Covers radiators, coolers, fans.

Chris Ploetner then reported on IEC / IEEE Dual Logo Documents:

Available dual logo documents: 6

- IEC/IEEE 60076-16 Wind turbine transformers
- IEC 60076-21 – IEEE Std. C57.15 Step voltage regulators
- IEC/IEEE 60076-57-1202 Phase shifting transformers
- IEC 62032 – IEEE C57.135 Guide for Phase shifting transformers
- IEC/IEEE 60076-57-129 HVDC Transformers
- IEC/IEEE 60214-2 Tap changer application guide

Dual logo documents in development: 1

- IEC/IEEE 63253-5713-8 Service station voltage transformers (SSVT)

Dual logo document in consideration: 1

- IEC/IEEE 60214-1 Tap changer performance requirements
 - Proceed after upcoming revision of C57.131 is completed. Craig Colopy noted the plan is to get document done in the next 2 years.

–

Other comments:

An inquiry was made about -3 the dielectrics document. The response is that there is no plan to update the dielectrics document at this time.



2020-10 IEC TC14
Report for IEEE Ope

6 Working Documents

The attached table shows the documents issued by TC14 since the plenary meeting in September 2018.



2020-10 IEC TC14
Report for IEEE UST/

7 Next IEC TC 14 plenary meeting

TBD no date discussed

8 New Business

No new business was discussed.

9 Schedule Next Meeting

To be held in conjunction with the IEEE Transformer Committee meeting.

10 Adjourn

Meeting was adjourned at 12:05 pm CST

Recorded by
Paul Orr 10-20-20

Reviewed by Counsel

APPENDIX 5

ASTM

No Report - ASTM did not meet

due to COVID-19 Pandemic.

APPENDIX 6

Meeting Planning

Refer to the main body of the meeting minutes, clause 3 for the "meeting minute."

APPENDIX 7

IEEE Staff Update Presentation

IEEE STANDARDS ASSOCIATION - TRANSFORMER COMMITTEE

PE/ TRANSFORMERS ADMINISTRATIVE SUBCOMMITTEE

FALL 2020

MALIA ZAMAN

M.ZAMAN@IEEE.ORG

AGENDA

SA Updates

PAR/Standards Status Update

Policy Updates

Updates – New WG chair support material

Copyright Policy Updates

Draft Sharing

IEEE/IEC Dual Logo Status

IEEE-SA UPDATES – PAR/STANDARDS STATUS

Expiring PARS:

2020 – 5 PARS are expiring

2 PARS are in Comment resolution stage

2 in WG development stage , (3 have submitted PAR extension on Dec. 2 agenda, 1 will be administratively withdrawn.)

2021 - 15 PARS expiring,

15 in WG Development stage

Expiring Standards in 2020

10 Stds. will become inactive, 2 submitted to Dec. 2nd RevCom meeting

2 do not have PARS to revise

Expiring Standards in 2021

7 Stds will become inactive

3 have no Active PARS,

UPDATES – NEW WG CHAIR SUPPORT

- [WG chair fundamental presentations available](#) -Consisting of twelve modules, Standards Working Group Chair Fundamentals explores the intricacies of Working Group leadership and assists new and aspirational Working Group Chairs in navigating the complexities of the standards development process
- **Welcome Kit and Next Steps Kits for new WG chair –**
- Welcome Kit: Once a PAR is approved, package with training material and templates will be sent
- Next steps Kit: Training on SA ballot and Comment resolutions material will be sent
- [IEEE Electronic meeting Guide](#) – Guidance on Teleconference meetings
- **Direct Vote Live** – Online voting mechanism, can create motions ahead of the meeting via a shared link, can provide a report and summary of the votes.
- Demonstrations can be arranged

COPYRIGHT POLICY – SUPPORTING DOCUMENTS

- ❑ **Presentations on IEEE SA COPYRIGHT POLICY FOR PARTICIPANTS IN IEEE STANDARDS ACTIVITIES**
- ❑ Clarifies Contributions
- ❑ When to obtain permissions
- ❑ Clarifies when you need authorization and consent
 - ❑ https://standards.ieee.org/content/dam/ieee-standards/standards/web/documents/other/Copyright_Policy_for_Participants.pdf
- ❑ **Updated FAQs, they are divided up into three separate sections:**
- ❑ Copyright FAQs for Participants
- ❑ Copyright FAQs for Working Group and Activity Chairs
- ❑ FAQs on Requesting Permission for Use of Material from Approved IEEE Standards
 - ❑ <https://standards.ieee.org/faqs/copyrights/index.html>.

DRAFT SHARING POLICY – STILL IN DEVELOPMENT

- Draft Sharing between IEEE SA Working Groups within an IEEE Standards Committee - with Standards Committee blanket approval
- Draft Sharing for IEEE SA Working Groups without blanket approval or between IEEE Standards Committees
- Draft Sharing with Organizations External to IEEE
- IEEE SA Standards Board Operations Manual -*
<https://standards.ieee.org/about/policies/opman/sect6.html>

IEEE/IEC DUAL LOGO UPDATE (ACTIVE PROJECTS)

Joint Development of standards with IEC

Published Standards

- IEC/IEEE 65700-19-03:2014, Standard Requirements, Terminology, and Test Code for Bushings for DC Applications Rated 110 kV BIL and Above
- Revision work discussed. No PAR submitted yet, IEC has issued questionnaire
- IEC/IEEE 60076-57-1202:2016, Standard Requirements for Liquid Immersed Phase-Shifting Transformers
- IEC/IEEE 60076-57-129:2017, Converter Transformers for HVDC Applications
- IEC/IEEE 60076-16-2018, Standard Requirements for Wind Turbine Generator Transformers
- IEEE PC57.15/IEC 60076-21, Guide for the Application, Specification and Testing of Phase-Shifting Transformers

Standards Under Development

- IEC/IEEE **P63253-5713-8**, Standard Requirements for Station Service Voltage Transformers
- PAR expires 2021, Draft development stage
- 60214-1-57-131**, Standard Requirements for Tap Changers
- PAR was for an adoption of an IEC standard, this PAR will be administratively withdrawn Dec. 2020
- PC57.131 WG will do a revision without IEC
- Staff is discussing with WG Chair potential copyright permission request

IEEE/IEC DUAL LOGO UPDATE (ACTIVE PROJECTS)

This report is an update on the activities taking place under the IEC/IEEE Dual Logo Agreement

- *IEC Adoption of IEEE Transformer Committee Standards under the IEC/IEEE Dual Logo Agreement*
- IEEE C57.15™-2009 (IEC 60076-16:2011-12) – Guide for the Application, Specification and Testing of Phase-Shifting Transformers
- IEEE C57.135™-2011 (IEC 62032 Ed.2:2012-06) – Guide for the Application, Specification and Testing of Phase-Shifting Transformers

APPENDIX 8

Treasurer's Report

MEMORANDUM

October 12, 2020

To: Bruce Forsyth, Chair
IEEE PES Transformers Committee

RE: IEEE PES Transformers Committee Treasurer's Report
Fall 2020 Meeting (for reporting period 02/01/2020 to
08/31/2020) with a separate Revenue / Expense Report

Dear Bruce,

The finances of the Committee are in good condition. As of September 1st (end of this reporting period), the balance in our account was \$91,212.16.

FYI: August 31st was essentially a "snap-shot in time" after all income & expenses were resolved from the cancelled Spring 2020 Meeting, and before we started spending significant funds for the Fall 2020 virtual meeting.

We initially estimated a \$21,000 loss for the Spring 2020 meeting expenses after the cancellation which is corrected to about a \$5,000 loss. All meeting registrants received refunds and our account was credited for all credit card usage fees. Prompt actions by participating members allowed cancellation of meeting services which reduced the amount of the outlaid of expenses.

- 2019 Audit was completed with satisfactory results with two resolved findings and four recommendations.
- The Kansas City Hotel for the Fall 2020 meeting agreed to cancel the contract with no penalty fees.
- Troy Tanaka has agreed to become the Assistant Treasurer with the potential to take over the Treasurer's position following the Spring 2021 Meeting.

See attached summary of the balance of this reporting period, and the previous periods. Let me know if you have any questions or concerns.

Sincerely,



Paul E. Boman, Treasurer
IEEE PES Transformers Committee

IEEE PES TRANSFORMERS COMMITTEE
Treasurer's Report - Fall 2020
(for reporting period 02/01/2020 to 08/31/2020)

AAAAA	Balance before Fall 2018 Meeting, as of 09/10/2018	\$87,143.80
AAAA	Balance before Spring 2019 Meeting, as of 01/31/2019	\$95,326.42
AAA	Balance before Fall 2019 Meeting, as of 09/01/2019	\$93,611.60
AA	Balance before Spring 2020 Meeting, as of 01/31/2020	\$119,318.89
	 <u>Misc Income, not related to a specific meeting</u>	
B.1	interest, approx 6 months	\$385.07
B.2	misc income; shirt sales, CD-ROM sales, book sales, etc.	\$0.00
B	<hr/> Total Misc Income, not meeting related	<hr/> \$385.07
	 <u>Misc Expenses, not related to a specific meeting</u>	
c.1	subscription fees, 123Signup, Authorized Net, Paypal	(\$353.40)
c.2	awards	(\$188.91)
c.3	equipment purchases; projectors & cases, etc.	\$0.00
c.4	technology; RFID tech, meeting app, WiFi equip, printers & ink, cables, etc	(\$270.59)
c.5	conferences, PES GM, remote meetings, etc.	(\$100.00)
c.6	other misc. expenses; shirts, audit, books, office supplies, name badges, etc.	(\$3,246.78)
c.7	memorial	\$0.00
C	<hr/> Total Misc. Expenses, not meeting related	<hr/> (\$4,159.68)
	 <u>Fall 2019 Meeting</u>	
d.1	late income, meeting registrations (rolling reserve paybacks)	\$0.00
d.2	misc late income (incentives, late sponsor contributions, etc.)	\$0.00
d.3	late meeting expenses	(\$862.00)
D	<hr/> Total Late Income/(expenses), Fall 2019 Meeting	<hr/> (\$862.00)
	reported prelim. gain/(loss), as of 01/31/2020, from previous Treasurer's Report	\$20,073.18
	Actual Gain/(Loss), Fall 2019 Meeting	\$19,211.18
	 <u>Spring 2020 Meeting</u>	
e.1	income, meeting registrations	\$180.12
e.2	income, coffee break sponsors	\$0.00
e.3	meeting expenses	(\$4,010.75)
E	<hr/> Income minus expenses (between 02/01/2020 and 08/31/2020)	<hr/> (\$3,830.63)
	meeting income (expenses), before 02/01/2020	(\$1,098.47)
	<u>Preliminary Gain/(Loss), Spring 2020 Meeting</u>	(\$4,929.10)
	 <u>Expenses, Future Meetings (deposits paid, etc)</u>	
FF	future meeting income (expenses), paid 09/01/2019 to 01/31/2020	\$0.00
FFF	future meeting income (expenses), paid 02/01/2020 to 08/31/2020	\$4,368.82
G	Net Income (loss), between Fall 2019 and Spring 2020 meetings (B+C+D+E)	(\$8,467.24)
A	Balance before Spring 2020 Meeting , as of 01/31/2020 [(AA + FF) + G]	\$110,851.65

IEEE PES Transformers Meeting Related Rev / Exp Detail (U-General, S-Spring Meeting, F-Fall meeting)

Sum of Credit/(Debit)		Meeting									
Category	Subcategory	21S	20U	20S	20F	19U	19S	19F	18U	18S	18F
1.2	Corporate	\$5,000.00					\$7,500.00	\$7,500.00		\$7,500.00	\$4,975.00
1.2	Total	\$5,000.00					\$7,500.00	\$7,500.00		\$7,500.00	\$4,975.00
2.1	Commission Meeting			\$10.75			\$3,551.74	\$2,896.09		\$2,734.36	\$6,436.00
2.1	Total			\$10.75			\$258,055.05	\$238,335.85		\$245,408.96	\$202,570.32
3.4	Interest		\$829.89			\$2,097.59			\$1,404.00		
3.4	Total		\$829.89			\$2,097.59			\$1,404.00		
4.1	Meeting Other Shipping Social Venue 123Signup RFID Award			(\$567.66)			(\$237,177.49)	(\$186,025.19)	(\$732.36)	(\$179,120.75)	(\$153,333.36)
4.1	Total			(\$567.66)			(\$237,177.49)	(\$186,025.19)	(\$732.36)	(\$179,120.75)	(\$153,333.36)
4.9	Other PES Audit			(\$541.56)	(\$631.18)		(\$1,199.65)	(\$858.52)		(\$63.74)	(\$883.31)
4.9	Total			(\$541.56)	(\$631.18)		(\$1,199.65)	(\$858.52)		(\$63.74)	(\$883.31)
5.3	Contractor			(\$500.00)			(\$64,833.01)	(\$25,839.53)		(\$20,857.40)	(\$41,837.00)
5.3	Total			(\$500.00)			(\$64,833.01)	(\$25,839.53)		(\$20,857.40)	(\$41,837.00)
7	Other						(\$543.84)			(\$297.60)	
7	Total						(\$543.84)			(\$297.60)	
Grand Total		\$5,000.00	(\$384.94)	(\$5,287.38)	(\$631.18)	(\$7,721.86)	(\$48,404.22)	\$22,648.83	(\$11,437.00)	\$39,263.60	\$2,173.61

Values are reported as YTD so current and future meeting revenue and expenses are reported as of the reporting date

Categories based on IEEE statement of accounts

1.2 Corporation are donations mainly for meeting breaks, corporate donors requested break sponsorship funds be reassigned from S20 to S21.

2.1 Commission Revenue, A/V and F/B are typically be rolled into the 4.1 Meeting Expense based on hotel invoice

2.1 Meeting Revenue from attendees, registration fees for F20 not included in this report.

4.1 Meeting expenses including credit card company fees from registration

4.1 Other includes 16F includes shirt expenses

4.1 Venue includes site visits to evaluate properties

4.9 Audit charges from previous year invoiced and paid during current year

4.9 PES for AdComm Officer PES meeting attendance

7.0 Asset is revenue for sold equipment or reimbursed by hotel, Other for rev/exp not otherwise assigned.

APPENDIX 9

May 2020 Virtual ADCOM Meeting Minutes

IEEE/PES TRANSFORMERS COMMITTEE

Fall 2020 Meeting; Webex Virtual Meeting

Administrative Subcommittee Minutes

Tuesday, October 13, 2020
1:00 PM – 4:00 PM (UTC -6)

Chair: Bruce Forsyth **Vice Chair:** Ed teNyenhuis **Secretary:** David Wallach
Treasurer: Paul Boman **Awards Chair/Past Chair:** Sue McNelly **Standards Coordinator:** Jim Graham

9. ADMINISTRATIVE SUBCOMMITTEE – BRUCE FORSYTH

9.1 Introduction of Members and Guests

The Chair called the meeting to order and attendees were recognized by their identification in the Webex attendee list. Introductions were made of guests.

Members and Guests Present:

Chair.....	Bruce Forsyth
Vice-Chair.....	Ed teNyenhuis
Secretary	David Wallach
Treasurer	Paul Boman
Standards Coordinator	Jim Graham
Awards/Past Chair	Sue McNelly
Bushings	Eric Weatherbee
Dielectric Tests	Ajith Varghese
Distribution Transformers	Ed Smith
Dry Type Transformers	Casey Ballard
HVDC Converter Transformers & Reactors.....	Ulf Radbrandt
Instrument Transformers.....	Thomas Sizemore
Insulating Fluids	Scott Reed
Insulation Life	Sheldon Kennedy
Performance Characteristics	Rogério Verdolin
Power Transformers	Bill Griesacker
Standards.....	Jerry Murphy
Underground Transformers & Network Protectors	George Payerle
Meetings.....	Tammy Behrens
Guests: Malia Zaman, Steve Shull	

9.2 Approval of Previous Meeting Minutes

The Fall 2020 minutes were approved at the May 2020 ADCOM meeting. The May 2020 ADCOM meeting minutes were approved by email ballot, so no meeting minute approvals were necessary at this meeting.

9.3 Additions to and/or Approval of the Agenda

The Chair noted item 1.2 revised to include prior minutes are approved. There were no objections to the revised agenda, therefore the below agenda was approved.

Approved Agenda:

1.	Administrative Topics	1:00
1.1.	Introduction of Members and Guests (:10)	All
1.2.	Review of status of meeting minutes Fall 2019 and Spring 2020 (:03)	Bruce Forsyth
1.3.	Approval of the Agenda (:02)	Bruce Forsyth
2.	Officer Reports	1:15
2.1.	Chair’s Report (:15)	Bruce Forsyth
2.2.	Vice Chair’s Report (:05).....	Ed teNyenhuis
2.3.	Secretary’s Report & New Committee Membership Approval (:15).....	David Wallach
2.4.	Treasurer’s Report (:05).....	Paul Boman
2.5.	Recognition & Awards Report (:05)	Sue McNelly
2.6.	Standards Report (:15).....	Jim Graham
3.	IEEE Report	2:15
3.1.	IEEE Staff Update (:10)	Malia Zaman
4.	Meeting Planning Report	2:25
4.1.	Meeting Planning Report (:10).....	Tammy Behrens
4.2.	F20 Meeting Format Discussion (:25).....	Tammy Behrens
5.	Subcommittee Reports	3:00
5.1.	Bushings (:03)	Eric Weatherbee
5.2.	Dielectric Test (:03)	Ajith Varghese
5.3.	Distribution Transformers (:03)	Ed Smith
5.4.	Dry Type Transformers (:03)	Casey Ballard
5.5.	HVDC (:03).....	Ulf Radbrandt
5.6.	Instrument Transformers (:03)	Thomas Sizemore
5.7.	Insulating Fluids (:03)	Scott Reed
5.8.	Insulation Life (:03)	Sheldon Kennedy
5.9.	Performance Characteristics (:03).....	Rogério Verdolin
5.10.	Power Transformers (:03)	Bill Griesacker
5.11.	Standards (:03)	Jerry Murphy
5.12.	Subsurface Transformers & Network Protectors (:03).....	George Payerle
6.	Old Business	3:36
6.1.	Copyright Compliance Update (:14)	Ed teNyenhuis
7.	New Business (:05)	3:50
8.	Wrap Up & Adjournment	3:55
8.1.	Wrap Up (:05)	Bruce Forsyth
8.2.	Adjourn	

9.4 Chair’s Report – Bruce Forsyth

Refer to Section 4.0 of the Main Minutes for a complete “Chair’s Report.”

9.5 Vice Chair's Report – Ed teNyenhuis

Refer to Section 5.0 of the Main Minutes for a complete “Vice Chair's Report.”

9.6 Secretary's Report – David Wallach

Refer to Section 6.0 of the Main Minutes for a complete “Secretary's Report.”

9.7 Treasurer's Report – Paul Boman

Refer to Section 7.0 of the Main Minutes for a complete “Treasurer's Report.”

9.8 Recognition & Awards Report – Susan McNelly

Refer to Section 8.0 of the Main Minutes for a complete “Recognition & Award's Report.”

9.9 Standards Report and New PAR Requests – Jim Graham

Refer to Section 10.0 of the Main Minutes for a complete “Standards Report.”

9.10 IEEE Staff Update – Malia Zaman

Refer to **Appendix 7** of the Main Minutes for the full PowerPoint presentation.

9.11 Meeting Planning Report – Tammy Behrens

9.11.1 We will hold Toronto hotel reservation link sharing on the website until late in 2020 to check the status of a Spring 2021 meeting.

9.11.2 F20 Meeting Format Discussion: We have training scheduled this week and those links have gone out. PSAV will run the meeting logistics. Tammy ran through a PowerPoint with PSAV screens. We will get attendance reports but PSAV will not establish quorum. Quorum could be established by displaying members on the screen and using the chat feature or a hand raise to check quorum. PSAV will record the meetings for the use of minutes only but will be deleted. We need to notify attendees the meetings will be recorded.

9.12 Subcommittee Reports/Hot Topics

Brief reports were received from all the subcommittee chairs.

9.12.1 Bushings [Eric Weatherbee]: nothing to add

9.12.2 Dielectric Test [Ajith Varghese]: Continuing previous discussions.

9.12.3 Distribution Transformers [Ed Smith]: One Entity PAR for OLTC will be discussed.

9.12.4 Dry Type Transformers [Casey Ballard]: Two primary documents 12.91 and 12.01 are complete. Four new TFs will be meeting. No updates on the solid-state transformer discussion. Casey has reached out to IEC to gauge their interest.

9.12.5 HVDC Converter Transformers & Reactors [Ulf Radbrandt]: IEEE 12.77 published this year. The SC will discuss presenting 1-2 tutorials. The SC scope may need to be reviewed updated to include converter reactors.

- 9.12.6 Instrument Transformers [Thomas Sizemore]: Continuing ongoing work. C57.13.2 surveyed draft to send to SC. 6245 dual logo work continues with first CD.
- 9.12.7 Insulating Fluids [Scott Reed]: Getting ready to launch four new TF for Guides that will expire in 2024.
- 9.12.8 Insulation Life [Sheldon Kennedy]: Phil McClure has retired and C57.165 is now chaired by Mark Tostrud. C57.12.90 chaired by Bob Thompson has retired and is now chaired by Dinesh Sankarakurup. Sheldon will be stepping down after the Fall 2020 meeting and a new chair will be announced.
- 9.12.9 Performance Characteristics [Rogerio Verdolin]: WG PC57.105 met since May in comment resolution. Updating PAR. Rogerio brought up the AMS email glitch where his email was sent repeatedly. We don't have a solution particularly on the weekends when 123Signup has no weekend support. Sue asked if we are big enough as IEEE to request an after-hours support.
- 9.12.10 Power Transformers [Bill Griesacker]: One new WG will meet. C57.116 will meet this next session. C57.131 is being sorted since it was pulled back from the dual logo process. There is a question about copyright material that may be in the document with dual logo development.
- 9.12.11 Standards [Jerry Murphy]: C57.12.00 and C57.12.90 are ready for ballot. Four other WG are moving along. Jerry Murphy will be stepping down after the Fall 2020 meeting and a new chair will be announced.
- 9.12.12 Subsurface Transformers & Network Protectors [George Payerle]: TF for corrosion is doing some interesting work.

Bruce reinforced the message when the draft schedule is sent out for review that no meetings should be canceled after approval.

9.13 Old Business

- 9.13.1 Copyright Compliance Update: we had training recently. The session was recorded and can be replayed.

9.14 New Business

- 9.14.1 Jim Graham brought up an issue related to the activity leader distribution list. If groups are not active, they should not be on a distribution list. We also need to maintain the myProject roles and let the Standards Coordinator know when changes occur. Jim Graham will send out a document for review next week. Sue asked that SC chairs look at their Website pages for updates. Active and inactive groups need to be updated.

9.15 Adjournment

The meeting was adjourned at 4:55 PM.

Submitted by:

David Wallach,
Secretary, Transformers Committee

October 18, 2020

APPENDIX 10

TF Virtual Fall Meeting Planning Minutes

Minutes

Task Force – Planning for Possible Virtual Fall Meeting

June 10, 2020 (Conference Call)

Meeting # 1

Ed teNyenhuis, June 24, 2020, Rev 0

- The Task Force meet at 16.00 on June 10, 2020 by Teams Call
- The Chair, Ed teNyenhuis, led the meeting.
- The following 7 persons attended:
 - Bruce Forsyth
 - David Wallach
 - Ed Smith
 - Tammy Behrens
 - Jerry Murphy
 - Casey Ballard
 - Ed teNyenhuis
- This was the first meeting
- The purpose was to discuss how a virtual fall meeting might look like and some of the challenges / planning around this
- Tammy Behrens forwarded some good experience from the Switchgear Committee that held a virtual meeting
- It was agreed that doing a partial virtual meeting (some in person, some virtual) was not workable. It should be all in person or all virtual.
- We can use the Webex tool through IEEE
- We could follow the normal 4 day schedule or only do Committee and Subcommittee meetings. The working groups and task forces could meet ahead of time.
- There needs to be a different protocol for larger meetings (need a moderator and maybe different software tool) than for smaller meetings
- There was discussion on whether a registration fee should still be charged.
- Voting could be complicated if a full vote is required. Apparent unanimous votes could be done by asking only the nays or abstentions to type in the chat box.
- We will meet again on June 24, 2020 at 16.00
- Meeting was adjourned at 17.00

Minutes

Task Force – Planning for Possible Virtual Fall Meeting June 24, 2020 (Conference Call) Meeting # 2

Ed teNyenhuis, June 24, 2020, Rev 0

- The Task Force meet at 16.00 on June 24, 2020 by Teams Call
- The Chair, Ed teNyenhuis, led the meeting.
- The following 7 persons attended:
 - Bruce Forsyth
 - David Wallach
 - Ed Smith
 - Tammy Behrens
 - Jerry Murphy
 - Casey Ballard
 - Ed teNyenhuis
- It was agreed that we should keep the format of a virtual meeting as the same 4 day schedule. This would ensure all groups meet and we keep a familiar structure in place.
- It was agreed to have the meeting around Central Time Zone (same as the planned Fall meeting). It was noted that those from overseas would have some inconvenience in attending all sessions due to the time difference.
- It was agreed to charge a registration for the meeting. The amount should be the normal charge or somewhat reduced.
- It was agreed to use the Webex tool for the meeting. ACTION - Ed will check how many concurrent Webex meetings we can have at the same time (we need 6 for our meeting).
- Voting was discussed. Unanimous type votes can be done by asking only the nays or abstentions to type in the chat box. Full real time voting will require a different tool like Slido or MS Forms. ACTION – Ed and Bruce will check if MS Forms would work for voting (it is no cost if you have Office).
- Registration for the meetings – Other meetings give the participant a code when they pay and then they register for each individual session. We do need to investigate this further.
- We should tell the WG/TF leaders ahead of time that they need to be ready to run a virtual meeting and maybe enlist someone to moderate the virtual meeting.
- We will meet again on July 8, 2020 at 16.00
- Meeting was adjourned at 17.05

Minutes

Task Force – Planning for Possible Virtual Fall Meeting

July 8, 2020 (Conference Call)

Meeting # 3

Ed teNyenhuis, July 8, Rev 0

- The Task Force meet at 16.00 on July 8, 2020 by Teams Call
- The Chair, Ed teNyenhuis, led the meeting.
- The following 8 persons attended:
 - Bruce Forsyth
 - David Wallach
 - Ed Smith
 - Tammy Behrens
 - Jerry Murphy
 - Casey Ballard
 - Jennifer Quandel
 - Ed teNyenhuis
- Voting during virtual meetings was discussed. Using MS Forms would be too cumbersome for a meeting. Jerry Murphy commented that meetings he has attended used Polling in Webex and had Motions 1 – 7 prepared before the meeting. If a vote was required it was given a Motion #. These Motions were used as required and the voting could be saved. Meeting attendance could also be saved in Webex. It was agreed that this was the way to do our meetings. Action - Bruce will check into this for Webex.
- Between meetings, David suggested that we have 6 meeting rooms set up for the normal time slots. Participants can register through AMS, and then get an email with instructions on how to attend any WG/TF meeting by calling into one of the 6 rooms. This is a nice simple way to keep our normal schedule and avoid registrations for each WG meeting. It was agreed that this was the way to do our Fall meeting.
- Moderators for the virtual meeting – It was discussed if volunteers could be found to moderate each of the 6 rooms. It was preferred if we could have moderators in order to reduce the work for the WG leader and minimize technical delays. Tammy suggested that the hotel could provide this service. Jennifer said that she could find a company that specialized in virtual meetings that could arrange all this as well. ACTION – Jennifer will introduce this vendor to Ed for discussion.
- Quorum – it was agreed that we needed to continue with quorum rules for our meetings. WG leaders will have to be prepared for this and in the worst case do votes after the meeting by electronic polling.
- We will meet again on July 22, 2020 at 16.30
- Meeting was adjourned at 16.50

Minutes

Task Force – Planning for Possible Virtual Fall Meeting July 22, 2020 (Conference Call) Meeting # 4

Ed teNyenhuis, July 22, Rev 0

- The Task Force meet at 16.30 on July 22, 2020 by Teams Call
- The Chair, Ed teNyenhuis, led the meeting.
- The following 8 persons attended:
 - Bruce Forsyth
 - Ed Smith
 - Tammy Behrens
 - Jerry Murphy
 - Casey Ballard
 - Jennifer Quandel
 - Ed teNyenhuis
- It was announced that the Officers decided to cancel the in person Fall meeting and that the virtual meeting was now to be done instead. Our contingency planning was well worth the effort.
- The Chair brought an update on 3 vendors that were met with that could offer to host our virtual meeting. All were technically able to provide what we needed and handle voting, attendance, control of registered attendees etc. Two vendors offered budgetary pricing. It was agreed again that we should use a vendor to host our meeting and that this could be absorbed by the registration fees. It was agreed that \$40k would be upper limit for a budget. It was agreed to try and select a vendor by mid-august. We will go back to the vendors with a draft schedule to allow them to better estimate a price and hopefully select a vendor at our next meeting.
- Jerry will prepare a draft schedule. It was agreed to remove the standards lunch, awards lunch (but make this an on demand taped presentation) and reduce the breaks to 10 minutes reduce the lunch break.
- It was agreed that we would firm up the registration fee by the end of August. It is expected to be in the \$150 range.
- It was agreed to update the website about the virtual meeting at the end of August.
- We will meet again on Aug 5, 2020 at 16.00
- Meeting was adjourned at 17.15

Minutes

Task Force – Planning for Virtual Fall Meeting

Aug 5, 2020 (Conference Call)

Meeting # 5

Ed teNyenhuis, Aug 5, 2020, Rev 0

- The Task Force met at 16.00 on Aug 5, 2020 by Teams Call
- The Chair, Ed teNyenhuis, led the meeting.
- The following 8 persons attended:
 - Bruce Forsyth
 - Ed Smith
 - Tammy Behrens
 - Jerry Murphy
 - Casey Ballard
 - Jennifer Quandel
 - David Wallach
 - Ed teNyenhuis
- There were 4 vendors met with to discuss offering technical support for the virtual meeting. Below is pricing that has been received from 3 vendors: Altour = \$44k, Vario = \$52k, PSAV = \$46k. All 3 vendors demonstrated capability to provide the meeting content and support we require. IEEE MCS is also seeing if they could offer this service. It was agreed that Tammy, Jennifer and Ed would meet to decide which vendor to best select. This would be presented to this group for approval. The Officers would also be notified for approval.
- It was agreed that an upper end cost of \$52k could be covered by the registration fees and that this was necessary to operate the meeting in a professional manner. Ed will check with Paul for the 123signup cost for registration so that the total expected costs for the meeting can be confirmed. It is anticipated that 400 attendees should allow a breakeven.
- The draft schedule was reviewed. It was agreed to reduce the meeting lengths to 45 minutes so that each day could finish by 5pm. The Newcomers Orientation and WG Officer Training would be recorded ahead of time for viewing on demand (to free up schedule time and allow 8am start time). The Planning SC will meet at another time. Jerry will revise the schedule accordingly and later send to the SC chairs for input.
- It was agreed to set the registration fees at \$100 for life members, \$130 for members and \$150 for non members. There will not be any cancellation refund and there will be a \$50 late fee adder.
- We will meet again on Aug 19, 2020 at 16.00
- Meeting was adjourned at 16.45.

Minutes

Task Force – Planning for Virtual Fall Meeting

Aug 19, 2020 (Conference Call)

Meeting # 6

Ed teNyenhuis, Aug 19, 2020, Rev 0

- The Task Force met at 16.00 on Aug 19, 2020 by Teams Call
- The Chair, Ed teNyenhuis, led the meeting.
- The following 8 persons attended:
 - Bruce Forsyth
 - Ed Smith
 - Tammy Behrens
 - Jerry Murphy
 - Casey Ballard
 - Jennifer Quandel
 - David Wallach
 - Ed teNyenhuis
- Tammy, Jennifer and Ed recommended that PSAV be selected as the vendor for the virtual platform for our fall meeting. The price is \$38k. David Wallach made a motion to proceed with PSAV (seconded by Casey Ballard) and this was unanimously approved. The officers will meet on Aug 20 to approve this vendor and Bruce will advise if ADCOM needs to approve as well.
- Tammy noted that the 123signup cost for registration is 3% so this does not require any change to our earlier registration cost calculations.
- The schedule updated by Jerry was reviewed. It will need to be soon confirmed if the awards luncheon and standards lunch are to be recorded ahead of time (Bruce to confirm). Jerry will now send to the SC chairs for input.
- Registration is set to open in September. It was agreed that there is no need for an early bird discount (we have a late fee instead).
- Ed Smith commented that the break sponsors have agreed to postpone this to the next in person meeting.
- We will meet again on Sept 2, 2020 at 16.00
- Meeting was adjourned at 16.30.

Minutes

Task Force – Planning for Virtual Fall Meeting

Sept 2, 2020 (Conference Call)

Meeting # 7

Ed teNyenhuis, Sept 2, 2020, Rev 0

- The Task Force met at 16.00 on Sept 2, 2020 by Teams Call
- The Chair, Ed teNyenhuis, led the meeting.
- The following 8 persons attended:
 - Bruce Forsyth
 - Ed Smith
 - Tammy Behrens
 - Jerry Murphy
 - Casey Ballard
 - Jennifer Quandel
 - David Wallach
 - Ed teNyenhuis
- PSAV contract will be signed shortly. Tammy is waiting for IEEE IT to review PSAV responses to an IEEE form. PSAV will setup a kickoff call on Sept 9 with Tammy and Ed.
- The schedule will be sent to the SC chairs for review by Jerry. Ed to ask Sue and Jim Graham if they are decided that their sessions are prerecorded.
- Registration is set to open in September. Tammy will send out an update email when the registration opens. It was agreed to not do newcomers reduced registration cost for this meeting.
- We will meet again on Sept 16, 2020 at 16.00
- Meeting was adjourned at 16.28.

Minutes

Task Force – Planning for Virtual Fall Meeting

Sept 16, 2020 (Conference Call)

Meeting # 8

Ed teNyenhuis, Sept 16, 2020, Rev 0

- The Task Force met at 16.00 on Sept 16, 2020 by Teams Call
- The Chair, Ed teNyenhuis, led the meeting.
- The following 7 persons attended:
 - Bruce Forsyth
 - Ed Smith
 - Tammy Behrens
 - Jerry Murphy
 - Casey Ballard
 - David Wallach
 - Ed teNyenhuis
- PSAV contract has been signed. Tammy and Ed have had a kickoff meeting with them. It is intended that there will be separate rehearsal meetings one week prior for the general sessions, tutorials and activity leaders. PSAV has all the resources planned for our meeting.
- The schedule has been revised several times and is in good shape.
- Registration opened and is going well.
- We should plan for copyright training about 2 weeks before the Fall meeting. Ed to plan this.
- We agreed to leave the Roberts Rules training for a later time.
- We agreed to draft an email to the activity leaders so they know what to expect. Ed to draft this. It can be sent 2 weeks before the Fall meeting.
- We will meet again on Sept 30, 2020 at 16.00
- Meeting was adjourned at 16.25.

Minutes

Task Force – Planning for Virtual Fall Meeting

Sept 30, 2020 (Conference Call)

Meeting # 9

Ed teNyenhuis, Sept 30, 2020, Rev 0

- The Task Force met at 16.00 on Sept 30, 2020 by Teams Call
- The Chair, Ed teNyenhuis, led the meeting.
- The following 6 persons attended:
 - Bruce Forsyth
 - Tammy Behrens
 - Jerry Murphy
 - Casey Ballard
 - David Wallach
 - Ed teNyenhuis
- PSAV is working on the platform and is on schedule to be ready for the meeting. We can shortly send out the invitations for the rehearsal meetings (week before).
- Ed will send out a note saying all presentations and recorded sessions to be loaded by PSAV are needed by Oct 12. They should send to Tammy.
- The schedule is fine.
- Registration is ongoing and there are 193 so far.
- Copyright training is planned for Oct 5.
- Email to the activity leaders on what to expect was sent.
- We will meet again on Oct 7, 2020 at 16.00
- Meeting was adjourned at 16.20.

Minutes

Task Force – Planning for Virtual Fall Meeting

Oct 7, 2020 (Conference Call)

Meeting # 10

Ed teNyenhuis, Oct 7, 2020, Rev 0

- The Task Force met at 16.00 on Oct 7, 2020 by Teams Call
- The Chair, Ed teNyenhuis, led the meeting.
- The following 5 persons attended:
 - Bruce Forsyth
 - Tammy Behrens
 - Jerry Murphy
 - David Wallach
 - Ed teNyenhuis
- Tammy showed the draft PSAV platform. This will go live on Oct 12. Everything is on schedule. The chairs will have a different webex login link than the participants which will be explained in the rehearsals.
- Training /rehearsal session invitations will go out later this week.
- The schedule was updated today for some cancelled meetings.
- Registration is at 438.
- We will meet again on Oct 14, 2020 at 16.00
- Meeting was adjourned at 16.16.

Minutes

Task Force – Planning for Virtual Fall Meeting

Oct 14, 2020 (Conference Call)

Meeting # 11

Ed teNyenhuis, Oct 14, 2020, Rev 0

- The Task Force met at 17.00 on Oct 14, 2020 by Teams Call
- The Chair, Ed teNyenhuis, led the meeting.
- The following 6 persons attended:
 - Bruce Forsyth
 - Tammy Behrens
 - Jerry Murphy
 - Ed Smith
 - David Wallach
 - Ed teNyenhuis
- The PSAV platform link was sent to registrants. The rehearsal meetings are planned for later this week. All the resources are in place for the Fall Meeting next week.
- No changes were made to the schedule.
- It was decided to change the General Session meeting from a Live Stream event to a webex meeting since there would be multiple presenters (SC Chairs, Liaison reports etc).
- Registration is at 488.
- Meeting was adjourned at 17.20.
- This will be our last meeting.

ANNEX A Bushings Subcommittee

October 21, 2020, 09:25AM
Virtual Meeting

Chair (presiding officer): Eric Weatherbee, Hubbell Power Systems / PCORE Electric
Vice-Chair: Scott Digby, Duke Energy
Secretary (minutes author): 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 meeting minutes and would be destroyed on 10/30/2020. Chair advised recording this meeting or taking screenshots is NOT permitted.

Chair introduced the Bushing Subcommittee leadership.

Chair presented the attendance requirements for becoming a member as well as how a lack of attendance can result in losing membership or being removed from the guest roster.

Chair advised how the circulation of physical sign-in rosters would be phasing out at the next meeting.

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

Eleven (11) new members were introduced to the SC and added to the roster. The new members were Mr. Tauhid Ansari, Mr. David Calitz, Mr. Paul Dolloff, Mr. Hugo Flores, Mr. Niklas Gustavsson, Mr. Toby Johnson, Mr. Matthew Mollenkopf, Mrs. Poorvi Patel, Mr. Scott Reed, Mr. Stephen Shull, and Mr. Jose Zambro.

A.1.4 Attendance

The Chair presented a list of the 83 current voting members before polling the **137 attendees** (@9:33AM). Poll determined a quorum was unofficially achieved as 49 of 83 total members were present. Results are documented in Table 1. Refer to [Appendix A](#) for meeting participants, their affiliation, and voting member status.

Table 1 – Results of Unofficial 3-minute Poll (9:33AM)

Members	49/137
Guests	58/137
Guests Requesting Membership*	15/137
No Answer	16/137

*Via chat log, one (1) of the fifteen (15) guests requesting membership advised their name. It was Muhammad Ali Masoud. This was Mr. Masoud's first meeting and therefore did not meet the qualifications to become a member.

A.1.5 Agenda Approval

The Chair presented the agenda and asked if there were any objections to approving. With no verbal objections made and no written objections noted in the chat log, F20 agenda was approved.

A.1.6 Previous Meeting's Minutes Approval

The Chair presented the F19 minutes, which were also posted on the IEEE Transformer website, and asked if there were any objections to approving those minutes. With no verbal objections made and no written objections noted in the chat log, the F19 meeting minutes were approved.

A.1.7 Status of Bushing Standards

The Chair presented the Standards Status Report for bushings, see [Appendix B](#).

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 and WG leadership has advised they are progressing at a rate that will not require an extension filed.

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

No meeting held as the latest revision was published July 2018 and is not due for revision again until the end of 2027.

Dr. Zhang stated a survey will be sent out after this F20 meeting and before the next meeting to see if there is justification to reserve a meeting timeslot at the Spring 2021 conference.

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

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

See complete WG minutes in [Appendix E](#) of this report.

WG represented by Mr. Del Rio, Secretary. IEC agrees with proceeding with the revision of this document, noting a PAR/POR is needed and the title and scope must match on both the IEC & IEEE side.

Request was made for volunteers/nomination for a Vice-Chair from the IEEE side. No volunteers came forward at the WG meeting nor at the Bushings SC meeting.

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.

Chair explained work is progressing well and his plan is to have the updated revision ready to go out for ballot by the end of 2021. 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 (new)

See complete WG minutes in [Appendix G](#) of this report.

Chair requested volunteers/nominations for Vice-Chair and Secretary. Christopher Whitten was nominated and accepted the position of Secretary at the end of this meeting.

Due to confusion on the scope and purpose of this TF, a clarification was made by the Bushings SC leadership. This TF was established at the F19 Bushings SC meeting after a motion by Kumar Mani was made and seconded. To clarify, the scope of this TF is to review existing IEEE bushing standards and guides for content that may need to be added or revised to accommodate Dry Bushing classification and performance. The TF will report their findings with recommendations to the Subcommittee. At the F19 meeting, the general consensus was “dry bushings” were not sufficiently defined, classified, and their performance/test requirements may not be adequately documented in the bushing standards.

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.

For clarification, TC14/36A, a draft report is currently being finalized regarding the feasibility for the dimensional standardization of IEC bushings 72.5kV – 500kV. For this study, only OIP, RIS, and RIP bushing technologies are being considered. IEEE bushing dimensions are not be considered at this time.

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

Meeting was held this week. Comment Resolution Group (CRG) has been created and more volunteers added to help resolve the high volume of comments from circulation. Chair also requested volunteers from the Bushings SC to provide examples of PD patterns to include in the Appendix as well as volunteers to help in resolving grammatical issues with the draft.

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

WG meeting will be held in China on Nov. 13. Revision 5 has been received and the Guide is 80% complete. Expectation is the group will be ready to submit for balloting before Spring 2021 meeting.

A.4 Unfinished Business

A.4.1 CIGRE Reference 755, Transformer Bushing Reliability, WG A2.43 – Durand Stacy

Mr. Durand Stacy was not able to attend this virtual meeting. Mr. Stacy had provided information on what topics were covered in the CIGRE document during the S19 meeting. At the F19 meeting Peter Zhao, then Bushings SC Chair, asked Mr. Stacy if he could find some common field issues with bushings that he could present to the subcommittee at the next meeting. Mr. Stacy agreed to provide and is expected to present the same at the Spring 2021 meeting.

A.4.2 PC57.165 Temperature Measurement in Bushings – Les Recksiedler

Scott Digby reported that he attended the meeting for this WG this week, and the general consensus from PC57.165 was the measurement of bushing hot spot temperature did not need to be included because the WG did not wish to include techniques or technology that was not generally mature, fully developed, or frequently used. The expectation is this section related to bushings will be deleted as Les Recksiedler originally recommended. PC57.165 is driving to get their document out to ballot shortly.

A.5 New Business

A.5.1 C57.152 Transformer Field Test Guide, Section 7.3 Bushings – Mario Locarno / JD Brafa

Mario reported Section 7.3 was 3-4 pages but has already been significantly expanded by update to almost 12 pages with significant content addition. The deliverable of turning over the rewrite of 7.3 to the C57.152 leadership is expected to be completed by Spring 2021. If any members of the Bushings SC would like to comment on this section of C57.152, they are urged to begin attending this WG meeting. Circulation of the completed document is not expected to happen soon, so there is more than enough time to begin attending and become a member. Comments regarding the current version of Section 7.3 of C57.152 may also be sent to the five (5) TF members responsible for the rewrite of Section 7.3: JD Brafa, Mario Locarno, Shibao Zhang, Peter Werelius, and Cornelius Plath.

A.5.2 TF Partial Discharge Testing of Class I Power Transformers – Stephen Shull

The Chair of the TF asked the Bushing Subcommittee for someone to attend their meeting to answer question pertaining to bushings. Mr. Stephen Shull volunteered to attend and informed the Subcommittee that he had answered some general bushing questions for the TF but nothing of importance to report at this time.

A.6 Other

A.7 Adjournment

Peter Zhao made the motion to adjourn

Motion to adjourn was 2nd by Kumar Mani

A.8 Next Meeting: Spring 2021, Toronto, Ontario CANADA – April 25-29, 2021

Annex A - Appendix A

	Membership Status	Role	Participant Status	Last Name	First Name	Affiliation
1	Active	z-Chair	Active	Weatherbee	Eric	PCORE Electric
2	Active	x-Vice-Chair	Active	Digby	Scott	Duke Energy
3	Active	y-Secretary	Active	Brafa	John (JD)	Hub City Consulting Services
4	Active	new-Guest	Active	Abbas	Mubarak	Siemens Industry
5	Active	Guest	Active	Antosz	Stephen	Stephen Antosz & Associates, Inc
6	Active	Guest	Active	Avanoma	Onome	Transformer Consulting Services Inc.
7	Active	new-Guest	Active	Banks	Darrell	Memphis Light, Gas & Water
8	Active	Guest	Active	Baumgartner	Christopher	We Energies
9	Active	Guest	Active	Beaster	Barry	H-J Enterprises, Inc.
10	Active	Guest	Active	Bernesjo	Mats	Hitachi ABB Power Grids
11	Active	new-Guest	Active	Bishop	Ryan	Minnesota Power
12	Active	Member	Active	Boettger	William	Boettger Transformer Consulting
13	Active	Member	Active	Bolar	Sanket	Megger
14	Active	new-Guest	Active	Bonfiglio	Susan	Western Area Power Admin.
15	Active	Guest	Active	Brzoznowski	Steven	Bonneville Power Administration
16	Active	new-Guest	Active	Buchgeher	Erich	Siemens Energy
17	Active	Member	Active	Calitz	David	Siemens Energy
18	Active	new-Guest	Active	Cantu de Leon	Jorge	SPX Transformer Solutions, Inc.
19	Active	Member	Active	Castellanos	Juan	Prolec GE
20	Active	new-Guest	Active	Cheema	Muhammad Ali Masood	Northern Transformer
21	Active	Guest	Active	Christodoulou	Larry	Electric Power Systems, Inc.
22	Active	new-Guest	Active	Cruz Valdes	Juan Carlos	Prolec GE
23	Active	Member	Active	Del Rio	J. Arturo	Siemens Energy
24	Active	new-Guest	Active	Dent	Brandon	Memphis Light, Gas & Water
25	Active	Member	Active	Dinh	Huan	Hitachi ABB Power Grids
26	Active	new-Guest	Active	Doak	Eric	D4EnergySolutions LLC
27	Active	new-Guest	Active	Door	Jeffrey	H-J Family of Companies
28	Active	Guest	Active	Dorris	Don	Nashville Electric Service
29	Active	new-Guest	Active	Draper	Zachary	Delta-X Research Inc.
30	Active	new-Guest	Active	Ermakov	Evgenii	Hitachi ABB Power Grids
31	Active	Guest	Active	Espindola	Marco	ABB Enterprise Software Inc.
32	Active	Member	Active	Euvrard	Eric	RHM International
33	Active	Guest	Active	Fattal	Feras	Manitoba Hydro
34	Active	new-Guest	Active	Fausch	Reto	RF Solutions
35	Active	Guest	Active	Ferreira	Marcos	Advisian-Worley Parsons
36	Active	Member	Active	Foschia	John	SPX Transformer Solutions, Inc.
37	Active	Guest	Active	Franchitti	Anthony	PECO Energy Company
38	Active	Guest	Active	Frazier	Raymond	Ameren
39	Active	new-Guest	Active	Gamboia	Jose	H-J Family of Companies
40	Active	Guest	Active	Gossett	Shawn	Ameren
41	Active	Member	Active	Griesacker	Bill	Duquesne Light Co.
42	Active	Guest	Active	Guner	Ismail	Hydro-Quebec
43	Active	Member	Active	Gustavsson	Niklas	Hitachi ABB Power Grids
44	Active	Member	Active	Hayes	Roger	General Electric
45	Active	new-Guest	Active	Hazlett	Benjamin	Bruce Power
46	Active	Guest	Active	Hernandez	Ronald	Doble Engineering Co.
47	Active	Member	Active	Hochanh	Thang	Surplec Inc.
48	Active	Guest	Active	Hoffman	Saramma	PPL Electric Utilities
49	Active	new-Guest	Active	Hollrah	Derek	Burns & McDonnell
50	Active	Member	Active	Johnson	Toby	Pacificorp

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51	Active	Guest	Active	Jordan	Stephen	Tennessee Valley Authority
52	Active	Guest	Active	Joshi	Akash	Black & Veatch
53	Active	Member	Active	Kaineder	Kurt	Siemens Energy
54	Active	Guest	Active	Kazmierczak	Jerzy	Hitachi ABB Power Grids
55	Active	Guest	Active	Kennedy	Gael	GR Kennedy & Associates LLC
56	Active	Member	Active	Kessler	Stacey	Basin Electric Power Cooperative
57	Active	Member	Active	Kirchenmayer	Egon	Siemens Energy
58	Active	new-Guest	Active	Klempner	Dmitriy	Southern California Edison
59	Active	Member	Active	Kornowski	Marek	Polycast International
60	Active	Member	Active	Kraemer	Axel	Maschinenfabrik Reinhausen
61	Active	Member	Active	Kumaria	Deepak	Hitachi ABB Power Grids
62	Active	Member	Active	Kuppuswamy	Raja	Dynamic Ratings, Inc.
63	Active	new-Guest	Active	Lamontagne	Donald	Arizona Public Service Co.
64	Active	Guest	Active	Li	Yaquan (Bill)	BC Hydro
65	Active	Member	Active	Locarno	Mario	Doble Engineering Co.
66	Active	Member	Active	Mangubat	Darrell	Siemens Power Operations Inc.
67	Active	Member	Active	Mani	Kumar	Duke Energy
68	Active	new-Guest	Active	Mani	Balakrishnan	Virginia Transformer Corp.
69	Active	Member	Active	Mansuy	Bruno	Trench France SAS
70	Active	new-Guest	Active	Marlow	Dennis	DenMar TDS Transformers
71	Active	Guest	Active	McBride	James	JMX Services, Inc.
72	Active	Member	Active	McFadden	Matthew	Oncor Electric Delivery
73	Active	Member	Active	McNelly	Susan	Xcel Energy
74	Active	Member	Active	Mehrotra	Vinay	SPX Transformer Solutions, Inc.
75	Active	Member	Active	Middleton	Robert	RHM International
76	Active	Guest	Active	Morales-Cruz	Emilio	Qualitrol Company LLC
77	Active	Guest	Active	Murray	David	Tennessee Valley Authority
78	Active	Guest	Active	Musgrove	Ryan	Oklahoma Gas & Electric
79	Active	Guest	Active	Natale	Anthony	HICO America
80	Active	new-Guest	Active	Nesvold	Brady	Xcel Energy
81	Active	Guest	Active	Ocon	Rodrigo	Industrias IEM
82	Active	Guest	Active	O'Malley	Anastasia	Consolidated Edison Co. of NY
83	Active	new-Guest	Active	Pagliuca	Vincenzo	Hartford Steam Boiler
84	Active	new-Guest	Active	Panesar	Parminder	Virginia Transformer Corp.
85	Active	new-Guest	Active	Partyka	George	PTI Transformers
86	Active	Member	Active	Patel	Poorvi	EPRI
87	Active	Guest	Active	Patel	Nitesh	HPT USA
88	Active	Guest	Active	Plante	Sylvain	Hydro-Quebec
89	Active	Member	Active	Ramirez	Juan	CELECO
90	Active	Guest	Active	Raymond	Timothy	EPRI
91	Active	Guest	Active	Reagan	John	Oncor Electric Delivery
92	Active	Member	Active	Reed	Scott	MVA
93	Active	Guest	Active	Reimer	Jonathan	FortisBC
94	Active	Guest	Active	Reiss IV	Clemens	Custom Materials, Inc.
95	Active	new-Guest	Active	Rincon	Diego	Electroporcelana Gamma
96	Active	Member	Active	Riopel	Sebastien	Electro Composites ULC
97	Active	Guest	Active	Robalino	Diego	Megger
98	Active	new-Guest	Active	Rocque	Tim	SPX Transformer Solutions, Inc.
99	Active	Guest	Active	Roman	Zoltan	GE Grid Solutions
100	Active	Guest	Active	Saad	Mickel	Hitachi ABB Power Grids
101	Active	Guest	Active	Sahin	Hakan	Independent
102	Active	new-Guest	Active	Sankarakurup	Dinesh	Duke Energy
103	Active	Guest	Active	Sauls	Roderick	Southern Company Services
104	Active	new-Guest	Active	Schiessl	Markus	SGB
105	Active	Guest	Active	Schwartz	Dan	Quality Switch, Inc.

Continued on page 8

106	Active	new-Guest	Active	Schweiger	Ewald	Siemens Energy
107	Active	Guest	Active	Sen	Cihangir	Duke Energy
108	Active	Guest	Active	Sheehan	David	HICO America
109	Active	Member	Active	Shull	Stephen	BBC Electrical Services, Inc.
110	Active	new-Guest	Active	Skinger	Kenneth	Scituate Consulting, Inc.
111	Active	Guest	Active	Slattery	Christopher	FirstEnergy Corp.
112	Active	new-Guest	Active	Sparling	Brian	Dynamic Ratings, Inc.
113	Active	Member	Active	Spitzer	Thomas	City Transformer Service Co.
114	Active	Guest	Active	Spurlock	Mike	Consultant
115	Active	Guest	Active	Staley	Brad	Salt River Project
116	Active	Member	Active	Stockton	David	H-J Family of Companies
117	Active	Member	Active	Sullivan	Kevin	Duke Energy
118	Active	Member	Active	Tanaka	Troy	Burns & McDonnell
119	Active	Member	Active	Tyler	Lee	Warco, Inc.
120	Active	new-Guest	Active	Vanier	Jacques	Electro Composites (2008) ULC
121	Active	Member	Active	Varghese	Ajith	SPX Transformer Solutions, Inc.
122	Active	Member	Active	Varnell	Jason	Doble Engineering Co.
123	Active	new-Guest	Active	Veens	Jos	SMIT Transformatoren B.V.
124	Active	Member	Active	Vermette	Yves	Electro Composites ULC
125	Active	Guest	Active	Vijayan	Krishnamurthy	PTI Transformers
126	Active	Member	Active	Vir	Dharam	SPX Transformer Solutions, Inc.
127	Active	new-Guest	Active	Wagenaar	Loren	WagenTrans Consulting
128	Active	Guest	Active	Waldrop	Hugh	Memphis Light, Gas & Water
129	Active	Member	Active	Wallach	David	Duke Energy
130	Active	new-Guest	Active	Warntjes	Michael	American Transmission Co.
131	Active	Member	Active	Werelius	Peter	Megger
132	Active	new-Guest	Active	Weyer	Daniel	Nebraska Public Power District
133	Active	Guest	Active	Whitehead	William	Siemens Energy
134	Active	new-Guest	Active	Whitten	Christopher	Hitachi ABB Power Grids
135	Active	Member	Active	Zhang	Shibao	PCORE Electric
136	Active	Member	Active	Zhao	Peter	Hydro One
137	Active	Corr. Member	Active	Zibert	Kris	Allgeier, Martin and Associates

Annex A - Appendix B

F20 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
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 - <u>PAR Extension</u>
65700-19-03	IEC/IEEE International Standard -- Bushings for DC application	L. Recksiedler	2014 12/2024	Develop PAR with IEC	IEC has confirmed agreement to proceed with revision
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, Monday October 19, 2020
On-Line Virtual Meeting

Unapproved Meeting Minutes

WG Chair Peter Zhao presided over the meeting, with David Stockton as the Secretary. The Chair informed the WG that the former Secretary has stepped down and Mr. David Stockton volunteered to accept the position of 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	99
Members in Attendance	26 out of 44 members, quorum attained
Guests in Attendance	73
Guests Requesting Membership	0

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 Chair noted that one of the main comment contributors may have retired so he may have to meet one-on-one between conferences to complete review of his submission work. The Secretary noted that the F19 minutes need to be approved and the agenda as well. The Chair asked if there were any objections or comments regarding the F19 minutes and none were received so they were noted as approved.

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: Page 14, Section 7.3.1, lines 38-40 – Self-contradictory, states that you must have full rated load specified in 5.4.1 during all the following testing, then states it can be simulated. **Proposed Change:** Remove allowance of simulation.

Discussion, disposition, and/or follow up action:

- [Accepted](#)

Review Section: 7. Test Procedure: Page 14, Section 7.3.1, line 41 – Stated as “1.2 time” which is an exact amount without a tolerance where it should be a minimum. **Proposed Change:** Revise to a “minimum of 1.2 times”.

Discussion, disposition, and/or follow up action:

- [Accepted](#)

Review Section: 7. Test Procedure: Page 16, Section 7.4.1, 2nd paragraph – States to use 10kV for a C2 test on bushings with a voltage tap. **Proposed Change:** Change 10kV to 2kV.

Discussion, disposition, and/or follow up action:

- [Accepted](#)

Review Section: 7. Test Procedure: Page 16, Subclause 7.4.2, Line NA – Comment to add at the end of paragraph 2 that a UST method may also be used. **Proposed Change:** add “the bushing may be also tested by the UST method when the bushing flange is isolated from the ground”

Page 1 of 5

Discussion, disposition, and/or follow up action: **TBD – Resubmit Revised version based on discussions**

- The following is some of the discussion that took place regarding this proposal:
 - There was a very lengthy discussion as it was pointed out that there is a special case of solid bushings with no tap that exist that also have epoxy flanges and that case should also be addressed. Therefore, following the meeting a revised version of the original comment was submitted which will need to be reviewed by the WG. The new revised comment is as follows:
 - **Following the meeting a revised version was submitted that will require review at the next meeting.**
 - **If specified, bushings without taps that have a conductive ground shield (i.e. metallic flange, conductive glaze etc.) shall be tested using either the Ground Specimen Test (GST) method following the rated frequency withstand voltage test or alternatively using the Ungrounded Specimen Test (UST) method. If the UST method is to be used following the rated frequency withstand test the bushing shall be supported on a properly insulated mounting frame (to avoid leakage currents to ground) or the bushing may be suspended from one terminal with a suitable insulator; the test apparatus lead shall be connected to the metallic flange or bushing ground shield connection point. For alternative bushing constructions or if you are unsure of the proper test method to use, consult with the bushing manufacturer to establish the proper test procedure.**

Review Standard to include references to the new 19.04 Standard, Pages 1, 2, 6, 7, 8 Subclauses 1.2, 2, 4.2.2, 5.3, 5.4.1, 6 – Comment was to also include 19.04 in areas that state references to 19.01.

Discussion, disposition, and/or follow up action: **Accepted**

Review Standard to include “Rated dry switching-impulse voltage” as it used in 19.04, Pages 7, 10, 13 –

Comment was made that dry switching needs to be specified in 19.00 as it is used in the 19.04 **Proposed Change:** TBD – No specific proposal was submitted as the 19.04 Chair was looking for help in generating the proper text

Discussion, disposition, and/or follow up action: **TBD – 19.04 Chair will review and submit some text for review at the next meeting**

- The 19.00 Chair sought comments from the WG, it was commented that we need to be careful examine this suggestion as currently only bushings rated 900kV BIL and above require wet switching.

Meeting was adjourned, 12:15pm

Respectfully Submitted,

WG Secretary David Stockton (generated by Eric Weatherbee)

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.
Member	Brad	Staley	Salt River Project
Member	Lee	Tyler	Warco, Inc.
Guest	Susan	McNelly	Xcel Energy
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: D1.6 Dated: March 2020

Meeting Date: October 20, 2020 Time: 10:50 am – 12:05 pm

Attendance: **Members** 33
Guests 41
Total* 74

Attendance:

Mubarak Abbas	Siemens Industry	Gary King	Howard Industries	Adrian Sigardo	IFD Corporation
Angela Amador	EATON Corporation	Marek Kornowski	Polycast International	Jonathan Sindair	PPL Electric Utilities
Israel Barrientos	Prolec GE	Andrew Larison	Hitachi ABB Power Grids	Edward Smith	H-J Family of Companies
Barry Beaster	H-J Enterprises, Inc.	Wajun Li	Braintree Electric Light Dept.	Brad Staley	Salt River Project
Darren Brown	Howard Industries	Joaquin Martinez	Siemens Energy	David Stockton	H-J Family of Companies
Steven Bizoznowski	Bonneville Power Administration	Lee Matthews	Howard Industries	Michael Thibault	Pacific Gas & Electric
Jorge Cantu de Leon	SPX Transformer Solutions, Inc.	Matthew McFadden	Oncor Electric Delivery	Timothy Tillery	Howard Industries
Solomon Chiang	The Gund Company	Philip Miller	Memphis Light, Gas & Water	Alan Traut	Howard Industries
Rhett Chrysler	ERMCO	Michael Morgan	Duke Energy	Lee Tyler	Warco, Inc.
Michael Dahike	Central Moloney, Inc.	Jerry Murphy	Reedy Creek Energy Services	Reinaldo Valentin	Duke Energy
Jonathan Deverick	Dominion Energy	Parminder Panesar	Virginia Transformer Corp.	Jacques Vanier	Electro Composites (2008) ULC
Huan Dinh	Hitachi ABB Power Grids	George Partyka	PTI Transformers	Joshua Verdell	ERMCO
Jeffrey Door	H-J Family of Companies	Poorvi Patel	Electric Power Research Institute (EPRI)	Yves Vermette	Electro Composites ULC
Jose Gamboa	H-J Family of Companies	Chris Pitts	Howard Industries	Duy Vo	Central Maine Power (AVANGRID)
Carlos Gaytan	Prolec GE	Tejasvi Prakash	Schweitzer Engineering Labs	Pragnesh Vyas	Sunbelt-Solomon Solutions
Ali Ghafourian	H-J Enterprises, Inc.	Jarrod Prince	ERMCO	Shelby Walters	Howard Industries
Oriando Giraldo	H-J Family of Companies	Juan Ramirez	CELECO	Eric Weatherbee	PCORE Electric
Zoran Goncin	PTI Transformers	Martin Rave	ComEd	Bruce Webb	Knoxville Utilities Board
Said Hachichi	Hydro-Quebec	Robert Reepe	Georgia Power Co.	Zachery Weiss	WEG Transformers USA Inc.
Kendrick Hamilton	Power Partners, Inc.	Clemens Reiss IV	Custom Materials, Inc.	William Whitehead	Siemens Energy
Kyle Heiden	EATON Corporation	Diego Rincon	Electroporalana Gamma	Christopher Whitton	Hitachi ABB Power Grids
Ronald Hernandez	Doble Engineering Co.	Albert Sanchez	Knoxville Utilities Board	Alan Wilks	Consultant
James Holt	Memphis Light, Gas & Water	Daniel Sauer	EATON Corporation	Deanna Woods	Alliant Energy
Ramadan Issack	American Electric Power	Jeffrey Schneider	EATON Corporation	Malia Zaman	IEEE
		Stephen Shull	BBC Electrical Services, Inc.	Shibao Zhang	PCORE Electric

Distribution Transformer Subcommittee Working Group Report

Meeting Minutes:

1. The meeting was called to order by the Chair at 10:50A.M. CST on October 20, 2020 and Quorum was checked and reached.
2. Agenda approval

The Chair displayed the Agenda for this meeting. He asked the WG for any proposed changes to the presented Agenda. No changes were offered and therefore the Agenda was declared approved as shown.
3. Minutes approval

The Chair commented that the Meeting Minutes of the last meeting were posted on the Transformer Committee website. He also informed all WG members and guests of this in an email prior to this meeting. A motion was made to approve Fall 2019 meeting minutes by Dan Sauer and second by Israel Barrientos. These were received with unanimous approval.
4. Confirmation of IEEE SA Essential Patent Statement

The Chair displayed the Essential Patent information. He informed all WG members and guests that the same information was sent via email prior to this meeting. The Chair asked for any claim of known Patents associated with this work. Nothing was brought to the Chair's attention.
5. IEEE SA Copyright Policy Statement

The Chair displayed the IEEE SA Copyright Policy information. He informed all WG member and guests that the same information was sent via email prior to this meeting and he asked that if there are any questions on this item to refer to this email.
6. Old Business
 - 6.1. Chair comments on Annex A

The Chair stated this informative annex was created from the Task Force's work on Three-Position Cantilever Testing. It captured their work as well as the conclusions which were approved at the last meeting.
 - 6.2. Taskforce report – Section 5.2.4 and Annex B & C – Barry Beaster, TF Chair

The TF Chair presented the Task Force report by explaining how the calculations were derived and helped the WG understand the application of these equations. The conclusion of the presentation was that the selection of the material correction to 160°C overstates the final temperature. The TF Chair suggested an alternative which was to use the tested terminal rise plus the ambient. Typical terminal rise is $\leq 75^{\circ}\text{C}$. The short circuit temperature may exceed the temperature limit of 180°C. He suggested that an alternative may be, for those higher temperature capability designs, to permit a temperature limit of 200°C. This recommendation was opened to floor for discussion which resulted in no comments. Because there wasn't any motion to change the existing draft, it will stand as written.
 - 6.3. Taskforce report – Table 4 – Lee Tyler, TF Chair

The TF Chair discussed the issues that the Task Force encountered when looking at the creep distance calculations. It was noted there was a variance between values established across multiple references including C57.19.01-Table 1, C57.12.20-Table 6, C37.100.1, as well as some IEC documents. A number of these appeared to share some common items.

 - o Contamination clearance per kV seemed to be common when it was referenced;
 - 28mm/kV for light contamination and
 - 44mm/kV for heavy contamination
 - o References Voltage varied when it was stated. These were typically;
 - Nominal system (L-G), or

Distribution Transformer Subcommittee Working Group Report

- Max system voltage.

The WG discussion brought out a number of items worth noting. First, the current Table 4 proposed values seem to be consistent with C57.19.01 for nominal system voltage of 15kV and greater as this standard used the 28mm/kV calculation constant. It was noted IEC standards TF60815-2 and TF60815-3 provided the theory behind the 28mm/kV and 44mm/kV calculation constants. The Bushing Subcommittee Chair suggested that Table 4 should follow as closely as possible to the C57.19.01 base calculations. Since some of the other standards only referenced BIL, it was suggested the creep distance in this table reference BIL levels as well. A comment was made that the tables for creep values listed in C57.12.20 have been accepted for decades and therefore the development of these is lost. However, these values have been the guiding number for this type of bushing and any changes to these established values might be significant and difficult to adopt as current values since these are already widely accepted by the industry. Since the 28mm/kV and 44mm/kV calculation constants are based on porcelain, a question was raised concerning if the inclusion other materials should be considered. It was pointed out that traditionally porcelain has always been the base material and other materials were judge against it.

The Chair asked the Task Force to continue to work on Table 4 by developing a direct comparison to other creep distances specified in the above referenced IEEE standards. The Chair acknowledged that the WG must work to come to consensus on how the creep distance will be determined. It is his hope that a comparison table will facilitate this at the next meeting. He stated that he will work with the TF to develop this table for the next meeting to hopefully bring this to a resolution.

7. New Business

Meeting time did not allow for review of new business, and this item was tabled until next meeting.

8. The meeting was adjourned at 12:04 pm.

Submitted by: Rhett Chrysler

Date: 10/20/2020

Annex A - Appendix E

IEC/IEEE 65700_19_03 DC Bushings TF

Minutes of 2020 Fall Meeting – Virtual Meeting
 Tuesday, October 20, 2020 Session 6 2:20 – 3:35PM

Les Recksiedler – Chair, Email - irecksiedler@hvdc.ca

XXXXXX – Vice Chair

J. Arturo Del Rio – Secretary

1. Attendee Poll carried out in Webex - Indicate Member, Guest, membership request.

5 members present out of 8. Quorum was achieved. Number of attendees and membership requests not available (TBA).

2. Still looking for a Vice Chair Volunteer

3. Agenda – Any additions

- **Patents and Copyrights** – No Declarations. Use of wording or figures from other IEEE standards, papers or other organizations need written permission from them. See IEEE website for details.
- Joint IEC IEEE standard - **Mr. Lars Jonsson, IEC Chairperson**- IEC surveyed their member for the areas needing revision, results provided and summarized below:

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.

- The Chair will request copy of the standard in Word format from IEEE SA for distribution among the members.

Major areas needing standard revision to be identified

- 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 are coordinated.
- **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

4. New Business – Major areas of the standard needing revision to be identified. Volunteers required to review sections.

5. Start working via Emails: or using a web-based meeting application such as MS Teams. Informal meetings by email to start of a list of issues and possible resolution will be done between now and next meeting

6. Meeting Adjournment @ 3:15 pm Approximately

Next Meeting to take place in Toronto, Canada, on April 25-29 2021.

