



Transformers Committee

Chair: Bruce Forsyth **Vice Chair:** Ed teNyenhuis **Secretary:** David Wallach

Treasurer: Paul Boman **Awards Chair/Past Chair:** Sue McNelly

Standards Coordinator: Steve Shull

IEEE/PES Transformers Committee

Spring 2021 Meeting Minutes

**Virtual Sessions
April 26-29, 2021**

Unapproved

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

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- 6.0 Secretary's Report – David Wallach
- 7.0 Treasurer's Report – Paul Boman
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- 9.0 Administrative SC Meeting Report – Bruce Forsyth
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- 15.0 Meetings Planning SC Minutes & Report – Tammy Behrens
- 16.0 Reports from Technical Subcommittees (decisions made during the week)
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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 & Smoothing 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. Subsurface Trans & Network Protectors SC – George Payerle

General Administrative Items

1 AGENDA

Opening Session

Monday, April 26, 2021: 8:00 am - 9:00 am CDT (UTC-05:00)

(Attendance recorded by Webex attendance – 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 2020 Meeting Bruce Forsyth
5. Chair's Report & Administrative Subcommittee Report Bruce Forsyth
6. Vice Chair's Report Ed teNyenhuus
7. Secretary's Report David Wallach
8. Treasurer's Report Paul Boman
9. Standards Report Steve Shull
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
 - 10.5. Transactions on Power and Delivery (TPWRD) Editor Liaison Xose Lopez-Fernandez
11. Hot Topics for the Upcoming Week Subcommittee Chairs
12. New Business & Wrap-up Bruce Forsyth

Closing Session

Thursday, April 29, 2021: 11:00 am - 12:00 pm CDT (UTC-05:00)

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 Dan Sauer
 - 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 Sam Sharpless
- 3.12. Performance Characteristics Rogerio Verdolin
- 4. Additional Report from Standards Coordinator (issues from the week) Steve Shull
- 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	Ansari	Tauhid Haque	Hitachi ABB Power Grids	X	X
CM	Antosz	Stephen	Stephen Antosz & Associates, Inc	X	
CM	Arteaga	Javier	Hitachi ABB Power Grids	X	X
CM-LM	Ayers	Donald	Ayers Transformer Consulting	X	X

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
CM	Ballard	Robert	DuPont	X	X
CM-EM	Balma	Peter	Retired	X	
CM	Barrientos	Israel	Prolec GE	X	X
CM-LM	Beaster	Barry	The H-J Family of Companies	X	X
CM	Beauchemin	Claude	TJH2b Analytical Services	X	X
CM	Bell	Myron	Delta Star Inc.	X	X
CM	Betancourt	Enrique	Prolec GE	X	X
CM	Biggie	Kevin	Weidmann Electrical Technology	X	X
CM-LM	Binder	Wallace	WBBinder Consultant	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	Castellanos	Juan	Prolec GE	X	X
CM	Caverly	David	Trench Limited	X	X
CM	Cheema	Muhammad Ali Masood	Northern Transformer		
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	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		
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	Beale AFB		X
CM	Flores	Hugo	Hitachi ABB Power Grids	X	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	Foster	Derek	Magnetics Design, 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.		

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
CM	Garcia Wild	Eduardo	Siemens Energy	X	X
CM	Gardner	James	SPX Transformer Solutions, Inc.	X	X
CM	Gaytan	Carlos	Prolec GE	X	
CM-LM	Ghafourian	Ali	H-J Enterprises, Inc.	X	X
CM	Ghosh	Rob	GE	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	
CM	Hachichi	Said	Hydro-Quebec	X	X
CM	Hampton	Kenneth	Baltimore Gas & Electric	X	X
CM	Hardin	Michael	H-J Enterprises, Inc.	X	X
CM	Harley	John	FirstPower Group LLC	X	X
CM-LM	Hayes	Roger	General Electric	X	X
CM	Hernandez	Ronald	Doble Engineering Co.		
CM-LM	Herron	John	Raytech USA	X	X

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
CM	Hochanh	Thang	Surplec Inc.	X	X
CM	Hoffman	Gary	Advanced Power Technologies	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
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	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

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
CM	Kraemer	Axel	Maschinenfabrik Reinhausen	X	X
CM	Kulasek	Krzysztof	Hitachi ABB Power Grids		
CM-LM	Lackey	John	PowerNex Associates Inc.	X	X
CM	Leal	Gustavo	Dominion Energy		
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-LM	McTaggart	Ross	Trench Limited	X	X
CM	Mehrotra	Vinay	SPX Transformer Solutions, Inc.	X	X
CM	Melle	Thomas	HIGHVOLT	X	X
CM-LM	Miller	Kent	T&R Electric Supply Co.	X	X
CM	Moleski	Hali	SDMyers, LLC.	X	

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
CM	Mulkey	Daniel	Mulkey Engineering Inc.	X	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	X
CM	Narawane	Aniruddha	Power Distribution, Inc. (PDI)	X	
CM	Parkinson	Dwight	EATON Corporation	X	X
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
CM	Ploetner	Christoph	Hitachi ABB Power Grids	X	X
CM	Pointner	Klaus	Trench Austria GmbH	X	X

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
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	Rasco	Jimmy	Rasco Consulting LLC	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
CM	Roman	Zoltan	GE Grid Solutions	X	
CM	Roussell	Marnie	Entergy	X	
CM-LM	Sampat	Mahesh	EMS Consulting Inc.	X	X
CM	Sankarakurup	Dinesh	Duke Energy	X	X
CM	Sarkar	Amitabh	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

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
CM	Schroeder	Stephen	Hitachi ABB Power Grids		
CM	Schweiger	Ewald	Siemens Energy	X	X
CM	Selvaraj	Pugal	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		
CM	Sharp	Michael	Trench Limited	X	
CM	Sharpless	Samuel	Rimkus Consulting Group	X	X
CM-LM	Shertukde	Hemchandra	University of Hartford	X	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
CM	Snyder	Steven	Hitachi ABB Power Grids	X	X
CM	Solano	William	Instrument Transformer Equip Corp	X	X
CM	Som	Sanjib	Pennsylvania Transformer	X	X

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
CM	Spitzer	Thomas	City Transformer Service Co.	X	X
CM	Spurlock	Mike	Spurlock Engineering Services, LLC	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	Tanaka	Troy	Burns & McDonnell	X	X
CM-LM	Tendulkar	Vijay	Power Distribution, Inc. (PDI)		X
CM	teNyenhuis	Ed	Hitachi ABB Power Grids	X	X
CM	Thibault	Michael	Pacific Gas & Electric	X	X
CM	Thompson	James	T&R Service Company	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

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
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	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	
CM	Wallach	David	Duke Energy	X	X
CM	Watson	Joe	JD Watson and Associates Inc.		
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
CM-LM	Wilks	Alan	Consultant	X	X

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

Based upon the above attendance totals:

Quorum was achieved at Monday Opening Session (166/206=79%).

Quorum was achieved at Thursday Closing Session (148/206=71%).

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		

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
AP	Abbott	Scott	PPG		
II	Acosta	Juan	Ergon, Inc.	X	
II	Adams	Kayland	SPX Transformer Solutions, Inc.	X	X
PCM	Ahuja	Raj	Raj Ahuja Consulting	X	X
II	Almeida	Nabi	Prolec GE USA LLC		X
II	Amador	Angela	EATON Corporation		
II	Amarasinghe	Dinu	Bruce Power	X	
II	Andersen	Glenn	Fayetteville PWC	X	
AP	Andrade Medina	Juan Pablo	Olsun Electrics Corporation		
II	Ante	Gregory	Southern California Edison	X	X
II	Anthony	Stephen	--		
II	Antosz Jr.	Stephen	Siemens Industry		
II	Arevalo	Edmundo	Bonneville Power Administration	X	X
AP	Arnold	Elise	SGB		
II	Ashcraft	Stephen	Hitachi ABB Power Grids		
II	Avanoma	Onome	MJ Consulting		X
II	Avila	Hugo	Hitachi ABB Power Grids		
II	Babanna	Suresh	SPX Transformer Solutions, Inc.		X
AP	Bachand	Martin	Cloverdale Paint Inc.		
AP	Bargone	Gilles	FISO Technologies Inc.	X	X
AP	Bartek	Allan	Spruce Run Engineering LLC	X	X
II	Bates	Jared	Oncor Electric Delivery		

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
AP	Baumgartner	Christopher	We Energies	X	X
AP	Behrens	Tammy	SPX Transformer Solutions, Inc.	X	X
AP	Benach	Jeff	Consultant	X	
II	Benedict	Ramon	SPX Transformer Solutions, Inc.		X
II	Benzler	Olle	Megger	X	
II	Berland	Robert	Kiewit Power Engineers	X	X
AP	Bernesjo	Mats	Hitachi ABB Power Grids	X	X
AP	Berube	Jean-Noel	Rugged Monitoring Inc.	X	X
AP	Bigham	Lee	Instrument Transformer Equip Corp	X	
II	Bishop	Ryan	Minnesota Power	X	X
PCM	Blackburn	Thomas	Gene Blackburn Engineering		X
AP	Blaszczyk	Piotr	Specialty Transformer Components LLC	X	
AP	Blew	David	PSE&G		
II	Bohrn	Joshua	PacifiCorp		
AP	Bolar	Sanket	Megger	X	
AP	Bolliger	Alain	HV TECHNOLOGIES, Inc.	X	
AP	Bolliger, Ph.D.	Dominique	HV TECHNOLOGIES, Inc.		
II	Bonn	Mike	Soltex Inc.	X	
AP	Botti	Michael	Hyosung HICO		
AP	Bradshaw	Jeremiah	Bureau of Reclamation	X	X
AP	Brannen	Randy	Southern Company Services	X	
AP	Brauer	Stephan	Morgan Schaffer		

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
AP	Bray	Elizabeth	Southern Company Services	X	X
AP	Britton	Jeffrey	Phenix Technologies, Inc.	X	X
II	Brzoznowski	Steven	Bonneville Power Administration	X	X
II	Buchgeher	Erich	Siemens Energy		
AP	Calitz	David	Siemens Energy	X	X
II	Carrizales	Juan	Prolec GE	X	X
II	Casserly	Edward	Ergon, Inc.	X	X
AP	Chambers	Stuart	Powertech Labs Inc.	X	
AP	Chisholm	John	IFD Corporation	X	X
II	Chorzepa	Jaroslav	ABB Inc.		
AP	Christodoulou	Larry	Electric Power Systems, Inc.		
II	Clift	Bobby	Xcel Energy		
AP	Corsi	Domenico	Doble Engineering Co.		
AP	Craig	Douglas	Richards Manufacturing Co.	X	
AP	Craven	Michael	Phoenix Engineering Services		
AP	Cross	James	Kinectrics	X	
PCM-LM	Crouse	John	Roswell Alliance	X	X
AP	Cruz	Jorge	PTI Transformers		
II	Cruz Valdes	Juan Carlos	Prolec GE	X	X
AP	Dahlke	Michael	Central Moloney, Inc.	X	X
II	Daily	Jahwill	Bureau of Reclamation		
AP	Davydov	Valery	Mr. Valery Davydov		
AP	De Oliveira	Everton	Siemens Ltda	X	

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
II	Debass	Sami	Electric Power Research Institute (EPRI)		
AP	Demes	Rolando	Arteche		
AP	Dennis	Scott	Hitachi ABB Power Grids		X
II	Dent	Brandon	Memphis Light, Gas & Water	X	X
II	Deverick	Jonathan	Dominion Energy		
AP	Dillon	Nikolaus	Dominion Energy	X	
AP	Dinh	Huan	Hitachi ABB Power Grids		
II	Doak	Eric	D4EnergySolutions LLC	X	X
II	Door	Jeffrey	H-J Family of Companies	X	X
II	DOWNEY	ANDY	SPX TRANSFORMER SOLUTIONS		
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	Samraghi	Siemens Energy	X	X
II	Eagle	Thomas	SPX Transformer Solutions	X	X
II	Eckroth	Megan	EATON Corporation	X	X
AP	Elliott	William	General Electric	X	X
II	Ellis	David	PSEG		
II	Ember Baci	Daniela	Hydro-Quebec - Laboratoire Haute Tension		
II	Ermakov	Evgenii	Hitachi ABB Power Grids	X	X
II	Espindola	Marco	Hitachi ABB Power Grids		

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
AP	Euvrard	Eric	RHM International	X	
II	Falkenburger	Thomas	Coil Innovation USA, Inc.	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
II	Fazlic	Zlatan	Camlin Power		
II	Feloni	Edmund	CEG Forensics LLC		
AP	Fenton	Roger	Fenton Solutions	X	
AP	Field	Norman	Teshmont Consultants LP		
II	Florida	Paul Gabriel	Howard Industries, Inc.	X	X
AP	Foschia	John	SPX Transformer Solutions, Inc.	X	X
AP	Franchitti	Anthony	PECO Energy Company	X	X
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		
AP	Garcia	Benjamin	Southern California Edison	X	
AP	Gaun	Alexander	Coil Innovation GMBH		
II	Geibel	David	Hitachi ABB Power Grids	X	
II	Giraldo	Orlando	THE H-J FAMILY OF COMPANIES		

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
II	Glynn	Andrea	Xcel Energy		
II	Gomez-Hennig	Eduardo	Siemens Energy		
II	Goncin	Zoran	PTI Transformers	X	
II	Gonzalez	Luis	Conduct Industries Limited	X	X
II	Gossett	Shawn	Ameren		X
II	Gradnik	Tim	Elektroinsitut Milan Vidmar	X	
AP	Gragert	Jeffrey	Xcel Energy	X	X
II	Gray	Taylor	Portland General Electric (PGE)	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.		
II	Hamoir	Didier	Transformer Protector Corp	X	X
II	Hanson	David	TJH2b Analytical Services	X	X
II	Harper	Robert	Soltex Inc.	X	
AP	Hartmann	Thomas	Pepco Holdings Inc.	X	
AP	Heiden	Kyle	EATON Corporation	X	X
II	Hernandez	Giovanni	Virginia Transformers Corporation	X	X
II	Hernandez Cano	Sergio	Hammond Power Solutions	X	X
II	Hoffman	Saramma	PPL Electric Utilities	X	X

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
II	Hogg	Ryan	Bureau of Reclamation		
AP	Holden	Andrew	Ergon, Inc.	X	
II	Holland	David	ExxonMobil	X	X
II	Hollrah	Derek	Burns & McDonnell	X	
AP	Holsomback	Steve	Southern Company Services	X	
II	Huzmezan	Mihai	Power Diagnostix	X	
II	Issack	Ramadan	American Electric Power	X	X
II	Jalhoun	George	PPI	X	
II	James	Kristin	Eaton	X	X
AP	Jarman	Paul	University of Manchester	X	X
AP-LM	Jaroszewski	Marion	Delta Star Inc.		
II	Jensen	Nicholas	Delta Star Inc.	X	
II	Johnson	Anna	Arkema Inc.		
II	Johnson	Jeremy	Intermountain Electronics	X	X
AP	Johnson	Toby	Pacificorp	X	X
II	Jonak	Ryan	Portland General Electric (PGE)		
II	Kadar	Laszlo	Hatch	X	X
AP	Karas	Jon	SDMyers, LLC.	X	X
II	Kazmierczak	Jerzy	Hitachi ABB Power Grids		
AP	Kessler	Stacey	Basin Electric Power Cooperative	X	X
II	Khan	Suleman	Ontario Power Generation	X	
AP	Kirchenmayer	Egon	Siemens Energy	X	X

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
AP	Kittrell	Brad	Consolidated Edison Co. of NY		
AP	Klein	Ken	Grand Power Systems		
AP	Kleine	Peter	US Army Corps of Engineers	X	X
II	Klempner	Dmitriy	Southern California Edison		X
II	Knappek	William	OMICRON electronics Corp USA	X	X
AP	Konta	Ivan	KONCAR - Instrument Transformers	X	
AP	Koshel	Anton	Delta Star Inc.		
II	Kotula	John	Dominion Energy		
II	Kutzleb	Michelle	TJH2b Analytical Services	X	
AP	Lachman	Mark	Doble Engineering Co.		
AP	Lamontagne	Donald	Arizona Public Service Co.	X	X
II	Larison	Andrew	Hitachi ABB Power Grids		X
AP	Larochelle	David	NDB Technologies	X	
AP	Leal	Fernando	Prolec GE	X	
AP	Lee	Moonhee	Hammond Power Solutions	X	X
II	Lejay	Olivier	Huaming USA Corp.		
II	Lewand	Lance	Doble Engineering Co.		
II	Li	Chao	EATON Corporation		
II	Li	Yaquan (Bill)	BC Hydro	X	
II	Lianides	Christopher	Southern California Edison	X	X
AP	Locarno	Mario	Doble Engineering Co.	X	

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
AP	Lovins	Colby	Federal Pacific Transformer		
II	Lucas	Tiffany	SPX Transformer Solutions, Inc.	X	X
AP	Lukenda	Nikola	Petro-Canada Lubricants Inc.		
AP	Macdonald	Nigel	Trench Limited	X	
AP	Macias	Alejandro	CenterPoint Energy	X	X
II	Manderfield	Rebecca	Xcel Energy		
AP	Mangubat	Darrell	Siemens Power Operations Inc.		
II	Mani	Balakrishnan	Virginia Transformer Corp.	X	X
AP	Mansuy	Bruno	Trench France SAS	X	
PCM	Marlow	Dennis	DenMar TDS Transformers	X	X
AP	Marquardt	Bryan	AK Steel		
II	Martinez	Joaquin	Siemens Energy	X	
AP	Martinez	Rogelio	Georgia Transformer		
II	Mattson	Trevor	OMICRON Electronics Corp USA		
AP	Mayer	Robert	Siemens Energy	X	
AP	McBride	James	JMX Services, Inc.	X	X
II	McCloskey	Scott	Amran Inc.		
II	McFadden	Matthew	Oncor Electric Delivery		
II	McGrail	Anthony	Doble Engineering Co.	X	
AP	Mciver	James	Siemens Energy		X
AP	Middleton	Robert	RHM International	X	

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
II	Millard	Zachary	Great River Energy	X	
II	Milojevic	Goran	DV Power Inc.		
AP	Minhaz	Rashed	Transformer Consulting Services Inc.	X	X
AP	Minikel	Justin	EATON Corporation	X	X
II	Misur	Slobodan	Trench Limited		X
II	Mohamad	Meri	Siemens Industry		
AP	Montpool	Rhea	Schneider Electric		
II	Morakinyo	Paul	PSEG	X	
AP	Morales-Cruz	Emilio	Qualitrol Company LLC	X	X
AP	Morgan	Michael	Duke Energy	X	
II	Mudryk	Anatoliy	Camlin Power	X	
II	Mullikin	Randolph	ABB Inc.		
AP	Munn	William	Southern Company Services	X	
AP	Munoz Molina	Martin	Orto de Mexico	X	X
II	Nabi-Bidhendi	Hossein	ABB Inc.	X	X
AP	Natale	Anthony	HICO America	X	
II	Neder	Frank	Trench Germany GmbH	X	
AP	Neild	Kristopher	Megger	X	X
II	Nesvold	Brady	Xcel Energy	X	
AP	Nims	Joe	Allen & Hoshall, Inc.	X	
II	Niroula	Ashmita	Ergon, Inc.		
II	Nunes, Jr	Jayme	Nynas AB	X	X
AP	Nunez	Arturo	Mistras Group, Inc.		
II	Nunn	Shawn	Hitachi ABB Power Grids	X	

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
II	Ocon	Rodrigo	Industrias IEM		
AP	Ogajanov	Rudolf	ABB Inc.		
AP	O'Malley	Anastasia	Consolidated Edison Co. of NY		
II	Orr	Paul	NEMA		
II	Panesar	Parminder	Virginia Transformer Corp.	X	X
AP	Partyka	George	PTI Transformers	X	
II	Pate	Ron	ABB Inc.		
II	Patel	Dipakkumar	Instrument Transformer Equip Corp	X	X
II	Patel	Monil	Pacific Gas & Electric Company	X	X
II	Patel	Nitesh	Hyundai Power Transformers USA	X	X
II	Patel	Rakesh	Hitachi-Powergrid		
II	Patel	Vinay	Consolidated Edison Co. of NY		
PCM-LM	Payne-Powell	Paulette	Retired	X	X
II	Pena	Arismendis	SDMyers, LLC.		
AP	Pepe	Harry	Phenix Technologies, Inc.	X	X
PCM-LM	Perkins	Mark	D4EnergySolutions LLC	X	
II	Peterson	Caroline	Xcel Energy	X	X
AP	Petotic	Branimir	Boiler Inspection & Insurance of Canada		X
II	Picher	Patrick	Hydro-Quebec IREQ		
II	Pitts	Chris	Howard Industries	X	
II	Plante	Sylvain	Hydro-Quebec	X	X

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
AP	Plath	Cornelius	OMICRON Energy Solutions GmbH		
II	Portillo	Alvaro	Ing. Alvaro Portillo	X	
AP	Portillo	Homero	Advanced Power Technologies	X	
II	Powell	Chris	Intermountain Electronics	X	X
II	Prakash	Tejasvi	Schweitzer Engineering Labs		X
AP	Prince	Jarrold	ERMCO	X	X
AP	Pruente	John	SPX Transformer Solutions, Inc.	X	
AP	Prykhodko	Volodymyr	ZTZ Services International		
II	Quispe Cuadrado	Lesther Alex	EATON Corporation	X	X
AP	Radu	Ion	Hitachi ABB Power Grids		
II	Ramesh	Gopalan	DNV GL		
AP	Ramirez	Juan	CELECO	X	
II	Ramirez Bettoni	Eduardo	Xcel Energy	X	
II	Rampersad	Shiva	Dow Chemical Company	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)		
II	Reagan	John	Oncor Electric Delivery	X	
II	Rebman	Larry	EMLS, Inc.		X

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
II	Reed	Samuel	EATON Corporation		
II	Reeder	Perry	SPX Transformer Solutions, Inc.		
II	Reepe	Robert	Georgia Power Co.	X	X
II	Reimer	Jonathan	FortisBC		X
AP	Reiss IV	Clemens	Custom Materials, Inc.	X	X
II	Rezaei-Zare	Afshin	York University		
II	Richardson	Michael	Ameren		
II	Rincon	Diego	Electroporcelana Gamma	X	
AP	Riopel	Sebastien	Electro Composites ULC		
AP	Rock	Patrick	American Transmission Co.	X	X
II	Rocque	Tim	SPX Transformer Solutions, Inc.	X	X
II	Rodriguez	Josue	Prolec GE	X	X
AP	Rodriguez	Leopoldo	Transformer Testing Services LLC	X	X
AP	Roizman	Oleg	IntellPower Pty Ltd	X	X
AP	Rottenbacher	Andre	Ritz Instrument Transformers		X
AP	Saad	Mickel	Hitachi ABB Power Grids	X	X
AP	Sahin	Hakan	Virginia and Georgia Transformers	X	X
AP	Salgado	Pedro	Electronic Technology Inc.		
II	Sanchez	Albert	Knoxville Utilities Board	X	X
AP	Sandhu	Surinder	Sanergy Consulting		
II	Sandsten	Lina	Hitachi Power Grids	X	X

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
II	Saraf	Manish	Hammond Power Solutions	X	
AP	Sauls	Roderick	Southern Company Services		X
II	Sawant	Anil	Virginia Transformer Corp.	X	X
AP	Schiessl	Markus	SGB		
II	Schindler	Stefan	Maschinenfabrik Reinhausen	X	X
AP	Schleismann	Eric	Southern Company Services	X	X
AP	Schneider	Jeffrey	Power Partners/Spire Power Solutions		
AP	Schrammel	Alfons	Siemens Energy		
II	Schrom	Wesley	Carolina Dielectric Maint & Testing Co.		X
AP	Schwartz	Dan	Quality Switch, Inc.	X	X
AP	Shalabi	Jaber	VanTran Industries, Inc.	X	
PCM	Sharifnia	Hamid	Consultant		X
AP	Sheehan	David	HICO America	X	
AP	Sheridan	Peter	SGB USA, Inc.	X	
II	Shingari	Avijit	Pepco Holdings Inc.	X	
II	Shrewsbury	Justin	AMR PEMCO		
II	Shukla	Kunal	PECO Energy Company	X	X
AP	Siebert-Timmer	Audrey	IFD Corporation	X	X
II	Silgardo	Adrian	IFD Corporation	X	X
AP	Simonov	Igor	Toronto Hydro	X	X
II	Sinclair	Jonathan	PPL Electric Utilities	X	X

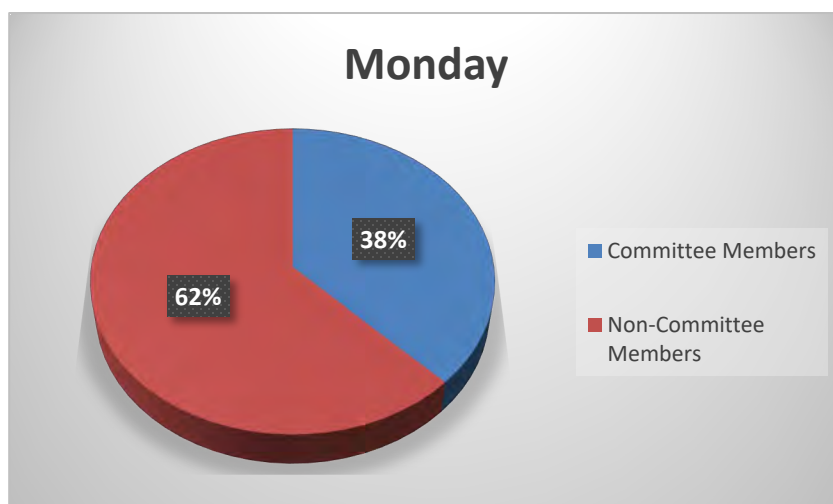
Member Type	Last Name	First Name	Company	Opening Session	Closing Session
AP	Singh	Kushal	ComEd	X	
AP	Slattery	Christopher	FirstEnergy Corp.	X	X
II	Smith	Adam	Commonwealth Associates, Inc.	X	X
II	Soeller	Markus	Power Diagnostix	X	
II	Sohail	Muhammad	Trench Limited	X	
AP	Sonnenberg	Brian	Instrument Transformers, LLC	X	X
II	Soto	Mauricio	Hitachi ABB Power Grids		
AP	Sparling	Brian	Dynamic Ratings, Inc.	X	X
AP	Spaulding	James	Fort Collins Utilities	X	X
AP	Speegle	Arthur	Entergy Services, Inc.		
AP	Spoone	Travis	EATON Corporation		
AP	Stacy	Fabian	Hitachi ABB Power Grids	X	X
AP	Staley	Brad	Salt River Project		X
II	Stechschulte	Kyle	American Electric Power	X	
II	Steele	Hampton	TVA	X	X
AP	Steeves	Gregory	Baron USA, LLC	X	X
AP	Steineman	Christopher	Delta Star Inc.		
AP	Stockton	David	Stockton Consulting		
II	Stretch	Kerwin	Siemens Energy	X	X
II	Strongosky	Neil	Memphis Light, Gas & Water	X	
II	Su	Paul	FM Global		X
AP	Sullivan	Christopher	Westmark Partners	X	
AP	Szczechowski	Janusz	Maschinenfabrik Reinhausen	X	X

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
II	Szewczyk	Radoslaw	Specialty Products Poland Sp. z o.o.	X	
II	Taipala	Stephen	Eaton Corporation	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	
AP	Theisen	Eric	Metglas, Inc.	X	X
II	Trifunoski	Risto	Trench Limited		X
AP	Tyler	Lee	Warco, Inc.		
II	Upadhyay	Parag	ABB Inc.		
AP	Van Horn	Jeremy	IFD Corporation	X	X
II	Van Vooren	Edward	ELTEK International Laboratories		
II	Vance	Ed	Ardry Trading Company, Inc.		
II	Vanier	Jacques	Electro Composites (2008) ULC		
AP	Vartanian	John	National Grid	X	X
AP	Veens	Jos	SMIT Transformatoren B.V.		
II	Veeran	Kannan	Georgia Transformer		X
AP	Vermette	Yves	Electro Composites ULC		
AP	Villagran	Deniss	GE Grid Solutions		X
AP	Viswasam	Anselm	Hyperion		
II	Vo	Duy	Central Maine Power (AVANGRID)	X	X
AP	vonGemmingen	Richard	Dominion Energy		X

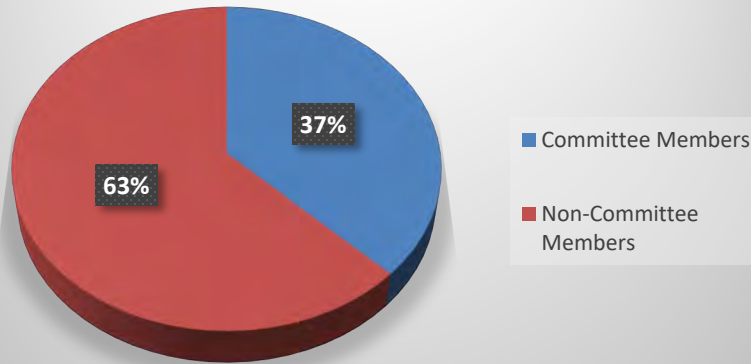
Member Type	Last Name	First Name	Company	Opening Session	Closing Session
II	Vukovic	Dejan	Hitachi ABB Power Grids		
II	Vyas	Pragnesh	Sunbelt-Solomon Solutions	X	X
II	Wagner	Dieter	Hydro One		X
II	Walder	Nicholas	EATON Corporation		
II	Waldrop	Hugh	Memphis Light, Gas & Water	X	X
AP	Walters	Shelby	Howard Industries	X	X
AP	Wang	Evanne	DuPont	X	X
II	Warntjes	Michael	American Transmission Co.	X	X
II	Washburn	Alan	Burns & McDonnell	X	X
II	Webb	Matthew	SPX Transformer Solutions, Inc.	X	
AP	Werelius	Peter	Megger	X	X
AP	Weyer	Daniel	Nebraska Public Power District		
AP	White	Leon	H2scan	X	
AP	Whitehead	William	Siemens Energy		
II	Whitten	Christopher	Hitachi ABB Power Grids		
II	Wilhelm	Helena	Vegoor Tecnologia Aplicada		
AP	Williams	Trenton	Advanced Power Technologies	X	X
AP	Wimberly	Barrett	GE Grid Solutions		
AP	Winter	Dr. Alexander	HIGHVOLT Pruftechnik Dresden	X	X
II	Yazdani	Mana	Trench Limited	X	

Member Type	Last Name	First Name	Company	Opening Session	Closing Session
AP	Yun	Joshua	Virginia Transformer Corporation	X	X
AP	Zaman	Malia	IEEE	X	
II	Zanwar	Anand	Siemens Energy	X	
II	Zarnowski	Michael	Carte International		X
II	Zemanovic	Kyle	EATON Corporation	X	X
PCM	Zhang	Shibao	PCORE Electric		

In addition to the above totals, there were **276** of the total attendees that attended **both** the Monday and Thursday Sessions and **412** that attended **either** the Monday or the Thursday Session.