Submitted respectfully,

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

Subgroup Name	Role	First Name	Last Name	Email	Company
65700.19.03 WG HVDC Bushings	Guest	Mubarak	Abbas	mubarak.abbas@siemens.com	Siemens Industry
65700.19.03 WG HVDC Bushings	Guest	Edmundo	Arevalo	erarevalo@bpa.gov	Bonneville Power Administration
65700.19.03 WG HVDC Bushings	Chair	Leslie	Recksiedler	lrecksiedler@yahoo.ca	Manitoba Hydro
65700.19.03 WG HVDC Bushings	Guest	Jeff	Benach	jeff.benach@weidmann-group.com	Weidmann Electrical Technology
65700.19.03 WG HVDC Bushings	Guest	Jeremiah	Bradshaw	jeremiah.l.bradshaw@ieee.org	Bureau of Reclamation
65700.19.03 WG HVDC Bushings	Guest	Steven	Brzoznowski	stbrzoznowski@bpa.gov	Bonneville Power Administration
65700.19.03 WG HVDC Bushings	Guest	Craig	Colopy	craigacolopy@eaton.com	EATON Corporation
65700.19.03 WG HVDC Bushings	Guest	Brandon	Dent	bdent@mlgw.org	Memphis Light, Gas & Water
65700.19.03 WG HVDC Bushings	Guest	Jonathan	Deverick	jonathan.h.deverick@dominionenergy.com	Dominion Energy
65700.19.03 WG HVDC Bushings	Guest	Scott	Digby	scott.digby@duke-energy.com	Duke Energy
65700.19.03 WG HVDC Bushings	Guest	Eric	Euvrard	eric.euvrard@rhmintl.com	RHM International
65700.19.03 WG HVDC Bushings	Guest	Ali	Ghafourian	asghar.ghafourian@gmail.com	H-J Enterprises, Inc.
65700.19.03 WG HVDC Bushings	Guest	Orlando	Giraldo	orlandog@h-jenterprises.com	H-J Family of Companies
65700.19.03 WG HVDC Bushings	Guest	Ismail	Guner	ismailguner@ieee.org	Hydro-Quebec
65700.19.03 WG HVDC Bushings	Guest	Thang	Hochanh	thanghochanh@surplec.com	Surplec Inc.
65700.19.03 WG HVDC Bushings	Secretary	J. Arturo	Del Rio	a.delrio@ieee.org	Siemens Energy
65700.19.03 WG HVDC Bushings	Member	Ulf	Radbrandt	ulf.radbrandt@ieee.org	Hitachi ABB Power Grids
65700.19.03 WG HVDC Bushings	Guest	Gael	Kennedy	grkennedy@ieee.org	GR Kennedy & Associates LLC
65700.19.03 WG HVDC Bushings	Guest	Raja	Kuppuswamy	raja.kuppuswamy@dynamicratings.com	Dynamic Ratings, Inc.
65700.19.03 WG HVDC Bushings	Guest	Olivier	Lejay	o_lejay@hotmail.com	Huaming USA Corp.
65700.19.03 WG HVDC Bushings	Member	Eric	Weatherbee	eweatherbee@hubbell.com	PCORE Electric
65700.19.03 WG HVDC Bushings	Guest	Matthew	McFadden	matthew.mollenkopf@oncor.com	Oncor Electric Delivery
65700.19.03 WG HVDC Bushings	Guest	Robert	Middleton	bob.middleton@rhmintl.com	RHM International
65700.19.03 WG HVDC Bushings	Guest	Parminder	Panesar	parminder_panesar@vatransformer.com	Virginia Transformer Corp.
65700.19.03 WG HVDC Bushings	Guest	George	Partyka	georgejr@ptitransformers.com	PTI Transformers
65700.19.03 WG HVDC Bushings	Guest	Sanjay	Patel	s.patel@smitusa.com	Royal Smit Transformers
65700.19.03 WG HVDC Bushings	Guest	Juan	Ramirez	jramirez@celeco.com.mx	CELECO
65700.19.03 WG HVDC Bushings	Guest	Shiva	Rampersad	srampersad@dow.com	Dow Chemical Company
65700.19.03 WG HVDC Bushings	Guest	Jonathan	Reimer	jonathan.reimer@fortisbc.com	FortisBC
65700.19.03 WG HVDC Bushings	Member	Kurt	Kaineder	kurt.kaineder@siemens.com	Siemens Energy
65700.19.03 WG HVDC Bushings	Guest	Diego	Rincon	drincon@corona.com.co	Electroporcelana Gamma
65700.19.03 WG HVDC Bushings	Guest	Sebastien	Riopel	sriopel@hubbell.com	Electro Composites ULC
65700.19.03 WG HVDC Bushings	Guest	Diego	Robalino	diego.robalino@megger.com	Megger
65700.19.03 WG HVDC Bushings	Guest	Zoltan	Roman	zoltan.roman@ge.com	GE Grid Solutions
65700.19.03 WG HVDC Bushings	Guest	Stefan	Schindler	s.schindler@reinhausen.com	Maschinenfabrik Reinhausen
65700.19.03 WG HVDC Bushings	Guest	Eric	Schleismann	eschleis@ieee.org	Southern Company Services
65700.19.03 WG HVDC Bushings	Guest	David	Sheehan	dsheehan@hicoamerica.com	HICO America
65700.19.03 WG HVDC Bushings	Guest	Markus	Stank	m.stank@reinhausen.com	Maschinenfabrik Reinhausen
65700.19.03 WG HVDC Bushings	Guest	David	Stockton	davids@h-j.com	H-J Family of Companies
65700.19.03 WG HVDC Bushings	Guest	Charles	Sweetser	charles.sweetser@omicronenergy.com	OMICRON electronics Corp USA
65700.19.03 WG HVDC Bushings	Guest	Troy	Tanaka	tтанaka@burnsmcd.com	Burns & McDonnell
65700.19.03 WG HVDC Bushings	Corresponding M	Roger	Hedlund	roger.hedlund@hitachi-powergrids.com	Hitachi ABB Power Grids
65700.19.03 WG HVDC Bushings	Guest	Zachery	Weiss	zweiss@weg.net	WEG Transformers USA Inc.
65700.19.03 WG HVDC Bushings	Guest	William	Whitehead	billwhitehead1@gmail.com	Siemens Energy

Annex A - Appendix F

C57.19.100 Bushing Application Guide Meeting Minutes

10/19/2020 Fall Virtual Meeting

Tommy Spitzer Chair

Jeff Benach Secretary

The meeting was called to order at 2:20 CST with 72 people present, 19 members 53 guests with 1 request for membership. Quorum was achieved.

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

Minutes from the Fall 2019 meeting minutes were approved.

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

The PAR has been approved,

Suggested additions/comments approved this meeting to the document:

- Circuit Breakers will not be included in this guide C57.19.00-1991 will need to be used for reference
- Discussed TBI transformer Breaker Interchangeable bushings designed to be used in transformer or oil circuit breaker applications.
- C57.91 Annex B has life calculations for bushing paper can be used to calculate loss of life number normal conditions. Effects of Solar radiation and harmonic current are not specified in the calculation. Decision was made to not add this to the document but rely on the ratings as published and apply to the environment. A cautionary note regarding those effects will be added.
- Proposed change request for operation of bushings with ambient temperatures greater than 40C. Adding a precautionary note that the engineer should take in to account the environment that the bushing is installed in when specifying the bushing.
- Proposed change request for operation of bushings in transformers with top oil temperature rise greater than 65C. Discussed adding a precautionary note that the engineer should take in to account the environment that the bushing is installed in when specifying the bushing.

Discussion on overload reports and using new materials for higher hot spot capability in bushings. Bushings typically are not designed for overload conditions, the manufacturer should be contacted to enquire what that would bushing overload could be to match up with the transformer capabilities. Peter Zhao will be contacted to get a report from the overload committee.

- Discussion on adding a note that new technology is allowing higher thermal insulation classes.

Sebastian Riope motioned to Adjourn; JD Brafa seconded the motion.

The meeting was adjourned at 1:34 PM CST

Jonathan Deverick requested membership.

In Attendance:

Status	Name	Status	Name
G	Anastasia O'Malley	G	Juan Carlos Cruz Valdes
M	Anthony Natale	G	Juan Castellanos
G	Barry Beaster	G	Kevin C. Sullivan
M	BESTALEY	G	Kurt Kainerder
M	Bob Middleton	M	Lee Tyler
M	Bruno Mansuy	G	Loren Wagenaar
G	Christopher Whitten	M	Mario Locarno
G	Daniel Sauer	G	Mubarak abbas
G	Danny Schwartz	G	Neil Strongosky
G	Darrell Banks	G	Olle Benzler
G	Dave Stankes	G	Parminder Panesar
G	David Murray	G	Peter Werelius
M	David Stockton	G	ray jl
M	Devki Sharma	G	Rich Von
G	Diego Rincon	G	Rod Sauls
G	Diego Robalino	G	Roger Hedlund
G	Dipak Patel	G	Roger Wlcks
G	Edmundo Arevalo	G	Ryan Jonak
M	Egon Kirchenmayer	G	Sanket Bolar
G	Eric Euvrard	M	Scott Digby
G	Eric Schleismann	M	Sebastien Riope
M	Eric Weatherbee	M	Shibao Zhang
G	Erich Buchgeher	G	Shiva Rampersad
G	Feras Fattal	G	Steve Antosz
G	Gael R Kennedy	G	Steve Brzoznowski
G	George Jr Partyka	G	Susan Mcnelly
G	Homer Portillo	G	Timothy Raymond
G	HUAN DINH	G	Toby Johnson
G	Jacques Vanier	M	Tommy Spitzer
M	Javier Del Rio	G	Tony Reiss
M	JD Brafa	G	Trevor Mattson
M	Jeff Benach	G	Troy Tanaka
G	Jeff Door	G	Vijay Tendulkar
G	Jeremiah Bradshaw	G	William Boettger
G	Jeremy Johnson	M	William J. Solano
G	Jonathan Deverick	M	Yves Vermette

Annex A - Appendix G

IEEE/PES TRANSFORMERS COMMITTEE

Bushings Subcommittee

TF Classification and Performance of Dry Type Bushings**Virtual****Monday, October 19, 2020**

The Task Force group met virtually on WebEx on Monday October 19, 2020, at 3:45 PM session 2. This was the first meeting.

1. Introductions 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.

2. Verification of Quorum

- Since this is the first TF meeting, membership has not been established. Quorum not verified. No decisions or formal motions took place during the meeting.
- The virtual attendance was checked with a Poll.
- There was a total of 32 participants out of which 18 requested membership. All requests for membership were granted. Membership list and status attached in these minutes.

3. Background for the TF

- As stated in the F19 October 30 2019, Annex A.5 of the Bushings Subcommittee meeting minutes, as new business related to this TF activity:

A.5 New Business**A.5.1 Composite Bushings – J. Arturo Del Rio**

The Chair (Peter Zhao) stated that Mr. John Graham led a TF looking into composite bushings for the subcommittee and submitted a final report 3 years ago. The Chair asked that Mr. Del Rio review the report as there were many unresolved issues. Mr. Del Rio asked that the Chair send him a copy of TF report and then presented several slides showing several types of "Dry Type" composite bushings designs and opened the floor to comments and questions.

- Mr. Robert Middleton stated that their company manufactures a similar product to RIS (Resin impregnated Synthetics) that they call RIF (Resin Impregnate Fiberglass). He would like a definition to not be dependent on the manufacturing process.
- Mr. Dave Geibel stated that new technologies are always evolving and asked if is necessary to categorize each new type or just stick to making classes with performance levels?
- Mr. Egon Kirchenmayer stated as a transformer manufacturer there is plenty of information on OIP bushings but nothing for "Dry" designs. Users need to understand what the differences are. We need to come to agreement on limits instead of seeking out each individual manufacture for information.
- Mr. Arup Chakraborty stated that as a transformer OEM he finds it confusing. Unless a user specifies what they want for a bushing type his only options is to review all the different literature available from all the manufacturers. No existing guide exists for a transformer manufacturer, having a guide developed would be very helpful.

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Bushings Subcommittee

- Mr. Geibel stated he believes we should help to promote innovation, reduce lead-times, improve on-time delivery and quality and warns that the standard should not limit this by going to deep into the details which may stifle innovation.
- The Chair agreed stating that performance is key, which materials are used are not critical.
- One commenter asked if any of the bushing manufactures are making bushings using natural ester fluid, and if not, can anyone tell him why? The Chair stated none are using ester fluids they are all based on mineral oil.
- Dr. Shibao Zhang stated he agrees performance is key and performance wise it's basically all covered in the standards If the transformer is operating per the standard application requirements. If there are special requirements, then they may have to go back to the bushing manufacturer for additional information.
- Mr. Huan Dinh stated he was recently tasked with specifying a polymer insulator and said it was a difficult task as there are so many materials and differences. Some materials are not even compatible with oil. It is very hard to find the required information to correctly select the proper product for the application.
- Mr. Florian Costa stated that we should not forget there are now plug-in bushings in the market.
- Mr. Kumar Mani made a motion to establish a TF to determine classification and performance requirements for dry type bushings which was 2nd and passed. The Chair asked Mr. Del Rio if he would Chair this new TF and he accepted the role.

4. Discussions

The key points from the participants feedback and contributions that summarize the meeting are as follow:

- Dry type bushings are required to comply with the existing standards IEEE or IEC. One way maybe to look at the guide or the description of both technologies would be to start from the OIP description and contrast every parameter for each of those technologies. So that user could tell by listing those parameters and comparing them with the others to provide a sense of what benefits those new technology can provide. In terms of usage, having some kind OIP as the reference and the level to be compared to, would probably help the users to understand what they can do. One way to achieve this is could be by creating a table that lists, broken down by voltage class, that tells the users the available options for condenser insulation, options for the insulating envelope. And then when get into performance characteristics.
- The purpose of the gathered information is to provide guidance. It must be informative and cannot imply that certain technology can be better than another because it could depend on the application and the conditions. It can highlight the differences and similarities, so that the users understand what they're getting. It cannot give recommendations. There are many things in the existing standards that do not apply to dry type bushing. For instance, a pressure test, or the way that it's described or methods of testing leak proof of a bushing or loss of life calculations. These are all things that this taskforce needs to address and propose ways of writing in new content into the standards, so that it clarifies those contentious points between the different technologies without getting into specific manufacturing or proprietary details.
- The idea of starting with this Task Force is to have a document similar to the oil impregnated bushings in which we can show the differences. But also try to keep the same format that it is used for oil impregnated bushings, keeping it as simple as possible.

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Bushings Subcommittee

- It was discussed that the dielectric characteristics will be probably the same, or nearly the same for all the bushings, where the differences are mainly in the temperature limits, temperature rise test limits. And also overload and application temperature limits. The dielectric test will stay the same in the application, similar, maybe some small deviations in the partial discharge levels and the power factor levels, which could be acceptable.
- Utilities in their specifications define if it contains paper or not, define if it contains oil or not. Define if it's self-contained oil or shared oil with the transformer. And define if it's solid bulk type, or if it's RIP or RIS. Previous to putting all that information in the specifications, it is difficult gathering what is the difference between a dry type and a solid type or a bulk type and IEEE doesn't have a really good definition of this is a condenser, dry type bushing type bushing etc.

5. New Business

5.1 The Chair will provide a preliminary draft for the TF Scope and Purpose for discussion.

- 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.

5.2 Chris Whitten was nominated by John Brafa for the position of secretary of this TF and Chris has accepted the role.

7. Adjournment

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

The next meeting will take place Spring 2021 – Toronto, Ontario CANADA April 25-29, 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	Mubarak	Abbas	Siemens Industry	Raleigh	NC	USA
Guest	Stephen	Anthony	--	Pittsburgh	PA	USA
Guest	Edmundo	Arevalo	Bonneville Power Administration	Vancouver	WA	USA
Guest	Jeremiah	Bradshaw	Bureau of Reclamation	Denver	CO	USA
Member	John	Brafa	Hub City Consulting Services	Medina	TN	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
Member	Eric	Euvrard	RHM International	Brookline	MA	USA
Member	Raymond	Frazier	Ameren	Arnold	MO	USA
Guest	Ismail	Guner	Hydro-Quebec	Saint-Hubert	QC	Canada
Guest	Saramma	Hoffman	PPL Electric Utilities	Fogelsville	PA	USA
Member	Kurt	Kaineder	Siemens Energy	Leonding	Other	Austria
Member	Egon	Kirchenmayer	Siemens Energy	Nuremberg	Other	Germany
Guest	Yaquan (Bill)	Li	BC Hydro	Surrey	BC	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
Member	Robert	Middleton	RHM International	Brookline	MA	USA
Guest	Poorvi	Patel	Electric Power Research Institute (EPRI)	Ballwin	MO	USA
Member	Dipakkumar	Patel	Instrument Transformer Equip Corp	Matthews	NC	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	Dinesh	Sankarakurup	Duke Energy	Raleigh	NC	USA
Member	William	Solano	Instrument Transformer Equip Corp	Monroe	NC	USA
Member	David	Stockton	H-J Family of Companies	High Ridge	MO	USA
Member	Eric	Weatherbee	PCORE Electric	LeRoy	NY	USA
Member	William	Whitehead	Siemens Energy	Raleigh	NC	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

FALL 2020 MEETING OF IEEE TRANSFORMER BUSHINGS

Location: VIRTUAL Meeting

Date: October 19 – 22, 2020

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	<p>Start the revision of IEC60599 (Mineral oil-filled electrical equipment in service – Guidance on the interpretation of dissolved and free gases analysis)</p> <p>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)</p>
Revision of IEC 60475 Method of sampling Insulating Fluids	<p>Start the revision of IEC60475 (Method of sampling Insulating Fluids)</p> <p>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.</p>
TC14/36A Bushing dimensional standardization	<p>A draft report is being finalized summarizing the possible standardization of the transformer bushings 72.5 to 500 kV.</p> <p>It is covering OIP, RIP and RIS technology.</p>
Guide of application for power apparatus bushings (IEEE C57.19.100)	<p>Study the feasibility of this document and the opportunity to approach IEEE for a dual logo new work</p>

Dielectric Tests Subcommittee

October 21st, 2020

Virtual meeting

Dielectric Tests Subcommittee		
Chair: Ajith M. Varghese	Vice-Chair: Thang Hochanh	Secretary: Poorvi Patel
Room: Virtual	Date: October 21 st 2020	Time: 11:00 am to 12:15 pm
Members: 137	Present at time of checking: 98	Present to AM System:
Guests present: 133	Membership requested:	Membership accepted:

B.1 Chair's Remarks

The Chair welcomed members and guests to the first virtual meeting. The Chair briefly highlighted the requirement that while introducing one need to state their employer/ company and sponsor if the difference from the company. This is especially important in a virtual setting. The chair also reminded that IEEE and transformer committees are non-commercial organizations and standards shall focus only on developing performance and functional requirement and not design and construction details.

The Unapproved minutes from the Fall 2019 meeting and the agenda for Fall 2020 meeting was sent out to members and guests 14 days before the Fall virtual meeting, and it's also posted on the website. The Spring 2020 meeting was cancelled due to Covid-19 pandemic.

All TF and WG **MUST** record the attendance in the AM System (no expectations that the meeting was held in an virtual setting) - The WG/TF minutes do not need to include the list of attendees. The attendance for the virtual meetings should be recoded with the Poll feature in Webex and WG/TFs are urged to keep website information current. Any presentation presented during the meetings should be posted.

All attendees should have updated information, such as email address in the AM system, as for all correspondence, this system is used.

The Chair reminded the WG and TF leaders to submit their minutes from the meetings within **15 days** to the SC chair and secretary. The SC Secretary then must submit the SC minutes within 45 days of the SC meeting. To minimize revision and errors in the sub-committee level and transformer committee level minutes, please send the final version of your minutes.

The Chair advised the WG/TF leaders to in advance before the DTSC meeting to submit any important motions or new Agenda to be discussed and approved during the DTSC meeting to the Chair.

The Chair reminded WGs that call of the patent is required a during every WG meetings including on-line/Teleconference meeting. If there are any patent claim, it shall be noted but not discussed at the working group meetings. Calls for Patents is not required for TF.

There is changes to copyright policy – WG/TF leaders must show the slides for the copyright policy at the beginning of the WG/TF meeting

- Any material submitted during standards development, whether verbal, recorded, or in written form, is a Contribution and shall comply with the IEEE-SA Copyright Policy
- Secretary to record in the minutes of the relevant meeting: That the foregoing information was provided and that the copyright slides were shown (or provided beforehand).

The Subcommittee chair showed the slides of the new copyright policy to the DT subcommittee members and guests.

Per new guidelines from IEEE, Audio/Video recording or photography is not allowed during SC, WG and TF meetings. In this virtual setting the sessions will be recorded and sent to the secretary for assisting in writing the minutes of meeting. The recording will be deleted after the use.

The Chair shared details of upcoming PES sponsored meeting as well as details of next transformer committee. The Spring committee meeting 2021 will be held in Toronto, Canada on the 25th -29th of April 2021. In late December 2020 or early January 2021- decision will be taken if this meeting will again be virtual due to the Covid-19 pandemic. Fall meeting 2021 will be held in Milwaukee, WI on the 17th -21st of October 2021. The Spring 2022 meeting is planned to be in Denver, CO on March 27th to 31st .

The Current Status of PARs was presented by The Chair.

- C57.127 Guide for the Detection of Acoustic Emissions from Partial Discharges in Oil-Immersed Power Transformers was published in 2019. Next revision 2028.
- C57.160 Guide for the Elec. Measurement of PD in HV Bushing and Instrument Transformers is in ballot resolution. The guide expires 2020. Par is extended to 2022.
- C57.113 Recommend Practice for Partial Discharge Measurement Power - Par expires 2021. The guide expires in 2020. The Par may need extension.
- C57.98 Guide for Transformer Impulse Tests. The Guide expires 2021 and Par expires in 2022. No major changes needed, so should be in good shape.
- C57.138 Recommended Practice for Routine Impulse Tests for Distribution Transformers there is no activity on as the guide does not expire until 2026. If a new WG needs to be formed earlier, please advise to the chair
- C57.161 Guide for DFR Measurements is approved and published 2018. There is no activity on as the guide as it does not expire until 2028.
- C57.168 Low-Frequency Test Guide is a new guide; PAR expires 2022.

- C57.200 Bushing Frequency Domain Spectroscopy Guide (ENTITY WG) is a new guide. PAR expires in 2022. There was no TF this Fall 2020.

If PAR extension is needed the last date for that next year is **18 October 2021**.

Since C57.12.00 and C57.12.90 are soon due to revision, the Chair presented highlights on topics that has been approved at the DTSC/WG/TF meetings previously or are in progress of changes in related TF/WG.

Affected Test/Area	Highlight of change *	TF/WG Chair	C57.12.00	C57.12.90	TF/WG	DTSC
External Clearances	New Clearance Table -Addition of line to ground and changes to <u>phase to phase</u> clearances	Eric Davis	6.8	NA	Approved	Approved
Switching Surge	Select Tap that will test LV close to its BSL Test on bridging position (Reactive LTC)	Pierre Riffon	NA	10.2.4	Approved	Approved
Impulse Waveform Front Time/Overshoot	Limit max front time to 2.5 μ s (regardless of overshoot). Clarity on IEEE 4 compliance	Pierre Riffon	NA	10.3.1.1	Approved	Approved
Chop Wave -Time from point of chop to voltage zero	Additional clarity on accepting Chopwave if 1 μ s limits can't be achieved	Pierre Riffon	NA	10.3.1.3	Approved	Approved
Terminals not being tested	Clarity on condition of non-impulsede terminal (ground/Float) during Impulse	Pierre Riffon	NA	10.3.2.1	Approved	Approved
PD Testing - wound Core	New Design Test and Limits for Wound Core Transformers	B. Griesacker P. Hopkinson	6.7.2.1 & Table 17	10.7.7	Approved	Approved

Affected Test/Area	Highlights of change *	TF/WG Chair	C57.12.00	C57.12.90	TF/WG	SC
Induce Test Tap	Select Tap that will test LV close to table 4. Test on bridging position (Reactive LTC)	B. Griesacker Bertrand	NA	10.8.1	Approved	Approved
Pressure during Induce	No artificial pressure during testing	B. Griesacker	NA	10.8.2	Approved	Approved
PD acceptance Limit Class II Transformer	1 Hour PD Limits <250pC Increase >50pC	B Griesacker V Mehrotra	NA	10.8.5	Approved	Approved
PD in Bushing during FAT	Address concern with bushing Venting to pass Transformer PD Testing	B Griesacker	NA	10.8.5	Not Approved**	
PD Testing Class I Transformers	Test Method and Acceptance limit for Class I when PD test is requested	B Griesacker D Ayers	5.10.5.3	TBD	Not Approved **	
Cap PF & Megger - Limits	Recommend Limits for FAT/Commissioning	Diego Robalino			Not Approved **	

The secretary reminded the WG on attendance requirement for membership and the continuation and the requirement to have attendance updated in AM system, i.e., to attend two out of last three meetings or three out of five last meetings.

In Columbus Fall of 2019 meeting 12 guests requested membership and 8 members were granted and 7 members were moved to guest status. The total membership of the Dielectric Subcommittee is today 137 members. To obtain Quorum 68 members is required. No meeting was held in Spring of 2020.

B.2 Quorum, Approval of Minutes and Agenda

In this virtual meeting the quorum was performed with the WebEx pooling system. According to the poll results total attendance were 231. Members attendance was 98. And 39 requested membership. However, the polling results with the names was lost. Please contact the Chair or the Secretary if you had requested membership.

Attendance Summary

	Webex
Total Attendees	231
Total # Of Members	137
Members Present	98
Quorum Present	YES (71.5%)

The virtual DTSC meeting had quorum.

The chair presented the agenda, and it was unanimously approved.

The minutes of the Fall 2019 meeting at Columbus meeting was approved unanimously.

B.3 Taskforce and Working Group Reports

B.3.1 Working Group Low-Frequency Dielectric Testing for Distribution, Power and Regulating Transformers

Unapproved Meeting Minutes
Virtual - WebEx | October 20th, 2020 | 9:25 – 10:40 AM CDT

Chair: Dan Sauer

Vice Chair: -

Secretary: -

Meeting Attendance

The working group met at 9:30am. There were 94 attendees and 13/36 members present. Quorum was not achieved.

Attendance

	WebEx
Total Attendees	94
Total # Of Members	36
Members Present	13
Quorum Present	36.1%

Discussions

- No essential patent claims noted.
- The IEEE copyright policy was shown, no objections were noted.
- The chair noted that the WG is currently seeking a secretary.
- The agenda of the Fall 2020 meeting and the minutes of the Fall 2019 meeting were not approved due to lack of a quorum.

Old Business

- Section 6 –Induced Testing.
 - Class 1 induced testing was reviewed, the wording “winding to ground appears twice, once is sufficient. The draft will be updated accordingly.
 - The 3.46x + 1000V not to exceed applied levels for single bushing transformers and wye connected and grounded three phase transformers is not addressed. Gary King agreed to provide further info on this type of testing.
 - Class 2 induced testing with PD was extensively reviewed by Bertrand.

- 200% nominal system voltage info to be removed from class 2 wording and the draft will be updated accordingly.
- The tables & graphs for the PD info are to be side by side
 - Such as 6.3.20 & 6.3.21
 - Also 6.3.30 & 6.3.31
 - Also 6.3.36 and so forth
 - The draft will be reviewed and corrected as needed
 - The draft will be reviewed to ensure that formatting in the document follows what was sent by Bertrand
- Time ran out before a review of the two submitted sections for insulation power factor could be reviewed.
 - These will be circulated via email by the chair for review

New Business

- There was a request by Raja Kuppaswamy to include information in the document on PD pattern recognition. Time ran out before this business could be discussed. The chair agreed to circulate this info to the members & guests for review
- The chair mentioned that the PAR is valid until December 2022, and with that in mind the document should be finalized at the Spring meeting and sent to ballot to permit time to resolve any negative comments.

Meeting adjourned without a motion as time ran out.

Dan Sauer



20

F20 Update: WG PC57.168 LF Di-Test Guide

Quorum: Not Achieved Agenda: Not approved MOM: Not Approved. Will try to approve via email.

Highlights:

- Discussed Induced Testing for Distribution/Class 1, and Induced/PD Testing for Class 2 transformer.
- Submissions were received for Power Factor testing, these will be circulated via email once copyright info has been secured
- New Business on PD patterns – we ran out of time. This will be circulated via email.
- Looking to finalize draft by Spring meeting and then proceed to Ballot

Role	First Name	Last Name	Company
Guest	Dennis	Marlow	DenMar TDS Transformers
Guest	Jerry	Murphy	Reedy Creek Energy Services
Member	William	Boettger	Boettger Transformer Consulting LLC
Guest	Barry	Beaster	H-J Enterprises, Inc.
Member	Bertrand	Poulin	Hitachi ABB Power Grids
Member	Stephen	Jordan	Tennessee Valley Authority
Guest	Gary	King	Howard Industries
Guest	Stephen	Antosz	Stephen Antosz & Associates, Inc
Guest	Loren	Wagenaar	WagenTrans Consulting
Guest	Donald	Ayers	Ayers Transformer Consulting
Member	Wallace	Binder	WBBinder Consultant
Guest	Philip	Hopkinson	HVOLT Inc.
Guest	Christopher	Baumgartner	We Energies
Guest	Christoph	Ploetner	Hitachi ABB Power Grids
Guest	Alain	Bolliger	HV TECHNOLOGIES, Inc.
Guest	Reto	Fausch	RF Solutions
Guest	Michael	Haas	Instrument Transformers, LLC
Guest	Robert	Ganser	Transformer Consulting Services, Co.
Guest	Thang	Hochanh	Surplec Inc.
Guest	Waldemar	Ziomek	PTI Transformers
Guest	Vinay	Mehrotra	SPX Transformer Solutions, Inc.
Guest	Eric	Davis	Burns & McDonnell
Member	Shibao	Zhang	PCORE Electric
Guest	David	Wallach	Duke Energy
Guest	Stephen	Shull	BBC Electrical Services, Inc.
Guest	Dharam	Vir	SPX Transformer Solutions, Inc.
Guest	Abderrahmane	Zouaghi	Hitachi ABB Power Grids
Member	John	Herron	Raytech USA
Guest	Rodrigo	Ocon	Industrias IEM
Guest	Hakan	Sahin	Independent
Guest	Eric	Weatherbee	PCORE Electric
Member	Brian	Penny	American Transmission Co.
Guest	Shamaun	Hakim	WEG Transformers USA Inc.
Member	Daniel	Blaydon	Baltimore Gas & Electric
Guest	Xose	Lopez-Fernandez	Universidade de Vigo
Chair	Daniel	Sauer	EATON Corporation
Guest	Aleksandr	Levin	Weidmann Electrical Technology
Member	Ajith	Varghese	SPX Transformer Solutions, Inc.
Guest	Baitun	Yang	R.E. Uptegraff
Guest	Jeffrey	Schneider	EATON Corporation

Role	First Name	Last Name	Company
Guest	Ali	Naderian	Metsco
Guest	Shankar	Nambi	Bechtel
Guest	Jos	Veens	SMIT Transformatoren B.V.
Guest	Leopoldo	Rodriguez	Transformer Testing Services LLC
Guest	Thomas	Melle	HIGHVOLT
Guest	Mark	Lachman	Doble Engineering Co.
Member	Fernando	Leal	Prolec GE
Guest	Ronald	Hernandez	Doble Engineering Co.
Guest	Aniruddha	Narawane	Power Distribution, Inc. (PDI)
Guest	Steven	Brzoznowski	Bonneville Power Administration
Member	Detlev	Gross	Power Diagnostix
Guest	Kushal	Singh	ComEd
Guest	Christopher	Whitten	Hitachi ABB Power Grids
Guest	Markus	Schiessl	SGB
Guest	Rhett	Chrysler	ERMCO
Member	Christopher	Slattery	FirstEnergy Corp.
Guest	Anthony	Franchitti	PECO Energy Company
Guest	William	Larzelere	Evergreen High Voltage
Guest	Anand	Zanwar	Siemens Energy
Guest	Tim-Felix	Mai	Siemens Energy
Member	Jorge	Cruz	PTI Transformers
Guest	Jinesh	Malde	M&I Materials Inc.
Member	Dr. Alexander	Winter	HIGHVOLT Pruftechnik Dresden
Guest	Trevor	Mattson	Schweitzer Engineering Labs
Guest	Dominique	Bolliger, Ph.D.	HV TECHNOLOGIES, Inc.
Guest	Raja	Kuppuswamy	Dynamic Ratings, Inc.
Guest	Malia	Zaman	IEEE
Member	John	Foschia	SPX Transformer Solutions, Inc.
Member	Cihangir	Sen	Duke Energy
Member	Janusz	Szczechowski	Maschinenfabrik Reinhausen
Guest	Brady	Nesvold	Xcel Energy
Guest	Nikolaus	Dillon	Dominion Energy
Member	George	Partyka	PTI Transformers
Guest	Nitesh	Patel	Hyundai Power Transformers USA
Guest	Pouneh	Davoudi	Delta Star Inc.
Guest	Ion	Radu	Hitachi ABB Power Grids
Guest	Duvier	Bedoya	Hitachi ABB Power Grids
Guest	David	Calitz	Siemens Energy
Guest	Sergio	Hernandez Cano	Hammond Power Solutions
Member	Moonhee	Lee	Hammond Power Solutions

Role	First Name	Last Name	Company
Guest	Joaquin	Martinez	Siemens Energy
Guest	Kyle	Stechschulte	American Electric Power
Guest	Shawn	Gossett	Ameren
Guest	Afshin	Rezaei-Zare	York University
Guest	Yaquan (Bill)	Li	BC Hydro
Guest	Megan	Eckroth	EATON Corporation
Guest	Duy	Vo	Central Maine Power (AVANGRID)
Guest	Albert	Sanchez	Knoxville Utilities Board
Guest	Vincenzo	Pagliuca	Hartford Steam Boiler
Guest	Dinu	Amarasinghe	Bruce Power

B.3.2 WG C57.113 - Recommended Practice for PD Testing,**Ali Naderian – Chair, Janusz Szczechowski – Vice Chair****John Foschia – Secretary****VIRTUAL MEETING | October 19th, 2020 | 10:10am – 11:35am ET****Chair:** Ali Naderian**Vice Chair:** Janusz Szczechowski**Secretary:** John Foschia**Meeting Attendance**

The working group met at 10:10am ET. There were 92 attendees and 15/38 members present. Quorum was not achieved to conduct official business.

Discussions

- No essential patent claims or copyright violations noted.
- Two separate polls were conducted in the online platform and confirmed a lack of quorum.
- The membership and participant lists were compared and confirmed a lack of quorum.
- The chair informed the working group of the recent passing of Dr. Jitka Fuhr and acknowledged her contributions to the field.
- It was noted that the current PAR expires December 2021.
 - Pending electronic approval of the WG, a 1 year PAR extension will be requested.
- It was noted that C57.124 has the same issues as C57.113 in that it is outdated and needs to be revised.
 - There was concern on whether the WG needs to approve the sharing of content between working groups. If so, the WG will seek electronic approval of the sharing of this content.
- There was commentary about a few of the items that should be modified within section 4 of the guide.
 - Programmable gain amplifier vs. attenuator
 - Time constant of 440 ms
 - Averaged pulse trains vs weighted
 - Calibration linearity when calibration signal is close to the noise floor.
 - Removal of Annex A
 - Raja K. disagreed with the removal of this Annex based on his experience.
 - Modifications to description of PD calibration equipment
 - Modifications to the scale factor language.
- Concern was brought up regarding the references to IEC 60270 because of copyright concerns and frustration of IEEE users not having access to an IEC document.
 - IEEE SA noted that we can extract 10% of the material without generating copyright issues.
 - Malia Zaman provided the following commentary:

- If its normative and in the body of the standard then it should be extracted and copyright permission should be requested, but if its informative, then you can reference it.
- Normative references are those documents that contain material that must be understood and used to implement the standard. Thus, normative references are indispensable when applying the standard. Each normative reference shall be cited in normative text and the role and relationship of each referenced document shall be explained in the body of the standard. If a reference is not specifically cited in the normative text of the document, then it shall not be listed in the normative references clause. In such cases, it shall be listed in the first or final informative annex, titled Bibliography [see item g) below]
- If the standard is intended for international adoption, the working group should consider requirements for normative references by international organizations, such as the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). These requirements may include procedures for justification of normative references that are not international standards. Contact IEEE-SA content publishing staff for information about specific requirements.11:01
- The chair asked the WG about their opinions on using a standardized form of PD patterns.
 - It was noted that the patterns are not explicitly stated in the PAR and that the C57.113 guide may be better off speaking to the usefulness of PD patterns instead.
 - The SCDT chair noted that the reference PD patterns may be best placed in the C57.168 low frequency dielectric test guide which is currently being developed.
- The meeting was adjourned at 11:35am ET without a motion.

John Foschia

Attendance WG C57.113

Participant	Name
1	Evgenii Ermakov
2	Mihai Huzmezan
3	Bill Li
4	Hakan Sahin
5	t901ajf
6	Jeff Benach
7	D Gross
8	Muhammad Ali Masood Cheema

9	suresh babanna
10	Susan
11	Michael A. Franchek
12	Dwight Parkinson
13	John Reagan
14	Ali Naderian
15	Raja Kuppuswamy
16	Dinesh Sankarakurup
17	david.larochelle
18	Jeff Door
19	Deniss Villagran
20	Dave
21	Hossein Nabi-Bidhendi
22	mfg18
23	Alexander Winter
24	Alexander Winter
25	miman
26	Erich Buchgeher
27	Tom Melle
28	Ajith Varghese (SPX, Waukesha)
29	George Jr Partyka
30	John Foschia
31	John Herron
32	John Herron
33	J.Dennis Marlow
34	David Calitz (Guest)
35	Pragnesh Vyas
36	Dominique Bolliger
37	Kiran Vedante
38	William Boettger
39	Edmundo Arevalo
40	ANIL SAWANT
41	Wallace Binder
42	Marco Espindola
43	Feras Fattal
44	Bertrand Poulin
45	Sergio Hernandez Cano
46	akash joshi
47	cjp
48	Troy Tanaka
49	Deepak kumaria

50	Anastasia O'Malley
51	Jacques Vanier
52	Shiva Rampersad
53	Yves Vermette
54	Ramon Benedict
55	Kayland Adams
56	Brian Penny
57	Jaroslaw Chorzepa
58	Ross McTaggart
59	shamaun Hakim
60	Parminder
61	Zoltan Roman
62	Tammy Behrens
63	Dejan Vuković
64	Nik Dillon
65	Nick Kostich
66	Fernando Leal
67	Chris Baumgartner
68	Nitesh Patel
69	Nitesh Patel
70	Waldemar Ziomek
71	Waldemar Ziomek
72	Waldemar Ziomek
73	Rodrigo Ocon
74	David Murray
75	Wayne
76	Wayne
77	Wayne
78	Malia Zaman
79	Polo Rodriguez
80	DANIELA EMBER BACIU
81	Shawn Gossett
82	Kris Neild
83	Robert Ganser
84	Nabi Almeida
85	WILLIAM LARZELERE
86	USDUBED
87	Dharam Vir
88	Steve Jordan
89	Feras Fattal
90	bill griesacker

91	Evgenii Ermakov
92	Saramma Hoffman
93	Marcos Ferreira
94	Darrell Banks
95	Darrell Banks
96	Darrell Banks
97	Darrell Banks
98	Jeremiah Bradshaw
99	Gael R Kennedy
100	James Mclver
101	Reto Fausch
102	Brady Nesvold
103	Joe Watson
104	David Murray
105	Kyle Stechschulte
106	Janusz Szczechowski
107	Janusz Szczechowski
108	Lee Tyler
109	Steve Brzoznowski
110	Steve Snyder
111	Anand Zanwar
112	Larry Dix
113	Dale
114	Doug McCullough
115	Peter Kleine
116	Eric Schleismann
117	Cihangir John
118	Derek Hollrah
119	Rod Sauls
120	Moonhee Lee
121	Don Dorris
122	Don Dorris
123	Balakrishnan
124	Balakrishnan
125	mark lachman
126	OAvanoma
127	janet
128	janet
129	janet
130	Danny Schwartz
131	Virtual Events PSAV

F20 Update: WG C57.113 PD Measurement Guide

Quorum: **Not achieved**

MOM & Agenda: **Will seek electronic approval**

Highlights:

- ❖ No official business conducted in the absence of quorum.
- ❖ Further updates to section 4 and 5 of the guide were presented.
- ❖ Discussion was held regarding the frequent references to IEC 60270, users opinions, and copyright considerations.
- ❖ Potential for the removal of phase-resolved PD patterns to include in the new C57.168 (currently in development)



B.3.3 Working Group for Impulse Guide – PC57.98

WG Secretary: John Foschia; WG Chair: Thang Hochanh; WG Vice Chair: Reto Fausch
VIRTUAL MEETING | October 19th, 2020 | 1:55pm - 3:10pm ET

Chair: Thang Hochanh

Vice Chair: Reto Fausch

Secretary: John Foschia

Meeting Attendance

The working group met at 1:55pm. There were 78 attendees and 11/33 members present. Quorum was not achieved to conduct official business.

Discussions

- No essential patent claims or copyright violations noted.
- Two separate polls were conducted in the online platform and confirmed a lack of quorum.
- The membership and participant lists were compared and confirmed a lack of quorum.
- The chair proposed text for two new subsections of the guide, specifically under section 4.1.2.1, ‘The transformers’ effect on the waveshape.’ (*See attached*)
 - The two sections’ proposed titles are as follows:
 - Test voltage factor procedure when performing chopped wave
 - Test voltage factor procedure and presentation of test results.
- The working group discussed the proposed text at length, yielding the following notes:
 1. The guide cannot specify requirements it can only reference standards and how to comply with the standards.
 2. Standard 4 recommends a level of overshoot of 5% and 10% if k-factor is used, but leaves it to the specific apparatus committees to determine limitations for their respective standards.
 3. The present version of C57.12.90 does mention overshoot handling for chopped waves (front or tail chopped).
 4. It was mentioned during the meeting, that in C57.12.90, any level of overshoot is allowed, provide that the front time does not exceed 2.5 microseconds.
 5. Most software does not display the value of the maximum value recorded during the test. The display voltage is only the corrected voltage when the k-factor function is enable. However, it is said that the peak voltage can be measured on the oscillogram.
- The chair of the SC for Dielectric Test asked if the distribution impulse guide could be included in C57.98. The WG chair agreed. No further discussion was held on the subject.
- The WG chair agreed to revise the text within the scope of a guide.

Adjournment

The meeting was adjourned at 3:10pm ET without a motion.

John Foschia

Attendance WG PC57.98

Participant	Name
1	Bill Li
2	Reto
3	Anand Zanwar
4	Ajith Varghese (SPX, Waukesha)
5	Mike Spurlock
6	Parminder
7	Leopoldo Rodriguez
8	Sam T. Reed
9	mark lachman
10	deepak kumaria
11	general session
12	general session
13	wziomek
14	Kyle Stechschulte
15	Ross McTaggart
16	Sergio Hernandez Cano
17	Joseph Tedesco
18	Edmundo Arevalo
19	Sylvain Plante
20	Kris Zibert
21	Steve Snyder
22	Pouneh Davoudi
23	Kiran Vedante
24	Kyle Heiden
25	Donald Ayers
26	Ryan Bishop
27	Shiva Rampersad
28	John K John
29	Jos Veens
30	Thang Hochanh
31	Jeffrey Schneider
32	Mike Spurlock
33	hossein
34	yang baitun
35	Chris Powell
36	Rod Sauls
37	Dominique Bolliger
38	Jeremy Johnson

39	Colby Lovins
40	J.Dennis Marlow
41	Darrell Banks
42	Megan Eckroth - Eaton
43	Dejan Vuković
44	Susan
45	Jim McBride
46	bill
47	Jorge Cruz
48	Bertrand Poulin
49	Curtiss Frazier (Ameren)
50	Danny Schwartz
51	DANIELA EMBER BACIU
52	Shawn Gossett
53	Shawn Gossett
54	Peter Kleine
55	HAKAN
56	John Foschia
57	Neil Strongosky
58	Neil Strongosky
59	pblaszczyk@transformercomponents.com
60	Mana Yazdani
61	Tim-Felix Mai
62	Juan Pablo Andrade Medina
63	Feras Fattal
64	Rodrigo Ocon
65	Justin PSAV
66	WILLIAM LARZELERE
67	XOSE M. LOPEZ-FERNANDEZ
68	Jacques Vanier
69	John Sinclair
70	Peter Balma
71	David Calitz (Guest)
72	David Wallach
73	Ken Klein
74	Mike
75	Jaroslav Chorzepa
76	Kyle Heiden
77	ray54162
78	Feras Fattal
79	edavis

80	edavis
81	Pierre Riffon
82	USDUBED
83	Saramma Hoffman
84	Malia Zaman
85	Hemchandra Shertukde
86	Hemchandra Shertukde
87	Gael R Kennedy
88	chuckj
89	Mark Perkins
90	Jonathan Reimer
91	Rudolf Ogajanov
92	Fernando Leal
93	shamaun Hakim
94	susan bonfiglio
95	t901ajf
96	t901ajf
97	Michael A. Franchek
98	yvermette@hubbell.com
99	zweiss
100	Sam T. Reed
101	Alan Washburn
102	Mike Warntjes
103	Alexander Winter
104	Brandon Dent
105	ANIL SAWANT
106	Brian Sonnenberg
107	HV Sales

10/19/2020 Proposed Text - IEEE WG Revision of C57.98 Guide for Transformer Impulse Tests

4.1.2.1 The transformer effect on the waveshape

Remove "Large transformers in IEEE Std 4".

4.1.2.1.1 Waveshape with overshoot (peak oscillations) and test voltage factor procedure

In IEEE Std-4-2013 clause 8.2.1.1 and Annex A, when an lightning impulse waveshape shows an relative overshoot B' , it is recommended to limit B' to 10% for HV apparatus. In impulse testing for transformers and reactors, due to low winding inductance and/or high surge capacitance, it is recommended to proceed with the test when the test circuit is optimal and the test voltage procedure is enable. For test voltage factor procedure and chopped wave, see clause 4.2.2.1.

NOTE – In case of an high B' value and an overshoot frequency above 500 kHz, the test voltage procedure reduce the test voltage value V_t significantly against the recorded peak value V_e . This may lead to higher electrical stress and possible breakdown of the insulation system.

For lightning impulse tests on transformers and reactors, a manual evaluation of the test function procedure is not reliable. A test laboratory who does not have the Test function procedure available, should inform the customer at the stage of quotation.

4.1.2.1.1 Test voltage factor procedure when performing chopped wave

In general, for liquid immersed transformers the chopped wave is 110% of the full wave, while in Dry-type transformers, the chopped wave is 100%. The test voltage procedure evaluation of a chopped wave of 110% of the wave, should give a peak value of 110% of the full wave.

When the test voltage procedure calculation of V_t is inconsistent, the following steps are recommended:

- a) Front chopped wave lightning impulse:
There is no correction and V_t is equal to V_e .
- b) Tail chopped lightning impulse:
Voltage reduction ratio Method (IEEE Std 4TM 2013, Annex A)
 - Apply a reduced full wave (RFW)
 - The test voltage procedure provide the test voltage V_t and the peak value V_e of the original recorded curve.
 - If V_e is not available, V_e can be determined graphically on the recorded oscillogram
 - Calculate the voltage reduction ratio $R_v = V_t / V_e$
 - Apply a full voltage chopped wave, having a recorded voltage $V'e$.
The calculate $V't$ is defined as:
 $V't = R_v * V'e$
- c) The value of front time T_1 of the reduced full wave (RFW) is used to determine the T_1 value of the chopped wave.

4.1.2.1.2 Test voltage factor procedure and presentation of test results

When the test voltage procedure is enable, the following test results should be displayed:

- V_t is the test voltage
- β' is the relative overshoot magnitude

The following optional value should be available for display:

- V_e the peak value of the original noise free recorded curve.

F20 Update: WG C57.98 Impulse Test Guide

Quorum: **Not achieved**

MOM & Agenda: **Will seek electronic approval**

Highlights:

- ❖ Two clauses was written to be incorporated into the actual guide about the use of k-factor.
- ❖ After discussion within the working group, it was agreed that this subject in the guide should refer to the standard for the mandatory use of the k-factor function.
- ❖ It was requested at the previous meeting from members to provide examples of lightning impulse oscillograms with overshoot on the peak. There are no feed-back on this subject.

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**B.3.4 Working Group for PD in bushings, PTs and CTs – PC57.160, WG Secretary: Reto Fausch; WG Chair: Thang Hochanh -Meeting Minutes:
VIRTUAL MEETING | October 20th, 2020 | 3:45pm - 5:00pm CT**

Meeting Attendance

The working group met at 3:45pm.

There were 45 attendees, 16 members 22 Guests, 7 requested membership, 8 no answers to the survey.

Quorum was not achieved to conduct official business.

Discussions

- No essential patent claims or copyright violations noted.
- A large portion of the discussion was on PD Pattern samples to be included in the guide
 - Detlev Gross did some explanations on the patterns he graciously supplied to be included in the guide.
 - Raja Kuppuswamy wanted some more text for clarification purposes, so he will supply text and additional samples to be included.
 - Bruno Mansuy ask the question sample pattern “void in epoxy resin” may not exactly reflect what is seen on that sample.
- The ballot submitted had an approval rate of 84% (min. required is 75%). Due to a high number of comments, the chair had to respond to comments before submitting to the CRG.
- The WG chair mentionned that Pierre Riffon is not present but accepted to chair the CRG.

Quorum

- We had no quorum.

Additional contribution with samples (PRPD patterns) will come from :

- Raja Kuppuswamy
- Zoltan Roman

There are several members volunteering to be on the comments resolution group (CRG)

Detlev Gross
 Dave Wallace
 Bruno Mansuy
 Ferras Fattal
 Reto Fausch
 Jonathan Deverick as English language editor
 Deepak Kumaria, as English language editor

Adjournment



The meeting was adjourned at 4:55pm ET, without a motion.

Reto Fausch, Secretary PC 57.160

WG C57.160 PD Guide Bushings/PTs/CTs

- ❖ PC57.160 was submitted to ballot and the approval rate is 84% (min. required is 75%). Due to the high number of comments I had respond to each of the comments and adjust the draft before submitting it to the CRG (Comments Resolution Group).
- ❖ Pierre Riffon has agreed to Lead the CRG. Pierre is not present at the meeting and Pierre message to the CRG, is that Pierre will contact them as soon as he has completed the revision of the document and answers to comments.
- ❖ At least two new individuals has requested to be part of the CRG. Actual number of the CRG is 17.
- ❖ The WG has discussed on the Annex A and the inclusion of the PRPD patterns. There were several questions about the accuracy of the patterns.

At the end and we all agree that we still leave the Annex A as is and several members presents have also propose to provide their own patterns to be included in the revision.

Attendance WG C57.160

this is imported from PSAV polling

Q1.What is your Membership Status?

Answers Results %

A Member 11/48 23

B Guest 22/48 46

C Guest Requesting Membership 7/48 15

No Answer 8/48 17

marked as Members but not on Member List

present from Memberlist

First Name	Last Name	Company Name	Member		
			A	B	C
hossein			X		
Mubarak	abbas			X	
Duvier	Bedoya			X	
Lee	Bigham	Instrument Transformer Equip Corp			
JD	Brafa,			X	

Steve	Brzoznowski	Bonneville Power Administration		X	
Jonathan	Cheatham	General Electric	X		
Jaroslav	Chorzepa			X	
HUAN	DINH			X	
Jeff	Door			X	
Wayne	Ellis				
DANIELA	EMBER	Hydro-Quebec IREQ		X	
Eric	Euvrard			X	
Feras	Fattal	Manitoba Hydro		X	
Reto	Fausch	RF Solutions			X
Marcos	Ferreira	Advisian-Worley Parsons			X
John	Foschia			X	
Shawn	Gossett			X	
Detlev	Gross	Power Diagnostix	X		
Thang	Hochanh	Surplec Inc.		X	
Derek	Hollrah			X	
Jeremy	Johnson				
Marek	Kornowski	Polycast International			
deepak	kumaria				X
Raja	Kuppuswamy	Dynamic Ratings, Inc.	X		
Fernando	Leal	Prolec GE		X	
Bruno	Mansuy	Trench France SAS		X	
Trevor	Mattson			X	
Ross	McTaggart	Trench Limited	X		
Bob	Middleton	RHM International	X		
Stephen	oakes	WEG Transformers USA Inc.	X		
Juan Jose	Ramirez Gamez		X		
Diego	Robalino	Megger		X	
general	session				
Thomas	Sizemore	ABB Inc.	X		
Steve	Snyder	Hitachi ABB Power Grids	X		
Janusz	Szczechowski	Maschinenfabrik Reinhausen			X
Jacques	Vanier	Electro Composites ULC		X	
Yves	Vermette	Electro Composites ULC		X	
David	Wallace	Mississippi State University	X		
Eric	Weatherbee	Knoxville Utilities Board	X		
Daniel	Weyer				X
Bill	Whitehead	Siemens Energy			X
Christopher	Whitten				
Roman	Zoltan		X		

B.3.5 Task Force for Bushing DFR – PC57.12.200, TF Secretary: Diego Robalino; TF Chair: Poorvi Patel; TF Vice Chair: Charles Sweetser

The TF did not have a virtual meeting this Fall 2020 meeting.

WG meeting is scheduled for 13th of November in China

Below are the highlights of the progress so far.

In Spring of 2021 the guide would be ready for balloting.

TF C57.200 Bushing DFS– P. Patel

Quorum: N/A MOM: N/A Agenda: N/A

Highlights:

- ❖ The TF did not meet this Fall- meeting
- ❖ A TF meeting was held on March 25th – Review and address comments of draft Rev. 4 of the Guide.
- ❖ The comments and revision has been addressed and a Rev. 5 was sent out to the members Mid- October.
- ❖ The Guide is about 80% complete.
- ❖ A WG meeting is planned for 13th of November to complete the document. WebEx information will be sent out to members as we get closer to the WG meeting.
- ❖ The Guide should be ready for Ballot at Spring 2021 meeting.

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B.3.6 TF on Revision of Low-Frequency Tests**Virtual Meeting – October 20, 2020 1:55 p.m,****Chair: Bill Griesacker, Vice Chair: Daniel Blaydon (acting secretary), Secretary: Myron Bell.**

1. The meeting was called to order at 1:56 PM.
2. A poll was conducted via Webex to determine whether a quorum was present. Based on the preliminary results, a quorum was achieved.

Attending members were counted and quorum was verified by the Webex Report, which is provided in summary below:

Attendance	
	Webex
Total Attendees	94
Total # Of Members	62
Members Present	39
Quorum Present	YES

3. The chair requested the working group to approve the the meeting agenda. There were no objections to unanimous approval of the agenda.
4. The chair requested the working group to approve the meeting minutes from the 2019 Fall Transformers Committee meeting held in Columbus, Ohio. There were no objections to unanimous approval of the meeting minutes.
5. Task Force on PD Testing of Class 1 Power Transformers report by Don Ayers (Appendix A – Meeting Minutes)

Don provided a summary report on the Task Force meeting that occurred on Monday, October 19th. A quorum was achieved at the meeting. A motion was made that when PD testing is specified for Class I Power Transformers that this test should be conducted in accordance with the procedure and PD limits for Class II power transformers as defined in C57.12.00 and C57.12.90. The motion passed.

Following this, a motion was made that PD measurements should only be taken on the terminals with the highest voltage rating. This motion passed.

6. Review of Survey Results for PD Limits in Factory Testing
The chair reviewed the history of this survey and results. The chair inquired about the next steps for inclusion of the other revisions to this section of the test code besides the previously established PD limits. The chair opened the floor to

discussion and suggested the formation of an additional task force to address the additional proposals for PD factory testing.

A motion was made by Bertrand Poulin and seconded by Dan Sauer to “Form a study group for the further development of the Class II power transformer partial discharge testing procedure and limits”. There was no objection to unanimous approval of the motion. These additional developments would be for the next revision of the C57.12.90 standard after the current revision is published.

7. Review of Survey Results for PD in Bushings During Transformer Factory Testing

The chair reviewed the history of this survey and provided a detailed summary of the results and comments received. A discussion was held with various individuals providing feedback on their experience with venting bushings during factory testing. It was stated that factory testing conditions are different from service conditions since the voltage is higher during the induced voltage test. The chair will summarize the survey results and send to the task force.

The chair noted that the meeting time had expired and that additional discussion will occur at the next meeting.

8. Old business

None.

9. New business

None.

10. The meeting was adjourned at 3:10pm.

F20 Update: TF Revision to Low Frequency Test

Quorum: Achieved MOM: Approved Agenda: Approved

- TF Class I PD Test – Looking to using Class II procedure and limits
 - Passed Motion: “When PD testing is specified for Class I Power Transformer, this test should be carried out as defined in C57.12.00-2015, and the PD limit shall be as stated in C57.12.90-2015.”
- Factory PD Limits – Motion approved to form new Study Group
- PD in Bushings – Reviewed survey on proposed statement



B.3.7 Task Force Winding Insulation Power Factor & Winding Insulation Resistance Limits, Diego Robalino (Chair) and Aniruddha Narawane (Secretary) at the meeting

Minutes of Meeting held on 10.20.2020: Virtual Meeting via WebEx

1. Meeting was called to order at 8.00 am by Chairman Diego Robalino
2. Chairman checked for any patents and copy rights and there were none
3. There were 25 members present out of 41. Based on the attendance, quorum was established.
4. Agenda was approved Unanimously.
5. Minutes of Fall 2019 meetings were approved Unanimously.
6. Chairman presented the data slides containing data from about 148K samples received by IEEE.
7. Questions were asked about the data samples relative to type of fluid if the data was from transformers with mineral oil or it also contained alternate fluids. Chairman responded that majority of the data was based on mineral oil transformers with some from transformers with alternate fluids.
8. Mentioned that for Class-II transformers difference between FAT and Field test values is not significant.
9. It was asked if the data was only for FAT or contained both FAT and Field. Chairman responded that it contained both. Chairman also mentioned that the data provided to the group was filtered out based on the data temperature range being close to the recommended temp range per IEEE C 57.12.90 from the total 148K data points received.
10. Chairman mentioned it is time to discuss if the group would like to discuss about accepting the data to submit it to subcommittee.
11. There was discussion about PF testing data provided by manufacturers at test temperature v/s the standard temperature. It was discussed that in absence of accurate conversion techniques for temperature it would be better to provide the test data and the temperature at which test was carried out as long as the test is carried out at a temperature which is in the range specified by IEEE C57.12.90.
12. Mr. Kumar Mani Moved the motion to “Accept the data presented and submit it to the Dielectric Tests Subcommittee” The motion was voted and carried with 30 voting for, 1 against and 7 Abstaining.
13. Chairman mentioned that between this and Spring 2021 meeting a report will be formulated to be submitted to subcommittee and requested for volunteers. Mario Locamo, Don Dorris, Lorne Gara, Zan Kiparizoski, Davis Wallach Volunteered. Chairman mentioned to communicate with himself or the secretary Aniruddha Narawane if more members/guests are interested to participate in formulating the report.
14. During the discussion, the issue of temperature influence on the data presented called for use of the additional data and show average variation of PF values by temperature and to collect this information into a paper to be published for general information of the industry.
15. Meeting was adjourned at 9.14 am.
- 16.

Annex A: attendance from PSAV report

Taking into account several duplicates (in/out/in) probably due to internet connection issues and taking away those attending less than 15 min, the total number of attendees to this meeting based on PSAV report is 96.

Annex B:

Quorum established. As reported by PSAV at the beginning of the meeting, out of 77 responding to the question, 25 were members attending the meeting. Total members in this TF is 41. Therefore, quorum was established with 61% attendance of TF members.

A.Member	25/77 (32%)
B.Guest	39/77 (51%)
C.Guest Requesting Membership	10/77 (13%)

Annex C: Relevant chat recorded during the meeting

from Timothy Raymond to everyone:

If the intent is to place a limit on _factory_ test values for insulation power factor, I think that is inappropriate. There are more appropriate factory acceptance tests for verifying insulation integrity. I don't see the added value or appropriateness in adding a limit. I understand that's a follow on discussion.

from David Wallach to everyone:

I personally like a presentation of histograms from a large database in a guide, with no limit, to let users decide what is limiting and also for evaluation during future maintenance.

from David Wallach to everyone:

We've collected data and created a method to store data with IEEE-SA which is HUGE.

from Don Dorris to everyone:

I studied our own Class II transformers for the past 50 years. From our data and the data I saw you could easily establish pf guidelines. Core, shell, auto etc.,

from Poorvi Patel to everyone:



Thanks Diego... good source of data for further analysis

26

TF Winding Insulation PF/Resistance Limits



Minutes of the meeting

Virtual Meeting
October 20, 2020
TF Chair: Diego Robalino (MEGGER)
TF Secretary: Aniruddha Narawane (PDI)

27

- Meeting was called to order at 8.00 am
 - Quorum Present = 25 members out of 41 listed
 - Number of attendees = 81
- No report received from PSAV yet
- Agenda for F20 meeting and minutes from F19 were unanimously approved.
- Total of 148k samples were collected by IEEE SA and data was presented following the recommendations of the TF during F19 meeting
- Data and analysis was reviewed by a group of volunteers (20) on a special meeting carried out on-line on March 03, 2020
- With the revisions of this group, all samples were taken for analysis and data was presented during the F20 meeting.
- Motion was raised to Approve the Data and the Analysis provided.
 - Motion was approved.
 - Discussion:
 - The material is to be presented in a formal report from this TF to the Dielectrics SC.
 - The report will include the suggested accuracy for testing equipment for PF testing
 - The report will include limits for PF
 - The report will include suggestion for IR testing and data recording.
 - SC will make recommendation for inclusion of results into an existing guide within Dielectric Test SC or other SC WG.
- Meeting was adjourned at 9.10 am.

Attendance TF Winding Insulation Power Factor & Winding Insulation Resistance Limits

Participant	Name
1	George Frimpong
2	Erich Buchgeher
3	Erich Buchgeher

4	Attila Gyore
5	Attila Gyore
6	Larry Christodoulou
7	ANIL SAWANT
8	Darrell Mangubat
9	Devki Sharma
10	Subhas Sarkar
11	Subhas Sarkar
12	Muhammad Ali Masood Cheema
13	Shiva Rampersad
14	Dinu Amarasinghe
15	Dinu Amarasinghe
16	Tony Reiss
17	Raj Ahuja
18	Cornelius Plath
19	Brady Nesvold
20	Rhea Montpool
21	Dejan Vuković
22	Drew Welton
23	general session
24	Jonathan Sinclair
25	Roger Hayes
26	Tim Rocque
27	DANIELA EMBER BACIU
28	John Lackey
29	David Wallach
30	Anthony Natale
31	Avijit Shingari
32	Zan Kiparizoski
33	Aniruddha Narawane
34	XOSE M. LOPEZ-FERNANDEZ
35	Alan Washburn
36	Zack Draper
37	Luiz Cheim
38	Anastasia O'Malley
39	Cihangir John
40	Donald Ayers
41	Guner Ismail
42	Guner Ismail
43	Guner Ismail
44	Jim Graham

45	Mario Locarno
46	Timothy Raymond
47	Donald Lamontagne
48	Derek Hollrah
49	Ali Naderian
50	Alan Sbravati
51	Zan Kiparizoski
52	Steve Jordan
53	Anand Zanwar
54	Kris Zibert
55	Poorvi Patel
56	Susan
57	Nitesh Patel
58	Samraghi Dutta Roy
59	Marco Espindola
60	Virtual Events PSAV
61	Egon Kirchenmayer
62	Egon Kirchenmayer
63	Parminder
64	Aleksandr Levin
65	vbaniroula
66	vbaniroula
67	Waldemar Ziomek
68	KUMAR
69	KUMAR
70	Wayne Ellis
71	Gary Hoffman
72	David Calitz (Guest)
73	Rob Shepherd
74	Charles Sweetser
75	Daniel Sauer
76	Jeffrey Schneider
77	Muhammad Ali Masood Cheema
78	Rodrigo Ocon
79	Fernando Saldivar
80	Zachery Weiss
81	Kris Neild
82	JS
83	Oleg Roizman
84	Ajith Varghese (SPX, Waukesha)

85	Lorne Gara
86	Kevin Biggie (Weidmann)
87	Diego Robalino
88	Diego Robalino
89	Stephanie Denzer
90	OAvanoma
91	Jorge Cruz
92	Peter Werelius
93	Roger Hayes
94	Don Dorris
95	Saramma Hoffman
96	Saramma Hoffman
97	Kyle Zemanovic
98	Pragnesh Vyas
99	David Murray
100	kushal singh
101	Lee Matthews
102	William Boettger
103	Eric Doak
104	Marc Foata
105	Fernando Leal
106	Kevin C. Sullivan
107	Kevin C. Sullivan
108	Martín Muñoz
109	Michael A. Franchek
110	Mike Waldrop
111	Michael A. Franchek
112	Ryan Bishop
113	Nik Dillon
114	Stuart Chambers
115	Jonathan Reimer
116	Evgenii Ermakov
117	Philip Miller
118	Kayland Adams
119	Kayland Adams
120	Bruce Webb
121	Joe Nims
122	David Holland
123	Kyle Heiden
124	Mickel Saad
125	Megan Eckroth

126	Balakrishnan Mani
127	Balakrishnan Mani
128	Balakrishnan

B.3.8 Task Force Transient Failure Mitigation (WG PC57.142), Jim McBride (Chair), Xose Lopez-Fernandez (Vice Chair) and Tom Melle (Secretary)

Minutes of Meeting held on 10.20.2020: Virtual Meeting via WebEx 2.30-3.35 PM Central Time

Meeting called to order at 2:25 PM Central Time. Welcome and Chair's Remarks

2) Attendance Poll was taken at 2:30 PM. 104 Attendees were present (66 Guests) 38 of 69 Members present (quorum was achieved)

3) IEEE Patent Policy Slides (no essential patent claims made)

4) Approval of Agenda without objection. Approval of Spring 2020 Meeting Minutes without objection (motion to approve by Phil Hopkinson / 2nd by Rogerio Verdolin).

5) Switchgear Liason Task Force Update – Dave Caverly, Jim McBride The WG continues to receive excellent comments since Draft 6 from Switchgear experts via the Switchgear Liason TF. Draft 8 was created to address many of the ongoing comments. The SC task force met on October 6, 2020 and reviewed changes made in D8. Additional comments have been received after the October 6th meeting which lead to Draft 8B (now circulated). The presentation and the minutes from the SLTF meetings will be posted on the WG website.

6) Status of present work (D8B) and comments – Jim McBride

It was noted the IEEE Transactions Paper developed by members of the C57.142 WG has been published and is now available on the IEEE website.

Most of the revision to the Guide is completed. However, the WG plans to file for a PAR extension, in the event the work is not completed by the end of 2021.

Draft 8B includes and address several additional comments from the Switchgear Committee. It is posted on the Transformers Committee website.

Poll Questions:

Poll Question #1 (Changes to Section 6.4 Interruption with repetitive re-ignition)

The chair reviewed comments by Dr. Edgar Dullni (Switchgear Committee). Amplification of internal transformer resonance was discussed, along with series/parallel considerations and impedances within the circuit. A motion was made by Phil Hopkinson to continue to study the data and review ABB Bland test protocol data (second by Mike Spurlock). The motion carried with 37/69 member votes. These topics will remain under discussion and other new comments will be reviewed at the next meeting.

Poll Question #2 (Delete Clause 6.6 Transformer internal voltage response)

The Chair asked if Section 6.6 remains necessary, after the addition of 6.5 and modification of other clauses. Discussion ensued whether to delete or keep Section 6.6.

A motion was made by Phil Hopkinson to keep as much of Section 6.6 as possible and continue to review and modify as necessary (second by Hemchandra Shertukde). The motion carried with 37/69 member votes.

Poll Question #3 (Change to Section 7.2 Other mitigation methods) Discussion ensued on whether to replace last paragraph of Clause 7.2 with new verbiage from Edgar Dullni. It was noted that along with prior contributions by Juliano Montanha (Siemens) and Pierre Riffon, additional mitigation methods are being discussed for inclusion in section 7.2 based on the submitted comments. Phil Hopkinson made a motion to accept the existing mitigation methods paragraph and add any new methods resulting from the meeting and future input (second by Vijay Tendulkar). The motion had no objections (*note: only 31/69 members approved in the 1 minute poll).

Poll Question #4 (Changes to Example A1) Prior to the meeting Pierre Riffon, suggested the analysis should rather refer to the clauses in the main text rather than re-describing the phenomenon . Therefore Example A1 needs a revision. Further discussion was tabled until the next meeting.

Polling question #5 (changes to example A5) It was suggested that Example A5 is not consistent and should be revised. With disconnecter switching, only the steepness of the breakdowns and the high number of breakdowns is decisive. Transformer resonances do not play a role. More information was solicited from the group and further discussion was tabled to the next meeting.

7) The mitigation methods task force had an update from Phil Hopkinson, but time ran out for a presentation. Motion was made by the chair to put Phil's presentation on the WG webpage without objection. The WG meeting slides and task force presentation have both been posted to the Transformers Committee webpage

8) New Business: none

9) Next Meeting: (Spring 2021 – Toronto, Ontario CA April 25-29)

10) Motion to Adjourn made by Hemchandra Shertukde (second by Phil Hopkinson). Meeting was adjourned at 3:35 PM without objection

Respectfully, Thomas R. Melle Secretary

Attendance

Role	First Name	Last Name	Company
Member	William	Boettger	Boettger Transformer Consulting LLC
Guest	Barry	Beaster	H-J Enterprises, Inc.
Member	Michael	Sharp	Trench Limited
Member	Steven	Snyder	Hitachi ABB Power Grids

Role	First Name	Last Name	Company
Member	Subhas	Sarkar	Virginia Transformer Corp.
Member	Bertrand	Poulin	Hitachi ABB Power Grids
Guest	Ed	teNyenhuis	Hitachi ABB Power Grids
Guest	Stephen	Jordan	Tennessee Valley Authority
Guest	Stephen	Antosz	Stephen Antosz & Associates, Inc
Guest	Loren	Wagenaar	WagenTrans Consulting
Guest	Donald	Ayers	Ayers Transformer Consulting
Guest	Dieter	Wagner	Hydro One
Guest	Jeffrey	Ray	JLR Consulting, Inc.
Member	Philip	Hopkinson	HVOLT Inc.
Guest	John	Crouse	Roswell Alliance
Guest	Axel	Kraemer	Maschinenfabrik Reinhausen
Guest	Christopher	Baumgartner	We Energies
Member	Enrique	Betancourt	Prolec GE
Guest	Christoph	Ploetner	Hitachi ABB Power Grids
Guest	Peter	Zhao	Hydro One
Guest	Michael	Haas	Instrument Transformers, LLC
Guest	Charles	Johnson	Hitachi ABB Power Grids
Member	Klaus	Pointner	Trench Austria GmbH
Guest	Robert	Ganser	Transformer Consulting Services, Co.
Member	Waldemar	Ziomek	PTI Transformers
Guest	Kumar	Mani	Duke Energy
Member	Vinay	Mehrotra	SPX Transformer Solutions, Inc.
Member	Rogério	Verdolin	Verdolin Solutions Inc.
Guest	Norman	Field	Teshmont Consultants LP
Member	Hemchandra	Shertukde	University of Hartford
Member	Ross	McTaggart	Trench Limited
Guest	Dwight	Parkinson	EATON Corporation
Guest	Shibao	Zhang	PCORE Electric
Guest	Neil	Strongosky	Memphis Light, Gas & Water
Member	Mike	Spurlock	Consultant
Chair	James	McBride	JMX Services, Inc.
Member	Dharam	Vir	SPX Transformer Solutions, Inc.
Member	Kiran	Vedante	Ritz Instrument Transformers
Guest	Rodrigo	Ocon	Industrias IEM
Member	Vijay	Tendulkar	Power Distribution, Inc. (PDI)
Vice-Chair	Xose	Lopez-Fernandez	Universidade de Vigo
Guest	Daniel	Sauer	EATON Corporation
Guest	Ajith	Varghese	SPX Transformer Solutions, Inc.

Role	First Name	Last Name	Company
Guest	Anthony	Natale	HICO America
Member	Baitun	Yang	R.E. Uptegraff
Member	Huan	Dinh	Hitachi ABB Power Grids
Member	Thomas	Sizemore	ABB Inc.
Guest	Jeffrey	Schneider	EATON Corporation
Guest	Jos	Veens	SMIT Transformatoren B.V.
Member	David	Caverly	Trench Limited
Guest	Roderick	Sauls	Southern Company Services
Guest	Egon	Kirchenmayer	Siemens Energy
Guest	Leopoldo	Rodriguez	Transformer Testing Services LLC
Member	Sukhdev	Walia	New Energy Power Co.
Secretary	Thomas	Melle	HIGHVOLT
Guest	Kevin	Sullivan	Duke Energy
Member	Weijun	Li	Braintree Electric Light Dept.
Member	John	John	Virginia Transformer Corp.
Member	Aniruddha	Narawane	Power Distribution, Inc. (PDI)
Guest	Kenneth	Harden	Schneider Electric
Guest	Patrick	Rock	American Transmission Co.
Guest	Jason	Varnell	Doble Engineering Co.
Guest	Lorne	Gara	Shermco
Guest	Michael	Frayne	Hammond Power Solutions
Guest	Andre	Rottenbacher	Ritz Instrument Transformers
Guest	Yves	Vermette	Electro Composites ULC
Guest	Kris	Zibert	Allgeier, Martin and Associates
Guest	Tim-Felix	Mai	Siemens Energy
Member	Shankar	Subramany	KEMA Labs
Guest	Feras	Fattal	Manitoba Hydro
Guest	Peter	Kleine	US Army Corps of Engineers
Member	Akash	Joshi	Black & Veatch
Guest	Malia	Zaman	IEEE
Guest	John	Foschia	SPX Transformer Solutions, Inc.
Member	Cihangir	Sen	Duke Energy
Guest	Zachery	Weiss	WEG Transformers USA Inc.
Member	Deepak	Kumaria	Hitachi ABB Power Grids
Member	Israel	Barrientos	Prolec GE
Guest	Caroline	Peterson	Xcel Energy
Guest	Joseph	Tedesco	Hitachi ABB Power Grids
Member	Kyle	Heiden	EATON Corporation
Guest	David	Calitz	Siemens Energy
Member	Sergio	Hernandez Cano	Hammond Power Solutions

Role	First Name	Last Name	Company
Member	Colby	Lovins	Federal Pacific Transformer
Guest	Brian	Sonnenberg	Instrument Transformers, LLC
Member	Moonhee	Lee	Hammond Power Solutions
Guest	Sylvain	Plante	Hydro-Quebec
Guest	Mana	Yazdani	Trench Limited
Guest	Kyle	Stechschulte	American Electric Power
Member	Afshin	Rezaei-Zare	York University
Guest	Eric	Doak	D4EnergySolutions LLC
Guest	Megan	Eckroth	EATON Corporation
Guest	Raymond	Frazier	Ameren
Guest	Alan	Washburn	Burns & McDonnell
Guest	Kayland	Adams	SPX Transformer Solutions, Inc.
Guest	Drazena	Brocilo	Google
Guest	Nicholas	Podany	Bureau of Reclamation
Guest	Adam	Smith	Commonwealth Associates, Inc.
Guest	Darrell	Banks	Memphis Light, Gas & Water
Guest	Jacques	Vanier	Electro Composites (2008) ULC
Guest	Angela	Amador	EATON Corporation
Guest	Nicholas	Walder	EATON Corporation
Guest	Dinu	Amarasinghe	Bruce Power

B.4 Liaison Reports

**IEEE High-Voltage Testing Techniques Subcommittee
Liaison Report to Dielectric Tests Subcommittee of IEEE Transformers Committee
Submitted by Jeff Britton (HVTT Subcommittee Chair)
Virtual Meeting 21st of October 2020.**

- ❖ The HVTT Subcommittee and its active working groups met virtually during the week of September 28th, 2020

Active Projects Include

- ❖ IEEE P1122 – Impulse Digitizer Standard. Draft 6 in development, revision nearly complete. PAR extended to 2022. Expected to go to Ballot in early 2021. – Chair: Jeff Britton, Phenix Technologies, Inc.
- ❖ IEEE P510 – High Voltage Safety Guide. Draft 4 in development. PAR extension to 2022 requested. Expected to go to Ballot in mid 2021 – Chair: Jeff Hildreth, Bonneville Power Administration.
- ❖ IEEE P2426 – Field Measurement of Fast Front and Very Fast Front Overvoltages in Electric Power Systems (Entity PAR). Draft 5.5 in development. PAR expires end of 2021. Expected to go to Ballot in early 2021. – Chair: Shijin Xie, State Grid Corporation China.

- ❖ WG P454 – “Guide for the Detection, Measurement and Interpretation of Partial Discharges”. Draft 1 in development. PAR expires end of 2023. – Chair: Detlev Gross, Power Diagnostix.
- ❖ WG P4.1 – “Guide for the Practical Implementation of IEEE Std 4 on High-Voltage and High-Current Measurement Systems”. Draft 1 in development. Chair: Bill Larzelere, Evergreen High Voltage.
- ❖ IEEE Std. 4 Revision to begin in 2021 – Target Date: End of 2023

Next HVTT Meetings

- ❖ Scheduled during week of January 10th, 2021 - During virtual IEEE PES Joint Technical Committee Meeting (JTCM 2021).
- ❖ Contact Jeff Britton (jeff@phenixtech.com) or Jim McBride (jim@jmxhv.com) to participate, or join the PSIM Committee 123SignUp database at: <https://www.123signup.com/maillinglist?Org=ieeee-psim>

B.5 Old/ Unfinished Business

Addition of STLI (Special Termination Lightning Impulse) to standard

- Parked till (Part of WG C57.142) TF on Risk mitigation on Transient failures presents their recommendation to DTSC

The WG is working on this. Phil has a presentation that is posted in Performance Characteristic Subcommittee site. It could be a few more meetings before it will come to the DTSC for the Impulse part.

B.6 New Business

C57.138 Recommended guide for Impulse Testing (Distribution transformers) – Standard valid 2026

The guide expires in 2026. The Chair raised a question if a PAR is needed to start a WG to start working on a revision. One opportunity is to adapt/incorporate requirement into C57.98- Impulse guide for power transformers.

There was discussion that Distribution Impulse testing is different compared to power transformer and it should be kept as either separate guide or incorporated into C57.98.

C57.98 is very good document for any kind of transformers. However, C57.138 is a good guide for higher volume transformers and therefore in some way be retained.

The Chair will reach out to the Distribution Transformer subcommittee to get their feedback and this topic will be discussed and decided on in the next DTSC meeting.

B.7 Adjournment

Meeting adjourned 12.20 PM.

Minutes respectfully submitted by:

Poorvi Patel

Secretary DTSC.

Attendance DTSC

Role	First Name	Last Name	Company
Member	Gregory	Anderson	GW Anderson & Associates, Inc.
Guest	Susan	McNelly	Xcel Energy
Guest	Dennis	Marlow	DenMar TDS Transformers
Member	Bruce	Forsyth	Bruce Forsyth and Associates LLC
Guest	James	Gardner	SPX Transformer Solutions, Inc.

Role	First Name	Last Name	Company
Guest	Bipin	Patel	Consultant
Member	William	Boettger	Boettger Transformer Consulting LLC
Guest	Timothy	Raymond	Electric Power Research Institute (EPRI)
Member	Bill	Griesacker	Duquesne Light Co.
Member	Joseph	Foldi	Foldi & Associates, Inc.
Member	Juan	Castellanos	Prolec GE
Guest	Mark	Perkins	D4EnergySolutions LLC
Member	Javier	Arteaga	ABB Enterprise Software Inc
Member	Steven	Snyder	Hitachi ABB Power Grids
Guest	Raj	Ahuja	Raj Ahuja Consulting
Guest	Dinesh	Sankarakurup	Duke Energy
Guest	Mahesh	Sampat	EMS Consulting Inc.
Member	Bertrand	Poulin	Hitachi ABB Power Grids
Member	Stephen	Jordan	Tennessee Valley Authority
Member	Emilio	Morales-Cruz	Qualitrol Company LLC
Guest	John	Lackey	PowerNex Associates Inc.
Guest	John	Lackey	PowerNex Associates Inc.
Member	Stephen	Antosz	Stephen Antosz & Associates, Inc
Guest	Loren	Wagenaar	WagenTrans Consulting
Member	Donald	Ayers	Ayers Transformer Consulting
Member	Dieter	Wagner	Hydro One
Guest	Dieter	Wagner	Hydro One
Guest	Dieter	Wagner	Hydro One
Guest	May	Wang	BC Hydro
Guest	Ali	Ghafourian	H-J Enterprises, Inc.
Guest	Ali	Ghafourian	H-J Enterprises, Inc.
Guest	Wallace	Binder	WBBinder Consultant
Member	Wallace	Binder	WBBinder Consultant
Member	Philip	Hopkinson	HVOLT Inc.
Guest	Paul	Jarman	University of Manchester
Member	Sheldon	Kennedy	Niagara Transformer
Guest	John	Crouse	Roswell Alliance
Member	Michael	Franchek	Retired
Member	Christopher	Baumgartner	We Energies
Member	Enrique	Betancourt	Prolec GE
Member	Enrique	Betancourt	Prolec GE
Guest	Christoph	Ploetner	Hitachi ABB Power Grids
Guest	Alain	Bolliger	HV TECHNOLOGIES, Inc.
Guest	Richard	Marek	Retired
Member	Peter	Zhao	Hydro One

Role	First Name	Last Name	Company
Guest	Gael	Kennedy	GR Kennedy & Associates LLC
Member	Ewald	Schweiger	Siemens Energy
Member	Reto	Fausch	RF Solutions
Member	Klaus	Pointner	Trench Austria GmbH
Member	Pierre	Riffon	Pierre Riffon Consultant Inc.
Guest	Robert	Ganser	Transformer Consulting Services, Co.
Vice-Chair	Thang	Hochanh	Surplec Inc.
Guest	Waldemar	Ziomek	PTI Transformers
Guest	Kumar	Mani	Duke Energy
Member	Vinay	Mehrotra	SPX Transformer Solutions, Inc.
Member	Eric	Davis	Burns & McDonnell
Member	Rogério	Verdolin	Verdolin Solutions Inc.
Member	Hemchandra	Shertukde	University of Hartford
Guest	Scott	Reed	MVA
Guest	James	Mciver	Siemens Energy
Member	James	Mciver	Siemens Energy
Member	Don	Dorris	Nashville Electric Service
Member	Dwight	Parkinson	EATON Corporation
Guest	Jean-Noel	Berube	Rugged Monitoring Inc.
Guest	Scott	Digby	Duke Energy
Member	J. Arturo	Del Rio	Siemens Energy
Guest	Stephen	Shull	BBC Electrical Services, Inc.
Member	Ulf	Radbrandt	Hitachi ABB Power Grids
Member	James	Graham	Weidmann Electrical Technology
Member	Roger	Hayes	General Electric
Member	Marcos	Ferreira	Advisian-Worley Parsons
Member	Mike	Spurlock	Consultant
Member	James	McBride	JMX Services, Inc.
Member	Dharam	Vir	SPX Transformer Solutions, Inc.
Member	George	Frimpong	Hitachi ABB Power Grids
Guest	Rudolf	Ogajanov	ABB Inc.
Guest	Donald	Lamontagne	Arizona Public Service Co.
Member	John	Herron	Raytech USA
Member	Peter	Werelius	Megger
Guest	Rodrigo	Ocon	Industrias IEM
Guest	Marco	Espindola	ABB Enterprise Software Inc.
Guest	Marco	Espindola	ABB Enterprise Software Inc.
Guest	Hakan	Sahin	Independent
Member	Vijay	Tendulkar	Power Distribution, Inc. (PDI)
Member	Eric	Weatherbee	PCORE Electric

Role	First Name	Last Name	Company
Member	Brian	Penny	American Transmission Co.
Guest	Shamaun	Hakim	WEG Transformers USA Inc.
Guest	Zan	Kiparizoski	Howard Industries
Guest	Jose	Gamboa	H-J Family of Companies
Secretary	Poorvi	Patel	Electric Power Research Institute (EPRI)
Guest	Juan Carlos	Cruz Valdes	Prolec GE
Member	Daniel	Blaydon	Baltimore Gas & Electric
Guest	Xose	Lopez-Fernandez	Universidade de Vigo
Member	Daniel	Sauer	EATON Corporation
Guest	Aleksandr	Levin	Weidmann Electrical Technology
Chair	Ajith	Varghese	SPX Transformer Solutions, Inc.
Member	Baitun	Yang	R.E. Uptegraff
Member	Huan	Dinh	Hitachi ABB Power Grids
Member	Mario	Locarno	Doble Engineering Co.
Member	Troy	Tanaka	Burns & McDonnell
Member	Krishnamurthy	Vijayan	PTI Transformers
	Ali	Naderian	Metsco
Member	Ali	Naderian	Metsco
Guest	Ryan	Musgrove	Oklahoma Gas & Electric
Guest	Shankar	Nambi	Bechtel
Guest	Zoltan	Roman	GE Grid Solutions
Guest	Darren	Brown	Howard Industries
Member	Diego	Robalino	Megger
Guest	Jos	Veens	SMIT Transformatoren B.V.
Guest	Roderick	Sauls	Southern Company Services
Guest	Parminder	Panesar	Virginia Transformer Corp.
Member	Egon	Kirchenmayer	Siemens Energy
Guest	Leopoldo	Rodriguez	Transformer Testing Services LLC
Guest	Saurahb	Ghosh	Transformers & Rectifiers (India) Ltd
Member	Saurahb	Ghosh	Transformers & Rectifiers (India) Ltd
Member	David	Wallace	Mississippi State University
Member	David	Murray	Tennessee Valley Authority
Member	Sukhdev	Walia	New Energy Power Co.
Member	Thomas	Melle	HIGHVOLT
Guest	Stephen	Oakes	WEG Transformers USA Inc.
Guest	John	Poelma	NRG Energy
Guest	Fernando	Leal	Prolec GE
Guest	Kevin	Sullivan	Duke Energy
Member	Weijun	Li	Braintree Electric Light Dept.

Role	First Name	Last Name	Company
Member	John	John	Virginia Transformer Corp.
Guest	Ronald	Hernandez	Doble Engineering Co.
Member	Aniruddha	Narawane	Power Distribution, Inc. (PDI)
Guest	Steven	Brzoznowski	Bonneville Power Administration
Member	Babanna	Suresh	Southwest Electric Co.
Guest	Kenneth	Harden	Schneider Electric
Guest	Anil	Sawant	Virginia Transformer Corp.
Member	Detlev	Gross	Power Diagnostix
Member	Jarrold	Prince	ERMCO
Guest	Mats	Bernesjo	Hitachi ABB Power Grids
Guest	Marc	Taylor	Cogent Power Inc.
Member	David	Larochelle	NDB Technologies
Guest	Deanna	Woods	Alliant Energy
Member	Kurt	Kaineder	Siemens Energy
Guest	Erich	Buchgeher	Siemens Energy
Member	Markus	Schiessl	SGB
Guest	Christopher	Slattery	FirstEnergy Corp.
Guest	Kristopher	Neild	Megger
Member	Jason	Varnell	Doble Engineering Co.
Guest	Jonathan	Reimer	FortisBC
Guest	Lorne	Gara	Shermco
Guest	Ismail	Guner	Hydro-Quebec
Guest	Jeffrey	Wright	Duquesne Light Co.
Member	Anthony	Franchitti	PECO Energy Company
Member	Peter	Sheridan	SGB USA, Inc.
Member	Kris	Zibert	Allgeier, Martin and Associates
Member	Tim-Felix	Mai	Siemens Energy
Guest	Attila	Gyore	M&I Materials Ltd
Member	Jorge	Cruz	PTI Transformers
Member	Dr. Alexander	Winter	HIGHVOLT Pruftechnik Dresden
Guest	Edward	Cassery	Ergon, Inc.
Guest	Jeremiah	Bradshaw	Bureau of Reclamation
Guest	William	Whitehead	Siemens Energy
Guest	Anastasia	O'Malley	Consolidated Edison Co. of NY
Member	Florin	Faur	SPX Transformer Solutions, Inc.
Guest	Sanket	Bolar	Megger
Guest	Daniela	Ember Baciu	Hydro-Quebec IREQ
Guest	Feras	Fattal	Manitoba Hydro
Member	Dominique	Bolliger, Ph.D.	HV TECHNOLOGIES, Inc.
Guest	Peter	Kleine	US Army Corps of Engineers

Role	First Name	Last Name	Company
Member	Mickel	Saad	Hitachi ABB Power Grids
Member	Raja	Kuppuswamy	Dynamic Ratings, Inc.
Member	Akash	Joshi	Black & Veatch
Guest	Malia	Zaman	IEEE
Member	John	Foschia	SPX Transformer Solutions, Inc.
Guest	Cihangir	Sen	Duke Energy
Member	Stacey	Kessler	Basin Electric Power Cooperative
Guest	Ryan	Bishop	Minnesota Power
Member	Daniel	Weyer	Nebraska Public Power District
Member	Janusz	Szczechowski	Maschinenfabrik Reinhausen
Guest	Brady	Nesvold	Xcel Energy
Guest	Zachery	Weiss	WEG Transformers USA Inc.
Member	Deepak	Kumaria	Hitachi ABB Power Grids
Guest	Nikolaus	Dillon	Dominion Energy
Guest	George	Partyka	PTI Transformers
Guest	Nitesh	Patel	Hyundai Power Transformers USA
Member	Ion	Radu	Hitachi ABB Power Grids
Guest	Caroline	Peterson	Xcel Energy
Guest	Adam	McDonald	CenterPoint Energy
Guest	Shiva	Rampersad	Dow Chemical Company
Member	Brad	Staley	Salt River Project
Guest	Muhammad Ali Masood	Cheema	Northern Transformer
Guest	Gilles	Bargone	FISO Technologies Inc.
Guest	Dervis	Tekin	Meramec Instrument Transformer Co.
Guest	Kyle	Heiden	EATON Corporation
Member	David	Calitz	Siemens Energy
Member	Sergio	Hernandez Cano	Hammond Power Solutions
Member	Darrell	Mangubat	Siemens Power Operations Inc.
Member	Moonhee	Lee	Hammond Power Solutions
Guest	Hugh	Waldrop	Memphis Light, Gas & Water
Member	Sylvain	Plante	Hydro-Quebec
Guest	Joaquin	Martinez	Siemens Energy
Guest	Samraghi	Dutta Roy	Siemens Energy
Guest	Dmitriy	Klempner	Southern California Edison
Guest	Kyle	Stechschulte	American Electric Power
Guest	Shawn	Gossett	Ameren
Guest	Afshin	Rezaei-Zare	York University
Guest	Eric	Doak	D4EnergySolutions LLC

Role	First Name	Last Name	Company
Guest	Jonathan	Sinclair	PPL Electric Utilities
Guest	Saramma	Hoffman	PPL Electric Utilities
Guest	Yaquan (Bill)	Li	BC Hydro
Guest	Matthew	McFadden	Oncor Electric Delivery
Guest	Hugo	Avila	Hitachi ABB Power Grids
Guest	Jeffrey	Door	H-J Family of Companies
Guest	Zachary	Draper	Delta-X Research Inc.
Guest	Tim	Rocque	SPX Transformer Solutions, Inc.
Guest	Juan	Acosta	Ergon, Inc.
Guest	Megan	Eckroth	EATON Corporation
Guest	Ashmita	Niroula	Ergon, Inc.
Guest	Raymond	Frazier	Ameren
Guest	Onome	Avanoma	Transformer Consulting Services Inc.
Guest	Alan	Washburn	Burns & McDonnell
Guest	Pragnesh	Vyas	Sunbelt-Solomon Solutions
Guest	Chris	Powell	Intermountain Electronics
Guest	Parag	Upadhyay	ABB Inc.
Guest	Susan	Bonfiglio	Western Area Power Admin.
Guest	Duy	Vo	Central Maine Power (AVANGRID)
Guest	Evgenii	Ermakov	Hitachi ABB Power Grids
Guest	Brandon	Dent	Memphis Light, Gas & Water
Guest	Jaroslav	Chorzepa	ABB Inc.
Guest	James	Holt	Memphis Light, Gas & Water
Guest	Darrell	Banks	Memphis Light, Gas & Water
Guest	Michael	Warntjes	American Transmission Co.
Guest	Hossein	Nabi-Bidhendi	ABB Inc.
Guest	Jacques	Vanier	Electro Composites (2008) ULC
Guest	Angela	Amador	EATON Corporation
Guest	Derek	Hollrah	Burns & McDonnell
Guest	Albert	Sanchez	Knoxville Utilities Board
Guest	Balakrishnan	Mani	Virginia Transformer Corp.
Guest	Robert	Shepherd	Bruce Power
Guest	Trevor	Mattson	OMICRON Electronics Corp USA
Guest	Dinu	Amarasinghe	Bruce Power

Annex C Distribution Subcommittee – Chair: Ed Smith

October 21, 2020

Virtual

Chair: Ed Smith

Vice-Chair: Jerry Murphy

Secretary: Josh Verdell

C.1 General Opening

Ed opened the meeting welcoming everyone to the meeting. To establish a quorum, a list of members was displayed, and a quorum poll was made. We did have a quorum with 42 members in attendance by count of those identified on a slide presented in the meeting. Recorded attendance gave 133 in attendance and 44 members.

The agenda was reviewed, a motion was made to approve by Dan Sauer, seconded by Gary Hoffman, and approved by unanimous acclamation of the members in attendance.

The Fall 2019 meeting minutes were reviewed, a motion was made to approve by Phil Hopkinson, seconded by Dan Sauer, and approved by unanimous acclamation of the members in attendance.

At this time, Ed Smith reviewed the copywrite requirements.

A slide was presented welcoming the new member of the subcommittee before proceeding with the working group and task force reports.

C.2 Working Group and Task Force Reports

██████████ C57.12.20 – Overhead Distribution Transformers – Al Traut

Al presented the following minutes from the working group meeting on October 19, 2020 at 11:45 a.m. with 56 in attendance.

1. Call to order

The meeting was called to order by the Chair (Al Traut) at 11:00AM CDT on Monday, October 19, 2020. This was a virtual meeting via Webex.

2. There was a call for essential patent by the Chair. There were none brought forward. The Chair announced if there was one to let the Chair or Vice Chair know. The IEEE SA Copyright policy was reviewed. No issues were identified.

3. Quorum Verification

A members list was displayed and an attendance poll was conducted. **30** of **52** members were present. A Quorum was declared. 3 guests requested membership. Total attendance was 56.

4. Approval of agenda for this meeting

The Chair sent out the Agenda prior to the meeting for review. He requested approval of the Fall 2020 Agenda. Agenda for the Fall 2020 meeting was approved with no negative votes.

5. Approval of minutes of the previous meeting

The Chair sent out the minutes prior to the meeting for review. He requested approval of the Minutes for the Fall 2019 meeting in Columbus, OH. The minutes for the Fall 2019 meeting were approved with no negative votes

6. Chair Report

The Chair announced the active PAR expires 12/31/2023.

7. Old Business

- a. Discussion - Annex B section A.2 test procedures, Steve Shull discusses test method. Also proposes changing wording in Figure A.1 from “4 in. copper tubing” to “1 in. section of 4 inch Type L copper tubing”.
- b. Discussion - Question from Alan Wilkes, “how long are the chains?” Steve S. responds that those lengths would be determined by tank diameter and the “B” dimension in the chart.
- c. Motion - Steve Shull moves to add this as an informative Annex. Second by Corey (Charles) Morgan.
 - i. Discussion - Monty suggests using the wording “Optional Tests” as it is used in ANSI standards.
 - ii. Motion 1 – 26 For, 0 against, 3 abstain, 28 no answer. Motion carries.
- d. Discussion on how C57.12.20 - Table 6 compares with Bushing Standard C57.19.02 Table 4. No motion to make a change at this time.
- e. Discussion on section 7.5.1 Covers and handholes. Point of clarification – removing handholes from the document is connected to previously removing internally mounted tap changers in previous draft.

8. New Business

- a. Discussion - Bruce Webb asks if we should add rise limits for “touch temperatures”? He suggests some limits may be added to C57.12.00. Mike Thibault recommends referring to limits in ASTM documents. R. Szewczyk makes the point that external transformer temperatures should be handle by procedure and by PPE. Marty Rave recommends stencil/decals for warning of excessive heat. Discussion will be tabled due to time restraints....

9. Next meeting - April 2021, Toronto, ON Canada.

10. The meeting adjourned at 12:00PM CDT.

██████████ C57.12.28, .29, .30, .31 & C57.12.32 – Enclosure Integrity – Dan Mulkey

Jeremy Van Horn, for Dan Mulkey, presented the following minutes from the working group meeting on October 20, 2020 at 8:00 a.m. in with 59 in attendance.

1. Dan Mulkey called the meeting to order at 8:00 AM CST.
2. Opening remarks and announcements
 - a. Dan Mulkey chastised the group as online vote / balloting was like pulling teeth – we will likely have to do this again so respond people!
 - b. Dan Mulkey commented that while planned, 2021 will unlikely be held in Toronto so be prepared for more email votes and online meetings – we need to do this to get our work done.
3. Dan Mulkey reviewed IEEE SA Copyright Policy and Essential Patent Claims. No issues were raised.
4. Membership changes were noted:
 - a. Changed to Guest: Jason Attard, Babanna Suresh, Giuseppe Termini, Robert Tinsley, and James Dorsten
 - b. Added: Brad Kittrell, Ion Radu
5. Quorum was verified. The working group consisted of 58 members, requiring 29 for quorum. 41 members were confirmed through the WebEx poll.
6. Dan Mulkey requested approval of the agenda. Hearing no requests for changes, the agenda were approved as written.
7. Dan Mulkey requested approval of the minutes. Hearing no requests for changes, the minutes were approved as written.
8. Status of Standards:
 - a. C57.12.28 Standard for Pad-Mounted Equipment – Enclosure Integrity, Published July 15, 2014
 - i. Revision Due: 12/31/2024
 - ii. PAR expiration: 12/31/2024
 - iii. Status: PAR approved 3/5/2020
 - b. C57.12.29 Standard for Pad-Mounted Equipment – Enclosure Integrity for Coastal Environments, Published August 8, 2014
 - i. Revision Due: 12/31/2024
 - ii. PAR expiration: 12/31/2024
 - iii. Status: PAR approved 3/8/2020
 - c. C57.12.30 Standard for Pole-Mounted Equipment – Enclosure Integrity for Coastal Environments, Published September 20, 2010
 - i. Revision Due: 6/17/2020
 - ii. PAR expiration: 12/31/2023
 - iii. Status: Balloted, submitted for approval
 - d. C57.12.31 Standard for Pole Mounted Equipment – Enclosure Integrity, Published September 20, 2010, Corrigenda approved May 16, 2014
 - i. Revision Due: 6/17/2020

- ii. PAR expiration: 12/31/2023
 - iii. Status: Balloted, submitted for approval
 - e. C57.12.32 Standard for Submersible Equipment – Enclosure Integrity, Published Aug 8, 2019
 - i. Revision Due: 12/31/2029
- 9. Old business:
 - a. Dan Mulkey updated the group on C57.12.31 ballot results and status
 - i. Email ballot was held: 39 approved CRG recommendations for the initial ballot, 0 against, and 19 abstentions.
 - ii. Recirculation with the modifications was initiated, CRG dealt with few new comments and with no new substantive changes.
 - iii. Standard submitted for approval: PC57.12.31 have been assigned to RevCom Agenda 02 Dec 2020
 - b. Dan Mulkey updated the group on C57.12.30 ballot results and status
 - i. Email ballot was held: 39 approved CRG recommendations for the initial ballot, 0 against, and 19 abstentions
 - ii. Recirculation with the modifications was initiated, CRG dealt with few new comments and with no new substantive changes
 - iii. Standard submitted for approval: PC57.12.30 have been assigned to RevCom Agenda 02 Dec 2020
 - c. Dan Mulkey reviewed status of standards, PAR was approved for PC57.12.28 and PC57.12.29.
- 10. New business:
 - a. Dan Mulkey presented proposed % mass loss calculation and scale accuracy for inclusion in the next revision of the standards starting with C57.12.28/29.
 - i. Text was taken from 4.3.2 Substrate performance requirements in C57.12.30/32 but with ‘weight’ changed to ‘mass’ and 4 significant figures added to the acceptance criteria
 - ii. Question was asked if this would be a corrigendum for C57.12.30/32. Dan said we can decide this later.
 - iii. Dan Mulkey proposed four significant figures to be required for mass measurements in Annex A, group discussed required scale accuracy.
 - 1. Paint manufacturers confirmed 0.0001g is a reasonable measurement.
 - 2. Tom Duzat mentioned that this accuracy may get difficult with samples greater than 0.25 inches thick.
 - 3. Concluded we need real test results to before accepting these proposed changes.
 - iv. Group discussed purpose of the mass loss test and what we should look at in order to improve this test.

1. Dan Mulkey commented the purpose of the tests included in the standard is to understand what happens if the coating system completely fails (e.g. will the bare substrate sufficiently protect me from corrosion?).
 2. Will Elliott has completed corrosion testing of various bare and painted substrates. Will noted that bare Cu-bearing failed the test. Full results will be presenting results in STNP TF Effects of Corrosion on Transformers at 2:20 PM CST.
 3. Bob Kinner asked if there is a procedure to remove rust and corrosion products before calculating mass loss. Will Elliott and Tom Dauzat stated that the procedure requires physical removal of oxides through abrasion but recognized this can be difficult to do.
 4. Tom Dauzat mentioned that with this procedure some samples had mass gain, likely due to embedding of salt in substrate material.
 5. Tom Dauzat mentioned there is a solution that can be used to remove corrosion products more effectively. Jane Hall, Tiffany Lucas and Bob Kinner confirmed there are several solutions that can do this including: Oxalic acid, citric acid, and diluted HCL.
 6. Zoran Goncin commented that mass loss is not an accurate representation measuring corrosion as failures are often associated with pitting or stress corrosion cracking (SCC) which can occur either due to the weld or inclusions in the steel.
 7. Tom Dauzat commented that proper annealing to relieve stresses after fabrication of tanks is critical in preventing pitting / SCC.
 8. Brian Klaponski commented that he has heard 304L underperforms 316L at higher temperatures. Will Elliott commented that temperature will impact corrosion rates but he does not have any data on this. Decided to discuss this further in the STNP TF Effects of Corrosion on Transformers at 2:20 PM CST.
- b. Dan discussed next steps for updating C57.12.28 / 29. Current timeline means we need to finish drafts at Spring 2023 meeting.
- i. Dan Mulkey informed the group that Justin Minikel previously volunteered to convert the old standard into the new IEEE template and redline text with previously approved changes from C57.12.30/31/32.
 - ii. Redlined standards will be reviewed and discussed in Spring 2021 meeting.
- c. Dan requested a taskforce to be formed to review the special security tests in C57.12.28 / .29 (pry-bar, wire probe, etc). It was brought to Dan's attention that referenced Iron Man scales No. 1756T4 seem to be obsolete / no longer available.
- i. Taskforce Members: No volunteers in the meeting. Dan will Voluntell some people.

- d. Dan Mulkey asked if anybody would be interested to do some coating tests
 - i. Jane Hall and Chris Guertin from Cloverdale Paint volunteered. Scott Abbott from PPG volunteered. Brian Klaponski volunteered as a transformer manufacturer. Carlos Gaytan volunteered as a transformer manufacturer.
 - ii. Group discussed test procedure and parameters
 - 1. Tom Dauzat suggested test samples should be prepared to mimic the transformer manufacturing process.
 - 2. Dan Mulkey commented that the last test the group ran included samples from transformer manufacturers as well as paint suppliers.
 - 3. Zoran Goncin commented the weld is the weakest point and should be considered specifically for pitting corrosion.
 - 4. Tom commented we need to keep in mind the time constraint as we have 1 year to complete the tests and include results in the standard.
 - 5. Jane Hall suggested to study the effect of temperature gradient on coatings.,
 - 6. Martin Bachand suggested to include the Atlas Cell test for IEEE C57.12.32.
 - 7. Scott Abbot mentioned there are other standards that have outlined test procedures such as SAE J2324 Cyclic Corrosion Test.
 - 8. Tiffany Lucas suggested we could use different ASTM methods such as D5849 or D4587 rather than referenced D4587.
 - iii. Scott Abbot commented there are two key questions we need to consider when developing this test plan:
 - 1. What do we want to evaluate: corrosion, adhesion, pitting?
 - 2. What tests are difficult to perform and is there an easier / more accurate way to do it?
 - iv. Group to continue this discussion at the next meeting.
 - v. Dan requested a taskforce to be formed to review and propose definitions for 304L, 409L and other steels (or find a reliable reference).
 - vi. Taskforce Members: Tiffany Lucas, Will Elliot, Bob Kinner
- 11. Next meeting: is planned for April 27, 2021 in Toronto, ON, Canada
 - a. The following attendees requested membership and will be added to membership for the Spring 2021 meeting: Ramadan Issack.
- 12. The meeting was adjourned at 9:13 AM CST.

█ C57.12.34 – Three Phase Pad-Mount Transformers – Steve Shull

Scott Dhalke, for Steve Shull, presented the following minutes from the working group meeting on October 19, 2020 at 2:20 p.m. with 65 in attendance. Phil Hopkinson had a question regarding step up transformers and he was directed to send the question to Steve Shull for a response.

1. The meeting was called to order by the Chair at 2:20 P.M. CST on October 19, 2020 and Quorum was checked and reached.
2. Agenda approval

The Chair displayed the Agenda for this meeting. He asked the WG for any proposed changes to the presented Agenda. No changes were offered and therefore the Agenda was declared approved as shown.
3. Minutes approval

The Chair commented that the Meeting Minutes of the last meeting were posted on the Transformer Committee website. He also informed all WG members and guests of this in an email prior to this meeting. The Chair asked the WG for any changes to the Minutes of the last meeting. No comments were brought forth, therefore the minutes of the last meeting were approved as written.
4. Confirmation of IEEE SA Essential Patent Statement

The Chair displayed the Essential Patent information. He informed all WG members and guests that the same information was sent via email prior to this meeting. The Chair asked for any claim of known Patents associated with this work. Nothing was brought to the Chairs attention.
5. IEEE SA Copyright Policy Statement

The Chair displayed the IEEE SA Copyright Policy information. He informed all WG member and guests that the same information was sent via email prior to this meeting and he asked that if there are any questions on this to refer to this email.
6. Old Business
 - 6.1. A Task Force (TF) composed of Jerry Murphy (Chair), Jeff Schneider, Gary King, Dan Mulkey, and Suresh Babanna was created last meeting to craft wording related to comments provided by a WG Member. Jerry Murphy presented the results of the TF to the WG. The first note was proposed to be added at the end of TABLE A.1 in Section A.3. The second note was proposed to be added at the end of Section A.4. Jerry Murphy made a motion to “add or replace these notes as specified by the TF to the current working draft”. The motion was seconded by Charles Morgan. The motion 1 passed with 36 votes “For”, 0 votes “Against” and 2 votes “Abstain”. Therefore, the new notes will be added to the current working draft as presented by the TF. The Motion 1 WG members were verified.
 - 6.2. A Task Force composed of Carlos Gaytan (Chair), Christopher Sullivan, Tom Callsen, Igor Simonov, and Pragnesh Vyas was created last meeting to review Section A.7. The TF Chair presented the proposals of the WG. This presentation proposed the term “Cabinet” to be changed to “Pad-Lockable Boxes” or “Pad-Lockable Enclosures”. It was stated that terms “Pad-Lockable Boxes” and “Pad-Lockable Enclosures” are the most common terms used in transformer specifications for renewable energy applications. This presentation also proposed changing the

terms on Fig. A.3. Fig A.3 currently depicts the “Boxes” on the LV side of the tank. The Chair asked if Fig A.3 should also show the “Boxes” on the HV End. The TF Chair agreed and stated there were “Boxes” on the HV side of tank for “Tap Changer Handles” and “Load-Break Switches”. His presentation proposed deleting the exclusion of the application of enclosure security standards (IEEE C57.12.28). The TF Chair stated that research of user specifications did not make reference to exempting requirements of this standard with the exception of the wire probe testing. After a lot of discussion, it was decided to send this back to the TF for more work on the section. The TF would take the WG discussions and comments and develop a new proposal for Section A.7. This taskforce report will be added to next meeting Agenda to present the TF recommendations.

6.3. Complete review of remain unreviewed sections of Annex A

- 6.3.1. The Chair asked for comments from the WG on Section A.8. A number of editorial comments were made and incorporated into the section. A question was raised as to the need for this section. Comments were made by two manufacturers that underoil arresters are common in single phase padmount transformers and many 34.5 kV three phase padmount transformer but not normally are seen in lower primary voltage three phase padmount transformers. There was also some discussion on the failure mode of these and it was pointed out that their placement was important not to cause damage to the core coil assembly as these are not field replaceable. At the conclusion of the discussion, it was decided that this section would be retained in the document.
- 6.3.2. The Chair asked for comments on Section A.9.1. A few editorial comments were raised and incorporated into the section.
- 6.3.3. The Chair asked for comments on Section A.9.2. A question was raised as to if it was appropriate to list standards in a separate section rather than the bibliography or normative references. The Chair explained to the WG that there is a precedence of putting certain standards for specific reference when required. A question was asked if there was a need to include standards for newer type sensors? The Chair asked Israel Barrientos to search for any other standards that would be applicable and report his findings in the next meeting.
- 6.3.4. The Chair asked for comments on A.9.3. A number of editorial changes were made and accepted by the WG.
- 6.3.5. The Chair asked for comments on Section A.10. A discussion occurred as to the need for hot spot monitors in this product. Due to WG comments, the Chair issued a Poll (Labeled as Motion 2, however only a poll) for all meeting participants to “leave Section A.10 Winding Hot Spot Monitors in Annex. The results of the poll is per the following: 20 votes “For”, 19 votes “Against”, and 10 votes “Abstain”. The Chair commented there were more votes “For” than “Against”, therefore Section A.10 will remain in Annex.
- 6.3.6. The Chair asked for comments on Section A.10.1. It was generally agreed that “Direct Measurement” type hot spot sensors are not used in distribution transformers. It was suggested removing all “Direct Measurement” sections (A.10.1.1 & A.10.1.2) from Annex. The Chair asked the WG if anybody in the WG disagreed with removing these 2 sections. There were no objections.

Therefore, Sections A.10.1.1 and A.10.1.2 “Direct Measurement” were removed from the Annex. The Chair volunteered to revise the numbering and reword the section to reflect the WG comments. This would be submitted for review at the next meeting.

7. New Business

The Chair asked the WG for any new business that would need to be addressed now as time was growing short. No one brought anything forward.

8. The meeting was adjourned at 3:30 P.M. CST.

████████ C57.12.36 – Distribution Substation Transformers – Jerry Murphy

This working group did not meet.

████████ C57.12.38 – Single-Phase Pad-Mounted Transformers – Ali Ghafourian

Marty Rave, for Ali Ghafourian, presented the following minutes from the working group meeting on October 19, 2020 at 12:55 p.m. with 78 in attendance.

The Chair called the virtual meeting to order at 12:55 pm CDT.

The Chair called for essential patents and the essential patents presentation slides were shown. No essential patents were brought forward.

The Chair advised the Working Group participants of the IEEE-SA copyright policy and the copyright presentation slides were shown.

9 New Members were introduced with 5 Members being changed to Guest status before this meeting in order to continue to meet quorum.

Quorum was established with 25 out of 40 Working Group members present per poll results generated, but according to preliminary attendance list and attendance list provided at the end of the meeting there were 28 out of 40 Working Group members present. Attendance varied throughout the meeting; therefore attendance was accounted for by using the preliminary attendance list and attendance list provided at the end of the meeting.

The agenda for the meeting was presented. The Chair asked the Working Group members for unanimous approval of the agenda. Hearing no objections from the Working Group members, the agenda was unanimously approved.

The meeting minutes for the 2019 Fall meeting in Columbus, OH were posted on the Distribution Subcommittee website after the meeting for the Working Group members to review. There were no proposed changes to the Fall 2019 meeting minutes brought forth. The Chair then asked the Working Group for unanimous approval of the minutes. Hearing no objections from the Working Group members, the meeting minutes for Fall 2019 meeting were unanimously approved.

The Chair informed the Working Group that the most recent standard was published in August 2014, and the next revision is due in December 2024.

Old Business:

Task Force 1

Jarrold Prince presented a revised informative Annex proposal for accessories developed by the original Task Force of Giuseppe Termini, Wes Suddarth, and Craig DeRouen. New Task Force volunteers Jim Spaulding and Mike Thibault were added at the Fall 2019 meeting. During the Fall 2019 meeting the Working Group reviewed the original proposal to form the informative Annex and suggested the Task Force to delete all the photos of accessories and replace them with sketches/drawings to avoid potential copyright issues. Steve Shull highlighted that the sketches/drawings in the revised informative Annex may still have copyright issues depending on the source material with Ed Smith in agreement on Steve's comment. Jarrod Prince and Craig DeRouen will review the source material for the sketches/drawings of the accessories to determine if there are copyright issues with the present version of the sketches/drawings in revised informative Annex proposal and whether permission is required from a copyright holder. The Work Group agreed that the sketches/drawings should be revised to avoid copyright infringement or should be deleted from the revised informative Annex proposal, if copyright permission is not granted from the copyright holder. This revised informative Annex will be added into the current Draft before for the next revision of C57.12.38 without any sketches/drawings until proper copyright permission is obtained.

Task Force 2

Israel Barrientos presented recommendations for revisions to existing figures in C57.12.38 as the result of a review performed by the Task Force comprised of Jim Spaulding, Mike Thibault, and Israel Barrientos. Israel Barrientos will review C57.12.38-2014 Corrigendum 1-2016 published and update the recommendations for revisions to existing figures in C57.12.38. The updated figures will be added into the current Draft before for the next revision of C57.12.38

Task Force 3

Jeremy Van Horn presented a revision proposal to C57.12.38 developed by the Task Force of Carlos Gaytan, Jarrod Prince, and Jeremy Van Horn due to C57.12.39 standard being published. The revision proposal is incorporated into the current Draft for the next revision of C57.12.38.

New Business:

A new Draft will be posted for Working Group to review before the Spring 2021 meeting that includes the most recent material submitted.

A total of 9 guests requested Working Group membership which will be reviewed to determine who is eligible for membership before the next meeting.

A new Task Force was formed comprised of Jeremy Van Horn, Dan Mulkey, and Bruce Webb with Jeremy as the Task Force lead. This Task Force will review the issue of Touch Temperature of the Tank and make a proposal as to which IEEE C57 standard should contain Touch Temperature information and what type of information should be included.

The Chair announced the Working Group will meet at the Spring 2021 meeting in Toronto, Ontario, Canada.

The Chair adjourned the meeting at approximately 1:45 pm CDT.

██████████ C57.12.39 – Tank Pressure Coordination – Carlos Gaytan

This working group did not meet

Task Force on Transformer Efficiency and Loss Evaluation – Phil Hopkinson

Phil presented the following minutes from the task force meeting on October 19, 2020 at 9:10 a.m. with 80 in attendance. Brian Klaponski asked about a concern with higher touch temperatures of transformers with higher temperature ratings. Phil noted this as a legitimate concern. Marty Rave notified the group that there was a task force from C57.12.38 looking into it. Phil asked if UL (Underwriters Laboratory) should be involved. Ali Ghaforian informed the group that the task force of C57.12.38 was meeting on November 2nd.

1. Call to order and any Chair's remarks

- 9:10 am meeting was called to order

2. Quorum Verification

- Not a working group; Quorum is not necessary

3. Confirmation of the essential patent statement and responses

- Not a working group, no patents were discussed.

4. Approval of minutes of the previous meeting

- Minutes approved.

5. Approval of agenda for this meeting.

- Agenda was posted and followed for this meeting.

6. Utilities loading data

Mr. Mulkey presented on utilities data mostly from Dominion Power (2018) that reflect accumulated smart meter data by transformer (collected over a yr. period) and that the RMS-equivalent loads are ~30 % of nameplate and the peak load <80% of nameplate. We are to anticipate load increase due to electric vehicles and HVAC conversions.

Dual nameplate KVA transformers were explained as:

- Base kVA set with 65 C rise parameters
- Higher kVA based on thermal class of insulation system

It was noted that we need more data.

7. Steve Rosenstock report on future utility outlook

Phil Hopkinson introduced Steve Rosenstock, Senior Manager, Customer Technical Solutions Edison Electric Institute.

Mr. Rosenstock report examined quite a number of forecasts for the future that show a 5-50% increase in load, dependent on how electrified the homes and businesses are today. This increase is attributed to 3 key factors: 1) Transportation – plug-in hybrid electric vehicles, 2) Building Electrification, 3) Codes and Standards Policies and Legislation. This will result in significant changes to loading on new distribution transformers over the next 5-10 years.

8. Kevin Rapp report on insulation thermal class

Mr. Rapp reported that considerable work has been going on to develop materials that can operate well at higher temperatures and that natural ester liquid and new thermally upgraded papers have the ability for transformers to be operated at up to 85C rise and still achieve the 180,000 hours of life that is recognized for today's 65 C rise transformers,

using mineral oil and thermally upgraded Kraft Paper. It was noted that Formvar magnet wire has shown able to operate at such temperatures as well with natural ester by preventing water from attacking the enamel.

Extensive sealed vessel tests to prove insulation material works. 100 vessels were aged at 5 different temperatures in 2 rounds of different tests. About 3- yrs. of aging to reach end of life points.

9. Tom Prevost report on Thermally upgraded Kraft Paper

Mr. Prevost presented that new thermally upgraded Kraft cellulose paper with Diamond Pattern Enhanced (DPE) has shown through life tests that it is able to achieve a 75C rise for 180,000 hours in mineral oil and an 85 C rise for 180,000 hours in Natural ester.

Now, by using DPE paper in mineral oil, distribution transformers can:

- Have even further extended life at 65 °C rise (practically double thermal life of TUK)
- or be advanced to 75 °C AWR, or to a dual temperature rating of 65 °C / 75 °C and run hotter without failures (physically smaller or more kVA capacity in same size)

10. Casey Ballard report on thermally upgraded solid materials

Considerable work has been going on in many parts of the world to apply Nomex to either mineral oil or natural ester. In fact, with Nomex, it is permissible to exceed 85 C rise.

11. Al Traut report on dual nameplate designs

Mr. Traut examined a number of key distribution transformer ratings and can see that 85C rise will allow significant increases in kVA with the newly available materials. Clearly these materials will require higher costs than present transformers, but the result of their use will allow increased output power from smaller sizes and comply with the DOE electrical efficiencies.

Al keyed in on the following design and application considerations for Dual kVA Transformers:

Transformer Design Considerations

- Material selection to meet desired thermal class
- Thermal design differences for different liquids
- Coil ducting practice (size, quantity and location) to support higher loads
- Component selection for higher continuous loads (leads, bushings, switches, etc.)
- Switching and load interrupting at higher loads and liquid temperatures.
- Under oil fuse and LV breaker operation. Is de-rating required for higher oil temperatures?
- Gaskets and seals for different liquids and temperatures
- Gas space volume, liquid level and tank pressure coordination
- Maximum conductor temperatures under long duration short circuit

Transformer Application Considerations

- Conductor sizing for transformer installation
- External fuse selection
- Maximum voltage drop at peak loads
- External transformer touch temperature (pad-mounts)

12. Documents

All documents from this meeting will be posted on the IEEE Distribution Transformers Subcommittee website

13. Next meeting--date and location

No additional comments before adjournment at 10:35am EDT.

██████████ PC57.167 – Guide for Monitoring Distribution Transformers – Gary Hoffman

Gary presented the following minutes from the working group meeting on October 20, 2020 at 3:45 p.m. with 86 in attendance.

1. Call to order and any Chair's remarks – Called to Order at approximately 3:55 PM by Gary Hoffman
2. Quorum Verification – 36 out of 69 WG Members in attendance. 16 Guests requested membership.
3. The Chair presented the Patent slides. No one spoke up with knowledge of any standard essential patents (SEPs) currently included in the draft and no questions about the Patent Policy. The Chair did remind the WG if they become aware of any SEPs, they should notify the Chair and the Chair will request that the SEP holder submit a Letter of Assurance with the IEEE SA. Next the copyright slides were explained with no questions asked.
4. Approval of agenda for this meeting. Motion by Brian Kaplonski, Second by Jerry Murphy – Unanimously Approved
5. Approval of the 14 May 2020 virtual WG meeting minutes. Motion by Trent Williams and, Second by Jon Karas – Unanimously Approved
6. The Chair provided an update from the unofficial WG meeting held 26 June. The issues brought up will be covered in agenda item 9.1.
7. Task Force Reports:
 - a. Clause 4 TF: Claude Beauchemin presented for Dan Mulkey to explain the rationale for the update that created a new table that succinctly brings together the necessary information that allows a reader to better understand the justification for monitoring the variety of Distribution Transformers. The presentation was well received and the Chair thanked Claude for his presentation.
 - b. Clause 5 TF: Jerry Murphy presented. There is still progress to be made to rationalize the table of Monitoring Parameters and to tie in the revised classifications in the Justification for Monitoring. The TF Chair called for volunteers specifically from the user interest category. The Chair thanked Jerry and requested the TF to continue to meet to move Clause 5 into high gear.
 - c. Clause 6 TF: Steve Shull for Mike Thibault presented. There was some discussion with the differentiation of the Physical Layer and Data Link Layer. The Chair thanked him for stepping in for Mike and encouraged Mike to convene a TF meeting to complete work on this Clause.
 - d. Clause 8 TF: The TF Chair Fenton was unable to present and we look forward to the Clause 8 TF report at our next WG meeting.
8. New business

- a. Report on a survey conducted as a result of a discussion at our unofficial 26 June 2020 meeting to include monitoring of tap changing equipment in PC57.167 of the DT and STNP Subcommittees to determine if the concept had traction among Members of both subcommittees presented by Steve Shull. The poll indicated that 73% of the respondents were against including the monitoring of tap changing equipment and 27% were for inclusion. There was no motion made and there was no objection by the party who made the presentation at our 26 June meeting for not including the monitoring of tap changing equipment to PC57.167.
 - b. The Chair discussed having a mid-January PC57.167 WG meeting. There was no objection and the Chair indicated that a Doodle poll will be sent to the WG participants for a mid-January timeframe.
9. Meeting was adjourned at 5:01 PM CT

██████████ C57.12.35 – Bar Coding for Transformers and Regulators– Rhett Chrysler

Rhett presented the following minutes from the working group meeting on October 20, 2020 at 12:55 p.m. with 23 in attendance.

1. Chair called the meeting to order at 12:55pm CDT.
2. Total attendance of 23. 13 of 23 members present and quorum was met. 1 guest requested membership.
3. Chair called for identification of essential patents pertaining to the work of this TF. None brought forward to the TF. IEEE SA Copyright policy presented. No issues identified.
4. Motion to approve meeting agenda by Ken Hampton, 2nd by Steve Shull, Approved unanimously.
5. Motion to approve Fall 2019 (Columbus, OH) meeting minutes by Israel Barrientos, 2nd by Lee Matthews, Approved unanimously
6. Chair Report
 - a. Chair asked for a user volunteer to fill Vice Chair role formerly held by Giuseppe Termini.
7. Old Business
 - a. TF on QR Codes (Israel Barrientos, Mike Thibault, Dan Mulkey). Israel presented work of the TF to introduce the WG to QR code basics. Next step the TF will look to incorporate the data in C57.12.37 (electronic test data) into a QR code for the WG to evaluate. Added Ramadan Issack and Ken Hampton to TF membership.
 - b. TF on Editorial Review (Darren Brown, Al Traut, Ed Smith). Rhett presented 6 of the 7 recommendations of the TF for review and modification.
 - i. Comment 1 – Update normative references to replace outdated versions.
 - ii. Comment 2 – Replace bar-code with bar code throughout the document.
 - iii. Comment 3 – Fix the hyperlink reference to the IEEE SA download site for the list of manufacturers and codes.

- iv. Comment 4 – 4.2.6.1 remove the reference to IEEE C57.12.00 since 12.00 does not define life of the nameplate.
 - v. Comment 5 – 4.2.6.3 and 4.3.5.3 add UVB-313EL lamps to UV testing requirements. Retain the FS-40 bulb method.
 - vi. Comment 6 – 4.2.6.4 allow the use of camera based scanners to verify readability on 300 series stainless steel permanent labels (nameplates).
 - vii. A motion was made (Shull/Murphy) to accept these 6 recommendations after discussion. Motion carried unanimously. These changes were incorporated into D2 during the meeting. Comment 7 regarding location of the temporary label in figure 7 for 1ph submersible transformers was tabled to the next meeting.
8. New Business
- a. Item 1 by Gilbert Kozer to add a new manufacturer code was tabled to the next meeting as we ran out of time.
 - b. No other new business brought forward.
9. Next meeting April 2021 Toronto, ON Canada
10. Meeting adjourned at 2:10pm CDT.

C.3 Old Business

- No old business was discussed

C.4 New Business

- Jerry Murphy brought forth a discussion on this SC sponsoring a project to develop an IEEE standard covering a capacity regulated transformer.
 - Jerry Murphy made the motion to approve the sponsorship of the project
 - Dan Saur 2nd the motion.
 - Dan noted that IEEE would likely sponsor this project elsewhere if this SC would not sponsor it.
 - Craig Colopy noted that other groups were working on voltage regulating distribution transformers.
 - Dan noted that this was not a voltage regulating device but instead a capacity regulating device.
 - Brian Klaponski asked if this device was for energy savings.
 - Jerry Murphy answered that per his understanding yes.
 - Jerry Murphy explained the functionality of the device in question.

- Gary Hoffman asked for an amendment to the motion in that the word Power be removed from the purpose of this motion.
 - Jerry and Dan approved the amendment
- Bruce Forsyth clarified that the motion was to have the SC sponsor this project.
- MOTION 1 to approve the amendment as proposed by Gary.
 - 35 Yay – Motion passes
- MOTION 2 to have SC sponsor this project as proposed by Jerry and 2nd by Dan.
 - 26 Yay – Motion passes
- We were over on time and the meeting ended immediately after the voting was complete.

C.5 Chairman’s Closing Remarks and Announcements

Ed had no closing comments to the SC.

C.6 Adjournment

Ed adjourned the meeting as provided in the meeting agenda at 10:15am.

List of Attendees and Affiliations:

First Name	Last Name	Company
Jerry	Allen	Metglas, Inc.
Javier	Arteaga	ABB Enterprise Software Inc
Hugo	Avila	Hitachi ABB Power Grids
Donald	Ayers	Ayers Transformer Consulting
Gilles	Bargone	FISO Technologies Inc.
Israel	Barrientos	Prolec GE
Jean-Noel	Berube	Rugged Monitoring Inc.
Kevin	Biggie	Weidmann Electrical Technology
Darren	Brown	Howard Industries
Thomas	Callsen	Weldy-Lamont Associates
Stuart	Chambers	Powertech Labs Inc.
Solomon	Chiang	The Gund Company
John	Chisholm	IFD Corporation
Rhett	Chrysler	ERMCO
Craig	Colopy	EATON Corporation
John	Crouse	Roswell Alliance
Michael	Dahlke	Central Moloney, Inc.
Thomas	Dauzat	General Electric
Hakim	Dulac	Qualitrol Company LLC
Samraghi	Dutta Roy	Siemens Energy
Megan	Eckroth	EATON Corporation
William	Elliott	General Electric
Reto	Fausch	RF Solutions
Bruce	Forsyth	Bruce Forsyth and Associates LLC
George	Frimpong	Hitachi ABB Power Grids
Lorne	Gara	Shermco
Benjamin	Garcia	Southern California Edison
James	Gardner	SPX Transformer Solutions, Inc.
Carlos	Gaytan	Prolec GE
Ali	Ghafourian	H-J Enterprises, Inc.
Saurahb	Ghosh	Transformers & Rectifiers (India) Ltd
Orlando	Giraldo	H-J Family of Companies
Zoran	Goncin	PTI Transformers
Monty	Goulkhah	Kinectrics
James	Graham	Weidmann Electrical Technology
Detlev	Gross	Power Diagnostix
Said	Hachichi	Hydro-Quebec
Kendrick	Hamilton	Power Partners, Inc.
Didier	Hamoir	Transformer Protector Corp
Kenneth	Hampton	Baltimore Gas & Electric
Kenneth	Harden	Schneider Electric
Kyle	Heiden	EATON Corporation
Sergio	Hernandez Cano	Hammond Power Solutions
John	Herron	Raytech USA
Gary	Hoffman	Advanced Power Technologies

James	Holt	Memphis Light, Gas & Water
Philip	Hopkinson	HVOLT Inc.
Ramadan	Issack	American Electric Power
Paul	Jarman	University of Manchester
John	John	Virginia Transformer Corp.
Jon	Karas	SDMyers, LLC.
Gael	Kennedy	GR Kennedy & Associates LLC
Gary	King	Howard Industries
Brad	Kittrell	Consolidated Edison Co. of NY
Brian	Klaponski	Carte International Inc.
Andrew	Larison	Hitachi ABB Power Grids
Moonhee	Lee	Hammond Power Solutions
Aleksandr	Levin	Weidmann Electrical Technology
Weijun	Li	Braintree Electric Light Dept.
Xose	Lopez-Fernandez	Universidade de Vigo
Tim-Felix	Mai	Siemens Energy
Jinesh	Malde	M&I Materials Inc.
Richard	Marek	Retired
Joaquin	Martinez	Siemens Energy
Lee	Matthews	Howard Industries
Trevor	Mattson	OMICRON Electronics Corp USA
Philip	Miller	Memphis Light, Gas & Water
Rhea	Montpool	Schneider Electric
Charles	Morgan	Eversource Energy
Jerry	Murphy	Reedy Creek Energy Services
Hossein	Nabi-Bidhendi	ABB Inc.
Aniruddha	Narawane	Power Distribution, Inc. (PDI)
Frank	Neder	Trench Germany GmbH
Kristopher	Neild	Megger
Ashmita	Niroula	Ergon, Inc.
Stephen	Oakes	WEG Transformers USA Inc.
Dwight	Parkinson	EATON Corporation
Vinay	Patel	Consolidated Edison Co. of NY
Caroline	Peterson	Xcel Energy
Chris	Pitts	Howard Industries
Nicholas	Podany	Bureau of Reclamation
Chris	Powell	Intermountain Electronics
Jarrold	Prince	ERMCO
Ion	Radu	Hitachi ABB Power Grids
Kevin	Rapp	Cargill, Inc.
Martin	Rave	ComEd
Robert	Reepe	Georgia Power Co.
Leopoldo	Rodriguez	Transformer Testing Services LLC
Fernando	Saldivar	Prolec GE
Mahesh	Sampat	EMS Consulting Inc.
Albert	Sanchez	Knoxville Utilities Board
Daniel	Sauer	EATON Corporation
Anil	Sawant	Virginia Transformer Corp.

Stefan	Schindler	Maschinenfabrik Reinhausen
Nick	Sewell	Alabama Power
Samuel	Sharpless	Rimkus Consulting Group
Hemchandra	Shertukde	University of Hartford
Kunal	Shukla	PECO Energy Company
Stephen	Shull	BBC Electrical Services, Inc.
Audrey	Siebert-Timmer	IFD Corporation
Adrian	Silgado	IFD Corporation
Jonathan	Sinclair	PPL Electric Utilities
Edward	Smith	H-J Family of Companies
Adam	Smith	Commonwealth Associates, Inc.
Steven	Snyder	Hitachi ABB Power Grids
Markus	Stank	Maschinenfabrik Reinhausen
David	Stankes	3M
Kerwin	Stretch	Siemens Energy
Janusz	Szczechowski	Maschinenfabrik Reinhausen
Radoslaw	Szewczyk	Specialty Products Poland Sp. z o.o.
Marc	Taylor	Cogent Power Inc.
Dervis	Tekin	Meramec Instrument Transformer Co.
Vijay	Tendulkar	Power Distribution, Inc. (PDI)
Eric	Theisen	Metglas, Inc.
Timothy	Tillery	Howard Industries
Mark	Tostrud	Dynamic Ratings, Inc.
Daniel	Tournoux	SPX Transformer Solutions, Inc.
Alan	Traut	Howard Industries
Parag	Upadhyay	ABB Inc.
Jeremy	Van Horn	IFD Corporation
John	Vartanian	National Grid
Joshua	Verdell	ERMCO
Duy	Vo	Central Maine Power (AVANGRID)
Pragnesh	Vyas	Sunbelt-Solomon Solutions
Sukhdev	Walia	New Energy Power Co.
Shelby	Walters	Howard Industries
Alan	Washburn	Burns & McDonnell
Bruce	Webb	Knoxville Utilities Board
Zachery	Weiss	WEG Transformers USA Inc.
Dr. Alexander	Winter	HIGHVOLT Pruftechnik Dresden
Baitun	Yang	R.E. Uptegraff
Malia	Zaman	IEEE
Kyle	Zemanovic	EATON Corporation

Annex D Dry Type Transformers Subcommittee

October 21, 2020

Virtual Meeting

Chair: Casey Ballard

Vice-Chair: Vacant

Secretary: David Stankes

D.1 Introductions and Approval of Agenda and Minutes

The Subcommittee met virtually on October 21, 2020 at 12:55PM.

No individual introductions were made, but Chair reminded participants to announce one's name and affiliation prior to speaking at this virtual meeting.

The meeting was convened with 47 people in attendance. 23 of the 31 members of the Dry Type Subcommittee were present, so quorum was reached. Seven guests requested membership. Three will be granted membership as they have met meeting attendance and participation requirements. The attendance roster will be recorded in the AMS.

The Chair displayed the proposed agenda that had been previously sent to the group. He also reminded attendees that the unapproved minutes from the last Dry type Transformers Subcommittee (DTSC) meeting that was held (Fall 2019 in Columbus) had been posted to the IEEE TC website. He asked if there were any objections to the unanimous approval of the agenda as well as the unapproved meeting minutes from Columbus. Hearing none, both the agenda and the unapproved Fall 2019 DTSC meeting minutes were approved.

D.2 Chairs Remarks

Chair congratulated WG and TF leaders for effectively reviewing IEEE copyright policy prior to start of meeting and appreciated those who sent this information out early to attendees to save time at meeting. He reminded attendees that within the DTSC and the broader Transformers Committee we are allowed to share any IEEE document or draft freely. Caveat is that for external copyright material that IEEE has approval to use, we must request permission for each document that may plan to use it. Also reminded group that we must get copyright approval in advance of sharing or displaying any non- IEEE document. This can be addressed by using the request form found on the IEEE website. Any questions may be directed to Casey Ballard, Ed teNyenhuis, or Malia Zaman.

Chair noted that there was no change in the DTSC membership since the last meeting.

Encouraged Task Force and Working Groups to conduct meetings between the Fall and Spring meeting sessions. Invitations and agenda should be shared a minimum of one month in advance, and good idea to post these on meetings page of SC website (Sue McNelly can help post). It is also required to record attendance in the AMS as well as record minutes. There are licenses of WebEx available from IEEE should you need one to host a virtual meeting.

Casey challenged TF and WG leaders to submit minutes from meetings in a timely manner, ideally before the subcommittee meeting on Wednesday.

Chair reminded WG chairs to keep rosters up to date and reviewed guidelines for membership.

D.3 Working Group/Task Force Reports

The next order of business was the presentation of the reports of the various working groups and task forces. See the following sections for the individual reports:

D.3.1 Revision of IEEE PC57.12.01 - Dry Type General Requirements Chair Casey Ballard

- SA Ballot process has been completed
- Casey is communicating with IEEE editor to correct some minor typos's but nothing will be changed that will affect the technical content of the document.
- Expect that the document will be published in 2021.
- Plan to meet at Spring 2021 meeting as a Task Force to begin PAR submission process as part of the decision to maintain 12.01 as a continuous revision document.

D.3.2 Revision of IEEE PC57.12.91 - Standard Test Code Chair David Walker

- SA Ballot process has been completed. Approved by Revcom and now in editing stage.
- Plan to meet at Spring 2021 meeting as a Task Force to begin PAR submission process as part of the decision to maintain 12.01 as a continuous revision document.
- Comments received during balloting process will be reviewed to help develop topics that may be addressed during the next revision cycle.

D.3.3 IEEE PC57.16 – Dry Type Reactors Chair Art Del Rio

The working group for the revision of C57.16 met virtually in WebEx on Monday October 19, 2020, at 9:10 AM.

1. 1. Introductions and Call for Patents

- The meeting was called to order at 9:10 AM by the WG Chair Art Del Rio.
- The meeting was opened with the introduction of participants.
- The WG Chair, Art Del Rio, 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 attendance was checked with a Poll.
- There was a total of 38 participants: 9 Members and 29 Guests out of which 4 guest requested membership. None granted based on attendance.
- 9 of the current 15 WG Members were present and quorum to carry out business was met.
- The meeting agenda, which was circulated by email among members and guests on Oct 17, 2020 by email, was presented to the participants.
- There were no objections or comments and the agenda was approved unanimously.

3. Approval of the minutes of the October 28, 2019, meeting in Columbus, OH, Ohio.

- The minutes from the F19 meeting in Columbus, which were circulated on October 17, 2020 by email, were presented to the participants.
- There were no objections or comments and the minutes were approved unanimously.

4. Continue to discuss and review

- Dave Caverly gave a presentation regarding the latest activities of the Liaison Task Force with the Switchgear Committee on this Standard.
- We have got good support from the Switchgear Committee and the general opinion from them is that we are on the right track.
- Next actions are:
 - Make further progress on Annex B & B-1 by end of 2020
 - Circulate, get input from anyone interested to contribute within Switchgear & Transformers Committees.
 - Feb/March 2021: Send for email ballot within Switchgear LTF re readiness to go to format ballot in Transformers Committee and SA.

4.a Annex B - Dry-type air-core shunt capacitor reactors. Update on TF from Switchgear Committee

- Dave Caverly presented the latest draft.
- Make minimal changes to the existing Normative Annex B
- Add an additional Informative Annex, e.g. Annex B-1 "Application and Rating Aspects of Shunt Capacitor Reactors (TLI's)"
Something less than an Application Guide, but more than a typical standard in terms of applications information, "what is behind the ratings" "tutorial like".
- Describe the basic issues and what is behind them, outline the evolving nature, and then point to specific switchgear documents to get the current information.

4.b Annex B1 – Informative. Supplementary to Annex B

- Dave Caverly presented the latest draft.
- Proposed title: Application and Rating Aspects of Shunt Capacitor Reactors (LTI's).
- Pierre Riffon pointed out that it is still a lot of material around the factor I time f, which is only valid for oil type circuit breakers and not for modern types of circuit breakers (e.g. SF6 and Vacuum). IEC and Cigré are going away for the I times f factor and instead talk about the inrush current integral for definition of the arc energy.
- Dave Caverly fully agreed that the I*f is going away – but that is the whole point of the historical review – to explain the evolving history for the many people, especially non-switchgear people, who may not know or understand it.

4.c Annex F - System considerations, TRV section update; feedback from Switchgear Committee

- Dave Caverly presented the latest draft.
- This Annex has been sent to the Switchgear Committee LTF for comments. Only one comment has been received and some more should come.
- Pierre Riffon pointed out that the location of the reactor can have a huge impact on the rating of the circuit breaker, i.e. if located at the source side then a CB with lower short circuit current rating can be selected.
- Dave Caverly agreed with the point and will endeavor to make some improvements

4.d PI Model: During previous meetings of the LTF with Switchgear, the topic of modelling of the reactor for transient studies was raised. (principally in respect of TRV studies, but perhaps not only that, (maybe also Lightning and high frequency harmonics calculations.)). Switchgear

folks would like to have the key modelling info readily available rather than having to request and dig for it, each and every time.

(This discussion is not specific to TLI's but rather was raised in the Switchgear LTF in the context of all series reactors and even shunt reactors. It is a general reactor issue.)

Various ideas were discussed in the Switchgear meeting and also in our F19 Columbus meeting, such as putting the data on the nameplate or drawing, or test reports. Until this Fall 2020 Transformers meeting however, no clear conclusion had been arrived at. One issue that has been recognized is that the key elements of a PI model include internal construction information which is available only to the manufacturer (eg. series capacitance of the winding), but also stray capacitance to ground which depends on mounting height - which the manufacturer may not know. So at least some of the time, no-one has all the information.

In addition to the above, a further issue that was briefly discussed is that the information in respect of modelling is often needed by the User far before an order is placed or a test report received. Rather such information is often needed in the planning and early budgetary quotation stage.

In this meeting Dave Caverly presented the idea of defining a standard simple PI model and associated standardized data table in the standard, along with a standard formula for stray capacitance to ground calculation and a standard formula for coil first parallel resonance frequency based on the stray capacitance to ground and supplier provided internal figures (eg. Series capacitance). The concept of this approach would be to facilitate a simple, clear and efficient data exchange between Supplier and User in the planning stage.

- Dave Caverly made a motion, which was seconded by Klaus Pointner, that we should develop specific language, model and table in line with the above concept and include- this at a suitable location (to be decided) within the standard (C57.16), the notion being that it is applicable to all series reactors. The result of the Poll was:
For: 8
Against: 0
Abstain: 1

5. New Business

- There were no new business.

6. Adjournment

- The meeting was adjourned at 10:31 AM.

Respectfully submitted,
Chairman: Art Del Rio (a.delrio@ieee.org)
Secretary: Ulf Radbrandt (ulf.radbrandt@ieee.org)

Attendee list from IEEE PC57.16 Fall 2020 WG Meeting						
	First Name	Last Name	Company	City	State	Country
Guest	Stephen	Antosz Jr.	Siemens Industry	NewKensington	PA	USA
Guest	Edmundo	Arevalo	BPA	Vancouver	WA	USA
Guest	Israel	Barrientos	Prolec GE	Apodaca	Other	Mexico
Guest	Steven	Brzoznowski	BPA	Vancouver	WA	USA
Member	David	Caverly	Trench Limited	Scarborough	ON	Canada
Guest	Solomon	Chiang	The Gund Company	Fergus	ON	Canada
Chair	J. Arturo	Del Rio	Siemens Energy	Raleigh	NC	USA
Guest	Jonathan	Deverick	Dominion Energy	Richmond	VA	USA
Member	Alexander	Gaun	Coil Innovation GMBH	Eferding	Other	Austria
Guest	Kendrick	Hamilton	Power Partners, Inc.	Athens	GA	USA
Guest	Kenneth	Hampton	Baltimore Gas & Electric	Baltimore	MD	USA
Guest	Ramadan	Issack	American Electric Power	Columbus	OH	USA
Guest	Jeremy	Johnson	Intermountain Electronics	Price	UT	USA
Guest	Kurt	Kaineder	Siemens Energy	Leonding	Other	Austria
Guest	Dmitriy	Klempner	Southern California Edison	Pomona	CA	USA
Guest	Axel	Kraemer	Maschinenfabrik Reinhausen	Regensburg	Other	Germany
Guest	Colby	Lovins	Federal Pacific Transformer	Bristol	VA	USA
Guest	Ross	McTaggart	Trench Limited	Pickering	ON	Canada
Guest	Martin	Munoz Molina	Orto de Mexico	Cuernavaca	Other	Mexico
Guest	Joe	Nims	Allen & Hoshall, Inc.	Nashville	TN	USA
Member	Sylvain	Plante	Hydro-Quebec	Montreal	QC	Canada
Guest	Christoph	Ploetner	Hitachi ABB Power Grids	Bad Honnef	Other	Germany
Member	Klaus	Pointner	Trench Austria GmbH	Leonding	Other	Austria
Secretary	Ulf	Radbrandt	Hitachi ABB Power Grids	Ludvika	Other	Sweden
Guest	Juan	Ramirez	CELECO	Apodaca	Other	Mexico
Member	Pierre	Riffon	Pierre Riffon Consultant Inc.	Longueuil	QC	Canada
Guest	Patrick	Rock	American Transmission Co.	Amherst	WI	USA
Member	Devki	Sharma	Entergy	Halifax	NS	Canada
Member	Michael	Sharp	Trench Limited	Scarborough	ON	Canada
Guest	Kunal	Shukla	PECO Energy Company	Philadelphia	PA	USA
Guest	Audrey	Siebert-Timmer	IFD Corporation	Vancouver	BC	Canada
Guest	Adam	Smith	Commonwealth Associates	Jackson	MI	USA
Guest	Kerwin	Stretch	Siemens Energy	Erlangen	Other	Germany
Guest	Neil	Strongosky	Memphis Light Gas & Water	Memphis	TN	USA
Guest	William	Whitehead	Siemens Energy	Raleigh	NC	USA
Guest	Alexander	Winter	HIGHVOLT Pruftechnik	Dresden	Other	Germany
Guest	Baitun	Yang	R.E. Uptegraff	Scottsdale	PA	USA
Guest	Malia	Zaman	IEEE	Piscataway	NJ	USA

D.3.4 IEEE PC57.124 – Dry Type Partial Discharge Guide Chair

Co-Chairman: Tom Prevost
Co-Chairman: Rick Marek
Secretary: Hemchandra Shertukde

Meeting (virtual) was called to order on 10/20/20 at 9:00 am EST with agenda displayed by Chair.

Membership poll started at 9:03 am. Poll results:

Members 19/39

Guests 12/39

Guest seeking membership 6/39

No consideration 2/39

Total attendance 39

We have 23 members of this WG so quorum was achieved at 19/23

Agenda was approved unanimously after motion to do so made by Charles Johnson and seconded by Tim-Felix Mai.

Unapproved minutes from Columbus meeting were approved unanimously after motion to do so made by Charles Johnson and seconded by Detlev Gross.

Call for patents and Copy right policy was displayed- There was no response on the call for patents from attendees.

Scope of the Guide was revisited to start updates from different task forces:

TF 1 Normative and References, Definitions - Casey Ballard

No work done yet as no input from the other TFs

TF 2 PD Detection Systems and Test Procedure - Detlev Gross

The present draft of WG C.57.113 has been adopted for Dry-Type transformers. Those changes/deletions presented. The highlighted material is proposed to be changed/deleted for this WG's work. This discussion ended at 9:47 am. The working draft will be shared with all attendees by the Chair.

TF 3 - Annexes - Raja Kuppuswamy

No draft for this work available yet. The annex will focus on measurement impedance. Raja was asked to provide one by next meeting. Which he agreed to.

TF 4 Bibliography Jagdish Burde/Joe Tedesco

Joe Tedesco indicated that he has not been able to get in touch with Jagdish since Fall 2019 meeting. He was not on call for this meeting. Joe was requested to be the next chair of this TF. The chair will contact Jagdish to ask if he plans to continue to participate in this project.

New Business

PAR Extension - Casey Ballard pointed out that the PAR for this project will expire at the end of 2021. A motion was made by Detlev Gross and seconded by Casey Ballard to request a PAR Extension for 2 yrs. Motion approved. Further action to be taken by chair.

Old Business - None

Meeting adjourned at 10:13 am

Next meeting: April 27, 2021 Toronto, Ontario Canada

Respectfully submitted

Hemchandra Shertukde, Ph.D. P.E.