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 Encore 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 - Spring 2021

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/2021-PES-Org-Chart.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

Secretary Diane Watkins (Xcel Energy)

Past Chair Farnoosh Rahmatian (Quanta Technology)

TECHNICAL COMMITTEES

Chair

Analytical Methods for Power Systems (AMPS) Kwok Cheung

Electric Machinery (EM) John Yagielski

Energy Development & Power Generation (EDPG) Robert Thornton-Jones

Energy Storage & Stationary Battery (ESSB) Babu Chalamala

Insulated Conductors (IC) Henk Geene

Nuclear Power Engineering (NPE) John White

Power System Communications & Cybersecurity (PSCC) Craig Preuss

Power System Dynamic Performance (PSDP) Leonardo Lima

Power System Instrumentation & Measurements (PSIM) Ernst Hanique

Power System Operation Planning & Economics (PSOPE) Fran Li

Power System Relaying & Control (PSRC) Murty Yalla

Smart Buildings Loads & Customer Systems (SLCS) Ron Melton

Substations (SUB) Patrick Fitzgerald

Surge Protective Devices (SPD) Steven Hensley

Switchgear (SWGR) Keith Flowers

Transformers (TRANS) Bruce Forsyth

Transmission and Distribution (T&D) Surya Santoso

COORDINATING COMMITTEES

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

Chair

Awards Committee	Farnoosh Rahamatian
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.....	Farnoosh Rahamatian

4.3 PES TECHNICAL COUNCIL ACTIVITIES

The Technical Council meeting schedule for 2021 is as follows:

- January 10-14, 2021 – JTCM – Web Meeting
- April 16, 2021 – Web Meeting
- July 25-29, 2021 – PES General Meeting
- Fall 2021 – Technical Council Retreat

4.4 SATELLITE COMMITTEES

The PES Technical Council has issued revised guidance related to the protocol for interaction between satellite committees and the parent PES technical committees. The revised procedure is as follows:

- a) Each satellite committee, subcommittee, working group, or task force will interact with the corresponding parent technical committee, subcommittee, working group, or task force via designated liaisons. The satellite committees could designate multiple liaisons.
- b) The technical committees in their organization and procedures manuals (O&P manual) have an established mechanism to interact with other entities using a liaison. This is the preferred means of interaction with other entities.
- c) The liaisons will have to become familiar with the process of interacting with the parent committee, subcommittee, working group or task force. Many of these parent entities, meet several times a year and in each of these meeting have an administrative session where reports are given on various activities conducted under the auspices of the parent entities by the liaisons. These reports are then included in the minutes of the meetings.
- d) It is also important to realize that not all individuals interested in a particular committee's activities immediately become members of the parent committee. This requires the individual to show intent and also participate and actively pursue technical activities starting at the task force, working group, and subcommittee levels. Participation is also provided by actively reviewing journal and conference papers for these entities. The committees do have an established procedure for

starting activities at the task force level and gradually progressing to become a member of the technical committee. The progression is outlined in the organization and procedures manual.

- e) In addition to the liaisons, other individuals from the satellite committees are encouraged to get personally involved in the working groups and task forces. Working groups and task forces are open to all contributing individuals (no country or regional limitations). Again, the PES strongly encourages all liaisons and interested individuals to read the relevant technical committee's O&P Manual, as well as their Working Group and Standards Policies & Procedures (WG P&P and Std P&P) manuals if they get involved in working groups.

4.5 TRANSFORMERS COMMITTEE ACTIVITIES

4.5.1 Liaison Representatives - Appointed by Committee Chair

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

4.5.2 Committee Schedule

The Spring 2021 Transformers Committee meeting was switched from an in-person meeting in Toronto, ON to a virtual meeting to protect the health and well-being of our members and their families. The audio-visual firm Encore 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 Milwaukee, WI, subject to review of pandemic related restrictions over the next few months.

4.5.3 WebEx Accounts for Standard Development and Virtual Meeting Notification

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 IEEE-SA WebEx service is available for those who do not have access to a suitable tool.

During the pandemic, several Transformers Committee activity groups have made effective use of virtual meetings in between the spring and fall main Committee meetings. All activity leaders are encouraged to use the resources available to them to advance their work. In addition, activity leaders are reminded to track attendance at each virtual meeting and to record attendance in the minutes of those meetings as well as in the AMS, just as they would for a meeting held in the spring or fall. Finally, to maintain the openness of our meetings, activity leaders are encouraged to use the Transformers Committee website to post notifications of any meetings that occur outside the spring and fall main meetings, thereby allowing any interested party the opportunity to participate. Website notifications can be made by providing the Committee webmaster the pertinent meeting information.

4.5.4 PAR Extensions

From time-to-time circumstances may prevent a working group from completing its work within the normal lifespan of a PAR, and when that happens a PAR extension is warranted. However, it has been observed that the Transformers Committee has had many PAR extensions requests in recent years. Some of these have been challenged by IEEE-SA. At a time when technology changes quickly and businesses need to be able to adapt to changing demands, it is important that the Transformers Committee strive to complete its tasks quickly and on-time. To that end, subcommittees are encouraged to carefully define the scope of the working groups they form to ensure the task assigned to the working group can be accomplished within the normal PAR lifetime. In addition, working groups are encouraged to work diligently to complete their tasks within the normal PAR lifetime and to strongly resist scope-creep that may prevent the completion of the document.

There have been some recent discussions related to the process a working group should follow to request a PAR extension, and specifically whether the working group Chair can make that decision without concurrence of the working group members. One can argue that a PAR extension constitutes a modification of the subgroup's duties and that requesting a PAR extension is a recommendation made by the working group. Section 7.1.1 of the Policies and Procedures for Working Groups (Individual Method) requires that such decisions or recommendations require approval by majority vote of the working group. This process allows working group members who may oppose a PAR extension an opportunity to express their opinion.

4.5.5 Meeting App

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

4.5.6 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.

4.5.7 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.

4.5.8 IEEE Copyright Policy

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

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.

4.5.9 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.

4.5.10 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 April 19, 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

Std No.	Patent Owner	Contact for License	Patent Serial No. (if indicated)	Letter Date	Licensing Assurance Received	Date record entered or revised (if known)
C37.60	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

4.5.11 Website

The Committee website has 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. 0, April 20, 2021

5 VICE CHAIR'S REPORT – ED TENYENHUIS

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

5.1 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.

- [2021 IEEE PES General Meeting](#)
July 18 – 22, 2021, Virtual Meeting
- [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

5.2 2021 IEEE PES GENERAL MEETING JULY 18 - 22, 2021 (VIRTUAL MEETING)

The weblink for the event is <http://pes-gm.org/2021/>. The meeting was originally planned for in person at Washington DC but was later changed to virtual.

The theme for the 2021 IEEE PES General Meeting is “Managing Energy Business During a Pandemic”. Supersession topics related to this theme are:

- Grid Resiliency
- Resource and Transmission Adequacy for Future Power System
- Grid Edge – Devices, Control, Applications, and System Operation
- Impact of Climate Change on the Power Grid
- Late Breaking News Session

The window for paper submission began on October 12, 2020 and ended on November 16, 2020. Papers were distributed to various Technical Committees for peer review based upon the paper content. The peer review process ended in February 2021 and authors were notified of final acceptance or rejection decisions by March 1, 2021.

Below is the outcome of the peer review process done by the Transformer Committee.

Total Submissions 7 (5 conference and 2 transaction)

Accepted 6 (4 conference and 2 transaction)

Rejected 1

Below is a listing of the approved papers (transaction and conference).

Paper	Title	Type
21PESGM0337	Experimental Study on the Gas Bubble Temperature Around an Arc under Insulation Oil	Transaction
21PESGM0589	Effect of Voltage Waveforms of HVDC Converter Transformer on Lifetime Characteristics	Transaction
21PESGM0248	Transformer Active Protection Method Based on Multi-Parameter Fusion	Conference
21PESGM0999*	A Simplified Solid-State Transformer Model for Teaching Basic Concepts and Ideas	Conference
21PESGM2041*	Optimized Modeling Process for Air Core Reactors using Finite Element Analysis	Conference
21PESGM2114*	Comprehensive Analysis of Continuously Variable Series Reactor Using G-C Framework	Conference

* Nominated as Paper Forum Paper

5.3 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 2021 paper season.

Ali Goharrizi

H Jin Sim

Dragan Tabakovic

Ewald Schweiger

Sanjib Som

Waldemar Ziomek

Respectfully submitted,

Ed teNyenhuis

Vice-Chair

March 16, 2021

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.

6.2 NEW COMMITTEE MEMBER APPROVALS

At the Fall 2021 (Virtual) Administrative Subcommittee meeting, zero new committee member applications were submitted for consideration.

Name	Affiliation	Sponsor #1	Sponsor #2	Sponsor #3	Membership Category
-	-	-	-	-	-

6.3 NEW MEMBER APPLICATIONS

Two new applications for Committee Membership have been received for consideration since the last Administrative Subcommittee meeting. The following table lists the names of the applicants and a summary of their supporting eligibility information.

Name	Affiliation	Sponsor #1	Sponsor #2	Sponsor #3	Membership Category
Kevin Biggie IEEE – Yes PES – Yes SA – Yes	Weidmann Electrical Technology	Sheldon Kennedy Insulation Life SC 4+ yr.	Roger Wicks WG PC57.100 3+ yr.	Rick Marek WG PC57.154 3 yr.	Producer

Ken Hampton IEEE – Yes PES – Yes SA – Yes	BGE, an Exelon Company	George Payerle STNP SC 2+ yrs.	Ed Smith DT SC 2+ yr.	Rhett Chrysler WG PC57.12.35 2 yrs.	User

6.4 ASSOCIATION MANAGEMENT SYSTEM (AMS) DATABASE

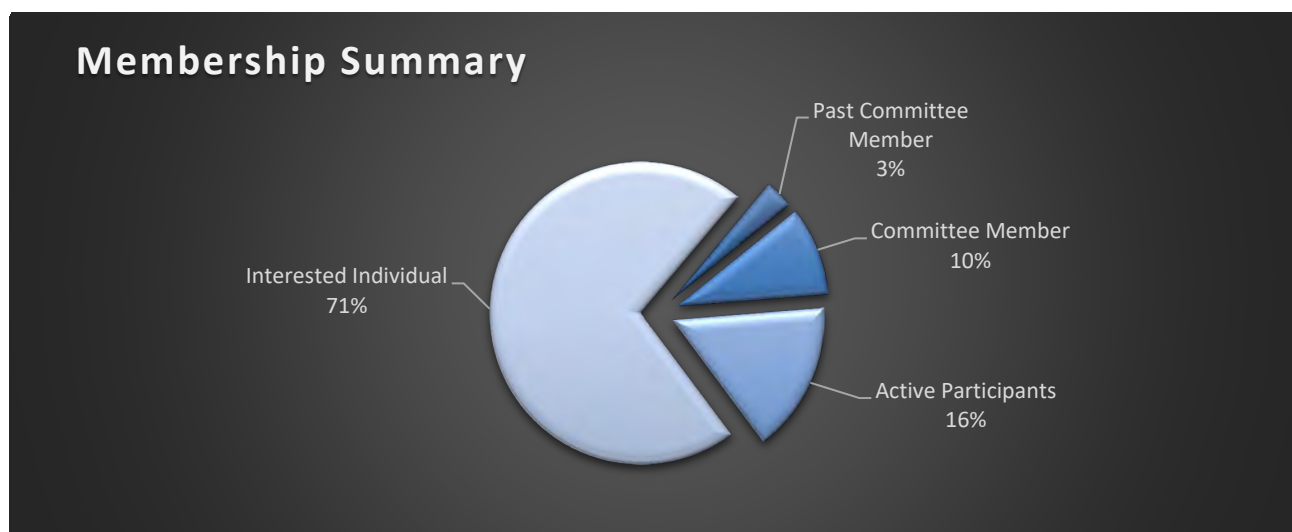
The Transformers Committee AMS database of people currently has three general categories of participation in our activities. These are: **Interested Individual**, **Active Participant**, and **Committee Member**. In addition, the Committee Secretary maintains a list of **Past Committee Members**. Anyone 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 everyone 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>	S16	F16	S17	F17	S18	F18	S19	F19	S20	F20	S21*
<i>Interested Individual</i>	1471	1507	1554	1550	1552	1551	1582	1632	1579	1563	1611
<i>Interested Individual - IEEE Life Member</i>	11	11	11	11	13	12	12	12	11	12	12
Total Interested Individuals	1482	1520	1565	1561	1565	1563	1594	1644	1590	1575	1623
<i>Active Participant</i>	242	258	275	302	321	324	349	362	365	362	360
<i>Active Participant - IEEE Life Member</i>	5	5	5	5	5	5	6	7	6	6	6
Total Active Participants	247	263	280	307	326	329	355	369	371	368	366
<i>Committee Member</i>	172	175	180	169	175	181	191	182	179	179	173
<i>Committee Member – Emeritus</i>	9	9	9	9	10	10	10	10	11	11	11
<i>Committee Member - IEEE Life Member</i>	25	27	29	28	33	33	33	32	33	33	32
Total Committee Members	206	211	218	206	216	224	234	224	223	223	216

<i>Past Committee Member</i>	32	31	30	42	38	38	38	50	48	48	59
<i>Past Committee Member - IEEE Life Member</i>	5	5	5	7	6	6	6	8	12	10	12
Total Past Committee Members	37	36	35	49	44	44	44	58	60	58	71
TOTAL IN AMS DATABASE	1972	2028	2098	2123	2151	2160	2227	2295	2244	2224	2276

*S21 data as of March 16, 2021



6.5 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 is used to update participant's membership profile.

6.6 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 Standards Association (IEEE/SA).

6.7 COMMITTEE MEMBERSHIP MAINTENANCE

A membership audit was performed October 2020 prior to the Fall 2021 Virtual Meeting. Committee Members not meeting the membership requirements in accordance with the Committee P&P were contacted (IEEE-PES and IEEE-SA). Most Committee Members contacted rectified their membership requirements, however, the following four members did not demonstrate compliance and were converted to Past Committee Member status on March 7, 2021.

1. Clair Claiborne
2. Thang Hochanh
3. Vladimir Khalin
4. Mike Lau

A review of member attendance for 3 of 5 of the last General Session meetings per the P&P resulted the following 9 members converted to Past Committee Member status on March 10, 2021 due to attendance shortfalls.

1. Gene Blackburn
2. Carl Bush
3. Jermain Clonts
4. Jeff Golarz
5. Mark Gromlovits
6. Hamid Sharifnia
7. Guiseppe Termini
8. William Wimmer
9. Kipp Yule

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.

6.8 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.

6.9 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.

6.10 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."

6.11 MEETING MINUTES

The minutes of the Fall 2020 meeting have been posted to the committee website. Thank you to everyone for submitting their minutes in a prompt fashion.

Subcommittee Chairs are asked to submit their respective subcommittee meeting minutes for the Spring 2021 Virtual meeting to the Committee Secretary no later **June 11, 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. The minutes shall record the essential business of each SC, WG, and TF meeting including:

- a) Name of group
- b) Date and location of meeting
- c) Officer presiding, including the name of the secretary who wrote the minutes
- d) Meeting participants, including affiliation, and voting member status at the end of the meeting
- e) Call to order, Chair's remarks
- f) Reminders of IEEE policies, such as Patent policy and Copyright policy
- g) The fact that a Call for Patents occurred, and any responses made to such Call
- h) Approval of minutes of previous meeting
- i) Approval of agenda
- j) Technical topics
 - 1) Brief summary of discussion and conclusions
 - 2) Motions exactly as they are stated, including the names of mover and seconder and the outcome of each motion

- k) Action items
- l) Items reported out of executive session
- m) Recesses and time of final adjournment
- n) Next meeting - date, time, and location

Respectfully submitted,

David Wallach

Secretary

IEEE/PES Transformers Committee

March 16, 2021

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 for the Spring 2021 Virtual meeting. The Awards presentation will again be presented as a prerecorded presentation with videos from awardees included in lieu of the normal Awards Luncheon.

8.2 IN MEMORIAM

8.2.1 David Laing Harris



David Harris, age 77, of Oconomowoc, WI passed away surrounded by his family on November 26, 2020. David is survived by his sons Ken & John, daughter Christy, & 11 grandchildren.

Dave started his career at Waukesha Electric Systems (now SPX Transformer Solutions) as a Power Delivery System Design Engineer, progressing to Design Engineering before taking up the role of Territory Sales Manager. With his strong technical acumen and personality, Dave developed a strong customer fan base wherever he visited. At the time of his retirement, Dave held the position of Customer Technical Executive.

Meeting with customers, Dave always had a genuine, pleasant smile and calming influence and always spoke with knowledge and authority. If he didn't know the answer to a question, he would always say so and follow up later with the answer. Dave did what he said he would do. Dave was able to gain his customer's respect and confidence in many challenging situations.

A good listener and teacher, he enjoyed presenting various topics at Regional Technical Seminars and patiently answering follow-up questions.

Dave was a prolific reader... seldom watching TV. He could relate almost any play of any baseball game the next day after reading about it in the newspaper, as if he saw the game himself.

We remember him as a great techno-commercial Engineer and his contributions to both his company and the industry

Tribute:

James Gardner – "I met Dave many, many years ago when I was a young engineer trying to write a transformer specification and valued his professionalism & friendship in our encounters during all the years afterward."

8.2.2 Robert Veitch

Robert Veitch passed away peacefully at his home November 18, 2020 with his wife Carmella at his side. Robert is also survived by his children Michael, Heather, Barbara, Roberta and stepson Jay, along with many grandchildren.

Robert was a graduate of the University of Toronto and spent his entire career as an electrical engineer. Robert was the Chair of the IEEE PES Transformers Committee from 1989 through 1991 and was considered a world authority on electrical transformers. He was proud to be named a fellow of the IEEE (Institute for Electrical and Electronic Engineers) in 1998

Robert had the distinction of being the only Committee Chair to serve for three years instead of the normal two years.

8.2.3 Dr. Eddy So



Eddy So died peacefully in Ottawa, October 26, 2020, aged 79. He was the beloved husband of Lilian Ong, loving father to Stephanie and Natasha, and Super Opa to Winnie and Oscar.

Dr. So immigrated to Canada in 1976 and worked for the National Research Council (NRC) for more than 40 years, until his retirement in 2018. Dr. So was responsible for the improvement of high accuracy electrical measurements, particularly in high voltage applications. The numerous high accuracy measuring equipment manufactured in Canada that he was responsible for are now used in facilities around the world.

Tribute:

Ernst Hanique: “Besides the committee work, I also had the pleasure working with Eddy to develop two state of the art three phase power loss measurement systems for transformers with uncertainty of <10ppm for SMIT Transformers. At that time, it was the first system in the world with that kind of specifications.

[In 2018] Eddy also successfully developed a three-phase power loss system for shunt reactors. Shunt reactors do have a very low PF of about 0.001.”

8.2.4 Jitka Fuhr



Jitka Fuhr passed away as a result of a tragic accident July 26, 2020.

Jitka was recognized and valued worldwide during her long career in industry and later in her company as a specialist and expert for high voltage components. Her numerous contributions in the field of diagnosis of power transformers and generators have received high recognition. Thanks to her extensive specialist knowledge, great commitment, and energy she was able to efficiently solve complex problems both in the manufacturer’s test field and in power plants and substations. For everyone who worked with her, her

humor and positive charisma, which always accompanied her even under difficult working conditions, remain unforgettable.

Tribute

Ali Nadarian: “She was a member of C57.113 and had a great impact on CIGRE”

8.3 GENERAL SERVICE AWARDS

Our sincere thanks and appreciation go out to the following for their service to the Transformers Committee.

8.3.1 Transformers Committee Standards Coordinator

A Certificate of Appreciation was presented to Jim Graham for his service as Transformers Committee Standards Coordinator from 2016 through 2020. The role of Standards Coordinator is key to the development and approval process of the standards and guides under the Transformers Committee’s purview.

As Standards Coordinator, Jim started WG Leader training sessions. These sessions have been extremely helpful to our WG leaders in helping them navigate the ins and outs of requirements as WG Chair, VC, or Secretary. He and Malia have also kept us current on the Standards Processes and copywrite rules in the Monday Standards Lunch and learn sessions, and most importantly, he helped keep us on track and kept our documents moving forward by reminding us of Standards Board deadlines and PAR expirations. Thank you to Jim for his 5 years of service in this role.

8.3.2 Transformers Committee Standards Subcommittee Chair

A Certificate of Appreciation was presented to Jerry Murphy for his service as Standards Subcommittee Chair from 2016 through 2020. In addition to his role as SC Chair, Jerry also agreed to take on the role of Meeting Schedule Coordinator and continues to support the Committee in this and other ways.

Jerry successfully chaired and kept afloat the Standards SC over the last 5 years. It wasn't always an easy task being the last SC meeting between several hundred people and the Wednesday night social. Jerry was adept at keeping the tone light even during spirited discussions among his 7 WGs. He was responsible for leading the charge for some of our most important standards such as C57.12.00, C57.12.90, and the highly controversial GMD Guide, C57.163, now just starting up its first WG for revision of the Guide. Thank you to Jerry for all of his work and commitment over the past 5 years.

8.3.3 Transformers Committee Insulation Life Subcommittee Chair

A Certificate of Appreciation was presented to Sheldon Kennedy for his service as Insulation Life Subcommittee Chair from 2016 through 2020.

Many thanks to Sheldon for keeping the ship pointed straight ahead on the 8 WGs he was responsible for as chair of the Insulation Life SC. Again, this SC is responsible for some of the major documents related to thermal performance and measurement in distribution and power transformers as well as the Loading Guide. Many of these standards and guides are key backbones of our Committee. Thank you to Sheldon for his service as Chair of this SC for the past 5 years.

8.4 NEW MEMBERS OF THE TRANSFORMERS COMMITTEE

The Transformers Committee welcomes the following 2 new committee members. They were welcomed to the Committee at the Monday General Session and a membership certificate was mailed to them. Thank you and welcome to the Committee!

1. Kevin Biggie	Weidmann Electrical Technology
2. Kenneth Hampton	Baltimore Gas & Electric

8.5 OUTSTANDING SERVICE AWARDS

For long-term commitment, dedication, and contributions to the Transformers Committee the following were awarded the Committee's Outstanding Service Award.

1. Sheldon Kennedy - Sheldon has been a Transformers Committee Member since May 15, 1991. He was elevated to the status of IEEE Fellow in 2016 for his leadership in the technology and standards for rectifier, inverter, and harmonic-mitigating transformers. He just completed his role as the Insulating SC Chair, and has been the Chair of C57.32 WG Neutral Grounding Devices and C57.18.10 WG for Semiconductor Rectifier Transformers in addition to be a member of several WGs and SCs.

Sheldon has been an outstanding contributor and leader in the Transformers Committee for many years. We are proud to present this award to Sheldon.

2. James Thompson - Jim has been a Transformers Committee Member since April 13, 1983. Jim has been the Chair and Vice-Chair of C57.106 WG for Oil Acceptance and Maintenance, C57.130 DGA for Factory Temperature Rise Limits, a member for

Moisture in Insulation and Moisture in Oil TFs. He has shown a real passion for the topic of Moisture in both insulation and oil systems and has presented this topic many times over the years.

Thank you to Jim for his commitment to the Committee and for sharing his passion with us for so many years.

8.6 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 C57.12.01™-2020 – IEEE Standard for Submersible Equipment – Enclosure Integrity Distribution and Power Transformers
WG Chair: Robert (Casey) Ballard
WG Secretary: Aleksandr Levin
Certificates of Appreciation: Mike Iman, Charles Johnson, Tim-Felix Mai, Rhea Montpool, Dhiru Patel, Joseph Tedesco, David Walker
2. IEEE Std 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
WG Chair: Alan Traut
WG Vice Chair/Secretary: Jermaine Clonts
3. IEEE Std C57.12.60™-2020 – IEEE Standard for Thermal Evaluation of Insulation Systems for Dry-Type Power and Distribution Transformers
WG Chair: Roger Wicks
WG Vice Chair: David Stankes
Certificates of Appreciation: Tim-Felix Mai, Casey Ballard, Kenneth McKinney
4. IEEE Std C57.12.70™-2020 – IEEE Standard for Standard Terminal Markings and Connections for Distribution and Power Transformers
WG Chair: Jason Varnell
WG Secretary: Kris Zibert
WG TF Chair: Stephen Antosz
WG TF Chair: Weijun Li
Certificates of Appreciation: Glenn Andersen, Lee Mathews, Tyler Morgan, Dan Mulkey, Ryan Musgrove, Steven Schappell

5. IEEE Std C57.12.91™-2020 – IEEE Approved Draft Standard Test Code for Dry-Type Distribution and Power Transformers
WG Chair: David Walker
WG Secretary: Tim-Felix Mai
Certificates of Appreciation: Robert (Casey) Ballard, Mohammad Iman, Charles Johnson, Rhea Montpool, Dhiru Patel, Joseph Tedesco
6. IEEE Std C57.3.5™-2019 – IEEE Standard for Performance and Test Requirements for Instrument Transformers of a Nominal System Voltage of 115 kV and Above
WG Chair: Pierre Riffon
WG Vice Chair: David Wallace
Certificates of Appreciation: Lee Bigham, Huan Dinh, Vladmir Khalin, Deepak Kumaria, Ross McTaggart, Zoltan Roman, Andre Rottenbacher, Thomas Sizemore, Steven Snyder, Barrett Wimberly, Igor Ziger
7. IEEE Std C57.32a™-2020 – Amendment to IEEE Standard for Requirements, Terminology, and Test Procedures for Neutral Grounding Devices
WG Chair: Sergio Panetta
WG Vice Chair: Yann Elessad
WG Secretary: Thomas Yingling
Certificates of Appreciation: Bernard Audouard, Sinan Balban, Robert Berger, Sedat Corapsiz, Richard Field, Stuart Gibbon, Andrew Keith, Sheldon Kennedy, Todd Locker, Lodovico Mascardi, Edmundo Perich, Leslie Recksiedler, Pablo Sanchez, Ed teNyenhuus
8. IEEE Std C57.93™-2019 – IEEE Guide for Installation and Maintenance of Liquid-Immersed Power Transformers
WG Chair: 9. Michael Lau
WG Vice Chair: Alwyn VanderWalt
WG Secretary: Scott Reed
Certificates of Appreciation: Derek Baranowski, Wally Binder, James Graham, Susan McNelly, Donald Platts, Richard Simonelli, Joe Watson
9. IEEE Std C57.109™-2018 – IEEE Guide for Liquid-Immersed Transformers Through-Fault-Current Duration
WG Chair: Vinay Mehrotra
WG Vice Chair: Hemchandra Shertukde
WG Secretary: Jason Varnell

10. IEEE Std C57.110™-2018 – IEEE Recommended Practice for Establishing Liquid Immersed and Dry-Type Power and Distribution Transformer Capability when Supplying Nonsinusoidal Load Currents
WG Chair: Richard Marek
WG Secretary: Samuel Sharpless
Certificates of Appreciation: Robert (Casey) Ballard, Thomas Holifield, Aleksandr Levin, Tim-Felix Mai, Hasse Nordman, Alvaro Portillo, David Walker
11. IEEE Std 1276™-2020 – IEEE Guide for the Application of High-Temperature Insulation Materials in Liquid-Immersed Distribution, Power, and Regulating Transformers
WG Chair: Roger Wicks
WG Secretary: Javier Arteaga
Certificates of Appreciation: C. Clair Claiborne, Marion Jaroszewski, Alan Sbravati
12. IEC/IEEE 60076-16™-2018 – IEC/IEEE International Standard - Power transformers - Part 16: Transformers for wind turbine applications
WG Chair: Phil Hopkinson
WG Secretary: Donald Ayers
Special note of appreciation to: Robert (Casey) Ballard, Thomas Breckenridge, David Buckmaster, Paul Jarman, Joseph Mango, Joe Watson (NOTE: Certificates of Appreciation from IEEE were not requested.)