Secretary, WG C.57.124

Attendance C.57.124 Fall 2020 Meeting

First Name	Last Name	Company
Thomas	Prevost	Weidmann Electrical Technology
Subhas	Sarkar	Virginia Transformer Corp.
Emilio	Morales-Cruz	Qualitrol Company LLC
Alain	Bolliger	HV TECHNOLOGIES, Inc.
Richard	Marek	Retired
Reto	Fausch	RF Solutions
Charles	Johnson	Hitachi ABB Power Grids
Klaus	Pointner	Trench Austria GmbH
Oleg	Roizman	IntellPower Pty Ltd
Mohammad	Iman	MGM Transformer Company
Roger	Wicks	DuPont
Hemchandra	Shertukde	University of Hartford
David	Stankes	3M
Vijay	Tendulkar	Power Distribution, Inc. (PDI)
Robert	Ballard	DuPont
Shawn	Nunn	Hitachi ABB Power Grids
Ali	Naderian	Metsco
Saurahb	Ghosh	Transformers & Rectifiers (India) Ltd
Ronald	Hernandez	Doble Engineering Co.
Detlev	Gross	Power Diagnostix
Kerwin	Stretch	Siemens Energy
David	Larochelle	NDB Technologies
Solomon	Chiang	The Gund Company
Piotr	Blaszczyk	Specialty Transformer Components LLC
William	Larzelere	Evergreen High Voltage
David	Walker	MGM Transformer Company
Tim-Felix	Mai	Siemens Energy
Trevor	Mattson	Schweitzer Engineering Labs
Juan Pablo	Andrade Medina	Olsun Electrics Corporation
Dominique	Bolliger, Ph.D.	HV TECHNOLOGIES, Inc.

Stephen	Antosz Jr.	Siemens Industry
Raja	Kuppuswamy	Dynamic Ratings, Inc.
Janusz	Szczechowski	Maschinenfabrik Reinhausen
Ken	Klein	Grand Power Systems
Joseph	Tedesco	Hitachi ABB Power Grids
Sergio	Hernandez Cano	Hammond Power Solutions
Colby	Lovins	Federal Pacific Transformer
Brian	Sonnenberg	Instrument Transformers, LLC
Moonhee	Lee	Hammond Power Solutions
Joaquin	Martinez	Siemens Energy
Chris	Powell	Intermountain Electronics
Jeremy	Johnson	Intermountain Electronics
Jaroslav	Chorzepa	ABB Inc.
Olle	Benzler	Megger
Hossein	Nabi-Bidhendi	ABB Inc.
Jacques	Vanier	Electro Composites (2008) ULC

D.3.5 IEEE PC57.12.52 – Task Force for Sealed Dry-Type

Chair Joe Tedesco

The Task Force met in virtually at 8:45am PDT, Monday, October 19, 2020 over Webex. The meeting was called to order at 8:47 AM by Chairman Joseph Tedesco.

A poll was taken for people to request membership. Of 15 people present 10 requested membership. A quorum was automatically present.

The agenda was approved unanimously.

Minutes from Fall 2019 meeting were approved unanimously.

Patent call was given. Slides were sent out before the meeting. Nobody responded to patent call.

Old Business:

PAR accepted at 3/5/20 NESCOM meeting. Expires on 12/31/2024. Official title is Standard for Sealed Dry-Type Distribution and Power Transformers.

Colby Lovins and Shawn Nunn compared C57.12.51 and current revision of C57.12.52 to see if there possible changes to C57.12.52 that would make it similar to C57.12.51.

C. Lovins- compared text in first half of 12.51 and 12.52. Normative references and abbreviations are different. Are the differences necessary? Section 5.1 – kVA ratings. 12.51 refers to 12.01. 12.52 defines standard kVAs and has more exceptions and tables of ratings. Insulation Levels- 12.51 refers just to line terminal insulation. 12.52 – refers to line and neutral separately. Angular displacement is similarly more detailed in 12.52 than 12.51. Impedance was removed from 12.51 but is currently in 12.52.

S. Nunn- Construction- 12.51 refers to 12.01, 12.52 has own explanation. Connection location- 12.51 moved to section 10 and added much more discussion than 12.52. LV neutral- 12.52 requires a terminal. 12.51 allows direct ground connection or a terminal. 12.52 has specific ground pad construction details. These were removed from 12.51. Testing- slight wording differences. Temperature conditions (temperature rises and insulations systems) 12.51 refers to 12.01. 12.52 refers to 12.01 but adds additional restrictions. Other editorial changes shown in the presentation. Current transformers- mainly differences in grammar except for 12.51 requiring that shorting terminal blocks need to be rated for the appropriate CT current.

Annex D

Casey Ballard commented that requiring HV voltage taps may not be necessary and should be optional rather than required as is currently in 12.52. Chuck Johnson asked if there was TF discussion in previous meetings about adding new things that are not currently in 12.52. J. Tedesco commented that the inclusion of insulating gasses other than air or nitrogen was discussed and then dropped due to lack of expertise in any other gasses. C. Johnson also suggested that adding information like the compromise method of temperature test that are specific to sealed transformers should be considered. D. Walker asked if the standard ought to specify particular test methodologies or not. Tabled until we get to that section in the future.

New Business:

Normative References- Chair proposed that the existing list of references is appropriate.

D. Walker suggested that editorial changes don't need approval except as a red lined standard draft and there is not a need for a motion on every change. C. Ballard suggested similarly.

Discussed generalizing discussion of clause 5.1. Chair introduced a suggestion. D. Walker and C. Johnson suggested simplifying the proposal to be more readable. Discussed that 12.52 currently has GA as the cooling class and the new version of 12.01 will use GNAN. Will change 12.52 to match 12.51. T. Mai will also talk to 12.80 WG about updating the definition from GA to GMAN to match 12.01.

Discussions of preferred kVA and voltage ratings. C. Johnson felt that this product has inherent limitations that are reflected in the table and it does not prevent manufacturers from using other values. D. Walker suggested the table be deleted and use the information in 12.01. C. Johnson did not agree. Chair to put proposal in red-lined draft.

Chair reviewed several proposed wording changes in various sections of the standard. Chair will send out a red lined draft.

Chair adjourned meeting at 10:00 am.

The Working Group will meet again at the Spring 2020 meeting in Toronto, ON, CA.

Chairman: Joseph Tedesco

Secretary: David Walker

Subgr	Role	Type	First Name	Last Name	Company	10/19/20
C57.12.52	Member	Active Participant	Juan Pablo	Andrade Medina	Olsun Electric Corporation	X
C57.12.52	Guest	Interested Individual	Onome	Avanoma	Transformer Consulting Services Inc.	
C57.12.52	Member	Committee Member	Robert	Ballard	DuPont	X
C57.12.52	Member	Active Participant	Mirvil	Bruno	ABB Inc.	
C57.12.52	Guest	Interested Individual	Lucas	Coffey	Alabama Power	
C57.12.52	Guest	Active Participant	Florin	Faur	SPX Transformer Solutions, Inc.	
C57.12.52	Member	Committee Member	Derek	Foster	Magnetics Design, LLC	
C57.12.52	Member	Interested Individual	Bob	Fyrer	DuPont	
C57.12.52	Guest	Active Participant	Kenneth	Harden	Schneider Electric	X
C57.12.52	Member	Interested Individual	Sergio	Hernandez Cano	Hammond Power Solutions	X
C57.12.52	Member	Committee Member	Charles	Johnson	Hitachi ABB Power Grids	X
C57.12.52	Guest	Interested Individual	Jeremy	Johnson	Intermountain Electronics	X
C57.12.52	Guest	Active Participant	Ken	Klein	Grand Power Systems	
C57.12.52	Guest	Interested Individual	Kyle	Knous	EATON Corporation	X
C57.12.52	Member	Active Participant	Colby	Lovins	Federal Pacific Transformer	X
C57.12.52	Member	Committee Member	Tim-Felix	Mai	Siemens Energy	X
C57.12.52	Member	Committee Member	Jerry	Murphy	Reedy Creek Energy Services	
C57.12.52	Guest	Committee Member	Ali	Naderian	Metsco	
C57.12.52	Guest	Committee Member	Aniruddha	Narawane	Power Distribution, Inc. (PDI)	
C57.12.52	Guest	Interested Individual	Nikoi	Nikoi	IEEE	
C57.12.52	Member	Interested Individual	Shawn	Nunn	Hitachi ABB Power Grids	X
C57.12.52	Member	Active Participant	Dhiru	Patel	Retired	
C57.12.52	Guest	Committee Member	Poorvi	Patel	Electric Power Research Institute (EPRI)	
C57.12.52	Guest	Interested Individual	Chris	Powell	Intermountain Electronics	X
C57.12.52	Member	Interested Individual	Manish	Saraf	Hammond Power Solutions	
C57.12.52	Member	Committee Member	Hemchandra	Shertukde	University of Hartford	
C57.12.52	Member	Interested Individual	Justin	Shrewsbury	AMR PEMCO	
C57.12.52	Guest	Interested Individual	Adam	Smith	Commonwealth Associates, Inc.	X
C57.12.52	Member	Committee Member	David	Stankes	3M	X
C57.12.52	Guest	Interested Individual	Kerwin	Stretch	Siemens Energy	
C57.12.52	Chair	Active Participant	Joseph	Tedesco	Hitachi ABB Power Grids	X
C57.12.52	Member	Committee Member	Vijay	Tendulkar	Power Distribution, Inc. (PDI)	
C57.12.52	Secretary	Committee Member	David	Walker	MGM Transformer Company	X
C57.12.52	Guest	Interested Individual	Kwasi	Yeboah	GE Energy Management	
C57.12.52	Member	Interested Individual	Robert	Zaretsky	Sargent & Lundy	

D.3.6 IEEE 259 – Low Voltage Thermal Aging Chair David Stankes

Chair: David Stankes

Vice-Chair: Joseph Tedesco

This was the third meeting of the task force, and the first that was not an ad hoc meeting. The task force meeting was held in the WebEx Session 5 meeting space during the Virtual Meeting and was called to order at 3:51 PM on 10/19/20.

There were 19 people present in the meeting. There were 5 members and 14 guests. 4 guests requested membership. The task force has 6 members; therefore, with 83%, a quorum was achieved, and business could be conducted.

There was unanimous approval of the agenda and the minutes from the Fall 2019 meeting. The patent and copyright policy were discussed, and a request was made for essential patents, but no one had any.

Old Business:

- Dave Stankes provided an update on the status of the PAR. It had been reviewed and approved by Jim Graham, and was submitted to NesCom for review at the next meeting.

Annex D

- Dave gave a brief overview of how IEEE 259 got to do this point: it was going to be withdrawn due to lack of use, but it was discovered that it was still referenced by IEEE C57.12.60, and the subcommittee then voted to form a task force to revise it.
 - At the first task force meeting, the membership discussed whether they wanted to “do the standard justice” and make a serious revision to bring IEEE 259 up-to-date, and the members agreed to do so.

New Business:

- Dave introduced Draft 1 to the task force.
 - He discussed how he and Joe Tedesco had worked on it, with the development being helped by initial feedback from a small team.
 - He discussed his plan to divide Draft 1 into sections and solicit volunteers to help with the different sections. Experts on electrical insulation systems and insulation system testing would be good, but anyone knowledgeable in transformer design and/or insulation materials would be welcome.
- Discussion began regarding the Draft and the plans for the standard.
 - Roger Wicks asked about the maximum voltage range. He suggested that it would be good to keep from conflicting with IEEE C57.12.60, which has 601 V as its minimum.
 - Annirudha Narawane and Vijay Tendulkar mentioned that 660 V and 690 V are both common, and that IEC has a 1.1 kV class.
 - Vijay proposed using 1.2 kV class instead of 600 V.
 - Dave brought up how he wanted the experts to work on test procedures and aging temperatures.
 - He asked Roger to contribute his expertise from IEEE C57.12.60, and assist in addressing the discrepancies in thermal classes between IEEE 259 and IEEE C57.12.60.
 - He also was interested in adding the proof testing from IEEE C57.12.60.
 - Dave discussed improving the section regarding interpretation of data.
 - Dave also described one of the reasons that IEEE 259 was not used was because most such testing was performed pursuant to UL 1446.
 - He thought it might be possible to incorporate parts of UL 1446 into IEEE 259.
 - Casey Ballard asked what was the plan?
 - Was the plan to cover all the sections in the meetings only?
 - Or was the plan to work in small task forces to work on the sections outside the meetings?
 - Dave planned to parse out the work to smaller task forces,
 - Casey agreed that this was a good plan.
 - Time will be working against the revision, so splitting up the work allows it to move forward more quickly, which is good.

Annex D

- Casey stated that it should be acceptable to also have the task force members report at the first working group meeting, which will presumably be in Spring 2021.
- Dave asked Casey about how to involve experts that had expressed an interest in participating but were either retired or not IEEE members.
 - Casey speculated that there might be ways to make that happen, and he would investigate them.

The date of the next meeting was not explicitly set, but it would most likely be part of the Spring 2021 meeting on April 26 or 27, 2021. That meeting will be in either Toronto, Canada or virtually.

The current meeting was adjourned at 4:46 PM.

Attendee List	
Moonhee Lee	Hammond Power Solutions
Jeremy Johnson	Intermountain Electronics
Vijay Tendulkar	Power Distribution, Inc. (PDI)
Joseph Tedesco	Hitachi ABB Power Grid
Ken Klein	Grand Power Systems
Aniruddha Narawane	Power Distribution, Inc. (PDI)
Roger Wicks	DuPont
Chuck Johnson	Hitachi ABB Power Grids
Colby Lovins	Federal Pacific
Brian Sonnenberg	Instrument Transformers, LLC
Rick Marek	Retired
Shawn Nunn	Hitachi ABB Power Grid
Kenneth Harden	Schneider Electric
Casey Ballard	DuPont
Juan Pablo Medina	Olsun
Tim-Felix Mai	Siemens
Roger Wicks	DuPont

D.3.7 IEEE C57.134 Chair Colby Lovins

The working group met on Monday, October 19, 2020 via webex on Group Session 4.

The meeting was called to order at 2:20 PM by Chairman Colby Lovins.

Chairman made opening comments.

The meeting was convened with 23 participants, 15 requesting membership and 7 guests. Being the first meeting, Quorum was reached.

Agenda was approved.

The chair made a call for known patents and took some time going over the IEEE guidelines on the patent disclosure. No patent related issues were claimed.

The chair made a copyright issues request and showed the copyright slide; no copyrights claims were made.

Old Business

- None being this our first meeting.

New Business

- Proposed Title
 - Discussions on adding “Distribution and Power” to the Title for the purpose of being consistent with C57.12.01.
 - Casey B. proposed the motion to use the Proposed Title “IEEE Guide for Determination of Hottest-Spot Temperature in Dry-Type Distribution and Power transformers. Motion was second by Chuck J. Motion was approved unanimously.
- Proposed Scope
 - Discussions on the proposed scope regarding the deletion of the IEC 60076-11 reference as well as deleting the exclusion of converter transformers. Discussions lead to a motion by Chuck J. to accept the proposed Scope: “This guide describes methodologies for determination of the steady-state winding hottest-spot temperature in dry-type distribution and power transformers. This guide applies to all dry-type transformers, including those with ventilated, sealed, solid cast, and encapsulated windings expect transformers described as exceptions in IEEE Std C57.12.01.”.
 - Motion was second by Vijay and approved unanimously.
 - The group mentioned that the deletion of the exclusion of converter transformers, should be discussed in further meetings to properly address issues regarding this and other type of transformers where heavy harmonic loads are present.
- Proposed Purpose
 - Discussions on the proposed purpose regarding the deletion of the first sentence on the existing purpose description. The group agreed that the sentence should live somewhere in the document. After further discussion, it was proposed to move the sentence to the Introduction section of the document, as well as into including section 1.3 with the sentence to make sure it was not missed.
 - A motion was proposed by Casey B. to remove the sentence “Assumptions regarding the relation of winding hottest-spot temperature rise to average winding temperature rise are not representative of all dry type transformer constructions and winding size.” from the original purpose and move it to the Introduction section as well as to include it as section 1.3 in the document. Motion was second by Juan Pablo Medina and approved unanimously.
- Submit to PAR
 - A motion was proposed by Roger W. to submit to PAR. Motion was approved unanimously.
- Chair final remarks.

Attendees:

Last Name	Frist Name	Company	Role
Andrade Medina	Juan Pablo	Olsun Electrics Corporation	Secretary
Ballard	Robert	DuPont	Member
Doak	Eric	D4EnergySolutions LLC	Member
Ghosh	Saurahb	Transformers & Rectifiers (India) Ltd	Member
Haas	Michael	Instrument Transformers, LLC	Guest
Harden	Kenneth	Schneider Electric	Guest

Johnson	Charles	Hitachi ABB Power Grids	Member
Johnson	Jeremy	Intermountain Electronics	Guest
Klein	Ken	Grand Power Systems	Member
Lee	Moonhee	Hammond Power Solutions	Member
Levin	Aleksandr	Weidmann Electrical Technology	Member
Li	Yaquan (Bill)	BC Hydro	Guest
Lovins	Colby	Federal Pacific Transformer	Chair
Mai	Tim-Felix	Siemens Energy	Member
Martinez	Joaquin	Siemens Energy	Guest
Neder	Frank	Trench Germany GmbH	Guest
Nunn	Shawn	Hitachi ABB Power Grids	Member
Powell	Chris	Intermountain Electronics	Member
Sonnenberg	Brian	Instrument Transformers, LLC	Guest
Stankes	David	3M	Member
Tedesco	Joseph	Hitachi ABB Power Grids	Member
Tendulkar	Vijay	Power Distribution, Inc. (PDI)	Member
Wicks	Roger	DuPont	Member

With no further business, the meeting was adjourned at 3:35 PM.

Following the report to the SC, Colby Lovins requested (and was granted) permission by the SC to extend the Task Force in order to complete its work.

Chairman: Colby Lovins
Secretary: Juan Pablo Medina

D.3.8 IEEE C7.96 Chair Aniruddha Narawane

Virtual Meeting 19/20/20 by WEBEX, 12.55 pm to 2.10 pm CST

Chair: Aniruddha Narawane

Vice Chair: Iman Mohammed

Secretary: Kerwin Stretch

Meeting called to order at 12:55 by the Chair

-
- All participants were notified that the meeting was being recorded for the purpose of taking notes but would be deleted after the meeting minutes are completed.
 - The chair presented the information on Patent Disclosures and asked the group to report any relevant patent issues – None were communicated.
 - Poll for membership taken at 13:00
 - 26 total persons present
 - 18 guests requesting membership
 - 7 requested to remain in guest status
 - 1 attendee did not respond

- As this was the first meeting of the TF, a quorum was established based on this poll
- Agenda for the meeting was approved unanimously without discussion
- The chair proposed that one motion for approval of the Title, Scope, and Purpose of the TF be held after the discussion and editing of all three sections.
- Title for the Task Force was shown for discussion
 - After some discussion it was agreed that it was not necessary to list exclusions for special types in the title. This will be handled in the body of the text.
 - Decision taken to remove “Draft” from the title. It was noted that this would have happened automatically and replaced by “IEEE” as part of the submission process.
- Scope for the Task Force was shown for discussion
 - It was inquired if we should reference that the guide would apply to transformers covered in C57.12.01. After some discussion it was agreed that the Scope should be as broad as possible to allow flexibility.
 - a question was raised regarding the application of the loading guide to 600V transformers. Discussions among participants indicated that this topic was never raised in the past and the guide is intended for 1.2 kV class and above. However, there is nothing stopping its application on 600 V provided there is agreement between the manufacturer and customer.
 - The TF should consider how the guideline will be aligned with 259 (the companion to C57.12.60)
- Purpose for the Task Force was shown for discussion
 - Many discussions took place regarding the removal of the word “risk” from the purpose. In the end it was decided to remove both “risk” and “consequence”. The new text, agreed by the members, is as follows –
“Guidance is also provided for assessing the effects of loading above nameplate rating.”
- Casey Ballard made a motion to approve the Title as shown on slide 5, the scope on slide 6, and the purpose shown on slide 7 using the modified text. Motion was seconded by Vijay and passed with 17 for, 0 against, and 2 abstaining.
- The remaining time in the meeting was used to discuss items for future considerations –
 - It was mentioned that it is necessary to Fix the mismatch in temperature class from 155C to 150C to align with C57.12.01
 - It was also suggested, some tables should be reviewed and evaluated if they are necessary in the future guideline.
 - Another suggestion was that C57.12.56 should be replaced by 12.60 in the normative references.
 - Additional suggestion was that we should closely follow the status of 259 and align were appropriate.
 - It was proposed that we evaluate the BASIC program shown in the Annex and suggested changing to a VBA macro for Excel or another modern programming language.
 - Also noted was that some tables should be updated to include the 240C temp class.

- It was recommended to review and update the bibliography with any new, relevant, sources that might have been released since the previous version
- Mike Iman made a motion at 14:09 to adjourn the meeting. Motion was seconded by Vijay and passed unanimously.

Following the report to the SC, Aniruddha Narawane requested (and was granted) permission by the SC to extend the Task Force in order to complete its work.

Chairman: Aniruddha Narawane
 Vice-Chairman: Iman Mohamed
 Secretary: Kerwin Stretch

Attendance

Last Name	First Name	Affiliation	Status
Arevalo	Edmundo		
Ballard	Casey	DuPont	Member
Haas	Michael	Instrument Transformers, LLC	Guest
Harden	Kenneth		
Iman	Mohammed	MGM Transformers	Vice Chair
Johnson	Charles	Hitachi ABB Power Grids	Member
Klein	Ken	Grand Power System	Member
Lee	Moonhee	Hammond Power Solutions	Member
Lovins	Colby	Federal Pacific Transformer	Member
Mai	Tim-Felix	Siemens Energy	Member
Marek	Rick	Retired	Member
Montpool	Rhea	Schneider Electric	Member
Narawane	Aniruddha	Eaton PDI	Chair
Nunn	Shawn	Hitachi ABB Power Grids	Member
Andrade-Medina	Juan Pablo	Olsun Electrics Corporation	Member
Patel	Vinay	Consolidated Edison Co. of NY	Guest
Peterson	Caroline	Xcel Energy	Guest
Podany	Nick	Bureau of Reclamation	Guest
Powell	Chris	Intermountain Electronics	Member
Smith	Adam	Commonwealth Associates, Inc	Guest
Sonnenberg	Brian	Instrument Transformers, LLC	Member
Stankes	Dave	3M	Guest
Stretch	Kerwin	Siemens Energy	Secretary
Tedesco	Joseph	Hitachi ABB Power Grids	Member
Tendulkar	Vijay	Eaton PDI	Member
Wicks	Roger	DuPont	Member

Chairman: Aniruddha Narawane
 Vice-Chairman: Iman Mohamed
 Secretary: Kerwin Stretch

D.4 Old Business

D.4.1 Status of Standards

- Revisions approved for C57.12.01 and C57.12.91
- PAR Approval pending for IEEE 259
- No standards at risk of lapsing
- Next standard to be worked on has 2025 expiration (Good shape!)

D4.2 NEMA Low Voltage (LV) Standards

This topic is regarding the possibility of moving current NEMA LV documents over to IEEE.

- David Walker reported there has not been a NEMA meeting since last IEEE SC meeting, so he was not able to gauge interest of NEMA membership to have this happen. He has received some unofficial comments from NEMA indicating that this is something that they would consider.
- Casey brought this proposal up to AdCom. Their view was that it was up to the SC to decide if this is something that should be done. AdCom's main concern was IEEE having enough members to take on and maintain the new document(s).
- Casey recommended waiting until we had an official response from NEMA. If NEMA approved, we would then go the SC for a vote to determine if we should pursue bringing the NEMA LV documents into IEEE.
- Chair asked if there were any comments, questions, or suggestions from the DTSC
 - Vijay Tendulkar asked what documents we were interested in bringing into IEEE. Ken Klein said both ST-20 and possibly ST-1 were of interest. He also stated that there was a scheduled NEMA (Transformer) meeting on 10/27/20.
 - Roger Wicks asked if 1255 would also be considered. Casey explained that NEMA has already extended copyright for this document over to IEEE, but IEEE has chosen not to revise the document and it is not included in the ten-year revision cycle as it is still a NEMA document. Casey expected that any new documents we agree to bring over would not be "parked" and that we would work on and maintain under 10-year mandatory revision cycle.
 - Chuck Johnson thought we never opened 1255 due to limited resources to work on the standard. He also felt it was a somewhat limited in scope document that was used when customers required 3rd party certification. Chuck recommended that if we do work on the document, we should make sure that we include feedback from people who are using the document to make sure we don't impact a manufactures ability to obtain 3rd party certifications.
 - Casey requested an informal non-binding poll regarding "would you be interested in being part of a group that would conduct a revision of C57.1255"
Results: 12 For, 4 Against, 12 Abstain, 16 No Response.
 - Colby Lovins informed the DTSC that the NEMA ST-20 document had been recently revised by NEMA and would not be in immediate need of IEEE revision.
 - David Walker stated that in his opinion that ST-20 would not take much effort to maintain, as many sections refer to other existing IEEE standards.

- Casey requested members who were planning to attend the 10/27 NEMA meeting ask if NEMA would be willing to share the ST-20 document for our review. Review of document may help members decide if we should pursue bringing over to IEEE.
- Joe Tedesco reminded group that ST-20 covers a wide size range including some very small transformers.
- Casey discussed a previous discussion regarding possibility of a joint IEEE/CSA document. He felt that CSA has already established documents containing excellent information on enclosures.
- Vijay Tendulkar commented that ST-20 considers sound level depending on K factor whereas IEEE standards currently do not.

D.5 New Business

No new business

Chair asked members to share comments regarding how the virtual meeting went as well as suggestions on how to make the virtual meetings better. Send comments to Casey or Ed T.

Next meeting very well could be virtual depending on Covid-19 situation, otherwise next meeting will be face to face in Toronto Spring 2021.

D.6 Adjournment

With no further business, the meeting was adjourned at 2:10 PM.

Chairman: Casey Ballard

Vice Chairman: Open

Secretary: David Stankes

(Notes prepared by Dave Stankes)

Dry Type Subcommittee Attendance Fall 2020 Virtual				
First Name	Last Name	Company	Role	10/21/2020
Juan Pablo	Andrade Medina	Olsun Electrics Corporation	Member	X
Robert	Ballard	DuPont	Chair	X
Israel	Barrientos	Prolec GE	Guest	X
William	Boettger	Boettger Transformer Consulting LLC	Guest	X
David	Caverly	Trench Limited	Guest	X
Solomon	Chiang	The Gund Company	Member	X
J. Arturo	Del Rio	Siemens Energy	Member	X
Saurahb	Ghosh	Transformers & Rectifiers (India) Ltd	Guest	X
Monty	Goulkhah	Kinectrics	Guest	X
Detlev	Gross	Power Diagnostix	Guest	X
Michael	Haas	Instrument Transformers, LLC	Guest	X
Kenneth	Hampton	Baltimore Gas & Electric	Guest	X

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Sergio	Hernandez Cano	Hammond Power Solutions	Guest	X
Mohammad	Iman	MGM Transformer Company	Member	X
Ramadan	Issack	American Electric Power	Guest	X
John	John	Virginia Transformer Corp.	Member	X
Charles	Johnson	Hitachi ABB Power Grids	Member	X
Ken	Klein	Grand Power Systems	Member	X
Kyle	Knous	EATON Corporation	Guest	X
Moonhee	Lee	Hammond Power Solutions	Member	X
Aleksandr	Levin	Weidmann Electrical Technology	Member	X
Colby	Lovins	Federal Pacific Transformer	Member	X
Tim-Felix	Mai	Siemens Energy	Member	X
Richard	Marek	Retired	Member	X
Joaquin	Martinez	Siemens Energy	Guest	X
Rhea	Montpool	Schneider Electric	Member	X
Jerry	Murphy	Reedy Creek Energy Services	Guest	X
Hossein	Nabi-Bidhendi	ABB Inc.	Guest	X
Aniruddha	Narawane	Power Distribution, Inc. (PDI)	Member	X
Shawn	Nunn	Hitachi ABB Power Grids	Guest	X
Stephen	Oakes	WEG Transformers USA Inc.	Guest	X
Klaus	Pointner	Trench Austria GmbH	Member	X
Chris	Powell	Intermountain Electronics	Guest	X
Thomas	Prevost	Weidmann Electrical Technology	Member	X
Ulf	Radbrandt	Hitachi ABB Power Grids	Guest	X
Michael	Sharp	Trench Limited	Member	X
Samuel	Sharpless	Rimkus Consulting Group	Guest	X
Edward	Smith	H-J Family of Companies	Guest	X
Brian	Sonnenberg	Instrument Transformers, LLC	Guest	X
David	Stankes	3M	Secretary	X
Kerwin	Stretch	Siemens Energy	Guest	X
Joseph	Tedesco	Hitachi ABB Power Grids	Member	X
Vijay	Tendulkar	Power Distribution, Inc. (PDI)	Member	X
Eric	Theisen	Metglas, Inc.	Guest	X
Parag	Upadhyay	ABB Inc.	Guest	X
David	Walker	MGM Transformer Company	Member	X
Roger	Wicks	DuPont	Member	X

Annex E HVDC Converter Transformers and Smoothing Reactors Subcommittee

**October 19, 2020, 3.45 pm
Virtual meeting**

**Chair: Ulf Radbrandt
Vice Chair: Les Recksiedler
Secretary: Pending (Ulf Radbrandt was secretary in this meeting)**

E.1 Introduction / Attendance

Introductions were made and the attendance was checked by a poll.

There were 12 members and 13 guests present. 2 new requests for membership was received.

The total membership of the SC is 14. We needed at least a total of 8 members to be present in order to have a quorum. This was achieved.

The agenda for this meeting, that was distributed via email October 12, was presented. The agenda was unanimously approved.

E.2 Approval of the minutes of the October 28, 2019 meeting in Columbus

The minutes from the Columbus meeting, that was distributed via email October 12, were presented and then unanimously approved.

E.3 Brief report on the meeting of the Administrative SC by Ulf Radbrandt

A satellite IEEE Transformers Committee is established in China. They might develop standards, but these standards must be approved by our committee.

A new standing committee for Entity Proposal Management is started. Requests will in firsthand be handled as proposals and not as PARs

If someone want to present or add a table or figure, the origin should be requested. A letter of assurance might be needed.

E.4 Working Group Reports

E.4.1 WG IEEE 1277 - Dry-Type and Oil-Immersed Smoothing Reactors and Dry-Type Converter Reactors

The WG chair, Klaus Pointner, gave an update of the status of the standard.

It was in ballot in November 2019 and then in a recirculation ballot in April 2020.

The standard has been approved May 6th, 2020 and is published (complementary PDF copies have been made available by IEEE to the WG members for download). The present standard will expire by December 31, 2030. The WG will not meet until a new PAR for revision is issued (~Fall 2026).

Awards for contributions and active participation are going to be sent directly to the recipients.

Recognitions will be made at one of the upcoming awards luncheons.

Klaus Pointner expressed his gratitude with his WG team with special thanks to Pierre Riffon and Ulf Radbrandt regarding the technical input on this update.

The subcommittee chair, Ulf Radbrandt, expressed his gratitude to Klaus Pointner for his great effort to successfully finalize this revision.

E.5 HVDC Tutorial

Ulf Radbrandt reported that he has been in contact with Tom Prevost about possible time slots for two HVDC tutorials. There are one available at Spring 2021 and one available at Fall 2021. We have earlier concluded that we would aim for both tutorials at one committee meeting. Now we must wait a quite long time to get both tutorials at one occasion.

A discussion showed that we prefer both tutorials at one occasion but that split tutorials also are ok.

Klaus Pointner made a motion to do one tutorial in spring 2021 and one in fall 2021. That was seconded by Pierre Riffon. None opposed to this and it was thereby decided.

We must consider copyright issues when we create the presentation material.

Ulf Radbrandt will ask Tom Prevost for template Power Point slides.

Involved persons should meet in a virtual meeting to go through material. Ulf Radbrandt will arrange that meeting.

The proposed plan for the tutorials is according to below:

HVDC Tutorial 1, HVDC System Aspects (LCC and VSC)	Duration, minutes	Responsible for material and doing presentation
Why HVDC? E.g. asynchronous connections, long DC cables, controllability, off-shore wind parks, Bulk Power	15	Les Recksiedler? (Ulf will ask)
Different types of converter configurations (e.g. bipolar, symmetrical monopolar, asymmetrical monopolar, back-to-back, multi-terminal). Perhaps we could include current rationale for application of different HVDC scheme types/topologies and any trends (IGBT ratings) or possible new technologies (Series Resonant Converters, MVDC)	10	Les Recksiedler? (Ulf will ask)
Different types of topologies 1/2 Bridge, Full Bridge, Hybrids, DC breakers	10	Klaus Pointner
Difference between Line Commutated Converters and Voltage Source Converters, including Single Line Diagram, operation principles, performance and guarantees	20	Pierre Riffon
Aspects of system design (e.g. calculations and simulations)	10	Ulf Radbrandt
Time for questions	10	

HVDC Tutorial 2, HVDC Equipment Aspects (LCC and VSC)	Duration, minutes	Responsible
Special stresses and testing of converter transformers (LCC and asymmetric VSC)	15	Pierre Riffon
Special stresses and testing of smoothing reactors	15	Klaus Pointner
Special stresses and testing of converter reactors (only VSC)	15	Klaus Pointner
Special stresses and testing of DC bushings	10	Waldemar Ziomek
Special stresses and testing of AC and DC filter equipment, for LCC, with focus on the filter reactors	10	Alexander Gaun
Time for questions		

E.6 Secretary of this Subcommittee

We are still missing a secretary of this SC. No-one volunteered at the meeting so volunteers are still welcome.

E.7 Name of this Subcommittee

Our standard IEEE 1277 does now also cover converter reactors for VSC applications. The covered converter reactors are those that are located at the valve arms and thereby and loaded with dc and ac current.

The name of this SC is now HVDC CONVERTER TRANSFORMERS AND SMOOTHING REACTORS SUBCOMMITTEE. The name does not include converter reactors and the scope of the SC does not either.

We discussed if we should apply for a change of the name of the subcommittee to also cover converter reactors?

Chris Plötner made a motion to change the name to HVDC CONVERTER TRANSFORMERS AND REACTORS SUBCOMMITTEE. That was seconded by Klaus Pointner. Another proposal appeared during the following discussions. That was TRANSFORMERS AND REACTORS FOR HVDC APPLICATIONS SUBCOMMITTEE.

A poll was arranged with the following alternatives:

- A) HVDC CONVERTER TRANSFORMERS AND REACTORS SUBCOMMITTEE.
- B) TRANSFORMERS AND REACTORS FOR HVDC APPLICATIONS SUBCOMMITTEE.
- C) Don't change the name of the subcommittee.

The result of the poll was as follows:

- A) 3
- B) 8
- C) 1

The decision was then that we should change the name to TRANSFORMERS AND REACTORS FOR HVDC APPLICATIONS SUBCOMMITTEE.

The scope of the subcommittee should also be adjusted in line with IEEE 1277 to also cover converter reactors.

Ulf Radbrandt will present this proposal to the officers of the Transformers Committee.

E.8 Old Business

There was no old business

E.9 New Business

There was no new business

E.10 Adjournment

The meeting was adjourned at 4:47 pm.

Annex F Instrument Transformers Subcommittee

Chair: Thomas Sizemore

Vice Chair: David Wallace

Secretary: Nigel MacDonald

F.1 Introductions

The table below shows all recorded attendees, affiliations and roles in the ITSC.

First Name	Last Name	Company/Affiliation	Role
Larry	Dix	Quality Switch, Inc.	Guest
Edward	Smith	H-J Family of Companies	Guest
Steven	Snyder	Hitachi ABB Power Grids	Member
Lee	Matthews	Howard Industries	Guest
Emilio	Morales-Cruz	Qualitrol Company LLC	Guest
Dieter	Wagner	Hydro One	Guest
Philip	Hopkinson	HVOLT Inc.	Guest
Devki	Sharma	Entergy	Guest
Devki	Sharma	Entergy	Guest
Gael	Kennedy	GR Kennedy & Associates LLC	Guest
Michael	Haas	Instrument Transformers, LLC	Guest
Pierre	Riffon	Pierre Riffon Consultant Inc.	Member
Ross	McTaggart	Trench Limited	Member
James	Graham	Weidmann Electrical Technology	Guest
James	McBride	JMX Services, Inc.	Guest
David	Ellis	PSEG	Guest
Rudolf	Ogajanov	ABB Inc.	Member
Kiran	Vedante	Ritz Instrument Transformers	Guest
John	Herron	Raytech USA	Guest

First Name	Last Name	Company/Affiliation	Role
Peter	Werelius	Megger	Guest
Jerry	Allen	Metglas, Inc.	Guest
Juan Carlos	Cruz Valdes	Prolec GE	Guest
Xose	Lopez-Fernandez	Universidade de Vigo	Guest
Daniel	Sauer	EATON Corporation	Guest
Huan	Dinh	Hitachi ABB Power Grids	Member
Thomas	Sizemore	ABB Inc.	Chair
Zoltan	Roman	GE Grid Solutions	Member
Scott	McCloskey	Amran Inc.	Member
Diego	Robalino	Megger	Member
David	Caverly	Trench Limited	Guest
Saurahb	Ghosh	Transformers & Rectifiers (India) Ltd	Guest
David	Wallace	Mississippi State University	Vice-Chair
Adnan	Rashid	Measurement Canada / ISED	Member
Stephen	Oakes	WEG Transformers USA Inc.	Member
Marek	Kornowski	Polycast International	Member
Steven	Brzoznowski	Bonneville Power Administration	Guest
Anil	Sawant	Virginia Transformer Corp.	Guest
Detlev	Gross	Power Diagnostix	Guest
Patrick	Rock	American Transmission Co.	Member
Eric	Euvrard	RHM International	Member
Kurt	Kaineder	Siemens Energy	Guest

First Name	Last Name	Company/Affiliation	Role
Igor	Ziger	KONCAR - Instrument Transformers	Member
Andre	Rottenbacher	Ritz Instrument Transformers	Member
Nigel	Macdonald	Trench Limited	Secretary
Lee	Bigham	Instrument Transformer Equip Corp	Member
Robert	Middleton	RHM International	Member
William	Whitehead	Siemens Energy	Guest
Juan Pablo	Andrade Medina	Olsun Electrics Corporation	Guest
Daniela	Ember Baciú	Hydro-Quebec IREQ	Guest
Feras	Fattal	Manitoba Hydro	Guest
Deniss	Villagran	GE Grid Solutions	Member
Dominique	Bolliger, Ph.D.	HV TECHNOLOGIES, Inc.	Member
Malia	Zaman	IEEE	Guest
Nicholas	Kostich	Ameren	Guest
Stacey	Kessler	Basin Electric Power Cooperative	Guest
Homero	Portillo	Advanced Power Technologies	Guest
Randy	Brannen	Southern Company Services	Member
Deepak	Kumaria	Hitachi ABB Power Grids	Member
Caroline	Peterson	Xcel Energy	Guest
Eric	Theisen	Metglas, Inc.	Guest
Juan	Ramirez	CELECO	Guest
Frank	Neder	Trench Germany GmbH	Guest

First Name	Last Name	Company/Affiliation	Role
Ivan	Konta	KONCAR - Instrument Transformers	Member
Dervis	Tekin	Meramec Instrument Transformer Co.	Member
Colby	Lovins	Federal Pacific Transformer	Guest
Brian	Sonnenberg	Instrument Transformers, LLC	Guest
Sylvain	Plante	Hydro-Quebec	Guest
Matthew	McFadden	Oncor Electric Delivery	Guest
Hugo	Avila	Hitachi ABB Power Grids	Guest
Ramadan	Issack	American Electric Power	Guest
William	Knapek	OMICRON electronics Corp USA	Guest
Risto	Trifunoski	Trench Limited	Guest
Nicholas	Podany	Bureau of Reclamation	Guest
Adam	Smith	Commonwealth Associates, Inc.	Guest
Brandon	Dent	Memphis Light, Gas & Water	Guest
Andrew	Larison	Hitachi ABB Power Grids	Guest
Jaroslaw	Chorzepa	ABB Inc.	Guest
James	Holt	Memphis Light, Gas & Water	Guest
Darrell	Banks	Memphis Light, Gas & Water	Guest
Olle	Benzler	Megger	Guest
Hossein	Nabi-Bidhendi	ABB Inc.	Guest
Suresh	Babanna	SPX Transformer Solutions, Inc.	Guest
Jonathan	Deverick	Dominion Energy	Guest

F.2 Quorum

26 of 35 members were present - quorum attained.

57 guests were also in attendance.

F.3 Agenda

An agenda was displayed by the chair. It was approved unanimously.

F.4 Approval of minutes – Columbus, Ohio meeting

Minutes were approved unanimously.

F.5 Essential Patent Claims & IEEE Copyright Policy

The essential patent claims slides were shown and no one brought any up. In addition, the copyright policy was discussed by the chair. It was mentioned that copyright permission is required to borrow material between IEEE standards.

F.6 Status of C57.13 Standards

The chair briefly presented the status of the various standards handled by the ITSC including both those being actively worked on at this time as well as those not yet due for revision.

F.7 Working Group Reports

F.7.1 JWG on Station Service Voltage Transformers, IEC-IEEE 63253-5713-8 – David Wallace & Ross McTaggart

Attendees: 51 people attended the meeting with 25 members present. Quorum was met. 8 people requested membership to the working group.

Essential Patent Claims: Was discussed by the Chair. The membership was inquired as to if anyone knew of essential patent claims. None were brought up.

IEEE Copyright Policy: Was discussed by the Chair.

Agenda: The agenda was displayed by the Chair. The agenda was approved with no objections made.

Minutes: Minutes of the Columbus, Ohio meeting were approved by the members of the working group with no objections.

David Wallace presented the status of the latest draft revision. The draft has been submitted for distribution to the committee for comment. The committee will have 16 weeks to review and comment on the draft. This will place comment resolution taking place beginning around the mid of January 2021 and having a revised draft ready by the Spring meeting.

In new business, discussions were held on the various methods of performing heat runs on the SSVT. Huan Dinh gave a presentation on a study made by ABB / Hitachi. There was a good round of discussions made by various members of the committee.

Zolton Roman gave his presentation on the Heat Run study made by GE followed by a round of discussions.

Igor Ziger presented the heat run findings obtained at Koncar. Unfortunately, time expired before he could finish his presentation.

It was decided to hold a later conference meeting to finish the heat run discussion. David Wallace will send out tentative dated for the meeting to be held on.

The meeting was adjourned at 9:15 am.

Next Meeting: The WG will meet to continue work at the Spring 2020 meeting in Toronto, Canada.

F.7.2.3 Working Group for PLC Capacitors and CCVT's C57.13.9 – Zoltan Roman

The Working Group Chair, Zoltan Roman, started the meeting with Deniss Villagran as the secretary, substituting Mike Craven. No introductions were made.

This is the Fall 2020 virtual meeting as a Working Group. There were 37 attendees.

Poll results

Members: 13/37, Guest: 18/37, Guest requesting membership: 3/37, No answer: 3/37

The patent notice was made and there were no patent claims.

The agenda was presented and approved, no comments.

Minutes of the 3 previous meetings were approved after motion by Deepak Kumaria, seconded by David Wallace.

Attendees were notified of new copyright rules.

Meeting started by presenting the status of the standard. The standard is 95%+ ready, comments received in the last 3 web meetings will be included in draft 9, which is intended for balloting.

Intend to have 2 more virtual meetings to finish standard.

1. Old business:

- a. PAR extension – expected date was 05/2020, if not needed we will not extend. Two more meetings to be scheduled to finish by January 2021.
- b. Review of Table 5 (dielectric levels) and

c. Table 8 (PD levels)

a. Dielectric table 5

- Survey question 1 results were presented.
- Dielectric levels from IEEE 1427 -2006 were presented. These levels match the proposal of Draft 8.
- Questioned if the values presented on draft 8 are acceptable, open discussion
- Ross we don't have the history of why those levels were specified, the concern is too relax the test requirements.
- Pierre agrees with the table and the values which are in line with the levels of the other instrument transformers.
- Steve Snyder supports proposal.
- Sylvain Plante don't see any issue. (user)
- Motion to accept the levels as they are shown in the table: Deepak Kumaria, second Rob Gosh

Vote for motion 1, only members to vote.

Results: For: 13, Against: 2, Abstain: 0. Motion accepted.

b. Table 8 (PD levels)

- Survey question 2 results were presented.
- Motion from Stephen Ashcraft to have further discussion on the PD levels. How were those levels determined?
- Response by Zoltan: 10pc is used in CT/VT standard. Other values are arbitrary. Higher capacitance higher is the noise during the testing.
- Pierre Riffon capacitance increase the sensitivity of the measurement equipment is decreased.
- Andre can achieve 5pc up to 25nF depending of the shielding.
- Suggestion to invite PD experts to present reasoning behind the testing settings.
- Feras Fattal they test up to 60 nF, values are ok. Send invitation to meeting (ffattal@hydro.mb.ca).
- Members to invite their teams to the meeting and email names to Zoltan.

These levels are for test single units. PD can be improved by testing 2 units in parallel.

2. New business

a. Review of Randy Brannen's suggestions to add an Appendix about the capacitance ranges of CCVTs

Presented proposed capacitance ranges to be added in an informative annex.

Proposed to have 3 ranges of capacitance, include an extra high capacitance and guidance on when to use the different ranges. Include the intention of when to use the different capacitance, TRV, PLC.

Include text in draft 9 and to be reviewed in the following meetings.

Survey to vote on the table to be proposed, including 3 ranges.

b. RIV testing – Pierre Riffon

Include 2 levels of acceptance for the 2 test methods for the RIV table. The impedance will be specified as 150 ohms for NEMA and 300ohms for IEC. The RIV test is no necessary for devices rated below 245kV.

Dieter Wagner is OK with proposal.
Ivan Konta agreed too.

The meeting was adjourned at 1:02pm

F.7.5 TF for Instrument Transformers Accuracy – Igor Ziger

Attendees: The exact number of participants will be provided after receiving the final data from PSAV, 19 members present and 9 people requested membership. Quorum was obtained

Essential Patent Claims: Text was displayed, and the Chair inquired as to if anyone knew of essential patent claims. None were brought up.

Copyright: Text was displayed at the meeting

Minutes of pervious meeting: Unanimously approved with motion brought forward by Pierre Riffon and seconded by Thomas Sizemore

Agenda: was displayed without any objections

Review of the action items for this task force :

- Presentation was done by I. Žiger on “Influence of burden on accuracy of VTs“, which took up most of the time. IT showcased the work done in previous meeting as well as data collected by T. Sizemore and I. Ziger. It also included some ideas on how to proceed forward. There were discussion points throughout the presentation. More notable comments are given below:
- Hossein suggested to have a survey on performing all measurements at 1.0 PF, as then the customers can easily recalculate the accuracy for any burden and power factor.
- R. Ogajanov suggested to include the impact of the new RCF/PF to the TCF in regards to proposed square accuracy limits
- I. Ziger and D. Kumaria to send out the survey to the main standard group and to the AEIC meter and service committee on the new burdens with unity PF and the application requirement for 400 VA and 0 VA burdens.
- I. Ziger and D. Kumaria will reach out and search for volunteers to work on a new informative annexure (Currently I. Ziger, T. Sizemore, D. Kumaria and R. Trifunoski)
- Web meetings to be scheduled to discuss further sections of the presentation
- I. Ziger to upload all previous materials to the IEEE server

Motion to adjourn: A motion was put forth by Deepak Kumaria and second by Rudolf Ogajanov.

Next Meeting: This WG will meet to continue work at the Toronto, Canada Spring 2020 meeting.

F.8 Old Business

F.9 New Business

Zoltan Roman questioned C57.13 – 2016 table 10 which in deviates from the method used in earlier versions of the standard regarding burdens at ratings other than 5 amperes. Considerable discussion took place without reaching a group consensus. Ross McTaggart took the action to contact ITSC members not in attendance that might be able to explain the reasons behind the change.

Diego Robalino raised a question regarding the uncertainty limits as presented in C57.13 – 2016 8.1.1. The requirements presented and the example do not seem to match. Thomas Sizemore is to reach out to Vladimir Khalin and Diego Robalino to discuss this topic.

F.10 ITSC Adjournment

The meeting concluded after a motion to adjourn by Steve Synder and seconding of this motion by Deepak Kumaria.

The next meeting is to be held in Toronto, Canada, in Spring 2021.

Annex G Insulating Fluids Subcommittee

October 21, 2020

Virtual Meeting

Chair: Scott Reed

Vice-Chair: Jerry Murphy

Secretary: Alan Sbravati

G.1 Introductions, Roll Call of Members for Quorum, Meeting Agenda Approval, S19 Minutes Correction and Approval, and Chair's Comments

G.1.1 Chair's Opening Remarks:

- a. Presentation of the Vice-Chair, Jerry Murphy and the Secretary Alan Sbravati.
- b. Reminded that the SC minutes are due December 11, 2020 - WG and TF meeting minutes are due for submittal to the Insulating Fluids Subcommittee (IFSC) Secretary Alan Sbravati due within 15 days of their meetings (November 11, 2020).

G.1.2 Roll Call of SC members: (Quorum requirement: 23 minimum)

- a. 32 Members signed in. Quorum was achieved.
- b. 73 Guests attended, and 16 requested membership, whose eligibility will be verified.
- c. Attendance list as follows:

Last Name	First Name	Company	Role
Acosta	Juan	Ergon, Inc.	Guest
Amarasinghe	Dinu	Bruce Power	Guest
Banks	Darrell	Memphis Light, Gas & Water	Guest
Barrientos	Israel	Prolec GE	Guest
Beauchemin	Claude	TJH2b Analytical Services	Member
Blackburn	Thomas	Gene Blackburn Engineering	Guest
Boettger	William	Boettger Transformer Consulting LLC	Guest
Bolliger, Ph.D.	Dominique	HV TECHNOLOGIES, Inc.	Guest
Boman	Paul	Hartford Steam Boiler	Member
Bonfiglio	Susan	Western Area Power Admin.	Guest
Bonn	Mike	Soltex Inc.	Member
Bradshaw	Jeremiah	Bureau of Reclamation	Guest
Buchgeher	Erich	Siemens Energy	Guest
Calitz	David	Siemens Energy	Member
Casserly	Edward	Ergon, Inc.	Member
Castellanos	Juan	Prolec GE	Member

Last Name	First Name	Company	Role
Chambers	Stuart	Powertech Labs Inc.	Member
Cheim	Luiz	Hitachi ABB Power Grids	Member
Chiang	Solomon	The Gund Company	Guest
Christodoulou	Larry	Electric Power Systems, Inc.	Member
Denzer	Stephanie	Alliant Energy	Member
Doak	Eric	D4EnergySolutions LLC	Guest
Draper	Zachary	Delta-X Research Inc.	Guest
Dukarm	James	Delta-X Research Inc.	Member
Field	Norman	Teshmont Consultants LP	Guest
Foschia	John	SPX Transformer Solutions, Inc.	Member
Frimpong	George	Hitachi ABB Power Grids	Guest
Frotscher	Rainer	Maschinenfabrik Reinhausen	Guest
Gara	Lorne	Shermco	Guest
Gardner	James	SPX Transformer Solutions, Inc.	Guest
Gaytan	Carlos	Prolec GE	Guest
Ghafourian	Ali	H-J Enterprises, Inc.	Guest
Ghosh	Saurahb	Transformers & Rectifiers (India) Ltd	Guest
Giraldo	Orlando	H-J Family of Companies	Guest
Graham	James	Weidmann Electrical Technology	Member
Guner	Ismail	Hydro-Quebec	Guest
Gyore	Attila	M&I Materials Ltd	Member
Hanson	David	TJH2b Analytical Services	Guest
Hayes	Roger	General Electric	Member
Hernandez	Ronald	Doble Engineering Co.	Guest
Hoffman	Saramma	PPL Electric Utilities	Guest
Holden	Andrew	Ergon, Inc.	Guest
Holland	David	ExxonMobil	Guest
Hollrah	Derek	Burns & McDonnell	Guest
John	John	Virginia Transformer Corp.	Member
Johnson	Toby	Pacificorp	Member
Jonak	Ryan	Portland General Electric	Guest
Kaineder	Kurt	Siemens Energy	Member
Karas	Jon	SDMyers, LLC.	Member
Kinner	Robert	FirstPower Group LLC	Guest
Kiparizoski	Zan	Howard Industries	Member
Kuppuswamy	Raja	Dynamic Ratings, Inc.	Guest
Kutzleb	Michelle	TJH2b Analytical Services	Guest
Lackey	John	PowerNex Associates Inc.	Guest
Lamontagne	Donald	Arizona Public Service Co.	Guest
Larison	Andrew	Hitachi ABB Power Grids	Guest
Lukenda	Nikola	Petro-Canada Lubricants Inc.	Guest

Last Name	First Name	Company	Role
Malde	Jinesh	M&I Materials Inc.	Member
Mani	Kumar	Duke Energy	Member
Mani	Balakrishnan	Virginia Transformer Corp.	Guest
Mciver	James	Siemens Energy	Guest
McNelly	Susan	Xcel Energy	Member
Murphy	Jerry	Reedy Creek Energy Services	Vice-Chair
Nambi	Shankar	Bechtel	Guest
Nesvold	Brady	Xcel Energy	Guest
Niroula	Ashmita	Ergon, Inc.	Guest
Nunes, Jr	Jayme	Nynas AB	Guest
Oakes	Stephen	WEG Transformers USA Inc.	Guest
Ocon	Rodrigo	Industrias IEM	Guest
O'Malley	Anastasia	Consolidated Edison Co. of NY	Guest
Panesar	Parminder	Virginia Transformer Corp.	Guest
Parkinson	Dwight	EATON Corporation	Member
Perjanik	Nicholas	Weidmann Electrical Technology	Member
Podany	Nicholas	Bureau of Reclamation	Guest
Prevost	Thomas	Weidmann Electrical Technology	Member
Prunte	John	SPX Transformer Solutions, Inc.	Guest
Rampersad	Shiva	Dow Chemical Company	Guest
Rapp	Kevin	Cargill, Inc.	Guest
Raymond	Timothy	Electric Power Research Institute (EPRI)	Guest
Reagan	John	Oncor Electric Delivery	Guest
Reed	Scott	MVA	Chair
Reimer	Jonathan	FortisBC	Guest
Reiss IV	Clemens	Custom Materials, Inc.	Guest
Rezaei-Zare	Afshin	York University	Guest
Robalino	Diego	Megger	Guest
Rock	Patrick	American Transmission Co.	Guest
Saad	Mickel	Hitachi ABB Power Grids	Member
Sawant	Anil	Virginia Transformer Corp.	Guest
Sbravati	Alan	Cargill, Inc.	Secretary
Schwartz	Dan	Quality Switch, Inc.	Guest
Sharp	Michael	Trench Limited	Guest
Shull	Stephen	BBC Electrical Services, Inc.	Guest
Sinclair	Jonathan	PPL Electric Utilities	Guest
Soto	Mauricio	Hitachi ABB Power Grids	Guest
Sparling	Brian	Dynamic Ratings, Inc.	Guest
Steeves	Gregory	Baron USA, LLC	Member
Strongosky	Neil	Memphis Light, Gas & Water	Guest
Sullivan	Kevin	Duke Energy	Member

Last Name	First Name	Company	Role
Szewczyk	Radoslaw	Specialty Products Poland Sp. z o.o.	Guest
Thompson	Ryan	Burns & McDonnell	Member
Vo	Duy	Central Maine Power (AVANGRID)	Guest
Vukovic	Dejan	Hitachi ABB Power Grids	Guest
Wallach	David	Duke Energy	Member
Wang	Evanne	DuPont	Guest
Warntjes	Michael	American Transmission Co.	Guest
Weiss	Zachery	WEG Transformers USA Inc.	Guest
Weyer	Daniel	Nebraska Public Power District	Guest
Whitten	Christopher	Hitachi ABB Power Grids	Guest
Wind	Rene	Siemens Energy	Guest
Woods	Deanna	Alliant Energy	Member

G.1.3 Agenda Approval:

- a. A motion was made by Stu Chambers and seconded by Ed Casserly to approve the agenda. The agenda was approved unanimously without objection.

G.1.4 Approval of minutes from the S19 meeting in Anaheim, CA:

- a. A motion was made by Ed Casserly and seconded by Jon Karas to approve the minutes. The minutes were approved unanimously without objection.

G.1.5 Chair's review of key IFSC Standards:

- a. The chair reviewed the status of each guide under the Sub-Committee Insulating Fluids. C57.155 will expire in 2024. C57.637, C57.130 and C57.139 C57.155 will expire in 2025.
- b. C57.104 was published in November 1, 2019.
- c. C57.147 will expire beyond 2025 and it will s be superseded by C57.166, so no activity is required at this point.
- d. C57.146 and C57.166 have active PAR's.

G.2 WG & TF Reports Presented at the SC Meeting

G.2.1.1 IEEE C57.166 I see Consolidation of Insulating Liquids Guides (PAR Expiration: Dec 2022)

WG Chair: Tom Prevost

The report of the WG Meeting was presented at the IFSC meeting by Tom Prevost:

- a. The WG meeting had 90 attendees. Of these, 24 of 36 members were present so a quorum was achieved.
- b. Six Task Forces chairs each gave a status report of their respective sections. For this meeting the chair decided to start the activities report from the TF6, in the reverse order. TF6 is only for editorial, no activities so far. TF5 presented a draft of the chapter 11, whose main discussion point were: the inclusion of BDV test as per ASTM D877, which was previously discussed in TF1 and the group decided to be exclude; a proposal for changing the voltage classes in the table, what is a significant issue. TF1 did an analysis of this and concluded it should not be changed. The chair created an ad hoc group with the TF leaders and contributors, making this a WG decision, for closing the topic. TF4 decision was to remove the chapter 10, not having any text to be prepared. TF3 had no new information to share. TF2 will start after TF1. TF1 had very short time. The voltage limits will be discussed in the ad hoc group, minimum values of BDV for new unused liquid were harmonized and limits for LFH were set as the same used for MO. The ad hoc group will have meetings during the interval till next meeting

See *Appendix I* for the F20 Minutes (unapproved) of C57.166 WG Meeting as submitted.

G.2.1.2 IEEE C57.146 IEEE Guide for Interpretation of Gasses Generated in Silicone-Immersed Transformers (PAR Expiration: Dec 2022)

WG Chair: Jon Karas

- a. The working group had a very low attendance, due to happening simultaneously with the C57.162. They had 16 attendees, and all were eligible to become members.
- b. They are trying to keep the std simple. Data shared from C57.104 was received and will be used. They are modifying the standard to have no more “abnormal conditions”, but statuses. Duval triangle for silicone fluid was added.

See *Appendix II* for the F20 Minutes (unapproved) of C57.146 WG Meeting as submitted.

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

TF Chair: Claude Beauchemin

- a. The working group had 115 attendees. 58 requests for membership plus the chair, making a total of 59 members.
- b. The WG was dismantled after the guide was published, thus, they are now meeting as a task force as a preparation for the next revision of 104.
- c. This task force will check the list included in an annex of C57.104 of activities the WG could not complete prior to the PAR expiration. They aim to complete some of these items prior to a new revision is started. Important aspects they listed include: improve the correlation between the DGA status and the actual issues; keep the database of DGA registers; find better solutions for data storage and handling for the large number of cases (over 1 million datapoints). Currently the data is divided in separated files; concerns with the potential misuse of the data.
- d. Online monitoring interpretation will be the subject of another sub-TF, in this group, as the guide under development for online monitoring does not cover data interpretation.
- e. They anticipate a duration ~2 years.
- f. Deliverables: a PAR for modifying documents / whitepaper showing the results / preparation of a database.

See *Appendix II* for the F20 Minutes (unapproved) of C57.146 WG Meeting as submitted.

G.3 Old Business

No Old Business to review.

G.4 New Business

- a. The chair presented a proposal for creating task forces for investigating the need of revision of standards: C57.155, C57.139, C57.637 and C57.130
- b. A Motion for opening a task force to evaluate a possible revision of C57.155 by Claude Beauchemin second by Kurt Kaineder. A discussion regarding the possible merging of DGA interpretation guides for all insulating liquids into a consolidated guide, as for C57.166. This proposal does not block the motion. Potentially the guides for the Tap Changer and for gases generated during temperature rise test should not be merged.
The existence of new data was questioned, and a new set of data from Alliant Energy, covering 8 years of data from natural and synthetic ester filled transformers was offered to the group. It was also mentioned the existence of a Cigre WG investigating the topic.
Jinesh Malde brought to the attention of the subcommittee about the IEEE DEIS Technical Committee on Liquid Dielectrics. The motion was unanimously approved.
- c. A Motion for opening a task force to evaluate a possible revision of TF C57.139 was presented by Tom Prevost and second by Claude Beauchemin.
There was no discussions nor opposition. Motion was unanimously approved.
- d. A Motion for opening a task force to evaluate a possible revision of TF C57.130 was presented by Claude Beauchemin and second by Juan Castellanos.
There was no discussions nor opposition. Motion was unanimously approved.
- e. A Motion for opening a task force to evaluate a possible revision of TF C57.637 was presented by Tom Prevost and second by Susan McNelly. A proposal was suggested to modify the title and scope of the standard, for including both reclamation and reconditioning of all liquids included in C57.166. The motion was unanimously approved.
- f. Jim Graham suggests having chairs for the TF's. Scott asks for volunteers to contact the subcommittee officers if they are interested in taking a leadership role.

G.5 Next Meeting:

March 25, 2020—Toronto, Canada

G.6 Adjournment

The subcommittee adjourned at 3:28 p.m.

Respectively Submitted, Alan Sbravati, Secretary IFSC

Unapproved Minutes from the F20 IFSC WG and TF meetings

Appendix I

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

**Tuesday, October 20, 2020
12:55 – 2:10 PM
Virtual Meeting
Minutes of WG Meeting**

Chairman Tom Prevost
Vice Chair Scott Reed
Secretary Alan Sbravati

The meeting was called to order at 1:00 pm by Chair Tom Prevost.

There were 24 of 36 members present. There were 66 guests. A membership quorum was achieved. The attendance list is reflecting the new roles of the participants, including the new members, resulting in a total of 30 members.

Attendance:

Last Name	First Name	Company	Role
Acosta	Juan	Ergon, Inc.	Guest
Allen	Jerry	Metglas, Inc.	Guest
Amador	Angela	EATON Corporation	Guest
Beauchemin	Claude	TJH2b Analytical Services	Member
Biggie	Kevin	Weidmann Electrical Technology	Guest
Blaszczyk	Piotr	Specialty Transformer Components LLC	Guest
Boettger	William	Boettger Transformer Consulting LLC	Guest
Bolliger, Ph.D.	Dominique	HV TECHNOLOGIES, Inc.	Member
Boman	Paul	Hartford Steam Boiler	Member
Bonn	Mike	Soltex Inc.	Member
Bradshaw	Jeremiah	Bureau of Reclamation	Member
Brauer	Stephan	Morgan Schaffer	Guest
Bray	Elizabeth	Southern Company Services	Guest
Cantu de Leon	Jorge	SPX Transformer Solutions, Inc.	Guest
Casserly	Edward	Ergon, Inc.	Member
Chambers	Stuart	Powertech Labs Inc.	Member
Cheema	Muhammad Ali Masood	Northern Transformer	Guest
Cheim	Luiz	Hitachi ABB Power Grids	Member
Christodoulou	Larry	Electric Power Systems, Inc.	Guest
Cruz Valdes	Juan Carlos	Prolec GE	Guest
Denzer	Stephanie	Alliant Energy	Guest
Doak	Eric	D4EnergySolutions LLC	Guest
Dorris	Don	Nashville Electric Service	Member
Doyle	Lee	Vaisala	Guest
Draper	Zachary	Delta-X Research Inc.	Guest

Last Name	First Name	Company	Role
Dukarm	James	Delta-X Research Inc.	Guest
Faur	Florin	SPX Transformer Solutions, Inc.	Guest
Frimpong	George	Hitachi ABB Power Grids	Guest
Frotscher	Rainer	Maschinenfabrik Reinhausen	Member
Gara	Lorne	Shermco	Guest
Graham	James	Weidmann Electrical Technology	Member
Guner	Ismail	Hydro-Quebec	Guest
Gyore	Attila	M&I Materials Ltd	Guest
Hanson	David	TJH2b Analytical Services	Guest
Hayes	Roger	General Electric	Member
Hernandez	Ronald	Doble Engineering Co.	Guest
Hoffman	Saramma	PPL Electric Utilities	Guest
Holden	Andrew	Ergon, Inc.	Guest
Holland	David	ExxonMobil	Guest
Hollrah	Derek	Burns & McDonnell	Guest
Johnson	Toby	Pacificorp	Member
Kaineder	Kurt	Siemens Energy	Member
Karas	Jon	SDMyers, LLC.	Member
Kennedy	Gael	GR Kennedy & Associates LLC	Guest
Kiparizoski	Zan	Howard Industries	Member
Klaponski	Brian	Carte International Inc.	Guest
Kutzleb	Michelle	TJH2b Analytical Services	Guest
Lamontagne	Donald	Arizona Public Service Co.	Guest
Levin	Aleksandr	Weidmann Electrical Technology	Guest
Lucas	Tiffany	SPX Transformer Solutions, Inc.	Guest
Lukenda	Nikola	Petro-Canada Lubricants Inc.	Member
Malde	Jinesh	M&I Materials Inc.	Member
Mani	Balakrishnan	Virginia Transformer Corp.	Guest
Mani	Kumar	Duke Energy	Member
Miller	Philip	Memphis Light, Gas & Water	Guest
Moleski	Hali	SDMyers, LLC.	Guest
Natale	Anthony	HICO America	Guest
Niroula	Ashmita	Ergon, Inc.	Guest
Nunes, Jr	Jayme	Nynas AB	Guest
Ocon	Rodrigo	Industrias IEM	Guest
O'Malley	Anastasia	Consolidated Edison Co. of NY	Guest
Panesar	Parminder	Virginia Transformer Corp.	Guest
Patel	Poorvi	Electric Power Research Institute (EPRI)	Guest
Perjanik	Nicholas	Weidmann Electrical Technology	Member
Picher	Patrick	Hydro-Quebec IREQ	Guest
Prevost	Thomas	Weidmann Electrical Technology	Chair
Rapp	Kevin	Cargill, Inc.	Member
Rasor	Robert	SDMyers, LLC.	Member
Raymond	Timothy	Electric Power Research Institute (EPRI)	Member
Reed	Scott	MVA	Vice-Chair
Reiss IV	Clemens	Custom Materials, Inc.	Guest
Rock	Patrick	American Transmission Co.	Member
Saad	Mickel	Hitachi ABB Power Grids	Member
Sbravati	Alan	Cargill, Inc.	Secretary
Selvaraj	Pugazhenth	Virginia Transformer Corp.	Member
Sheehan	David	HICO America	Guest
Simonelli	Richard	SPX Transformer Solutions, Inc.	Member
Sinclair	Jonathan	PPL Electric Utilities	Member

Last Name	First Name	Company	Role
Soto	Mauricio	Hitachi ABB Power Grids	Guest
Sparling	Brian	Dynamic Ratings, Inc.	Guest
Spitzer	Thomas	City Transformer Service Co.	Guest
Steeves	Gregory	Baron USA, LLC	Member
Su	Paul	FM Global	Guest
Sullivan	Kevin	Duke Energy	Guest
Szewczyk	Radoslaw	Specialty Products Poland Sp. z o.o.	Guest
Tanaka	Troy	Burns & McDonnell	Guest
Taylor	Marc	Cogent Power Inc.	Guest
Thompson	Ryan	Burns & McDonnell	Guest
VanderWalt	Alwyn	Public Service Co. of New Mexico	Member
Vermette	Yves	Electro Composites ULC	Guest
Vukovic	Dejan	Hitachi ABB Power Grids	Guest
Wallach	David	Duke Energy	Guest
Weiss	Zachery	WEG Transformers USA Inc.	Guest
Weyer	Daniel	Nebraska Public Power District	Guest
Whitten	Christopher	Hitachi ABB Power Grids	Guest
Woods	Deanna	Alliant Energy	Guest
Yazdani	Mana	Trench Limited	Guest
Zaman	Malia	IEEE	Guest
Zemanovic	Kyle	EATON Corporation	Guest
Zhao	Peter	Hydro One	Guest
Ziomek	Waldemar	PTI Transformers	Guest

Introductions

Approval of Agenda

Approval of Spring 2019 Minutes

Call for Patents

New Document:

Title

Scope

Purpose

Review of Document Structure and Task Forces

Task Force Reports

TF1 Types of Insulating Liquids—Jinesh Malde

TF2 In Service—Scott Reed

TF3 Mixture of Insulating Liquids—Alan Sbravati

TF4 Maintenance of Insulating Liquids—Andy Holden

TF5 Insulating Liquids for LTCs—Rainer Frotscher

TF6 Editorial—Toby Johnson

New Insulating Fluids – Continued Discussion from Fall 2018 Meeting

Voltage Levels within Acceptance Tables- Discussion

New Business

Adjourn

The Fall 2019 minutes were unanimously approved. Motion for approving the minutes of meeting from Tim Raymond, second Andy Holden. No comments were presented, minutes from Fall 2019 were approved unanimously. Motion for approval the agenda from Rainer Frotscher, seconded by Attila Gyore. No comments were presented, agenda was approved unanimously.

Chairman Prevost posted the Patent Claim. No claims were made.

Chairman Prevost presented the copyright policy slides.

TF 6 (Tobby Johnson): Essentially no activities yet, as their will start after a first draft is available.

TF 5 (Rainer Frotscher): Presented the draft his task force prepared for chapter 11 - Tap Changers.

Main points highlighted by Rainer:

- They tried to make the chapter as compact as possible. Some tables need to be repeated here, for the acceptance criteria is not the same applied for the fluid in the transformer main tank;
- The TF considered it would be better to have a single item for ester fluids, not differentiating natural and synthetic fluids;
- The columns of the presented tables used are based on max voltage level (U_M), instead of the voltage class as per other IEEE standards. Rainer arguments were that this is a more modern and international approach. It is the reference adopted by IEC.
- The limits between the intermediary voltage class and higher voltage class was changed, using 170kV (U_M) instead of 230kV (voltage class). The motivation is the significant differences between a tap changers up to 170kV and a for 230kV.
- They added tables with limits for fluids properties for continuous operation, as the other chapters have for the liquid in the main tank, but they also have table setting limits for re-energization after a maintenance intervention. This second set of tables is not used in other chapters.

Following Rainer presentation, Tom Prevost opened a discussion considering two main points:

- 1) Keeping the reference of ASTM D877 conflicts with previous decisions (TF1);
- 2) Changing the values for the voltage classes is a major question. Tom suggests forming an ad hoc group for discussing this change, due to the large impacts in many other standards.

Jinesh Malde reported that TF1 did an investigation of this topic, more specifically Zan Kiparizoski from Howard Transformers. Their conclusions were compiled in a document to be shared with the group. The result of this assessment is to keep the voltage classes as per IEEE, not adopting the IEC ranges. Zan argued the creation of the ad hoc group should wait for the TF1 presentation. Tom replied that he wanted to move ahead and create the group, even if they will only analyze the conclusions from TF1.

Alan made a comment that the question should be discussed as two separated topics:

- The use of “voltage classes” vs “maximum voltages”
- The upper limit for the intermediary level, which is reduced from 230kV to 170kV

Scott reminded everyone that the group already discussed and decided to remove ASTM D877. He also questioned the inclusion of silicone fluid for tap changers. Rainer explained that silicone presents some limitations for the energized tap changer (LTC), due to the wearing of the contacts. But the chapter also covers the deenergized tap changers, which may more often filled with silicone.

The document prepared by TF5 will be shared with the working group for comments.

TF 4 (Andy Holden):

Andy reported that they identified that this chapter is already covered by the IEEE guide C57.637.

Tom mentioned this is focused only in mineral oil.

Scott informed that the guide C57.637 will be suggested to be opened to revision during the IFSC meeting tomorrow.

Tom suggests keeping the limit values in C57.166, a standard, and the description of the procedures in C57.637, a guide.

Andy presented a motion for removing the item 10 from C57.166, seconded by Jinesh.