8.7 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

April 25, 2021

9 ADMINISTRATIVE SUBCOMMITTEE – BRUCE FORSYTH

The Administrative Subcommittee met virtually on April 20, 2021. 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.....	Steve Shull
Awards/Past Chair	Sue McNelly
Bushings	Eric Weatherbee
Dielectric Tests	Ajith Varghese
Distribution Transformers	Ed Smith
Dry Type Transformers	Casey Ballard
Instrument Transformers.....	Thomas Sizemore
Insulation Life	Sam Sharpless
Performance Characteristics	Rogério Verdolin
Power Transformers	Bill Griesacker
Standards	Dan Sauer
Underground Transformers & Network Protectors	George Payerle
Meetings	Tammy Behrens
Guests: Malia Zaman, Troy Tanaka, Peter Balma, Jonathan Stewart	

Affiliation Changes: Ed teNyenhuis had a company name change to Hitachi ABB Power Grids. Sam Sharpless (Rimkus) and Dan Sauer (Eaton) are first time ADCOM attendees.

9.2 APPROVAL OF PREVIOUS MEETING MINUTES

The Chair requested if there were comments on the draft Fall 2021 Administrative Subcommittee meeting minutes. Without comments received, the Fall 2021 Administrative Subcommittee minutes were approved by unanimous consent.

9.3 ADDITIONS TO AND/OR APPROVAL OF THE AGENDA

The preliminary agenda was previously distributed in advance of the meeting. The Chair proposed a new item would be added to the agenda under new business to consider one request for committee Emeritus Member status. There were no objections to approval of the revised agenda, therefore the below agenda was approved.

Approved Agenda:

1. **Administrative Topics**..... 2:00
 - 1.1. Introductions and Attendance (:09) Bruce Forsyth
 - 1.2. Affiliation Change Updates (:02).....All
 - 1.3. Review and Approval of the Agenda (:02) Bruce Forsyth
 - 1.4. Approval of Fall 2020 Minutes (:02) Bruce Forsyth
2. **Officer Reports**..... 2:15
 - 2.1. Chair's Report (:10) 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 Coordinator's Report (:15).....Steve Shull
 - 2.6.1. Standards Report
 - 2.6.2. Entity Proposal Report
3. **IEEE Report**..... 3:10
 - 3.1. IEEE Staff Update (:10).....Malia Zaman
4. **Meeting Planning Report** 3:20
 - 4.1. Meeting Planning Report (:05) Tammy Behrens
 - 4.2. S21 Meeting Format Discussion (:05) Tammy Behrens
5. **Subcommittee Reports** *(please limit your report to less than 4 minutes)* 3:30
 - 5.1. Bushings.....Eric Weatherbee
 - 5.2. Dielectric Test Ajith Varghese
 - 5.3. Distribution Transformers Ed Smith
 - 5.4. Dry Type Transformers Casey Ballard

5.5.	HVDC	Ulf Radbrandt	
5.6.	Instrument Transformers.....	Thomas Sizemore	
5.7.	Insulating Fluids	Scott Reed	
5.8.	Insulation Life.....	Sam Sharpless	
5.9.	Performance Characteristics.....	Rogério Verdolin	
5.10.	Power Transformers	Bill Griesacker	
5.11.	Standards	Dan Sauer	
5.12.	Subsurface Transformers & Network Protectors	George Payerle	
6.	Unfinished Business (:05)		4:20
7.	New Business (:30)		4:25
7.1.	CD Collection Plan (:05)	Peter Balma	
7.2.	Emeritus Status Request (<i>added to agenda</i>)	Bruce Forsyth	
7.3.	NEMA Standards Development Presentation (:20)	Jonathan Stewart	
8.	Wrap Up & Adjournment		4:55
8.1.	Wrap Up & Adjournment (:05)	Bruce Forsyth	

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.”

David Wallach made a motion to approve two new member applications:

- Kevin Biggie, Weidmann Electrical Technology, Producer
- Ken Hampton, BGE, and Exelon Company, User

Ed teNyenhuis seconded the motion. The two new member applications were approved unanimously without opposition.

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 – STEVE SHULL

Refer to Section 10.0 of the Main Minutes for a complete "Standards Report." Malia has a report available to list standards approved in a period will be helpful for the Awards and Standards Chairs. Malia will begin providing this report. Entity PAR activity has reduced. One Entity PAR arrived from the EPMC, "Guide for the detection, monitoring, and evaluation of winding deformation in oil-immersed power transformers" and was discussed. After discussion, the PCS SC was requested to look at this Entity PAR and will review with Steve Shull.

9.10 IEEE STAFF UPDATE – MALIA ZAMAN

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

Direct Vote Live tool being made available for online voting, surveys, etc. Bruce plans to try it out for the survey about the next meeting venue/format.

There was some discussion of the process for sharing drafts on slides 5-9 from Malia's report (Appendix 7). Currently, attendees with the main committee password can access all Working Group and Task Force documents. The process in the slides discusses a more formal sharing arrangement with requests, voting to share or not, formal transmittal with carbon copy to IEEE staff. This would imply documents on the Committee website would require WG and TF specific passwords. Malia will reexamine this setup with IEEE Staff and report back.

9.11 MEETING PLANNING REPORT – TAMMY BEHRENS

Meeting Planning Report: The conditions in Milwaukee are being monitored to determine if we can meet in-person this fall. Milwaukee is under capacity restrictions today and the hotel could not handle our full attendance. Tammy believes today it is 50-50 whether we can meet in person. The city has more restrictions than the suburbs.

The following meetings will be Denver, Charlotte, and Kansas City. We have a gap in 2023 that could be used for virtual if we decide to mix in-person and virtual meeting experiences.

We have 534 registered attendees for this upcoming Spring 2021 as of today (April 20, 2021).

S21 Meeting Format Discussion – we will have more meeting rooms available to us. Back-to-back meetings will be less of an issue this time. We still have 10 minutes between meetings, and we will have to end on time. The RFID email list in the meeting schedule has become stale. SC Chairs should remind WG chairs to review those email addresses along with the schedule.

9.12 SUBCOMMITTEE REPORTS/HOT TOPICS

Brief reports were received from all the subcommittee chairs.

9.12.1 Bushings Subcommittee | Eric Weatherbee

The chair for DC bushings WG must step down. This is a dual logo standard. The chair for IEC believes the work should be postponed. The WG is small. The secretary doesn't feel comfortable with the chair role. The chair had the lead and expertise with technical issues. Atruo Del Rio will run the S21 meeting.

9.12.2 Dielectric Test Subcommittee | Ajith Varghese

No new items. Insulation power factor and Insulation resistance is finishing up their report. C57.200 is progressing well (Entity work). Ajith is in his fifth year as DiTest chair and Bruce and Ajith will discuss replacement candidates.

9.12.3 Distribution Transformers Subcommittee | Ed Smith

Reported no issues or concerns for this meeting.

9.12.4 Dry Type Transformers Subcommittee| Casey Ballard

Two primary documents C57.12.91 and C57.12.01 are complete and will plan a new PAR for continuous revision process. C57.124 is late and is linked with C57.113. Other documents are early in their PAR cycle.

9.12.5 HVDC Converter Transformers & Reactors Subcommittee | Bruce Forsyth for Ulf Radbrandt

The Subcommittee chair was not in attendance with an update. Bruce Forsyth reviewed the communication from the Subcommittee Chair. The name of this Subcommittee is now HVDC CONVERTER TRANSFORMERS AND SMOOTHING REACTORS SUBCOMMITTEE. The name does not include converter reactors (used for VSC, Voltage Source Converters) and the scope of the SC does not either. The recently published IEEE 1277 (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) does now include converter reactors so we feel that we should update the name and the scope to cover those reactors.

The Subcommittee also agreed also that the scope of the subcommittee should be updated accordingly and that should be in line with the recently updated IEEE 1277. A proposal to new scope is with changes in red text:

SCOPE

- Studying and reviewing engineering aspects of the requirements, design, testing, and installation of HVDC converter transformers, **smoothing reactors, and converter reactors. Only converter reactors for DC transmission located at the converter arms are dealt with;**
- Developing and maintaining related standards, recommended practices, and guides for such product;
- Coordinating with other technical committees, groups, societies, and associations as required.

Bruce Forsyth has researched the topic and a change in a Subcommittee scope would require Adcom review and Transformers Committee approval. If the overall scope of the Transformers Committee is impacted, then the PES Tech Council would also need to approve.

Bruce will send this information to the Adcom for survey. There could be a ripple effect to the committee O&P, etc.

9.12.6 Instrument Transformers Subcommittee | Thomas Sizemore

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. An update on these efforts is expected at the meeting next week.

C57.13.2 – Submitted the latest draft to the MEC process and ballot pool invitations have been sent. This is a small standard and it is hoped the work can be completed in a timely manner.

IEC-IEEE 63245-57.13.8 – The second CD has come back, and the over 400 comments responded to through a series of online JWG meetings. The meeting on Tuesday will feature a status update and discussion of how close this working group is to going to ballot.

TF IT accuracy – This TF continues to meet regarding potential changes to the standard burdens and accuracy definitions. A presentation is planned for how VT accuracy can be determined through a combination of measurements and calculations.

9.12.7 Insulating Fluids Subcommittee | Scott Reed

No report.

9.12.8 Insulation Life Subcommittee | Sam Sharpless

A couple of standards have been replaced by a different standard number. This comment will be provided to Steve Shull via email. C57.154 and C57.91 have some questions about what material belongs where. A TF will be initiated to setup an amendment to a standard.

9.12.9 Performance Characteristics Subcommittee | Rogerio Verdolin

The SC meeting will be on Wednesday. There are 3 WG and 3 TF meetings. PAR for C57.136 is approved. Rogerio brought forth a question about FFD and IFFD insulation resistance C57.19.90 clause 10.11 and which SC should cover the topic. After discussion, DiTest will receive information from Rogerio to consider. Another question came up about the sizing of a loaded tertiary and simultaneous loading C57.12.10 clause 4.2.2. Rogerio will add this topic as new business to PCS agenda.

9.12.10 Power Transformers Subcommittee | Bill Griesacker

PAR extension PC57.143 Monitoring will be requested. C57.125 PAR was requested. A vote was not made by the WG to request PAR extension but will be added to the WG agenda. Five standards near expiration and chairs are being sought for PAR generation.

9.12.11 Standards Subcommittee | Dan Sauer

Noted the IEC TAG meeting is being held in the same time slot. Standards under this Subcommittee are in good shape.

Not too much to report. More WG and TF leaders can attend this set of meetings.

9.13 UNFINISHED BUSINESS

None

9.14 NEW BUSINESS

- 9.14.1 CD Standards Collection Plan: Peter Balma reported it has been about five years between collections. We are always concerned about getting the latest 12.00 and 12.90 complete to provide in the collection. We hope these two standards will be published in 2021. The last CD collection contained a gateway to access the collection online. This time there will be an electronic gateway access to the standards collections handled electronically. Peter will socialize a list of standards through Adcom to include in the collection. This would be the time to add specific other standards that add value such as IEEE Std 4. Once we know that C57.12.00 and C57.12.90 are about to be published, so we will pause until those are complete. It will likely be F22 meeting for this collection to be available.
- 9.14.2 Kipp Yule was recently moved to Past Committee Member and has requested Emeritus Status. Bruce asked for opposition to approval of Kipp Yule for Emeritus Status and has status change was approved.
- 9.14.3 NEMA Standards Development Presentation by Jonathan Stewart: Jonathan presented a PowerPoint regarding NEMA Transformer Standards as a best first step. Projects include data center LV AC and DC transformers. WG are being formed now. Renewable DC applications are another area of interest. Lastly a dual nameplate kVA rating to address the impact growing loads with undetermined growth. Non-NEMA members may now participate in a new consensus standards body within NEMA. Jonathan.Stewart@nema.org is the contact with questions. Casey Ballard raised a question about the dual kVA nameplate. IEEE Transformers Committee is already working on this topic and has a presentation next week. NEMA may reexamine the dual kVA rating project. NEMA is missing government, academia, and end users at the table. Jonathan is available to provide more information to SC. There could be some overlap and collaboration will be better than competition.

9.15 ADJOURNMENT

The meeting was adjourned at 5:01 PM.

Submitted by:

David Wallach,
Secretary, Transformers Committee

April 22, 2021

April 20, 2021 Adcom Meeting Attendance

Last Name	First Name	Affiliation	Meeting Date 4/20/2021
Ballard	Robert	DuPont	X
Behrens	Tammy	SPX Transformer Solutions, Inc.	X
Boman	Paul	Hartford Steam Boiler	X
Forsyth	Bruce	Bruce Forsyth and Associates LLC	X
Griesacker	Bill	Duquesne Light Co.	X
McNelly	Susan	Xcel Energy	X
Payerle	George	Carte International Inc.	X
Radbrandt	Ulf	Hitachi ABB Power Grids	
Reed	Scott	MVA	
Sauer	Daniel	EATON Corporation	X
Sharpless	Samuel	Rimkus Consulting Group	X
Shull	Stephen	BBC Electrical Services, Inc.	X
Sizemore	Thomas	ABB Inc.	X
Smith	Edward	H-J Family of Companies	X
Tanaka	Troy	Burns & McDonnell	X
teNyenhuis	Ed	Hitachi ABB Power Grids	X
Varghese	Ajith	SPX Transformer Solutions, Inc.	X
Verdolin	Rogério	Verdolin Solutions Inc.	X
Wallach	David	Duke Energy	X
Weatherbee	Eric	PCORE Electric	X
Zaman	Malia	IEEE	X

10 STANDARDS REPORT – STEVE SHULL

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.

11.3.1 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.

11.3.2 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

11.3.3 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

Tom Prevost presented an overview of ASTM D27 activities. His presentation is available in **Appendix 5**.

12 HOT TOPICS FOR THE UPCOMING WEEK

The Subcommittee Chairs typically provide brief updates on topics of special importance being addressed during the week; however, time ran short at this meeting and no updates were provided.

13 OPENING SESSION ADJOURNMENT

The meeting adjourned at 9:05 AM CDT.

Thursday Closing Session

14 CHAIR'S REMARKS AND ANNOUNCEMENTS

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

Agenda was reviewed and approved on Monday.

The chair thanked everyone for attending this important work. The chair thanked the activity leaders.

The chair reviewed where data uploads are located and to be patient as there is some lag. The *.csv WEBEX login files are requested. This meeting request the file from the meeting coordinator. This topic will be discussed as lessons-learned for future meetings.

The chair reviewed how meeting affiliation should be current in AMS and the best practice of updating your name and affiliation in WEBEX before logging into the meeting.

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

Power Transformer Subcommittee Meeting Minutes

Spring 2021 Virtual Meeting

April 28, 2021

12:55-2:10pm CT

The Power Transformers Subcommittee met on Wednesday afternoon at 12:55pm CT.

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

Attendance

	Webex (To Be Verified)
Total Attendees	243
Total # Of Members	128
Members Present	98
Quorum Present	76.6 %

The proposed agenda was approved by unanimous consent.

The minutes from the Fall 2020 PTSC meeting 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

WG Revision of C57.116 GSU Transformers - W. Li

The working group for revising C57.116 met on Monday and achieved a quorum. The PAR for this effort is valid until the end of 2023. This working group is split into 4 task forces to review various sections of document to identify changes that should be made. Each task force provided updates on their work at the meeting. Noted additions the document include a paragraph added for back-feed operation and a new section to address 3 winding auxiliary unit transformers. They are looking for additional members to contribute to these task forces. They plan to review all figures in the document to see if any of them need to be updated or replaced.

TF for Revision of C57.125 - W. Binder

This task force met on Monday. A presentation on the history of the guide was provided. Attendees were informed that they will need to attend the Fall 2021 meeting in order to become members of the new Working Group. A motion was approved in the meeting to advance the PAR with a revised purpose statement to the Subcommittee. Several individuals have volunteered to become officers of the new Working Group.

At the conclusion of the task force report, Wallace Binder made a motion that the PTSC establish a Working Group at the Fall 2021 meeting to undertake the revision of C57.125-2015. The motion was seconded by Craig Colopy. The motion was approved unanimously by the PTSC.

WG Revision of C57.131 Tap Changers – C. Colopy

Craig provided background on IEC 60214-1 and the attempts to make a dual logo standard. Due to some obstacles, it was decided that the revision of C57.131 would proceed without dual logo status and to that end, a Working group was formed with the goal of completing this effort within a couple years. The current standard expires in 2022.

The working group held their first meeting and established its membership. They have an existing PAR that was approved in December 2020 which expires in 2024. They plan to have meetings in between the Spring

and Fall meetings to complete the work in 2 years with the goal being to harmonize with 60214-1. The revision will add in both IEC and IEEE references and it was noted that it will address vacuum tap changers, SF6 tap changers and voltage regulators. The draft document will be sent out to working group members.

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

This working group met on Monday and a quorum was achieved. There was a patent issue in this working group, a Letter of Assurance was sent last week. A 2 year PAR extension was filed in March and they are waiting for resolution from NesCom. All TF leaders gave updates on their sections. There was a discussion on Chapter 4 to be separated into two different sections. It was decided that new Chapter 4 will be kept as it is. The document will be circulated among the working group and they will be holding a virtual working group meeting to discuss further. They are intending to have it ready for ballot at end of 2021.

WG Revision of C57.148 Guide for Control Cabinets for Power Transformers – J. Watson

This document has been published. They will likely start work again in 5 years. Key contributors to the document should be receiving recognition in the mail and possibly at the next meeting. This document was finished within the allotted time of the PAR.

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

This group did not meet. They are no longer taking new material and are preparing to send the document to the working group for a straw ballot. The PAR expires at the end of 2021 and an extension is needed to complete the balloting process.

Dan Sauer made a motion that C57.150 has the approval of the PTSC to proceed with the PAR extension request. This motion was seconded by Bruce Forsyth. The motion was approved unanimously by the PTSC.

WG C57.170 Condition Assessment Guide– K. Mani

This working group met Tuesday and a quorum was achieved. There were 4 presentations given by the various TF working on the document. They hope to have the draft ready for the working group to review by the Spring 2022 meeting. A question was raised about adding financial considerations to the guide. This will be discussed at the next meeting.

Gary Hoffman mentioned that there are anti-trust issues associated with including financial considerations. He offered to send a document to the working group chair about these issues.

TF on V/Hz Curve – J. Watson:

This task force has completed their assignment. They have examined existing V/Hz curves used by the industry and identified issues and have provided recommended text for C57.116 for its next revision. The task force is recommending that a new working group be formed to develop a V/Hz guide to include the impact of V/Hz on power transformers, issues with existing V/Hz curves, methodology to develop V/Hz curves for transformer designs, and temperature/time criteria for manufactures to use to develop V/Hz curves.

Request approval of this recommendation from the SC and allow time for the new working group to meet for the first time at the Fall 2021 meeting.

Joe Watson made a motion to make a recommendation to AdCom for a new working group that will cover effects of V/Hz on power transformers and related topics. This motion did not receive a second and generated discussion under which subcommittee that the working group would exist.

It was mentioned that it should be a PAR study group (TF) under the PTSC to develop a title and scope to create a PAR and that AdCom may recommend that it go to a different subcommittee if necessary.

The PTSC Chair stated that he would appoint a Chair of the PAR study group, provided the PTSC would approve the formation of the group.

Joe Watson made a motion that the SC approve the formation of a task force to create a PAR for the scope and purpose for a new guide on transformer V/Hz. This motion was seconded by Dan Sauer. This motion was approved unanimously by the PTSC.

The PTSC Chair asked if Joe Watson would accept the Chair position of the task force, which he accepted.

The V/Hz presentation will be posted to the Transformers Committee website.

Will post presentation on website

Liaison to PC57.93a – Installation and Maintenance Guide - S. Reed

The first meeting was held in September 2020. There has only been one meeting to date and there has been no communication as to when the next meeting will be scheduled. There was discussion at the meeting about natural ester fluid requirements and consideration was given to doing experiments related to cold weather start up procedures.

Scott Reed brought up various scope issues related to transformer kV/MVA ratings in the existing C57.93 under Clause 4. He asked if the subcommittee would open up a PAR study group to consider a revision of C57.93 to address these issues.

Scott Reed made a motion to open a new task force as a PAR study group for C57.93. This motion was seconded by Marcus Ferreira. The motion was approved unanimously by the PTSC.

Old Business

There was no old business.

New Business

The Chair covered 5 documents which are close to expiring, or up for revision.

- C57.17 Arc Furnace Transformers
- C57.135 Phase Shifting Transformers Guide
- C57.153 Paralleling Guide
- C57.156 Tank Rupture Guide

- IEEE 638 Class 1E Xfmrs for Nuclear Stations

The Chair asked if there is anyone interested in working on these as a PAR study group.

C57.17 Arc Furnace - Expires Dec 2022 A

Dan Sauer made a motion to form a PAR study group to look into PAR issues for C57.17. This motion was seconded by Sheldon Kennedy. The motion was approved unanimously by the PTSC.

A Chair is needed in to lead this group.

C57.135 Phase Shifting Transformers Guide – Expires 2021

Ewald Schweiger made a motion to form a PAR study group to investigate continued use of this document. This motion was seconded by Joe Watson. The motion was approved unanimously by the PTSC.

IEEE 693 Seismic Requirements for Substations:

Michael Riley, mjriley@bpa.gov, the chair, has requested that several manufactures of transformers join this working group to help balance their membership and help revise the seismic design requirements for transformers. This is a very important task.

Input was solicited from transformer manufacturers to provide input into this standard. An email will be sent out regarding this to the subcommittee.

The last 3 documents listed on the meeting slide have 4-5 years before expiration.

The meeting adjourned at 2:16pm CT.

16.2 STANDARDS DAN SAUER

Below is summary of standards SC for closing meeting:

- Standard SC met at 3:45 CDT and quorum was achieved (34 of 67 present at time of polling)
- Agenda and prior meeting minutes got approved
- Activity Report out
 - o C57.12.00 – Balling is complete and comments are being forwarded to resolution group.
 - o C57.12.90 – Didn't report out but status is similar to C57.12.00 – Under ballot resolution
 - o C57.12.80 - Chair is looking for feedback/involvement from other SCs members for any addition/changes needed in Transformer IEEE Terminology guide.
 - o C57.152 and C57.163 – Activities are on track to complete per PAR timeline
 - o C57.12.70 and TF on IEC/IEEE Cross reference didn't meet
- There was no old business.
- No new business brought up but there was a short discussion about definition or overlap between distribution and Class I transformers. It was reported by distribution SC that a TF is forced to looked into.

Standard SC currently have no plan of action and no decision was made.

o Meeting adjourned at 4:35 PM CDT.

16.3 SUBSURFACE TRANSFORMERS & NETWORK PROTECTORS GEORGE PAYERLE

STNP SC met on Wed morning and had a quorum. The Working Groups and Task Forces all met either Monday or Tuesday and all had quorums.

WG reports:

C57.12.24 Three phase submersibles

Their PAR will expire at the end of 2023. In order to move the work along, chair Ben Garcia held 2 informal meetings since the F20 meeting. Discussions from those meetings were considered by the WG at the Tuesday meeting.

Highlights – work on **table 6**, originally meant to reconcile English vs metric dimensions has been expanded to address minimum material thicknesses for the transformer tank. Once further input is received from the corrosion task force, this effort will continue.

Sec. 5.2 kVA ratings, there was discussion on how to present info on nonsymmetrical unbalanced loads in wye-wye connected transformers. In the end it was decided to refer to C57.105 for information and proper design methods.

Two voltages, 16,340 and 17,200 were added to **Table 2**

In **Figure 1**, a drawing of a round tank was added next to the rectangular tank that was already in the standard.

C57.12.40 Secondary network transformers met on Tuesday

John Vartanian (National Grid) and Brad Kittrell (ConEd) presented on cathodic protection initiatives and then also on their companies respective primary switch locations.

On tables 8 and 9, Mike Zarnowski recommended an update to include transformer fluids. Dave Blew agreed to conduct research to determine if any users are using fluids other than mineral oil or FR3.

Dn Schwartz agreed to review C57.12.24 and C57.12.40 to identify discrepancies between them. Dave Blew, Mike Zarnowski, and Brad Kittrell agreed to provide suggestions for keeping consistencies between the two standards.

C57.12.44 Network protectors

12.44's PAR expires at the end of this year, so their main item was to move their standard to ballot. They made a motion to do this and it was carried. They also set up to deal with changes requested by MEC.

A motion needed to be presented to the SC to move 12.44 rev 10 to ballot. It was moved and seconded and passed unanimously.

Task Force Corrosion effects on Subsurface Transformers

Will Elliott reviewed historical corrosion reports from 1968, 1972 and 1991. He is looking for data from the 1980s

Will also presented the 3D CT scans he performed on samples to determine where compatibility issues exist.

He also reviewed the proposed draft, which was compiled as an informative guide for users, with the following sections:

1 Guide purpose

2 Methods of defining the environment

3 Vault design considerations

4 Design considerations for equipment enclosures with superior corrosion resistance

5 Cathodic protection guide

6 Proposed simulated vault corrosion test method

Dan Mulkey suggested distinguishing the difference between a vault installation where there is room to walk around a transformer and a 'surface operable' unit where there is no additional room around a unit.

There was no **old business**

In **new business**, a member commented that there have been some connection issues during various meetings and as if to illustrate that, I had to ask him to repeat his statement because I couldn't understand part of it due to a connection problem.

STNP SC adjourned with time to spare which is also how I plan to have our minutes submitted.

16.4 BUSHINGS ERIC WEATHERBEE

The Bushing Subcommittee met virtually yesterday morning, at the time of the quorum check there were 139 attendees with 53 of 83 members in attendance and therefore a quorum was reached.

The Bushing Subcommittee has 3 active PARS with 6 active groups that held meetings during this conference, and all were able to obtain quorums except for C57.19.01 which held its first meeting to review how to proceed for the next revision cycle.

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

C57.19.01 – Standard for Performance and Dimension – Has I mentioned previously the group held their first meeting on how to address the next revision cycle. If you have any comments please share them with Dr. Zhang who is the Chair, you can find his contact information on the Transformer Committee Bushing Subcommittee webpage.

PC57.19.02 – Standard for Distribution Bushings – This is a new standard and the group has done an excellent job formulating the document. Currently they plan to have one final review at the next meeting to confirm that the document is ready to proceed to ballot. The current PAR expires at the end of 2022.

65700-19-03 – Dual Logo Standard for DC Bushings – Previously IEC had confirmed the need to revise this document. Unfortunately, a few weeks ago the IEEE Chair informed us that he must resign from the position but hopes to return next year. The IEC Chair thought it may be wise to stop progress on revision process. IEEE communicated that we would like to discuss this in the upcoming meeting which took place on Wednesday. The IEEE group agreed that the areas as previously determine in need of revision by both IEC and IEEE are very important and they wish to proceed. Arturo Del Rio, the IEEE Secretary, and I will communicate this to the IEC Chair ask them to review and agree to the areas already designated as revision targets. If they agree we can start formulating the matching PARs. With that said the IEEE TF is seeking a new Chair if anyone is confident with DC applications and if knowledgeable in the dual logo process that would be a bonus. If anyone is interested, it would be greatly appreciated if they contact Mr. Del Rio or myself. Our contact information can be found easily on the Transformers Committee webpage. Also, to note the document expires at the end of 2024.

PC57.19.100 – The Bushing Application Guide – After completion of the Overload Taskforce, their recommendation was that more information is required in the Application Guide regarding overloading. The Subcommittee assigned this task to the Application WG. This is of course too large of a topic of to go into details. In general, the bushing standards do not specify an overload requirement. The new technology bushings such as RIS dry bushing types do not behave in overload the same way as the OIP bushings everyone has become familiar with. These bushings use new materials that have higher temperature ratings and may operate at a high temperatures at their rated current, and likely cannot take the abuse that an OIP bushing may be expected to endure with a trade off in loss of life. Due to time restraints of the PAR, the current revision will likely recommend that with overload requirements the end user, transformer and bushing manufacturers review the specific requirements to ensure the proper bushing selection is made.

The IEC Bushing Liaison reported several topics a few of those were as follows:

1. The work on a draft report of SC 36A Bushing Dimensional Standardization has been finalized and will be discussed at the virtual meeting taking place on June 15th.
2. They will also be looking at the study on the feasibility of Application Guide for Power Apparatus Bushings.
3. Also, it was noted they will be evaluating comments received in regard to IEC 60137, the standard for bushing rated above 1kV

TF for Classification and Performance of Dry Bushings – Several members volunteered to review existing bushing documents with open PARs. 19.00 General Requirements and Test as well 19.100 the bushing Application Guide to see if there is anything that may be updated regarding Dry Bushings that will not severely impact the PAR timeline.

16.5 DIELECTRIC TESTS AJITH VARGHESE

The Subcommittee met yesterday, and a quorum was achieved.

C57.168 LF Dielectric Test – reviewed the sections related to power factor. Agreement was obtained to add an annex on the measurement of AC voltages. A final review is planned for the document for the fall meeting.

C57.113 PD Measurement Guide – agreement was made to remove certain sections related to PD patterns. The WG approved a motion to request a 1-year PAR Extension.

C57.98 Impulse Test Guide – there were discussions of beta corrections and beta prime. The document is on track.

C57.160 PD Guide for Bushings – the Guide is expired and is in comment resolution.

TF LF Tests – PD levels for Class I discussions continue arriving at a partial discharge limit of 500 pC and a 150 pC increase limit in line with the existing 2015 standard but will differ from Class II being balloted now.

PD in bushings during factory test – discussions continue with differing opinions between manufacturers and end users. Manufacturers seek the ability to troubleshoot and continue testing while users are concerned about field reliability of the bushing. There is no direct correlation between any bushing failures related to bushing venting during testing. Agreement was made to continue discussion of this topic at a future Bushing SC meeting as there was no consensus.

TF Working with C57.200 – This is an Entity PAR working with a group in China. An update was provided and the WG has made significant progress. The final draft is in review and expect to have the Dielectric Test SC for review and approval in August before the Fall 2021 meeting. There was discussion to change the title of the document from Frequency Domain Spectroscopy to Dielectric Frequency Response for Transformer Bushings to align terminology with other IEEE documents.

TF Impulse Test – comments from C57.12.90 ballot have been reviewed and have resolution actions.

TF on Insulation Power Factor and Insulation Resistance – the final draft report has been presented and will be reviewed by the Dielectric SC.

TF Mitigation of Impulse Transients – provided an update on a presentation for the C57.142 guide which is preparing for ballot. Most of the work now will be about the transient development.

HVDC Test Techniques – provided an update on activities. There is a lot of detail so please refer to the meeting minutes.

Under new business, a motion was approved to establish a PAR for C57.130, recommended guide for impulse testing.

Under new business the topic of establishing limits for core and core frame insulation resistance, however, due to lack of time, this discussion will be brought up at the next meeting.

16.6 DISTRIBUTION TRANSFORMERS ED SMITH

The Distribution SC met yesterday, and a quorum was established. We had 6 WG and 1 TF meet this week.

PC57.167 – the PAR expires in 2022. Review of table key monitoring parameters was reviewed.

Transformer impact class will be integrated from Clause 4 into the table. The WG reviewed method of alert and telemetry. The WG started review of the installation section of the Guide. An interim meeting is planned before Fall to make progress towards going to ballot in January 2022.

PC57.12.20 – the PAR expires in 2023. Progress is going well on the document. Section 7.5.1, covers was discussed. Table 6 for electrical characteristics for bushings was covered. C57.19.02 will continue its work on the bushing topic. Dielectric test, strength of covers was discussed.

C57.12.28 – expires in 2024

C57.12.29 – expires in 2024

C57.12.30 - published last year so no activity needed.

C57.12.31 – published last year so no activity needed.

C57.12.32 – published in 2019. Several things were worked on during the meeting including creating an annex of various steels and definitions, prybar and probe test, and tank touch temperature.

C57.12.35 – PAR expires 2023. QR plan is being worked on to present to Distribution Subcommittee.

C57.12.34 – PAR expires in 2022. Completed work on an informative annex for accessories. A concern of the dielectric test section was raised but time ran out. The chair will work with the individual to document the concerns and it will be brought up at the next meeting.

TF on Efficiency and DOE Topics – various reports were given during the TF meeting with a lot of participation. Topics included utility loading data, thermal class information, thermally upgraded craft paper and solid materials, and dual nameplate ratings.

New Business – the topic of distribution transformer classification and if two classes of distribution type classes may be needed was raised. The chair requested the information be brought together for future discussion.

16.7 DRY TYPE TRANSFORMERS CASEY BALLARD

- TF C57.12.01 General Requirements and TF C57.12.91 Test Requirements each met as a new TF with the charter of developing PARs for their continuous revision. When discussing the scope of transformers covered (which is the same for each document) it was challenged if the scopes should be expanded below 601V to include low voltage equipment and/or specifically exclude drive and inverter transformers (which are not defined even in 12.80). Topics for the revision were also discussed with additional feedback requested.
- WG C57.16 Air Core Reactors discussed the annexes with a plan to finalize them before the Fall meeting and move for SA ballot on/before the Spring 22 meeting
- WG C57.124 Partial Discharge is moving closer to having a draft for ballot but will not meet the current PAR expiration. The WG and subsequently the SC approved to proceed with a request for a 2 year PAR extension and also passed a motion to clearly state the intent is to have a draft prepared on or before the Fall 21 meeting.
- WG C57.12.52 Sealed Dry Type - Draft 1 is taking shape with many updates related to more recent changes in 12.01 and the path of removing duplication of requirements that can cause confusion if they become out of sync.

- WG 259 LV Thermal Aging - first meeting as a WG and the sections of the documents were assigned to TFs in order to process them quickly. Discussion covered if the document should document a process to make a Thermal Index and/or what/how the reference system would be chosen
- TF C57.134 - Hottest Spot Determination - PAR has been submitted and is in the May 4 agenda. Initial discussions on what should be updated were held.
- WG C57.96 Loading Guide - PAR was approved and document was divided into TF to make the initial recommendations for revisions.
- Liaison WG C57.12.80 - Dry-Type documents were reviewed and suggestions proposed to existing WG/TF to remove definitions if they were already part of 12.80. Also made proposal to add several more terms to 12.80.
- The Chair asked for volunteers to lead a TF charged with generating a PAR for C57.12.59 and C57.94 which both expire in 2025. C57.12.59 will be led by Derek Foster and C57.94 will be Chaired by Dave Stankes.

Several topics for the revision of 12.01 and 12.91 have overlapping impacts so there will be a poll to the SC Members to vote on which ones should be investigated and which ones should not. This was decided upon to keep all of the SC documents moving in the same direction and since any PARs must pass through the SC anyway.

16.8 HVDC CONVERTER TRANSFORMERS & REACTORS ULF RADBRANDT

The HVDC SC met on Monday and a quorum was achieved. At the last meeting the SC decided to recommend a scope and name change. The Transformers Committee must vote to approve a name change. The question was raised if we had a quorum at this Thursday meeting. A poll was launched to determine if we had quorum. 145 members of 206 reported as present via the poll. The SC chair made a motion to change the name to “Transformers and Reactors for HVDC Applications Subcommittee” and to change the scope first bullet, with additional text in red, to “Studying and reviewing engineering aspects of the requirements, design, testing, and installation of HVDC converter transformers, **smoothing reactors and converter reactors. Only converter reactors for dc transmission located at the converter arms are included;**”. One attendee asked if condition assessment of reactors was included in the scope. The response was affirmative as the topic would be part of the engineering aspects. The TC chair asked if there was opposition to unanimous approval of the change to the SC name and scope. There was no opposition, so the motion was approved. NOTE: This change does not change the scope of the Transformers Committee so there are no other approvals required.

There are no documents under revision at this time.

16.9 INSTRUMENT TRANSFORMERS THOMAS SIZEMORE

Closing report to the IEEE Transformers Committee

From: ITSC

Date: 4/28/2021

Brief status of active working groups and task forces and meeting details:

Both the SSVT JWG and the WG developing a standard for Power line carrier coupling capacitors and coupling capacitor voltage transformers are nearing the end of the development cycle and are expected to be in balloting later this year. Both will be seeking PAR extensions to complete the ballot phase.

The task force on instrument transformer accuracy featured a presentation on voltage transformer at different burdens and power factors.

The ITSC meeting featured several items of new business. Most of the conversation focused on three specific items that will likely be addressed in future versions of C57.13 and C57.13.5. Finally, there was a discussion of when to start work on the next revision of C57.13 and also some discussion took place concerning if this standard should move to a continuous revision or simply start the next revision.

16.10 INSULATING FLUIDS SCOTT REED

April 28, 2021 started promptly at 3:20 pm

- a. 29 Members of 39 signed in so quorum was achieved. Total of 87 attendees, 18 requested membership

I reminded the working group and task force chairs to fill out attendance in AMS so the records are up to date.

Activity is increasing within IFSC for the review of guides.

Next we review the status each Working Group and Task Force:

C57.166—Consolidation of Insulating Liquids Guide, Chairman Tom Prevost led the meeting.

29 of 36 members were present so a quorum was achieved.

1. Tom reported that the Working Group is on schedule to complete the new guide by the PAR expiration date of December 1, 2022.
2. TF1, which is the largest task force, expects to complete its draft next month.
3. The working group voted to keep the IEEE voltage classes instead of adopting IEC voltage classes.
4. There will be a draft guide prepared prior to the fall meeting.

C57.146--Guide for DGA in Silicone-Immersed Transformers, Chairman Jon Karas led the meeting.

1. They had 32 attendees but only 11 members, so a quorum was not met.
2. The guide is set to expire at the end of this year so there will be a gap until the new guide is finished and approved.

3. The working group is still analyzing sources of DGA data to develop tables similar to C57.104.

C57.104 Task Force for the DGA of Mineral Oil Transformers—the next revision: Chairman Claude Beauchemin led the meeting:

1. 35 of 59 members so there was a quorum. 118 total attendees.
2. Discussion has begun on how to create a transformer assessment instead of a DGA status.
3. Zach Draper of Delta X gave a presentation comparing industry interpretation methodologies to analyze predictive capabilities after analyzing 15,000 transformers in service that had 300 failures.

C57.637 Task Force for Reclamation of Mineral Insulating Oil and Criteria for Its Use held its first meeting. Stephanie Denzer.

1. This task force revised the title, scope, and purpose to expand the guides' maintenance techniques to include other insulating fluids and not just mineral oil. The new title is, "IEEE Guide for Reclamation and Reconditioning of Insulating Liquids."
2. A motion was made and approved for the Task Force to submit a PAR.

C57.155 Interpretation of Gases Generated in Natural Ester and Synthetic Ester-Immersed Transformers held its first meeting. Alan Sbravati is the chair.

1. This task force revised the title, scope and purpose and where it was feasible, adopted C57.104's language.
2. A motion was made and approved for the Task Force to submit a PAR.

C57.130 Dissolved Gas Analysis Applied to Factory Temperature Rise Tests for the Evaluation of Mineral Oil-Immersed Transformers and Reactors held its first meeting. John Foschia is the Chair.

1. The task force held conversations around expanding the guide to include limits for natural and synthetic esters. The concern is how much available data there is so a survey will be performed to see what data OEM's and utilities have to see if this is a viable option. At the very least, an appendix will be developed to include ester factory temperature rise test information
2. As a result, the task force revised the title, scope and purpose but kept 'mineral oil' as part of the title with the understanding that if the group successfully collects enough ester data, the title would be revised.
3. A motion was made and approved for the Task Force to submit a PAR.

Old Business to review.

1. Rainer Frotscher agreed to be the Task Force Chairman for C57.139 Dissolved Gas Analysis in Transformer Load Tap Changers

No New business

The next meeting is scheduled for October 20, 2021—Milwaukee, WI and the meeting was adjourned at 3:26 pm.

16.11 INSULATION LIFE SAM SHARPLESS

The Insulation Life Subcommittee met this week and achieved a quorum.

PC57.91 – The PAR expires at the end of 2021. The WG voted last December to request a two-year PAR extension which has been submitted. The extension is intended to update Clause 7, Annex G, and the bubble evolution section.

PC57.100 – The PAR expires in 2022 and progress going well.

PC57.154 – The PAR expires in 2022 and are on schedule. There was a SC TF suggested to consider reopening 12.76 to pick up some information that will be removed from C57.154.

PC57.162 – The PAR expires the end of 2022. The main work is mostly complete with some planned work to update bubble evolution topic with information from C57.91. The PAR has already been extended twice and this is a large guide with 9 sections with a lot of work.

PC57.165 – The PAR expires this year. The request to request a PAR extension was approved. A change to the purpose statement was also voted on and approved and will be submitted for PAR revision.

PC57.169 – The PAR expires in 2023 and is moving along well.

TF PC57.12.90 Clause 11 – recommended changes to clause 11.3.2 had been suggested and were discussed but did not result in updated text during the meeting so it was turned back for further review to discuss at the next meeting.

TF PC57.12.00 Clause 5.11.1.4 – a wording change was discussed about absolute temperature versus temperature rise. The suggestion was made to include an example. This recommended update was brought to the SC and approved.

TF Volts/Hz Liaison – an issue had been raised and will be referred to the Power Transformer SC for feedback.

16.12 PERFORMANCE CHARACTERISTICS ROGERIO VERDOLIN

The Performance Characteristics Subcommittee met this week and achieved a quorum. The status of active PARs was presented.

PC57.149 – The WG did not achieve a quorum. The WG discussed three new radial and two axial examples. A new template was proposed to submit these case studies. They are looking for examples for transportation issues, shorted turn failures, design related issues, and measurement problems.

TF Audible Sound Revisions to Clause 13 of C57.12.90 – the first technical agenda item dealt with three technical issues with measuring transformer noise; impact of temperature on core noise, impact of temperature on load noise, and impact of the tap position on load noise. More work is needed, and this TF will meet in the Fall of 2021 and the noise guide WG will have a separate meeting slot.

TF Continuous Revisions to C57.12.00 – discussed inclusion of more information on the nameplate. Adding information about the core design was discussed on C class nameplates.

TF Continuous Revisions to C57.12.90 Clauses 7.1.2, 7.2.3, 12.3.4, 9.3 – various options were discussed for updates.

WG PC57.142 – approved draft 9b to go to ballot. The WG voted to approve requesting a PAR extension to provide time to ballot. The Switchgear Committee has requested more information about mitigating the impacts.

WG PC57.164 – The WG met and had a quorum. The update on the status of draft 6 of the guide was discussed. The guide is ready for ballot and has been submitted for MEC review and the ballot pool is being formed. The PAR will expire this year and expect to complete the guide.

New Business

C57.136 is a new WG that will meet in the Fall.

The wording of transformer loading in C57.12.10 Clause 4.2.2 was discussed. After discussed, no changes were suggested but some users suggested the wording was not clear to this item will be discussed again in the Fall.

17 ADDITIONAL REPORT FROM THE STANDARDS COORDINATOR

This report provides an opportunity to present standard development issues from the week. The Standards Coordinator reported that there was nothing special to report this meeting. Reach out to the Standards Coordinator if you have questions or need assistance.

18 NEW BUSINESS

No new business items were brought up.

19 CLOSING SESSION ADJOURNMENT

The meeting was adjourned at 12:22 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, APRIL 20

TIME	ACTIVITY	TRACK	MTG CHAIR	STATUS	ATTENDANCE	RM CAP	ROOM (FLOOR)
1:00 PM – 4:00 PM	Administrative Subcommittee - Closed meeting, by invitation only	Admin	B. Forsyth	–	35	35	Session 1

MONDAY, APRIL 26

TIME	ACTIVITY	TRACK	MTG CHAIR	STATUS	ATTENDANCE	RM CAP	ROOM (FLOOR)
On – demand	Newcomers Orientation		E. teNyenhuis	–	100	150	Pre-recorded
8:00 AM – 9:00 AM	Opening Session		B. Forsyth	-	600	677	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	100	114	Session 1
9:10 AM – 10:35 AM	WG Guide of FRA for Liquid Filled Transf. C57.149	PCS	C. Sweetser	I	80	236	Session 2
9:10 AM – 10:35 AM	WG Partial Discharge Test - C57.113	DiTests	A. Naderian	I	50	132	Session 3
9:10 AM – 10:35 AM	WG Std Transf. Terminology C57.12.80	Stds	J. Graham	I	90	265	Session 4
9:10 AM – 10:35 AM	TF Transf Efficiency & Loss Evaluation (DOE Activity)	Distr	P. Hopkinson	I	44	280	Session 5
9:10 AM – 10:35 AM	WG Moisture in Insulation PC57.162	Ins Life	T. Prevost	I	130	265	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	75	114	Session 1
10:45 AM – 12:00 PM	WG C57.116 Guide for Trfs Direct Connect to Generators	Power	W. Li	I	50	236	Session 2
10:45 AM – 12:00 PM	WG Bushings Gen. Require. C57.19.00	Bush	P. Zhao	I	57	132	Session 3
10:45 AM – 12:00 PM	WG Sealed Dry-Type Transf. PC57.12.52	Dry Type	J. Tedesco	I	35	265	Session 4
10:45 AM – 12:00 PM	TF Partial Discharge Tests for Class I Transformers	DiTests	D. Ayers	I	128	280	Session 5
10:45 AM – 12:00 PM	TF Guide for DGA in Silicone C57.146	IF	J. Karas	N	20	265	Session 6
12:00 PM – 12:55 PM	Lunch Break				240		
12:55 PM – 2:10 PM	WG 1-ph Padmount Dist Transf. C57.12.38	Distr	A. Ghafourian	I	65	114	Session 1
12:55 PM – 2:10 PM	WG Dry Type Gen. Requirements C57.12.01	Dry Type	C. Ballard	N	35	236	Session 2
12:55 PM – 2:10 PM	WG PC57.152 Guide for Field Testing	Stds	M. Ferreira	I	60	132	Session 3
12:55 PM – 2:10 PM	WG Standard Requirements for Tap Changers - C57.131	Power	C. Colopy	I	75	265	Session 4
12:55 PM – 2:10 PM	TF Audible Sound Revision to Test Code	PCS	R. Girgis	I	160	280	Session 5
12:55 PM – 2:10 PM	WG High Temp Liquid Transformers C57.154	Ins Life	R. Marek	I	100	265	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	80	114	Session 1
2:20 PM – 3:35 PM	WG Transformer Monitoring C57.143	Power	M. Spurllock	I	88	236	Session 2
2:20 PM – 3:35 PM	WG Transformer Impulse Test Guide PC57.98	DiTests	T. Hochanh	I		132	Session 3
2:20 PM – 3:35 PM	TF C57.134 Guide for Hottest-spot in Dry-type	Dry Type	C. Lovins	I	25	265	Session 4
2:20 PM – 3:35 PM	WG Bushing Applicat. Guide C57.19.100	Bush	T. Spitzer	I	125	280	Session 5
2:20 PM – 3:35 PM	TF PCS Cont. Revisions to C57.12.00	PCS	T. Ansari	I	200	265	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	50	114	Session 1
3:45 PM – 5:00 PM	TF Dry Bushing Class and Perf.	Bush	A. Del Rio	N	19	236	Session 2
3:45 PM – 5:00 PM	TF Failure Investigation & Reporting PC57.125	Power	W. Binder	N	50	132	Session 3
3:45 PM – 5:00 PM	TF Next Revision to C57.104 Guide for DGA in Mineral Oil	IF	C. Beauchemin	N	100	265	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	25	280	Session 5
3:45 PM – 5:00 PM	SC HVDC Converter Transfs & Smoothing Reactors	HVDC	U. Radbrandt	-	60	265	Session 6

TUESDAY, APRIL 27

TIME	ACTIVITY	TRACK	MTG CHAIR	STATUS	ATTENDANCE	RM CAP	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	40	114	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	75	236	Session 2
8:00 AM – 9:15 AM	WG Station Service Volt. Transf. C57.13.8	Instr TR	D. Wallace	I	55	132	Session 3
8:00 AM – 9:15 AM	WG Dry Type PD Detection PC57.124	Dry Type	T. Prevost	I	88	265	Session 4
8:00 AM – 9:15 AM	TF on Winding Insulation PF	DiTests	D. Robalino	I	127	280	Session 5
8:00 AM – 9:15 AM	TF PCS Cont. Rev. to Test Code C57.12.90	PCS	H. Sahin	I	180	265	Session 6
9:15 AM – 9:25 AM	Break						
9:25 AM – 10:40 AM	WG Low Frequency Test Guide PC57.168	DiTests	D. Sauer	I	100	114	Session 1
9:25 AM – 10:40 AM	WG Submersible Transf. C57.12.24	STNP	B. Garcia	I	63	236	Session 2
9:25 AM – 10:40 AM	TF Instrument Transf. Accuracy	Instr TR	I. Ziger	I	48	132	Session 3
9:25 AM – 10:40 AM	WG Temp Measurement PC57.165	Ins Life	M. Tostrud	I	61	265	Session 4
9:25 AM – 10:40 AM	WG Condition Assessment Guide PC57.170	Power	K. Mani	I	130	280	Session 5
9:25 AM – 10:40 AM	TF Guide for the Reclamation of Mineral Oil - C57.637	IF	S. Denzer	N	100	265	Session 6
10:40 AM – 10:50 AM	Break						
10:50 AM – 12:05 PM	WG Distrib. Transf. Bushings PC57.19.02	Bush	S. Shull	I	88	114	Session 1
10:50 AM – 12:05 PM	WG Liquid-immersed Sec. Network TRs C57.12.40	STNP	D. Blew	I	51	236	Session 2
10:50 AM – 12:05 PM	WG PLC Caps & CCVTs PC57.13.9	Instr TR	Z. Roman	I	35	132	Session 3
10:50 AM – 12:05 PM	WG PC57.163 Geomagnetic Disturbances	Stds	D. Blaydon	N	160	265	Session 4
10:50 AM – 12:05 PM	TF Continuous revision of Impulse Test C57.12.90	DiTests	P. Riffon	I	100	280	Session 5
10:50 AM – 12:05 PM	TF Guide DGA for Factory Temp Rise Tests - C57.130	IF	J. Foschia	N	80	265	Session 6
12:05 PM – 12:55 PM	Lunch Break					540	Pre-recorded
Awards Presentation - prerecorded for viewing at a time of your choosing.							
12:55 PM – 2:10 PM	WG Consolidation Insulating Fluid Guides PC57.166	IF	T. Prevost	I	75	114	Session 1
12:55 PM – 2:10 PM	TF Bar Coding for Distr Transf. C57.12.35	Distr	R. Chrysler	I	80	236	Session 2
12:55 PM – 2:10 PM	TF Cont. Revision to Low Frequency Tests	DiTests	B. Griesacker	I	48	132	Session 3
12:55 PM – 2:10 PM	WG Guide for Loading Dry Type Transformers C57.96	Dry Type	A. Narawane	I	27	265	Session 4
12:55 PM – 2:10 PM	WG Determine Max Winding Temp Rise PC57.169	Ins Life	S. Digby	I	30	280	Session 5
12:55 PM – 2:10 PM	WG Perform Char & Dims for Outdoor Bushings	Bush	S. Zhang	N	140	265	Session 6
2:10 PM – 2:20 PM	Break						
2:20 PM – 3:35 PM	Freq Domain Spec Bush C57.12.200	DiTests	P. Patel	E/I	40	114	Session 1
2:20 PM – 3:35 PM	TF Effects of Corrosion on Transformers	STNP	W. Elliott	I	50	236	Session 2
2:20 PM – 3:35 PM	WG Thermal Evaluation C57.100	Ins Life	R. Wicks	I	138	265	Session 3
2:20 PM – 3:35 PM	TF Volts per Hertz	Power	J. Watson	I	20	265	Session 4
2:20 PM – 3:35 PM	WG Sw Transients Ind by TR/Bkr Interaction PC57.142	PCS	J. McBride	I	220	280	Session 5
2:20 PM – 3:35 PM	WG Bushings IEC/IEEE 65700.19.03 Dual Logo	Bush	L. Recksiedler	I	138	265	Session 6
3:35 PM – 3:45 PM	Break						
3:45 PM – 5:00 PM	WG Guide for PD Measure HV Bushings & Inst Trf C57.160	DiTests	T. Hochanh	NC		114	Session 1
3:45 PM – 5:00 PM	WG Guide for Monitoring Distr Transf PC57.167	Distr	G. Hoffman	I	125	236	Session 2
3:45 PM – 5:00 PM	WG Short Circuit Withstand PC57.164	PCS	S. Patel	I	50	132	Session 3
3:45 PM – 5:00 PM	WG Loading Guide PC57.91	Ins Life	D. Wallach	I	130	265	Session 4
3:45 PM – 5:00 PM	TF Guide DGA in Ester-Immersed Transformers- C57.155	IF	A. Sbravati	N	140	280	Session 5
3:45 PM – 5:00 PM	WG Dry Type Test Code C57.12.91	Dry Type	D. Walker	N	130	265	Session 6
5:10 PM – 6:25 PM	TF Continuous Rev Clause 11 Temp Rise Tests C57.12.90	Ins Life	D. Sankarakurup	I			Session 1

WEDNESDAY, APRIL 28

TIME	ACTIVITY	TRACK	MTG CHAIR	STATUS	ATTENDANCE	RM CAP	ROOM (FLOOR)
On – demand	SC Meetings Planning - All interested individuals welcome	Mtgs	T. Behrens	–	24	57	Pre-recorded
8:00 AM – 9:15 AM	SC Instrument Transformers	Instr TR	T. Sizemore	–	68	265	Session 1
8:00 AM – 9:15 AM	SC Insulation Life	Ins Life	S. Sharpless	–	234	280	Session 2
9:15 AM – 9:25 AM	Break						
9:25 AM – 10:40 AM	SC Distribution Transformers	Distr	E. Smith	–	130	265	Session 1
9:25 AM – 10:40 AM	SC Bushings	Bush	E. Weatherbee	–	165	280	Session 2
10:40 AM – 10:50 AM	Break						
10:50 AM – 12:05 PM	SC Submersible Transf. & Network Protectors	STNP	G. Payerle	–	49	265	Session 1
10:50 AM – 12:05 PM	SC Dielectric Test	DiTests	A. Varghese	–	269	280	Session 2
12:05 PM – 12:55 PM	Lunch Break						
12:55 PM – 2:10 PM	SC Dry Type Transformers	Dry Type	C. Ballard	–	45	265	Session 1
12:55 PM – 2:10 PM	SC Power Transformers	Power	B. Griesacker	–	250	280	Session 2
2:10 PM – 2:20 PM	Break						
2:20 PM – 3:35 PM	SC Insulating Fluids	IF	S. Reed	–	100	265	Session 1
2:20 PM – 3:35 PM	SC Performance Characteristics	PCS	R. Verdolin	–	250	280	Session 2
3:35 PM – 3:45 PM	Break						
3:45 PM – 5:00 PM	SC Standards	Stds	D. Sauer	–	100	265	Session 1
3:45 PM – 5:00 PM	IEC TC-14 Technical Advisory Group		P. Hopkinson	–	100	265	Session 2

THURSDAY, APRIL 29

TIME	ACTIVITY	TRACK	MTG CHAIR	STATUS	ATTENDANCE	RM CAP	ROOM (FLOOR)
8:00 AM – 9:15 AM	Technical Presentation 1 "Effect of reverse power flow on transformers" - Ed teNyenhuys - See flyer on website for details **	Tutorial			400	677	Session 1
9:15 AM – 9:30 AM	Break						
9:30 AM – 10:45 AM	Technical Presentation 2 "HVDC Tutorial #1, HVDC System Aspects (LCC and VSC)" - Ulf Radbrandt - See flyer on website for details **	Tutorial			400	677	Session 1
10:45 AM – 11:00 AM	Break						
11:00 AM – 12:00 PM	Closing Session - All attendees are encouraged to attend - See separate document on website for meeting agenda		B. Forsyth		400	677	Session 1

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

FUTURE COMMITTEE MEETINGS

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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SUBCOMMITTEE MEETING LIST