Michael from ABB made a question between the different limits for reprocessing and reclaiming.

Scott clarified that the limits in service are to be defined by the TF2. What would be removed is only the description of how to perform the maintenance.

The motion was unanimously approved.

TF3 (Alan Sbravati): the TF had no meetings since F19, thus the document is still the same that was already presented. The only missing topic is the sampling procedure. Handling and storage was already covered by TF1.

TF2 (Scott Reed): as the activities of this TF are intrinsically related to the definitions from TF1, they will wait to the activities from TF1 to be completed.

TF1 (Jinesh Malde):

Their document is almost complete, and it should be distributed to the WG for comments.

There would be a few points he wants to bring to discussion today:

- 1) The assessment they did regarding IEEE vs IEC voltage levels will be distributed to the group.
- 2) Limits for unused liquids were harmonized among all liquids. Values for synthetic ester were changed and the new ASTM standard, should be adjusted accordingly.
- 3) The group decided to use the same limits from mineral oil for the Less Flammable Hydrocarbons (LFH). They decided to include values for silicone only for the first column, up to 69kV.
- 4) ASTM draft standard for synthetic ester liquids is still facing some difficulties for the final approval. As the discussion does not affect the limits, we can move ahead with the information in C57.166

Jinesh planned to present a motion for:

- Merging the lines of mineral oil and and LFH
- Having silicone limited to 69kV

The motion was not discussed due to the lack of time.

Old Business: Chairman Prevost mentioned there are no old business.

New Business: No new business.

The meeting was adjourned at 2:13 pm.

Next meeting is scheduled for April 27, 2021 in Toronto, Ontario Canada

Alan Sbravati, Secretary

Scott Reed, Vice Chair

Appendix II

Working Group for C57.146 IEEE Guide for DGA in Silicone

**Monday, October 19th, 2020
10:45 AM - 12:00 PM (central time)
Virtual Meeting**

Minutes of Working Group Meeting

Chairman Jon Karas
Vice Chair Toby Johnson

Attendance: Scott Reed, Jon Karas, Claude Beauchemin, Paul Boman, Rob Ghosh, Akash Joshi, Andy Holden, E Davis, Florin Faur, Jayme Nunes, John Prunte, Norman Field, Rob Shepherd, Zoran Goncin, Toby Johnson, John Lackey

Call for patents – none at this time

Copyright discussed.

Background mainly industrial transformers involved

Title/Scope (As stated in minutes)

- Item 'C' has changed – add Duval Triangle to guide
- Title scope are approved by formal vote

Purpose

- Second sentence might need to change. Eliminate second sentence. Motion to approve removal of second sentence and accept purpose with change.
- Purpose approved by formal vote

Question: What is 'fixed instruments'? Answer – Online monitor.

Discussion about table 1: Claude shared his work on the table. Compute ratio between CIGRE numbers and IEEE C57.146. If anyone has any more DGA values for Silicone please share.

Values from the two sources analyzed were close to the values in C57.146 except for C2H6. May need to split the data sets into two different tables (as done in .104) depending on what the other data sets (that still need to be analyzed) show. Discussion about difference between handling silicone vs mineral oil and if it makes sense to compare the two. Claude is expecting a few months before samples 3 and 4 have been analyzed and

Should we make a Copyright request to use CIGRE document? Paul Boman will make request.

Row 10 and 11 98th and 99th percentile

Do we know how the numbers were generated for the initial guide? Paul to check on that as well.

Claude will follow-up with Michel. Michel said no changes. Implementing the Duval triangle.

Rough draft not finished yet.

Florin Faur – ABB ratio to be applied? Probably not for Silicone (Scott). Ratio would be infinity.

No plans to include ratios. Other industry recognized diagnostics for Silicone? No.

Seeking volunteer to help Jon and Toby – Secretary – Paul Boman

Adjourn

Appendix III

TF Next Revision to C57.104: Guide for Interpretation of Gases Generated in Mineral Oil-Immersed

Monday, October 19th, 2020

3:45 PM (central time)

Virtual Meeting

Minutes of Task Force Meeting

The virtual meeting was called to order by Chair Claude Beauchemin at 4:47 PM. Claude introduced himself, Norman (Vice Chair) and Hali (Secretary). There were 115 attendees at the start of the meeting. There were 58 requests for membership during the online poll. This is 59 members including the Chair.

Attendees requesting membership are:

1. Anand Zanwar
2. Anastasia O'Malley
3. Bill Whitehead
4. Bob Rasor
5. Brad Staley
6. Brady Nesvold
7. Cihangir John
8. Claude Beauchemin (Chair)
9. David Calitz
10. David Murray
11. David Wallach
12. Diego Robalino
13. Dmitriy Klempner
14. Don Dorris
15. Donald Lamontagne
16. Dwight Parkinson
17. Emilio Morales-Cruz
18. Eric Doak
19. Erich Buchgeher
20. Florin Faur
21. Hali Moleski (Secretary)
22. James Dukarm
23. Jayme Nunes
24. Jerry Murphy
25. Jim Graham
26. John K John
27. John Prunte
28. John Sinclair
29. Jon Karas
30. Juan Acosta
31. Kris Zibert
32. Kumar
33. Larry Christodoulou
34. Lee Doyle
35. Luiz Cheim
36. Marco Espindola
37. Markus Schiessl
38. Michael Botti
39. Mickel Saad
40. Monty Goulkhah
41. Nick Perjanik
42. Nitesh patel
43. Norman Field (Vice Chair)
44. Oleg Roizman
45. Paul Boman
46. Roger Hayes
47. Samraghi Dutta Roy
48. Scott Reed
49. Shiva Rampersad
50. Stacey Kessler
51. Stephanie Denzer
52. Stuart Chambers
53. Sukhdev Walia
54. Susan McNelly
55. Timothy Raymond
56. vbaniroula
57. William Boettger
58. Zack Draper
59. Zan Kiparizoski

The copywrite policy was reviewed. History of C57.104 Gas Guide was mentioned as the 2019 version is published and in use with much effort from the last working group. During that work, improvements had been identified. The purpose of this task force was to start preparation for C57.104 in the future, not to revise the existing standard.

A power point presentation was reviewed to show the objective of 'evaluating the way forward' and to address the lessons learned from the last revision. Many of these are listed in the Gas Guide Annex. Scope is to address these topics from Annex and additional added topics and evaluate how to address them for the next revision.

Annex A items were reviewed:

- Reduce number of 'investigate' transformers
- Better correlation between DGA results and actual faults
- Build database (data storage, access, legal implications, etc)
- Adapt guide to better apply to online monitors (data/sample frequency)
- Data handling protocol, including code/tools

And the virtual floor was opened for discussion:

- Paul Bowman: Benefit to see how existing guide works via feedback from utilities and end users. Norman suggested a survey with several open-ended questions to provide feedback.
- Luiz Chem: Weariness of data sharing is a continual issue, and questions will remain. Technology that could be considered and researched is BlockChain whereas data submittal is anonymous. Claude agreed a good idea, but first need to handle data security in general. Norman added that IEEE did not have an answer on disclaimer/waiver on data. And labs may not want others to have access to data set. Claude added that a nondisclosure agreement was started previously, but the data supplier and IEEE did not agree.
- Jerry Murphy: Suggest data provider analyze their own data prior to submittal to reduce issues. Claude said pros and cons to this. If this were done, only ranges could be published and must rely on each supplier that their analysis was done well. Norman added that identifying parameters of most importance would be difficult if data were analyzed separately.
- Don Dorris: Problem with some data is that there is an unknown with processing and/or transformer history and failure. Therefore 'clean' data is important. Claude agreed that is an issue and therefore very important. Normalizing the data collection is very important, and should also keep customer ID anonymous.
- Don Lamontagne: Don offered to help with online monitor interpretation
- Diego Robalino: IEEE SA has managed NDA and data acceptance in his group (PF Limits). This was good to hear. Michel Saad asked how long data would be kept. Diego replied it has been roughly 2.5 years with no discussion of data not being available.
- Muhammad Cheema: Requested membership and could also volunteered to assist in data handling tools.

- David Wallach: Requested timeframe for this task force. Claude responded that could be a couple years if not longer. Added that hopefully the end result is to suggest avenue or preliminary solution to the next group that revises C57.104.
- Luiz Chem: Asked if it would be appendix or new guide? Claude answered that it is too soon to tell.
- Norman added that progress must coordinate with C57.143. Don Lamontagne added that C57.143 does not go in-depth, so should be easier to coordinate the two guides.
- Kumar Mani: Will data in solar farms and windfarms be addressed? Claude said that it could be looked at and there is already realization that they are different and the current guide does not address it clearly. Kumar offered to share data and help.
- Muhammad Cheema: Windfarm data also seen and should consider harmonics and gassing. Offered to share and collaborate with data. Claude agreed that it is a large topic. Offered to run data in the tool used for C57.104 if it was helpful for those that have data.
- Alan Sbravati: C57.155 took advantage of progress in data analysis tools.

Meeting was adjourned

Insulation Life Subcommittee

October 21st, 2020

Virtual Meeting

Chair: Sheldon Kennedy

Vice-Chair: Sam Sharpless

Secretary: Jinesh Malde

The Insulation Life Subcommittee (ILSC) was called to order by the Chair in virtual meeting on October 21, 2020 at 8:00 AM CST. Due to the size of the group, general introductions were not made. The Chair requested that each person state their name and affiliation when addressing the subcommittee.

The Chair announced the resignation of Barry Beaster as Vice-Chair of the subcommittee and thanked him for the years of service as Vice-Chair.

The Chair announced the appointment of Sam Sharpless as Vice-Chair of the subcommittee who used to be the secretary of the subcommittee for several years.

H.1 Chair's Report/Remarks

The chair provided the date of upcoming Transformer Committee meetings as follow;

2021 Spring Meeting; April 25-29, 2021, Toronto, ON, Canada

2021 Fall Meeting; October 17-21, 2021, Milwaukee, Wisconsin, USA

2022 Spring Meeting; March 27-31, 2022, Denver, CO, USA

2022 Fall Meeting; October 16-20, 2022, Charlotte, NC, USA

2023 Spring Meeting, Kansas City, MO, USA

The Chair requested that any person with knowledge of a patent essential that meets the requirements of any subcommittee standard to bring the issue forward for discussion. No one responded to this request.

The Chair showed the Copyright slides and advised to the subcommittee that permission would be required from the authors or organizations for use of information. If any information is presented in the meeting, it automatically provides IEEE license for use.

The Chair requested the following items be included in all activity group minutes;

- The name of the activity.
- The date and time of the meeting.
- The number of members and guests in attendance. Full attendance should be recorded in the AMS system.
- The presence or absence of a quorum.

- Any essential patent issues raised during the meeting.
- A summary of discussion. Intricate detail not required. Use a separate document to explain decisions that are made.
- A record of the decisions made in the meeting.
- If there will be another meeting. If so, state the time and place.
- Submit minutes as soon as possible, but no more than 15 days after the meeting.

The Chair reminded everyone that working groups must achieve a two-thirds majority to submit a document for Sponsor Ballot. The subcommittee must achieve a simple majority to submit a document for Sponsor Ballot.

The Chair discussed the membership requirements and recognized the following new member: Saramma Hoffman

The Chair stated that the following members had been moved to guest status due to lack of attendance: Peter Heinzig, Surinder Sandhu, Oleg Roizman, Steven Schappell, Patrick McShane, Dhiru Patel, Mike Spurlock, Mathieu Sauzay, Juliano Montanha, Mario Alonso, Jason Attard

The Chair also noted that no new guests were removed by request.

H.2 Secretary's Report

The attendance poll reported that 73 out of 103 members were present in the meeting along with 139 guests and that a quorum had thus been achieved. For the Fall 2020 virtual meeting, only poll roster was used. Participants requesting membership for the subcommittee were advised to request in the poll to be a member or email the Chair, Vice-Chair or Secretary. 38 guests requested membership. List of attendees is provided at the end of this report.

The agenda for the meeting was approved after hearing no objection from the attendees. The Fall 2019 subcommittee meeting minutes had been provided to participants in advance of the meeting for review and were approved after hearing no objection from the attendees.

H.3 Project Status Reports. The Chair reported the status of each project as follows:

H.3.1.1 C57.91 IEEE Guide for Loading Mineral-Oil-Immersed Transformers

C57.91 is valid until December 31st 2021. The Working Group Chair is David Wallach.

H.3.1.2 C57.100 IEEE Standard Test Procedure for Thermal Evaluation of Liquid-Immersed Distribution and Power Transformers

C57.100 is valid until December 31st 2022. The Working Group Chair is Roger Wicks.

H.3.1.3 C57.154 Design, Testing and Application of Liquid-Immersed Transformers with High-Temperature Insulation

C57.154 is valid until December 31st 2022. The Working Group Chair is Richard Marek.

H.3.1.4 C57.162 Guide for the Interpretation of Moisture Related Parameters in Dry, Gas Insulated and Liquid Immersed Transformers and Reactors

C57.162 is a new document. The PAR for creating this document expires December 31, 2020. The working group Chair is Thomas Prevost.

H.3.1.5 1276 Guide for the Application of High Temperature Insulation Materials in Liquid-Immersed Power Transformers

1276 expires Dec 31, 2030. The working group Chair for this document is Roger C. Wicks.

H.3.1.6 C57.165 IEEE Guide for Temperature Measurements for Liquid Immersed Transformers and Reactors

PAR expires December 31, 2021. The working group Chair is Mark Tostrud.

H.3.1.7 PC57.169 replacing 1538 - IEEE Guide for Determination of Maximum Winding Temperature Rise in Liquid-Immersed Transformer

PAR valid till December 31st 2023. The working group Chair is Scott Digby

H.3.1.8 C57.119 IEEE Recommended Practice for Performing Temperature Rise Tests on Oil-Immersed Power Transformers at Loads Beyond Nameplate Ratings

Revised standard published on October 18th 2018. Standard valid until December 31st, 2026

H.3.2 Working Group (WG) and Task Force (TF) Reports:

H.3.2.1 Working Group on C57.162 Guide for the Interpretation of Moisture Related Parameters in Dry, Gas Insulated and Liquid Immersed Transformers and Reactors – Tom Prevost

Chairman: Tom Prevost
Vice Chair: Valery Davydov
Secretary: Stephanie Denzer

The meeting was called to order at 10:45 am on October 19th by Chair Tom Prevost.

41 members were present and 44 were required for a quorum. A membership quorum was not achieved. It was discussed that membership would be evaluated by next meeting

Agenda:

1. Establishment of Quorum – we did not establish a quorum to approve agenda or minutes
2. Approval of Agenda – no quorum
3. Approval of Minutes from fall 2019 – No quorum
4. Call for Patents
5. Copyright policy
6. Review of PAR

- a. Project Scope
- b. Project Purpose
- 7. Project Scope
- 8. Chair's Remarks
- 9. Project Timeline
- 10. Membership Review
- 11. Document Status

Update on Task Force Activity

TF1: Terminology and definitions

TF3: Measurement and evaluation of moisture-in-liquid insulation parameters

TF4: Measurement of moisture in solid insulation using sample of insulation

TF5: Evaluation of moisture in solid insulation using dielectric response methods

TF6: Inferring of moisture in solid insulation from measurements conducted in liquid or gaseous medium

TF7: Evaluation of aging and end of life of solid insulation parameters – Bob Rasor

TF8: Factory/workshop application of knowledge on moisture; establishing baselines

TF9: Field application of knowledge on moisture – Tom P. will be working with Bob Rasor to complete along with Jim Thompson TF leader.

TF10: Moisture migration, distribution and equilibrium charts – Oleg compiled, needs to be put into document.

Minutes:

A call for patents was completed and there were NO responses. (Slide1, 2, and 4 of the presentation)

Standards conduct and compliance along with standards bylaws and was discussed. (Slide 3 of the presentation.) Slides were also sent out to members and guests prior to the meeting.

A quorum was not established, and agenda's and minutes were not approved. It was discussed that this can be completed by members via email. (3) meetings of approvals needed. There was also discussion that the member list may need further updating, it was updated last after the spring 2019 meeting.

Copyright was discussed and policy was sent out to members and guests prior to the start of this meeting and assumed to be read and understood. If further questions arise please see the IEEE website for more information.

PAR extension will be expiring end of 2020. Another PAR extension has been requested; it was requested for 2 years. If approved balloting needs to be completed by end of 2021. By spring of 2021 have most major and minor editorial deeds completed.

A few weeks after the end of the fall 2020 meeting, The Chair will send out a meeting invitation to all TF chairs to compile the document to be ready for draft by spring 2021.

A discussion on Terms and Definitions occurred and the task force owner will have all relevant material after we meet in a few weeks to finish compiling the document.

Oleg Roizman presented on Bubble Evolution and proposed TF 10 be put into section 2 of the document. There were also some proposed changes to TF9 based on the presentation. During this presentation Tim Raymond posed a question on where the material should reside since it is also applicable to the loading guide. It was discussed that they thought it was most important in the C57.162 guide, and in loading guide, but we do not want to duplicate data. It was decided that this would be brought up to the sub-committee level. Tom Prevost stated he would prepare a proposal for the sub-committee.

TF7 will supply a draft soon.

New Business:
 None

The meeting was adjourned at 12:15 pm.

ILSC notes: The ILSC Chair commented that the working group and taskforces should try to meet in between the main meetings to complete the open items to keep the work moving.

Meeting Attendees:

Role	First Name	Last Name	Role	First Name	Last Name
Chair	Thomas	Prevost	Member	Stephan	Brauer
Vice-Chair	Valery	Davydov	Member	Stuart	Chambers
Secretary	Stephanie	Denzer	Member	Sukhdev	Walia
Member	Aleksandr	Levin	Member	Thomas	Melle
Member	Brian	Sparling	Member	Timothy	Raymond
Member	Bruce	Forsyth	Member	Zan	Kiparizoski
Member	Claude	Beauchemin	Guest	Alan	Sbravati
Member	Diego	Robalino	Guest	Ali	Naderian
Member	Don	Dorris	Guest	Alonso	Castillo
Member	Edward	Casserly	Guest	Attila	Gyore
Member	Emilio	Morales-Cruz	Guest	Axel	Kraemer
Member	Enrique	Betancourt	Guest	Cihangir	Sen
Member	Evanne	Wang	Guest	Clemens	Reiss IV
Member	Hali	Moleski	Guest	Deniss	Villagran
Member	Ismail	Guner	Guest	Donald	Lamontagne
Member	James	Gardner	Guest	James	Dukarm
Member	Jon	Karas	Guest	Jean-Noel	Berube
Member	Kumar	Mani	Guest	Jeremiah	Bradshaw
Member	Larry	Christodoulou	Guest	Jerry	Murphy
Member	Luiz	Cheim	Guest	Jinesh	Malde
Member	Mike	Spurlock	Guest	Joe	Nims
Member	Nicholas	Perjanik	Guest	John	Harley
Member	Oleg	Roizman	Guest	John	Brett
Member	Parminder	Panesar	Guest	Jorge	Cruz
Member	Paul	Su	Guest	Mickel	Saad
Member	Peter	Werelius	Guest	Peter	Balma
Member	Poorvi	Patel	Guest	Philip	Miller
Member	Pugazhenth	Selvaraj	Guest	Rainer	Frotscher
Member	Raj	Ahuja	Guest	Robert	Ganser
Member	Richard	Marek	Guest	Roger	Hayes
Member	Robert	Rasor	Guest	Scott	Reed
Member	Robert	Kinner	Guest	Sheldon	Kennedy
Member	Roderick	Sauls	Guest	Timothy	Tillery
Member	Roger	Wicks	Guest	Trenton	Williams
Member	Ronald	Hernandez	Guest	Waldemar	Ziomek
Member	Samuel	Sharpless	Guest	Zoltan	Roman

H.3.2.2 Working Group on Application of High-Temperature Materials IEEE P-1276 – Roger Wicks

Working group for 1276 did not meet as the updated guide was published in April 2020

H.3.2.3 Working group on C57.100 IEEE Standard Test Procedure for Thermal Evaluation of Liquid-Immersed Distribution Transformers – Roger Wicks

Fall 2020 “Virtual” Meeting – 20 October 2020, 2:20 p.m. – 3:35 p.m. CDT, Webex
Chairman: Roger Wicks, Secretary: Kevin Biggie

The Chair called the meeting to order at 2:20 p.m. and welcomed attendees. After a second attendance poll, 33 members were present (of 63), thus a quorum was achieved. Full attendance details were provided separately by the PSAV virtual meeting service.

Subsequently, attendance was confirmed to be a total of 99 attendees, with 33 members and 66 guests present. There were 17 guests requesting membership, with 6 meeting the membership requirement of attending the last two consecutive, or three of the last five meetings of an existing WG. The WG welcomes new members: Afshin Rezaei, George Frimpong, Gilles Bargone, Kevin Rapp, Rob Ghosh, and Timothy Raymond. Thus, the new total number of members is 69, including the Chair and Secretary. The other 11 guests requesting membership will be reconsidered upon achieving the meeting attendance membership requirements. Final attendance was recorded in AMS.

The Chair then proceeded with a review of a prepared meeting presentation, beginning with the meeting agenda, Essential Patent Claims information (none were noted), copyright information, and status of the PAR (which expires in December 2022). Then the results of a working group survey conducted after the last meeting (27 May virtual meeting) were reviewed, and it was mentioned that Draft 1 circulated before the meeting included: section reordering, an alternate lifetime (135k hours), and a screening test, all resulting from the WG survey results.

Roger then reviewed a proposed “Change Section” (= Clause 6) in Draft 1, with details on a sub-section about change in life requirements, discussing modified testing times or temperatures. Sasha Levin clarified that the proposed change in life (from 180k to 135k hours) question from the WG survey was not a proposal to change testing times or temperatures, but rather to use a shorter life for evaluating test results to derive thermal class. Rick Marek agreed with Sasha not to change test times, stating that at 180k hours materials are fragile and the curves are flat, thus 135k hours would be better. Alan Sbravati agreed also, and added that DP at 150k hours may also be considered.

Roger also reviewed the proposed screening test that was added as Annex C in Draft 1.

Short updates were reviewed on activities of the Task Forces. TF 1 - Industry Proven System Listing: wire enamel added in May meeting. TF 2 - Location of test methods in draft: reordered per the WG survey, but need to confirm “Power Transformer Test” is ‘Informative’ and not ‘Normative’ in Draft. TF3 - Sealed Tube Method improvement: highlights of several points were made.

One particular proposal about sealed tube method improvement was presented by Tom Prevost, regarding material testing ratios. Tom’s presentation provided background and justification for his proposal to have just one material ratio (not separate Distribution and Power ratios), being the Distribution ratio, by weight, at 14.2 to 1 (equivalent to current 16.3 to 1 Distribution ratio by volume). Radek Szewczyk asked if one ratio is used, what would be the paper to board ratio. Sasha agreed with having one ratio, but made

a point for using a worse case to be conservative, which would rather be the Power ratio, both of solid to liquid and paper to board. Tom replied that the entire sealed tube being at a single high temperature is already a worse case vs. what would be seen in a transformer, and Alan agreed. Roger mentioned that a change to the ratios should consider a statement about disposition of earlier tests not conducted to the new ratios. Ed Casserly mentioned a concern about liquids also being measured by weight in the ratio, and that because different liquids have different densities, he recommended a ‘blend’ of listing liquid by volume and solids by weight in the ratio. Jinesh Malde agreed with Ed, and suggested that the topic of material ratios and the proposal by Tom and discussion in this meeting be addressed in his TF3.

Jinesh brought up the recent published work by Weidmann on an aging test method for enameled wire in liquids, and asked if this should be considered for potential inclusion in the standard, perhaps with further input from wire manufacturers. Sasha added that it is recognized that there is no current test method to determine the thermal class of enameled wires in liquid, and agreed with forming a new Task Force to include contents from the published proposed method as a separate test in a new Annex. Jinesh agreed. Sasha then made a motion, which was worded as follows: “Motion to develop a normative Annex for evaluation of the thermal performance of enameled wires in liquids.” Jinesh seconded the motion. A member vote on the motion was held, and the motion passed: For = 28, Against = 1, Abstain = 3, No Vote = 1.

Luiz Cheim briefly reviewed again several points presented in the May meeting related to end of life, including: consideration of pyrolysis, hydrolysis and oxidation; importance of DP testing and that it can be related to paper samples from real transformers; that insulation mechanical end of life does not mean actual end of life; and the importance of the effect of moisture and oxygen on aging.

Roger briefly reviewed next steps, and that another draft with updates from today’s discussion points would be circulated by the end of October for comment, targeting to have another draft for review prior to the next meeting.

The virtual meeting was adjourned at 3:35 p.m.

ILSC meeting minutes: Chair of IEEE C57.100 mentioned that a new taskforce will be formed to add information in the Annex on a test method to determine the thermal endurance of enamel wires. Chair requested volunteers for the TF.

Meeting attendance:

Role	First Name	Last Name	Role	First Name	Last Name
Chair	Roger	Wicks	Guest	Eric	Theisen
Secretary	Kevin	Biggie	Guest	Erich	Buchgeher
Member	Afshin	Rezaei-Zare	Guest	Fernando	Leal
Member	Alan	Sbravati	Guest	Fernando	Saldivar
Member	Aleksandr	Levin	Guest	Gary	King
Member	Attila	Gyore	Guest	Hakan	Sahin
Member	Bruce	Forsyth	Guest	Hakan	Sahin
Member	Clemens	Reiss IV	Guest	Homero	Portillo
Member	Darrell	Mangubat	Guest	Hugo	Avila
Member	David	Stankes	Guest	Javier	Arteaga
Member	Dinesh	Sankarakurup	Guest	Javier	Arteaga
Member	Edward	Casserly	Guest	John	Reagan
Member	Emilio	Morales-Cruz	Guest	Juan	Acosta
Member	Evanne	Wang	Guest	Kevin	Sullivan
Member	George	Frimpong	Guest	Kristopher	Neild
Member	Gilles	Bargone	Guest	Kushal	Singh

Member	Ion	Radu	Guest	Lee	Matthews
Member	Jinesh	Malde	Guest	Lee	Matthews
Member	Jon	Karas	Guest	Malia	Zaman
Member	Juan	Castellanos	Guest	Marco	Espindola
Member	Kevin	Rapp	Guest	Marco	Espindola
Member	Kurt	Kainerder	Guest	Marion	Jaroszewski
Member	Luiz	Cheim	Guest	Martin	Munoz Molina
Member	Mark	Tostrud	Guest	Michael	Franchek
Member	Mickel	Saad	Guest	Michael	Franchek
Member	Onome	Avanoma	Guest	Michael	Warntjes
Member	Paul	Su	Guest	Nicholas	Kostich
Member	Radoslaw	Szewczyk	Guest	Nitesh	Patel
Member	Richard	Marek	Guest	Oleg	Roizman
Member	Robert	Ballard	Guest	Oleg	Roizman
Member	Samuel	Sharpless	Guest	Parminder	Panesar
Member	Saurahb	Ghosh	Guest	Patrick	Picher
Member	Sheldon	Kennedy	Guest	Paul	Jarman
Member	Solomon	Chiang	Guest	Pragnesh	Vyas
Member	Stacey	Kessler	Guest	Rainer	Frotscher
Member	Steven	Schappell	Guest	Richard	vonGemmingen
Member	Stuart	Chambers	Guest	Roderick	Sauls
Member	Thomas	Prevost	Guest	Ronald	Hernandez
Member	Timothy	Raymond	Guest	Ryan	Musgrove
Guest	Anastasia	O'Malley	Guest	Samragini	Dutta Roy
Guest	Anatoliy	Mudryk	Guest	Sanjay	Patel
Guest	Anthony	Franchitti	Guest	Sanjay	Patel
Guest	Ashmita	Niroula	Guest	Saramma	Hoffman
Guest	Bill	Griesacker	Guest	Shawn	Gossett
Guest	Bill	Griesacker	Guest	Shiva	Rampersad
Guest	Bruce	Webb	Guest	Suresh	Babanna
Guest	Chao	Li	Guest	Susan	McNelly
Guest	Chris	Powell	Guest	Susan	McNelly
Guest	Daniel	Weyer	Guest	Tiffany	Lucas
Guest	Daniel	Tournoux	Guest	Tim	Rocque
Guest	Daniela	Ember Baciu	Guest	Timothy	Raymond
Guest	David	Murray	Guest	Valery	Davydov
Guest	Derek	Hollrah	Guest	Yaquan (Bill)	Li
Guest	Dmitriy	Klempner	Guest	Zachary	Draper
Guest	Donald	Lamontagne			

H.3.2.4 Working group on C57.91 IEEE Guide for Loading Mineral-Oil-Immersed Transformers – David Wallach

Working group met on October 20th, 2020 virtually.

1. The Chair made the opening remarks and proposed a meeting agenda.
2. Establishment of quorum- Number of Current Members = 43; Number of Members Present in Meeting= 26; Quorum Present = 60% and with a total number of 97 attendees at the meeting.
3. Previous Meeting Minutes Approval

- a. Pittsburgh, 2018 Spring – Approved unanimously.
 - b. Jacksonville, 2018 Fall (with corrected reference to Clause B.1.1)– Approved unanimously.
 - c. Anaheim, 2019 Spring- Approved unanimously.
 - d. Columbus 2019 Fall- Approved unanimously.
4. The meeting agenda was approved unopposed.
 5. Call for Patents: A call for patents was made and there were none claimed.
 6. Copyright Policy: The IEEE copyright policy was read out.
 7. Discussions on Draft Document D3 (circulated before the meeting):
 - a) The Chair indicated that the current PAR for this standard expires on Dec 31, 2021.
 - b) Distribution Transformer Loading Guide: The Chair mentioned that he attended the TF Transformer Efficiency & Loss Evaluation (DOE Activity) meeting chaired by Phil Hopkinson Oct 19, 2020 and there has been no input identified for this guide.
 - c) Tim Raymond made a presentation on Clause 9.2.1 and Table 8-9 (2008 Version):
 - Tim presented a revised verbiage for Clause 9.2.1 and a combined Table 8 (old 8 and 9 were combined) with maximum loading limited to 150%.
 - Jeff Wright commented that we should not include the maximum loading line item in the revised table.
 - Daniel Blaydon insisted that the 200% maximum loading number has been firmly established in many end-user documents and therefore it should not be removed from the current guide.
 - There was a lot of other discussions on this topic with good comments from Javier Arteaga, Jeffrey Wright, Daniel Blaydon, Igor K, Anthony Franchitti, Mickel Saad, Juan Castellanos, Peter Zhao, David Wallach, Wallace Binder, Craig Colopy, Bruce Forsyth and Tim Raymond.
 - Tim R reminded the attendees that these overload limits apply to in-service transformers and overloading limits are specified in the ordering specification for new transformers. He added that there will be loss of life during overloading situations.
 - Peter Zhao who was part of the original WG for this guide mentioned that the overload rating was related to time duration and that individual rating of each component can be detrimental to the overload rating.
 - Mickel Saad proposed a motion to approve the revisions made by Tim R without the maximum loading line in Table 8. This was seconded by Jeff Wright. The motion did not pass with For-13, Against- 11 and Abstain- 7 votes. The Chair remarked that there was no agreement to lower the maximum loading limit of 200%.
 8. Oleg Roizman made a presentation on Annex G and Clause 7 suggesting a new differential equation and some edits to Clause 7 and Annex G. He noted that the fiber optic sensor-based data provided by Brad Staley could not be used. He also suggested we combine Clause 7 and Annex G. Tim Raymond volunteered to help Oleg with these revisions. Oleg further noted that the steady state model in Annex A should be replaced by a transient one.

The Chair opined whether we should continue with simpler revisions, update Annex A to meet the PAR completion date (the current standard will expire in Dec 2021). Oleg R suggested we should extend the PAR and complete the revisions in two years.

9. New Business: Oleg pointed out that Clause 5 and Annex I needs to be revised based upon the outcomes of EPRI and other research that now suggests that moisture and oxygen has a big impact on insulation life, He mentioned that the IEC overloading guide was also revised in 2018 using the new insulation life equations. He added that the term acceleration factor term should be replaced by relative rate of aging.

David W commented that we probably need to coordinate with the Moisture WG to look at which C57 guide / standard the bubble equation should reside in. He added that we may need to take the WG suggestions to the Insulation Life SC for guidance.

Sheldon K suggested that the guide could still be effective if we could get it into the balloting stage by Dec 2021.

10. The next meeting is planned to be held at Toronto, Canada in April 2021.

11. The following nine attendees have been granted membership; Roger Hayes, Timothy Raymond, Peter Zhao, George Frimpong, Brad Staley, Saramma Hoffman, Eric Doak, Ali Naderian and Daniel Blaydon. The following members have been granted Provisional Membership (Membership will be confirmed after they attend two meetings): Mario Locarno, Luiz Cheim, Juan Acosta, Kurt Kaineder and Anthony Franchitti.

12. Adjournment

Meeting Attendance:

Role	First Name	Last Name	Role	First Name	Last Name
Chair	David	Wallach	Guest	Dmitriy	Klempner
Vice-Chair	Javier	Arteaga	Guest	Donald	Lamontagne
Secretary	Kumar	Mani	Guest	Edward	Casserly
Member	Aleksandr	Levin	Guest	Eric	Davis
Member	Ali	Naderian	Guest	Eric	Davis
Member	Brad	Staley	Guest	Florin	Faur
Member	Bruce	Forsyth	Guest	Gael	Kennedy
Member	Bruce	Webb	Guest	J. Arturo	Del Rio
Member	Craig	Colopy	Guest	J. Arturo	Del Rio
Member	Daniel	Blaydon	Guest	James	Dukarm
Member	Darrell	Mangubat	Guest	Jean-Noel	Berube
Member	David	Calitz	Guest	Jeffrey	Ray
Member	Egon	Kirchenmayer	Guest	John	Lackey
Member	Emilio	Morales-Cruz	Guest	John	Brett
Member	Eric	Doak	Guest	Jonathan	Reimer
Member	George	Frimpong	Guest	Jorge	Cantu de Leon
Member	Gilles	Bargone	Guest	Juan Pablo	Andrade Medina
Member	Jeffrey	Wright	Guest	Kayland	Adams
Member	John	Lackey	Guest	Kevin	Sullivan
Member	John	John	Guest	Kurt	Kaineder
Member	Juan	Castellanos	Guest	Kyle	Stechschulte
Member	Lee	Matthews	Guest	Luiz	Cheim
Member	Mickel	Saad	Guest	Mario	Locarno
Member	Oleg	Roizman	Guest	Megan	Eckroth
Member	Peter	Zhao	Guest	Nikolaus	Dillon
Member	Richard	vonGemmingen	Guest	Olle	Benzler

Member	Roger	Wicks	Guest	Patrick	Picher
Member	Roger	Hayes	Guest	Patrick	Picher
Member	Samuel	Sharpless	Guest	Radoslaw	Szewczyk
Member	Saramma	Hoffman	Guest	Radoslaw	Szewczyk
Member	Sheldon	Kennedy	Guest	Richard	Marek
Member	Stacey	Kessler	Guest	Richard	Simonelli
Member	Steven	Schappell	Guest	Roderick	Sauls
Member	Sukhdev	Walia	Guest	Ryan	Thompson
Member	Timothy	Raymond	Guest	Sebastien	Riopel
Member	Wallace	Binder	Guest	Shelby	Walters
Member	Weijun	Li	Guest	Shelby	Walters
Guest	Adam	Smith	Guest	Steven	Schappell
Guest	Afshin	Rezaei-Zare	Guest	Susan	McNelly
Guest	Anastasia	O'Malley	Guest	Thomas	Prevost
Guest	Anatoliy	Mudryk	Guest	Thomas	Blackburn
Guest	Angela	Amador	Guest	Tim-Felix	Mai
Guest	Anil	Sawant	Guest	Troy	Tanaka
Guest	Anthony	Natale	Guest	Valery	Davydov
Guest	Anthony	Franchitti	Guest	William	Elliott
Guest	Brian	Penny	Guest	Yaquan (Bill)	Li
Guest	Devki	Sharma	Guest	Zachary	Draper
Guest	Devki	Sharma	Guest	Zachery	Weiss
Guest	Dinesh	Sankarakurup			

H.3.2.5 Working group on C57.169 Maximum Winding Temperature Rise in Liquid-Filled Transformers (PC57.169 replacing IEEE 1538) – Scott Digby

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

The Chair presented slides regarding the IEEE patent and copyright policies and asked the participants if there are any claims that should be reported regarding these policies. There were no claims brought up by attendees in the meeting, so the poll was opened by the PSAV admin to see the membership status in the meeting after the Chair presented the members list. According to the first poll results the quorum was not established so it was decided to open another poll later in the meeting.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Meeting Attendance:

Chair	Scott	Digby	Guest	Jacques	Vanier
Secretary	Cihangir	Sen	Guest	James	Holt
Member	Afshin	Rezaei-Zare	Guest	Jaroslav	Chorzepa
Member	Anatoliy	Mudryk	Guest	Jarrod	Prince
Member	Brad	Staley	Guest	John	Reagan
Member	Brad	Staley	Guest	Jonathan	Reimer
Member	Bruce	Forsyth	Guest	Jos	Veens
Member	Darrell	Mangubat	Guest	Kayland	Adams
Member	Dinesh	Sankarakurup	Guest	Laszlo	Kadar
Member	Egon	Kirchenmayer	Guest	Malia	Zaman
Member	Emilio	Morales-Cruz	Guest	Marco	Espindola
Member	Eric	Davis	Guest	May	Wang
Member	Gilles	Bargone	Guest	Michael	Warntjes
Member	Hakim	Dulac	Guest	Mubarak	Abbas
Member	Jason	Varnell	Guest	Nitesh	Patel
Member	Javier	Arteaga	Guest	Norman	Field
Member	Jean-Noel	Berube	Guest	Onome	Avanoma
Member	Juan	Castellanos	Guest	Paul	Jarman
Member	Mana	Yazdani	Guest	Raymond	Frazier
Member	Martin	Munoz Molina	Guest	Richard	vonGemmingen
Member	Matthew	Webb	Guest	Roderick	Sauls
Member	Matthew	McFadden	Guest	Ross	McTaggart

Member	Oleg	Roizman	Guest	Ryan	Jonak
Member	Pragnesh	Vyas	Guest	Ryan	Bishop
Member	Ryan	Musgrove	Guest	Samraghi	Dutta Roy
Member	Sheldon	Kennedy	Guest	Samuel	Sharpless
Member	Steven	Schappell	Guest	Sanjay	Patel
Member	Sukhdev	Walia	Guest	Saramma	Hoffman
Guest	Adrian	Silgado	Guest	Shankar	Nambi
Guest	Alan	Washburn	Guest	Shiva	Rampersad
Guest	Ali	Ghafourian	Guest	Stacey	Kessler
Guest	Anil	Sawant	Guest	Suresh	Babanna
Guest	Bruce	Webb	Guest	Susan	Bonfiglio
Guest	Darrell	Banks	Guest	Thang	Hochanh
Guest	Dieter	Wagner	Guest	Thomas	Blackburn
Guest	Dmitriy	Klempner	Guest	Tim	Rocque
Guest	Domenico	Corsi	Guest	Timothy	Tillery
Guest	Drazena	Brocilo	Guest	Trenton	Williams
Guest	Eric	Theisen	Guest	Vinay	Patel
Guest	Erich	Buchgeher	Guest	William	Whitehead
Guest	Evgenii	Ermakov	Guest	Yaquan (Bill)	Li
Guest	Huan	Dinh	Guest	Yves	Vermette
Guest	Hugh	Waldrop	Guest	Zachery	Weiss
Guest	Hugo	Avila			

H.3.2.6 Working group on C57.165 IEEE Guide for Temperature Measurements for Liquid Immersed Transformers and Reactors – Phil McClure

Officers:

Chair – Mark Tostrud

Vice Chair – Vacant

Secretary – Zan Kiparizoski

1. Meeting Date and Time: 10/22/2020 at 9:25-10:20am CST

Meeting was called to order at 9:30am

2. Call for essential patents

The patent slides were projected on screen and a request for any known patents that were essential to the work of the Working Group was made. There were no responses to the request.

3. Reviewed IEEE-SA Copyright Policy

The copyright policy slides were projected on screen and a request for any known copyright issues was made. There were no responses to the request.

4. Officer changes

Officer changes - Phil McClure (Chair) retired in September, 2020. Robert Thompson (Vice-Chair) retired in February, 2020. The secretary, Mark Tostrud, has moved to the Chair position. A volunteer was requested to fill the secretary position. Zan Kiparizoski volunteered to serve as secretary. At this time, the vice-chair position will not be filled.

5. Chairs remarks

The PAR for this project expires on 12/31/2020. A schedule to complete the guide was proposed to the working group to complete the guide early in 2021 so we can begin the ballot process by the spring of

2021. Sheldon Kennedy commented that it is important to start the ballot process by Spring, 2021. A PAR extension will probably not be granted if we are not in ballot.

6. Attendance

- Two electronic polls were sent. The results for both electronic polls showed 11 of 25 members were present.
- Quorum check
 - The first electronic poll showed 11 of 25 members were present
 - A second electronic poll was performed about 10 minutes into the meeting. 10 of 25 members were present for the second poll.
 - A manual poll was performed using the chat box. 13 of 25 members were present so a Quorum was achieved

7. Approval of the agenda and minutes

- There was no objection to the unanimous approval of the meeting agenda
- There was no objection to unanimous approval of the fall, 2019 meeting minutes after minor corrections were made

7. Old Business

Chair requested updates from the volunteers for various sections in the guide:

- Purpose – A purpose statement was drafted and emailed to the former chair late in 2019. The volunteer will try to find the email but is not sure if he will be able to locate the email since his computer failed and he may not be able to recover it. If the original proposal cannot be found, a new purpose statement will be drafted. Since the Scope doesn't specify whether design measurements will be considered in the guide, the purpose statement will address whether R&D measurements and type test measurements are included.
- Purpose statement will clarify whether the guide will include R&D measurements and other test measurements.
- Section 3 - Definitions: Section was recently reviewed. The section is in pretty good shape. A final review will be performed once the document is further along to minimize the number of revisions required.
- Section 4.4 – Core Temperature Measurements: Review of this section will be completed by December 2019.
- Section 4.6 – OLTC temperature measurements - The methods to monitor OLTC temperatures are identical to the methods used to monitor top oil and bottom oil temperature. Recommendation is to include OLTC oil temperature measurements in section 4.2.
- Section 4.8 – Bushing temperature measurement – Volunteers from the bushing committee provided guidance on this section in an email to the previous chair in January/February, 2020. The email will be forwarded to the current chair for his consideration.
- A motion passed in fall, 2019 to remove sections 4.5 to 4.10 from the guide since the measurements in these sections were R&D measurements. Since we don't have content for these sections, we will proceed with removing those sections. If viable methods to monitor bushing temperatures are identified, a motion will be made to add section 4.8 back into the document.
- During the fall 2019 new business discussion, a proposal was made to reorganize the document by measurement type rather than by component. The proposal was tabled until this meeting since the former chair was not present in the meeting. The current chair indicated he was not considering reformatting the document since we are in the final stages of completing the document.

8. New Business

- The chair proposed the following timeline to allow us the move the guide towards ballot:
 - December, 2020 – Complete all sections discussed in old business above
 - January, 2021 – Update the guide to include the content submitted in December and send the draft out for comment
 - February/March, 2021 – resolve all comments and update the guide
 - April, 2021 – Begin the ballot process

9. Motion to adjourn

10. Minutes

The minutes were recorded by Mark Tostrud – Chair and reviewed by Zan Kiparizoski – Secretary

Meeting Attendance:

Role	First Name	Last Name	Role	First Name	Last Name
Chair	Mark	Tostrud	Guest	Jeremiah	Bradshaw
Secretary	Zan	Kiparizoski	Guest	Jinesh	Malde
Member	Babanna	Suresh	Guest	John	John
Member	Gilles	Bargone	Guest	Kayland	Adams
Member	Hakim	Dulac	Guest	Nicolas	Blais
Member	Jean-Noel	Berube	Guest	Nitesh	Patel
Member	Juan	Castellanos	Guest	Oleg	Roizman
Member	Martin	Munoz Molina	Guest	Onome	Avanoma
Member	Ryan	Musgrove	Guest	Parminder	Panesar
Member	Samuel	Sharpless	Guest	Roderick	Sauls
Member	Sheldon	Kennedy	Guest	Ronald	Hernandez
Member	Steven	Schappell	Guest	Samragni	Dutta Roy
Member	Trenton	Williams	Guest	Scott	Digby
Guest	Abderrahmane	Zouaghi	Guest	Shamaun	Hakim
Guest	Anastasia	O'Malley	Guest	Solomon	Chiang
Guest	Anatoliy	Mudryk	Guest	Stefan	Schindler
Guest	Daniela	Ember Baciu	Guest	Thomas	Blackburn
Guest	Darren	Brown	Guest	Tiffany	Lucas
Guest	Homero	Portillo	Guest	Vijay	Pargaonkar
Guest	Jacques	Vanier	Guest	Zachery	Weiss
Guest	Jean-Noel	Berube			

H.3.2.7 Working group on C57.154 Design, Testing and Application of Liquid-Immersed Transformers with High-Temperature Insulation – Richard Marek

The meeting was called to order at 12:55PM (CDT) by Chair, Richard Marek. Vice-Chair, Anastasia O’Malley and Secretary, Ewald Schweiger (writer of Minutes) were also present.

This was the fourth meeting as a WG. 10 of the total 75 attendees requested membership.

A total of 75 people connected to the virtual meeting.

Data from the list provided by meeting host:

Number of Members in WG = 58

Number of Members Present = 34

Quorum was met with 58.6% of membership present

Rainer Fortscher , Kevin Rapp, Alan Traut, V. Baniroula, Erich Buchgeher, Radoslaw Szewczyk, Dejan Vukovic, Chao Li, David Sundin and Larry Dix requested membership.

Introductions of the Chair, Vice Chair and Secretary were made. Due to the large number of attendees and the new format for this meeting, no individual introductions were made.

The patent slides and the copyright policy had been provided by email before the meeting. A reminder of these slides was given and a call for patents was made, with no response.

The agenda was approved unanimously as well as approval of the minutes from the previous meeting in the fall of 2019.

The chair reported the results of a mid-summer survey ballot on a proposed Annex.

Valid ballot responses were:	Ballot results
a. Add proposed Annex to PC57.154	9
b. Amend Annex B in IEEE Std 1276-2020	21
c. Abstain	2
Total ballots received	32

With 58 members, 32 ballots constitute a quorum and the survey was valid.

The WG decided to recommend that the ILSC initiate a WG or TF to amend Annex B in the recently published IEEE Std 1276-2020 document.

Alan Sbravati reported on TF1 - Defining temperature limits for insulating liquids

- Several test series on aging of three fluids, HyVolt II, FR3, Midel 7131 were performed in four labs at 180°C
- A second round of tests will be performed at two different temperatures: 165°C and 180°C
- Copper wire, aluminum and core steel will be added to the test cells
- The number of monitored key properties for analysis will be reduced
- The properties will be: color, DDF, neutralization number, tension, breakdown voltage and moisture

Kevin Biggie reported on the status of TF2 – Reviewing and suggesting disposition of draft comments

- There was significant initial discussion on Clause 4.1 and Tables 2 & 3 regarding: ‘Insulation system’ thermal class, vs. ‘solid insulation’ and ‘liquid insulation’ thermal classes.
- A new proposal for Clauses 4, 5 and 6 was submitted with the following notable changes:
 - Only makes use of the term ‘insulation system’ thermal class, rather than the terms ‘solid’ and ‘liquid’ thermal classes
 - Removes design specific recommendations that are contained in IEEE Std 1276, and instead just makes simple descriptions of ‘hybrid’ and ‘high-temperature’ insulation systems
- All changes have been incorporated into Draft 3 and the TF will continue reviewing comments after this meeting.

The next topic of discussion was Draft 3, which was distributed before the meeting. The chair noted, that it is the WG intent not to duplicate content in multiple documents. Therefore, content moved to IEEE Std 1276 will only be referenced. The chair emphasized that initially with the first edition, guidance was needed because high temperature was relatively new to the industry. But now it is more common and therefore it is time to concentrate on transformer requirements, leaving informative and tutorial material to IEEE Std 1276. The example given was IEEE C57.12.00. This document covers all different types of transformers from pole mounted to pad mounted to large power and even shell

type transformers. Specific winding design detail should be treated as informative and properly belongs in IEEE Std 1276 which is a companion guide.

Comments on Draft 3 were then requested:

Radek Szewczyk made the following comments:

- The thermal class of insulation systems should not focus on the insulation system only. It should consider the characteristics of fluids as well. Alan Sbravati’s TF1 is working on defining these limits.
- The thermal class of the highest temperature of the system and not of the complete transformer should be redefined in Table 2
- Radek Szewczyk will propose wording for Clause 4.1 or Clause 3 for Insulation system thermal class and Transformer insulation system thermal class and work with Kevin’s TF2.

Attila Gyore commented

- That table 3 should be modified to incorporate an upper limit in addition to a lower limit only, such as 115°C.
- In addition, he suggested adding another table with “typical” liquid temperatures for various material combinations. This will be discussed in Kevin’s TF2 meetings. The chair stated that adding a table of “typical” temperatures to this standard would certainly become defined values. He suggested that this might belong more properly in IEEE Std 1276 which is a guide and that a proposal to establish a TF to discuss modification of Annex B of that document will be made at the next ILSC meeting. It would be possible to include this topic as well. Sheldon Kennedy, the chair of ILSC agreed. Jinesh Malde and Alan Sbravati agreed to work on such a table within TF1.

Alan commented that he thinks the hottest spot temperature limits in the tables are too high and TF1 is working on suggestions to limit this temperature suggesting that it should not be higher than the flash point of the fluid.

- The chair said that this might have an impact on other standards as well.
- Kurt Kaineder shared insight of a transformer manufacturer, that lowering the hottest spot would have an impact on the design of transformers

Rainer Frotscher asked about the purpose of a temperature range on the tables and feels it does not make sense. He emphasized that the numbers in Tables ALWAYS indicate MAX or MIN values. In our case they should be MAX values. And this is the only relevant number. Alan will discuss this topic in TF1, since his group will provide a procedure to determine these maximum limits.

There was no additional new business and the meeting was adjourned at 2:10PM (CDT).

Meeting Attendance:

Role	First Name	Last Name	Role	First Name	Last Name
Chair	Richard	Marek	Member	Solomon	Chiang
Vice-Chair	Anastasia	O'Malley	Member	Stuart	Chambers
Secretary	Ewald	Schweiger	Member	Thomas	Prevost
Member	Alan	Traut	Guest	Adam	Smith
Member	Alan	Sbravati	Guest	Balakrishnan	Mani
Member	Aleksandr	Levin	Guest	Chao	Li
Member	Andrew	Holden	Guest	Claude	Beauchemin
Member	Attila	Gyore	Guest	Dejan	Vukovic
Member	Clemens	Reiss IV	Guest	Dipakkumar	Patel
Member	David	Stankes	Guest	Eric	Schleismann

Member	David	Sundin	Guest	Erich	Buchgeher
Member	Edward	Casserly	Guest	Huan	Dinh
Member	Evanne	Wang	Guest	Jeffrey	Door
Member	Florin	Faur	Guest	Jeremiah	Bradshaw
Member	George	Frimpong	Guest	Juan	Acosta
Member	Gilles	Bargone	Guest	Juan Pablo	Andrade Medina
Member	Jinesh	Malde	Guest	Kyle	Knous
Member	Jon	Karas	Guest	Laszlo	Kadar
Member	Juan	Castellanos	Guest	Laszlo	Kadar
Member	Kevin	Biggie	Guest	Loren	Wagenaar
Member	Kevin	Rapp	Guest	Mahesh	Sampat
Member	Kurt	Kainerder	Guest	Martin	Munoz Molina
Member	Larry	Dix	Guest	Michael	Botti
Member	Larry	Christodoulou	Guest	Nicholas	Walder
Member	Loren	Wagenaar	Guest	Olle	Benzler
Member	Marion	Jaroszewski	Guest	Orlando	Giraldo
Member	Matthew	Webb	Guest	Patrick	Picher
Member	Mike	Bonn	Guest	Paul	Jarman
Member	Moonhee	Lee	Guest	Saurahb	Ghosh
Member	Nikola	Lukenda	Guest	Stephen	Oakes
Member	Paul	Su	Guest	Stephen	Oakes
Member	Philip	Hopkinson	Guest	Tiffany	Lucas
Member	Radoslaw	Szewczyk	Guest	Tim	Rocque
Member	Rainer	Frotscher	Guest	Vijay	Tendulkar
Member	Robert	Ballard	Guest	Vijay	Tendulkar
Member	Roger	Wicks	Guest	William	Solano
Member	Samuel	Sharpless	Guest	Zack	Blackwell
Member	Sheldon	Kennedy			

**H.3.2.8 Taskforce on Rises of Metallic Parts other than Windings C57.12.00,
 Clause 5.11.1.4 – Toby Johnson**

Call for patents and review of copyright policy – showed the fall 2020 slide deck covering potential essential patent claims, ways to inform, copyright policy and the other guidelines of SA committee. No claims were made.

Background covering the scope of the task force – which was to eliminate confusion in the guide surrounding the 130 deg C core hot spot temperature (not rise) stated in 5.11.1.4. The desire was to make it clear that the core hot spot maximum temperature should not go above 130 deg C or gassing would result.

Options discussed were to reword the title to remove the word ‘rise’, reword the text in the body of the section to state that 130 deg C was a maximum temperature. Another option was to make the temperature a rise to match with all the other parts of the guide that refer to rises. It didn’t make sense to have one section referring to a maximum temperature when all the other sections refer to temperature rise limits instead. Concern expressed with how to do this properly considering some maximum average daily temperatures were above the standard 30 deg C.

Motion to refer to section 4.1.2.1 as the standard for ambient to use in the rise calculation and if the maximum daily average exceed that temperature the core hot spot rise should be adjusted accordingly.

Motion by Norman Field, seconded by Juan Castellanos: “The core hot spot temperature *rise* shall be limited to $100^{\circ} C$ for the condition of highest core over-excitation, rated load and the maximum average daily ambient temperature for transformers filled with mineral oil. *If maximum average daily ambient temperatures exceed those stated in 4.1.2.1 of this document, the core hot-spot temperature rise shall be adjusted by the same amount.*”

There were other concerns with this section brought up by the task force:

1. The section refers to the temperature limit with respect to mineral oil only. Does that mean it does not apply to other insulating fluids? Should other insulating fluids be addressed at all? Should the specificity of mineral oil be removed and made more general? It was mentioned that the gassing at 130 deg C was only specifically known for mineral oil and that is why it is worded the way it is. C57.154 is working on specific temperatures of other insulating liquids and it might be good to wait for that to make any changes to this part of the section. But the task force felt like it should be addressed.
2. The last paragraph of the section should be reviewed and discussed. There are a few concerns with this section. There was a task force previously created that tried to address this portion of the section but was not ultimately able to resolve.
3. Discussions around whether the using the maximum average daily temperature was sufficient and if we should reduce the rise to 90 deg C instead of 100 deg C. or use the maximum daily temperature. It was determined that this was not the correct way to specify the rise and the motion as worded was confirmed.

There were several discussions in the chat as well.

ILSC meeting minutes: The rewording was presented to the ILSC members and guest and there were discussions on the ambient temperature. Since time was running out, a motion was made by Bruce Foresyth to have a second meeting in Spring 2021 to complete the work. Akash Joshi seconded motion. The motion carried.

Meeting Attendance:

Liason Report

Liason report for Volts/Hz provided by Jeff Ray- The taskforce did not meet in the virtual session.

H.4 Old Business

There was no old business

H.5 New Business

There were several items for new business brought up prior to the meeting and during the chat session in the virtual meeting. Only first item of new motions was discussed as the subcommittee was running out of time. The Chair said that he would reach out to the members and guests in email to discuss the other new items.

1. The first item of new business was to make a motion requested by the WG chair (Rick Marek) of IEEE C57.154. The motion made by Rick Marek was “To approve the establish a taskforce under

IEEE 1276 WG to investigate the addition of new material to an existing Annex in 1276 and to develop a PAR for the amendment. Motion was seconded by Gary Hoffman. A question was presented by Alan Sbravati whether Annex B from IEEE C57.154 would only move to 1276 or addition of new material. Rick mentioned that this would be up to the taskforce to determine that since there is no scope established. The motion carried with For-58, Against- 2 and Abstained-9.

2. Jason Varnell from Doble Engineer requested following items for consideration:
 - a. Subclause 11.1.2.2.c indicates that the liquid temperature rises taken at the end of the total loss run should be performed according to Subclause 11.3.2. Subclause 11.3.2 refers to the “ultimate liquid temperature rise” as being the value recorded at the end of stabilization. Based on observations on how a few transformer manufacturers have interpreted these subclauses for the purposes of guaranteeing temperature rises, I recommend that Subclause 11.3.2 be expanded to define what is meant by “ultimate liquid temperature rise.” The term is not found elsewhere in C57.12.90 or in C57.12.80 or C57.12.00. I believe that the intent of Subclause 11.3.2 is to define the top oil temperature rise, which is used to compare to the rated/guaranteed liquid temperature rise as defined in C57.12.00-2015 Subclause 5.11.1.5 (i.e. 65 °C). I have observed some manufacturers take an average of the last three or four readings associated with the last three or four hours of the total loss run. The IEC standard allows for an average of several readings but it is within the last hour of the test and not the last three or more. It should be noted that the variation in determination of the top oil temperature rise also affects the determination of the maximum (hottest-spot) winding temperature rise in accordance to C57.12.00-2015 subclause 5.11.1.1.c and IEEE 1538-2000 Clause 6. His recommend was that the first paragraph in subclause 11.3.2 add the following sentence at the end of the paragraph: The ultimate liquid temperature rise, taken at the end of the total loss run, shall be recorded in the certified test report according to IEEE Standard C57.12.00-2015 Subclause 8.7.c.6 and compared to the liquid temperature rise according to IEEE Standard C57.12.00-2015 Subclause 5.11.1.5.
 - b. Subclauses 11.4.1 and 11.4.2 do not provide indication for which exponent to use for K and L type insulating fluids associated with the cooling class designations per C57.12.00-2015 Subclause 5.1 (e.g. KNAN or KNAF). His recommend that the working group consider adding K and L type insulating fluids to these subclauses for temperature rise test corrections.
3. C57.162 and C57.91 - Both Guides could contain the bubble evolution model. Most seem to agree that we should maintain in one place and have one refer to the other. Which guide should be home to the bubble model?
4. Anastasia O'Malley mentioned that Con Edison like other utilities is assessing the impact of climate change on our transformer capabilities, both ratings and life. This may be a topic to discuss and incorporate into relevant guides and standards.
5. Given the current COVID19 situation that does not indicate resolution soon (before summer next year according to many experts) I propose the next meeting in Toronto be a hybrid meeting. Face to face + virtual.

H.6 Adjournment

The Chair Sheldon Kennedy announced that he was stepping down as the Chair of the ILSC and Sam Sharpless was going to be the Chair in 2021. Members and Guests thanked Sheldon for the great work in being the chair and congratulated Sam on taking on the task.

The meeting was adjourned at 9:20AM.

Attendance Roster

Last Name	First Name	Role	Company	Country
Acosta	Juan	Guest	Ergon, Inc.	USA
Antosz	Stephen	Member	Stephen Antosz & Associates, Inc	USA
Arteaga	Javier	Member	ABB Enterprise Software Inc	USA
Avanoma	Onome	Guest	Transformer Consulting Services Inc.	Canada
Avila	Hugo	Guest	Hitachi ABB Power Grids	USA
Ayers	Donald	Member	Ayers Transformer Consulting	USA
Ballard	Robert	Member	DuPont	USA
Bargone	Gilles	Member	FISO Technologies Inc.	Canada
Barrientos	Israel	Guest	Prolec GE	Mexico
Baumgartner	Christopher	Guest	We Energies	USA
Beaster	Barry	Member	H-J Enterprises, Inc.	USA
Beauchemin	Claude	Member	TJH2b Analytical Services	Canada
Bedoya	Duvier	Guest	Hitachi ABB Power Grids	USA
Benedict	Ramon	Guest	SPX Transformer Solutions, Inc.	USA
Betancourt	Enrique	Guest	Prolec GE	Mexico
Betancourt	Enrique	Guest	Prolec GE	Mexico
Biggie	Kevin	Member	Weidmann Electrical Technology	USA
Binder	Wallace	Guest	WBBinder Consultant	USA
Bishop	Ryan	Guest	Minnesota Power	USA
Blackburn	Thomas	Guest	Gene Blackburn Engineering	USA
Blaszczyk	Piotr	Guest	Specialty Transformer Components LLC	USA
Boettger	William	Member	Boettger Transformer Consulting LLC	USA
Boman	Paul	Guest	Hartford Steam Boiler	USA
Bonn	Mike	Guest	Soltex Inc.	Canada
Brown	Darren	Guest	Howard Industries	USA
Buchgeher	Erich	Guest	Siemens Energy	Austria
Calitz	David	Guest	Siemens Energy	USA
Casserly	Edward	Member	Ergon, Inc.	USA
Castellanos	Juan	Member	Prolec GE	Mexico
Chambers	Stuart	Member	Powertech Labs Inc.	Canada
Cheema	Muhammad Ali Masood	Guest	Northern Transformer	Canada
Cheim	Luiz	Member	Hitachi ABB Power Grids	USA
Chiang	Solomon	Member	The Gund Company	Canada
Christodoulou	Larry	Guest	Electric Power Systems, Inc.	USA
Christodoulou	Larry	Guest	Electric Power Systems, Inc.	USA

Chrysler	Rhett	Guest	ERMCO	USA
Crouse	John	Guest	Roswell Alliance	USA
Cruz	Jorge	Member	PTI Transformers	Canada
Davis	Eric	Guest	Burns & McDonnell	USA
Davydov	Valery	Guest	Mr. Valery Davydov	Australia
Denzer	Stephanie	Guest	Alliant Energy	USA
Digby	Scott	Member	Duke Energy	USA
Dix	Larry	Guest	Quality Switch, Inc.	USA
Doak	Eric	Guest	D4EnergySolutions LLC	USA
Dorris	Don	Guest	Nashville Electric Service	USA
Dulac	Hakim	Guest	Qualitrol Company LLC	Canada
Dutta Roy	Samraghi	Guest	Siemens Energy	USA
Eckroth	Megan	Guest	EATON Corporation	USA
Eckroth	Megan	Guest	EATON Corporation	USA
Espindola	Marco	Guest	ABB Enterprise Software Inc.	USA
Ferreira	Marcos	Member	Advisian-Worley Parsons	USA
Forsyth	Bruce	Member	Bruce Forsyth and Associates LLC	USA
Franchek	Michael	Guest	Retired	USA
Franchitti	Anthony	Guest	PECO Energy Company	USA
Frazier	Raymond	Guest	Ameren	USA
Frimpong	George	Member	Hitachi ABB Power Grids	USA
Frotscher	Rainer	Guest	Maschinenfabrik Reinhausen	Germany
Gara	Lorne	Guest	Shermco	Canada
Gardner	James	Guest	SPX Transformer Solutions, Inc.	USA
Gaytan	Carlos	Guest	Prolec GE	Mexico
Ghafourian	Ali	Guest	H-J Enterprises, Inc.	USA
Graham	James	Member	Weidmann Electrical Technology	USA
Griesacker	Bill	Member	Duquesne Light Co.	USA
Guner	Ismail	Guest	Hydro-Quebec	Canada
Gyore	Attila	Member	M&I Materials Ltd	UK
Hakim	Shamaun	Guest	WEG Transformers USA Inc.	USA
Hampton	Kenneth	Guest	Baltimore Gas & Electric	USA
Hanson	David	Guest	TJH2b Analytical Services	USA
Harden	Kenneth	Guest	Schneider Electric	USA
Hayes	Roger	Member	General Electric	Canada
Heiden	Kyle	Guest	EATON Corporation	USA
Heiden	Kyle	Guest	EATON Corporation	USA
Hernandez Cano	Sergio	Guest	Hammond Power Solutions	Mexico
Hochanh	Thang	Guest	Surplec Inc.	Canada
Hoffman	Gary	Member	Advanced Power Technologies	USA
Hoffman	Saramma	Member	PPL Electric Utilities	USA
Holden	Andrew	Guest	Ergon, Inc.	USA
Hollrah	Derek	Guest	Burns & McDonnell	USA
Jarman	Paul	Guest	University of Manchester	UK

John	John	Member	Virginia Transformer Corp.	USA
Jordan	Stephen	Member	Tennessee Valley Authority	USA
Joshi	Akash	Member	Black & Veatch	USA
Kadar	Laszlo	Guest	Hatch	Canada
Kaineder	Kurt	Member	Siemens Energy	Austria
Karas	Jon	Member	SDMyers, LLC.	USA
Kennedy	Sheldon	Chair	Niagara Transformer	USA
Kennedy	Gael	Member	GR Kennedy & Associates LLC	USA
Kessler	Stacey	Member	Basin Electric Power Cooperative	USA
King	Gary	Guest	Howard Industries	USA
King	Gary	Member	Howard Industries	USA
Kinner	Robert	Guest	FirstPower Group LLC	USA
Kiparizoski	Zan	Member	Howard Industries	USA
Kleine	Peter	Guest	US Army Corps of Engineers	USA
Kraemer	Axel	Guest	Maschinenfabrik Reinhausen	Germany
Kraemer	Axel	Guest	Maschinenfabrik Reinhausen	Germany
Kuppuswamy	Raja	Guest	Dynamic Ratings, Inc.	USA
Lamontagne	Donald	Guest	Arizona Public Service Co.	USA
Larison	Andrew	Guest	Hitachi ABB Power Grids	USA
Lee	Moonhee	Member	Hammond Power Solutions	Canada
Levin	Aleksandr	Member	Weidmann Electrical Technology	USA
Li	Chao	Guest	EATON Corporation	USA
Li	Yaquan (Bill)	Guest	BC Hydro	Canada
Li	Weijun	Member	Braintree Electric Light Dept.	USA
Locarno	Mario	Member	Doble Engineering Co.	USA
Lukenda	Nikola	Guest	Petro-Canada Lubricants Inc.	Canada
Mai	Tim-Felix	Guest	Siemens Energy	Germany
Malde	Jinesh	Secretary	M&I Materials Inc.	USA
Mangubat	Darrell	Member	Siemens Power Operations Inc.	Philippines
Mani	Balakrishnan	Guest	Virginia Transformer Corp.	USA
Mani	Kumar	Member	Duke Energy	USA
Marek	Richard	Member	Retired	USA
Marlow	Dennis	Guest	DenMar TDS Transformers	Canada
Martinez	Joaquin	Guest	Siemens Energy	Mexico
Mayer	Robert	Guest	Siemens Energy	Austria
McNelly	Susan	Member	Xcel Energy	USA
Mehrotra	Vinay	Member	SPX Transformer Solutions, Inc.	USA
Mendez	Victor	Guest	Southern California Edison	USA
Mendez	Victor	Guest	Southern California Edison	USA
Montpool	Rhea	Guest	Schneider Electric	USA
Mudryk	Anatoliy	Guest	Camlin Power	Ukraine
Murray	David	Member	Tennessee Valley Authority	USA
Musgrove	Ryan	Guest	Oklahoma Gas & Electric	USA
Nambi	Shankar	Member	Bechtel	USA

Narawane	Aniruddha	Member	Power Distribution, Inc. (PDI)	USA
Natale	Anthony	Guest	HICO America	USA
Neild	Kristopher	Guest	Megger	USA
Nesvold	Brady	Guest	Xcel Energy	USA
O'Malley	Anastasia	Member	Consolidated Edison Co. of NY	USA
Panesar	Parminder	Guest	Virginia Transformer Corp.	USA
Patel	Nitesh	Guest	Hyundai Power Transformers USA	USA
Patel	Vinay	Guest	Consolidated Edison Co. of NY	USA
Patel	Poorvi	Member	Electric Power Research Institute (EPRI)	USA
Penny	Brian	Guest	American Transmission Co.	USA
Perkins	Mark	Guest	D4EnergySolutions LLC	USA
Ploetner	Christoph	Guest	Hitachi ABB Power Grids	Germany
Pointner	Klaus	Member	Trench Austria GmbH	Austria
Powell	Chris	Guest	Intermountain Electronics	USA
Prevost	Thomas	Member	Weidmann Electrical Technology	USA
Prince	Jarrold	Guest	ERMCO	USA
Pruente	John	Guest	SPX Transformer Solutions, Inc.	USA
Quispe				
Cuadrado	Lesther Alex	Guest	EATON Corporation	USA
Radu	Ion	Member	Hitachi ABB Power Grids	USA
Rapp	Kevin	Guest	Cargill, Inc.	USA
Ray	Jeffrey	Member	JLR Consulting, Inc.	USA
Raymond	Timothy	Guest	Electric Power Research Institute (EPRI)	USA
Reagan	John	Guest	Oncor Electric Delivery	USA
Reed	Scott	Guest	MVA	USA
Reiss IV	Clemens	Guest	Custom Materials, Inc.	USA
Rocque	Tim	Guest	SPX Transformer Solutions, Inc.	USA
Roizman	Oleg	Guest	IntellPower Pty Ltd	Australia
Saad	Mickel	Member	Hitachi ABB Power Grids	Canada
Sanchez	Albert	Guest	Knoxville Utilities Board	USA
Sankarakurup	Dinesh	Guest	Duke Energy	USA
Sarkar	Subhas	Guest	Virginia Transformer Corp.	USA
Sauls	Roderick	Guest	Southern Company Services	USA
Sbravati	Alan	Member	Cargill, Inc.	USA
Schiessl	Markus	Guest	SGB	Germany
Schleismann	Eric	Guest	Southern Company Services	USA
Schneider	Jeffrey	Guest	EATON Corporation	USA
Schwartz	Dan	Guest	Quality Switch, Inc.	USA
Schweiger	Ewald	Member	Siemens Energy	Germany
Sen	Cihangir	Guest	Duke Energy	USA
Sharma	Devki	Guest	Entergy	Canada
Sharpless	Samuel	Vice-Chair	Rimkus Consulting Group	USA
Sheehan	David	Guest	HICO America	USA

Shertukde	Hemchandra	Member	University of Hartford	USA
Shull	Stephen	Guest	BBC Electrical Services, Inc.	USA
Shull	Stephen	Guest	BBC Electrical Services, Inc.	USA
Sinclair	Jonathan	Guest	PPL Electric Utilities	USA
Skinger	Kenneth	Guest	Scituate Consulting, Inc.	USA
Skinger	Kenneth	Guest	Scituate Consulting, Inc.	USA
Slattery	Christopher	Guest	FirstEnergy Corp.	USA
Soto	Mauricio	Guest	Hitachi ABB Power Grids	USA
Spurlock	Mike	Guest	Consultant	USA
Stankes	David	Guest	3M	USA
Stechschulte	Kyle	Guest	American Electric Power	USA
Su	Paul	Guest	FM Global	USA
Sullivan	Kevin	Member	Duke Energy	USA
Suresh	Babanna	Member	Southwest Electric Co.	USA
Szczechowski	Janusz	Member	Maschinenfabrik Reinhausen	Germany
Szewczyk	Radoslaw	Guest	Specialty Products Poland Sp. z o.o.	Poland
Tanaka	Troy	Member	Burns & McDonnell	USA
Taylor	Marc	Guest	Cogent Power Inc.	Canada
Tendulkar	Vijay	Guest	Power Distribution, Inc. (PDI)	USA
Tostrud	Mark	Member	Dynamic Ratings, Inc.	USA
Upadhyay	Parag	Guest	ABB Inc.	USA
Vance	Ed	Guest	Ardry Trading Company, Inc.	USA
VanderWalt	Alwyn	Member	Public Service Co. of New Mexico	USA
Varghese	Ajith	Member	SPX Transformer Solutions, Inc.	USA
Varnell	Jason	Member	Doble Engineering Co.	USA
Veens	Jos	Guest	SMIT Transformatoren B.V.	Netherlands
Verdell	Joshua	Guest	ERMCO	USA
Verdolin	Rogério	Member	Verdolin Solutions Inc.	Canada
Vijayan	Krishnamurthy	Guest	PTI Transformers	Canada
Vir	Dharam	Member	SPX Transformer Solutions, Inc.	USA
Vo	Duy	Guest	Central Maine Power (AVANGRID)	USA
vonGemmingen	Richard	Member	Dominion Energy	USA
Vukovic	Dejan	Guest	Hitachi ABB Power Grids	Germany
Vyas	Pragnesh	Guest	Sunbelt-Solomon Solutions	USA
Wagenaar	Loren	Guest	WagenTrans Consulting	USA
Waldrop	Hugh	Guest	Memphis Light, Gas & Water	USA
Walia	Sukhdev	Member	New Energy Power Co.	USA
Wallach	David	Member	Duke Energy	USA
Walters	Shelby	Guest	Howard Industries	USA
Wang	Evanne	Guest	DuPont	USA
Warntjes	Michael	Guest	American Transmission Co.	USA
Washburn	Alan	Guest	Burns & McDonnell	USA
Webb	Bruce	Guest	Knoxville Utilities Board	USA
Weiss	Zachery	Guest	WEG Transformers USA Inc.	USA

Welton	Drew	Guest	Intellirent	USA
Weyer	Daniel	Guest	Nebraska Public Power District	USA
Whitten	Christopher	Guest	Hitachi ABB Power Grids	USA
Wicks	Roger	Member	DuPont	USA
Williams	Trenton	Guest	Advanced Power Technologies	USA
Woods	Deanna	Guest	Alliant Energy	USA
Zemanovic	Kyle	Guest	EATON Corporation	USA
Zhao	Peter	Member	Hydro One	Canada
Zibert	Kris	Guest	Allgeier, Martin and Associates	USA
Ziomek	Waldemar	Guest	PTI Transformers	Canada

Respectfully submitted,

Jinesh Malde
Secretary, Insulation Life Subcommittee

Meeting Planning Subcommittee Minutes

Fall 2020

Tammy Behrens provided updates during the General Session with information included in the main body of the minutes.