SPRING 2021 MEETING: APRIL 26 TO APRIL 29

On-Line Meeting; Virtual, Central Time Zone USA

Date	Time Start	Time End	Session Title	Track	Chair	Room/Location
4/20/2021	1:00 PM	4:00 PM	Administrative Subcommittee - Closed meeting, by invitation only	Admin	B. Forsyth	Session 1
4/26/2021	10:45 AM	12:00 PM	WG Bushings Gen. Require. C57.19.00	Bush	P. Zhao	Session 3
4/26/2021	2:20 PM	3:35 PM	WG Bushing Applicat. Guide C57.19.100	Bush	T. Spitzer	Session 5
4/26/2021	3:45 PM	5:00 PM	TF Dry Bushing Class and Perf.	Bush	A. Del Rio	Session 2
4/27/2021	10:50 AM	12:05 PM	WG Distrib. Transf. Bushings PC57.19.02	Bush	S. Shull	Session 1
4/27/2021	12:55 PM	2:10 PM	WG Perform Char & Dims for Outdoor Bushings	Bush	S. Zhang	Session 6
4/27/2021	2:20 PM	3:35 PM	WG Bushings IEC/IEEE 65700.19.03 Dual Logo	Bush	L. Recksiedler	Session 6
4/28/2021	9:25 AM	10:40 AM	SC Bushings	Bush	E. Weatherbee	Session 2
4/26/2021	9:10 AM	10:35 AM	TF Transf Efficiency & Loss Evaluation (DOE Activity)	Distr	P. Hopkinson	Session 5
4/26/2021	10:45 AM	12:00 PM	WG Overhead Distr. Transf. C57.12.20	Distr	A. Traut	Session 1
4/26/2021	12:55 PM	2:10 PM	WG 1-ph Padmount Dist Transf. C57.12.38	Distr	A. Ghafourian	Session 1
4/26/2021	2:20 PM	3:35 PM	WG 3-ph Padmount Dist Transf. C57.12.34	Distr	S. Shull	Session 1
4/27/2021	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
4/27/2021	12:55 PM	2:10 PM	TF Bar Coding for Distr Transf. C57.12.35	Distr	R. Chrysler	Session 2
4/27/2021	3:45 PM	5:00 PM	WG Guide for Monitoring Distr Transf PC57.167	Distr	G. Hoffman	Session 2
4/28/2021	9:25 AM	10:40 AM	SC Distribution Transformers	Distr	E. Smith	Session 1
4/26/2021	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
4/26/2021	9:10 AM	10:35 AM	WG Partial Discharge Test - C57.113	DiTests	A. Naderian	Session 3
4/26/2021	10:45 AM	12:00 PM	TF Partial Discharge Tests for Class I Transformers	DiTests	D. Ayers	Session 5
4/26/2021	2:20 PM	3:35 PM	WG Transformer Impulse Test Guide PC57.98	DiTests	T. Hochanh	Session 3
4/27/2021	8:00 AM	9:15 AM	TF on Winding Insulation PF	DiTests	D. Robalino	Session 5
4/27/2021	9:25 AM	10:40 AM	WG Low Frequency Test Guide PC57.168	DiTests	D. Sauer	Session 1
4/27/2021	10:50 AM	12:05 PM	TF Continuous revision of Impulse Test C57.12.90	DiTests	P. Riffon	Session 5
4/27/2021	12:55 PM	2:10 PM	TF Cont. Revision to Low Frequency Tests	DiTests	B. Griesacker	Session 3
4/27/2021	2:20 PM	3:35 PM	Freq Domain Spec Bush C57.12.200	DiTests	P. Patel	Session 1
4/27/2021	3:45 PM	5:00 PM	WG Guide for PD Measure HV Bushings & Inst Trf C57.160	DiTests	T. Hochanh	Session 1
4/28/2021	10:50 AM	12:05 PM	SC Dielectric Test	DiTests	A. Varghese	Session 2
4/26/2021	9:10 AM	10:35 AM	WG Dry Type Reactors PC57.16	Dry Type	A. Del Rio	Session 1
4/26/2021	10:45 AM	12:00 PM	WG Sealed Dry-Type Transf. PC57.12.52	Dry Type	J. Tedesco	Session 4
4/26/2021	12:55 PM	2:10 PM	WG Dry Type Gen. Requirements C57.12.01	Dry Type	C. Ballard	Session 2
4/26/2021	2:20 PM	3:35 PM	TF C57.134 Guide for Hottest-spot in Dry-type	Dry Type	C. Lovins	Session 4
4/26/2021	3:45 PM	5:00 PM	TF IEEE 259 Test for Eval of Insulation for Dry-Type Transfs	Dry Type	D. Stankes	Session 5
4/27/2021	8:00 AM	9:15 AM	WG Dry Type PD Detection PC57.124	Dry Type	T. Prevost	Session 4
4/27/2021	12:55 PM	2:10 PM	WG Guide for Loading Dry Type Transformers C57.96	Dry Type	A. Narawane	Session 4
4/27/2021	3:45 PM	5:00 PM	WG Dry Type Test Code C57.12.91	Dry Type	D. Walker	Session 6
4/28/2021	12:55 PM	2:10 PM	SC Dry Type Transformers	Dry Type	C. Ballard	Session 1
4/26/2021	3:45 PM	5:00 PM	SC HVDC Converter Transfs & Smoothing Reactors	HVDC	U. Radbrandt	Session 6
4/26/2021	10:45 AM	12:00 PM	TF Guide for DGA in Silicone C57.146	IF	J. Karas	Session 6
4/26/2021	3:45 PM	5:00 PM	TF Next Revision to C57.104 Guide for DGA in Mineral Oil	IF	C. Beauchemin	Session 4
4/27/2021	9:25 AM	10:40 AM	TF Guide for the Reclamation of Mineral Oil - C57.637	IF	S. Denzer	Session 6
4/27/2021	10:50 AM	12:05 PM	TF Guide DGA for Factory Temp Rise Tests - C57.130	IF	J. Foschia	Session 6
4/27/2021	12:55 PM	2:10 PM	WG Consolidation Insulating Fluid Guides PC57.166	IF	T. Prevost	Session 1
4/27/2021	3:45 PM	5:00 PM	TF Guide DGA in Ester-Immersed Transformers- C57.155	IF	A. Sbravati	Session 5
4/28/2021	2:20 PM	3:35 PM	SC Insulating Fluids	IF	S. Reed	Session 1
4/26/2021	9:10 AM	10:35 AM	WG Moisture in Insulation PC57.162	Ins Life	T. Prevost	Session 6
4/26/2021	12:55 PM	2:10 PM	WG High Temp Liquid Transformers C57.154	Ins Life	R. Marek	Session 6
4/27/2021	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
4/27/2021	9:25 AM	10:40 AM	WG Temp Measurement PC57.165	Ins Life	M. Tostrud	Session 4
4/27/2021	12:55 PM	2:10 PM	WG Determine Max Winding Temp Rise PC57.169	Ins Life	S. Digby	Session 5
4/27/2021	2:20 PM	3:35 PM	WG Thermal Evaluation C57.100	Ins Life	R. Wicks	Session 3
4/27/2021	3:45 PM	5:00 PM	WG Loading Guide PC57.91	Ins Life	D. Wallach	Session 4
4/27/2021	5:10 PM	6:25 PM	TF Continuous Rev Clause 11 Temp Rise Tests C57.12.90	Ins Life	D. Sankarakurup	Session 1
4/28/2021	8:00 AM	9:15 AM	SC Insulation Life	Ins Life	S. Sharpless	Session 2
4/27/2021	8:00 AM	9:15 AM	WG Station Service Volt. Transf. C57.13.8	Instr TR	D. Wallace	Session 3
4/27/2021	9:25 AM	10:40 AM	TF Instrument Transf. Accuracy	Instr TR	I. Ziger	Session 3
4/27/2021	10:50 AM	12:05 PM	WG PLC Caps & CCVTs PC57.13.9	Instr TR	Z. Roman	Session 3
4/28/2021	8:00 AM	9:15 AM	SC Instrument Transformers	Instr TR	T. Sizemore	Session 1
4/28/2021	On	demand	SC Meetings Planning - All interested individuals welcome	Mtgs	T. Behrens	Pre-recorded

SUBCOMMITTEE MEETING LIST

SPRING 2021 MEETING: APRIL 26 TO APRIL 29

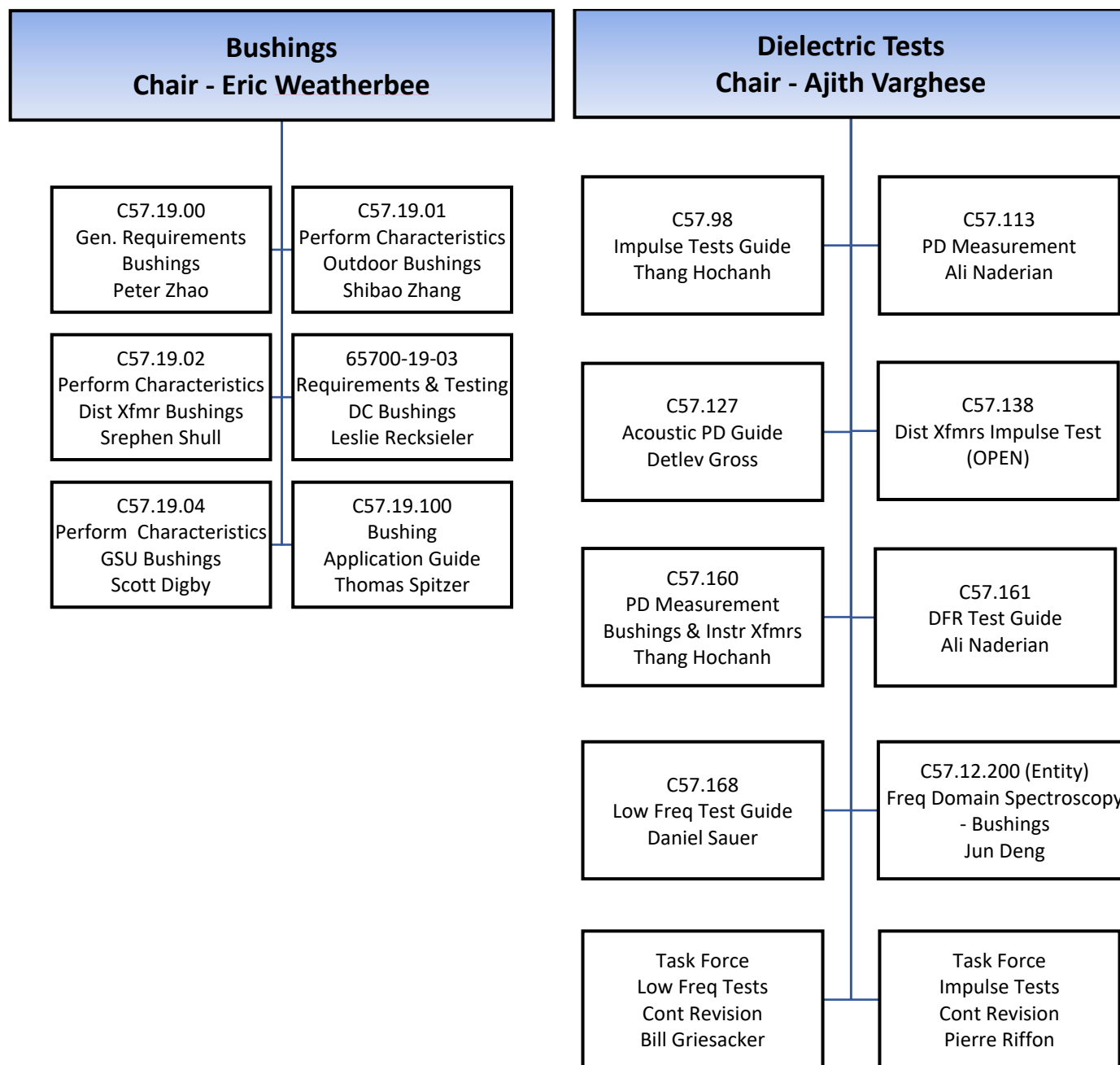
On-Line Meeting; Virtual, Central Time Zone USA

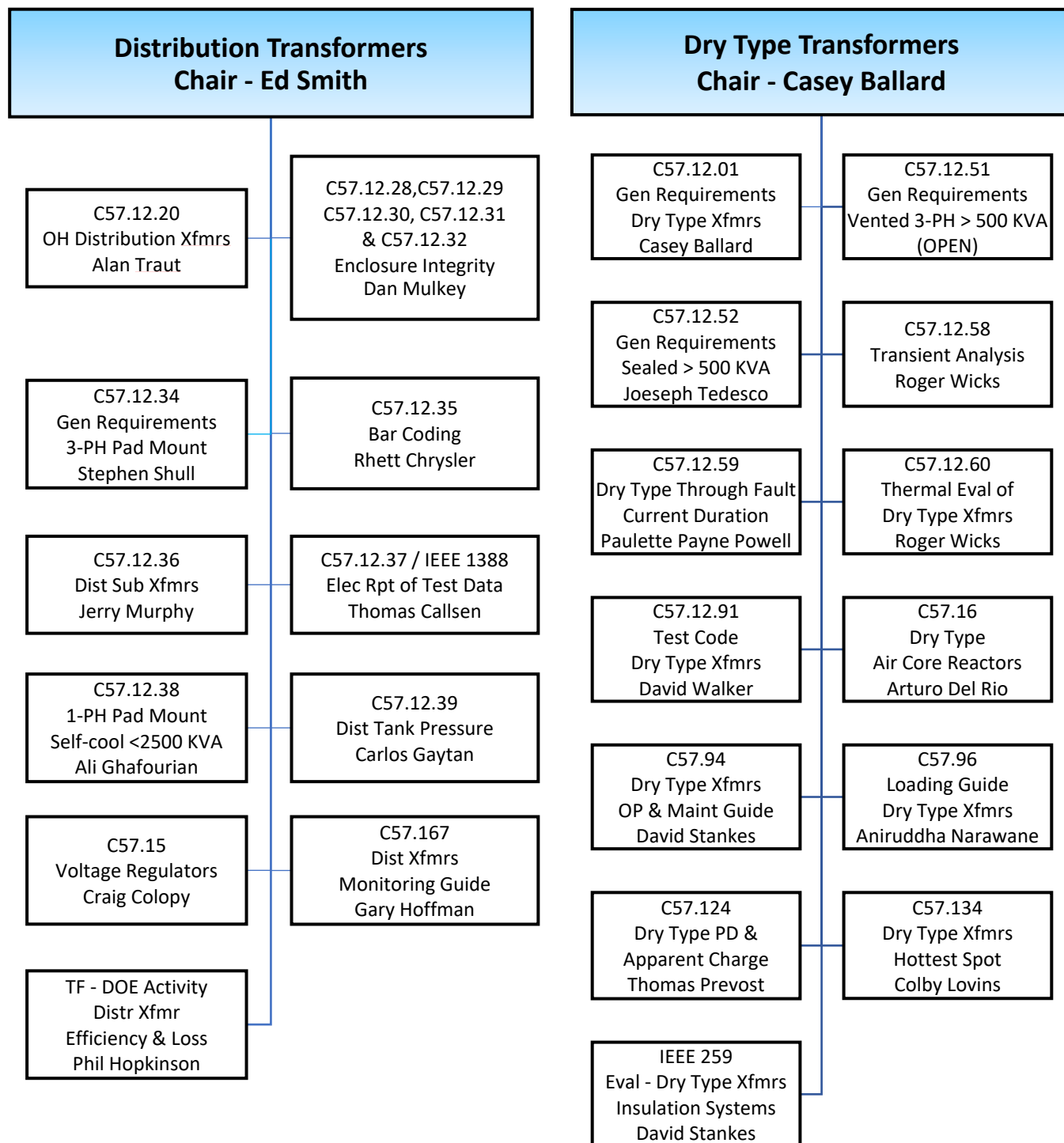
Date	Time Start	Time End	Session Title	Track	Chair	Room/Location
4/26/2021	9:10 AM	10:35 AM	WG Guide of FRA for Liquid Filled Transf. C57.149	PCS	C. Sweetser	Session 2
4/26/2021	12:55 PM	2:10 PM	TF Audible Sound Revision to Test Code	PCS	R. Girgis	Session 5
4/26/2021	2:20 PM	3:35 PM	TF PCS Cont. Revisions to C57.12.00	PCS	T. Ansari	Session 6
4/27/2021	8:00 AM	9:15 AM	TF PCS Cont. Rev. to Test Code C57.12.90	PCS	H. Sahin	Session 6
4/27/2021	2:20 PM	3:35 PM	WG Sw Transients Ind by TR/Bkr Interaction PC57.142	PCS	J. McBride	Session 5
4/27/2021	3:45 PM	5:00 PM	WG Short Circuit Withstand PC57.164	PCS	S. Patel	Session 3
4/28/2021	2:20 PM	3:35 PM	SC Performance Characteristics	PCS	R. Verdolin	Session 2
4/26/2021	10:45 AM	12:00 PM	WG C57.116 Guide for Trfs Direct Connect to Generators	Power	W. Li	Session 2
4/26/2021	12:55 PM	2:10 PM	WG Standard Requirements for Tap Changers - C57.131	Power	C. Colopy	Session 4
4/26/2021	2:20 PM	3:35 PM	WG Transformer Monitoring C57.143	Power	M. Spurlock	Session 2
4/26/2021	3:45 PM	5:00 PM	TF Failure Investigation & Reporting PC57.125	Power	W. Binder	Session 3
4/27/2021	9:25 AM	10:40 AM	WG Condition Assessment Guide PC57.170	Power	K. Mani	Session 5
4/27/2021	2:20 PM	3:35 PM	TF Volts per Hertz	Power	J. Watson	Session 4
4/28/2021	12:55 PM	2:10 PM	SC Power Transformers	Power	B. Griesacker	Session 2
4/26/2021	9:10 AM	10:35 AM	WG Std Transf. Terminology C57.12.80	Stds	J. Graham	Session 4
4/26/2021	12:55 PM	2:10 PM	WG PC57.152 Guide for Field Testing	Stds	M. Ferreira	Session 3
4/27/2021	10:50 AM	12:05 PM	WG PC57.163 Geomagnetic Disturbances	Stds	D. Blaydon	Session 4
4/28/2021	3:45 PM	5:00 PM	SC Standards	Stds	D. Sauer	Session 1
4/26/2021	3:45 PM	5:00 PM	WG Sec. Network Protectors C57.12.44	STNP	M. Faulkner	Session 1
4/27/2021	9:25 AM	10:40 AM	WG Submersible Transf. C57.12.24	STNP	B. Garcia	Session 2
4/27/2021	10:50 AM	12:05 PM	WG Liquid-immersed Sec. Network TRs C57.12.40	STNP	D. Blew	Session 2
4/27/2021	2:20 PM	3:35 PM	TF Effects of Corrosion on Transformers	STNP	W. Elliott	Session 2
4/28/2021	10:50 AM	12:05 PM	SC Submersible Transf. & Network Protectors	STNP	G.Payerle	Session 1

APPENDIX 2

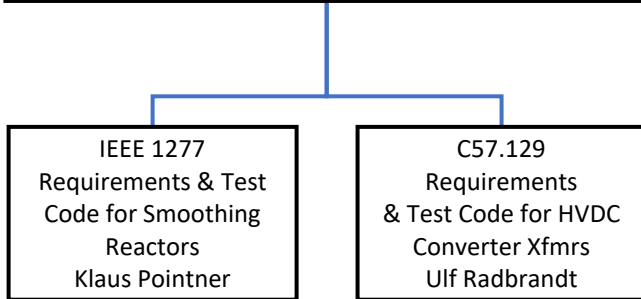
Semi-Annual Standards Report



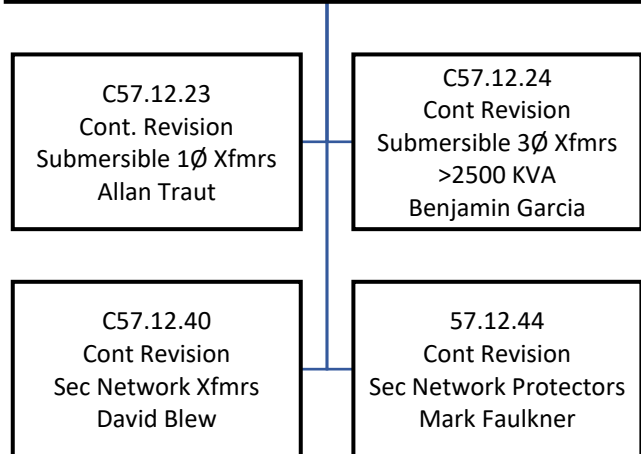




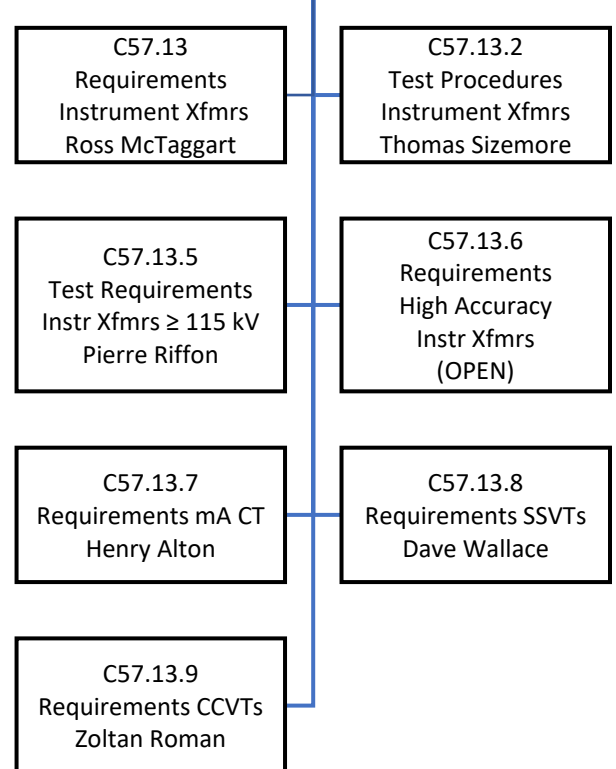
HVDC Converter Transformers & Smoothing Reactors Chair - Ulf Radbrandt

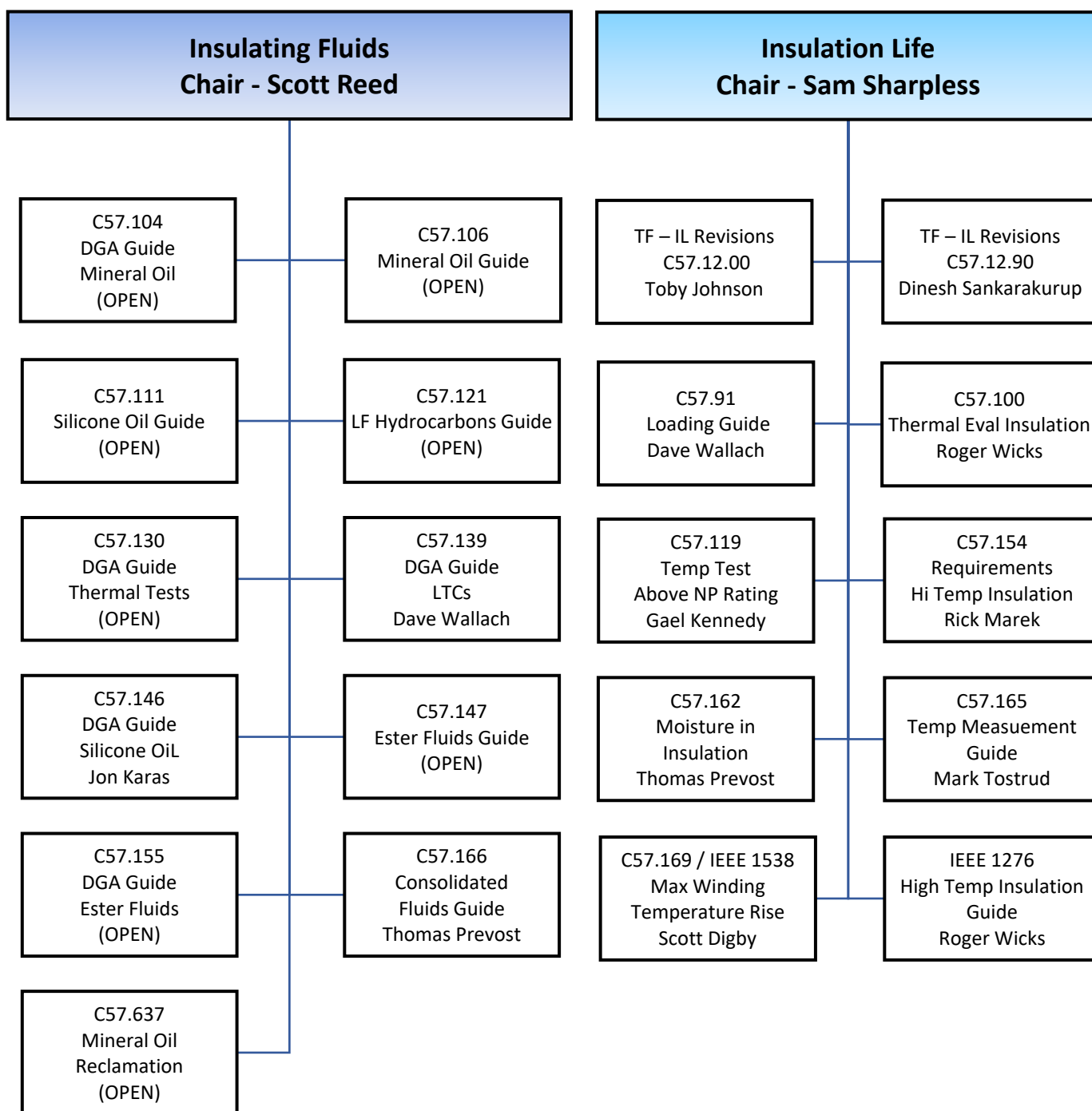


Subsurface Transformers & Network Protectors Chair - George Payerle



Instrument Transformers Chair - Thomas Sizemore



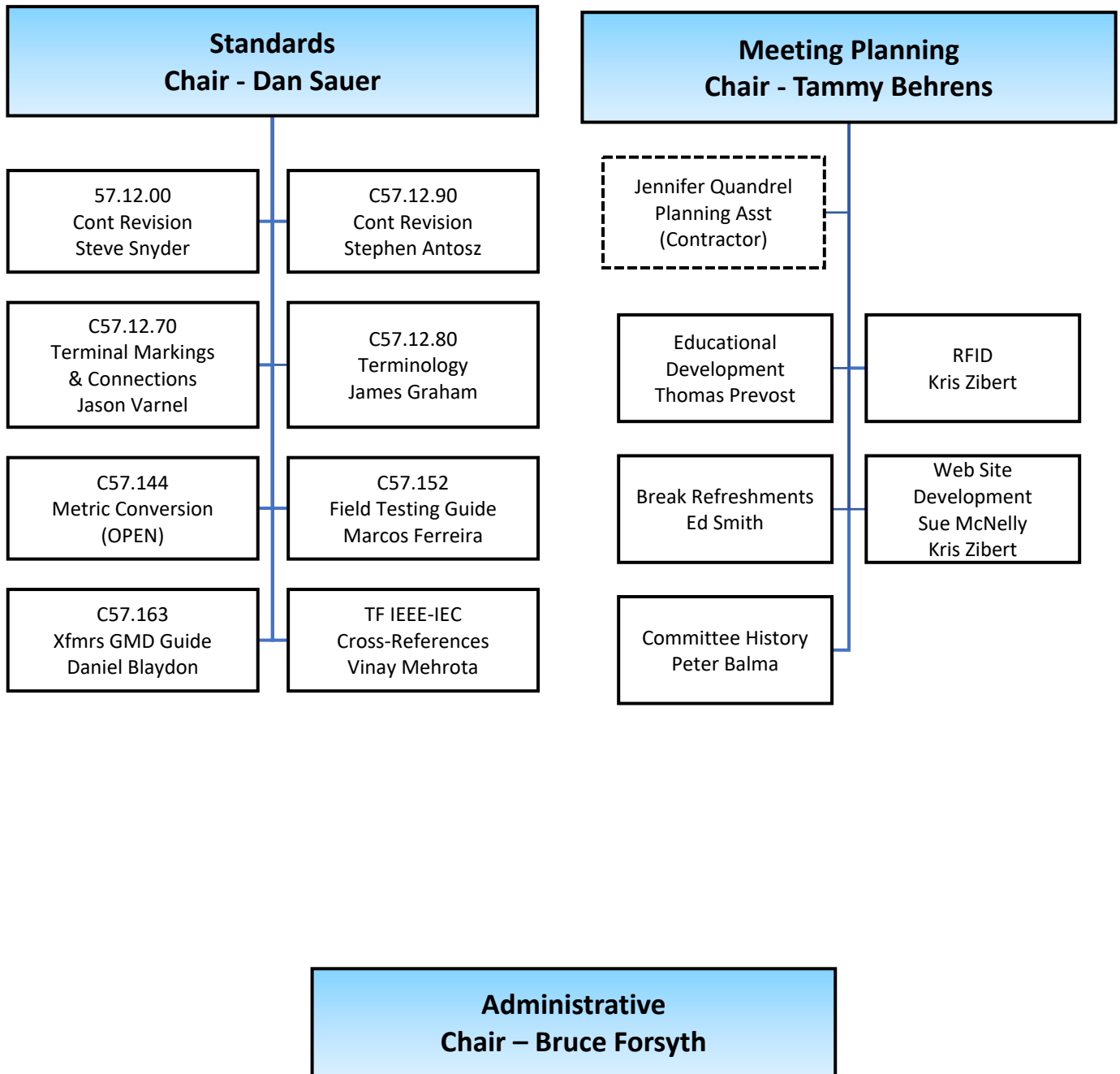


Performance Characteristics Chair - Rogerio Verdolin

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 teNyenhuus
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 Hopkinson
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	



IEEE/PES TRANSFORMERS COMMITTEE

Status Report of Transformers Standards

Appendix 2

STANDARD		Working Group Chair	Pub Year	PAR Issue Date	Standard Status
BALLOT TYPE		Phone			Remark
PROJECT		Email	Rev Due Date	PAR Expiration	
SubCommittee BUSHINGS					
CHAIR:	Eric Weatherbee	eweatherbee@hubbell.com	(585) 768 - 1272		
Individual	Draft Standard for Design and Performance Requirements for Bushings Applied to Liquid Immersed Distribution Transformers	Stephen Shull (417) 206 - 4047 sshull@ckt.net		2/5/2016	PAR approved with one PAR extension
PC57.19.02				12/31/2022	
C57.19.00	Standard General Requirements and Test Procedure for Power Apparatus Bushings	Peter Zhao (416) 345 - 5926 peter.zhao@hydroone.com	2004	2/15/2018	WITHDRAWN + PAR for Revision
Individual			12/31/2020	12/31/2022	
PC57.19.00					
C57.19.01	IEEE Standard Performance Characteristics and Dimensions for Outdoor Apparatus Bushings	....	2017		Approved
Individual		.....	12/31/2027		
					
C57.19.03	IEC/IEEE International Standard -- Bushings for DC application	....	2014		Approved
Individual		.....	12/31/2024		IEEE /IEC Dual Logo Approved by SASB in June 2014 (65700-19-03)
					
C57.19.04	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	....	2018		Approved
Individual		.....	12/31/2028		
					
C57.19.100	IEEE Guide for Application of Power Apparatus Bushings	Roger Wicks (804) 383 - 3300 roger.c.wicks@dupont.com	2012	5/21/2019	Approved + PAR for Revision
Individual			12/31/2022		
PC57.19.100				12/31/2023	

IEEE/PES TRANSFORMERS COMMITTEE

Status Report of Transformers Standards

Appendix 2

STANDARD		Working Group Chair	Pub Year	PAR Issue Date	Standard Status
BALLOT TYPE		Phone		Rev Due Date	Remark
PROJECT		Email		PAR Expiration	
SubCommittee DIELECTRIC TESTS					
CHAIR: Ajith Varghese		ajith.varghese@spx.com		(262) 442 - 7197	
Entity	Guide for the Frequency Domain Spectroscopy Measurement of Transformer Bushings	Jinli Wang		9/27/2018	Active PAR
PC57.12.200		 wangjinli@epri.sgcc.com.cn		12/31/2022	
Individual	Guide for the Electrical Measurement of Partial Discharges in High Voltage Bushings and Instrument Transformers	Thang Hochanh		6/15/2017	Active PAR
PC57.160		(819) 821-3636 thanghochanh@surplec.com		12/31/2022	SA BALLOT: In Comment Resolution
Individual	Guide for Low Frequency Dielectric Testing for Distribution, Power and Regulating Transformers	Daniel Sauer		6/14/2018	Active PAR
PC57.168		(262) 896 - 2417 dmsauer@mtu.edu		12/31/2022	
C57.113	IEEE Guide for Partial Discharge Measurement in Liquid-Filled Power Transformers and Shunt Reactors	Ali Naderian	2010	12/3/2017	WITHDRAWN + PAR for Revision
Individual		(647) 300 - 8836 ali.naderian@ieee.org		12/31/2020	
PC57.113				12/31/2021	
C57.127	IEEE Guide for the Detection, Location and Interpretation of Sources of Acoustic Emissions from Electrical Discharges in Power Transformers and Power Reactors	....	2018		Approved
Individual		.....		12/31/2028	
C57.138	IEEE Recommended Practice for Routine Impulse Test for Distribution Transformers	....	2016		Approved
Individual		.....		12/31/2026	
C57.161	IEEE Guide for Dielectric Frequency Response Test	....	2018		Approved
Individual		.....		12/31/2028	
C57.98	IEEE Guide for Transformer Impulse Tests	Thang Hochanh	2011	10/27/2018	Approved + PAR for Revision
Individual		(819) 821-3636 thanghochanh@surplec.com		12/31/2021	
PC57.98				12/31/2022	

IEEE/PES TRANSFORMERS COMMITTEE

Status Report of Transformers Standards

Appendix 2

STANDARD		Working Group Chair	Pub Year	PAR Issue Date	Standard Status
BALLOT TYPE		Phone			Remark
PROJECT		Email	Rev Due Date	PAR Expiration	
SubCommittee DISTRIBUTION TRANSFORMERS					
CHAIR: Edward Smith		edsmith@h-j.com		(636) 677 - 3421	
Entity	Recommended Practice for On-load Capacity Switching Distribution Transformers	Jinli Wang wangjinli@epri.sgcc.com.cn		2/10/2021	Active PAR
PC57.12.210				12/31/2025	
Individual	Guide for Monitoring Distribution Transformers	Gary Hoffman (973) 474 - 2171 grhoffman@advpowertech.co		6/14/2018	Active PAR
PC57.167				12/31/2022	
C57.12.20	Standard for Overhead Type Distribution Transformers, 500 kVA and Smaller, High-Voltage 34 500 Volts and Below; Low-Voltage, 7970/13 800 Y Volts and Below	Alan Traut (601) 422 - 1198 atraut@ieee.org	2017	2/8/2019	Approved + PAR for Revision
Individual			12/31/2027		
PC57.12.20				12/31/2023	
C57.12.28	Standard for Pad Mounted Equipment - Enclosure Integrity	Daniel Mulkey (707) 776 - 7346 dhmulkey@ieee.org	2014	3/5/2020	Approved + PAR for Revision
Individual			12/31/2024		
PC57.12.28				12/31/2024	
C57.12.29	Standard for Pad Mounted Equipment - Enclosure Integrity for Coastal Environments	Daniel Mulkey (707) 776 - 7346 dhmulkey@ieee.org	2014	3/5/2020	Approved + PAR for Revision
Individual			12/31/2024		
PC57.12.29				12/31/2024	
C57.12.30	Std for Pole-Mounted Eqpt - Enclosures for Coastal Environment	.... ..... .....	2020		Approved new standard
Individual			12/31/2030		
C57.12.31	IEEE Standard for Pole Mounted Equipment - Enclosure Integrity	.... ..... .....	2020		Approved
Individual			12/31/2030		
C57.12.32	Standard for Submersible Equipment - Enclosure Integrity	.... ..... .....	2019		Approved
Individual			12/31/2029		

IEEE/PES TRANSFORMERS COMMITTEE

Status Report of Transformers Standards

Appendix 2

STANDARD		Working Group Chair	Pub Year	PAR Issue Date	Standard Status
BALLOT TYPE		Phone			Remark
PROJECT		Email	Rev Due Date	PAR Expiration	
SubCommittee DISTRIBUTION TRANSFORMERS					
CHAIR: Edward Smith		edsmith@h-j.com		(636) 677 - 3421	
C57.12.34	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	Stephen Shull (417) 206 - 4047 sshull@ckt.net	2015 12/31/2025	9/22/2016 12/31/2022	Approved + PAR for Revision + one PAR extension
Individual					
PC57.12.34					
C57.12.35	IEEE Standard Bar Coding for Distribution Transformers and Step-Voltage Regulators	Rhett Chrysler (731) 288 - 2831 rhettchrysler@ieee.org	2013 12/31/2023	6/13/2019 12/31/2023	Approved + PAR for Revision
Individual					
PC57.12.35					
C57.12.36	Standard Requirements for Liquid-Immersed Distribution Substation Transformers	.... ..... .....	2017 12/31/2027		Approved
Individual					
C57.12.37	IEEE Standard for the Electronic Reporting of Transformer Test Data	.... ..... .....	2015 12/31/2025		Approved
Individual					
C57.12.38	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	Ali Ghafourian (706) 202 - 7212 asghar.ghafourian@gmail.com	2014 12/31/2024	10/28/2017 12/31/2021	Approved + PAR for Revision
Individual					
PC57.12.38					
C57.12.39	IEEE Standard for Requirements for Distribution Transformer Tank Pressure Coordination	.... ..... .....	2017 12/31/2027		Approved
Individual					
C57.15	IEEE Standard Requirements, Terminology, and Test Code for Step-Voltage Regulators		2017 12/31/2027		Approved
Individual					

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STANDARD		Working Group Chair	Pub Year	PAR Issue Date	Standard Status
BALLOT TYPE		Phone	Rev Due Date	PAR Expiration	Remark
PROJECT		Email			
SubCommittee DRY TYPE TRANSFORMERS					
CHAIR: Robert Ballard		robert.c.ballard@ieee.org		(276) 608 - 7133	
259	IEEE Standard Test Procedure for Evaluation of Systems of Insulation for Dry-Type Specialty and General-Purpose Transformers	David Stankes (512) 984 - 5026 dsstankes@mmm.com	1999 12/31/2020	12/3/2020 12/31/2024	WITHDRAWN + PAR for Revision Standard was allowed to expire by the SC. However, when revising IEEE C57.12.60, the need for this standard was recognized.
Individual					
P259					
C57.12.01	IEEE Standard for General Requirements for Dry-Type Distribution and Power Transformers	.... ..... .....	2020 12/31/2030		Approved This standard is under continuous revision with a planned PAR submittal in 2021.
Individual					
C57.12.51	IEEE Guide for Mechanical Interchangeability of Ventilated Dry-Type Transformers	.... ..... .....	2019 12/31/2029		Approved
Individual					
C57.12.52	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	Joseph Tedesco (276) 688-1675 joseph.l.tedesco@hitachi-pow	2012 12/31/2022	3/5/2020 12/31/2024	Approved + PAR for Revision
Individual					
PC57.12.52					
C57.12.58	IEEE Guide for Conducting a Transient Voltage Analysis of a Dry-Type Transformer Coil	.... ..... .....	2017 12/31/2027		Approved
Individual					
C57.12.59	IEEE Guide for Dry-Type Transformer Through-Fault Current Duration	.... ..... .....	2015 12/31/2025		Approved A TF Chair to study the need for revision will be requested at the Spring 21 Subcommittee Meeting.
Individual					
C57.12.60	IEEE Standard for Thermal Evaluation of Insulation Systems for Dry-Type Power and Distribution Transformers	.... ..... .....	2020 12/31/2030		Approved
Individual					
C57.12.91	IEEE Standard Test Code for Dry-Type Distribution and Power Transformers		2020 12/31/2030		Approved This standard is under continuous revision with a planned PAR submittal in 2021.
Individual					

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BALLOT TYPE		Phone	Rev Due Date	PAR Expiration	Remark
PROJECT		Email			
SubCommittee DRY TYPE TRANSFORMERS					
CHAIR: Robert Ballard		robert.c.ballard@ieee.org		(276) 608 - 7133	
C57.124	IEEE Recommended Practice for the Detection of Partial Discharge and the Measurement of Apparent Charge in Dry-Type Transformers	....	1991	6/15/2017	WITHDRAWN + PAR for Revision
Individual		.....	12/31/2019		This is late due to an earlier decision to wait on the development of IEEE C57.113 to keep the testing processes in sync between liquid filled and dry type. For the next revision it has been proposed that these two documents be combined to reduce the effort. It is questionable if it will complete in 2021.
PC57.124		.....		12/31/2021	
C57.134	IEEE Guide for Determination of Hottest Spot Temperature in Dry Type Transformers	....	2013		Approved
Individual		.....	12/31/2023		A PAR request has been submitted and is on the REVCOM agenda for May 4 2021.
					
C57.16	IEEE Standard Requirements, Terminology, and Test Code for Dry-Type Air- Core Series- Connected Reactors	J. Arturo Del Rio	2011	2/5/2016	Approved + PAR for Revision + 2 yrs Extension
Individual		(919) 449 - 5675	12/31/2021		PAR for new Revision approved Feb 2016
PC57.16		a.delrio@ieee.org		12/31/2022	
C57.94	IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers	....	2015		Approved
Individual		.....	12/31/2025		A TF chair to study the need for revision will be appointed at the Spring 21 Subcommittee meeting
					
C57.96	IEEE Guide for Loading Dry-Type Distribution and Power Transformers	Aniruddha Narawane	2013	2/10/2021	Approved + PAR for Revision
Individual		(804) 229 - 5956	12/31/2023		
PC57.96		aniraj200@yahoo.com		12/31/2025	

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BALLOT TYPE		Phone	Rev Due Date	PAR Expiration	Remark
PROJECT		Email			
SubCommittee HVDC TRANSFORMERS					
CHAIR:	Ulf Radbrandt	ulf.radbrandt@ieee.org		4 (624) 078 - 3357	
1277	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	....	2020		Approved
Individual	.....		12/31/2030		
60076-57-129	IEC/IEEE International Standard - Power transformers--Part 57-129: Transformers for HVDC applications	....	2017		Approved
Individual	.....		12/31/2027		
C57.129	IEEE General Requirements and Test Code for Oil Immersed HVDC Converter Transformers		2007		WITHDRAWN
Individual			12/31/2018		

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STANDARD		Working Group Chair	Pub Year	PAR Issue Date	Standard Status
BALLOT TYPE		Phone			Remark
PROJECT		Email	Rev Due Date	PAR Expiration	
SubCommittee INSTRUMENT TRANSFORMERS					
CHAIR: Thomas Sizemore		thomas.sizemore.us@ieee.org		(252) 827 - 3235	
Individual	Standard Requirements for Station Service Voltage Transformers	David Wallace (662) 325 - 2009 daweleceng@aol.com		3/21/2019	Active PAR
P63253-5713-8				12/31/2021	
Individual	Standard for Power-Line Carrier Coupling Capacitors and Coupling Capacitor Voltage Transformers	Zoltan Roman (706) 360 - 4964 zoltan.roman@ge.com		3/23/2017	Active PAR
PC57.13.9				12/31/2021	
C57.13	IEEE Standard Requirements for Instrument Transformers	....	2016	3/20/2019	Approved + PAR for Corrigenda
Individual		.....	12/31/2026		
PC57.13-2016		.....		12/31/2023	
C57.13.2	Conformance Test Procedure for Instrument Transformers	Shibao Zhang (585) 768-1273 szhang@hubbell.com	2005	12/6/2017	Approved + PAR for Revision
Individual			12/31/2020		
PC13.2				12/31/2021	
C57.13.5	Standard of Performance and Test Requirements for Instrument Transformers of a Nominal System Voltage of 115 kV and Above	....	2019		Approved
Individual		.....	12/31/2029		
C57.13.6	Standard for High Accuracy Instrument Transformers	....	2005		WITHDRAWN
Individual		.....	12/31/2020		
C57.13.7	IEEE Standard for Current Transformers with Maximum Milliampere Secondary Current of 250 mA		2018		Approved
Individual			12/31/2028		

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BALLOT TYPE		Phone		Rev Due Date	Remark
PROJECT		Email		PAR Expiration	
SubCommittee INSULATING FLUIDS					
CHAIR:	Scott Reed	sreed@mvadiagnostics.com		(330) 498 - 6259	
Individual	Guide for the Interpretation of Moisture Related Parameters in Liquid Immersed Transformers and Reactors	Thomas Prevost (802) 751 - 3458 tprevost@ieee.org		2/10/2021 12/31/2022	Active PAR + 2 PAR Extensions This will not get another extension with significant extenuating circumstances.
PC57.162					
Individual	Guide for Acceptance and Maintenance of Insulating Liquids in Transformers and Related Equipment	Thomas Prevost (802) 751 - 3458 tprevost@ieee.org		3/8/2018 12/1/2022	Active PAR
PC57.166					
C57.104	IEEE Guide for the Interpretation of Gases Generated in Mineral Oil-Immersed Transformers	....	2019		Approved
Individual		.....	12/31/2029		
					
C57.106	IEEE Guide for Acceptance and Maintenance of Mineral Insulating Oil in Electrical Equipment	....	2015		Approved
Individual		.....	12/31/2025		
					
C57.111	IEEE Guide for Acceptance of Silicone Insulating Fluid and Its Maintenance in Transformers	....	1989		WITHDRAWN
Individual		.....	3/19/2019		
					
C57.121	IEEE Guide for Acceptance and Maintenance of Less-Flammable Hydrocarbon Fluid in Transformers	....	1998		WITHDRAWN
Individual		.....	12/9/2019		
					
C57.130	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	....	2015		Approved
Individual		.....	12/31/2025		
					
C57.139	Guide for Dissolved Gas Analysis in Transformer Load Tap Changers	....	2015		Approved
Individual		.....	12/31/2025		
					
C57.146	Guide for Interpretation of Gasses Generated in Silicone-Immersed Transformers		2005	3/5/2020	Approved + PAR for Revision
Individual			12/31/2021		
PC57.146				12/31/2024	

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BALLOT TYPE		Phone			Remark
PROJECT		Email	Rev Due Date	PAR Expiration	
SubCommittee INSULATING FLUIDS					
CHAIR:	Scott Reed	sreed@mvadiagnostics.com		(330) 498 - 6259	
C57.147	Guide for Acceptance and Maintenance of Natural Insulating Liquid in Transformers	....	2018		Approved
Individual		.....	12/31/2028		
					
C57.155	IEEE Guide for Interpretation of Gases Generated in Natural Ester and Synthetic Ester-Immersed Transformers	....	2014		Approved
Individual		.....	12/31/2024		
					
C57.637	IEEE Guide for the Reclamation of Mineral Insulating Oil and Criteria for Its Use		2015		Approved
Individual			12/31/2025		
					

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BALLOT TYPE		Phone		Rev Due Date	Remark
PROJECT		Email		PAR Expiration	
SubCommittee INSULATION LIFE					
CHAIR: Samuel Sharpless		ssharpless@rimkus.com		(407) 661 - 1245	
Individual	Guide for Temperature Measurements for Liquid Immersed Transformers and Reactors	Mark Tostrud (262) 746 - 1230 mark.tostrud@dynamicratings.		2/17/2017	Active PAR
PC57.165				12/31/2021	
Individual	Guide for Determination of Maximum Winding Temperature Rise in Liquid-Immersed Transformers	Scott Digby (919) 546 - 5798 scott.digby@duke-energy.com		3/21/2019	Active PAR
PC57.169				12/31/2023	
1276	IEEE Guide for the Application of High-Temperature Insulation Materials in Liquid-Immersed Distribution, Power, and Regulating Transformers	.... ..... .....	2020	12/31/2030	Approved
Individual					
1538	IEEE Guide for Determination of Maximum Winding Temperature Rise in Liquid Filled Transformer	.... ..... .....	2000	12/31/2021	Approved Please note that this document will be allowed to go inactive as it is being replaced by C57.169.
Individual					
1538a	IEEE Guide for Determination of Maximum Winding-Temperature Rise in Liquid Immersed Transformers -- Amendment 1	.... ..... .....	2015	12/31/2021	Approved Please note that this document will be allowed to go inactive as it is being replaced by C57.169.
Individual					
C57.100	IEEE Standard Test Procedure for Thermal Evaluation of Liquid-Immersed Distribution and Power Transformers	Roger Wicks (804) 383 - 3300 roger.c.wicks@dupont.com	2011	10/30/2018	Approved + PAR for Revision
Individual				12/31/2021	
PC57.100				12/31/2022	
C57.119	IEEE Recommended Practice for Performing Temperature Rise Tests on Liquid Immersed Power Transformers at Loads Beyond Nameplate Ratings	.... ..... .....	2018		Approved
Individual				12/31/2028	
C57.154	IEEE Guide for Conducting Functional Life Tests on Switch Contacts Used in Insulating Liquid--Immersed Transformers	Richard Marek (804) 768 - 0748 rick.marek@gmail.com	2012	10/27/2018	Approved + PAR for Revision
Individual				12/31/2022	
PC57.154				12/31/2022	
C57.91	IEEE Guide for Loading Mineral-Oil-Immersed Transformers and Step-Voltage Regulators	David Wallach (980) 373 - 4167 david.wallach@duke-energy.c	2011	10/28/2017	Approved + PAR for Revision
Individual				12/31/2021	
PC57.91				12/31/2021	

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BALLOT TYPE		Phone			Remark
PROJECT		Email	Rev Due Date	PAR Expiration	
SubCommittee PERFORMANCE CHARACTERISTICS					
CHAIR: Rogerio Verdolin		roger.verdolin@ieee.org		(403) 850 - 4304	
Entity	Guide for the Selection of Neutral-Grounding Devices for High Voltage Direct Current (HVDC) Converter Transformers	Ding Lijie ding_lijie@163.com		10/30/2018	Active PAR
PC57.32.10				12/31/2022	
Individual	Guide for Establishing Short Circuit Withstand Capabilities of Liquid Immersed Power Transformers, Regulators, and Reactors	Sanjay Patel (843) 871 - 3434 s.patel@smitusa.com		6/30/2016	Active PAR + 1 PAR Extension
PC57.164				12/31/2022	
C57.105	IEEE Guide for Application of Transformer Connections in Three-Phase Distribution Systems	Rogerio Verdolin (403) 850 - 4304 roger.verdolin@ieee.org	2019	12/3/2020	Approved+ PAR for Corrigenda
Individual			12/31/2029		Corrigenda for the 2019 version of the standard
PC57.105/Cor 1				12/31/2024	
C57.109	IEEE Guide for Liquid-Immersed Transformers Through-Fault-Current Duration	.... ..... .....	2018		Approved
Individual			12/31/2028		
C57.110	IEEE Recommended Practice for Establishing Liquid Immersed and Dry-Type Power and Distribution Transformer Capability when Supplying Nonsinusoidal Load Currents	.... ..... .....	2018		Approved
Individual			12/31/2028		
C57.120	IEEE Guide for Loss Evaluation of Distribution and Power Transformers and Reactors	.... ..... .....	2017		Approved
Individual			12/31/2027		
C57.123	IEEE Guide for Transformer Loss Measurement	.... ..... .....	2019		Approved
Individual			12/31/2029		
C57.136	IEEE Guide for Sound Level Abatement and Determination for Liquid- Immersed Power Transformers and Shunt Reactors Rated Over 500 kVA	Ali Naderian (647) 300 - 8836 ali.naderian@ieee.org	2000	2/10/2021	WITHDRAWN + PAR for Revision
Individual			12/31/2018		
PC57.136				12/31/2025	
C57.142	A Guide To Describe The Occurrence And Mitigation Of Switching Transients Induced By Transformer-Breaker Interaction	Jim McBride (770) 460-6626 jim@jmxhv.com	2010	3/23/2017	WITHDRAWN + PAR for Revision
Individual			12/31/2020		
PC57.142				12/31/2021	

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BALLOT TYPE		Phone	Rev Due Date	PAR Expiration	Remark
PROJECT		Email			
SubCommittee PERFORMANCE CHARACTERISTICS					
CHAIR: Rogério Verdolin		roger.verdolin@ieee.org		(403) 850 - 4304	
C57.149	Guide for the Application and Interpretation of Frequency Response Analysis for Oil Immersed Transformers	Charles Sweetser (617) 901 - 6180 charles.sweetser@omnicronen	2012 12/31/2022	6/14/2018 12/31/2022	Approved + PAR for Revision
Individual					
PC57.149					
C57.158	IEEE Guide for the Application of Tertiary and Stabilizing Windings in Power Transformers	.... ..... .....	2017 12/31/2027		Approved
Individual					
C57.159	IEEE Guide on Transformers for Application in Distributed Photovoltaic (DPV) Power Generation Systems	.... ..... .....	2016 12/31/2026		Approved
Individual					
C57.18.10	IEEE Standard Practices and Requirements for Semiconductor Power Rectifier Transformers	.... ..... .....	1998 12/31/2019	6/30/2016 12/31/2022	WITHDRAWN + PAR for Revision
Individual					
PC57.18.10					
C57.21	IEEE Standard Requirements, Terminology, and Test Code for Shunt Reactors Rated Over 500 kVA	Sanjib Som (724) 705-3050 ssom@patransformer.com	2008 12/31/2018	8/21/2014 12/31/2021	WITHDRAWN + PAR for Revision Ballot closed - 3/19/2021 RevCom Extension Requested (April 28,2021 MEETING)
Individual					
PC57.21					
C57.32	IEEE Standard Requirements, Terminology, and Testing Procedures for Neutral Grounding Devices	.... ..... .....	2015 12/31/2025		Approved
Individual					
C57.32a	IEEE Standard for Requirements, Terminology, and Test Procedure for Neutral Grounding Devices--Amendment 1: Neutral Grounding Resistors Clause (AM)		2020 12/31/2025		Approved
Individual					

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PROJECT		Email	Rev Due Date	PAR Expiration	
SubCommittee POWER TRANSFORMERS					
CHAIR:	Bill	Griesacker			
		bgiesacker@verizon.net	(412) 916 - 6446		
Individual	Guide for the Condition Assessment of Liquid Immersed Transformers, Reactors and Their Components	Kumar Mani (919) 546 - 2791 kumar.mani@duke-energy.co		9/5/2019	Active PAR
PC57.170				12/31/2023	
Entity	IEEE Approved Draft Guide for Installation and Maintenance of Liquid-Immersed Power Transformers Amendment: Cold Start of Power Transformers filled with Natural Ester Fluids	Wei Yao yaoweidky@163.com		2/10/2021	Active PAR
PC57.93a				12/31/2024	
60076-16	IEC/IEEE International Standard - Power transformers - Part 16: Transformers for wind turbine applications	.... ..... .....	2018 12/31/2028		Approved
60076-57-1202	IEC/IEEE International Standard Power transformers --Part 57-1202: Liquid immersed phase-shifting transformers	.... ..... .....	2016 12/31/2026		Approved
60214-2	IEEE Draft Standard for Tap-Changers - Part 2: Application Guide	.... ..... .....	2019 12/31/2029		Approved
638	IEEE Standard for Qualification of Class 1E Transformers for Nuclear Power Generating Stations	.... ..... .....	2013 12/31/2023		Approved
C57.116	IEEE Guide for Transformers Directly Connected to Generators	Weijun Li (781) 348 - 1076 wli@beld.com	2014 12/31/2024	11/7/2019	Approved + PAR for Revision
PC57.116				12/31/2023	
C57.117	IEEE Guide for Reporting Failure Data for Power Transformers and Shunt Reactors on Electric Utility Power Systems		1987 12/31/2018		Withdrawn
Individual					

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PROJECT		Email	Rev Due Date	PAR Expiration	
SubCommittee POWER TRANSFORMERS					
CHAIR:	Bill	Griesacker			
		bgriesacker@verizon.net	(412) 916 - 6446		
C57.12.10	Standard Requirements for Liquid-Immersed Power Transformers	....	2017		Approved
Individual		.....	12/31/2027		
					
C57.125	IEEE Guide for Failure Investigation, Documentation, Analysis, and Reporting for Power Transformers and Shunt Reactors	....	2015		Approved
Individual		.....	12/31/2025		Oct'10: decision to merge with C57.117.
		.....			Feb'11: NESCOM approved new PAR to merge 117 and 125. Standard approved Sept 2015
C57.131	IEEE Standard Requirements for Tap Changers	Craig Colopy	2012	12/3/2020	Approved + PAR for Revision
Individual		(262) 896 - 2342	12/31/2022		
PC57.131		craigacolopy@eaton.com		12/31/2024	
C57.135	IEEE Guide for the Application, Specification and Testing of Phase- Shifting Transformers	....	2011		Approved
Individual		.....	12/31/2021		
					
C57.140	IEEE Guide for Evaluation and Reconditioning of Liquid Immersed Power Transformers	....	2017		Approved
Individual		.....	12/31/2027		
					
C57.143	Guide for Application for Monitoring Equipment to Liquid-Immersed Transformers and Components	Mike Spurlock	2012	2/17/2017	Approved + PAR for Revision
Individual		(614) 933 - 2284	12/31/2022		
PC57.143		mspurlock@ieee.org		12/31/2021	
C57.148	Standard for Control Cabinets for Power Transformers	....	2020		Approved
Individual		.....	12/31/2030		
					
C57.150	IEEE Guide for the Transportation of Transformers and Reactors Rated 10 000 kVA or Higher		2012	3/23/2017	Approved + PAR for Revision
Individual			12/31/2022		
PC57.150				12/31/2021	

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PROJECT		Email			
SubCommittee POWER TRANSFORMERS					
CHAIR:	Bill	Griesacker			
		bgiesacker@verizon.net	(412) 916 - 6446		
C57.153	Guide for Paralleling Power Transformers	....	....	2015	Approved
Individual		.....		12/31/2025	
					
C57.156	IEEE Guide for Tank Rupture Mitigation of Liquid-Immersed Power Transformers and Reactors	....	....	2016	Approved
Individual		.....		12/31/2026	
					
C57.157	IEEE Guide for Conducting Functional Life Tests on Switch Contacts Used in Insulating Liquid-Immersed Transformers	....	....	2015	Approved
Individual		.....		12/31/2025	
					
C57.17	Standard Requirements for Arc Furnace Transformers	....	....	2012	Approved
Individual		.....		12/31/2022	
					
C57.93	IEEE Approved Draft Guide for Installation and Maintenance of Liquid-Immersed Power Transformers			2019	Approved
Individual				12/31/2029	
					

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BALLOT TYPE		Phone			Remark
PROJECT		Email	Rev Due Date	PAR Expiration	
SubCommittee STANDARDS					
CHAIR: Daniel Sauer		dmsauer@mtu.edu		(262) 896 - 2417	
C57.12.00	IEEE Standard for General Requirements For Liquid-Immersed Distribution, Power, and Regulating Transformers	Steven Snyder (859) 219 - 6057 slnsnyder@ieee.org	2015 12/31/2025	2/17/2017 12/31/2021	Approved + PAR for Revision SA BALLOT
Individual					
PC57.12.00					
C57.12.70	IEEE Standard For Standard Terminal Markings and Connections for Distribution and Power Transformers	.... ..... .....	2020 12/31/2030		Approved
Individual					
C57.12.80	IEEE Standard Terminology for Power and Distribution Transformers	James Graham (412) 478 - 4450 jimgraham@ieee.org	2010 12/31/2020	3/23/2017 12/31/2021	WITHDRAWN + PAR for Revision
Individual					
PC57.12.80					
C57.12.90	IEEE Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers	Stephen Antosz (412) 498 - 3916 santosz@ieee.org	2015 12/31/2025	12/7/2017 12/31/2021	Approved Includes Corregenda 1 for Editorial and Technical Corections SA BALLOT
Individual					
PC57.12.90					
C57.144	Guide for Metric Conversion of Transformer Standards	.... ..... .....	2004 12/31/2020		Withdrawn This was to be incorporated into P947 but this project has been withdrawn. This needs to be reviewed in light of SCC 14 documents.
Individual					
C57.152	IEEE Guide for Diagnostic Field Testing of Fluid-Filled Power Transformers, Regulators, and Reactors	Marcos Ferreira (971) 703 - 0777 mdferreira@comcast.net	2013 12/31/2023	6/13/2019 12/31/2023	Approved + PAR for Revision
Individual					
PC57.152					
C57.163	IEEE Guide for Establishing Power Transformer Capability while under Geomagnetic Disturbances	Daniel Blaydon (410) 470 - 8827 dblaidon@ieee.org	2015 12/31/2025	3/5/2014 12/31/2024	Approved + PAR for Revision Corregenda 1 will be included with this Revision
Individual					
PC57.163					

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BALLOT TYPE		Phone	Rev Due Date	PAR Expiration	Remark
PROJECT		Email			
SubCommittee SUBSURFACE TRANSFORMERS & NETWORK PROTECTORS					
CHAIR: George Payerle		gpayerle@roadrunner.com		(330) 908 - 0418	
C57.12.23	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	....	2018		Approved
Individual		.....	12/31/2028		
C57.12.24	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	Benjamin Garcia (714) 895-0787 benjamin.garcia@sce.com	2016	2/8/2019	Approved + PAR for Revision
Individual			12/31/2026		
PC57.12.24				12/31/2023	
C57.12.40	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)	David Blew (973) 430-7743 david.blewiv@pseg.com	2017	5/21/2019	Approved + PAR for Revision
Individual			12/31/2027		
PC57.12.40				12/31/2023	
C57.12.44	IEEE Standard Requirements for Secondary Network Protectors	Mark Faulkner (864) 993-0509 markafulkner@eaton.com	2014	3/26/2015	Approved + PAR for Revision
Individual			12/31/2024		
PC57.12.44				12/31/2021	
C57.12.57	Requirements for Ventilated Dry-Type Network Transformers 2500 kVA and Below, Three-Phase with High Voltage 34 500 Volts and Below, Low Voltage 216Y/125 and 480Y/125 Volts	....	1992		Withdrawn
Individual		.....	12/31/2000		

APPENDIX 3

CIGRE Liaison Report



CIGRÉ

International Council on Large Electric Systems

Liaison Report on SCA2 Transformers for
IEEE Transformers Committee-
Spring 2021 Meeting
April 26, 2021

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 fall 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 Centennial Session 2021**
 - Palais des Congrès, Paris, France, August 20-25, 2021
- **CIGRÉ A2/B3 Study Committee Colloquium**
 - Bucharest, Romania, October 11-13, 2021
 - Paper manuscripts submitted by June 31, 2021
- **CIGRÉ US Committee 2020 Grid of the Future**
 - Providence, RI, October 17-20, 2021
 - Hosted by National Grid
 - Paper manuscripts submitted by July 30, 2021
- **CIGRÉ Symposium**
 - Ljubljana, Slovenia, November 21-24, 2021



IEEE Liaison Report

THANK YOU!