Subcommittee meeting minutes were not provided.

Annex J Performance Characteristics Subcommittee (PCS)

October 21st, 2020, Virtual Meeting

UNAPPROVED MINUTES

Chair: Rogerio Verdolin

Vice Chair: Sanjib Som

Secretary: Kris Zibert

J.1 Introduction / Attendance

There were 80 of the 119 PCS members in attendance so quorum was achieved (67% in attendance). In addition, 82 guests were present at the meeting. The total attendance at the meeting was 162. There were 26 guests who requested membership. Their requests for membership and past attendance will be reviewed. If they meet the membership requirements, they will be granted membership before the next meeting in Toronto, Ontario, Canada, April 25 – 29, 2021.

J.2 Chairman's Remarks

The Chair introduced himself, the vice-chair and secretary and provided the below updates and comments.

The Chair asked everyone to mute their microphones unless speaking and reminded everyone to identify themselves and their affiliation when speaking. The Chair discussed that the meeting would be recorded for minutes purposes and then deleted.

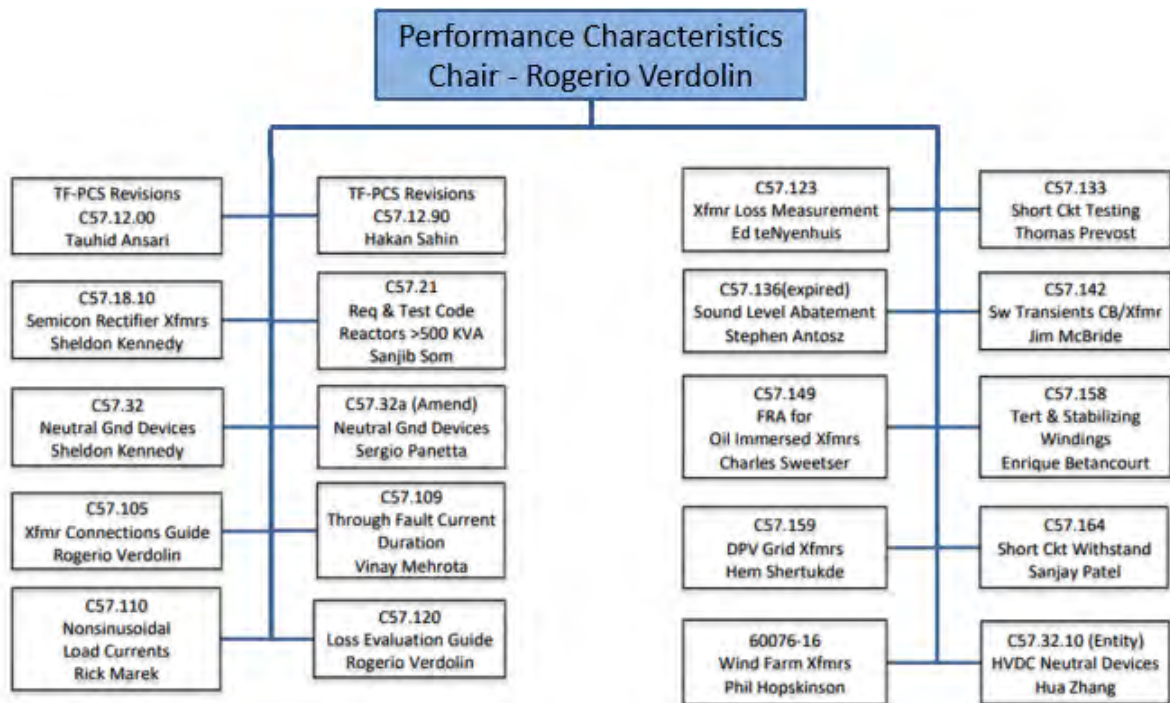
The Chair asked everyone to state any affiliation changes since last meeting in the chat window.

PCS Responsibilities: Defined by the Transformers Committee Organization and Procedures Manual.

The Performance Characteristics Subcommittee shall be responsible for the following:

- Studying and reviewing the treatment of loss, impedance, exciting current, inrush current audible sound and vibration, and other performance characteristics and their methods of application, measurement, or test for liquid filled transformers and liquid filled and dry type reactors.
- Studying and reviewing the treatment of the performance characteristics of other special use transformers e.g. photovoltaic, wind, and rectifier transformers.
- Developing and maintaining related standards, recommended practices, and guides for such criteria
- Coordinating with other technical committees, groups, societies, and associations as required

Standards Supported by PCS:



- C57.12.00 – TF to provide PCS revisions – T. Ansari
- C57.12.90-2015 – TF to provide PCS revisions – H. Sahin (test code) & R. Girgis (audible sound)
- C57.18.10 – Semiconductor rectifier transformers – S. Kennedy
- C57.21 – Requirements & Test Code For Shunt Reactors >500kVA – S. Som
- C57.32-2015 – Neutral Grounding Devices (2025) – S. Kennedy
- C57.32a – Neutral grounding devices – S. Panetta
- C57.32.10 - new Entity PAR - WG Neutral Grounding Reactors Guide for HVDC Converter Transformers
- C57.105 – Transformer connections guide – R. Verdolin
- C57.109 – Through Fault Current Duration – V. Mehrotra
- C57.110 – Xfmr Capability when Supplying Nonsinusoidal Load Currents – R. Marek
- C57.120 – Guide for loss evaluation – R. Verdolin
- C57.123 – Transformer Loss Measurement – E. teNyenhuis
- C57.133-exp – Guide for Short Circuit Testing (Expired – now covered by C57.12.90) – T. Prevost
- C57.136 – Sound Abatement Guide (will let expire, may cover in C57.12.90) – S. Antosz
- C57.142 – Switching Transients Circuit breaker/Transformer – J. McBride
- C57.149 – New SFRA Guide (2022) – C. Sweetser
- C57.158 – Tertiary & Stabilizing Windings (2027) – E. Betancourt
- C57.159 – DPV Transformers (2026) – H. Shertukde
- C57.164-new – Short Circuit Withstand (in development) – S. Patel
- 60076-16 – Wind Turbine Generator Transformers – P. Hopkinson
- C57.32.10 (Entity) HVDC Neutral Devices Hua Zhang

Status of Active PAR's:

- **2020 PAR's**
 - C57.18.10 – Semiconductor Rectifier Transformers (in Comment Resolution phase)
 - C57.21 – Shunt Reactors over 500kVA (in Comment Resolution phase)
 - C57.164 – Short Circuit Withstand Guide (Straw Ballot resolution completed)
- **2021 PAR's**
 - C57.142 – Transient Guide (WG in draft development)
 - C57.32a – Neutral Grounding Devices amendment (in Comment Resolution phase)
 - C57.123 – Loss measurement guide (in Comment Resolution phase)
- **2022 PAR's**
 - C57.32.10 – Entity WG Neutral Grounding Reactors Guide for HVDC Converter Transformers (WG in draft development)
 - C57.149 – SFRA Guide (WG in draft development)

Status of Standards without active PARs

- C57.133 – Guide for Short Circuit Testing (Expired, now covered by C57.12.90)
- C57.136-2000 – Sound Abatement Guide (intentionally allowed to expire)
- C57.32-2015 – Neutral Grounding Devices (2025)
- C57.159-2016 – DPV Transformers (2026)
- C57.120-2017 – Loss Evaluation Guide (2027)
- C57.158-2017 – Application of Tertiary and Stabilizing Windings Guide (2027)
- 60076-16-2018 – Wind Turbine Generator Transformers (2028)
- C57.109-2018 – Through Fault Current Duration (2028)
- C57.110-2018 – Xfrmr Capability when Supplying Nonsinusoidal Loads (2028)
- C57.105-2019 – Transformer connections guide (2029)
- C57.123-2019 – Loss Measurement Guide (2029)

Performance Characteristics Subcommittee Membership Requirements

- Voting membership may be requested and granted after attending two consecutive meetings.
- If a voting member misses two consecutive meetings, his or her voting privileges may be revoked. Notification will be sent if voting privileges are revoked.
- Voting privileges may be reinstated and granted after attending two consecutive meetings.

Performance Characteristics Subcommittee WG / TF Leaders

- Issue agenda at least 30 days ahead of time
- Minutes are due in 15 days, please get a rough draft of them to us today in MS Word (not PDF) format
- Please keep your webpages up to date – review regularly and send any content/files to Sue
- Must track attendance in AM System
- A patent and copyright call must occur at every WG/TF meeting

Performance Characteristics Subcommittee Meeting Minutes

- Name of the group, time, date, and location of meeting
- Officers names, meeting participants, and member status
- Chair’s remarks and reminders of IEEE policies (Patent and Copyright)
- Approval of minutes of previous meeting and agenda
- Technical topics: Brief summary (discussions and conclusions, motions exactly as they are stated, including the names of mover and seconder, and the outcome of each motion)
- Action items, items reported out of executive session
- Recesses and time of final adjournment
- Next meeting—date, time, and location

WG / TF Balloting Reminder

- Working Groups must achieve a 2/3 majority to submit a document for Sponsor Ballot.
- The Subcommittee must achieve a simple majority to submit a document for Sponsor Ballot.

Attendance / Membership / Quorum

- Quorum determination made through digital poll.
- PCS now has 119 members after a review of the Fall 2019 meeting attendance, along with the 4 previous meetings
- A meeting quorum will be reached if 60 members are in attendance

Attendance / Membership – moved to Guest status

The following 11 Members missed the past 2 meetings and have been moved to “Guest” status:

- | | |
|----------------------------------|--------------------|
| ▪ Myron Bell | ▪ Mark Lowther, Jr |
| ▪ Richard Amos | ▪ Sylvain Plante |
| ▪ Anthony Franchetti | ▪ Ewald Schweiger |
| ▪ Carlos Gaytan | ▪ Thomas Sizemore |
| ▪ Jose Antonio Gonzalez Ceballos | ▪ Waldemar Ziomek |
| ▪ Raka Levi | |

Please contact Sanjib by sending him a message or see him after the meeting if you believe your membership status is not accurate.

Attendance / Membership – New Members

These 21 former Guests requested membership at the Fall 2019 meeting and have attended the past 2 of the last 3 meetings:

- | | | |
|------------------------|------------------|------------------------|
| • Gilles Bargone | • Sanket Bolar | • Michael Craven |
| • Florin Faur | • Shawn Gossett | • Thomas Hartman |
| • Akash Joshi | • Deepak Kumaria | • Arnaud Martig |
| • Ryan Musgrove | • Ulf Randbrandt | • Leslie Recksiedler |
| • Pierre Riffon | • Tim Rocque | • Mark Shem-Tov |
| • Christopher Slattery | • Mike Spurlock | • Banana Suresh |
| • Joshua Verdell | • Sukhdev Walia | • Dr. Alexander Winter |

Welcome the New Members: We look forward to your contributions to the Subcommittee

Attendance / Membership – Quorum determination

- Current breakdown of the Subcommittee:
 - 119 Members
 - 60 are needed for a quorum
- Quorum was established.

J.3 Approval of Agenda

The Chair presented the agenda and entertained a motion to approve. The agenda had been sent to the members by email several weeks prior to the meeting. Marcos Ferreira made 1st motion to approve the agenda and was seconded by Ken Skinger. The motion passed by unanimous consent.

J.4 Approval of Last Meeting Minutes

The Chair presented the minutes of meeting held in the Fall 2019 – Columbus, Ohio, October 30th, 2019 and entertained a motion to approve. The minutes had been sent to the members by email several weeks prior to the meeting. Phil Hopkinson made 1st motion to approve Fall 2019 meeting, which was seconded by Ken Skinger. The motion passed by unanimous consent.

J.5 Minutes from Working Groups and Task Force

The following WG and Task Force reports were received (the reports are appended later).

- | | |
|---|--------------------|
| • WG Guide for FRA for Liquid Filled Transformers C57.149 | C. Sweetser |
| • TF PCS Continuous Revisions to Test Code C57.12.90 | H. Sahin |
| • TF PCS Audible Sound Revision to Clause 13 of C57.12.90 | R. Girgis |
| • TF PCS Continuous Revisions to C57.12.00 | T. Ansari |
| • WG Shunt Reactors C57.21 | S. Som |
| • WG HV & EHV Breaker & Transformer Sw. Transients C57.142 | J. McBride |
| • WG Short Circuit Withstand Design Criteria C57.164 | S. Patel |

Below are highlights that were discussed at the PCS meeting:

1) WG Guide for FRA for Liquid Filled Transformers C57.149 C. Sweetser

Meeting Date/Time: October 19, 2020 10:10 AM

Vice-Chair: Poorvi Patel (EPRI)

Secretary: James Cross (Kinectrics)

- 85 total attendees, consisting of 13 members and 73 guests. The WG achieved a quorum. 13/25

Highlights:

- Grounding Influence and Technique
 1. Introduction Paragraph – Prepared and submitted by Mario Locarno
 2. Examples and Description – discussion focus on ground issues associated with co-axial screens and impedances inserted within the ground loop
 3. Grounding Types and Techniques – the WG focused on the frequency range definition as seen by poor grounding. > 500 kHz was the starting point, wording was the key argument; typically, generally, often, were debated. Connection Diagram Discussion –

Diego Robalino presented a new table to be added to the connection diagram section. This effort was a contribution/attempt to simplify the already lengthy connection section.

4. Tap Changer “As-Found” - Diego Robalino submitted wording that cautions the user about moving the DETC for testing purposes; “it is a decision for the transformer owners”
5. Analysis & Interpretation – This is the last section to be reviewed and edited. Peter Werelius will lead a small group and submit recommendations to the WG.

2) TF on PCS Continuous Revisions to Test Code C57.12.90 H. Sahin

Meeting Date/Time: October 20, 2020 8:00-9:15 AM Central Times

- 88 participants attended the meeting. 33 members, 31 guests, 14 requested membership. Needed 43 for quorum. Quorum not met

Highlights:

- Review of the survey results for the following 3 businesses which were surveyed thru PCS. All below sections were approved, but worth the review due to good comments:
 - A. Winding resistance test section will be revised for the minor editorial correction and handed over to PCS as approved clause from the TF.
 - B. Ratio tests section will be revised in accordance with the comments and send for survey within the TF before the next meeting.
 - C. LTC test sections will be reworked due to overwhelming comments even though it had passed.
- Old business for number of short test tests is in works.
- New business ratio test method will continue to be worked on in the TF
- New business for new low voltage test method for zero sequence was presented and maybe considered to be discussed in the next meeting, since there was no quorum

Meeting adjourned at 9:02 am Central time

3) TF on Audible Sound Revision to Clause 13 of C57.12.90 R. Girgis(presented by Barry Beaster)

- This TF met at 12:55 pm on Monday.
- The TF mostly discussed and agreed on a proposed new Guide on “**Audible Sound of Power Transformers**” to replace the old “**C57.136-2000 Sound Abatement**” Guide which was allowed to expire in 2010, since some of it was outdated and much of the key material was moved into C57.12.90-2015 Clause 13.
- It was realized recently that there is some good material that we don’t want to lose, so want to reinstate the guide, with revisions and up to-date information
- Barry Beaster made a motion for the Performance Characteristics Subcommittee to approve submission of a PAR request for **Revision of C57.136-2000 (expired)**. Seconded by Steve Antoz.
 - Title: Guide on Audible Sound of Liquid-Immersed Power Transformers
 - Scope: This document provides information on sound producing sources in liquid-immersed Power Transformers. Methods are described for achieving various levels of sound reduction in transformer design, manufacturing, and on site.
 - Purpose: This guide is intended to supplement other IEEE documents related to sound levels of power transformers. C57.12.00 defines sound levels and C57.12.90 describes factory test procedures. The purpose of this guide is to provide practical information about sound level and reduction techniques to assist users and

manufacturers in the proper specification, design, manufacturing, testing, and application of liquid-immersed power transformers.

- This guide does not cover shunt reactors, dry-type or distribution transformers. This is due to the many different issues related to sound level determination. It is up to the reader to determine applicability of the material in this guide to such equipment.
- Motion passed with a vote of 64 to 1 with 2 abstentions.

4) TF on PCS Continuous Revisions to C57.12.00 T. Ansari(Presented by Enrique Betancourt)

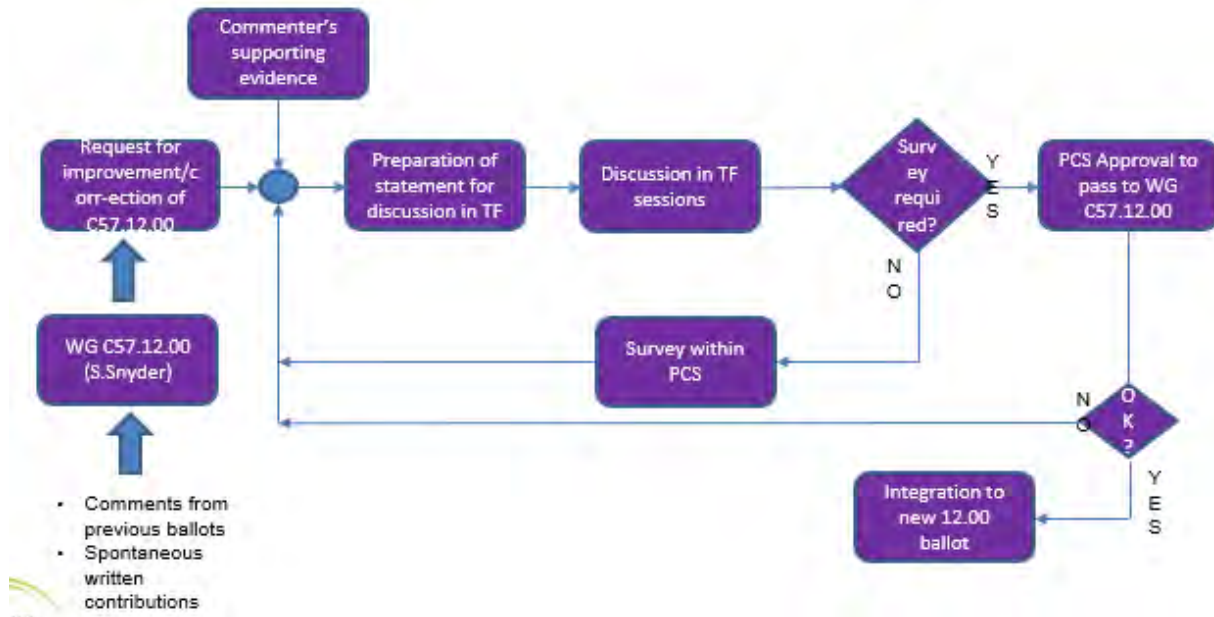
Meeting Date/Time: October 19, 2020 14:20 Hr

Secretary: Enrique Betancourt (Prolec GE) [Meeting's Acting Chair]

- 92 total attendees, consisting of 36 members and 56 guests. The WG did not achieved a quorum (41M required). 15 Attendees not enabled for poll.

Highlights:

- Old Business from F' 19 meeting
 1. Three out of four proposals did not pass PCS meeting approval (Turns Ratio tolerance/0.5% Tolerance ratio between phases/Core type on Nameplate): Chair to prepare material for remote discussion before S'21 meeting
 2. New WG item resolved by survey previous to this meeting: SC Temperature Equations Correction, brought up by David Walker. 24 members responded to survey and accepted recommendation. The correction will be done in next revision.
- The coefficients listed for "C" in C57.12.01-2015 are different than the values in C57.12.01-2005. Difference from erroneous conversion to metric units.
- TF Scope presented to the Group in form of flow chart, with extended explanation from Steve Snyder:



6) WG Shunt Reactors C57.21 S. Som

- After the first ballot we had more than enough to go to publishing the standard, but since we had some time to take care of the comments from first ballot, we did the second ballot.
- Ballot results, from first round yielded 67 returns out of 76; 88% return. 60 approvals out of which 7 approvals were with comments; 89% approval.
- After the second ballot we had a 13 comments and most of them have been resolved. There were three which the CRG did not approve since those were not accurate or out of scope.
- WG is going for a third ballot within few days.
- Since there are no additional business, we did not meet during this virtual meeting.

7) WG on HV & EHV Breaker & Transformer Sw. Transients C57.142 J. McBride

- 104 total attendees, consisting of 38 members and 66 guests. The WG achieved a quorum. 38 / 104
- Agenda and Minutes were Approved.
- IEEE Transactions Paper developed by those in the C57.142 WG has been published and is now available for early access.
- Switchgear Committee has provided several comments to Draft 6. Draft 8 was created to address many of these comments. The SC task force met on October 6, 2020 and reviewed changes made in Draft 8. Additional comments have been received after the October 6th meeting.
- Draft 8B was completed to include and address several additional comments from the Switchgear Committee. It has been posted on the Transformers Committee website. This draft was discussed at our meeting.
- Five comments requiring further discussion were reviewed during our WG meeting on Tuesday afternoon. Action was taken on 3 of these comments and 2 comments are still under consideration.
- Additional mitigation methods are being developed for inclusion in section 7.2. The mitigation methods task force had some input from Phil Hopkinson, but time ran out for this presentation. Phil's presentation and the WG meeting presentation have both been posted to the Transformers Committee webpage.
- Most of the revision is completed. However, the WG plans to file for a PAR extension in the event the work is not completed by the end of 2021.

8) WG Short Circuit Withstand Design Criteria C57.164 S. Patel

- Meeting Date/Time: October 20, 2020 / 4:45 PM
- Final Attendance Not Determined, 27/46 Members for a Quorum
- Highlights:
 - Straw Ballot resolution completed
 - 66 Comments Accepted or Revised (Accepted but modified)
 - 3 Comments Rejected
 - Rejected comments discussed in the meeting with consensus
 - Revised Draft 4 had been emailed to the WG through AMS for review, but several members and guests did not receive the email.
 - We resent to all through AMS with a request in the meeting to notify the Secretary if not received

- We will have a 2nd Straw Ballot to produce a Draft 5 by year's end to submit for WG approval then SC approval by Spring meeting
- The Title and Scope may need to be revised to include Distribution Transformers which we expect will require a PAR revision. TBD
- A PAR extension was filed previously and the PAR now expires at the end of 2021.

J.6 Unfinished (Old) Business

J.7 New Business and Motions

J.8 Minutes of Meetings of Working Group (WG) and Task Force (TF) Reports (all unapproved)

J.8.1 WG Guide for FRA for Liquid Filled Transformers C57.149

Working Group “Guide for FRA for Liquid-Filled Transformers” C57.149

(Performance Characteristics Sub-Committee)

Meeting Date/Time: October 19, 2020 1010 H

Meeting Location: Virtual

Chairman: Charles Sweetser [CS] (Omicron)

Vice-Chair: Poorvi Patel (EPRI)

Secretary: James Cross (Kinectrics)

Meeting was convened at 1010 H by Chairman Charles Sweetser with 85 total attendees, consisting of 13 members and 72 guests. The WG achieved a quorum.

The following agenda was presented and reviewed:

AGENDA

1. Introductions and Attendance Sheet
2. IEEE-SA Standards Board Bylaws on Patents in Standards
3. Approval of Minutes from October 28, 2019 Meeting (Columbus, OH)
4. Review of Suggestions
 - a. Update/Presentation - Grounding Influence and Technique
 - Mario Locarno (Doble)
 - Poorvi Patel (EPRI)
 - Charles Sweetser (Omicron) - Lead
 - Peter Werelius (Megger)
 - b. Update/Presentation - Analysis & Interpretation
 - Mario Locarno (Doble)
 - Diego Robalino (Megger)
 - Peter Werelius (Megger) – Lead
 - c. Update/Presentation – Post-fault condition wording
 - Diego Robalino (Megger)
5. Connection Diagram Discussion - Continued from last meeting.
6. Old Business
7. New Business
8. Adjourn

CS reviewed the copyright and standard patent disclosure info. (No response from attendees to request for patent info.)

The October 2019 Meeting Minutes and October 2020 Agenda were unanimously approved.

Review of Suggestions:

- Grounding Influence and Technique
 1. Introduction Paragraph – Prepared and submitted by Mario Locarno

“The importance of good measurement lead connections cannot be overstated. Poor connections can result in measurement errors causing confusion and may bring the user to question the transformer integrity. This applies not only to the measurement leads, (source reference etc.) but also the shield grounds of those cables. It is crucial that the grounding path not introduce any additional impedance into the circuit. To that end care should be taken to ensure the connections are solid. Quite often when connections are made to the bushing flange or mounting bolts, rust, paint and oxidation will create adverse conditions that must be overcome.”

This paragraph will be inserted in the first draft.

2. Examples and Description – discussion focus on ground issues associated with co-axial screens and impedances inserted within the ground loop. The following scenarios were discussed.
 - Source Lead (Yellow/Red) Ground Problem
 - Measurement Lead (Blue) Ground Problem
 - All (Yellow/Red/Blue) Ground Problem
 - Bushing Flange Ground Problem
 - Test Instrument Overall Ground Problem
 3. Grounding Types and Techniques – the WG focused on the frequency range definition as seen by poor grounding. > 500 kHz was the starting point, wording was the key argument; typically, generally, often, were debated. Three grounding techniques were defined and presented:
 - a) The method of using a shortest possible braid along bushing surface connect the shields to the bushing flange, transformer tank ground.
 - b) Using a fixed length wire, not coiled, connect the shields to the bushing flange, transformer tank ground.
 - c) Using a common, grounded, connection point near the bushings under test where the test leads shields are connected to.
- Connection Diagram Discussion - Diego Robalino presented a new table to be added to the connection diagram section. This effort was a contribution/attempt to simplify the already lengthy connection section.

Diego recommended two approaches:

 1. Eliminate previous tables that only consider 0 or 30 degree phase deviation but are quite bulky.
 2. Use the provided chart and as an extension that also includes the previous tables. Maybe expand on the connections for capacitive and inductive interwinding in a similar table but separately.
 - Tap Changer “As-Found” - Diego Robalino submitted wording that cautions the user about moving the DETC for testing purposes; “it is a decision for the transformer owners”
 - Analysis & Interpretation - This is the last section to be reviewed and edited. Peter Werelius will lead a small group and submit recommendations to the WG.

Charles Sweetser
Chair
C57.149 WG

J.8.2 TF PCS Continuous Revisions to Test Code C57.12.90

PCS TF C57.12.90 Unapproved Meeting Minutes for Fall 2020 Virtual Meeting

Oct 20, 2020

8:00 AM – 9:15 AM Central Time, US TF PCS Cont. Rev. to Test Code C57.12.90 PCS, Session 6

Chair Hakan Sahin Secretary Pugazhenthii Selvaraj

Chair Opened the meeting at 8:03 am central time, and welcomed the group and reviewed the general guidance of the virtual meeting, followed by the copyright policy.

First poll results showed:

88 participants attended the meeting. 33 members, 31 guests, 14 requested membership. Needed 43 for meeting quorum. Quorum not met. Decided to do another poll 10 minutes into the meeting.

Chair discussed the agenda and provided the update on the poll survey results of the three surveys sent out through PCS from the old business meeting. All the three survey results came in favor with acceptance. However, the Comments received with “unapproved “ status for related Ratio test & frequency revision survey and the LTC testing survey were significant enough that Chair informed the group that it was worth reviewing all comments and deciding where to go with these old businesses even though mathematically they could be considered approved thru PCS survey.

Second poll was performed, and the group did not achieve a quorum. Meeting continued.

Bob Ganser commented that he is a member but didn't see his name on the members' list. Chair agreed to add his name as member.

Larry Dix had the similar comment as above and Chair will double check Larry's membership and add him as member.

Chair commented that this presentation has so much valuable information with especially all the survey comments that he would like to share with the TF for their reference. Sue McNally commented that she can post it. Steve Antosz commented that the chair has no restriction, and it would be a good thing to share the presentation.

The old businesses which were surveyed were:

- A. Winding resistance test requirement on wye connected transformers with neutral bushing brought out, section 5.4.1
- B. Ratio tests voltage and frequency section 7.1.2
- C. New proposed test sections 8.7 & 9.6 for OLTC tests

Chair shared the sections for each section, showed the surveyed results and reviewed the comments.

A. For winding resistance test the chair's decision is to make the editorial correction submitted by Steve Antosz thru the survey and give the clause to PCS as approved business since it was already approved in PCS survey as well.

B. For ratio test, even though the survey results were passing, 2 comments were valuable enough for the TF to re-consider the revision of this clause.

Below are the discussion comments on the Ratio test frequency survey.

- Kris. Neild commented that the limits on the frequency may not be appropriate
- Alexander commented that the frequency higher limit not required to be restricted and the left “ as is “ in the standard.
- Dharam, Vir suggested to make the change in the upper limit of the frequency to be inline with IEC.

Chair’s final decision communicated to the TF was to revise the clause in respect to higher end frequency limit and send to TF for survey before the next meeting. If passes, this clause will be handed over to PCS for their consideration.

C. LTC tests

Chair mentioned that we have been working on these 2 sections to be added to C57.12.90 since 2015. Even though the survey results passing, there were many great comments

Below are the discussion comments on LTC testing survey

Chair reviewed every comment that was received during the survey. Additional comment came from Shamun Hakim suggested a sequence of LTC functional test. He recommended to consider LTC functional tests at the end of dielectric tests

Final conclusion was to re-work these 2 sections with respect to all comments, and volunteers agreed to help the chair. These volunteers were Rainer Frotscher, Joe Foldi, Craig Colopy and couple others.

Old Business:

Chair shared the old business on “Short Circuit number of tests” and told the group that this is still being worked on but not much was accomplished in the last 8 months and promised that more off line work will be done before the next meeting.

Discussion on New businesses

New Business 1

John.Herron proposed the new business of revising the section 7.3 of C57.12.90 to include transformer ratio test method.

- Robert Ganser commented that the accuracy requirements of the test methods need to be considered.
- Larry Dix remarked that the C57.12.100 provides tolerance requirement details
- Bertand Pollin clarified the difference between the tolerance requirement and the accuracy of test measurements. Chair also agreed that there is a difference between accuracy vs tolerances and the tolerances are defined in C57.12.00
- Shumun Hakim remarked that the accuracy of instruments are traceable to NIST standards

Chair commented that we will continue working on this new business to modernize the section 7.3. This doesn't mean to eliminate the current methods, but maybe to add the transformer turns ratiometer method as an additional method.

New business 2

Chair presented the proposal of Haytam Saeed on Low voltage determination of Zero Sequence impedance for power Transformer

- Bertrand Poulin recommended to consider this test method as a guide than test standard. He also suggested to consider this as test for field testing
- Krish Vijayakumar provided his remarks in chat note that whether this test can be included in the test section of tertiary stabilization winding since this test is more specific to units with tertiary.
- Daniel Blaydon suggested to consider including this test in C57.152 field test guide

Since there was no quorum, there was no agreement to whether to consider this as new business in our TF or not.

Meeting adjourned at 9 02 AM central time

Pugazhenth Selvaraj
Secretary

Hakan Sahin
Chair

ALL ATTENDED TO THE MEETING LIST

Participant Name	Affiliation
Jarrold Prince	Ermco
Axel Krämer	Reinhausen
Kevin C. Sullivan	Duke
Anastasia O'Malley	Coned.Com
Nik Dillon	Dominionenergy.Com
Steve Jordan	Tva.Gov
Gilles Bargone	Independent
Neil Strongosky	Mlgw
Steve Antosz	Consultant
Troy Tanaka	Burnsmcd
Alwyn VanderWalt	Pnm
Philip Hopkinson	Hvolt
Sanjay Patel	Smitusa
Daniel Weyer	Nppd
Shawn Gossett	Ameren
Scott Digby	Duke

Anthony Franchitti	Exeloncorp
Mats Bernesjo	Hitachi-powergrids
Ramsis Girgis	Hitachi-powergrids
Ed Davis	Burnsmcd
Craig Colopy	Eaton
Kris Zibert	Amce
Weijun Li	Beld
Bill Li	Bhydro
Samraghi Dutta Roy	Siemens
William Boettger	Consultant
Ryan Musgrove	Consultant
Jos Veens	Sgb-smit
mark lachman	Doble
shamaun Hakim	Weg
John Foschia	Spx
Mike Spurlock	Retired
Shibao Zhang	Independent
John Reagan	Oncor
Dinesh Sankarakurup	Duke
Ajith Varghese	Spx
Tom Melle	Consultant
Shankar Subramany	Kema
Bruce Forsyth	Consultant
Monty Goulkhah	Kinectrics
yang baitun	Uptegraff
Paul Jarman	Manchester AC
Rich Von Gemmingen	Dominionenergy
Ryan Thompson	Burnsmcd
Ulf Radbrandt	ABB
DANIELA EMBER BACIU	Hydro Quebec
Markus Schiessl	Sgb Smit
Larry Dix	Qualityswitch
Daniel Blaydon	Bge
scott dennis	Hitachi-powergrids
Chris Slattery	Firstenergycorp
George Jr Partyka	Ptitransformers
Kris Neild	Megger
Sukhdev Walia	Consultant
Robert Ganser	Neo
Bertrand Poulin	Hitachi-powergrids
Jorge Cruz	Ptitransformers

Roger Verdolin	Shaw
Joe Foldi	Consultant
HAKAN SAHIN	Independent
Dharam Vir	Spx
Raj Ahuja	Consultant
John K John	Vatransformer
Danny Schwartz	Qualityswitch
akash joshi	Consultant
Mike Warntjes	Atc LLC
Chris Baumgartner	We Energies
Kyle Knous	Eaton
Joe Watson	Fpl
Craig Colopy	Eaton
Brian Penny	Atc LLC
Leopoldo Rodriguez	Consultant
Curtiss Frazier (Ameren)	Ameren
Fernando Leal	Consultant
Jean-Noel Berube	Rugged monitoring
Rod Sauls	Southernco
suresh babanna	Spx
Juan Carlos Cruz Valdes	Prolecge
J.Dennis Marlow	Consultant
John Herron	Raytect
Alexander Winter	Highvolt
Mark Perkins	Consultant
orlandog	H-J
Sanjay Patel	Smitusa
Rainer Frotscher	Reinhausen
Krishnamurthy Vijayan	Ptitransformers
Shankar Nambi	Bechtel
Marc Taylor	Cogentpowerinc
Nick Walder	Eaton
bill griesacker	Consultant
Susan McNelly	Xcelenergy
Jason Varnell	Consultant
Pugal Selveraj	Vatransformer
Javier Arteaga	Hitachi-powergrids
Duvier Bedoya	Hitachi-powergrids
Gregory Anderson	Consultant
Nick Podany	Usbr Gov
Eric Schleismann	Southernco

J.8.3 TF PCS Audible Sound Revision to Clause 13 of C57.12.90

Unapproved Minutes of Fall 2020 TF PCS Audible Sound Revision to Clause 13 of C57.12.90

The task force met at 12:55 PM, on Monday, October 29, 2020. Chairman Dr. Ramsis Girgis presided over the technical part of the meeting and Secretary Barry Beaster handled the administrative duties of the meeting.

After the Fall 2019 meeting, the membership was adjusted to 38 members. There were of 20 members of a total 50 persons in attendance. A quorum was established with 52.6 % of the membership. A call was made for any objections for a unanimous approval of the Fall 2019 TF minutes; no objections were raised so minutes were approved as written. The proposed agenda was presented without objections for approval. Any requests for membership will be reviewed. A call for any patents or copyright concerns was made without comment.

In opening remarks, Dr. Girgis commented this meeting would not be addressing open action items of the previous meeting but rather focus on the development of the new Sound Guide. The task force mostly discussed and agreed on a proposed new Guide on 'Audible Sound of Power Transformers' to replace the old 'C57.136-2000 Sound Abatement Guide' which was allowed to expire in 2010. Some material in that guide was outdated and much of the key material was moved into C57.12.90-2015 Clause 13 as a result of work of this task force.

It was also recently realized there is some good material in the original guide which should not be lost, so a reinstatement of the guide with revisions and up to-date information should be undertaken. A presentation was made by Stephen Antosz of the proposed title, scope and purpose. Individual motions were made on the title, scope, and purpose. Seconds were made and discussion was held. Each motion carried with a majority or unanimous approval.

It was agreed to retain the original standard number of C57.136 for this updated guide.

Title

Guide on Audible Sound of Liquid-Immersed Power Transformers

Scope

This document provides information on sound producing sources in liquid-immersed power transformers. Methods are described for achieving various levels of sound reduction in transformer design, manufacturing, and on site.

Purpose

This guide is intended to supplement other IEEE documents related to sound levels of power transformers. C57.12.00 defines sound levels and C57.12.90 describes factory test procedures. The purpose of this guide is to provide practical information about sound level and reduction techniques to assist users and manufacturers in the proper specification, design, manufacturing, testing, and application of liquid-immersed power transformers. This guide does not cover shunt reactors, dry-type or distribution transformers. This is due to the many different issues related to sound level determination. It is up to the reader to determine applicability of the material in this guide to such equipment.

The proposed Working Group leaders for PC57.136:

- Chairman, Stephen Antosz
- Vice-Chairman, Ramsis Girgis
- Secretary, Mats Bernesjo

Dr. Girgis presented suggested changes and updates that would be needed. Volunteers to assist with the revised Guide were solicited and were asked to contact Stephen Antosz and let him know what part (s) of the Guide they can contribute to.

To proceed with the new guide a submission of a PAR request for revision of C57.136-2000 (expired) would be required at the Performance Characteristics Subcommittee. This motion is as follows:

‘I move the Performance Characteristic Subcommittee to approve submission of a PAR request for Revision of C57.136-2000 (expired)’.

After the Subcommittee approves, the Working Group Chair will apply for a PAR.

The Chairman of the Audible Sound TF stated that the work of the Task Force will continue with the prior action items carried from earlier meetings. A meeting in the Spring of 2021 is planned.

Respectfully submitted,
Barry Beaster, TF Secretary

J.8.4 TF PCS Continuous Revisions to C57.12.00

PCS Task Force on General Requirements C57.12.00

*Performance Characteristics Subcommittee
IEEE / PES Transformers Committee*

October 19, 2020 2:20 PM

On-Line Meeting; Virtual, CT Time Zone USA

UNAPPROVED MINUTES

The PCS Task Force on General Requirements for C57.12.00 met on Monday, October 19, 2020. The (acting) Chair Enrique Betancourt called the Group to order at 2:20 PM and reminded purpose and scope of the TF. The copyright statement from IEEE was presented to the Group, as well as the essential patents claim; none of the present was aware of issues related to this WG’s activities. According to the on-line system (two polls), 37 Members and 55 guests were present. The quorum to conduct regular business was not considered achieved, as 82 members are registered in the Task Force. After the meeting, file from PSAV was received indicating attendance of 41 members, minimum valid number for a quorum; the minutes from the F’19 meeting will be approved by mail vote from members present (Annex A below).

The following 12 (by system identifiable) guests requested membership:

Alexander Winter	HIGHVOLT Pruftechnik Dresden
Christopher Slattery	FirstEnergy Corp.
Dinesh Sankarakurup	Duke Energy
Dipak Patel	(Not provided)
Kris Zibert	Allgeier, Martin and Associates
Peter Kleine	US Army Corps of Engineers
Phil Hopkinson	HVOLT Inc.
Waldemar Ziomek	PTI Transformers
Samraghi Dutta	(Not provided)
Sergio Hernandez Cano	Hammond Power Solutions
Shawn Gosset	Ameren
Babanna Suresh	Southwest Electric Co.

WG proposed Agenda and the Columbus (Fall 2019) minutes could not be approved by the Group. The (acting) Chair announced that in case quorum would not be reached, the rest of the session would be mainly informative for attendees.

The (acting) Chair gave the Group quick update about old business items still open.

1. OLD BUSINESS

A. **Inclusion of Core information on Nameplate**

Proposed new text prepared by the Group was not accepted as such when presented to the PCS meeting last Fall. The TF Chair Tauhid Ansari is still working on new proposal, to be discussed during next meeting.

B. **Load Loss Measurement at other than nominal rating.**

This proposal stated addition of sentence “*At least one test shall be performed at the minimum kVA rating and one test at the maximum kVA rating.*” to current requirements for Load Loss Testing on Table 17 of C57.12.00. The text prepared by the Group was accepted at the last Fall meeting of PCS and will be submitted to Steve Snyder’s Group for edition and inclusion in next ballot for C57.12.00.

C. **Change in turns ratio tolerance to “0.5% or less than 1/10th of the transformer impedance”.**

IEEE C57.12.00 Sect. 9.1 currently states that “*when the volts per turn of the winding exceeds 0.5% of the nameplate voltage, the turns ratio of the winding on all tap connections shall be to the nearest turn.*”

It was submitted proposal to modify text according to: “*when volts per turn exceeds 0.5% of the phase to ground voltage of the name plate voltage, the ratio on winding on all tap connection can be higher than +/-0.5% but not exceeding either 1/10th of percentage impedance at the base MVA or the %step of the tap whichever is lower.*”

The Chair has pending preparation of new text for discussion among the Group; once ready, it will be preliminarily surveyed within the TF group before the next meeting.

D. **WG Item 112, clarification on ±0.5% tolerance of ratio of three phase transformer**

It was requested addition of a tolerance for the difference in turns ratio of the phases of three-phase transformers: “as the standard is written now, there could be a 1% difference between one phase and another”.

In the last TF meeting, motion “to investigate acceptable tolerance in turns ratio between phases of a three-phase transformer” passed and the TF Chair was to assemble a small group to investigate the subject and propose new text; the task is still in progress.

E. A new TF item came up before this meeting: **Short Circuit Temperature Equations Correction**, identified by David Walker. The coefficients listed for "C" in C57.12.01-2015 are different than the values in C57.12.01-2005 and the values in C57.12.00-2015 despite the thermal models being the same. The difference in values can be attributed to erroneous attempt to convert the equations in C57.12.01-1989 from imperial to metric units. New, correct coefficients for C57.12.00 and C57.12.01 are as:

Current	Recommended
$m = \frac{W_s t}{C(T_k + T_s)}$ <div style="border: 1px solid black; padding: 5px; margin: 5px auto; width: fit-content;"> <p>[384 + 0.0496(T₁ + T₂) + 110 A_i/A_c] for copper [893 + 0.220(T₁ + T₂) + 360 A_i/A_c] for aluminum</p> </div>	$m = \frac{W_s t}{C(T_k + T_s)}$ <p>C = 384 + 0.0496(T₁ + T₂) + 243 $\frac{A_i}{A_c}$ for copper C = 893 + 0.220(T₁ + T₂) + 794 $\frac{A_i}{A_c}$ for aluminum</p>

The proposed change was discussed by TF Chair Tauhid Ansari with Steve Snyder and resolved by a survey conducted before this meeting: 24 members responded to survey and unanimously accepted the recommendation. With no further comments from Members in attendance, the correction will be done in next revision of C57.12.00.

F. Next Agenda item was to share with members and guests present a flow chart showing operation of the TF, within the process of improving Std. C57.12.00. No further adjustments came from the Group.

2. NEW BUSINESS

A. The (acting) Chair asked if there were new business to bring up to the Group.

With no new items brought up by the Group, the meeting was adjourned at 3:00 PM.

Respectfully submitted,

Tauhid Ansari
WG Chair

Enrique Betancourt
Secretary and Acting Chair

ANNEX A. Attendance list received from PSAV:

No	NAME	M	G	GRM	No	NAME	M	G	GRM	No	NAME	M	G	GRM
1	Ajith Varghese SPX, Waukesha X	X			30	Jarrod Prince X	X			59	orlandog			N
2	akash joshi X	X			31	Jason Varnell X	X			60	Parminder X			X
3	Alexander Winter X			X	32	Javier Arteaga X	X			61	Peter Kleine X			X
4	Angela Amador X		X		33	Joe Nims X		X		62	Philip Hopkinson X			X
5	Anton Koshel X		X		34	John Foschia X		X		63	Pierre Riffon X			X
6	Brian Penny X	X			35	John Herron X	X			64	Raj Ahuja		N	
7	Bruce Forsyth X	X			36	John K John X	X			65	Ramsis Girgis X		X	
8	Chris X		X		37	Jonathan Reimer X		X		66	Reto Fausch		N	
9	Chris Baumgartner X	X			38	Jorge Cruz		N		67	Samraghi Dutta Roy X			X
10	Chris Slattery FirstEnergy X			X	39	Kenn Skinger	N			68	Sanjay X		X	
11	Cihangir John X		X		40	Kevin Rapp X		X		69	scott dennis X		X	
12	Curtiss Frazier Ameren X		X		41	Kris Neild X	X			70	Sergio Hernandez Cano X			X
13	Daniel Blaydon X	X			42	Kris Zibert X			X	71	shamaun Hakim X		X	
14	Daniel Sauer X		X		43	Krishnamurthy Vijayan X	X			72	Shankar Nambi X		X	
15	Darren Brown X	X			44	Leopoldo Rodriguez X	X			73	Shawn Gossett X			X
16	David Wallach X		X		45	Mahesh Sampat X		X		74	Sheldon Kennedy X		X	
17	Dharam Vir X	X			46	Marc Taylor X		X		75	Steve Antosz		N	
18	Didier Hamoir X		X		47	mark lachman X	X			76	Steve Schroeder X		X	
19	Dinesh Sankarakurup X			X	48	Mark Perkins X	X			77	Steve Snyder X		X	
20	Dipak Patel X			X	49	Markus Schiessl X	X			78	Sukhdev Walia		N	
21	Donald Ayers X	X			50	Megan Eckroth - Eaton X		X		79	suresh babanna X			X
22	Ed teNyenhuis X	X			51	mjaroszewski X	X			80	Sylvain Plante X		X	
23	edavis X		X		52	musgrorj X	X			81	t901ajf X		X	
24	enrique betancourt ramirez X	X			53	Nick Podany X		X		82	Tom Dauzat X		X	
25	Evgenii Ermakov		X		54	Nick Walder X		X		83	Tom Melle X		X	
26	Feras Fattal X		X		55	Nik Dillon X		X		84	Will Elliott X		X	
27	George Jr Partyka X		X		56	Nitesh X			X	85	William Boettger X		X	
28	Hakan Sahin X	X			57	Olle Benzler X		X		86	wziomek X			X
29	J.Dennis Marlow		N		58	Omar Mendez		N		87	yang baitun		N	
		12	13	4			14	13	2			15	6	8

Member Guest GRM Not counted
36 27 14 15

Count original (during meeting)

Count adding attendees in PSAV file 41 32 14

J.8.5 WG HV & EHV Breaker & Transformer Sw. Transients C57.142

MEETING MINUTES *IEEE / PES Transformers Committee Performance* *Characteristics Subcommittee*

WG to Investigate the Interaction between Substation Transients and Transformers in HV and EHV Applications and Revision of C57.142

Virtual Meeting
Tuesday, October 20, 2020
2:30 PM – 3:35 PM Central Time Zone - USA

Chairman – Jim McBride
Vice Chair – Xose Lopez-Fernandez
Secretary – Tom Melle

- 1) Meeting called to order at 2:25 PM Central Time.
Welcome and Chair's Remarks
- 2) Attendance Poll was taken at 2:30 PM.
104 Attendees were present (66 Guests)
38 of 69 Members present (quorum was achieved)
- 3) IEEE Patent Policy Slides (no essential patent claims made)
- 4) Approval of Agenda without objection. Approval of Spring 2020 Meeting Minutes without objection (motion to approve by Phil Hopkinson / 2nd by Rogerio Verdolin).
- 5) Switchgear Liason Task Force Update – Dave Caverly, Jim McBride
The WG continues to receive excellent comments since Draft 6 from Switchgear experts via the Switchgear Liason TF. Draft 8 was created to address many of the ongoing comments. The SC task force met on October 6, 2020 and reviewed changes made in D8. Additional comments have been received after the October 6th meeting which lead to Draft 8B (now circulated). The presentation and the minutes from the SLTF meetings will be posted on the WG website.
- 6) Status of present work (D8B) and comments – Jim McBride

It was noted the IEEE Transactions Paper developed by members of the C57.142 WG has been published and is now available on the IEEE website.

Most of the revision to the Guide is completed. However, the WG plans to file for a PAR extension, in the event the work is not completed by the end of 2021.

Draft 8B includes and address several additional comments from the Switchgear Committee. It is posted on the Transformers Committee website.

Poll Questions:

Poll Question #1 (Changes to Section 6.4 Interruption with repetitive re-ignition)

The chair reviewed comments by Dr. Edgar Dullni (Switchgear Committee). Amplification of internal transformer resonance was discussed, along with series/parallel considerations and impedances within the circuit. A motion was made by Phil Hopkinson to continue to study the data and review ABB Bland test protocol data (second by Mike Spurlock). The motion carried with 37/69 member votes. These topics will remain under discussion and other new comments will be reviewed at the next meeting.

Poll Question #2 (Delete Clause 6.6 Transformer internal voltage response)

The Chair asked if Section 6.6 remains necessary, after the addition of 6.5 and modification of other clauses. Discussion ensued whether to delete or keep Section 6.6. A motion was made by Phil Hopkinson to keep as much of Section 6.6 as possible and continue to review and modify as necessary (second by Hemchandra Shertukde). The motion carried with 37/69 member votes.

Poll Question #3 (Change to Section 7.2 Other mitigation methods)

Discussion ensued on whether to replace last paragraph of Clause 7.2 with new verbiage from Edgar Dullni. It was noted that along with prior contributions by Juliano Montanha (Siemens) and Pierre Riffon, additional mitigation methods are being discussed for inclusion in section 7.2 based on the submitted comments. Phil Hopkinson made a motion to accept the existing mitigation methods paragraph and add any new methods resulting from the meeting and future input (second by Vijay Tendulkar). The motion had no objections (*note: only 31/69 members approved in the 1 minute poll).

Poll Question #4 (Changes to Example A1)

Prior to the meeting Pierre Riffon, suggested the analysis should rather refer to the clauses in the main text rather than re-describing the phenomenon. Therefore Example A1 needs a revision. Further discussion was tabled until the next meeting.

Polling question #5 (changes to example A5)

It was suggested that Example A5 is not consistent and should be revised. With disconnecting switching, only the steepness of the breakdowns and the high number of breakdowns is decisive. Transformer resonances do not play a role. More information was solicited from the group and further discussion was tabled to the next meeting.

- 7) The mitigation methods task force had an update from Phil Hopkinson, but time ran out for a presentation. Motion was made by the chair to put Phil's presentation on the WG webpage without objection. The WG meeting slides and task force presentation have both been posted to the Transformers Committee webpage

- 8) New Business: none
- 9) Next Meeting: (Spring 2021 – Toronto, Ontario CA April 25-29)
- 10) Motion to Adjourn made by Hemchandra Shertukde (second by Phil Hopkinson). Meeting was adjourned at 3:35 PM without objection

Respectfully,
 Thomas R. Melle
 Secretary

J.8.6 WG Short Circuit Withstand Design Criteria C57.164

WG for PC57.164
 Guide for Establishing Short Circuit Withstand Capabilities of Liquid Immersed Power Transformers, Regulators, and Reactors

Sanjay Patel - Chair, Raj Ahuja - Vice Chair, Joe Watson - Secretary

The group met on-line on Tuesday, October 20, 2020, 3:45-5:00 PM. There were 79 people logged in, including 27 of the 46 members who achieved a quorum. Additionally, there were 39 guests and 9 guests that requested membership and 9 attendees that did not respond to the attendance poll.

The patent and copyright questions were addressed with no conflicts noted.

The Agenda called for a review of Draft 4, which was revised to address the straw ballot comments, but we quickly discovered that the attendees had not received the email that had been sent through the AMS system, and that the system had rejected the message due to the file size being over 2MB.

The straw ballot resulted in 91 votes and 69 comments, 8 were for approval without comments, 29 were for approval with comments, 41 were for disapproval with comments, and 13 were comments without approval or disapproval indicated. Of the 69 comments, 24 were accepted as proposed, 42 were accepted with minor adjustments, and 3 were rejected.

So we discussed the 3 straw ballot comments that had been rejected and the WG was in agreement. But due to the large number of changes and the inability of the WG to review the new Draft before the meeting, we agreed to email out the Draft 4 revision to everyone after the meeting for a second straw ballot to be returned by mid-November. We intend to finalize the document after this second straw ballot then hold an on-line meeting with the members before the end of the year, with the goal of approving the document to send to the Performance Characteristics Subcommittee for approval to go for balloting through the IEEE SA.

The PAR was extended earlier this year and will now expire at the end of 2021.

The meeting adjourned at 5:00 PM.

The following members (including officers) and guests attended the meeting, as is also recorded in the AMS system.

Status	First Name	Last Name	Affiliation
--------	------------	-----------	-------------

Chair	Sanjay	Patel	Royal Smit Transformers
Vice-Chair	Raj	Ahuja	Raj Ahuja Consulting
Secretary	Joe	Watson	JD Watson and Associates Inc.
Member	Enrique	Betancourt	Prolec GE
Member	William	Boettger	Boettger Transformer Consulting LLC
Member	Muhammad Ali Masood	Cheema	Northern Transformer
Member	Domenico	Corsi	Doble Engineering Co.
Member	Ramsis	Girgis	Hitachi ABB Power Grids
Member	Akash	Joshi	Black & Veatch
Member	Kurt	Kaineder	Siemens Energy
Member	Zan	Kiparizoski	Howard Industries
Member	Krzysztof	Kulasek	Hitachi ABB Power Grids
Member	Vinay	Mehrotra	SPX Transformer Solutions, Inc.
Member	Ion	Radu	Hitachi ABB Power Grids
Member	Markus	Schiessl	SGB
Member	Eric	Schleismann	Southern Company Services
Member	Hemchandra	Shertukde	University of Hartford
Member	Kushal	Singh	ComEd
Member	Shankar	Subramany	KEMA Labs
Member	Ed	teNyenhuis	Hitachi ABB Power Grids
Member	Jason	Varnell	Doble Engineering Co.
Member	Kiran	Vedante	Ritz Instrument Transformers
Member	Krishnamurthy	Vijayan	PTI Transformers
Member	Dharam	Vir	SPX Transformer Solutions, Inc.
Guest	Stephen	Antosz	Stephen Antosz & Associates, Inc
Guest	Darrell	Banks	Memphis Light, Gas & Water
Guest	Christopher	Baumgartner	We Energies
Guest	Ryan	Bishop	Minnesota Power
Guest	Piotr	Blaszczyk	Specialty Transformer Components LLC
Guest	Bruno	Bosnjak	Hyundai Electric Switzerland
Guest	Jeremiah	Bradshaw	Bureau of Reclamation
Guest	Erich	Buchgeher	Siemens Energy
Guest	John	Crouse	Roswell Alliance
Guest	Jorge	Cruz	PTI Transformers
Guest	Juan Carlos	Cruz Valdes	Prolec GE
Guest	Pouneh	Davoudi	Delta Star Inc.
Guest	Brandon	Dent	Memphis Light, Gas & Water
Guest	Huan	Dinh	Hitachi ABB Power Grids
Guest	Larry	Dix	Quality Switch, Inc.
Guest	Marco	Espindola	ABB Enterprise Software Inc.
Guest	Norman	Field	Teshmont Consultants LP
Guest	Robert	Ganser	Transformer Consulting Services, Co.

Guest	Saurahb	Ghosh	Transformers & Rectifiers (India) Ltd
Guest	Bill	Griesacker	Duquesne Light Co.
Guest	Shamaun	Hakim	WEG Transformers USA Inc.
Guest	Didier	Hamoir	Transformer Protector Corp
Guest	Sergio	Hernandez Cano	Hammond Power Solutions
Guest	Philip	Hopkinson	HVOLT Inc.
Guest	Gael	Kennedy	GR Kennedy & Associates LLC
Guest	Anton	Koshel	Delta Star Inc.
Guest	Deepak	Kumaria	Hitachi ABB Power Grids
Guest	Moonhee	Lee	Hammond Power Solutions
Guest	Tim-Felix	Mai	Siemens Energy
Guest	Jinesh	Malde	M&I Materials Inc.
Guest	Balakrishnan	Mani	Virginia Transformer Corp.
Guest	Kristopher	Neild	Megger
Guest	Rodrigo	Ocon	Industrias IEM
Guest	Parminder	Panesar	Virginia Transformer Corp.
Guest	George	Partyka	PTI Transformers
Guest	Nitesh	Patel	Hyundai Power Transformers USA
Guest	Sylvain	Plante	Hydro-Quebec
Guest	Christoph	Ploetner	Hitachi ABB Power Grids
Guest	Nicholas	Podany	Bureau of Reclamation
Guest	Jarrood	Prince	ERMCO
Guest	Shiva	Rampersad	Dow Chemical Company
Guest	Pierre	Riffon	Pierre Riffon Consultant Inc.
Guest	Patrick	Rock	American Transmission Co.
Guest	Tim	Rocque	SPX Transformer Solutions, Inc.
Guest	Hakan	Sahin	Independent
Guest	Albert	Sanchez	Knoxville Utilities Board
Guest	Daniel	Sauer	EATON Corporation
Guest	Jeffrey	Schneider	EATON Corporation
Guest	Stephen	Schroeder	Hitachi ABB Power Grids
Guest	Steven	Snyder	Hitachi ABB Power Grids
Guest	Neil	Strongosky	Memphis Light, Gas & Water
Guest	Marc	Taylor	Cogent Power Inc.
Guest	Vijay	Tendulkar	Power Distribution, Inc. (PDI)
Guest	Ajith	Varghese	SPX Transformer Solutions, Inc.
Guest	Jos	Veens	SMIT Transformatoren B.V.
Guest	Pragnesh	Vyas	Sunbelt-Solomon Solutions
Guest	May	Wang	BC Hydro
Guest	Michael	Warntjes	American Transmission Co.
Guest	Kris	Zibert	Allgeier, Martin and Associates

Additionally, the following people were signed into the meeting, but were not listed in AMS and no affiliations were listed. Perhaps they entered their name incorrectly or inconsistently with their listing in AMS:

- Yang Baitun
- Guner Ismail
- Cihangir John
- Tony Reiss
- Samragni Dutta Roy
- Janet Sheridan

J.9 Adjournment

The Chair entertained a motion to adjourn. Marcos Ferreira made the motion, seconded by Daniel Sauer. The meeting was adjourned at 3:27PM

J.10 Performance Characteristics Subcommittee Attendance List

Role	First Name	Last Name	Company
Guest	Gregory	Anderson	GW Anderson & Associates, Inc.
Guest	Dennis	Marlow	DenMar TDS Transformers
Member	William	Boettger	Boettger Transformer Consulting LLC
Member	Bill	Griesacker	Duquesne Light Co.
Member	Joseph	Foldi	Foldi & Associates, Inc.
Member	Joe	Watson	JD Watson and Associates Inc.
Guest	Stephen	Schroeder	Hitachi ABB Power Grids
Guest	Paulette	Powell	3P
Member	Barry	Beaster	H-J Enterprises, Inc.
Guest	Mark	Perkins	D4EnergySolutions LLC
Guest	Edward	Smith	H-J Family of Companies
Member	Javier	Arteaga	ABB Enterprise Software Inc
Guest	Michael	Sharp	Trench Limited
Member	Steven	Snyder	Hitachi ABB Power Grids
Guest	Raj	Ahuja	Raj Ahuja Consulting
Guest	Dinesh	Sankarakurup	Duke Energy
Guest	Mahesh	Sampat	EMS Consulting Inc.
Member	Bertrand	Poulin	Hitachi ABB Power Grids
Member	Ed	teNyenhuis	Hitachi ABB Power Grids
Guest	Alan	Traut	Howard Industries
Guest	Gary	King	Howard Industries
Member	Emilio	Morales-Cruz	Qualitrol Company LLC
Guest	John	Lackey	PowerNex Associates Inc.
Member	Stephen	Antosz	Stephen Antosz & Associates, Inc
Guest	Loren	Wagenaar	WagenTrans Consulting
Member	Donald	Ayers	Ayers Transformer Consulting

Member	Ramsis	Girgis	Hitachi ABB Power Grids
Guest	Wallace	Binder	WBBinder Consultant
Member	Wallace	Binder	WBBinder Consultant
Member	Philip	Hopkinson	HVOLT Inc.
Guest	Paul	Jarman	University of Manchester
Member	Sheldon	Kennedy	Niagara Transformer
Guest	Axel	Kraemer	Maschinenfabrik Reinhausen
Member	Christopher	Baumgartner	We Energies
Member	Enrique	Betancourt	Prolec GE
Guest	Christoph	Ploetner	Hitachi ABB Power Grids
Member	Richard	Marek	Retired
Member	Peter	Zhao	Hydro One
Member	Sanjay	Patel	Royal Smit Transformers
Member	Sanjay	Patel	Royal Smit Transformers
Guest	Gael	Kennedy	GR Kennedy & Associates LLC
Member	Klaus	Pointner	Trench Austria GmbH
Member	Pierre	Riffon	Pierre Riffon Consultant Inc.
Guest	Krzysztof	Kulasek	Hitachi ABB Power Grids
Member	Craig	Colopy	EATON Corporation
Member	Steven	Schappell	SPX Transformer Solutions, Inc.
Member	Vinay	Mehrotra	SPX Transformer Solutions, Inc.
Guest	Eric	Davis	Burns & McDonnell
Chair	Rogério	Verdolin	Verdolin Solutions Inc.
Guest	Gary	Hoffman	Advanced Power Technologies
Member	Hemchandra	Shertukde	University of Hartford
Member	Charles	Sweetser	OMICRON electronics Corp USA
Guest	Scott	Digby	Duke Energy
Member	J. Arturo	Del Rio	Siemens Energy
Member	Ulf	Radbrandt	Hitachi ABB Power Grids
Member	Marcos	Ferreira	Advisian-Worley Parsons
Member	Mike	Spurlock	Consultant
Member	James	McBride	JMX Services, Inc.
Member	James	McBride	JMX Services, Inc.
Member	Dharam	Vir	SPX Transformer Solutions, Inc.
Member	Kiran	Vedante	Ritz Instrument Transformers
Member	John	Herron	Raytech USA
Guest	Peter	Werelius	Megger
Guest	Marco	Espindola	ABB Enterprise Software Inc.
Guest	Hakan	Sahin	Independent
Member	Vijay	Tendulkar	Power Distribution, Inc. (PDI)
Member	Brian	Penny	American Transmission Co.
Member	Said	Hachichi	Hydro-Quebec
Guest	Jose	Gamboa	H-J Family of Companies

Member	Poorvi	Patel	Electric Power Research Institute (EPRI)
Guest	Juan Carlos	Cruz Valdes	Prolec GE
Guest	Juan Carlos	Cruz Valdes	Prolec GE
Vice-Chair	Sanjib	Som	Pennsylvania Transformer
Member	Daniel	Blaydon	Baltimore Gas & Electric
Member	Robert	Ballard Lopez-	DuPont
Member	Xose	Fernandez	Universidade de Vigo
Member	Daniel	Sauer	EATON Corporation
Member	Kenneth	Skinger	Scituate Consulting, Inc.
Member	Baitun	Yang	R.E. Uptegraff
Guest	Mario	Locarno	Doble Engineering Co.
Guest	Troy	Tanaka	Burns & McDonnell
Member	Krishnamurthy	Vijayan	PTI Transformers
Member	Ryan	Musgrove	Oklahoma Gas & Electric
Guest	Jos	Veens	SMIT Transformatoren B.V.
Member	Egon	Kirchenmayer	Siemens Energy
Guest	Leopoldo	Rodriguez	Transformer Testing Services LLC
Member	David	Murray	Tennessee Valley Authority
Member	Sukhdev	Walia	New Energy Power Co.
Member	Thomas	Melle	HIGHVOLT
Member	Scott	Dennis	Hitachi ABB Power Grids
Member	Weijun	Li	Braintree Electric Light Dept.
Member	John	John	Virginia Transformer Corp.
Member	Aniruddha	Narawane	Power Distribution, Inc. (PDI)
Guest	Steven	Brzoznowski	Bonneville Power Administration
Member	Jarrold	Prince	ERMCO
Guest	Mats	Bernesjo	Hitachi ABB Power Grids
Guest	Marc	Taylor	Cogent Power Inc.
Guest	Elizabeth	Bray	Southern Company Services
Guest	Markus	Schiessl	SGB
Guest	Rhett	Chrysler	ERMCO
Member	Christopher	Slattery	FirstEnergy Corp.
Member	Kristopher	Neild	Megger
Member	Jason	Varnell	Doble Engineering Co.
Member	Jeffrey	Wright	Duquesne Light Co.
Guest	Anthony	Franchitti	PECO Energy Company
Member	Samuel	Sharpless	Rimkus Consulting Group
Guest	Anand	Zanwar	Siemens Energy
Secretary	Kris	Zibert	Allgeier, Martin and Associates
Member	Tim-Felix	Mai	Siemens Energy
Member	Dr. Alexander	Winter	HIGHVOLT Pruftechnik Dresden
Member	Florin	Faur	SPX Transformer Solutions, Inc.

Member	Sanket	Bolar	Megger
Guest	Daniela	Ember Baciu	Hydro-Quebec IREQ
Guest	Feras	Fattal	Manitoba Hydro
Guest	Peter	Kleine	US Army Corps of Engineers
Member	Akash	Joshi	Black & Veatch
Guest	Cihangir	Sen	Duke Energy
Member	Stacey	Kessler	Basin Electric Power Cooperative
Guest	Ryan	Bishop	Minnesota Power
Guest	Daniel	Weyer	Nebraska Public Power District
Guest	Zachery	Weiss	WEG Transformers USA Inc.
Member	Deepak	Kumaria	Hitachi ABB Power Grids
Guest	Nitesh	Patel	Hyundai Power Transformers USA
Guest	Pouneh	Davoudi	Delta Star Inc.
Member	Ion	Radu	Hitachi ABB Power Grids
Guest	Drew	Welton	Intellirent
Guest	Eric	Theisen	Metglas, Inc.
	Muhammad Ali		
Member	Masood	Cheema	Northern Transformer
Guest	Monty	Goulkhah	Kinectrics
Member	Gilles	Bargone	FISO Technologies Inc.
Member	Bruce	Webb	Knoxville Utilities Board
Guest	Kyle	Heiden Hernandez	EATON Corporation
Guest	Sergio	Cano	Hammond Power Solutions
Guest	Colby	Lovins	Federal Pacific Transformer
Guest	Moonhee	Lee	Hammond Power Solutions
Guest	Hugh	Waldrop	Memphis Light, Gas & Water
Guest	Sylvain	Plante	Hydro-Quebec
Guest	Joaquin	Martinez	Siemens Energy
Guest	Samraghi	Dutta Roy	Siemens Energy
Guest	Dmitriy	Klempner	Southern California Edison
Guest	Kyle	Stechschulte	American Electric Power
Member	Shawn	Gossett	Ameren
Guest	Afshin	Rezaei-Zare	York University
Guest	Yaquan (Bill)	Li	BC Hydro
Guest	Matthew	McFadden	Oncor Electric Delivery
Member	Tim	Rocque	SPX Transformer Solutions, Inc.
Guest	Megan	Eckroth	EATON Corporation
Guest	Ramadan	Issack	American Electric Power
Guest	Raymond	Frazier	Ameren
Guest	Onome	Avanoma	Transformer Consulting Services Inc.
Guest	Alan	Washburn	Burns & McDonnell
Guest	Pragnesh	Vyas	Sunbelt-Solomon Solutions

Guest	Parag	Upadhyay	ABB Inc.
Guest	Nicholas	Podany	Bureau of Reclamation
Guest	Adam	Smith	Commonwealth Associates, Inc.
Guest	Brandon	Dent	Memphis Light, Gas & Water
Guest	Mubarak	Abbas	Siemens Industry
Guest	Didier	Hamoir	Transformer Protector Corp
Guest	James	Holt	Memphis Light, Gas & Water
Guest	Angela	Amador	EATON Corporation
Guest	Albert	Sanchez	Knoxville Utilities Board
Guest	Suresh	Babanna	SPX Transformer Solutions, Inc.

Annex K Power Transformers Subcommittee

October 21, 2020

Virtual Meeting

Meeting Time: 12:55-2:10 p.m. CT

Chair: Bill Griesacker

Vice Chair: Alwyn VanderWalt

Secretary: Daniel Blaydon

K.1 Meeting Attendance

The Power Transformers Subcommittee met on Wednesday, October 21, 2020 at 12:55 PM EST. The WebEx attendance record indicated that 78 out of 114 members of the subcommittee were in attendance; a quorum at the meeting was achieved. A total of 231 individuals attended the meeting; 41 guests requested membership.

The complete attendance record is provided in Attachment K.1.

K.2 Approval of Agenda and Meeting Minutes

The Chair requested a motion for approval of the proposed meeting agenda. A motion to approve was made by Wallace Binder and seconded by Dan Sauer. The motion to approve the agenda was approved by unanimous consent. The approved agenda can be found in Attachment K.2.

The Chair requested a motion for approval of the Spring 2019 meeting minutes which was inadvertently omitted at the Fall 2019 meeting. A motion to approve was made by Marcos Ferreira and seconded by Ewald Schweiger. The motion to approve the minutes was approved by unanimous consent.

The Chair requested a motion for approval of the Fall 2019 meeting minutes. A motion to approve was made by Phil Hopkinson and seconded by Rogerio Verdolin. The motion to approve the minutes was approved by unanimous consent.

K.3 Chair's Remarks

The Chair provided an overview the future scheduled meetings and proposed locations.

The Chair provided an overview of the present subcommittee membership statistics, including new members and those members which had been moved to guest status.

The Chair provided an overview of the Working Group and Task Force requirements for the scheduling of meetings, submission of minutes, and other administrative tasks.

K.4 Working Group and Task Force Reports

K.4.1 Revision of C57.12.10 IEEE Standard Requirements for Liquid-Immersed Power Transformers

This group did not meet.

K.4.2 Liaison to PC57.93a IEEE Guide for Installation and Maintenance of Liquid-Immersed Power Transformers – Scott Reed

This past January a request was made to open up a PAR for an amendment to the document for cold start of natural ester filled transformers. The PAR was approved in March and the first meeting was held in Beijing, China with Scott Reed participating as a liaison. The primary goal is to develop a cold start procedure for natural ester filled transformers.

The complete meeting minutes can be found in Attachment K.4.2.

K.4.3 Revision of C57.125 Guide for Failure Investigation, Documentation, Analysis and Reporting for Power Transformers and Shunt Reactors

This group did not meet.

K.4.4 WG IEC 60214-2 - Tap Changer Application Guide - Craig Colopy

This group did not meet.

K.4.5 WG 60214-1 (C57.131) - Tap Changers - Craig Colopy

A joint review creating a revision of 60214-1 (2014) by IEC and IEEE is currently under consideration. A review report will be issued by the IEC TC14 Secretary at the end of the maintenance review and will be circulated to the member countries before the TC 14 plenary meeting in September 2020. It is anticipated that a joint review for revising 60214-1 (2014) will be initiated after this meeting.

IEC 60214-1 and C57.131 standards were originally going to be developed into a dual logo standard. Due to approval obstacles with the European Standards Organization (CENELEC), it was decided that the revision of C57.131 would proceed without dual logo status and so the Working Group has submitted a PAR that will be reviewed at the December NESCOM meeting. The goal of this working group is to complete this effort within a couple years.

K.4.6 C57.140 Guide for the Evaluation and Reconditioning of Liquid-Immersed Power Transformers

This group did not meet.

K.4.7 C57.143 – Guide for Application of Monitoring Equipment to Liquid-Immersed Transformers and Equipment – Mike Spurlock

This Working Group met on Monday but did not have a quorum present. One patent claim was recorded and the party will be working on a letter of assurance. Six task forces were formed, each to focus on a different area of the guide and progress continues on the guide mostly outside the meetings. The latest draft version is posted on the committee webpage, which is estimated to be about 45% complete. A new Annex F on data analysis methods for online DGA may be outside the scope of the document and therefore they will be evaluating whether it should be in a different guide. New topics included online thermal imaging, online FRA, and online insulation power factor. The cut off date for submission of the revision is February 22nd, so that the draft can go to ballot in March. The PAR expires at the end of 2021. If this date cannot be met, a PAR extension will be filed.

The complete meeting minutes can be found in Attachment K.4.7.

K.4.8 Revision of C57.148 Guide for Control Cabinets for Power Transformers - Joe Watson

The working group did not meet since the guide was approved at the October RevCom meeting. Publication is expected in later 2020 or 2021. This group's work is complete and the working group has been disbanded. The chair noted that the work started 5 years before the expiration and almost needed a PAR extension to complete the work which is a reminder for everyone to start work on revisions early. The chair expressed his thanks for everyone who worked on and contributed to the guide.

K.4.9 Revision of C57.150 Guide for the Transportation of Transformers and Reactors Rated 10,000 kVA or Larger – Greg Anderson

This group did not meet. They are no longer taking new material and are focusing on creating an initial draft document to share with the working group. They intend to send the first draft to the working group within the next couple of weeks and have a straw vote in February so that they can deliver the document to the PTSC in April, before the Spring meeting. The PAR expires at the end of 2021.

The complete update can be found in Attachment K.4.9.

K.4.10 Development of PC 57.153 Guide for Paralleling Transformers

This group did not meet.

K.4.11 Development of PC57.156 Guide for Transformer Tank Rupture Mitigation of Liquid-Immersed Power Transformers and Reactors

This group did not meet.

K.4.12 Development of PC57.157 Guide for Conducting Functional Life Tests for De-Energized Tap Changer Contacts

This group did not meet.

K.4.13 Task Force on V/Hz Curve – Joe Watson

This group did not meet. No progress has been made since the last meeting. Ramsis Girgis and Kipp Yule are going to write a document and present the draft to the WG C57.116 IEEE Guide for Transformers Directly Connected to Generators by the next meeting.

The complete update can be found in Attachment K.4.13.

K.4.14 Development of PC57.170 Condition Assessment Guide – Kumar Mani

This group met on Tuesday and achieved a quorum. A task force was setup to look at the CIGRE 761 technical bulletin to see how it could be incorporated into their document. A motion was accepted to develop the guide into 9 chapters and 3 annexes. Task forces were setup to review the new chapters and start developing material. They are seeking volunteers to lead these task forces and will begin working on the new chapters at the Spring meeting.

The complete meeting minutes can be found in Attachment K.4.14.

K.4.15 PAR Study Group for C57.116 GSU Transformers – Weijun Li

The WG for revising C57.116 met for the first time on Monday. A motion was approved to form 4 task forces to review sections of C57.116 and identify changes that should be made. Members volunteered for each of the task forces. The V/Hz task force is preparing a section on a recommended practice for creating a V/Hz curve for new transformers under C57.116 to be added to the document.

The complete meeting minutes can be found in Attachment K.4.15.

K.5 Old Business

No old business.

K.6 New Business

1. Wallace Binder, WBBinder Consultant, provided the following motion for consideration of the subcommittee:

In the capacity as (designated) WG Chair for PC57.125, I wish to make the following motion: Move that the Power Transformer SC establish a Task Force to prepare a PAR for revision of C57.125-2015, IEEE Guide for Failure Investigation, Documentation, Analysis, and Reporting for Power Transformers and Shunt Reactors meet at the time of the next meeting, establish a WG to accomplish this task, and find a Chair to conduct the revision.

This motion was seconded by Tom Melle, Hi Volt.

During the discussion, it was stated it would be good to review what additional technologies can be introduced, how to rearrange the document, and to review the data reporting portion which has been adopted by EPRI and DOBLE. Both of these entities have established data bases and there is a desire for them to share a portion of the data to prove value of capturing this information.

Gary Hoffman called the question. There was no objection to unanimous approval to call the question.

There was no objection to unanimous approval of the motion.

2. There was no further new business.

K.7 Adjournment

The meeting was adjourned at 1:55 pm CT

K.8 Attachments

Attachment K.1 – Attendance
Attachment K.2 – F20 PTSC Agenda
Attachment K 4.2 - Liaison to PC57.93a
Attachment K 4.7 – C57.143 Monitoring Guide
Attachment K 4.9 – C57.150 Transportation Guide
Attachment K 4.13 – TF V/HZ

Attachment K 4.14 – PC57.170 Condition Assessment Guide
Attachment K 4.15 - PAR Study Group for C57.116

Attachment K.1

Role	First Name	Last Name	Company
Guest	Juan	Acosta	Ergon, Inc.
Guest	Kayland	Adams	SPX Transformer Solutions, Inc.
Guest	Raj	Ahuja	Raj Ahuja Consulting
Guest	Dinu	Amarasinghe	Bruce Power
Member	Gregory	Anderson	GW Anderson & Associates, Inc.
Member	Stephen	Antosz	Stephen Antosz & Associates, Inc
Member	Javier	Arteaga	ABB Enterprise Software Inc
Guest	Onome	Avanoma	Transformer Consulting Services Inc.
Guest	Hugo	Avila	Hitachi ABB Power Grids
Member	Donald	Ayers	Ayers Transformer Consulting
Guest	Suresh	Babanna	SPX Transformer Solutions, Inc.
Guest	Darrell	Banks	Memphis Light, Gas & Water
Guest	Gilles	Bargone	FISO Technologies Inc.
Member	Christopher	Baumgartner	We Energies
Guest	Barry	Beaster	H-J Enterprises, Inc.
Guest	Duvier	Bedoya	Hitachi ABB Power Grids
Guest	Jeff	Benach	Weidmann Electrical Technology
Guest	Ramon	Benedict	SPX Transformer Solutions, Inc.
Guest	Mats	Bernesjo	Hitachi ABB Power Grids
Guest	Jean-Noel	Berube	Rugged Monitoring Inc.
Member	Enrique	Betancourt	Prolec GE
Member	Wallace	Binder	WBBinder Consultant
Guest	Ryan	Bishop	Minnesota Power
Guest	Thomas	Blackburn	Gene Blackburn Engineering
Secretary	Daniel	Blaydon	Baltimore Gas & Electric
Member	William	Boettger	Boettger Transformer Consulting LLC
Guest	Sanket	Bolar	Megger
Member	Paul	Boman	Hartford Steam Boiler
Guest	Susan	Bonfiglio	Western Area Power Admin.
Guest	Bruno	Bosnjak	Hyundai Electric Switzerland
Guest	Jeremiah	Bradshaw	Bureau of Reclamation
Member	Elizabeth	Bray	Southern Company Services
Guest	Steven	Brzoznowski	Bonneville Power Administration
Guest	Erich	Buchgeher	Siemens Energy
Member	David	Calitz	Siemens Energy
Guest	Jorge	Cantu de Leon	SPX Transformer Solutions, Inc.
Guest	Juan	Castellanos	Prolec GE
Guest	Stuart	Chambers	Powertech Labs Inc.

Member	Muhammad Ali Masood	Cheema	Northern Transformer
Member	Luiz	Cheim	Hitachi ABB Power Grids
Member	Craig	Colopy	EATON Corporation
Guest	Juan Carlos	Cruz Valdes	Prolec GE
Member	Eric	Davis	Burns & McDonnell
Guest	Brandon	Dent	Memphis Light, Gas & Water
Guest	Stephanie	Denzer	Alliant Energy
Member	Scott	Digby	Duke Energy
Guest	Huan	Dinh	Hitachi ABB Power Grids
Guest	Eric	Doak	D4EnergySolutions LLC
Member	Lee	Doyle	Vaisala
Guest	Zachary	Draper	Delta-X Research Inc.
Member	Hakim	Dulac	Qualitrol Company LLC
Guest	Megan	Eckroth	EATON Corporation
Guest	Evgenii	Ermakov	Hitachi ABB Power Grids
Guest	Marco	Espindola	ABB Enterprise Software Inc.
Guest	Feras	Fattal	Manitoba Hydro
Member	Florin	Faur	SPX Transformer Solutions, Inc.
Member	Reto	Fausch	RF Solutions
Member	Marcos	Ferreira	Advisian-Worley Parsons
Guest	Marc	Foata	Maschinenfabrik Reinhausen
Member	Joseph	Foldi	Foldi & Associates, Inc.
Guest	Bruce	Forsyth	Bruce Forsyth and Associates LLC
Guest	John	Foschia	SPX Transformer Solutions, Inc.
Member	Anthony	Franchitti	PECO Energy Company
Guest	Raymond	Frazier	Ameren
Guest	George	Frimpong	Hitachi ABB Power Grids
Guest	Rainer	Frotscher	Maschinenfabrik Reinhausen
Guest	Jose	Gamboa	H-J Family of Companies
Guest	Lorne	Gara	Shermco
Guest	James	Gardner	SPX Transformer Solutions, Inc.
Guest	Ramsis	Girgis	Hitachi ABB Power Grids
Guest	Shawn	Gossett	Ameren
Member	James	Graham	Weidmann Electrical Technology
Chair	Bill	Griesacker	Duquesne Light Co.
Guest	Niklas	Gustavsson	Hitachi ABB Power Grids
Guest	Attila	Gyore	M&I Materials Ltd
Guest	Shamaun	Hakim	WEG Transformers USA Inc.
Guest	Didier	Hamoir	Transformer Protector Corp
Member	Roger	Hayes	General Electric

Guest	Kyle	Heiden	EATON Corporation
Guest	Ronald	Hernandez	Doble Engineering Co.
Guest	John	Herron	Raytech USA
Member	Gary	Hoffman	Advanced Power Technologies
Guest	Saramma	Hoffman	PPL Electric Utilities
Guest	Derek	Hollrah	Burns & McDonnell
Member	Philip	Hopkinson	HVOLT Inc.
Guest	Paul	Jarman	University of Manchester
Member	John	John	Virginia Transformer Corp.
Guest	Toby	Johnson	Pacificorp
Guest	Stephen	Jordan	Tennessee Valley Authority
Member	Akash	Joshi	Black & Veatch
Guest	Laszlo	Kadar	Hatch
Member	Kurt	Kaineder	Siemens Energy
Guest	Jon	Karas	SDMyers, LLC.
Member	Sheldon	Kennedy	Niagara Transformer
Guest	Gael	Kennedy	GR Kennedy & Associates LLC
Guest	Stacey	Kessler	Basin Electric Power Cooperative
Member	Zan	Kiparizoski	Howard Industries
Member	Egon	Kirchenmayer	Siemens Energy
Member	Peter	Kleine	US Army Corps of Engineers
Guest	Dmitriy	Klempner	Southern California Edison
Guest	William	Knapek	OMICRON electronics Corp USA
Guest	Nicholas	Kostich	Ameren
Member	Axel	Kraemer	Maschinenfabrik Reinhausen
Guest	Krzysztof	Kulasek	Hitachi ABB Power Grids
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Member	Raja	Kuppuswamy	Dynamic Ratings, Inc.
Guest	Donald	Lamontagne	Arizona Public Service Co.
Guest	Andrew	Larison	Hitachi ABB Power Grids
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Member	Weijun	Li	Braintree Electric Light Dept.
Guest	Yaquan (Bill)	Li	BC Hydro
Guest	Mario	Locarno	Doble Engineering Co.
Guest	Jinesh	Malde	M&I Materials Inc.
Member	Kumar	Mani	Duke Energy
Guest	Dennis	Marlow	DenMar TDS Transformers
Guest	Lee	Matthews	Howard Industries
Guest	Trevor	Mattson	OMICRON Electronics Corp USA
Guest	James	McBride	JMX Services, Inc.

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Guest	Omar	Mendez Zamora	Prolec GE
Guest	Philip	Miller	Memphis Light, Gas & Water
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Guest	Shankar	Nambi	Bechtel
Member	Kristopher	Neild	Megger
Guest	Brady	Nesvold	Xcel Energy
Guest	Ashmita	Niroula	Ergon, Inc.
Member	Anastasia	O'Malley	Consolidated Edison Co. of NY
Guest	Parminder	Panesar	Virginia Transformer Corp.
Guest	Dwight	Parkinson	EATON Corporation
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Guest	Nicholas	Podany	Bureau of Reclamation
Member	Ion	Radu	Hitachi ABB Power Grids
Guest	Shiva	Rampersad	Dow Chemical Company
Guest	Kevin	Rapp	Cargill, Inc.
Guest	Timothy	Raymond	Electric Power Research Institute (EPRI)
Guest	John	Reagan	Oncor Electric Delivery
Member	Scott	Reed	MVA
Guest	Jonathan	Reimer	FortisBC
Guest	Sebastien	Riopel	Electro Composites ULC
Guest	Diego	Robalino	Megger
Guest	Patrick	Rock	American Transmission Co.
Guest	Tim	Rocque	SPX Transformer Solutions, Inc.
Guest	Leopoldo	Rodriguez	Transformer Testing Services LLC
Guest	Hakan	Sahin	Independent

Guest	Albert	Sanchez	Knoxville Utilities Board
Guest	Dinesh	Sankarakurup	Duke Energy
Guest	Subhas	Sarkar	Virginia Transformer Corp.
Member	Daniel	Sauer	EATON Corporation
Guest	Roderick	Sauls	Southern Company Services
Guest	Anil	Sawant	Virginia Transformer Corp.
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Guest	Markus	Schiessl	SGB
Guest	Stephen	Schroeder	Hitachi ABB Power Grids
Member	Dan	Schwartz	Quality Switch, Inc.
Member	Ewald	Schweiger	Siemens Energy
Member	Adam	Sewell	Quality Switch, Inc.
Guest	David	Sheehan	HICO America
Guest	Peter	Sheridan	SGB USA, Inc.
Member	Hemchandra	Shertukde	University of Hartford
Guest	Stephen	Shull	BBC Electrical Services, Inc.
Guest	Jonathan	Sinclair	PPL Electric Utilities
Guest	Kenneth	Skinger	Scituate Consulting, Inc.
Guest	Adam	Smith	Commonwealth Associates, Inc.
Guest	William	Solano	Instrument Transformer Equip Corp
Guest	Brian	Sparling	Dynamic Ratings, Inc.
Member	Mike	Spurlock	Consultant
Member	Brad	Staley	Salt River Project
Guest	Markus	Stank	Maschinenfabrik Reinhausen
Guest	Kyle	Stechschulte	American Electric Power
Guest	Neil	Strongosky	Memphis Light, Gas & Water
Guest	Paul	Su	FM Global
Guest	Kevin	Sullivan	Duke Energy
Guest	Charles	Sweetser	OMICRON electronics Corp USA
Member	Craig	Swinderman	Mitsubishi Electric Power Products
Guest	Janusz	Szczechowski	Maschinenfabrik Reinhausen
Guest	Radoslaw	Szewczyk	Specialty Products Poland Sp. z o.o.
Member	Troy	Tanaka	Burns & McDonnell
Guest	Marc	Taylor	Cogent Power Inc.
Guest	Ed	teNyenhuis	Hitachi ABB Power Grids
Guest	Ryan	Thompson	Burns & McDonnell
Guest	Timothy	Tillery	Howard Industries
Guest	Mark	Tostrud	Dynamic Ratings, Inc.
Guest	Daniel	Tournoux	SPX Transformer Solutions, Inc.

Vice-Chair	Alwyn	VanderWalt	Public Service Co. of New Mexico
Member	Ajith	Varghese	SPX Transformer Solutions, Inc.
Member	Jason	Varnell	Doble Engineering Co.
Guest	Kiran	Vedante	Ritz Instrument Transformers
Guest	Jos	Veens	SMIT Transformatoren B.V.
Member	Rogério	Verdolin	Verdolin Solutions Inc.
Member	Krishnamurthy	Vijayan	PTI Transformers
Member	Dharam	Vir	SPX Transformer Solutions, Inc.
Guest	Duy	Vo	Central Maine Power (AVANGRID)
Guest	Pragnesh	Vyas	Sunbelt-Solomon Solutions
Guest	Loren	Wagenaar	WagenTrans Consulting
Guest	Dieter	Wagner	Hydro One
Guest	Hugh	Waldrop	Memphis Light, Gas & Water
Guest	Sukhdev	Walia	New Energy Power Co.
Guest	Eric	Wallace	Photon Control
Member	David	Wallach	Duke Energy
Guest	Evanne	Wang	DuPont
Guest	Michael	Warntjes	American Transmission Co.
Guest	Alan	Washburn	Burns & McDonnell
Member	Joe	Watson	JD Watson and Associates Inc.
Guest	Eric	Weatherbee	PCORE Electric
Member	Bruce	Webb	Knoxville Utilities Board
Guest	Zachery	Weiss	WEG Transformers USA Inc.
Guest	Peter	Werelius	Megger
Member	Daniel	Weyer	Nebraska Public Power District
Guest	William	Whitehead	Siemens Energy
Guest	Trenton	Williams	Advanced Power Technologies
Guest	Rene	Wind	Siemens Energy
Guest	Dr. Alexander	Winter	HIGHVOLT Pruftechnik Dresden
Member	Jeffrey	Wright	Duquesne Light Co.
Member	Peter	Zhao	Hydro One
Member	Kris	Zibert	Allgeier, Martin and Associates
Guest	Waldemar	Ziomek	PTI Transformers

AGENDA

Power Transformers Subcommittee

IEEE PES Transformers Committee Wednesday,

October 21, 2020, 12:55-2:10 PM CDT On-Line

Meeting; Virtual

Bill Griesacker – Chair, Alwyn VanderWalt – Vice Chair, Dan Blaydon – Secretary

1. Call to order
2. Determine quorum
3. Approval of agenda, approval of previous meeting minutes
4. Chair remarks
5. Working Group and Task Force reports
 - a. WG Revision of C57.116, GSU Transformers W. Li
 - b. WG 60214-1-57-131, Tap Changers (on hold) C. Colopy
 - c. WG Revision of C57.143, Monitoring Guide M. Spurlock
 - d. WG Revision of C57.148, Control Cabinet Standard J. Watson
 - e. WG Revision of C57.150, Transportation Guide G. Anderson
 - f. WG C57.170, Condition Assessment Guide K. Mani
 - g. TF Transformer V/Hz Curves J. Watson
 - h. PAR status for C57.17, Arc Furnace Transformers P. Balma
 - i. Liaison to PC57.93a – Installation and Maintenance Guide S. Reed
6. Old business
7. New business
8. Adjournment

Working Group for Installation of Power Transformers C57.93a
8:30 pm – 11:00pm
Beijing, China
Wednesday, September 2, 2020

The purpose of the guide amendment as outlined during a presentation:

1. Review requirements for properties of natural esters at cold temperatures.
2. Old start procedure of natural ester filled power transformers.
3. Fluid warming procedure.
4. Operational requirements of transformer mechanically operated devices.

Below is a summary of the discussion.

- Dr. Wei Yao (HEPRI) introduced the draft outline in detail. The draft outline was discussed heatedly by all. The discussion had been summed in the following,

(1) Jie Liu, Huaqiang Li, Zhiqiang Huang etc., said it was OK that the discussion on the framework for the first meeting was consistent with the scope submitted before. At the while, the framework is OK. The body part only writes the conclusion, and the data support can be added to the attachment.

(2) In section 4.4, the main content should be introduced the properties of natural ester fluids under cold conditions.

The crystallization and moisture content of natural ester insulating oil at different temperatures will be studied. The breakdown voltage, kinematic viscosity, pour point, moisture content and other parameters of natural ester insulation oil under low temperature condition and the law of temperature change will be given.

(3) In section 4.4, it should be proposed the cold start procedure of natural ester-filled power transformers.

The insulation strength of transformer filled with natural ester in liquid state, liquid-solid mixed state and solid state under low temperature condition will be analyzed. The apparent viscosity of natural ester and the change rule of temperature will be compared, and the corresponding relationship between apparent viscosity and shear rate will be analyzed at different temperatures.

Give full consideration to natural ester transformer low temperature cold start, such as the actual environment temperature, viscosity of natural ester, low temperature storage time, voltage level and capacity. The influence of specific transformer no-load running and the running time, transformer load operation condition and operation time, mechanical device operation requirements, etc., to realize the natural ester insulated oil transformer low temperature cold start process.

(4) In section 4.4, it is recommended to cover liquid heating procedures and operating requirements for the transformer's mechanically operated devices.

There are maybe some heat preservation measures for respirator External piping, heat sink.

Consider minimum operating temperature if tap switch and oil pump are available.

**Revision to C57.143 – “Guide for Application of Monitoring Equipment to
Liquid-Immersed Transformers and Components”
Transformer Monitoring Working Group**

Monday, October 19, 2020

Virtual Meeting

Minutes of WG Meeting (Revised November 5, 2020)

The meeting was called to order at 2:20pm (Central Daylight Time) by Chair Mike Spurlock. Vice Chair Poorvi Patel and Secretary Elizabeth Bray was also present. This was the sixth meeting of the working group. The on-line poll tally indicated only 38 members were present, which does not constitute a quorum, so the WG was unable to perform official business. After the meeting however, the names listed in the polls were studied further and it was found to include 43 members present. The attendance for the meeting, based on the poll tallies was as follows:

Number of Members in Activity = 80
Number of Members Present = 43
Percentage of Members Present = 53.75%
Number of attendees = 152
Attendees requesting Membership = 45

The WG does plan to meet at the Spring 2021 Transformers Committee Meeting in Toronto Canada.

PAR Status: PAR for a Revision to an existing IEEE Standard

Type of Project: Revision to IEEE Standard C57.143-2012

PAR Request Date: 19-Nov-2016

PAR Approval Date: 17-Feb-2017

PAR Expiration Date: 31-Dec-2021

The Agenda for the meeting was reviewed as seen below.

K.9 MEETING AGENDA

1. Welcome & Introduction
2. Call for Patent Disclosure
3. *Quorum Check*
4. Chair Remarks
5. Recognition and thanks to volunteers.
6. New Members – Indicate on Roster
7. Call for approval of Fall 2019 Meeting Minutes (Columbus, OH)
8. Task Force Activities:

Task Force 1 – Trent Williams
Task Force 2 – Poorvi Patel
Task Force 3 – Emilio Morales
Task Force 4 – Bill Whitehead
Task Force 5 – Zlatan Fazlic
Task Force 6 – Elizabeth Bray
Appendix

9. New Business

A call for patents disclosure was made by Mike Spurlock and one patent claim was reported: Don Lamontagne referred to Annex F (data analytic methods for online dissolved gas monitors) for Arizona Public Service and a letter of agreement with IEEE was referenced. No other patents were brought before the meeting. Mike Spurlock then discussed the copyright policy.

The 2020 accomplishments were reviewed and a call for new volunteers were announced. The 2020 accomplishments formation of six task forces which was approved by a vote of 49 for and 0 against (0 abstained) in an email ballot on April 17, 2020.

In other discussion, it was noted that there is a lot of good material in the new Annex F Data analytic methods for online dissolved gas monitors, but further investigation will be needed to verify this is still within the scope of the C57.143 PAR. Gaps were noted in Chapter 4 for pictures.

Task Force Chairs reported on their progress to date and future activities.

Online transient monitoring was discussed, and Jim McBride offered to help write a new section on this topic. Xose Lopez volunteered to assist with this effort.

A new clause on voltage and current monitoring was also discussed. Nilanga Abeywickrama volunteered to work on this. This clause would include performing on-line leakage reactance measurements which is an indication of winding deformation.

Mike Spurlock also noted the Par status timeline as we look ahead to 2021 and suggested a cutoff deadline of February 22, 2021 for revision submittals. The Guide then could be balloted by March 15, 2021 and possibly submitted to RevCom by Sept 10, 2021.

A quorum check was performed several times throughout the meeting and quorum was not met. There was some discussion on people who thought they were members but did not show up in the member list. Those names were noted and will be investigated to determine membership status.

Without quorum no motions or business could be conducted. Instead each task force chair gave report outs as well as asking for additional volunteers.

Task Force 1 – Trent Williams there is a big need for multiple references changes in the document and needs to be in line with Chapter 4. Lots of suggestions have been made and there is a good bit of work to be done.

Task Force 2 – Poorvi Patel – almost complete and some areas are ready for the work group to review.

Task Force 3 – Emilio Morales – almost complete with 5.7 and 5.11 needing to be reviewed as well as an ask for volunteers. D. Gross did offer assistance.

Task Force 4- Bill Whitehead – good shape and some areas need to be reduced due to content magnitude. Oleg Roizman offered to review Section 5.9. Section 5.12 on GIC Trent Williams is supporting this section.

Task Force 5 – Zlatan Fazlic was unable to join the meeting. The Communications chapter is just getting started and currently checking with other IEEE Standards on this topic. Zlatan is also requesting volunteers. Brian Sparling offered to assist with this session.

Task Force 6 – Elizabeth Bray – A review of the diagrams and flow of cost benefits needs to be reviewed and a call for help was made to those that were the originators of this chapter for a better understanding. Brian Sparling offered to volunteer to assist.

Mike Spurlock recognized all the volunteers and thanked them for the great progress this year.

Mike will have a spreadsheet of the volunteers and send it via email to the team.

New Business

Mike Spurlock brought up the possibilities to add online thermal imaging section to the guide and asked for the teams opinions. Poorvi Patel asked if there was a volunteer to write this section and asked that who suggested this topic be the one to write the section. Sam Reed volunteered to participate since he was the one who brought up the topic.

Kumar (Duke) suggested a temperature section and Sam Reed and Kumar will work on scope of what the thermal imagining would need to include.

The next topic of discussion that Mike Spurlock suggested to the team was the possibility of removing the insulation power factor section from the guide, due to the fact that no one knows how to monitor this online. Joe Watson did bring up the point that this is under development and could be a topic to include in the future. A good bit of discussion was around this topic and it was suggested it be removed from the guide.

No other new business was brought before the committee.

Next meeting April 25-29 2021 in Toronto Canada.

Meeting ended at 3:34pm CST.

Meeting Participants:

Role	First Name	Last Name	Affiliation
Guest	Kayland	Adams	SPX Transformer Solutions, Inc.
Guest	Nabi	Almeida	Prolec GE USA LLC
Guest	Dinu	Amarasinghe	Bruce Power
Guest	suresh	babanna	SPX Transformer Solutions, Inc.
Guest	Peter	Balma	Retired
Member	Gilles	Bargone	FISO Technologies Inc.
Member	Claude	Beauchemin	TJH2b Analytical Services
Guest	Jean-Noel	Berube	Rugged Monitoring Inc.
Guest	Ryan	Bishop	Minnesota Power
Guest	Paul	Boman	Hartford Steam Boiler
Guest	Susan	Bonfiglio	Western Area Power Admin.
Guest	Michael	Botti	Hyosung HICO
Guest	Jeremiah	Bradshaw	Bureau of Reclamation
Guest	Stephan	Brauer	Morgan Schaffer
Secretary	Elizabeth	Bray	Southern Company Services
Guest	John	Brett	Delta-X Research Inc.
Guest	David	Calitz	Siemens Energy
Guest	Jorge	Cantu de Leon	SPX Transformer Solutions, Inc.
Member	Stuart	Chambers	Powertech Labs Inc.
Guest	Muhammad Ali Masood	Cheema	Northern Transformer
Member	Luiz	Cheim	Hitachi ABB Power Grids
Member	Larry	Christodoulou	Electric Power Systems, Inc.
Guest	Craig	Colopy	EATON Corporation
Guest	Domenico	Corsi	Doble Engineering Co.
Guest	John	Crouse	Roswell Alliance
Guest	Juan Carlos	Cruz Valdes	Prolec GE
Guest	Brandon	Dent	Memphis Light, Gas & Water
Member	Stephanie	Denzer	Alliant Energy
Guest	Jonathan	Deverick	Dominion Energy
Guest	Eric	Doak	D4EnergySolutions LLC
Guest	James	Dukarm	Delta-X Research Inc.
Member	Hakim	Dulac	Qualitrol Company LLC
Guest	Marco	Espindola	ABB Enterprise Software Inc.
Guest	Norman	Field	Teshmont Consultants LP
Guest	Bruce	Forsyth	Bruce Forsyth and Associates LLC
Guest	Michael	Franchek	Retired
Member	George	Frimpong	Hitachi ABB Power Grids
Member	Lorne	Gara	Shermco
Guest	James	Gardner	SPX Transformer Solutions, Inc.

Guest	Alexander	Gaun	Coil Innovation GMBH
Guest	Monty	Goulkhah	Kinectrics
Guest	Detlev	Gross	Power Diagnostix
Guest	Bill	Griesacker	Duquesne Light Co.
Guest	Niklas	Gustavsson	Hitachi ABB Power Grids
Guest	Didier	Hamoir	Transformer Protector Corp
Member	John	Harley	FirstPower Group LLC
Member	Roger	Hayes	General Electric
Guest	Ben	Hazlett	Bruce Power
Member	Kyle	Heiden	EATON Corporation
Guest	Ronald	Hernandez	Doble Engineering Co.
Member	Gary	Hoffman	Advanced Power Technologies
Guest	Saramma	Hoffman	PPL Electric Utilities
Guest	Derek	Hollrah	Burns & McDonnell
Guest	James	Holt	Memphis Light, Gas & Water
Guest	Mihai	Huzmezan	Power Diagnostix
Guest	Paul	Jarman	University of Manchester
Guest	John	John	Virginia Transformer Corp.
Guest	Toby	Johnson	Pacificorp
Guest	Stephen	Jordan	Tennessee Valley Authority
Member	Arvin	Joshi	General Electric
Guest	László	Kádár	Hatch
Member	Jon	Karas	SDMyers, LLC.
Guest	Gael R	Kennedy	GR Kennedy & Associates LLC
Guest	Stacey	Kessler	Basin Electric Power Cooperative
Guest	Robert	Kinner	FirstPower Group LLC
Guest	Egon	Kirchenmayer	Siemens Energy
Guest	Dmitriy	Klempner	Southern California Edison
Member	Nicholas	Kostich	Ameren
Guest	Axel	Kraemer	Maschinenfabrik Reinhausen
Member	Krzysztof	Kulasek	Hitachi ABB Power Grids
Guest	deepak	kumaria	Hitachi ABB Power Grids
Member	Raja	Kuppuswamy	Dynamic Ratings, Inc.
Guest	John	Lackey	PowerNex Associates Inc.
Member	Donald	Lamontagne	Arizona Public Service Co.
Guest	Fernando	Leal	Prolec GE
Guest	Weijun	Li	Braintree Electric Light Dept.
Member	Xose	Lopez-Fernandez	Universidade de Vigo
Guest	Balakrishnan	Mani	Virginia Transformer Corp.
Member	Kumar	Mani	Duke Energy
Guest	J.Dennis	Marlow	DenMar TDS Transformers
Guest	Zach	Martin	Delta Star Inc.

Member	Robert	Mayer	Siemens Energy
Member	James	McBride	JMX Services, Inc.
Guest	Tony	McGrail	Doble Engineering Co.
Guest	Vinay	Mehrotra	SPX Transformer Solutions, Inc.
Guest	Philip	Miller	Memphis Light, Gas & Water
Member	Emilio	Morales-Cruz	Qualitrol Company LLC
Guest	Anatoliy	Mudryk	Camlin Power
Member	Martin	Munoz Molina	Orto de Mexico
Guest	Ali	Naderian	Metsco
Member	Kristopher	Neild	Megger
Guest	Anastasia	O'Malley	Consolidated Edison Co. of NY
Guest	Vincenzo	Pagliuca	Hartford Steam Boiler
Guest	Nitesh	Patel	Hyundai Power Transformers USA
Vice-Chair	Poorvi	Patel	Electric Power Research Institute (EPRI)
Guest	Caroline	Peterson	Xcel Energy
Guest	Patrick	Picher	Hydro-Quebec IREQ
Guest	Nick	Podany	Bureau of Reclamation
Guest	Tejasvi	Prakash	Schweitzer Engineering Labs
Member	Thomas	Prevost	Weidmann Electrical Technology
Member	John	Pruente	SPX Transformer Solutions, Inc.
Guest	John	Reagan	Oncor Electric Delivery
Guest	Larry	Rebman	EMLS, Inc.
Guest	Samuel	Reed	EATON Corporation
Member	Scott	Reed	MVA
Guest	Tom	Rocque	SPX Transformer Solutions, Inc.
Guest	Oleg	Roizman	IntellPower Pty Ltd
Member	Mickel	Saad	Hitachi ABB Power Grids
Guest	Fernando	Saldivar	Prolec GE
Guest	Dinesh	Sankarakurup	Duke Energy
Guest	Anil	Sawant	Virginia Transformer Corp.
Guest	Steve	Schappell	SPX Transformer Solutions, Inc.
Guest	Stephen	Schroeder	Hitachi ABB Power Grids
Guest	Ewald	Schweiger	Siemens Energy
Guest	Mauricio	Soto	Hitachi ABB Power Grids
Guest	Rob	Shepherd	Bruce Power
Guest	Adrian	Silgardo	IFD Corporation
Guest	John	Sinclair	PPL Electric Utilities
Guest	Adam	Smith	Commonwealth Associates, Inc.
Member	Brian	Sparling	Dynamic Ratings, Inc.
Guest	Travis	Spoone	EATON Corporation
Chair	Mike	Spurlock	Consultant

Member	Brad	Staley	Salt River Project
Member	Markus	Stank	Maschinenfabrik Reinhausen
Guest	Kyle	Stechschulte	American Electric Power
Guest	Paul	Su	FM Global
Member	Kevin	Sullivan	Duke Energy
Guest	Janusz	Szczechowski	Maschinenfabrik Reinhausen
Guest	Ryan	Thompson	Burns & McDonnell
Member	Mark	Tostrud	Dynamic Ratings, Inc.
Guest	Dan	Tournoux	SPX Transformer Solutions, Inc.
Member	Marco	Tozzi	Camlin Power
Guest	Jason	Varnell	Doble Engineering Co.
Guest	Kiran	Vedante	Ritz Instrument Transformers
Guest	Jos	Veens	SMIT Transformatoren B.V.
Member	Rogério	Verdolin	Verdolin Solutions Inc.
Guest	Dieter	Wagner	Hydro One
Guest	Hugh	Waldrop	Memphis Light, Gas & Water
Guest	Eric	Wallace	Photon Control
Member	Joe	Watson	JD Watson and Associates Inc.
Guest	Matthew	Webb	SPX Transformer Solutions, Inc.
Guest	Drew	Welton	Intellirent
Guest	Daniel	Weyer	Nebraska Public Power District
Member	William	Whitehead	Siemens Energy
Member	Trenton	Williams	Advanced Power Technologies
Member	Deanna	Woods	Alliant Energy
Guest	Jeffrey	Wright	Duquesne Light Co.
Guest	Mana	Yazdani	Trench Limited
Guest	Malia	Zaman	IEEE
Guest	Anand	Zanwar	Siemens Energy
Guest	Kyle	Zemanovic	EATON Corporation
Guest	Peter	Zhao	Hydro One

UNKNOWN:

	mfg18
Dave	
	risto
	nibl01
v	baniroula
	USHUAVI
Guner	Ismail

**PC57.150 - Revision of IEEE Guide for the Transportation of Transformers and Reactors,
Rated 10,000 kVA or Larger**

**Fall 2020 Meeting (Virtual Meeting)
Minutes of WG Meeting (Unapproved Minutes)**

The WG did not meet at this meeting.

Our PAR expires at the end of 2021. We stopped taking new material to add to the document, and are now focusing on getting an initial draft ready to show to the WG. We hope to send that FIRST DRAFT to the WG by the end of 2020. We plan to have 1 or 2 virtual WG meetings in the next 2-3 months to gather and resolve initial comments, with the goal of doing a "straw vote" within the WG sometime in February.

If all that goes well, and we're able to quickly resolve comments from that straw vote, we hope to deliver the document to the PTSC for their approval in mid-April, a couple of weeks before the Spring Committee Meeting. To finish the project by end of 2021, we need to submit the final draft to IEEE-SA by September 10. Although we could ask for an extension, we should be able to meet this deadline.

The following is a list of current WG Members; i.e., "voting members". Currently, we have 49 members.

Greg Anderson WG Chair	Ewald Schweiger WG Vice-Chair	Marnie Roussell WG Secretary & Technical Editor
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WG Members (voting members), as of November 2020		
Last Name	First Name	Affiliation
Abdelkamel	Hamid	Ameren
Alonso	Mario	Transformer Quality Consulting
Anderson	Gregory	GW Anderson & Associates, Inc.
Arteaga	Javier	ABB Enterprise Software Inc
Binder	Wallace	WBBinder Consultant
Boettger	William	Boettger Transformer Consulting LLC
Bradshaw	Jeremiah	Bureau of Reclamation
Doak	Eric	D4EnergySolutions LLC
Dolloff	Paul	East Kentucky Power
Fairris	James	KMS Electrical Products
Ferreira	Marcos	Advisian-Worley Parsons
Garcia	Eduardo	Siemens AG
Hrkac	Miljenko	ABB Inc.
Jhala	Anirudhdhsinh	Transformers & Rectifiers (India) Ltd
Jordan	Stephen	Tennessee Valley Authority
Kessler	Stacey	Basin Electric Power Cooperative
Kleine	Peter	US Army Corps of Engineers
Lau	Michael	Self Employed
Lee	So-young	Hyundai Electric
Locarno	Mario	Doble Engineering Co.
MacArthur	Tara-lee	Ergon Energy
Malde	Jinesh	M&I Materials Inc.

McNelly	Susan	Xcel Energy
Nambi	Shankar	Bechtel
Rathi	Rakesh	Virginia Transformer Corp.
Roussell	Marnie	Energy
Sarkar	Amitabh	Virginia Transformer Corp.
Schrammel	Alfons	Siemens Energy
Schweiger	Ewald	Siemens Energy
Selvaraj	Pugazhenth	Virginia Transformer Corp.
Sen	Cihangir	Duke Energy
Sharpless	Samuel	Rimkus Consulting Group
Shem-Tov	Mark	VRT Power
Simonelli	Richard	SPX Transformer Solutions, Inc.
Simons	Andre	Cogent Power Inc.
Skinger	Kenneth	Scituate Consulting, Inc.
Su	Roy	Fortune Electric
Sullivan	Kevin	Duke Energy
Swinderman	Craig	Mitsubishi Electric Power Products
Uhlmann	Olivier	Reinhausen Canada Inc.
VanderWalt	Alwyn	Public Service Co. of New Mexico
Verdolin	Rogério	Verdolin Solutions Inc.
Vijayan	Krishnamurthy	PTI Transformers
Wallach	David	Duke Energy
Watson	Joe	JD Watson and Associates Inc.
Webb	Bruce	Knoxville Utilities Board
Weisensee	Matthew	PacifiCorp
Weyer	Daniel	Nebraska Public Power District
Zibert	Kris	Allgeier, Martin and Associates

TF on V/Hz Requirements Minutes

Kipp Yule – Chair, Ramsis Girgis, – Vice Chair, Joe Watson – Secretary

The Task Force on Volts/Hz Requirements was scheduled to meet from 2:20 – 3:35 PM on Tuesday, October 20th, but the TF did not meet.

The TF will hold at least one video-conference meeting before the next Transformers Committee meeting, with the goal of finalizing the recommended section(s) to submit to the C57.116 WG by their Spring 2021 meeting.

The basic contents of the section to submit to the C57.116 WG are planned to be as follows:

- 1) Phenomenon of short term overexcitation (covered by Drew Welton)
 - a. Overvoltage or under-frequency generator operation
 - b. Generator load rejection
- 2) Relay Practices (covered by Drew Welton)
 - a. Generator curves
 - b. Typical V/Hz protection
- 3) Effect of short term overexcitation in power transformers
 - a. Structural parts overheating in core form transformers (covered by Ramsis Girgis)
 - b. Structural parts overheating in shell form transformers (covered by Ramsis Girgis)
 - c. Oil bubbling or gassing (Need authors)
 - d. Insulation deterioration (Need authors)
- 4) V/Hz curves presently used by the industry (covered by Ramsis Girgis)
 - a. Original GE curve
 - b. Issues with the GE curve and presently used curves
- 5) Updated V/Hz curves
 - a. Process for estimating thermal impact of short-term overexcitation (covered by Ramsis Girgis)
 - b. Development of Thermal criteria for Gas generation and insulation deterioration (need authors)
 - c. Process for developing V/Hz curves (covered by Ramsis Girgis)
- 6) References (need authors)

The TF is looking for members who have the expertise to contribute to the technical areas indicated above as “need authors”

The TF is expected to meet during the Spring 2021 meetings.

IEEE PC.57.170 Condition Assessment Guide Working Group Meeting Minutes

Date and Venue: 10:25-11:3, Oct 20th, 2020 (Virtual Meeting)

Total Attendees: 114

Members: 35 (out of 60) Guest: 45 Guest Requesting Membership: 26 No answer: 9 Total Attendees: 125

Total Members: 60, Members Attended: 35; 58% quorum achieved.

1. The chair outlined the IEEE Patent disclosure policy and no disclosure was noted.
2. The chair outlined the IEEE Copyright Policy.
3. A membership quorum was polled, and a quorum was established.
4. Adoption of Fall 2019 Meeting Minutes: Approved Unanimously.
5. Adoption of Fall 2020 Meeting 2020 Agenda: Approved Unanimously.
6. The task force report on the proposed chapters for this guide was presented by Dr. Luiz Cheim. This TF recommended to condense the Cigre TB 761 chapters into nine proposed chapters and three annexes in the PC57.170 guide.

6.1. Fundamentals of Transformer Condition Assessment (Chapter 1)

- Asset management strategies
- Transformer failure modes
- Condition assessment
- Indices utilized in transformer condition assessment (Intro)
- Post-Mortem analysis and feedback

6.2. Transformers condition assessment indexes (*TCAI*) (Chapter 2)

- Main objectives of implementing/developing a *TCAI* (business drivers)
 - Fleet screening
 - Maintenance and operations
 - Budget allocation
 - Repair/replacement
 - System expansion
- Overview of most common approaches – parameters to consider
- Advantages and disadvantages of most common approaches
- Case studies
 - Common approach to fleet screening (example)
 - Common approach to support maintenance and operations
 - Common approach in support of repair/replace strategy
 - Common approach on system expansion application

6.3. Dealing with uncertainty in information (Chapter 3)

- Dealing with uncertainty (old data, data entry etc.) with available information
- Dealing with missing data
 - Stop assessment, or ignore missing data and manually assess

- Use a default value
- Use a default with a range
- Use of statistical inference on limited number of parameters
- Use of statistical inference on many input parameters
- Imputation using external and local circumstances
- Machine learning imputation (remark only)
- Examples

6.4. Criticality and Consequence of Failure (Chapter 4)

- Assessing critically & developing a criticality index

6.5. Transformer Active Part (Chapter 5)

- Solid insulation degradation assessment
- Dielectric assessment
- Mechanical assessment

6.6. Bushings and Cable Boxes (Chapter 6)

- Transformer bushings
- Transformer bushing test and diagnostics
- Failure mode assessment
- Transformer cable boxes
- Failure mode assessment

6.7. OLTC (LTC) & DETC (Chapter 7)

- Failure Modes -> IEEE C57.140
- Tests and diagnosis

6.8. Cooling System, Transformer Tank, & Ancillary Components (Chapter 8)

- Cooling System
 - Failure Modes
 - Tests and Diagnosis
- Transformer Tank
 - Failure Modes
 - Tests and Diagnosis
- Ancillary Components
 - Failure Modes
 - Tests and Diagnosis

6.9. Insulating Liquids (Chapter 9)

- Recommend that the mineral oil assessment follow C57.106. May need to refer to other documents related to other insulating fluids (esters, silicon, less flammable hydrocarbon liquids).
- Include insulating liquid condition in the general condition assessment indexes (TCAI)

6.10. Annex A Transformer Condition Assessment Tables (Requires inputs from all sections)

6.11. Annex B How to develop a TCAI (Requires inputs from all sections)

6.12. Annex C Literature overview

7. After the presentation was completed, the floor was opened for questions and discussions about those chapters.
- Very good discussion was held about the proposed chapters.
 - Several recommendations were made regarding the use of Cigre documents and their approval. The chair noted that we need to ensure that we do not duplicate the work of other existing IEEE guides but use them only for reference purposes only.
 - A motion was made by Hemchandra Shertukde to accept the proposed nine chapters and three annexes for incorporation in this guide. This motion was seconded by Poorvi Patel.
 - Gary Hoffman made a friendly amendment to the motion to change chapters terminology to "clauses" in line with existing IEEE guide formats.
 - An amended motion was restated by Hemchandra Shertukde to accept the proposed nine clauses in this guide. This amended motion was seconded by Poorvi Patel.
 - The amended motion moved was unanimously approved unopposed by the present working group members.
 - The Chair proposed four task force teams to work on the clauses shown below and sought volunteers for this work.
 - TF1: clause 1 & 2
 - TF2: clauses 3,4&5
 - TF3: Clauses 6,7&8
 - TF4: Clauses 9 and Annexes
 - Several guests / members volunteered to join the four task forces (Clauses 1-2, Clause 3-4-5, Clauses 6-7-8 and Clause 9 and three annexures) via the chat section on WebEx.
 - The chair noted that each TF lead and team must request copyright permission of use of any Cigre / IEEE document while writing their clauses in case they planned to use large portions of the reference texts in their clauses.
 - A consolidated list of TF volunteer members (with chapters assigned) is attached with the meeting minutes.
 - There were no new items for consideration.

The meeting was adjourned at 11:40 am.

Kumar Mani
Chair

James Cross
Vice Chair

Akash Joshi
Secretary

List of attendees:

First Name	Last Name	Member/Guest	Company
Raj	Ahuja	Guest	Raj Ahuja Consulting
Richard	Amos	Guest	Retired
Javier	Arteaga	Member	ABB Enterprise Software Inc
Onome	Avanoma	Guest	Transformer Consulting Services Inc.
Ralph	Averitt	Guest	Reinhausen Mfg.
Roy	Ayers	Guest	Nashville Electric Service
Israel	Barrientos	Guest	Prolec GE
Cheryl	Basel	Guest	WEG Transformers USA Inc.
Claude	Beauchemin	Member	TJH2b Analytical Services
Myron	Bell	Guest	Delta Star Inc.
Jeff	Benach	Guest	Weidmann Electrical Technology
Enrique	Betancourt	Guest	Prolec GE
Dennis	Blake	Guest	Pennsylvania Transformer
William	Boettger	Member	Boettger Transformer Consulting LLC
Paul	Boman	Member	Hartford Steam Boiler
Elizabeth	Bray	Guest	Southern Company Services
Erich	Buchgeher	Guest	Siemens Energy
Marcelo	Catugas	Guest	NEIL Services
Luiz	Cheim	Member	Hitachi ABB Power Grids
Larry	Christodoulou	Member	Electric Power Systems, Inc.
James	Cross	Vice Chair	Kinectrics
Stephanie	Denzer	Member	Alliant Energy
Eric	Doak	Guest	D4EnergySolutions LLC
Don	Dorris	Member	Nashville Electric Service
Samraghi	Dutta Roy	Guest	Siemens Energy
Marco	Espindola	Guest	Advisian-Worley Parsons ABB Enterprise Software Inc.
Florin	Faur	Guest	SPX Transformer Solutions, Inc.
Marcos	Ferreira	Member	
Norman	Field	Guest	Teshmont Consultants LP
Bruce	Forsyth	Member	Bruce Forsyth and Associates LLC
Michael	Franchek	Guest	Retired
Raymond	Frazier	Guest	Ameren
George	Frimpong	Guest	Hitachi ABB Power Grids
Lorne	Gara	Guest	Shermco
James	Gardner	Guest	SPX Transformer Solutions, Inc.
Jonathan	Garrity	Guest	Tagup
James	Graham	Member	Weidmann Electrical Technology
Bill	Griesacker	Member	Duquesne Light Co.
Ismail	Guner	Guest	Hydro-Quebec
Niklas	Gustavsson	Guest	Hitachi ABB Power Grids
Attila	Gyore	Member	M&I Materials Ltd

John	Hall	Guest	Tennessee Valley Authority
Thomas	Hartmann	Guest	Pepco Holdings Inc.
Roger	Hayes	Member	General Electric
Roger	Hedlund	Guest	Hitachi ABB Power Grids
Kyle	Heiden	Member	EATON Corporation
Thang	Hochanh	Guest	Surplec Inc.
Gary	Hoffman	Member	Advanced Power Technologies
Saramma	Hoffman	Guest	PPL Electric Utilities
Jill	Holmes	Guest	Bureau of Reclamation
Zachary	Hutchinson	Guest	East Kentucky Power Cooperative
Marion	Jaroszewski	Guest	Delta Star Inc.
John	John	Guest	Virginia Transformer Corp.
Akash	Joshi	Secretary	Black & Veatch
Stephen	Kanty	Guest	Isberg & Associates, Inc.
Jon	Karas	Guest	SDMyers, LLC.
Gael	Kennedy	Guest	GR Kennedy & Associates LLC
Stacey	Kessler	Guest	Basin Electric Power Cooperative
Egon	Kirchenmayer	Guest	Siemens Energy
Peter	Kleine	Member	US Army Corps of Engineers
Anton	Koshel	Guest	Delta Star Inc.
Raja	Kuppuswamy	Member	Dynamic Ratings, Inc.
Jacob	Kuruvilla	Guest	Exelon
Donald	Lamontagne	Guest	Arizona Public Service Co.
Wejun	Li	Member	Braintree Electric Light Dept.
Mario	Locarno	Member	Doble Engineering Co.
Tara-lee	MacArthur	Guest	Ergon Energy
Darrell	Mangubat	Member	Siemens Power Operations Inc.
Kumar	Mani	Chair	Duke Energy
Terence	Martin	Guest	MarVen
Robert	Mayer	Guest	Siemens Energy
Matthew	McFadden	Guest	Oncor Electric Delivery
Susan	McNelly	Member	Xcel Energy
Victor	Mendez	Guest	Southern California Edison
Philip	Miller	Guest	Memphis Light, Gas & Water
Emilio	Morales-Cruz	Guest	Qualitrol Company LLC
David	Murray	Guest	Tennessee Valley Authority
Paul	Mushill	Guest	Ameren
Ali	Naderian	Guest	Metsco
Kristopher	Neild	Guest	Megger
Joe	Nims	Guest	Allen & Hoshall, Inc.
William	Oliver	Guest	Virginia/Georgia Transformer
Anastasia	O'Malley	Guest	Consolidated Edison Co. of NY
Sanjay	Patel	Guest	Royal Smit Transformers

Poorvi	Patel	Member	Electric Power Research Institute
Nitesh	Patel	Guest	Hyundai Power Transformers USA
Patrick	Picher	Guest	Hydro-Quebec IREQ
Cornelius	Plath	Guest	OMICRON Energy Solutions GmbH
Shiva	Rampersad	Guest	Dow Chemical Company
Kevin	Rapp	Guest	Cargill, Inc.
Timothy	Raymond	Member	Electric Power Research Institute
Scott	Reed	Member	MVA
Kevin	Riordan	Guest	WEG Transformers USA Inc.
Diego	Robalino	Guest	Megger
Mickel	Saad	Member	Hitachi ABB Power Grids
Oliverio	Sanchez	Guest	Pacific Gas & Electric
Jose	Sanchez-Marin	Guest	ABB Inc.
Alan	Sbravati	Guest	Cargill, Inc.
Hemchandra	Shertukde	Guest	University of Hartford
Jonathan	Sinclair	Guest	PPL Electric Utilities
Kushal	Singh	Guest	ComEd
K. Shane	Smith	Guest	Delta Star Inc.
Brian	Sparling	Guest	Dynamic Ratings, Inc.
Mike	Spurlock	Guest	Consultant
Brad	Staley	Guest	Salt River Project
Gregory	Steeves	Guest	Baron USA, LLC
Christopher	Steineman	Guest	Delta Star Inc.
Kevin	Sullivan	Guest	Duke Energy
Charles	Sweetser	Member	OMICRON electronics Corp USA
Janusz	Szczechowski	Guest	Maschinenfabrik Reinhausen
Miloje	Tanaskovic	Guest	Boiler Inspection & Insurance, Canada
Olivier	Uhlmann	Guest	Reinhausen Canada Inc.
Alwyn	VanderWalt	Guest	Public Service Co. of New Mexico
Jason	Varnell	Member	Doble Engineering Co.
Rogerio	Verdolin	Guest	Verdolin Solutions Inc.
Karsten	Viereck	Guest	Maschinenfabrik Reinhausen
Krishnamurthy	Vijayan	Guest	PTI Transformers
Pragnesh	Vyas	Member	Sunbelt-Solomon Solutions
Sukhdev	Walia	Member	New Energy Power Co.
Darren	Walker	Guest	General Electric
Alan	Washburn	Guest	Burns & McDonnell
Joe	Watson	Member	JD Watson and Associates Inc.
Drew	Welton	Guest	Intellirent
Peter	Werelius	Member	Megger
Daniel	Weyer	Guest	Nebraska Public Power District
William	Whitehead	Member	Siemens Energy
Deanna	Woods	Guest	Alliant Energy

Jeffrey
Kwasi
Peter

Wright
Yeboah
Zhao

Guest
Guest
Guest

Duquesne Light Co.
GE Energy Management
Hydro One

MEETING MINUTES

IEEE PES TRANSFORMERS COMMITTEE
Working Group for Revision of C57.116
IEEE Guide for Transformers Directly Connected to Generators

Chair: Weijun Li, Vice-Chair: Jason Varnell, Secretary: Bill Griesacker

The first meeting of the working group met on Monday 10/19/2020 at 12:55 p.m. in Session 2 via Webex. 35 attendees were recorded including a PSAV moderator and an individual attended via 2 separate lines; therefore, a total of 33 attendees participated in the meeting. All meeting attendees were eligible to join the WG. The complete attendance record is available in the AM System. 22 attendees requested membership and have become members of the WG.

The chair presented the IEEE prepared patent slides and requested any essential patents or patent claims to be made known. There was no response from the meeting participants.

The chair presented the IEEE prepared copyright slides.

The chair presented and discussed the PAR timeline, scope, and purpose. The PAR was approved on 11/7/2019 and is valid until the end of 2023.

Joe Watson stated that the TF working on V/Hz issues will have prepared information as they apply to this type of transformers, and a recommended practice for developing a more correct V/Hz curve for new transformers. The TF intends to submit a section to this WG to include the V/Hz information in the next revision. They want to finalize this work in the next several months.

A straw poll was taken: Are you in favor of reviewing and revising the scope for this PAR? One objection was communicated from the meeting attendees, the objection was made based on the time frame for completing the revision of the guide.

The chair requested a motion to divide the document and assign into task forces for review to determine what should be revised in the existing guide. Akash Joshi made the motion and Toby Johnson seconded motion to form task forces. There were no objections. The following task forces were discussed and the listed attendees volunteered:

1. TF1 – review Sections 4 (background), 5 (transformer connections), 9 (load tap changing), 10 (iso-phase bus), 11 (back-feed)
2. TF2 – review Section 6 (selection of parameters of unit transformers)
3. TF3 – review Section 7 (Selection of parameters of unit aux. transformers), 8 (overcurrent)
4. TF4 – draft a new annex for a list of things to consider while purchasing new or replacing step-up transformers
5. All to review and consider changes to the PAR.

Since there was no time remaining, the meeting adjourned at about 2:10 p.m. The WG will meet again in Toronto, Ontario, Canada in April 2021.

<u>Role</u>	<u>First Name</u>	<u>Last Name</u>	<u>Company</u>	<u>10/19/2020</u>
Member	Kayland	Adams	SPX Transformer Solutions, Inc.	X
Member	Suresh	Babanna	SPX Transformer Solutions, Inc.	X
Member	Peter	Balma	Retired	X
Guest	Paul	Boman	Hartford Steam Boiler	X
Member	Elizabeth	Bray	Southern Company Services	X
Member	Jorge	Cantu de Leon	SPX Transformer Solutions, Inc.	X
Guest	Domenico	Corsi	Doble Engineering Co.	X
Guest	Juan Carlos	Cruz Valdes	Prolec GE	X
Member	Jonathan	Deverick	Dominion Energy	X
Secretary	Bill	Griesacker	Duquesne Light Co.	X
Guest	Didier	Hamoir	Transformer Protector Corp	X
Member	Gary	Hoffman	Advanced Power Technologies	X
Member	Toby	Johnson	Pacificorp	X
Member	Akash	Joshi	Black & Veatch	X
Guest	Gael	Kennedy	GR Kennedy & Associates LLC	X
Member	Egon	Kirchenmayer	Siemens Energy	X
Member	Raja	Kuppuswamy	Dynamic Ratings, Inc.	X
Member	John	Lackey	PowerNex Associates Inc.	X
Guest	Donald	Lamontagne	Arizona Public Service Co.	X
Chair	Weijun	Li	Braintree Electric Light Dept.	X
Member	Kumar	Mani	Duke Energy	X
Member	Vinay	Mehrotra	SPX Transformer Solutions, Inc.	X
Member	Emilio	Morales-Cruz	Qualitrol Company LLC	X
Corresponding				
Member	Bipin	Patel	Consultant	X
Guest	Nicholas	Podany	Bureau of Reclamation	X
Member	Dinesh	Sankarakurup	Duke Energy	X
Member	Steven	Schappell	SPX Transformer Solutions, Inc.	X
Member	Stephen	Schroeder	Hitachi ABB Power Grids	X
Guest	Mike	Spurlock	Consultant	X
Guest	Ryan	Thompson	Burns & McDonnell	X
Guest	Daniel	Tournoux	SPX Transformer Solutions, Inc.	X
Vice-Chair	Jason	Varnell	Doble Engineering Co.	X
Member	Joe	Watson	JD Watson and Associates Inc.	X

Annex L Standards Subcommittee – Unapproved Minutes

October 21, 2020

Virtual Meeting from 3:45PM-5:00PM (USA – CST) on WebEx Session 1

Chair: Jerry Murphy

Vice Chair: Daniel Sauer

Secretary: Marcos Ferreira

Standards Coordinator: Jim Graham

The Chair, Jerry Murphy opened the meeting calling for a show of members to establish quorum which was met based on RFID system, Pooling was provided by the WebEx pooling system to be counted members attended the meeting.

L.1 Meeting Attendance

The Standards Subcommittee met on Wednesday; October 21st, 2020 and started at 3:45 PM (CST). As shown WebEx Virtual Meeting indicated **27 of 48** members in attendance the beginning of the meeting which met the quorum requirement. Overall, the attendance roll showed according to WebEx pool: there were **180** attendees, **27** members and **151** guests (**23** guest requested membership and **62** are new guests). Steve Shull moved to approve the agenda with second by Susan McNelly; motion was carried with unanimous consent. Jerry then requested a review of the Jacksonville minutes; motion was made by Steve Shull and seconded by Jim Graham; motion was carried with unanimous consent.

L.2 Chair's Remarks

L.3 Working Group and Task Force Reports

L.3.1 Standards Working Group on the Continuous Revision of C57.12.00

Standards Subcommittee
IEEE/PES Transformers Committee
WG Chair: Steven L. Snyder
October 21, 2020

The purpose of this WG is to compile all the work being done in various TF/WG/SC's for inclusion in the continuous revision of C57.12.00 in a consistent manner. This WG coordinates efforts with the companion Standard C57.12.90 so that they publish together.

The current standard was approved by the IEEE-SA Standards Board on December 5, 2015, with an official publication date of May 12, 2016. The standard is good for 10 years but is under continuous revision and will be next balloted when sufficient new material is available. The PAR which covers the ongoing continuous work on the document is good through December 31, 2021.

Presently I have received fully vetted material ready for inclusion into a new draft according to the following topics and clauses:

- Clause 6.7.2.1 Grounding of Wound Cores
- Table 17 Add partial discharge test for core gassing

- Clause 6.8 Minimum External Clearances of Transformer Live Parts

& Table 10

Table 17 Audible sound level comments revised
& Annex C Add audible sound pressure level table for NL noise

Clause 7.4 Calculation of winding temperature during short circuit, equations corrected due to metrication error

I recommend we move immediately for next revision ballot to begin in early 2021.

Respectfully submitted,
Steven L. Snyder
WG Chair Standard C57.12.00

L.3.2 WG Standard Terminal Markings and Connections for Transformers C57.12.70

IEEE / PES Transformers Committee
Columbus, OH, USA
Marion
Tuesday, October, 29th - 3:15PM – 4:30PM
Working Group of C57.12.70

Meeting Minutes

Chair Jason Varnell presiding with Secretary Kris Zibert recording minutes.

Call to order – 3:15PM

The chair read the slides provided by IEEE-SA with regards to essential patent claims & copyright.

Introductions were made. The electronic roster was utilized to record attendance. Quorum was established with seven of ten members in attendance.

The Agenda was presented and approved. M: S. Antosz, S: R. Musgrove passed viva voce.

The minutes of the Spring 19 meeting were presented and approved. M: S. Antosz, S: S. Musgrove – passed viva voce.

Reports:

- a. Chair:
 - o Reviewed PAR and PAR dates
- b. Antosz:
 - o TF – Nameplate Requirement
 - TF met via e-mail correspondence
 - TF recommended new sentence added to Section 6.1.3
 - o S. Antosz made a motion to include this sentence in the standard. S: Dan Mulkey.
 - Discussion regarding “tie-in” with C57.12.00.
 - Motion approved by unanimous consent.

- c. Li:
 - o TF – Figure 11
 - Chair Varnell reported on the work of the TF on behalf of W. Li who was unable to attend.
 - o R. Musgrove made a motion to accept the figure as revised by the TF. S: Dan Mulkey.
 - Motion approved by unanimous consent.

Old Business:

- a. “Tap terminal” definition
 - o Chair Varnell presented how the term is used in C57.12.70 and the existing definitions in C57.12.80.
 - o Discussion regarding use of X4 “midpoint” tap and “tap terminal”.
 - o Discussion by D. Mulkey to revise language in section 3.4 to say “A neutral terminal of a wye or zigzag winding in a three phase transformer shall be marked with the proper letter followed by the subscript 0, for exam, H0, X0, etc.” and “A terminal brought out from the winding for a use other than H0 or X0 shall be marked as a tap terminal.”
 - o Discussion regarding removing the word “neutral” from section 3.4 heading.
 - o Dan Mulkey makes a motion to change first sentence to say “A neutral terminal of a wye or zigzag winding in a three phase transformer shall be marked with the proper letter followed by the subscript 0, for exam, H0, X0, etc.” S: S. Antoz. Motion approved by unanimous consent.
 - o S. Antoz made a motion to delete the sentence “A terminal brought out from the winding for a use other than that...”.
 - Discussion regarding section 6.4 that has similar language
 - Suggestion that document should be reviewed to make sure deleting the sentence doesn’t cause issues with the rest of the document.
 - M: D. Mulkey S: S. Antoz – amend the motion to keep the sentence but change end of sentence “To be marked as detailed in subclause 6.4.” Motion failed viva voce.
 - Main motion passed by unanimous consent, sentence to be deleted.

New Business:

- a. Introduction
 - o Chair Varnell reviewed proposed introduction.
 - Discussion and revisions were made.
- b. Clause 6.2
 - o Motion to add C57.12.38 and C57.12.34 to the first paragraph by L. Matthews. S: D. Mulkey. Approved by unanimous consent.
- c. Motion by D. Mulkey to go to SA Ballot. S: S. Antoz. Motion pass by a vote of 7 for and 0 against. 7 members were present.

A motion to adjourn was made and seconded.

The meeting was adjourned at 4:28 PM.

The next meeting will be held in Charlotte, NC during the Spring 2020 meeting of the IEEE Transformers Committee.

L.3.3 WG Standard Transformer Terminology for Transformers C57.12.80

Document #: C57.12.80

Document Title: **Standard Terminology for Distribution and Power Transformers**

Chair: James Graham Vice-Chair: Open
 Secretary: Richard vonGemmingen

Current Draft Being Worked On: 1.0 Dated: NA

Meeting Date: 2020-10-19 Time: 9:10 AM

Attendance:	Members	<u>8</u>
	Guests:	<u>24</u>
	Total*	<u>32</u>

*** For details of attendance, please refer to AMS system of the Transformers Committee**

Meeting Minutes / Significant Issues / Comments:

The Chair opened the meeting at 9:10 a.m. (Central) on Monday, 19 October 2020.

1) Attendance Sign In sheet/ Quorum Check

Quorum was achieved with eight of nine members present. 24 non-voting participants also attended. Nine participants requested membership. No new members have been added since the last meeting.

2) Approval of the Agenda

The agenda was approved as presented with no objections.

3) Approval of the Fall 2019 minutes

The Fall 2019 meeting minutes were approved with no revisions.

4) Call for Essential Patents

A call for essential patents was made. No essential patent issues were reported.

5) Copyright policy

The IEEE copyright policy was briefly reviewed.

6) Unfinished Business

a) Core Form and Shell form definitions proposal:

Revised definitions for core and shell form type transformers were reviewed. A lengthy discussion centered on how the definitions related to distribution transformers, core construction, and active parts configurations. The challenge is to develop definitions that apply equally well to all types of transformers, not just power transformers.

A motion by Dan Sauer, seconded by Richard vonGemmingen, to form a task force to more fully develop the core form and shell form definitions passed with no objections. The task force will comprise Dan Sauer, Enrique Betancourt, and Jerry Murphy. Dan Sauer will chair the task force.

Dan Sauer also volunteered to work up definitions of wound core and stacked core type transformers for the next meeting.

Low frequency dielectric test definition

A definition of low frequency dielectric test was proposed and discussed. A motion by Dan Sauer, seconded by Jerry Murphy, to approve the definition and add it to the standard was passed with no objections.

7) New Business

- a) A call for volunteers was made to review definitions in the existing transformer standards and make recommendations to add to the terminology standard.

Dry Type Stds – Tim-Felix Mai

Insulation Life Stds – Nambi Shanka

Power Transformer Stds – Gary Hoffman

- b) The need for additional meetings before spring 2021 to make better progress was discussed. Future meetings will occur every six weeks via Webex.

8) The meeting was adjourned at 10:35 a.m. (Central)

Next meeting – December 2020 via Webex

Submitted by: Jim Graham, Chair

Date: 10/19/2020

L.3.4 WG Standards Transformer on Continuous Revision for C57.12.90

Standards Subcommittee

IEEE/PES Transformers Committee

WG Chair: Stephen Antosz

October 29, 2019 old comments in green font

October 21, 2020 new additions in purple font

INTRODUCTION

This is a working group by committee of task forces, for continuous revision of C57.12.90. The purpose of the WG is to keep track of the work being done in various TF/WG/SC's for inclusion in the continuous revision of C57.12.90 in a consistent manner.

Currently there are five Task Forces in three different Subcommittees, as follows:

1. PCS – Cont Rev to Test Code C57.12.90 Clauses 5-9, & 12, TF Chair: Hakan Sahin
2. PCS – Audible Sound Revision Clause 13, TF Chair: Ramsis Girgis
3. Dielectric Test – Cont Rev to Impulse Tests in Clause 10, TF Chair: Pierre Riffon
4. Dielectric Test – Cont Rev to LowFrequency Tests Clause 10, TF Chair: Bill Griesacker
5. Insulation Life – Cont Rev to Temperature Test Clause 11, TF Chair: Ajith Varghese

SUMMARY

The revised document was published in March 2016 as IEEE Std C57.12.90-2015. Shortly after the document was published, one error and one omission were discovered, so a Corrigendum was done and published on March 23, 2017.

STATUS

A new PAR was approved by NESCOM in December 2017 and has a life of 4 years.

UPDATE as of Oct 21, 2020: Due primarily to Covid, there has not been much activity on this document since last Fall's meeting, in other words, the work has been stalled for 1 year. It DID NOT go to ballot, as planned. For this status report, I have kept all of last year's comments in green and added any new information in purple.

as of Oct 29, 2019: We have been planning to shut down work for this Standard (and C57.12.00 concurrently) at the end of 2019, and then open for balloting in 2020. There has been some more work finalized at Task Force and Subcommittee meetings this week. I am waiting for those TF/SC Chairs to forward to me their minutes and notes and instructions along with the official text, for me to put into the 12.90 document for ballot.

~~There is one TF (#1 above) that I expressed concern to the TF Chair after the TF meeting and again at the PCS Subcommittee meeting that the work that has been done since Fall 2016 has not been surveyed and approved by PCS Subcommittee, nor has it been forwarded to me as WG Chair in the Standards Subcommittee. I asked the TF Chair to gather whatever work the TF has approved since Fall 2016, to summarize the actions and decisions, and to survey the PCS Subcommittee for concurrence and approval. Then forward to me and the Standards Subcommittee. I asked him to do all this by Dec 31, 2019. Whatever is not completed by Dec 31, 2019, will have to wait until the next revision.~~

FUTURE REVISIONS AND PENDING WORK

As agreed at the Fall 2016 Standards Subcommittee meeting, any new material provided by the various Task Forces to this WG Chair for inclusion in the next revision, will first be approved by the responsible technical subcommittee (Diel Test, PCS, Dist, IL, etc) and then presented to the Standards Subcommittee for the "official" vote of approval.

Since this is a continuous revision document, there continues to be ongoing work in the various Task Forces.

Changes already approved for the next revision:

1. Changes to 9.3.1 Wattmeter-voltmeter-ammeter method from Mark Perkins' PCS TF for Revision of C57.12.90. Final survey approved in Nov 2015 in both the TF and PCS. The following text is to be added just prior to Figure 18 for three-phase transformers:

An alternate method for either single phase or three phase transformers is to provide capacitive compensation for the transformer impedance at the terminals of the transformer so that the AC source need only supply the real power for the test. Figure 18 shows the apparatus and connections for a single phase transformer for this alternate method and the method can also be used in a three phase configuration. In this case, the wattmeter will measure the real power of the transformer under test plus the power of the capacitors, which will be very small compared to the power in the transformer. The load loss in the transformer is determined by subtracting the loss in the capacitors from the measured loss. For modern oil film capacitors, a loss of 0.2 watts per actual kVAR may be used unless a specific capacitor bank loss is known. This method requires a separate CT or set of CTs at the transformer for setting the current and measuring the transformer impedance. The advantage of this alternate method is that the phase angle between the voltage and current at the wattmeter is low (closer to zero degrees) due to the capacitor compensation, so any phase angle errors in the loss measurement circuit are much less significant.

2. Add in subclause 10.3.1 and 10.3.1.1 Lightning Impulse, the following words in red; by Pierre Riffon's WG Revision to Impulse Test in Dielectric Test Subcommittee. Submitted on 11/4/2016. These subjects have been surveyed within the Dielectric Tests SC and within the TF. The 4th survey got a 100% approval rate.