APPENDIX 4

IEC TC14 Liaison Report



IEC TC14 Power Transformers

Chairman: Christoph Ploetner, DE

Secretary: Mick Maghar, UK

**Status Report to
IEEE Transformers Committee
Spring e-meeting 2021**



General Information TC 14

- **Membership (countries)** **48**
 - **P - Members** **36**
 - **O - Members** **12**
- **Registered experts** **261**
- **Currently active MT, PT, WG, AHG** **10**
- **Documents in charge of (TR, TS, IS)** **40**
 - **under maintenance / in development** **6 / 2**
 - **IEC/IEEE common documents** **6**
- **Last plenary meeting** **Sep 2019 in Paris**
- **Next plenary meetings** **Nov 2021 in India or virtual**
Nov 2022 in San Francisco



Recent Publications (new docs)

- **IEC 60076-22-x Transformer and Reactor Fittings**
 - 5 Pumps** Published in January 2021
 - 6 Fans** Published in January 2021
 - Convener: Gianmarco Ghioldi, IT



Revisions in progress I

- **IEC 60076-1 General**
 - Convener Paul Jarman, UK
 - 11th meeting to hold in May 2021
 - First CD expected beginning 2022

- **IEC 60076-2 Temperature rise**
 - Convener Dejan Susa, NO
 - First CD expected later in 2021
(content to be aligned with IEC 60076-1)

- **IEC 60076-4 Guide to LI and SI testing**
 - Convener Thang Hochanh, CA
 - CDV publication expected in Q3/2021



Revisions in progress II

- **IEC 60076-5 Ability to withstand short circuit**
 - Convener Jean-Christophe Riboud, FR
 - Major revision – 10 meetings held so far
 - First CD expected end 2021
- **IEC 60076-6 Reactors**
 - Convener Rob Verhoeven, NL
 - First CD expected later in 2021
- **IEC 60076-19 Uncertainties in Loss Measurement**
 - Convener Anders Bergman, SE
 - CDV in preparation, expected in Q3/2021



New documents in development

- **IEC 60076-25 Neutral Grounding Resistors**
 - Convener Hakam El Assad, FR
 - Preparation of 2nd CD or CDV ongoing – expected later in 2021
- **IEC 60076-22-8 Transformer and Reactor Fittings -
Devices suitable for use in
communication networks**
 - Convener: Gianmarco Ghioldi, IT
 - Document completed – publication scheduled for April 2021



Joint Ad Hoc Group

- **Joint Ad Hoc Group 7 – SC36 / TC14**

To produce the framework of standard or technical report for dimensional standardization of transformer bushings

- Convener Flavio Mauri, IT
- Final report published in January 2021 as “Document for Comment 36A/204e/DC” – Comments received in March
- Next step: Development of a Technical Report (TR)
“Transformer Bushings standardization “
- Responsible: IEC SC 36A – Insulated bushings



Continuing Ad Hoc Group

- **Ad Hoc Group 35**

Functional classification of power transformers

- Convener: Angelo Baggini, IT
 - update Scope of TC 14 as well as “Power transformer” definition to be technology neutral
 - clarification of boundaries between TC 14 and TC 22F (Power electronics for electrical transmission and distribution systems)
 - consideration of a horizontal standard covering Ratings and Performance Parameters applicable for all technologies (definition of the network interface)



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 revision of C57.131 is completed

APPENDIX 5

ASTM

**No Report - ASTM did not meet
due to COVID-19 Pandemic.**

ASTM Committee D27 Electrical Insulating and Gases Liaison Report

Thomas Prevost

IEEE/PES Transformers Committee

April 26, 2021

Virtual

AGENDA

Introduction to ASTM D27

Current Hot Topics

Future Meetings

Committee D27 on Electrical Insulating Liquids and Gases

ASTM Committee D27 on Electrical Insulating Liquids and Gases was formed in 1959. D27 meets twice each year, in November and May, with about 30 members participating in 12 meetings over two days. The Committee, with a membership of approximately 90 members, currently has jurisdiction of over 60 approved standards that are published in the Annual Book of ASTM Standards, Volume 10.03

D27 Committee Scope

The promotion of knowledge pertaining to electrical insulating liquids and gases, whether of synthetic or natural origin, and the recommendation of standards pertinent to these materials.

The principal materials included in this scope are oils of petroleum origin, synthetic liquids, halogenated and other gases, when used, singularly or as combinations, as electrical insulation or as an environment for electrical insulation.

Standards peculiar to solid insulating materials and varnishes and the development of standards pertaining to the nonelectrical uses of liquid and gaseous materials are excluded from the scope of Committee D27. Development in these fields incidental to the normal work of Committee D27 will be coordinated with the appropriate technical committees of the Society.

Committee Officers

Chairman:	Lance R. Lewand
Vice-chairman:	Edward W. Casserly
Secretary:	Michael Bonn
Staff manager:	Kelly Paul
Admin assistant:	Lindsey Limone
Editor:	Christine Leinweber

Subcommittees

D27.01 Mineral

D27.02 Gases and Non-Mineral Oil Liquids

D27.03 Analytical Tests

D27.05 Electrical Test

D27.06 Chemical Test

D27.07 Physical Test

D27.15 Planning Resource and Development

D27.90 Executive

D27.91 I.E.C. TC 10 and Advisory

D27.95 Awards, Special Events, and Bylaws.

ASTM D27 Hot Topics

Last meeting: Nov 16-17, 2020 Virtual

Subcommittee Reports

D27.01 - Mineral Oils, Jimmy Rasco:

- The new standard specification for rerefined mineral insulating oil (WK31231) in ballot resolution.

D27.02 - Gases and Non-Mineral Oil Liquids, Denis Lafrance:

- The new standard specification for synthetic esters (WK46195) will be re-balloted at both sub-committee and main committee.

ASTM D27 Hot Topics

D27.03 - Analytical Tests, Claude Beauchemin:

- New test method for methanol and ethanol in electrical insulating oils of petroleum origin has been approved.

D27.05 - Electrical Tests, Sandra Smith:

- Developing test method for PD inception of electrical insulating liquids

D27.06 - Chemical Tests, Lance Lewand:

ASTM D27 Hot Topics

D27.07 - Physical Tests, William Hand:

D27.95 - Awards, Special Events, Bylaws, Clair Claiborne:

D27.15 - Planning, Resources and Development, Kevin Rapp:

D27.91 - IEC TC 10 Advisory, Kevin Rapp:

Kevin Rapp presented the IEC TC 10 Advisory report.

Future Meetings

May 17-18, 2021 Virtual

Nov 14th -16th 2021; Atlanta Marriott Marquis, Atlanta GA

APPENDIX 6

Meeting Planning

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

Meetings Planning SC

Spring 2021 Meeting

VIRTUAL

Subcommittee Meeting

Report Out

Tammy Behrens

SPX Transformer Solutions

Meetings Subcommittee Chair

Spring 2021 (S21) Virtual Meeting

THANK YOU TO OUR ENCORE MEETING TEAM!

Dale Baer

Daniel Lantzy

Dustin Buse

Dustin Roberson

ALL THE ROOM, RECORDS, CHIME PORTAL TECHNICIANS:

Garrey Dunn

Emily Siegal

Brandt Gentry

Chaz Green

Manuel Luna

Darren Cox

Sergio Sanchez

“Goose”

Phil Waldvogel

	2019 Spring Anaheim	2019 Fall Columbus	2020 Spring Charlotte	2020 Fall VIRTUAL	2021 Spring VIRTUAL
Attendees	596 (605 – 9)	603 (606 – 3)	538 CANCELLED	508	558
Spouses/ Companions/ Guests	79 (80 – 1)	47 (48 – 1)			

Newcomers Orientation On Demand Available As Soon As Portal Opened

Awards Presentation

On Demand

Available Monday AM

Meetings

Subcommittee Mtg

On Demand

Available Tuesday PM

Virtual Meeting FEEDBACK

Feedback Received

- Reminder to general attendees to update their WebEx profiles with their full name and email address used to register for the meeting
- Note to meeting leaders about WebEx rendering delays

Meetings Subcommittee Volunteer UPDATES

Tasks and Volunteers

TUTORIALS

Tutorial Proposals in the Queue

tprevost@ieee.org for
information on submitting a tutorial proposal.

BREAK SPONSORS

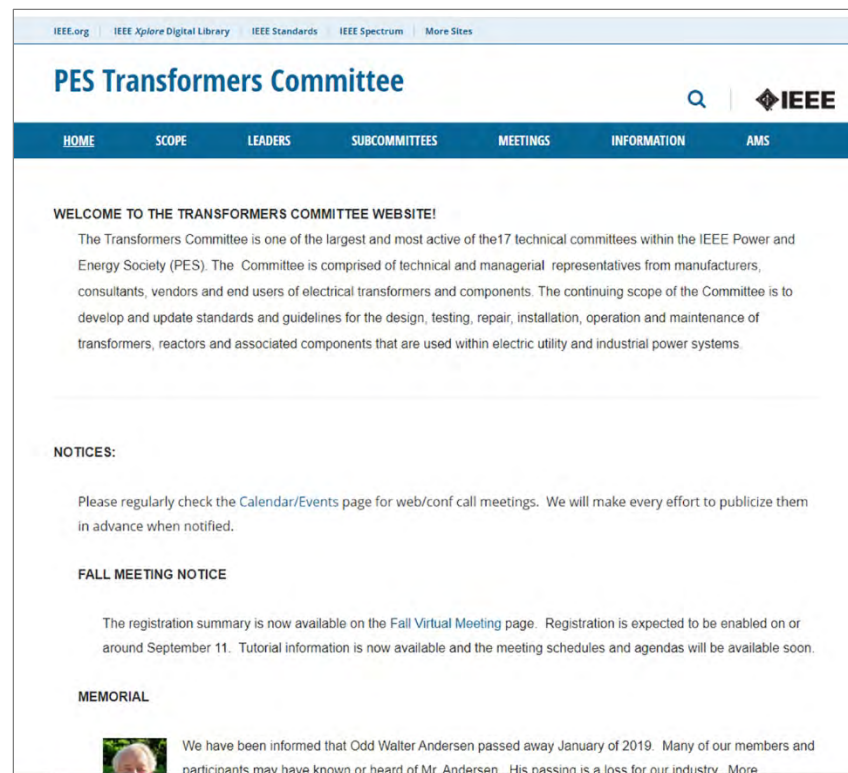
- Break sponsors scheduled for the spring and fall 2020 meetings as well as the spring 2021 meeting were moved to the next in-person meetings, with the rest of the schedule pushed out accordingly
- Fall 2022 – Two available break sponsorships remaining, one on Monday and one on Wednesday
- Fall 2023 – First meeting with full break sponsorship schedule available

Contact Ed Smith at edsmith@h-j.com to schedule a break sponsorship at an upcoming in-person meeting – cost is \$2500/day.

WEBSITE

new platform as
of S19 meeting

Committee Website Update



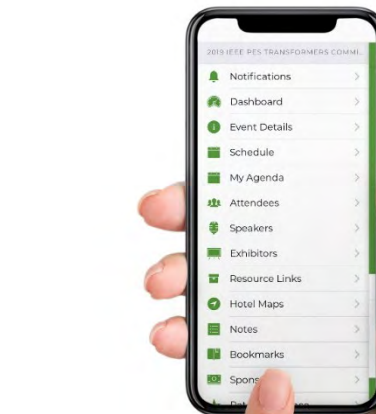
Contact Sue McNelly at sjmcnelly@ieee.org or Kris Zibert at Kris.Zibert@amce.com with any questions or comments on the website.

NEW MEETING APP

IEEE

EventHub

when in-person meetings resume



RFID

RFID System Update

- Solution that would allow anyone with a smart phone to download an app and be able to check into meetings through the app
- New solution could reduce costs and simplify meeting setup
 - Reduce/Eliminate RFID equipment maintenance and replacement
 - Reduce/Eliminate badge sticker purchases
 - Reduce/Eliminate need for highboys and RFID signage at entrance of every meeting room

Contact Kris Zibert at Kris.Zibert@amce.com with any questions or feedback on the RFID system.

MEETING SCHEDULE

Meeting Schedule Update

- Schedule layout
- Visibility of group leadership, including email addresses
- Sorting by subcommittee
- Report distribution from RFID system
- Meeting room signage

Contact Jerry Murphy at jerry.murphy@ieee.org with any scheduling questions or requests for future meetings.

Considerations for Future Meeting Sites

- hosts
- consideration of # of attendees
- availability of technical tours and activities
- walking distance restaurants
- international airport

FALL 2021 — October 17-21
Milwaukee, WI USA
Hyatt Regency

SPRING 2022 — March 27-31
Denver, CO USA
Hyatt Regency Denver at
Colorado Convention Center

FALL 2022 — October 16-20
Charlotte, NC USA
Sheraton / Le Méridien



Watch for a survey from Bruce
Forsyth in late May/early June
re: fall meeting in-person
participation!

When this spring meeting ends...

**PLEASE CONTACT ME WITH ANY
FEEDBACK, COMMENTS OR
QUESTIONS AT
TC-MEETINGS@IEEE.ORG**

**Thank you for all your work this week
and over the course of the year!**

APPENDIX 7

IEEE Staff Update Presentation

IEEE STANDARDS ASSOCIATION - TRANSFORMER COMMITTEE

PE/ TRANSFORMERS ADMINISTRATIVE SUBCOMMITTEE

SPRING 2021

MALIA ZAMAN

M.ZAMAN@IEEE.ORG

AGENDA

Appendix 7

☐ **SA Updates**

- ☐ PAR/Standards Status Update

☐ **Policy Updates**

- ☐ Updates – New WG chair support material
- ☐ Draft Sharing
- ☐ Direct- Vote Live
- ☐ IEEE Privacy Policy

☐ **IEEE/IEC Dual Logo Status**

☐ **Expiring PARS:**

- ☐ **2021** – 16 PARS are expiring
 - ☐ 2 PARs are in SA Ballot stage
 - ☐ 2 PARS are on the NesCom for PAR extensions
 - ☐ 1 PAR on RevCom Agenda
 - ☐ 11 in WG development stage
- ☐ **2022** - 17 PARS are expiring
 - ☐ 2 in Comment resolution
 - ☐ 15 n WG Development stage

☐ **Expiring Standards in 2021**

- ☐ 7 Stds. will become inactive,
- ☐ 2 do not have PARS to revise

☐ **Expiring Standards in 2022**

- ☐ 8 Stds. will become inactive
- ☐ 1 with no Active PAR

UPDATES – NEW WG CHAIR SUPPORT

Appendix 7

- **WG chair fundamentals presentations available** - Consisting of 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
 - Now Available in English and Mandarin:
- **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

DRAFT SHARING POLICY

Appendix 7

DRAFTS SHARING METHODS AVAILABLE:

- ❑ SHARING DRAFTS WITH IEEE SA WORKING GROUPS AND IEEE STANDARDS COMMITTEES
- ❑ SHARING DRAFTS WITH ORGANIZATIONS EXTERNAL TO IEEE
- ❑ *IEEE SA Standards Board Operations Manual*
<https://standards.ieee.org/about/policies/opman/sect6.html>

SHARING DRAFTS WITH IEEE SA WORKING GROUPS

Appendix F

AND IEEE STANDARDS COMMITTEES

Another IEEE SA Working Group may:

- ☐ Decide to share their draft with another IEEE SA Working Group or IEEE Standards Committee; or
- ☐ Receive a request for a copy of their draft from another IEEE SA Working Group or IEEE Standards Committee

It is the decision of the IEEE SA Working Group developing the draft to share the draft.

- ☐ It is recommended that the Working Group vote on sharing the draft.

If the Working Group developing the draft decides to share the draft, the Working Group Chair:

- ☐ Shall ensure that the draft is in the **IEEE SA template** for draft standards and that the **cover page** provided by their Program Manager (PM) is inserted as the first page of the .pdf file of the draft prior to sharing the draft.
- ☐ Sends the draft to the **IEEE SA Working Group Chair** or IEEE Standards Committee Chair with whom the draft is being shared, copying their **IEEE Standards Committee Chair, Program Manager** and IEEE SA Intellectual Property Rights (**stds-copyright@ieee.org**).

If the Working Group developing the draft decides not to share the draft, the Working Group Chair should:

- ☐ Provide the rationale to the Working Group or Standards Committee requesting the draft, and
- ☐ Copy their Standards Committee Chair and Program Manager on the rationale.

SHARING DRAFTS WITH ORGANIZATIONS EXTERNAL TO IEEE

Appendix 7

The sharing of drafts with organizations external to IEEE is done in accordance with [subclause 6.1.3.4](#) of the *IEEE SA Standards Board Operations Manual*, “Draft distribution for coordination.”

- A draft sharing relationship with an organization external to IEEE must be established by IEEE SA prior to the IEEE SA WG sharing the draft.
- A list of established relationships for the purposes of draft sharing is available on the [Working Group Draft Sharing List for Coordination](#).
 - If the IEEE SA WG believes that the draft sharing relationship has already been established, the WG Chair should contact the Program Manager.

The Working Group Chair reviews the [Working Group Draft Sharing List for Coordination](#) to determine if the draft sharing relationship has been established.

- If the IEEE SA WG does not have a draft sharing relationship established with a specific technical group in an organization external to IEEE (even if another IEEE SA Working Group has an established relationship with the same technical group), the relationship with the specific technical group must first be established by IEEE SA prior to sharing the draft (see Slide 8 - “Establishing the Draft Sharing Relationship”).
- If the draft sharing relationship has been established:
 - If the [Working Group Draft Sharing List for Coordination](#) indicates “Yes” under the column “Seek PM Guidance”, the Working Group Chair shall contact the PM prior to sharing the draft.
 - If the [Working Group Draft Sharing List for Coordination](#) indicates “No” under the column “Seek PM Guidance”, the draft can be shared (see Slide 9 - “Sharing the Draft” for steps to be taken).

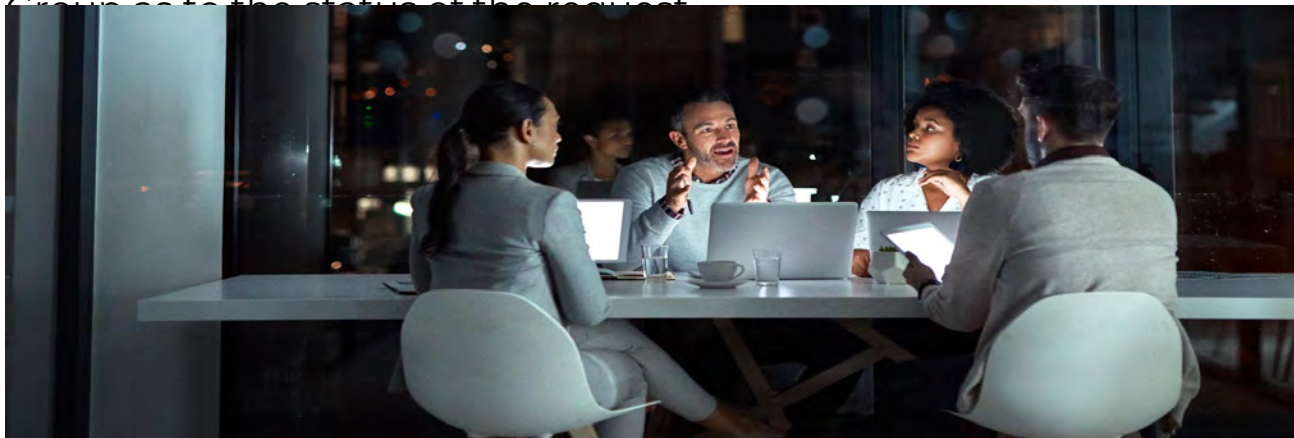
Note: Additional steps may be needed as some organizations external to IEEE have their own processes.

ESTABLISHING THE DRAFT SHARING RELATIONSHIP Appendix 7

The IEEE SA WG submits the form “[Request for Sharing Drafts with Organizations External to IEEE](#)”, requesting to establish a draft sharing relationship with a technical group in an organization external to IEEE.

- It is recommended that the Working Group vote to establish the draft sharing relationship.

The IEEE SA Program Manager will inform the IEEE SA Working Group of the status of the request.



SHARING THE DRAFT/MAINTAINING THE DRAFT SHARING RELATIONSHIP

Appendix 7

Sharing the Draft

- Once the draft sharing relationship has been established, the process for sharing the draft is as follows:
 - The IEEE SA Working Group Chair completes the Cover Letter provided by the IEEE SA Program Manager and shall insert the cover letter as the first page of the draft standard in PDF format.
 - The IEEE SA Working Group Chair sends the combined PDF to the technical group in the organization external to IEEE, copying the Program Manager and IEEE SA Intellectual Property Rights (stds-copyright@ieee.org).
 - The IEEE SA Working Group is responsible for considering the information or feedback related to drafts received from the technical group in the organization external to IEEE.

Maintaining the Draft Sharing Relationship

- The IEEE SA Working Group Chair is responsible for reviewing the draft sharing relationship annually with the Working Group to ensure that it continues to be productive.
- If the relationship is no longer productive, the IEEE SA Working Group or Standards Committee Chair shall inform IEEE SA Intellectual Property Rights (stds-copyright@ieee.org) and their Program Manager.

Note: The draft sharing “Cover Letter” is an actual letter only to be used when sharing drafts with organizations external to IEEE.

CONSENT TO IEEE PRIVACY POLICY

Appendix 7

IEEE SA has noted that many of the volunteers who are using iMeet Central have not consented to the IEEE Privacy Policy. If you have received such an email, please provide consent if you agree to the IEEE Privacy Policy by completing the following online form and indicating "Standards Development Activities and Tools" as the "Applicable Program": <https://engagestandards.ieee.org/IEEE-SA-Privacy-Policy-Acceptance.html>.

We have requested that this action be taken by 16 April 2021 or your iMeet Central account may be deactivated, and you will no longer have access to IEEE SA iMeet Central Workspaces Kindly please consent to the Privacy policy :
<https://engagestandards.ieee.org/IEEE-SA-Privacy-Policy-Acceptance.html>.

A Validator Tool is available to check if the volunteers have consented to the IEEE Privacy Policy. IEEE SA will provide training for the WG officers to use the validator tool as needed. Once the training session(s) are set up, we will inform the committees.

IEEE/IEC DUAL LOGO UPDATE (ACTIVE PROJECTS) Appendix 7

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, IEC COMPLETED CD, **IEEE SA Ballot will be during CDV stage? Confirm with Ross.**

UPDATE:

- ❑ **P60214-1-57-131**, Standard Requirements for Tap Changers
 - ❑ PAR was for an adoption of an IEC standard, this PAR was 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) Appendix 7

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

March 26, 2021

To: Bruce Forsyth, Chair
IEEE PES Transformers Committee

RE: IEEE PES Transformers Committee Treasurer's Report
Spring 2021 Meeting
(for reporting period 09/01/2020 to 01/31/2021)

Dear Bruce,

The finances of the Committee are in sound condition. As of February 1st (end of this reporting period), the balance in our account was \$120,083.56.

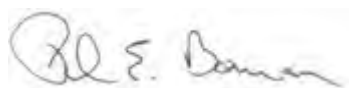
FYI: January 31st was essentially a "snap-shot in time" after all income & expenses were resolved from the previous Fall 2020 virtual meeting and before we started spending significant funds for the Spring 2021 Virtual Meeting.

Report period highlights include,

- The 2019 Audit was completed with satisfactory results,
- a 2020 Audit will not be required because we do not meet the minimum revenue / expense threshold,
- the Fall 2019 Meeting reported a profit because of lower expenses associated with virtual meetings,
- IEEE is scheduled to change our banking system software on May 1, 2021, which may have functionality to switch from cash-based accounting to accrual-based accounting system, and
- the Treasurer Officer position will be turned over to Troy Tanaka, Burns and McDonnell on July 1, 2021.

See attached summary of the balance of this reporting period, and the previous periods. It has been my pleasure to serve the Committee for the last several years. 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 - Spring 2021
(for reporting period 09/01/2020 to 01/31/2021)

AAAAA	Balance before Spring 2019 Meeting, as of 01/31/2019	\$95,326.42
AAAA	Balance before Fall 2019 Meeting, as of 08/31/2019	\$93,611.60
AAA	Balance before Spring 2020 Meeting, as of 01/31/2020	\$119,318.89
AA	Balance before Fall 2020 Meeting, as of 08/31/2020	\$110,945.49
	<u>Misc Income, not related to a specific meeting</u>	
B.1	interest, approx 6 months	\$242.00
B.2	misc income; shirt sales, CD-ROM sales, book sales, etc.	\$0.00
B	Total Misc Income, not meeting related	\$242.00
	<u>Misc Expenses, not related to a specific meeting</u>	
c.1	subscription fees, 123Signup, Authorized Net, Paypal	(\$385.40)
c.2	awards	\$0.00
c.3	equipment purchases; projectors & cases, etc.	\$0.00
c.4	technology; RFID tech, meeting app, WiFi equip, printers & ink, cables, etc	\$0.00
c.5	conferences, PES GM, remote meetings, etc.	\$0.00
c.6	other misc. expenses; shirts, audit, books, office supplies, name badges, etc.	\$0.00
c.7	memorial	\$0.00
C	Total Misc. Expenses, not meeting related	(\$385.40)
	<u>Spring 2020 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	\$0.00
D	Total Late Income/(expenses), Spring 2020 Meeting	\$0.00
	reported prelim. gain/(loss), as of 08/31/2020, from previous Treasurer's Report	(\$4,929.10)
	Actual Gain/(Loss), Spring 2020 Meeting	(\$4,929.10)
	<u>Fall 2020 Meeting</u>	
e.1	income, meeting registrations	\$69,430.00
e.2	income, coffee break sponsors	\$0.00
e.3	meeting expenses	(\$40,457.90)
E	Income minus expenses (between 09/01/2020 and 01/31/2021)	\$28,972.10
	meeting income (expenses), before 08/31/2020	(\$1,098.47)
	<u>Preliminary</u> Gain/(Loss), Fall 2020 Meeting	\$27,873.63
	<u>Expenses, Future Meetings (deposits paid, etc)</u>	
FF	future meeting income (expenses), paid 02/01/2020 to 08/31/2020	\$0.00
FFF	future meeting income (expenses), paid 09/01/2020 to 01/31/2021	\$0.00
G	Net Income (loss), between Spring 2020 and Fall 2020 meetings (B+C+D+E)	\$28,828.70
A	Balance before Spring 2021 Meeting , as of 08/31/2020 [(AA + FF) + G]	\$139,774.19

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

Sum of Credit/(Debit)		Meeting								
Category	Subcategory	21U	21S	21F	20U	20S	20F	19U	19S	19F
1.2	Corporate			\$5,000.00					\$7,500.00	\$7,500.00
1.2 Total				\$5,000.00					\$7,500.00	\$7,500.00
2.1	Commission Meeting								\$3,551.74	\$2,896.09
						\$10.75	\$69,430.00		\$258,055.05	\$238,335.85
2.1 Total						\$10.75	\$69,430.00		\$261,606.79	\$241,231.94
3.4	Interest	\$87.59			\$1,120.84			\$2,097.59		
3.4 Total		\$87.59			\$1,120.84			\$2,097.59		
4.1	Meeting Shipping	(\$70.00)			(\$35.00)	(\$567.66)	(\$40,457.90)		(\$237,177.49)	(\$186,025.19)
	Social					(\$541.56)	(\$631.18)		(\$1,199.65)	(\$858.52)
	Venue					(\$500.00)			(\$64,833.01)	(\$25,839.53)
	123Signup								(\$543.84)	
	RFID				(\$703.80)			(\$535.98)		
	Award				(\$270.59)				(\$3,397.99)	(\$3,401.01)
			(\$170.21)			(\$188.91)				
4.1 Total		(\$70.00)	(\$170.21)		(\$1,009.39)	(\$1,798.13)	(\$41,089.08)	(\$535.98)	(\$307,151.98)	(\$216,124.25)
4.9	Other PES Audit				(\$555.84)			(\$40.00)		
								(\$5,996.69)		
								(\$3,246.78)		
4.9 Total					(\$555.84)			(\$9,283.47)		
5.3	Contractor					(\$3,500.00)			(\$10,359.03)	(\$9,958.86)
5.3 Total						(\$3,500.00)			(\$10,359.03)	(\$9,958.86)
Grand Total		\$17.59	(\$170.21)	\$5,000.00	(\$444.39)	(\$5,287.38)	\$28,340.92	(\$7,721.86)	(\$48,404.22)	\$22,648.83

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 F21.