10.3.1 Impulse tests shall be made without excitation. **The impulse waveshape parameters such as peak voltage, front time and tail time are determined on the test voltage curve which is obtained after having processed the recorded curve using the test voltage function method, as defined in IEEE Std. 4.**

- 2a. 10.3.1.1 Full-wave test

The test wave rises to crest in 1.2 μs and decays to half of crest value in 50 μs from the virtual time zero. The crest value shall be in accordance with the assigned basic impulse insulation level (BIL), subject to a tolerance of $\pm 3\%$; and no flashover of the bushing or test gap shall occur. The tolerance on virtual front time should be $\pm 30\%$, and the tolerance on time to half of crest should be $\pm 20\%$. However, as a practical matter, once the manufacturer has proven that they have test equipment limitations, the following shall be considered:

a) **If the standard impulse shape cannot reasonably be obtained because of low winding inductance or high capacitance to earth and the resulting impulse shape is oscillatory so that the relative overshoot magnitude exceeds 5 % then the front time may be increased to reduce the overshoot amplitude. In all cases, the front time shall not exceed 2.5 μs regardless of the overshoot amplitude.**

Note 1: The overshoot can be reduced by increasing the front resistor value of the impulse generator. The use of low inductance connections between the impulse generator and the tested transformer are also recommended.

3. New wording in subclause 10.3.1.3 Chopped-wave test, approved by the TF and SC following the Louisville meeting in Fall 2017.

10.3.1.3 Chopped-wave test

A chopped wave is inherently a full lightning impulse wave, except that the crest value shall be at the required level and the voltage wave shall be chopped at or after the required time to flashover (time to chopping) but not later than 6 μs after virtual origin. The virtual front time of the chopped wave may be different than the virtual front during a full-wave test because of the presence of the chopping gap. Nevertheless, the tolerance on the virtual front time for the chopped-wave test should remain as defined for full-wave test.

The gap or other equivalent chopping device shall be located as close as possible to the terminals of the transformer without disrupting its electrical field distribution. The distance between the chopping device and the test object shall not exceed a lead length greater than the total height of the transformer (tank + bushing). The impedance between the tested terminal and the grounded end of the chopping device shall be limited to that of the necessary leads. The voltage zero following the instant of chopping should occur within 1 μs . However, for some winding **and transformer** designs (particularly low-voltage windings of high stray capacitance, **layer windings, high capacitance windings, UHV transformers requiring large clearances, etc.**), the circuit response after chopping may not be oscillatory it may be overdamped **or may collapse to zero with a lower frequency (slower voltage collapse)**. For such cases, the time interval to the first voltage zero after the instant of chopping may be significantly greater than 1 μs **and this deviation shall be accepted if the chopping gap is located as described above.**

In order to have a common procedure for the determination of the steepness of voltage collapse, the steepness of the voltage collapse shall be the time interval between the instant of the voltage chopping to the instant where the applied voltage is 20% of the voltage level at instant of chopping. This time interval should be equal to or less than 0.8 μs .

Only for cases...*(this paragraph and the last paragraph remain as they are in the 2015 edition, including the three NOTES)*..."

4. Add the following text in red to subclause 10.8.2 Test Procedure (for Induced Test). This work was done in Bill Griesacker's (formerly Bertrand Poulin) Task Force. The work started in 2015 and after several surveys was approved by the TF and SC in October 2018. It stipulates a limit of overpressure applied inside a transformer tank during induced voltage test.

10.8.2 Test procedure

The voltage shall first be raised to the 1 h level and held for a minimum of 1 min or until a stable partial discharge level is obtained to verify that there are no partial discharge problems. The level of partial discharges shall be recorded just before raising the voltage to the enhancement level. The voltage shall then be raised to the enhancement level and held for 7200 cycles. The voltage shall then be reduced directly to the 1 h level and held for 1 h.

During this 1 h period, partial discharge measurements shall be made at 5 min intervals. Partial discharge acceptance criteria shall be based on each line terminal rated 69 kV and above. These measurements shall be made in accordance with 10.9.

The pressure inside the transformer tank during induced test shall not be increased by artificial means for the purpose of reducing the PD level. The liquid level and pressure inside of the transformer tank and/or conservator tank shall be configured such that oil head pressure during the induced test does not exceed the pressure under usual service conditions. Any exceptions that increase tank pressure by more than 3.5 kPa (0.5 psi) over normal operating pressure, such as the use of an elevated test facility conservator tank, requires customer approval prior to test. A note shall be added to the certified test report confirming this approval.

Note: Increasing the pressure for diagnostic purposes, such as to identify and possibly reduce suspected bubbles in the liquid, may be done as a remedial step to diagnose a source of high PD. To be considered valid, the test shall be repeated with no added pressure as stated above.

5. Tap changer position during Induced Test. Subclause 10.8.1. This work was done in Bill Griesacker's (formerly Bertrand Poulin) Task Force. In Fall 2018 Bertrand reviewed in the TF the text to be added. It received 100% approval. He forwarded it to the Dielectric test Subcommittee for inclusion in C57.12.90.

General 10.8.1 ... Add the following new text after the first existing paragraph ...

For a transformer built with a single magnetic core holding all windings, all windings are excited at a unique induction level, often referred to as "Volts-per-turn". During induced test, with the transformer connected and excited as in service, all windings are excited at the same overvoltage factor, regardless of what tap is selected. Each winding turn receives the same voltage. The tap connections shall be chosen, when possible, such that voltages developed across other windings meet or exceed the required overvoltage factor.

The situation is quite different when transformers are equipped with auxiliary devices with separate magnetic cores, such as preventive autotransformers, series (booster) transformer or series regulator. Different magnetic cores can be excited at different levels during operation or testing. In certain tap positions, these auxiliary devices do not have their core excited at all and no voltage appears across their windings. For such cases, the selection of the tap changer position shall be guided by the principles described below. One exception is when such auxiliary devices are not excited on a permanent basis but rather used only as transitional devices.

For transformers equipped with a series (booster) transformer, preventive autotransformer (PA), or any other device, the selected tap position of the LTC shall be the one that produces the highest voltage across the windings of the series (booster) transformer, preventive auto, and other auxiliary devices as applicable. There can be a conflict of choosing such tap position when more than one such device is

present. In such case the selected tap position of the LTC should be the best compromise so that all devices are tested with overvoltage. One common example is the case where a series (booster) transformer and preventive auto are both present. In this case, the tap selected shall be the one that is closest to the position that produces the highest voltage across the windings of the series (booster) transformer and simultaneously excites the preventive auto, which is typically a bridging position (not applicable when the preventive auto is energized only during transition).

In order to test the series (booster) transformer, preventive autotransformer and other devices, at the required minimum overvoltage factor, the voltage developed on the terminals of other windings may exceed the one hour level mentioned in IEEE C57.12.00, Table 4. In such cases, an alternate tap position may be selected by agreement between the manufacturer and the purchaser to avoid overstressing components such as bushings. Annex D shows examples which can serve as a guide to select the LTC tap position for transformers having series (booster) transformer and/or preventive autos in the main tank.

For certain types of devices such as series reactors used as current limiting devices, there is no voltage developed across their windings during the induced voltage test as these devices are only excited when current flows in their windings. There is no option available to apply any overvoltage for these devices during induced test.

Note: the selection of the tap changer position for induced test should be agreed upon between Manufacturer and Purchaser prior to design to avoid conflicts during final acceptance tests.

6. Other revisions to subclauses 10.2 to 10.4 from Pierre Riffon's TF for revision of impulse tests.
- 6a. This text was approved by the Task Force and SC in Spring 2019. Add the following text in **red** to subclause 10.3.2.1 Connection of tertiary bushings during impulse test

10.3.2.1 Terminals not being tested

Neutral terminals shall be solidly grounded. Line terminals, including those of autotransformers and regulating transformers, shall be either solidly grounded or grounded through a resistor with an ohmic value not in excess of the values given in Table 3.

Tertiary winding terminals shall be considered as line terminals.

When buried stabilizing winding terminals have been temporarily brought out of the tank for testing purposes only, they shall be connected the same way as they will be in service during impulse tests (grounded or in open circuit).

When a stabilizing winding terminal is brought out of the tank for grounding purposes, this terminal shall be grounded during impulse tests.

When stabilizing winding terminals are brought out of the tank for the purpose of grounding the winding and closing the delta, these terminals shall be connected as intended for service during impulse tests.

The rest of the clause remains as is.

- 6b. This text was approved by the Task Force and SC in Spring 2019. Add the following text in **red** to subclause 10.2.4 Tap positions during Switching Impulse Test

10.2.4 Tap connection

The choice of the tap connection shall follow the following rules:

- The tap position shall be selected in order to induce, as close as possible (preferably within $\pm 3\%$), the rated switching impulse withstand voltage value on the LV winding terminal;
- If the LV winding has no rated switching impulse level, the tap position shall be selected in order to induce, as close as possible (preferably within $\pm 3\%$), 83% of the LV winding rated BIL value on LV winding terminal.

It should be noted that for some cases, the LV winding may receive a voltage which is less than its rated switching impulse level or 83% of its rated BIL and this shall be accepted.

It should be also noted that for some other cases, the LV winding may receive a voltage which is higher than its rated switching impulse level or 83% of its rated BIL, this shall be accepted and the transformer shall be designed for it.

For transformers having a preventive autotransformer, the tap changer shall be in a bridging positing if this operational mode is permitted for continuous operation."

7. Bill Griesacker's TF (formerly Bertrand Poulin) for revision of low frequency tests. Revisions to subclauses 10.5 to 10.10.

- 7a. This change was approved by Bill Griesacker's TF (formerly Bertrand Poulin) for revision of low frequency tests, and approved by the Dielectric Test Subcommittee during the Fall 2019 meetings. Reduce the acceptable PD levels in subclause 10.8.5 Failure Detection during Induced Test for Class II Power Transformers. Add the following words in red, and delete the words in blue text:

10.8.5 Failure Detection.

- a) The magnitude of the partial discharge level does not exceed ~~500~~ 250 pC during the 1-h test period.
- b) The increase in partial discharge levels during the 1-h period does not exceed ~~150~~ 50 pC.
- c) The partial discharge levels during the 1-h period do not exhibit any steadily rising trend, and no sudden sustained increase in the levels occurs during the last 20 min of the test.

There are no other changes to subclause 10.8.5. It will remain as is.

- 7b. Bill Griesacker's TF (formerly Bertrand Poulin) for revision of low frequency tests. Revisions to subclauses 10.5 to 10.10.

Additions from Phil Hopkinson to detect improper core grounding in 10.7.7 for Special Induced-Voltage partial discharge Test for distribution and class I power transformers with a wound core. Wording to insert into IEEE C57.12.90

10.7.7 Special Induced-Voltage Test for distribution and class I power transformers with a wound core, Low-High winding construction and having a high voltage winding voltage of 25 kV, (15 kV to ground) or greater to detect improper core grounding. Note that this test is intended only for detection of inadequate core grounding issues and not for accessories like dead front bushings, tap changers, current limiting fuses or dual voltage switches, which may have difficulty passing the test at 100 pc. The transformer may or may not contain such components. If the transformer fails the test with such components, the components may be removed or bypassed and the test re-run. The Design Test shall be conducted on a transformer with functionally similar core grounding.

10.7.7.1 Minimum test duration and application of voltage

1. Voltage shall be raised to 100% of rated volts for 30 seconds and PD shall be measured and recorded.
2. Voltage shall be raised to 110% of rated volts for 30 seconds and PD shall be measured and recorded.
3. Voltage shall be raised to 150% of rated volts, held for 1 minute and PD shall be measured and recorded.
4. Voltage shall be lowered to 140% of rated volts, held for 1 minute and PD shall be measured and recorded.
5. Voltage shall be lowered to 130% of rated volts, held for 1 minute and PD shall be measured and recorded.
6. Voltage shall be lowered to 120% of rated volts, held for 1 minute and PD shall be measured and recorded.
7. Voltage shall be lowered to 110% of rated volts, held for 10 minutes and PD shall be measured and recorded

PD is to be measured as apparent charge in pico-coulombs (pC). One reading shall be made at the end of each interval.

10.7.7.2 Test Frequency

As an induced-voltage test applies greater-than-rated volts per turn to the transformer, the frequency of the impressed voltage shall be high enough to limit the flux density in the core to that permitted by 4.1.6.1 of IEEE Std.C57.12.00-2010. The minimum test frequency to meet this condition is given in Equation (27):

$$\text{Minimum test frequency} = \frac{E_t}{1.1 \times E_r} \times \text{rated frequency} \quad (27)$$

where

E_t is the induced voltage across winding (V)

E_r is the rated voltage across winding (V)

10.7.7.3 Grounding of Windings

When a transformer has one end of the high-voltage winding grounded, the other windings should be grounded during the induced-voltage test. This ground on each winding may be made at a selected point of the winding itself or of the winding of a step-up transformer that is used to supply the voltage or that is connected for the purpose of furnishing the ground.

10.7.7.4 Failure detection

The test is considered passed if PD recorded in step 7 of 10.7.7.1 does not exceed partial discharge level of 100 pC. Judgment shall be used in test intervals such that momentary excursions beyond 100 pC may be acceptable, however at the end of step 7 of 10.7.7.1 PD must not exceed 100 pC.

Note —Normally, transformers will pass the test if they are equipped with outside core grounds and with shielded and grounded inside outer core loops. In cases where pass-fail is marginal at the 110% voltage level, it is useful to continue reducing voltage until partial discharge is extinguished. Core gassing results in bubbles between core laminations that push liquid out and leave only gas that ionizes at much lower voltages than the insulating liquid. Hence, core gassing usually results in partial discharge (pd) extinction well below rated voltage. Most other components in the transformer behave more linearly and do not persist with partial discharge at or below rated voltage.

8. Revise to subclause 11.1 from Ajith Varghese’s TF under Insulation Life SC regarding reducing resistance measurement reheat time from 60 minutes to 30 minutes during Temperature Rise test. This work was approved by the TF and the SC at Fall 2019 meeting. The exact text change and location is not yet clear. This has not yet been received from the TF/SC.

The Task Force will stay as a Continuous Revision TF to review the Temperature Test procedures, tentatively to be chaired by ~~Robert Thompson~~ Dinesh Sankarakurup. ~~At this time (Fall 2019), there are no specific topics being reviewed.~~ In Fall 2020 there were two issues brought to the Insulation Life SC, but these were not addressed due to lack of time at the SC meeting:

- 11.1.2.2.c and 11.3.2. Defining the top oil rise as the last reading at the end of the stabilization period of the total loss run, not an average.

Subclause 11.1.2.2.c indicates that the liquid temperature rises taken at the end of the total loss run should be performed according to Subclause 11.3.2, which refers to the “ultimate liquid temperature rise” as being the value recorded at the end of stabilization. Based on observations on how a few transformer manufacturers have interpreted these subclauses for the purposes of guaranteeing temperature rises, I recommend that Subclause 11.3.2 be expanded to define what is meant by “ultimate liquid temperature rise.” The term is not found elsewhere in C57.12.90 or in C57.12.80 or C57.12.00. I believe that the intent of Subclause 11.3.2 is to define the top oil temperature rise, which is used to compare to the rated/guaranteed liquid temperature rise as defined in C57.12.00-2015 Subclause 5.11.1.5 (i.e. 65 °C). I have observed some manufacturers

take an average of the last three or four readings associated with the last three or four hours of the total loss run. The IEC standard allows for an average of several readings but it is within the last hour of the test and not the last three or more. It should be noted that the variation in determination of the top oil temperature rise also affects the determination of the maximum (hottest-spot) winding temperature rise in accordance to C57.12.00-2015 subclause 5.11.1.1.c and IEEE 1538-2000 Clause 6. I recommend that the first paragraph in subclause 11.3.2 add the following sentence at the end of the paragraph: The ultimate liquid temperature rise, taken at the end of the total loss run, shall be recorded in the certified test report according to IEEE Standard C57.12.00-2015 Subclause 8.7.c.6 and compared to the liquid temperature rise according to IEEE Standard C57.12.00-2015 Subclause 5.11.1.5.

- Possible revision to 11.4.1 and 11.4.2. These subclauses do not provide indication for which exponent to use for K and L type insulating fluids associated with the cooling class designations per C57.12.00-2015 Subclause 5.1 (e.g. KNAN or KNAF). I recommend that the TF consider adding K and L type insulating fluids to these subclauses for temperature rise test corrections.

PENDING WORK

1. Possible future revisions from Hakan Sahin's PCS TF for Revision of C57.12.90. (formerly Mark Perkins was TF Chair until Fall 2016)
 - a) to add a new clause 4.5 in General Section that a transformer be tested with the same insulation liquid that it will use in service. For example, a unit to be filled with ester liquid should (or shall?) not be tested with mineral oil in the factory. Or this requirement may be put into C57.12.00 Clause 8.1 General Testing. This work was to be forwarded after Fall 2018 to Standards SC. However, I am not sure I saw it on that SC's agenda. **Fall 2019 this topic was not discussed anywhere. It seems to have been dropped. Nothing in Fall 2020 either.**
 - b) Load Tap Changer performance 8.7 voltage test and 9.6 current test. Text seems to have been approved in Fall 2018, and moved up to the Perf Char SC. Spring 2019 this work was not on TF or SC agendas, so the result is not clear. Was it surveyed in TF and SC? **Fall 2019 this topic was not discussed anywhere. It seems to have been dropped.** This topic was resurrected after Fall 2019 and surveyed via email in very early 2020. It was discussed at the Fall 2020 meeting. There were significant comments that need resolved, so this topic will carry forward to the next meeting.
 - c) Addition in 5.4.1 new wording for winding resistance test requirement on wye connected transformers with neutral bushing brought out. Fall 2018 meeting minutes not clear as to disposition of this issue. Spring 2019 this work was not on TF or SC agendas. Was it surveyed in TF and SC? **Fall 2019 this topic was not discussed anywhere. It seems to have been dropped.** This topic was resurrected after Fall 2019 and surveyed via email in very early 2020. It was discussed at the Fall 2020 meeting. There was only one small editorial change and the proposal was Approved and forwarded to the PCS. A new sentence should be added to 5.4.1 **When there is a neutral bushing brought out, at least one terminal-to-neutral measurement ~~must~~ shall be made at rated tap position and reported.**
 - d) Altitude correction under clause 11.4.3. Spring 2019 this work was not on TF or SC agendas. Note that clause 11 is out of scope of PCS. **Note in Spring 2019 PCS Minutes say that this topic will be handled in Standards SC. Was it forwarded there? Fall 2019 this topic was not discussed anywhere. It seems to have been dropped.** This is only an editorial change and I will make it myself in the document. The altitude of 1000 meters is shown as equivalent to 3300 feet in one place and 3280 feet in others. I will make it all consistent.

- e) OLTC continuity tests. Spring 2019 this work was not on TF or SC agendas. Fall 2019 this topic was not discussed anywhere. It seems to have been dropped. Nothing in Fall 2020 either.
- f) I received an email in Aug 2019 from Ajith Varghese, Chair of Diel Test SC that DGA limits are supposed to go into C57.12.90 (and 12.00). Ajith said this work is to be done in Hakan's TF. In Dec 2019 it was decided to include this in the new C57.168 Low-Frequency Test guide that Dan Sauer is chairing. Nothing to do here in 12.90 so it will be dropped.
- g) Discussed at Fall 2019 and Fall 2020 meetings. ~~It is unclear what decisions were made, if any. These topics will be reviewed after the TF/SC minutes are published.~~
- a. Number of short-circuit tests under subclause 12.3.4. This work was discussed in Spring 2019 and continued in Fall 2019. Still ongoing in Fall 2020. Nothing to report.
 - b. Ratio test voltage and frequency under subclause 7.1.2. Request to change frequency bandwidth. Was New Business in Spring 2019. This topic was resurrected after Fall 2019 and surveyed via email in very early 2020. It was discussed at the Fall 2020 meeting. There were comments to be resolved, so this topic will carry forward to the next meeting.
 - c. Request to revise the Ratio test methods under subclause 7.3, since these are not used any more. Mostly, ratio meters are used. This topic was discussed in the Fall 2020 virtual meeting. There were comments that need resolved, so this topic will carry forward to the next meeting.
 - d. A new topic came up in Fall 2020 regarding low voltage measurement of zero-sequence impedance to possibly be added to subclause 9.5.3. A main point of discussion was that this material belongs better in a Guide than a Standard. No decisions were made so this topic will carry forward.
2. Other possible revisions to subclauses 10.5 to 10.10 from Bill Griesacker's TF for revision of low frequency tests. Ongoing work continues.
- Class I transformer PD test revision to the test procedure – Don Ayers. This TF met for the first time in Columbus Fall 2019. Nothing to report yet. Still ongoing in Fall 2020.
 - Clarification of measuring voltage during low frequency tests – Bertrand Poulin. This topic was not on the TF or SC agenda during Fall 2019. Not sure the status. Nothing to report in Fall 2020.
 - Text for venting bushings during PD test, discussed in TF during Fall 2018. Dave Geibel Study Group. It was surveyed in Diel Test SC in Sept 2019 to add the following note to 10.8.5 Failure Detection. I'm not sure the status. No decisions made during Fall 2019. This was surveyed and reviewed in the Fall 2020 TF meeting. There was significant disagreement and many comments. No decisions were made so this topic will continue to be discussed.
- “If partial discharge is observed during the induced testing of the transformer and appears to be generated within an OIP bushing(s), it is permissible to “vent” the bushing(s) to atmosphere using the bushing manufacturer's instructions to allow for the dissipation of gas bubbles in the oil. Gas bubbles sometimes form following a temperature rise test during cool down or may be present for other reasons. Reestablishment of the bushing gas space blanket and resealing of the bushing must also be performed in accordance with the bushing manufacturer's instructions following completion of the induced test.”

3. Possible change to sound test from Ramsis, regarding whether or not it is critical to do the sound test at elevated core temperature. This item was discussed at Fall 2019. No conclusions. Work is still ongoing. There are no changes at all, to the Sound Test clause 13 for this revision. Nothing to report in Fall 2020.
4. No other changes to Impulse Test clauses 10.2 to 10.4 from Pierre Riffon's TF. This Task Force did not have any work to do and did not meet at Fall 2019 meeting. Nothing to report in Fall 2020.

Respectfully submitted,
Stephen Antosz, WG Chair
Oct 29, 2019
Oct 21, 2020

L.3.5 WG Standards Transformer on Continuous Revision for C57.152, Guide of Field Tests

Welcome

The chair, Marcos Ferreira opened the meeting at 1:00PM.

1. Attendance and Attendance for Quorum

The Members, 51 including Chair, Vice Chair and Secretary, slide was shown. In the poll of 89 logged in 33 responded as Members, 29 as Guests, and 14 as Guests Requesting Membership. 33 Members present of 51 mean requirements for quorum was fulfilled.

2. Approval of Agenda

The group unanimously approved the Agenda. No objections it passes unanimously.

3. Approval of Minutes of Meeting from Fall 2019

The group unanimously approved the Minutes of Meeting from Fall 2019. No objections it passes unanimously.

4. Call for Patents

The chair presented slide 1-4, dated January 2, 2018 informing the IEEE patent policy and participants duty to inform. There were no issues related to patent assurance brought up by attendees in the meeting.

5. IEEE Copyright Policy

The chair presented IEEE-SA Copyright Policy slides 1-2 informing the audience of the policy.

6. Chair's Remarks

“Welcome to the STD. WG C57.152 to work on new revision. This approved PAR will allow us to run this working group for the next three years. Based on previous meeting, fall 2019, we had volunteers to work on three main sections (7.2 – Main Tank; 7.3 – Bushings; and 7.4 – Tap

Changers). Therefore, each section has been meeting virtually coordinated by a team leader to come up a new revision.”

Task Force Section 7.2 – Main Tank (Active Parts) corresponded Annexes – Chuck Sweetser

Task Force Section 7.3 – Bushings and corresponded Annexes – Mario Locarno

Task Force Section 7.4 – Tap Changers and corresponded Annexes – Marcos Ferreira

Note: We, team 3, would invite additional volunteers to our section to address reactor (preventive autotransformer) and series transformers to acknowledge the need for diagnostics of their conditions. It is a common practice in the United States using tap changers reactor, and resistor with series transformer.

7. Three Sections broke into three task forces new revision working progress summary

Team 1 – Section 7.2 – Main Tank Volunteers

C. Sweetser (team leader), Ed teNyenhuis, Don Doris, Robert Mayer, Ronald Hernandez, Peter Werelius, and Mario Locarno

C. Sweetser presented:

Our objective was to review Section 7.2 and make recommendations for changes. We are submitting a comment file that includes 180 comments that were generated during the review. We rated the comments as follows (see columns L-Q in Excel document):

- GREEN – Should be addressed/obvious
- YELLOW – Borderline/ may generate discussion
- RED – Do not address or required discussion/debate

We also placed text in each rating to help describe the possible effort required: SIMPLE, CHANGE, and ADD

Out of the 180 comment, 30 comments were selected as important and requiring effort beyond a simple edit: most likely involving WG discussion. The preselected comments are: 25-27, 29, 31-37, 46, 51, 57, 61, 71-75, 81, 117, 129, 135, 158, 159, 167, 168, 179, 181

We recommend the WG review the comments. If the WG approved these recommendations, we will proceed with a draft of changes.

Motion by Chuck Sweetser “Send the list of comments to the WG (Guests and Members) for Members to Vote if the group should proceed with draft changes. Wallace Binder seconded the motion. The members unanimously approved the motion.

Team 2 – Section 7.3 – Bushings Volunteers

Mario Locarno (team leader), JD Brafa, Eric Weatherbee, Peter Werelius, and Cornelius Plath

Mario Locarno presented:

- Work continues this section, including revisions and additions to technical content.
- Removed reference to measurement of contact resistance on bushings from Table 1 Maintenance Test Chart and all locations in the document
- Under the section for Capacitance and Power Factor added content concerning proper preparation of bushings (installed in power transformers) for field testing, safety concerns, and recommendation for investigation of suspected problems
- In addition, the section on recommendations for Hot Collar testing was completely revised in a detailed description of the process
- Added updated references to pertinent IEEE Standards along the way

A motion was brought out by Mario Locarno, but after some discussion on TF section 7.3 bushing to be revised more completely by John Brafa and Marion dropped the motion Therefore, the TF Section 7.3 Bushings will return a complete rewrite of the section to be sent out to members and guests for review well in time for the spring 2021 meeting and no objections from members.

Team 3 – Section 7.4 – Tap Changers Volunteers

Marcos Ferreira (team leader), Raka Levi, Peter Werelius, Cornelius Plath, Axel, Kraemer, Marc Foata, Niklas Gustavsson

Marcos Ferreira presented:

- As team leader I would like first to recognize the contribution of each task force team member: Raka Levi, Peter Werelius, Niklas Gustavsson, Axel Kraemer, Cornelius Plath, Marc Foata, Drew Welton, Mario Locarno, Olivier Lejay, and myself Marcos Ferreira.
- The team exchanged e-mails with comments and suggestions for the modifications.
- We met few times virtually through Microsoft Team to review and approve each comment presented by each member.
- As you can see on the Excel spreadsheet projected, it is the last version reviewed and approved by the team
- It is important to emphasize that each team member was aware of revising as well as the corresponded annex pertaining to the sections.
- Finally, on behalf of our team I would like to bring up about possible two additions: Diagnostics of Reactor (Preventive Auto) and of Series Transformers as part of Load-Tap Changers. We need to define working principle and test diagnostic specifically for them". This would be added to section 7.4, which was not considered at previous revisions of the document. Therefore, we're looking for volunteer members considered themselves experts.

Marcos suggested that also group 7.4 will send out a draft for review to Members and Guests well in time for the spring 2021 meeting to follow the same approach presented by John Brafa and Mario Locarno.

8. New Businesses

Quite a bit of general discussion. Wallace Binder asked about opinions of the submitted proposal of change of table 1. Add a column for “receipt” before commissioning test. **Motion:** by Wallace Binder: “Each section, e.g. 7.1, 7.2 and 7,3 to review proposed added column “Receipt” in Table 1. Drew Walton seconded the motion. No discussion. No objections the members approved unanimously the motion.

9. Meeting Adjournment

The meeting adjourned at 2:05PM

Respectfully submitted,
 Marcos Ferreira – Chair
 Raka Levi – Vice Chair
 Peter Werelius – Secretary

L.3.6 WG PC57.163 IEEE Guide for Establishing Power Transformer Capability while under Geomagnetic Disturbances

10:50 AM to 12:05 PM Central, October 20, 2020
 Virtual Session

Unapproved Minutes

WG Chair Dan Blaydon presided over this meeting, with WG Vice-Chair Dr. Ramsis Girgis and WG Secretary Scott Digby also in attendance. This was the first meeting of this new Working Group, with 118 attendees, with 58 attendees requesting membership during the Poll taken during the meeting. Including the three WG officers the WG membership is 61. Participants were advised that membership requests made thru the meeting session Chat feature would be accepted, as well as email requests from attendees to the WG Chair and/or Secretary. The meeting attendance list is included at the end of this report. One attendee was not identifiable from the records received from PSAV, which is also noted at the end of the attendee list.

The Chair reviewed the IEEE essential patent claim slides and the IEEE copyright policy. There were no responses to the call for patents.

The WG Chair reported that the PAR was submitted in January-2020, was approved in March-2020, and has an expiration date of December 31, 2024. In order to introduce the revision effort to the attendees and to encourage participation, the WG Chair gave a presentation detailing the original development process. This included a chronological review of industry activities from the Feb-2012 IEEE Spectrum article “*Here Comes The Sun: How A Solar Superstorm Could Take Down Power Grids EVERYWHERE*” to Jan-2014 PAR submittal thru the Sept-2015 approval of the current Guide, noting the expedited nature of that original development process for the guide.

The WG Vice-Chair provided a discussion of an initial list of proposed updates and additions, reporting that much has been learned and developments have been made in the past 5-years since approval of the current Guide. This includes incorporating more recent calculation methods that have been developed as well as expanding content to incorporate guidance relative to a typical time series of a GIC signature such as the NERC reference GIC signature from TPL-007, which was not in place at publication of the current document.

It was mentioned by an attendee that we are currently entering solar activity cycle 25, which is predicted to be less severe than cycle 24.

Attendees advised that there is an active Task Force within an IEEE Task Force on Power Equipment Vulnerability to GIC under the WG on Modeling and Analysis of System Transients using Digital Programs, and that CIRGE is scheduled to publish document A257 covering GMD topics.

For next steps, the WG is soliciting volunteers to review and contribute potential revisions and/or additions to the document, with attendees encouraged to email the WG Chair to indicate parts of the Guide they can and would like to contribute to. The WG Chair encouraged end users and manufacturers to share experience with using the guide.

Some additional suggestions regarding areas to review were brought up by attendees. This including whether countermeasure or mitigation should be considered. This is specifically excluded by the current scope with the basis noted during the meeting as being that it tends to be more of a power system topic rather than a Transformers Committee topic. It was noted that this guide is specific to power transformers and a statement was made that GMD impact on shunt reactors is not significant.

The WG Chair stated that a copy of the currently published document would be obtained from IEEE as the initial Draft document for this WG. This document will be posted to the Transformers Committee website using a special password, which will subsequently be shared with WG members.

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

Respectfully Submitted,
Scott Digby, WG Secretary

L.3.7 IEEE / IEC Continuous Cross Reference

Minutes of the Task Force Meeting

The task force meeting was held at 2.20pm on October 19, 2020. The chair presented the patent and copyright slides. A poll was conducted for the quorum. 3 of 4 members were present, so a quorum was achieved, 16 guests also attended, for a total attendance of 19. The agenda for Fall 2020, Fall 2019, Fall 2018 and minutes of meeting for Fall 2019, Fall 2018 and Fall 2016 were approved unanimously.

This was followed with a detailed presentation on the differences between IEEE Std. C57.91-2011 IEEE Guide for Loading Mineral-Oil-Immersed Transformers and Step-Voltage Regulators and IEC 60076-7-2018 POWER TRANSFORMERS – Part 7: Loading guide for mineral-oil-immersed power transformers by Richard Marek.

The task force meeting was adjourned at 3.28 pm.

Respectfully submitted
Vinay Mehrotra
TF Chair
October 19, 2020

Presentation from Richard Marek will be available upon request.

L.4 Old Business

There was no old business discussed.

L.5 New Business

Motion made by Steve Antosz, C57.12.90 and seconded by Steve Snyder, C57.12.00 to go to Ballot, and it passed unanimously with permission to include work prepared by PCS TF for revisions that were approved by the TV at the fall 2019 meeting.

L.6 Adjournment

The meeting was adjourned at 4:50 PM CST.

Respectfully submitted,
Marcos Ferreira
Standards SC Secretary

# of Attendees	Last	First	Email	Role	Request Membership	Check-in
1	abbas	Mubarak	mubarak.abbas@siemens.com	GUEST		*
2	Antosz	Steve	santosz@comcast.net	MEMBER		*
3	Arteaga	Javier	javier.arteaga@hitachi-powergrids.com	GUEST		*
4	Avanoma	O	o.avanoma@outlook.com	GUEST		*
5	Avila	Hugo	hugo.p.avila@us.abb.com	GUEST		*
6	baitun	yang	yangbaitun@uptegraff.com	NOT FOUND		*
7	Balae	Balakrishnan	balae07@gmail.com	GUEST		*
8	Ballard	Robert	robert.c.ballard@ieee.org	MEMBER		*
9	Banks	Darrell	dbanks@mlgw.org	GUEST		*
10	Bargone	Gilles	gilles.bargone@gmail.com	GUEST	YES	*
11	Barrientos	Israel	juanangel.barrientos@prolecge.com	GUEST		*
12	Baumgartner	Chris	chris.baumgartner@we-energies.com	GUEST		*
13	Beaster	Barry	blbeaster@ieee.org	GUEST		*
14	Beauchemin	Claude	beauchemin@tjh2b.com	GUEST		*
15	bernesjo	Mats	mats.s.bernesjo@hitachi-powergrids.com	GUEST		*
16	Berube	Jean-Noel	jnberube@ruggedmonitoring.com	GUEST		*
17	bidhendi	hossein	hossein.nabi-bidhendi@us.abb.com	GUEST		*
18	Bishop	Ryan	rbishop@mnpower.com	GUEST		*
19	Blackburn	Gene	g.blackburn@ieee.org	GUEST		*
20	Blaydon	Daniel	daniel.blaydon@bge.com	MEMBER		*
21	Boettger	William	weboettger@aol.com	GUEST	YES	*
22	bonfiglio	susan	abonfig@wapa.gov	GUEST		*
23	Bradshaw	Jeremiah	jbradshaw@usbr.gov	GUEST		*
24	Brzoznowski	Steve	stbrzoznowski@bpa.gov	GUEST		*
25	Buchgeher	Erich	erich.buchgeher@siemens.com	GUEST		*
26	Calitz	David	david.calitz@siemens.com	GUEST		*
27	chiang	solomon	schiang@thegundcompany.com	GUEST		*

# of Attendees	Last	First	Email	Role	Request Membership	Check-in
28	Chorzepa	Jaroslav	jaroslav.chorzepa@us.abb.com	GUEST		*
29	Christodoulou	Larry	l.christodoulou@epsii.com	MEMBER		*
30	Colopy	Craig	craigacolopy@eaton.com	MEMBER		*
31	Dauzat	Thomas (Tom)	thomas.dauzat@ge.com	GUEST	YES	*
32	davis	Eric	edavis@burnsmcd.com	GUEST		*
33	Davoudi	Pouneh	pdavoudi@deltastar.com	GUEST		*
34	Dent	Brandon	bdent@mlgw.org	GUEST		*
35	Digby	Scott	scott.digby@duke-energy.com	GUEST	YES	*
36	Doak	Eric	ericdoak88@gmail.com	GUEST	YES	*
37	Dutta Roy	Samraghi	samraghi.dutta_roy@siemens.com	GUEST		*
38	Eckroth	Megan	megan.m.kell@gmail.com	GUEST		*
39	Ermakov	Evgenii	evgenii.ermakov@hitachi-powergrids.com	GUEST		*
40	Espindola	Marco	mespindola@ieee.org	GUEST		*
41	Fattal	Feras	ffattal@hydro.mb.ca	GUEST		*
42	Faur	Florin	florin.faur@spx.com	GUEST	YES	*
43	Fausch	Reto	reto.fausch54@gmail.com	GUEST		*
44	Ferreira	Marcos	mdferreira@comcast.net	SECRETARY		*
45	Forsyth	Bruce	bruce.forsyth@ieee.org	MEMBER		*
46	Foschia	John	john.foschia@spx.com	GUEST		*
47	Frimpong	George	george.k.frimpong@hitachi-powergrids.com	GUEST		*
48	Ghosh	Saurahb (Rob)	sghrob@gmail.com	MEMBER		*
49	Girgis	Ramsis	ramsis.girgis@Hitachi-powergrids.com	GUEST	YES	*
50	Gossett	Shawn	sgossett@ameren.com	GUEST		*
51	Graham	Jim	jimgraham@ieee.org	MEMBER		*
52	griesacker	bill	bgriesacker@verizon.net	MEMBER		*
53	Hamoir	Didier	dhamoir@transproco.com	GUEST		*
54	Harden	Kenneth	kenneth.harden@se.com	GUEST		*
55	Hernandez	Ronald	rhernandez@doble.com	GUEST		*
56	Hernandez Cano	Sergio	shernan@hammondpowersolutions.com	GUEST		*
57	Herron	John	herronjph@aol.com	MEMBER		*
58	Hoffman	Gary	grhoffman@ieee.org	MEMBER		*
59	Hoffman	Saramma	shoffman@pplweb.com	GUEST		*
60	Hollrah	Derek	dhollrah@burnsmcd.com	GUEST		*
61	Holt	Curt	cholt@mlgw.org	GUEST		*
62	Hopkinson	Philip	phopkinson@hvolt.com	MEMBER		*
63	Ismail	Guner	ismailguner@ieee.org	GUEST		*
64	Issack	Ramadan	raissack@aep.com	GUEST	YES	*
65	John	John	John_John@vatransformer.com	MEMBER		*
66	John	Cihangir	cihangir.sen@duke-energy.com	GUEST		*

# of Attendees	Last	First	Email	Role	Request Membership	Check-in
67	Johnson	Toby	toby.johnson@pacificorp.com	GUEST		*
68	Jonak	Ryan	ryan.jonak@pgn.com	GUEST		*
69	joshi	akash	akash.d.joshi@ieee.org	GUEST	YES	*
70	Kádár	László	laszlo.kadar@hatch.com	GUEST		*
71	Kaineder	Kurt	kurt.kaineder@siemens.com	GUEST	YES	*
72	kennedy	Sheldon	skennedy@niagaratransformer.com	GUEST		*
73	Kessler	Stacey	SKessler@bepc.com	GUEST		*
74	King	Gary	gking@howard.com	GUEST		*
75	Kirchenmayer	Egon	egon.kirchenmayer@siemens.com	GUEST		*
76	Klein	Ken	ken00klein@gmail.com	GUEST		*
77	Knapek	Will	will.knapek@omicronenergy.com	GUEST	YES	*
78	Koshel	Anton	akoshel@deltastar.com	GUEST		*
79	Kostich	Nick	nkostich@ameren.com	GUEST		*
80	Kraemer	Axel	A.kraemer@reinhausen.com	GUEST	YES	*
81	kumaria	deepak	dkkumaria@gmail.com	GUEST		*
82	Kuppuswamy	Raja	raja.kuppuswamy@dynamicratings.com	GUEST		*
83	Lamontagne	Donald	donald.lamontagne@aps.com	GUEST		*
84	Larison	Andrew	Andrew.T.Larison@us.abb.com	GUEST		*
85	Lee	Moonhee	lee.moonhee@gmail.com	GUEST		*
86	Li	Weijun	wli@beld.com	GUEST		*
87	Li	Yaquan	yaquan.li@bchydro.com	GUEST		*
88	Locarno	Mario	mlocarno@doble.com	GUEST	YES	*
89	Mai	Tim-Felix	tim-felix.mai@siemens.com	GUEST		*
90	Marek	Richard	rick.marek@gmail.com	MEMBER		*
91	Marlow	J.Dennis	denmar@ieee.org	GUEST		*
92	Martinez	Joaquin	martinez.joaquin@siemens.com	GUEST		*
93	Matthews	Lee	lmatthews@ieee.org	GUEST		*
94	Mcfadden	Matthew	Matthew.Mcfadden@oncor.com	GUEST	YES	*
95	McNelly	Susan	susan.j.mcnelly@xcelenergy.com	MEMBER		*
96	mehrotra	vinay	vinay.mehrotra@spx.com	MEMBER		*
97	Middleton	Bob	bob.middleton@rhmintl.com	GUEST		*
98	Morales-Cruz	Emilio	emorales@qualitrolcorp.com	GUEST		*
99	Murphy	Jerry	jerry.murphy@ieee.org	CHAIR		*
100	Musgrove	Ryan	ryan.musgrove@ieee.org	GUEST		*
101	Naderian	Ali	ali.naderian@ieee.org	GUEST		*
102	Nambi	Shankar	snambi@bechtel.com	MEMBER		*
103	Narawane	Aniruddha	aniruddha.narawane@pdicorp.com	GUEST		*
104	Natale	Anthony	anatale@hicoamerica.com	GUEST		*
105	Neild	Kris	kris.neild@megger.com	MEMBER		*

# of Attendees	Last	First	Email	Role	Request Membership	Check-in
106	Nesvold	Brady	banesvold@ieee.org	GUEST		*
107	niroulaa	ashmita	ashmita.niroulaa@ergon.com	GUEST		*
108	Ocon	Rodrigo	rocon@condume.com.mx	GUEST		*
109	O'Malley	Anastasia	omalleya@coned.com	GUEST		*
110	Panesar	Parminder	parminder_panesar@vatransformer.com	GUEST		*
111	Patel	Poorvi	ppatel@epri.com	GUEST		*
112	Penny	Brian	bpenny@atcllc.com	GUEST		*
113	Perkins	Mark	markperkins82@hotmail.com	GUEST		*
114	Podany	Nick	npodany@usbr.gov	GUEST		*
115	Powell	Chris	chris.powell@ie-corp.com	GUEST		*
116	Prince	Jarrold	jarrod.prince@ermco-eci.com	GUEST		*
117	Reed	Scott	sreed@mvadiagnostics.com	GUEST		*
118	Reepe	Robert	rbreepe@southernco.com	GUEST		*
119	Reimer	Jonathan	jonathan.reimer@fortisbc.com	GUEST		*
120	Reiss	Tony	treiss@custommaterials.com	GUEST		*
121	Rezaei-Zare	Afshin	rezaei@eecs.yorku.ca	GUEST	YES	*
122	Robalino	Diego	diego_robalino@ieee.org	GUEST		*
123	Rocque	Tim	tim.rocque@spx.com	GUEST		*
124	Rodriguez	Leopoldo	apolo15@live.com	GUEST		*
125	Roman	Zoltan	zoltan.roman@ge.com	GUEST		*
126	S ?????	Rachel (PSAV)	ve001@psav.com	NOT FOUND		*
127	Saad	Mickel	mickel.saad@hitachi-powergrids.com	MEMBER		*
128	Sampat	Mahesh	maheshsapat@gmail.com	GUEST		*
129	Sanchez	Albert	Albert.Sanchez@kub.org	GUEST		*
130	Sankarakurup	Dinesh	dinesh.sankarakurup@duke-energy.com	GUEST		*
131	Sauer	Daniel	danielmsauer@eaton.com	VICE-CHAIR		*
132	Sawant	ANIL	anil_sawant@vatransformer.com	GUEST		*
133	Schiessl	Markus	markus.schiessl@sgb-smit.group	GUEST		*
134	Sharma	Devki	devkisharma@ieee.org	GUEST		*
135	sharpless	sam	slsharpless@rimkus.com	GUEST		*
136	Shertukde	Hemchandra	shertukde@hartford.edu	GUEST	YES	*
137	Shull	Stephen	sshull@ckt.net	MEMBER		*
138	Sinclair	Jonathan	jjsinclair@pplweb.com	GUEST		*
139	Slattery	Chris	cslattery@firstenergycorp.com	GUEST		*
140	Smith	Adam	adam.smith@cai-engr.com	GUEST		*
141	Smith	James Edward	edsmith@h-jenterprises.com	GUEST		*
142	Snyder	Steve	slsnyder@ieee.org	MEMBER		*
143	Soto	Mauricio	mausotog@hotmail.com	GUEST		*
144	Spurlock	Mike	mspurlock@ieee.org	GUEST		*

# of Attendees	Last	First	Email	Role	Request Membership	Check-in
145	Stank	Markus	m.stank@reinhausen.com	GUEST		*
146	Stankes	Dave	dsstankes@mmm.com	GUEST		*
147	Strongosky	Neil	nstrongosky@mlgw.org	GUEST		*
148	Sullivan	Kevin	kevin.sullivan@duke-energy.com	GUEST		*
149	Sweetser	Charles	charles.sweetser@omiconenergy.com	GUEST		*
150	Taylor	Marc	marc.taylor@cogentpowerinc.com	GUEST		*
151	Tedesco	Joseph	joseph.l.tedesco@hitachi-powergrids.com	GUEST		*
152	Tendulkar	Vijay	VIJAY.TENDULKAR@PDICORP.COM	GUEST		*
153	teNyenhuis	Ed	edt@ieee.org	GUEST		*
154	trifunoski	risto	risto.trifunoski@trench-group.com	GUEST		*
155	Upadhyay	Parag	parag.upadhyay@us.abb.com	GUEST		*
156	Varnell	Jason	jason.r.varnell@ieee.org	GUEST	YES	*
157	Veens	Jos	Jos.Veens@sgb-smit.group	GUEST		*
158	Verdell	Josh	josh.verdell@ermco-eci.com	GUEST		*
159	Verdolin	Roger	roger.verdolin@shaw.ca	GUEST	YES	*
160	Vijayan	Krishnamurthy	kvijayan@ptitransformers.com	GUEST		*
161	Vir	Dharam	dharam.vir@spx.com	GUEST	YES	*
162	vo	duy	duy.vo@avangrid.com	GUEST		*
163	Vyas	Pragnesh	pvyas@solomoncorp.com	GUEST		*
164	Walder	Nick	nickwalder@eaton.com	GUEST		*
165	Waldrop	Mike	mwaldrop@mlgw.org	GUEST		*
166	Walia	Sukhdev	SDEV.WALIA@GMAIL.COM	MEMBER		*
167	Wallach	David	david.wallach@ieee.org	GUEST	YES	*
168	Warntjes	Mike	mwarntjes@atcllc.com	GUEST		*
169	Washburn	Alan	awashburn@burnsmcd.com	GUEST		*
170	Webb	Bruce	bruce.webb@kub.org	GUEST		*
171	weiss	zachery	zweiss@weg.net	GUEST		*
172	Welton	Drew	dwelton88@live.com	GUEST	YES	*
173	Werelius	Peter	peter@werelius.eu	GUEST		*
174	Whitehead	Bill	bill.whitehead@siemens.com	GUEST	YES	*
175	Wright	Jeffrey	jwright@duqlight.com	GUEST		*
176	Zaman	Malia	m.zaman@ieee.org	GUEST		*
177	Zanwar	Anand	anand.zanwar123@gmail.com	GUEST	YES	*
178	Zemanovic	Kyle	kylezemanovic@eaton.com	GUEST		*
179	zhao	peter	peter.zhao@hydroone.com	MEMBER		*
180	Zibert	Kris	kris.zibert@amce.com	MEMBER		*

Subsurface Transformers and Network Protectors Subcommittee Meeting Minutes

Chairman: George Payerle

Vice-Chair: Tony Reiss

Meeting Date: 10/21/2020 **Location:** Wherever you are **Time:** 10:50 – 12:05 CT

Meeting Administration:

Meeting opened at 10:51 CT

- Sign In
- Chairman's Comments
 - Ken Hampton requested membership in at F19 meeting and is now a member
- Quorum Determination, member list
 - 52 participants – 21 polled as members, Bruce Webb – KUB participated by phone and was added to member poll tally. 31 guests. No SC membership requests.
 - Quorum reached with 21 of 37 members – 57%
- Patent Slides – reviewed and none sited
- Copyright rules – reviewed
- Approval of the Agenda – hearing no objections, agenda approved
- Approval of the Fall 2019 minutes
 - Motion by Gary Hoffman to approve, 2nd by Brian Klaponski – Unanimously approved

SC Members Present

Israel	Barrientos	Prolec GE
Douglas	Craig	Richards Manufacturing Co.
Thomas	Dauzat	General Electric
Larry	Dix	Quality Switch, Inc.
Mark	Faulkner	EATON Corporation
Carlos	Gaytan	Prolec GE
Said	Hachichi	Hydro-Quebec
Kenneth	Hampton	Baltimore Gas & Electric
Gary	Hoffman	Advanced Power Technologies
Brad	Kittrell	Consolidated Edison Co. of NY
Brian	Klaponski	Carte International Inc.
Charles	Morgan	Eversource Energy
George	Payerle	Carte International Inc.
Juan	Ramirez	CELECO
James	Ratty	Electronic Technology Inc.
Clemens	Reiss IV	Custom Materials, Inc.
Pedro	Salgado	Electronic Technology Inc.
Dan	Schwartz	Quality Switch, Inc.

Subsurface Transformers and Network Protectors Subcommittee Meeting Minutes

Jeremy	Sewell	Quality Switch, Inc.
Adam	Sewell	Quality Switch, Inc.
Alan	Traut	Howard Industries
John	Vartanian	National Grid
Joshua	Verdell	ERMCO

SC Guests Present

Jerry	Allen	Metglas, Inc.
Kevin	Biggie	Weidmann Electrical Technology
William	Elliott	General Electric
Benjamin	Garcia	Southern California Edison
Ali	Ghafourian	H-J Enterprises, Inc.
Zoran	Goncin	PTI Transformers
Kendrick	Hamilton	Power Partners, Inc.
Didier	Hamoir	Transformer Protector Corp
* Ramadan	Issack	American Electric Power
Robert	Kinner	FirstPower Group LLC
Kyle	Knous	EATON Corporation
Andrew	Larison	Hitachi ABB Power Grids
Jinesh	Malde	M&I Materials Inc.
Vinay	Patel	Consolidated Edison Co. of NY
Chris	Pitts	Howard Industries
Fernando	Saldivar	Prolec GE
Nick	Sewell	Alabama Power
* Avijit	Shingari	Pepco Holdings Inc.
Audrey	Siebert-Timmer	IFD Corporation
Edward	Smith	H-J Family of Companies
Adam	Smith	Commonwealth Associates, Inc.
Eric	Theisen	Metglas, Inc.
Timothy	Tillery	Howard Industries
* Parag	Upadhyay	ABB Inc.
Duy	Vo	Central Maine Power (AVANGRID)
Eric	Wallace	Photon Control
Shelby	Walters	Howard Industries
Bruce	Webb	Knoxville Utilities Board
Kyle	Zemanovic	EATON Corporation

* Requested membership

Working Groups Report:

Subsurface Transformers and Network Protectors Subcommittee Meeting Minutes

- **C57.12.23 Single-Phase Submersible Transformers** working group –
- **NOT MEETING AT THIS TIME**

Alan Traut, Chairman,

- Revision due date: 12/31/2028
- PAR Approval Date: 12/5/2018
- PAR Expiration Date:

Stage: On break

- **C57.12.24 Three-Phase Submersible Transformers** working group –
Ben Garcia, Chairman; Tom Dautat, Vice Chair; George Payerle, Secretary
 - Approved: **12/7/2016**
 - Revision Due Date: **6/17/2026**
 - PAR Approval Date:
 - PAR Expiration Date: **12/31/26**

Stage: Recently Approved

Members present

Israel	Barrientos	Prolec GE
Piotr	Blaszczyk	Specialty Transformer Components
John	Chisholm	IFD Corporation
Rhett	Chrysler	ERMCO
Douglas	Craig	Richards Manufacturing Co.
Michael	Dahlke	Central Moloney, Inc.
Thomas	Dautat	General Electric
Larry	Dix	Quality Switch, Inc.
William	Elliott	General Electric
Benjamin	Garcia	Southern California Edison
Carlos	Gaytan	Prolec GE
Said	Hachichi	Hydro-Quebec
Kenneth	Hampton	Baltimore Gas & Electric
Robert	Kinner	FirstPower Group LLC
Brad	Kittrell	Consolidated Edison Co. of NY
Brian	Klaponski	Carte International Inc.
Charles	Morgan	Eversource Energy
Michael	Morgan	Duke Energy
George	Payerle	Carte International Inc.
Jarrold	Prince	ERMCO
Juan	Ramirez	CELECO
James	Ratty	Electronic Technology Inc.
Pedro	Salgado	Electronic Technology Inc.
Michael	Thibault	Pacific Gas & Electric
Alan	Traut	Howard Industries
Reinaldo	Valentin	Duke Energy
Jeremy	Van Horn	IFD Corporation
John	Vartanian	National Grid

Subsurface Transformers and Network Protectors Subcommittee Meeting Minutes

Guests present

Scott	Abbott	PPG
Jerry	Allen	Metglas, Inc.
Kevin	Biggie	Weidmann Electrical Technology
Ali	Ghafourian	H-J Enterprises, Inc.
Zoran	Goncin	PTI Transformers
James	Holt	Memphis Light, Gas & Water
*Ramadan	Issack	American Electric Power
Charles	Johnson	Hitachi ABB Power Grids
Kyle	Knous	EATON Corporation
Andrew	Larison	Hitachi ABB Power Grids
Olivier	Lejay	Huaming USA Corp.
Vinay	Patel	Consolidated Edison Co. of NY
Clemens	Reiss IV	Custom Materials, Inc.
Albert	Sanchez	Knoxville Utilities Board
Dan	Schwartz	Quality Switch, Inc.
Ewald	Schweiger	Siemens Energy
Jeremy	Sewell	Quality Switch, Inc.
Adam	Sewell	Quality Switch, Inc.
Nick	Sewell	Alabama Power
Avijit	Shingari	Pepco Holdings Inc.
Audrey	Siebert-Timmer	IFD Corporation
*Christopher	Sullivan	Westmark Partners
*Radoslaw	Szewczyk	Specialty Products Poland Sp. z o.o.
Joseph	Tedesco	Hitachi ABB Power Grids
Eric	Theisen	Metglas, Inc.
Joshua	Verdell	ERMCO
Duy	Vo	Central Maine Power (AVANGRID)
Shelby	Walters	Howard Industries
*Kyle	Zemanovic	EATON Corporation

* Requested membership

The F20 Webex meeting was called to order at 9:25 AM CT with Ben Garcia as chair, Tom Dautat as vice-chair and George Payerle as secretary. There were 28 members and 29 guests in attendance. There was a quorum. Membership requirement for 12.24 is that you have attended 2 meetings in a row or 3 of the last 5. Four guests requested membership at the F20 meeting. Christopher Sullivan, Audrey Siebert-Timmer, Ramadan Issack have now met membership requirements and will be members at the S21 meeting. Kyle Zemanovic does not qualify yet but will if he attends the S21 meeting.

Previously three people qualified and became members at the Columbus meeting: Fred Friend, Larry Dix, and Jim Spaulding.

George Payerle moved to approve the agenda and Israel Barrientos seconded. The motion passed unanimously. Jeremy Sewell moved to accept the minutes of the fall 2019 meeting in

Subsurface Transformers and Network Protectors Subcommittee Meeting Minutes

Columbus and Brian Klaponski seconded. The minutes were approved unanimously. The chair showed the patent slides. There were no disclosures. The chair showed the copyright slides and the secretary provided a brief explanation.

The Chair noted that work on the PAR was begun at the S19 Anaheim meeting. The PAR will expire December 31, 2023. We have 4 working meetings to finalize the draft and get it to review and resolve comments.

Old business: - Revision of table 6 which concerns minimum material thickness was delayed until the Spring 2020 Toronto (or Virtual) meeting.

Will Elliott and Tom Dauzat presented their findings from salt spray testing samples for 1000 and 3000 hours. Details of the presentation will be posted on the website. Will noted that though the test calls for 5 samples to be tested, only one was tested. Results of the testing may prompt a reevaluation of the numbers in Table 6. One of their findings was that paint protects CU bearing steel. Brian Klaponski noted that corrosion may also depend on the temperature of the environment that the equipment is operating in.

The chair went through the standard and there was a discussion on Section 4.1 Cooling air temperature limit. After much discussion, members voted on an amended motion made by Brian Klaponski and seconded by George Payerle to add the words “for any 15 minute period” after the words “shall not exceed 50 degrees C”. The motion was carried with 15 votes for and 6 votes against.

There was also discussion on section 2 Normative references specifically how IEEE C57.12.00-2015 is referenced. All the other standards are referenced without date and it is expected that the user will look for the most recent version of the standard. It was decided that this is correct and that to make the standard more correct, table 2 from C57.12.40 should be included in C57.12.24.

The meeting was adjourned at 10:38 AM CT. The next meeting will be either virtually or in Toronto, Ontario, Canada on Tuesday April 27, 2021.

Respectfully Submitted by: Ben Garcia, Chairman C57.12.24 Working Group

-
- **C57.12.40 Secondary Network Transformer** working Group –
Dave Blew, Chairman, Dan Schwartz, Secretary
 - Published 2017
 - Revision due date: **12/31/2027**
 - PAR Approval Date: 8/31/2012
 - PAR Expiration Date: **12/31/2023**

Subsurface Transformers and Network Protectors Subcommittee Meeting Minutes

Stage: Submitted to Revcom on RevCom Agenda 04-May-2017

IEEE Transformers Committee

C57.12.40

Secondary Network Transformer Working Group

Fall 2020 Virtual Meeting Minutes

WebEx

10:50 am October 20, 2020

Members Present

Dan Schwartz (Secretary)
Douglas Craig
Tom Dauzat
Larry Dix
William Elliott
Mark Faulkner
Brad Kittrell
Brian Klaponski
Charles Morgan
George Payerle
James Ratty
Pedro Salgado
Adam Sewell
Jeremy Sewell
John Vartanian

Company

Quality Switch
Richards Manufacturing Co.
Prolec GE
Quality Switch
Prolec GE
Eaton Corporation
Consolidated Edison Co. of NY
Carte International Inc
Eversource Energy
Carte International Inc
Richards Manufacturing Co.
Electronic Technology Inc.
Quality Switch
Quality Switch
National Grid

Guests Present

Scott Abbott
*Juan Acosta
Jerry Allen
Erich Buchgeher
Lucas Coffey
John Crouse
Attila Gyore
Didier Hamoir
Robert Kinner
Kyle Knous
Kent Miller
Ashmita Niroula
Vinay Patel
Anil Sawant
*Avilit Shingari
*Travis Spone
Christopher Sullivan
Mike Waldrop

Company

PPG
Ergon, Inc.
Metglas, Inc.
Siemens AG
Alabama Power
Roswell Alliance
Midel
Transformer Protector Corp.
First Power Group LLC
Eaton Corporation
T&R Electric Supply
Ergon, Inc.
Consolidated Edison Co. of NY
Virginia Transformer Corp.
Pepco
Eaton Corporation
Westmark Partners
Memphis Light, Gas & Water

Subsurface Transformers and Network Protectors Subcommittee Meeting Minutes

Malia Zaman
*Kyle Zemanovic

IEEE
Eaton Corporation

*Requested Membership

- 1) The group met on Tuesday, October 20, 2020 at 10:50 am with 15 members and 20 guests. Four (4) guests requested membership. Quorum was not achieved with 15/35 (43%) of members present.
- 2) A call for patents was made; none were mentioned.
- 3) Copyright requirements were reviewed by the Chair.
- 4) An agenda was presented and approved, and introductions were made.
- 5) The minutes of the October 29, 2019, meeting in Columbus, OH were reviewed. The minutes were approved unanimously.
- 6) The Secretary served this meeting as Chair.
- 7) The Chair reviewed that the PAR was approved and became active May 21, 2019 and expires December 31, 2023.
- 8) Old Business - The Chair reviewed the previous meetings list of topics to be addressed in the next revision of C57.12.40 and the following items were discussed:
 - a. It was discussed that the Task Force on Corrosion and Cathodic Protection was meeting later this afternoon to discuss results and finding of the past year. It was determined that Corrosion and Cathodic Protection should be addressed as separate items in the future revision. Both were requested to be inserted as informative annexes in the future revision along with addressing any required items within the standard as well. The current standard was reviewed by Dan Schwartz and Jeremy Sewell for areas that would require addressing corrosion and CP; it was then determined that this activity should wait to be fully addressed based on recommendations from the TF.
 - b. John Vartanian (National Grid) and Brad Kittrell (Consolidated Edison) agreed to present on Cathodic Protection initiatives (during the next meeting) at each respective company to provide some background on CP.
 - c. Brian Klaponski agreed to develop wording and scoping on standardized tank and throat sizing in the standard for the group to review at the next meeting.
 - d. Brian Klaponski agreed to develop wording and scoping on improved bushing standardization in the standard for the group to review at the next meeting.
 - e. John Vartanian and Brad Kittrell agreed to present at the next meeting on their respective company's primary switch location methodology regarding safety and operational requirements.
 - f. Dan Schwartz agreed to review C57.12.24 compared to C57.12.40 to identify any discrepancies between the two standards. He will also communicate with Ben Garcia (Chair of C57.12.24) to discuss findings.
 - g. Brian Klaponski (Carte) and Will Elliott (GE Prolec) agreed to review Tables 7 (up to 600 V), 8, and 9 to update them for current practical requirements.

Subsurface Transformers and Network Protectors Subcommittee Meeting Minutes

- h. Type testing for arc withstand was tabled until future meetings due to intellectual property concerns of each manufacturer and if that type of test can be developed.
- 9) New Business – The Chair opened the discussion on any new items the group felt needed to be addressed in the next revision.
- a. It was discussed that there needs to be some clarification of the testing required on primary switches pertaining to Section 6. Cory Morgan agreed to review the section and provide input on points of clarification that should be addressed.
- 10) The Chair discussed that we have a few meetings to hash out the proposed modifications to the current revision, but that we must be diligent about doing so in order to finish the next revision in a timely manner.
- 11) The meeting was adjourned at 11:35 PM with the next meeting set for Toronto, ON on April 27, 2020.

Respectfully submitted,
D. Schwartz, Secretary

• **Docu
ment
#:**

• **C57.12.44**

• **Docume
nt Title:**

• **STANDARD REQUIREMENTS FOR SECONDARY
NETWORK PROTECTORS**

• **Chai
r:**

• **Mark
Faulkner**

• **Vice-Chair**

• **Alex Macias**

• **Secr
etar
y**

• **n/a**

• **Current Draft Being
Worked On:**

• **DRAFT 10**

• **Da
ted
:**

• **October
19, 2020**

• **Meeting Date:**

• **October 19,
2020**

• **Time:**

• **4:45PM**

• Meeting Attendance

• Activity Name: C57.12.44 WG Secondary Network Protectors

Activity ID:

Number of Members in Activity = 20

Number of Members Present = 15

Subsurface Transformers and Network Protectors Subcommittee Meeting Minutes

Quorum Present = 57.1%

Number of attendees = 28

-
- Dan Schwartz • schwartz@qualityswitch.com • member
- Dan Mulkey • dhmulkey@ieee.org • member
- Brian Klaponski • brian.klaponski@carte.ca • member
- Thomas (Tom) Dauzat • thomas.dauzat@ge.com • member
- pedro salgado • pedro@eti-nj.com • member
- George • gpayerle@roadrunner.com • member
- James Ratty • jratty@eti-nj.com • member
- Jeremy Sewell • jsewell@qualityswitch.com • member
- Travis Spooone • travisspoone@eaton.com • member
- ADAM SEWELL • adamsewell@qualityswitch.com • member
- DougC • dougc@richards-mfg.com • member
- john vartanian • john.vartanian@nationalgrid.com • member
- Mark Faulkner • markafaulkner@eaton.com • member
- Charles.Morgan@eversource.com • member
- Cory Morgan • kittrellb@coned.com • member
- Brad •
-
- Malia Zaman • m.zaman@ieee.org • guest
- Brandon Dent • bdent@mlgw.org • guest
- Will Elliott • william.elliottjr@ge.com • guest
- Avijit Shingari • ashingari@pepco.com • guest
- vinay • patelvin@coned.com • guest
- Adam Smith • adam.smith@cai-engr.com • guest
- Tony Reiss • treiss@custommaterials.com • guest
- Nick Sewell • nsewell@southernco.com • guest
- Martín Muñoz • martin.munoz@orto.mx • guest
- jack.harley@firstpowergroupllc.com • guest
- jharley •
- Sam T. Reed • samtreed@eaton.com • guest

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- Kyle Knous • kyledknous@eaton.com • guest
- Ramadan Issack • raissack@aep.com • guest

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• Meeting Minutes / Significant Issues / Comments:

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- The minutes shall record the essential business of the Working Group, including the following items at a minimum:

- Call to order and any Chair's remarks

- **4:55 PM**
- **Focus on review of new 600V table and other changes in draft**
- **Draft for preparation and discussion for Ballot and MEC**

•

- Quorum Verification

- **Quorum was confirmed polling via webex**

•

- Confirmation of the essential patent statement and responses

- **No conflicts presented to group**

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- Approval of minutes of the previous meeting

- **Motion made by Doug Craig**
- **Minutes approved**

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- Approval of agenda for this meeting.

- **Motion made to accept agenda, any opposed**
- **No opposed; Agenda approved**

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- Technical

- **Discussion of the redline changes in the draft**

- **600V table reviewed and no changes requested**
- **Discussed and agreed to removing manufacturer references from fuses/connectors**
- **Revised 8.3 a) from Copper to Copper link for clarity and consistency through document**
- **Both small stud and spade terminal amperage range were set to 800-2000 where previously one had 800-1875 and the other had 800-2000**
- **Clarified verbiage on 11.5.3 to make less ambiguous**
- **Remove footnotes referencing manufacturer model numbers**
- **Add figure 9 to terminator pads, remove OD of pads as bolt circle diameter is the key dimension**
- **Fixed several grammatical, spelling, and format errors**

Subsurface Transformers and Network Protectors Subcommittee Meeting Minutes

- A motion was placed to accept the edits and send out revised draft for further review by Doug Craig, 2nd Cory Morgan
 - No opposition, motion passed
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- PAR expiration confirmed to be 12/31/2021
- Meeting adjourned at 5:55 pm
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- Spring meeting--date and location
 - Toronto, ON
 - Date: April 25th-29th 2021
- Copies of any handouts and/or subgroup reports will be made available as separate items but referenced by these minutes.
-
- Submitted by: Mark Faulkner
Date: 10/19/2020

. **C57.167 Guide for Monitoring Distribution Transformers** working group – Gary Hoffman, Chairman, Mike Thibault, Secretary ○ Revision due date: N/A – **new standard**

○ PAR Approval Date: **6/14/2018**

○ PAR Expiration Date: **12/31/2022**

Gary said he will summarize the meeting in the Dist SC but highlighted that the survey on load tap changers was conducted and several meetings have been held in 2020. There are plans for a January 2021 Google poll to STNP and DIST

**Subsurface Transformers and Network Protectors Subcommittee
Task force / Working Group Report**

- a. Will Elliott reviewed field corrosion measurement procedure that was followed during testing. No comments were received from the group.
- b. Will Elliott reviewed 1500 and 3000 hrs results from Salt-Spray testing
 - i. Test procedure was based on the new 1500 salt-spray test for BARE enclosure material (substrate) in C57.12.32-2019 with a few modifications. Details on test method is included in report that will be posted on the website.
 - ii. Test were performed on the bare and coated test panels with and without weld beads. Details on test samples are included in the report that will be posted on the website.
 - iii. Summary of test results are as follows:
 1. Bare Cu-bearing steel failed evaluation criteria of 2.5% as it had a 5.08% mass loss after 1500 hrs.
 2. Bare Cu- bearing steel with weld % mass loss increased to 8.04% after 1500 hrs.
 - iv. Will commented that there are concerns with the test method and potential with flawed measurements with the tests specified in the standard. These tests were performed as a preliminary experiment to give the group some data to decide where we should go next.
- c. Will Elliott reviewed results from material compatibility testing
 - i. Test procedure involved creating galvanic cells using various hardware materials and copper cathode combinations.
 1. Hardware components included bolts, washers and weld-nuts with the following materials: 304 Stainless Steel, Carbon-Steel, 303Se Stainless Steel, Silicon-Bronze and Galvanized Steel as a bonus.
 2. Cathode configurations: bare copper, coated copper, no copper
 3. Used silicone chalk to insulate electrical connections in order to measure galvanic potentials. Assemblies were suspended in an electrolyte solution in glass jars with nylon zip ties and various cathodes wrapped around the inside surface of the jar.
 4. Further details on test procedure can be found in the report which will be posted on the website.
 - ii. Test measurements involved measuring the % mass loss / year, as well as measuring depth of pit which was used to calculate pitting corrosion rate mm / year, and surface corrosion depth resulting in a similar mm / year rate. Details on measurement methods can be found in the report.
 - iii. Test results: surface corrosion
 1. Worst surface corrosion was found on Silicon Bronze hardware with copper cathode
 2. In general surface corrosion was the worst with a bare copper cathode, better with coated copper cathode and best with no copper cathode.

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- iv. Test results: pitting corrosion
 - 1. Worst pitting corrosion occurred on the stainless steel samples.
 - 2. In general pitting corrosion was the worst with a bare copper cathode, better with a coated copper cathode and best with no copper cathode.
 - 3. Using a coated copper cathode resulted 50% reduction in corrosion-rate at minimum
 - v. Will Elliott noted that cu-bearing steel was not tested.
 - vi. Will commented that galvanized steel samples were also tested and showed minimum corrosion but as this material is not used commonly in the industry we did not review the results in the meeting.
 - vii. Will commented that there are limitations in making conclusions based on the testing, and there are opportunities to improve and expand the test method. These tests were performed as a preliminary experiment to give the group some data to decide where we should go next. Of particular concern is the significant pitting corrosion observed on the stainless steel samples.
- d. The group discussed the results
- i. Zoran Goncin asked if the presented mass loss and corrosion rate were linked
 - 1. Will Elliott commented that mass loss was measured because that method is defined in the current C57.12.32-2019, and corrosion rate was not based on that measurement. He stated that corrosion rate was an independent and separate measurement based on physical measurement of final dimensions of the samples, and was not based on the mass loss measured.
 - 2. Tom Dauzat requested to add the term pit to the corrosion rate title to clarify. Will Elliott clarified that that column represented corrosion depth rate and included both pitting and uniform surface corrosion. The table was updated to reflect “corrosion depth rate”.
 - ii. Comment from Tom Dauzat: Fastenal recommend not mixing materials to limit corrosion (e.g. Stainless with Stainless). Did you see that in your results?
 - 3. Will Elliott same hardware is preferred but regardless material selection you will have crevices which could be a corrosion point.
 - iii. Comment from Tom Dauzat: 303se is supposed to be better for threads and galling, though you could add lubricant to mitigate this
 - 4. Steve Shull noted that if you add lubricant you will have apply higher torque.
 - iv. Christopher Sullivan asked if thread coatings / treatment would impact corrosion rates (e.g. Loctite, Teflon tape).

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5. Will Elliott not sure as we didn't test this. That being said, no corrosion was observed on the threads themselves
 - v. Zoran Goncin commented that it is best practice to have multiple test samples. Will Elliott agreed.
 - vi. It was noted that the silicone bronze and bare copper had 15.05 mm pit which is close to 0.5 inches!
 1. Will Elliott commented this is probably related to the amount of copper surface area in the cell.
 - vii. Jane Hall suggested testing samples as per ASTM standards and generate Tafel curves to compare corrosion performance. These methods are a bit more repeatable. Suggested we could also do a long-term corrosion test for 6 months.
- e. Will Elliott requested group input on the next steps / next test procedure:
 - i. Tom Dauzat volunteered to build boxes with pipe flanges for further testing
 - ii. Jane Hall volunteered to contribute in developing the test plan.
 - iii. Zoran Goncin mentioned he would provide comments to Will Elliott.
 - iv. Bob Kinner volunteered to contribute.
- f. Will requested vault information from users including size, volume, how much cooper is in the vault etc.
 - i. Brad Kittrell from ConEd volunteered to provide some information.
9. Next meeting: April 27; Toronto, Ontario, Canada
 - a. The 7 attendees requested membership and will be added to membership for the Spring 2021 meeting.
10. The meeting was adjourned at 1:35 PM CST.

Submitted by: Audrey Siebert-Timmer

Date: 20/10/2020

Old Business:

- No old business

New Business:

**Subsurface Transformers and Network Protectors Subcommittee
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- No new business

Next meeting:

- April 28, 2021 in Toronto, Canada

Meeting adjourned at 12:25 CT

Respectfully submitted by George Payerle 11/3/2020