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 S21 not included in this report.

4.1 Meeting expenses including credit card company fees from registration

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.

ANNEX A Bushings Subcommittee

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

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

A.1 Opening of the Meeting

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

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

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

Chair reviewed the IEEE Senior member requirements.

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

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

A.1.2 Reminders of IEEE policies

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

A.1.3 New Members

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

A.1.4 Attendance

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

Table 1 – Virtual Meeting Attendance

Total	159
Members	54
Guests	105
Guests Requesting Membership*	17

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

A.1.5 Agenda Approval

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

A.1.6 Previous Meeting's Minutes Approval

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

A.1.7 Status of Bushing Standards

The Chair presented the Standards Status Report for standards and guides under the Bushing SC, see [Appendix B](#).

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

A.2 Working Group and Taskforce reports

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The existing PAR expires at the end of 2023.

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

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

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

The TF intends to hold a virtual meeting in June.

A.3 External Liaison Reports

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

Mr. Mansuy presented the summary included in [Appendix H](#) of this report.

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

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

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

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

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

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

A.4 Unfinished Business

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

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

A.5 New Business

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

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

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

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

A.6 Adjournment

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

Annex A - Appendix A

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

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

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

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

Annex A - Appendix B

S21 Unofficial Standards Status Report

Standard Project	Title	WG Chair	Pub Year Rev. Due Date	PAR Issue Par Expiration	Comments
PC57.19.00	IEEE Standard General Requirements and Test Procedure for Power Apparatus Bushings	P. Zhao	2004 12/2020	2018 12/2022	WG Draft Development Considered not active but is still available
C57.19.01	IEEE Standard Performance Characteristics and Dimensions for Outdoor Apparatus Bushings	S. Zhang	2017 12/2027		
PC57.19.02	Standard for the Design and Performance Requirements of Bushings Applied to Liquid Immersed Distribution Transformers	S. Shull	New	2016 12/2022	WG Draft Development
65700-19-03	IEC/IEEE International Standard -- Bushings for DC application	L. Recksiedler TBD	2014 12/2024	Develop PAR with IEC	Following the S21 meeting need to reaffirm the status with IEC
C57.19.04	Standard Performance Characteristics and Dimensions for High Current Power Transformer Bushings with Rated Continuous Current in Excess of 5000 A in Bus Enclosures	S. Digby	2018 12/2028		
PC57.19.100	IEEE Guide for Application of Power Apparatus Bushings	T. Spitzer	2012 12/2022	2019 12/2023	WG Draft Development

Annex A - Appendix C

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

10:45 AM to 12:00 PM CST on Monday, April 26, 2021

On-Line Virtual Meeting

Unapproved Meeting Minutes

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

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

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

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

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

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

Discussion, disposition, and/or follow up action:

- Accepted

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

Discussion, disposition, and/or follow up action:

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

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

Discussion, disposition, and/or follow up action:

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

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

Discussion, disposition, and/or follow up action:

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

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

Respectfully Submitted,
WG Secretary David Stockton

Recorded Attendance as provided by PSAV data following the virtual meeting

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

Recorded Attendance as provided by PSAV data following the virtual meeting

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

Recorded Attendance as provided by PSAV data following the virtual meeting

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

Annex A - Appendix D

Distribution Transformer Subcommittee Task force / Working Group Report

Document #: PC57.19.02

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

Chair: Steve Shull Vice-Chair: Ed Smith
Secretary: Rhett Chrysler Percent Complete: 60

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

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

Attendance:

NAME	Affiliation	M or G	Name	Affiliation	M or G	Name	Affiliation	M or G
Adrian Bilardo	IFD Corporation	G	Fabian Stacy	Hitachi ABB Power Grids	M	Martin Rave	ComEd	M
Alan Traut	Howard Industries	M	Gary King	Howard Industries	G	Michael Dahlke	Central Mooney, Inc.	M
Alan Wilks	Consultant	M	George Partyka	PTI Transformers	G	Michael Morgan	Duke Energy	M
Albert Sanchez	Knoxville Utilities Board	G	Giovanni Hernandez	Virginia Transformers Corporation	G	Mubarak Abbas	Siemens Industry	G
Ali Ghafourian	H-J Enterprises, Inc.	M	Hamid Sharifia	Consultant	G	Orlando Giraldo	H-J Family of Companies	G
Andrew Larson	Hitachi ABB Power Grids	G	Huan Dinh	Hitachi ABB Power Grids	M	Paminder Panesar	Virginia Transformer Corp.	G
Angela Amador	EATON Corporation	G	Jacques Vanier	Electro Composites (2008) LLC	G	Paul Gabriel Florida	Howard Industries, Inc.	G
Barry Beaster	The H-J Family of Companies	M	Javier Arteaga	Hitachi ABB Power Grids	M	Poonil Patel	Electric Power Research Institute (EPRI)	M
Carlos Gaytan	Prolec GE	M	Jeffrey Door	H-J Family of Companies	G	Pragnesh Vyas	Sunbelt-Solomon Solutions	M
Chris Pitts	Howard Industries	G	Jerry Murphy	Reedy Creek Energy Services	M	Ramadan Issack	American Electric Power	M
Christopher Whitten	Hitachi ABB Power Grids	G	Jose Gamboa	H-J Family of Companies	M	Rhett Chrysler	ERMCO	SEC
Clemente Reis IV	Custom Materials, Inc.	M	Joshua Verdell	ERMCO	M	Robert Reepe	Georgia Power Co.	G
Darren Brown	Howard Industries	M	Joshua Yun	Virginia Transformer Corporation	M	Ryan Hogg	Bureau of Reclamation	G
David Geibel	Hitachi ABB Power Grids	M	Juan Ramirez	CELECO	M	Said Hachichi	Hydro-Quebec	M
David Stockton	Stockton Consulting	M	Kendrick Hamilton	Power Partners, Inc.	G	Shelby Walters	Howard Industries	M
Diego Rincon	Electroporcelana Gamma	G	Kunal Shukla	PECO Energy Company	G	Stefan Schindler	Maschinenfabrik Reinhausen	G
Duy Vo	Central Maine Power (AVANGRID)	G	Lee Matthews	Howard Industries	G	Stephen Shull	BBC Electrical Services, Inc.	CHR
Edward Smith	H-J Family of Companies	VCHR	Lee Tyler	Warco, Inc.	M	Timothy Tillery	Howard Industries	M
Eric Weatherbee	POORE Electric	M	Marek Komowski	Polycast International	M	Weijun Li	Braintree Electric Light Dept.	M
						Yves Vermette	Electro Composites LLC	M

Meeting Minutes:

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

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

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

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

Distribution Transformer Subcommittee Working Group Report

Old Business

Taskforce report – Table 4 – Lee Tyler

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

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

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

New business

No new business was brought forward.

Meeting was adjourned at 11:56 am.

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

Submitted by: Rhett Chrysler

Date: 4/27/2021

Annex A - Appendix E

IEC/IEEE 65700_19_03 DC Bushings TF

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

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

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

1. Welcoming and Call for Patents, Copyrights

- The meeting was called to order at 2:20 PM by the TF Secretary Arturo Del Rio.
- Due to personal reasons, the TF Chair Leslie Recksiedler has resigned. The Task Force is looking for a volunteer to fill this roll. Leslie is planning to return in 2022.
- Currently, the positions for Chair and Vice Chair are vacant and looking for volunteers for the rolls.
- The TF Secretary did a call for potentially essential patents and copyrights issues as slides sent in advance in meeting invite. None were reported.

2. Verification of Quorum

- The virtual attendance was checked with a Poll from Webex Encore
- There was a total of 20 participants: 5 Members and 15 Guests out of which 2 guests requested membership, not granted based on meeting attendance guidelines
- 5 of the current 8 TF Members were present and quorum to carry out business was met.
- The agenda for the meeting which was circulated by email among members and guests on April 19, 2021, was presented to the participants.
- There were no objections, and the agenda was approved unanimously.

3. Approval of the minutes of the October 20, 2020, virtual meeting

- The minutes from the F20 virtual meeting, which were circulated on April 19, 2021 by email, were presented to the participants.
- There were no objections or comments and the minutes were approved unanimously.

4. Discussion and Review

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

Mr. Lars Jonsson, IEC Chairperson- IEC survey results:

Proposal for the revision has covered as following, but not limited to:

1) Alignment of IEC/IEEE 65700-19-03 with IEC 60137

- Altitude correction is now inconsistent, and there may also be a need for clarification whether site conditions or test conditions shall be the base.
- Creepage distance calculation to be clarified
- The consequences of some of the cross references between the two documents should be reviewed, and clarifications added. Areas where different interpretations from different stakeholders have been noted concerns cantilever testing and impulse testing.
- Clarification regarding calculations of equivalent currents.

2) Take in consideration the possibility to decouple the two standards,

3) Necessity to provide a different variable name for the rated voltage for bushings for combined voltage application

4) Review the necessity of possible extension of qualifying DC tests

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

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

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

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

5. New Business

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

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

6. Meeting Adjournment @ 3:15 pm

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

Submitted respectfully,

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

TF Secretary

Meeting Attendance and Membership standing.

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

Annex A - Appendix F

C57.19.100 Bushing Application Guide Meeting Minutes

4/26/2021 Spring Virtual Meeting

Tommy Spitzer Chair

Jeff Benach Secretary

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

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

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

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

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

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

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

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

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

The meeting was adjourned at 3:35 PM CST

Attendance:

1.Quorum

A.Member 19/44 (43%)

B.Guest 16/44 (36%)

C.Requesting Membership 4/44 (9%)

No Answer 5/44 (11%)

	A	B	C

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

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

Annex A - Appendix G

IEEE/PES TRANSFORMERS COMMITTEE

Bushings Subcommittee

TF Classification and Performance of Dry Type Bushings**Virtual****Monday, April 26, 2021**

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

1. Welcome**2. Welcoming and Call for Patents**

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

3. Verification of Quorum

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

4. Approval of Agenda

- There were no objections to approving the agenda.

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

- There were no objections to approving the previous minutes.

6. Definitions in existing bushing standards.

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

IEEE/PES TRANSFORMERS COMMITTEE

Bushings Subcommittee

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

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

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

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

IEEE/PES TRANSFORMERS COMMITTEE

Bushings Subcommittee

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

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

8. New Business

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

IEEE/PES TRANSFORMERS COMMITTEE

Bushings Subcommittee

9. Adjournment

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

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

Respectfully submitted,

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

Secretary: Chris Whitten (christopher.l.whitten@hitachi-powergrids.com)

IEEE/PES TRANSFORMERS COMMITTEE

Bushings Subcommittee

Attendance and membership status

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

IEEE/PES TRANSFORMERS COMMITTEE

Bushings Subcommittee

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

Annex A - Appendix H

SPRING 2021 MEETING OF IEEE TRANSFORMER BUSHINGS

Location: VIRTUAL Meeting

Date: April 26-29, 2021

BUSHINGS SUBCOMMITTEE WORKING GROUP AND TASK FORCE MEETINGS

Liaison Reports - IEC Bushing Standardization Activities

INTERNATIONAL ELECTROTECHNICAL COMMISSION

TECHNICAL COMMITTEE No.36A: Insulated Bushing

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

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

Dielectric Tests Subcommittee

April 28th, 2021
Virtual meeting

Dielectric Tests Subcommittee		
Chair: Ajith M. Varghese	Vice-Chair: Thang Hochanh	Secretary: Poorvi Patel
Room: Virtual	Date: April 28 th 2021	Time: 11:00 am to 12:15 pm
Total DTSC Members: 136	Members present at the meeting: 109	Attendance according AMS: 254
Guests present: 145	Membership requested: 25	Membership accepted: 23

B.1 Chair's Remarks

The Chair welcomed members and guests to the Spring 2021 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 2020 meeting and the agenda for Spring 2021 meeting was sent out to members and guests 14 days before the Spring virtual meeting, and it's also posted on the website.

All TF and WG **MUST** record the attendance in the AM System (no expectations that the meeting was held in a virtual setting) - The WG/TF minutes do 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/TF leaders that if a PAR extension is needed – this should have a WG approval before proceeding. However, the WG should try to complete the revision/guide within the given timeline. If the document is almost complete and new information comes to attention, in that case the WG-leader makes the call to include it or if the new information could wait until the next revision.

To keep the PAR timeline it is also recommended to have on-line meetings between the scheduled Fall and Spring meetings- to get the revision work moving. The on-line working meeting agenda should be posted before the meeting as well as minutes and attendance should be recorded.

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- June 11th 2021. 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. Motion could also be posted on the chat during the meeting.

The Chair reminded WGs that call of the patent is required 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.

Highlights from ADCOM:

- a) If a PAR Extension is needed then the following must be followed:
 - WG should get opportunity to discuss and shall approve extension
 - Same shall be documented in minutes
- b) For all Online meetings the following should be performed:
 - Shall provide notice and shall be posted on webmaster
 - Attendance and Minutes are required.

Ballot update of C57.12.00 and C57.12.90 related to DTSC. The Ballot comments were forwarded to the WG/TF leaders. Comments related to Impulse Testing was reviewed and responded during TF meeting on Tuesday 27th of April 2021. All comments have been responded. Comments related to low Frequency Testing couldn't get reviewed during S21. Resolution study group has been set-up to go over the comments.

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 Fall committee meeting 2021 will be held in Milwaukee on the 17th -21th of October 2021. A survey will be sent out in June-July and based on the outcome of the survey decision will be taken if this meeting will again be virtual or in person. 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. Currently is inactive.
- C57.160 Guide for the Elec. Measurement of PD in HV Bushing and Instrument Transformers is in ballot resolution. The guide expired in 2020. Par is extended to 2022.
- C57.113 Recommend Practice for Partial Discharge Measurement Power - Par expires 2021. The guide expired in 2020. The WG approved a motion to apply for PAR extension to December 2022.
- 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.
- 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**.

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.

There was an issue with the Poll results from the Fall virtual meeting. So, if you had requested a membership-please email the secretary. One guest email requested membership and was granted membership and 1 member were moved to guest status. The total membership of the Dielectric Subcommittee is today 139 members. To obtain Quorum 70 members is required.

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 254. Members attendance was 109. And 25 requested membership and 23 members were granted.

Attendance Summary

	Webex
Total Attendees	254
Total # Of Members	136
Members Present	109
Quorum Present	YES (80%)

The virtual DTSC meeting had quorum.

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

The minutes of the Fall 2020 Virtual 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 | April 27th, 2021 | 9:25 – 10:40 AM CDT

Chair: Dan Sauer

Vice Chair: -

Secretary: -

Meeting Attendance

The working group met at 9:30am. There were 83 attendees and 29/53 members present. Quorum was achieved.

Attendance

	WebEx
Total Attendees	83
Total # Of Members	53
Members Present	29
Quorum Present	54.7%

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 Spring 2021 meeting was approved (Motion made by Bertrand Poulin, seconded by Brian Penny).
- The minutes of the Fall 2020 meeting were approved (Motion made by Fabian Stacy seconded by Ajith Varghese).
- The minutes of the Fall 2019 meeting were approved (Motion made by Bertrand Poulin, seconded by Eduardo Garcia Wild).

Old Business

- Section 7 – Insulation Power Factor Testing
 - o Change lead references in the section from “Red” and “Blue” to R1 & R2
 - o Sergio Hernandez Cano will provide updated figures 7.2, 7.5, & 7.6
 - o Bertrand & Fernando Leal will propose a test sequence for multi-winding transformers
 - o In section 7.6.1.2 in the table remove the reference to temperature correction.
 - o Include a note about oil types impacting permittivity (submitted by Waldemar Ziomek)
 - o Table 7.6.1.6 update with info from the TF on Power Factor Limits
 - o Bertrand Poulin has volunteered to review the section for additional changes, additions, and edits
- Annex A – AC Measurement during dielectric test
 - o No additional comments
- Section 6 – update with proper margins & layout to have tables & graphs side-by-side

New Business

- The chair mentioned that the PAR is valid until December 2022, and with that in mind the document should be finalized at the Fall meeting and sent to ballot to permit time to resolve any negative comments.

Meeting adjourned by a motion made by Bertrand Poulin and seconded by Tauhid Haque Ansari.

Dan Sauer

S21 Update: WG PC57.168 LF Di-Test Guide

Quorum: Achieved Agenda: Approved MOM: Approved.

Highlights:

- Combined insulation power factor section was reviewed. Numerous improvements were suggested.
- The power factor section will be further reviewed based on the suggestions and will be circulated for further comment.
- Info on measurement of AC voltage was presented and approved for an annex.
- Document will be final edited and circulated for final approval prior to the fall meeting. We decided that we have sufficient material for a first published document.



Attendee List:

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B.3.2 WG C57.113 - Recommended Practice for PD Testing,**Ali Naderian – Chair, Janusz Szczechowski – Vice Chair****John Foschia – Secretary****VIRTUAL MEETING | April 26th, 2021 | 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 101 attendees and 15/17 members present. Quorum was met.

Discussions

- No essential patent claims or copyright violations noted.
- An updated membership list was presented based on attendance.
- Through WebEx, a poll was conducted to determine member attendance and requests for membership. Quorum was met with 15/17 members present.
- The spring 2021 meeting agenda was approved.
 - o Motion by Tauhid Ansari
 - o Second by Detlev Gross.
 - o No discussion and unanimous consent.
- IEEE copyright and patent claim slides were presented. No copyright or patent concerns were brought to the attention of the WG.
- The minutes of the Fall 2019 meeting were approved.
 - o Motion by Tauhid Ansari
 - o Second by Detlev Gross.
 - o No discussion and unanimous consent.
- The minutes of the Fall 2020 meeting were approved.
 - o Motion by Detlev Gross
 - o Second by Hemchandra Shertukde
 - o No discussion and unanimous consent.
- The current PAR will expire at the end of 2021.
 - o The chair solicited approval of a PAR extension of 1 year
 - Motion by Detlev Gross
 - Second by Alex Winter
 - No discussion and unanimous consent.
 - o **PAR extension of 1 year was approved by the WG and approval of the Dielectric Test subcommittee is necessary to submit the PAR extension request.**
- The updated draft of the guide was presented and feedback was solicited.
 - o Discussion amongst multiple members centered around removal of the phase-resolved partial discharge patterns from the guide because they are not in the scope of the guide. Reference was made to IEEE 454 and additional CIGRE documents.
- A motion was made to “modify the wording of Annex G, removed the phase-resolved partial discharge patterns, and reference ‘upper’ IEEE documents.”
 - o Motion by Hemchandra Shertukde
 - o Second by Detlev Gross
 - o Removal of the noise identification patterns in Annex F and G was discussed.

- The motion was amended to:
 - “**Modify the wording of Annex G, removed the phase-resolved partial discharge patterns in Annex F and Annex G, and reference ‘upper’ IEEE documents.**”
 - Second by Detlev Gross
 - No further discussion and unanimous consent.
- A motion was made “to remove an example of the calculations provided in Annex A and to only include formulae in Annex A.”
 - Motion by Detlev Gross
 - Second by Hemchandra Shertukde
 - It was noted that these calculations were initially included as a tutorial for less experienced users of the guide but that it would be acceptable to remove.
 - Unanimous consent to approve the motion.
- A motion was made “to remove the example patterns in Annex B but to keep the pulse repetition rate graph and frequency response graph.”
 - Motion by Detlev Gross
 - Second by Hemchandra Shertukde
 - Discussion centered around the extension of the graph to a frequency lower than 1 Hz.
 - No opposition to unanimous consent.
- The meeting was adjourned at 11:25am ET.

Attendance (as reported by electronic survey during the meeting)

mark lachman	Jeff Door	Brady Nesvold
Jacques Vanier	Troy Tanaka	Andy Downey
suresh babanna	dervis serhat tekin	Raymond Curtiss Frazier
Peter Kleine	Derek Hollrah	1871913115
YaquanBill Li	Eric Schleismann	Bertrand Poulin
Malia Zaman IEEE SA	Anand Zanwar	Zach Millard
Mana Yazdani	Jaroslav Chorzepa	Stacey Kessler
Polo Rodriguez	Wallace Binder	Ali Naderian
Waldemar Ziomek	Kyle Stechschulte	Gael R Kennedy
David Walker	Myron Bell	Jose Gamboa
William Boettger	Dipak Patel	Dan Schwartz
Onome A	Cihangir Sen	Nick Walder
Muhammad Abdullah Sohail	Dave	Sanjib
Moonhee Lee	Harry Pepe	Janusz Szczechowski
John Foschia	Hemchandra Shertukde	Markus Söller
Reto Fausch	HSahin	Alain Bolliger
Fernando Leal	Steve Jordan	Alexander Winter
Jean-Noel Berube	Pragnesh Vyas	Detlev Gross
Taylor Gray	Tom Melle	Lina Sandsten
DANIELA EMBER BACIU	Steve Snyder	Markus Schiessl
Feras Fattal	Nitesh patel	Robert Mayer
asarkar	Rob	Mihai Huzmezan
Juan Alfredo Carrizales Baaldua	Christopher Whitten	Tauhid Ansari
Monil Patel	Everton De Oliveira	Donald Ayers
Steve Brzoznowski	Fabian Durand Stacy	Zoltan
Ajith Varghese	Shibao zhang	DAVID ELLIS
Sergio Hernandez Cano	Dinesh Sankarakurup	Shawn Gossett
Eduardo Garcia	Steve Holsomback	Hampton Steele
Jeff Benach	Hugo Flores	Ross McTaggart
Kipp J Yule	mfg18	Ed Van Vooren
J.Dennis Marlow	domenico corsi	David Calitz Guest
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Raj Ahuja	David Larochelle, NDB Tech	

S21 Update: WG C57.113 PD Measurement Guide

Quorum: **Achieved**

MOM & Agenda: **Approved**

Highlights:

- ❖ Reviewed the current status and discussed annex content
- ❖ WG agreed to:
 - ❖ Omit PRPD patterns in Annex F and G, deemed to be out-of-scope
 - ❖ Omit example calculations of quadrupoles in Annex A
 - ❖ Omit patterns in Annex B but maintain/enhance the pulse repetition rate and frequency response graphs
 - ❖ Include reference to IEEE documentation of common PRPD patterns
- ❖ Request for SCDT approval of 1 year PAR extension
 - ❖ Approved by WG in S21 meeting



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 | April 26th, 2021 | 3:20pm – 4:35pm ET

Chair: Thang Hochanh

Vice Chair: Reto Fausch

Secretary: John Foschia

Meeting Attendance

The working group met at 3:20pm ET. There were 63 attendees and 12/21 members present. Quorum was met.

Discussions

An updated membership list was presented based on attendance.

Through WebEx, a poll was conducted to determine member attendance and requests for membership. Quorum was met with 12/21 members present.

The fall 2020 meeting minutes were approved.

Motion by Hemchandra Shertukde

Second by Reto Fausch

No discussion and unanimous consent.

IEEE copyright and patent claim slides were presented. No copyright or patent concerns were brought to the attention of the WG.

The chair presented the IEEE 4 text proposal which limit the beta-prime value (relative overshoot) to 10% for HV apparatus. As C57.98 is a guide, the decision for transformers test to specify or remove the above limitation of 10% overshoot, has to be handled by C57.12.90.

- This request will be transmitted to Pierre Riffon's WG for consideration.

The Chair reviewed the test voltage factor procedure for chop waves (front and tail chops) when the test voltage overshoot calculation is inconsistent (voltage reduction ratio method IEEE Std 4 2013 Annex A)

The WG was asked about more example of impulse traces, notably of common failure modes.

- There was no feedback provided from the membership.
- An email will be sent to the WG to solicit input of updated impulse traces.

The Chair provided example of IEC CD-60076-4 draft which demonstrates that high beta prime value does not necessarily lead to high voltage correction. It was noted that the voltage correction is dependent on the frequency and not on the high value of beta-prime. Examples show beta-prime= 25%, correction= 1.4%, f=167 kHz and for beta-prime= 26%, correction= 13.7%, f= 756 kHz.

A motion was made that IEC CD-60076-4:2021, annex C.1 be copied as an annex in C57.98 revision.

Motion by Hemchandra Shertukde

Second by Reto Fausch

No discussion and no objection to unanimous approval.

A motion was made to include an example of impulse trace of an improperly grounded bushing on the top cover of a transformer (part of IEC CD-60076-4:2021).

Motion by Reto Fausch

Second by Hemchandra Shertukde
No objection to unanimous approval.

Adjournment

The meeting was adjourned at 4:27pm ET. Motion by Hemchandra Shertukde and seconded by Reto Fausch.

Chair's proposed text:

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 a lightning impulse waveshape shows a relative overshoot β' , it is recommended to limit β' 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 β' 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 4TM2013, 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

The TF inputs will be included in the WG revision. Pierre Riffon will send that within a week.

There was a discussion around the impulse correction factor- the requirement is in C57.12.90. Overshoot is taken care of it as well in this standard. Discussion should be discussed in the next WG meeting. Maybe there will be a new business in the next DTSC meeting.

Request to add the Annex C should be done to have the TF look into it.

S21 Update: WG C57.98 Impulse Test Guide

Quorum: YES Meeting MOM: approved Agenda: approved

Highlights:

- ❖ The WG requested that Annex C.1 from IEC CD-60076-4 be added to C57.98 revision, with permission of IEC.
- ❖ The Annex C.1 demonstrated that, when an overshoot occurs during a lightning impulse test, the voltage correction as recommended by IEC 60060-1, is dependent on the the frequency of the overshoot impulse and not only on β' (overshoot relative amplitude):
 - ❖ For $\beta' = 25\%$, $f = 167$ kHz, Voltage correction = +1.4%
 - ❖ For $\beta' = 26\%$, $f = 756$ kHz, Voltage correction = +13.7%
- ❖ The WG is asking C57.12.90 to deal with the actual proposition that limit β' to 10%. (IEEE Std-4-2013 Clause 8.3.2.1): 10% in absence of clear guidance)



Attendance (as reported by electronic survey during the meeting)

Orlando Giraldo	Paul Florida	Sergio Hernandez Cano
Thang Hochanh	Zach Millard	DANIELA EMBER BACIU
Waldemar Ziomek	David Murray	Mana Yazdani
Polo Rodriguez	Brady Nesvold	Monil Patel
Yaquan Bill Li	Brandon Dent	Mark Perkins
John Foschia	Tiffany Lucas - SPX	Jeff Ray JLR Consulting
Eduardo Garcia	Jorge Cruz	Hampton Steele
Curtiss Frazier	Baitun Yang	dervis serhat tekin
Onome A	HSahin	Eric Davis
Reto Fausch	Jaroslav Chorzepa	Jeff Gragert
Josh Bohrn PacifiCorp	Rob Ghosh	Piotr Blaszczyk
Juan Alfredo Carrizales Baaldua	Hossein Nabi-Bidhendi	Ryan Bishop
William Boettger	Alain Bolliger	Gael R Kennedy
Feras Fattal	Erich Buchgeher	Alexander Winter
Fernando Leal	Hemchandra Shertukde	Lina Sandsten
Parminder	Peter Kleine	jos veens
Tommy Eagle	Rudolf Ogajanov	Donald Ayers
Paul Morakinyo	Rodrigo Ocon	Harry Pepe
555217	USIORAD	

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 | April 27th, 2021 | 3:45pm - 5:00pm CT

Meeting Attendance

The working group met at 3:45pm CST
There were 36 attendees 17 Guest 4 requested membership
and 15/27 members present.
Quorum was achieved to conduct official business.

Discussions

- No essential patent claims or copyright violations noted.
- The Minutes from Fall 2020 meeting were approved.
- Based on the Ballot return there very many comments, approx. 500; most editorial, from that pool there are 85 technical to be resolved.
- The Chair asked for volunteers to get the workload distributed among the members of the group.
 - Review of actual members who asked to be part of the CRG (Comments Resolution Group) who were present on this meeting

Some of the volunteers from Previous meeting had changed work position and were unable to attend or contribute CRG

For editorial in English Sanket Bolear volunteered as one

Additional contribution with samples suppose to come from but they were unable to attend this meeting

Raja Kuppuswamy

Zoltan Roman

There are 7 members from the present group are volunteering to be on the CRG resolution team

Adjournment

The meeting was adjourned at 4:35pm CST

Motion: Detlev Gross / 2nd by Reto Fausch

Reto Fausch

The Chair requested the ballot resolution group to meet and resolve most of the issues between now and next meeting. The PAR is about the expire and the Guide is expired last year.

PC 57.160 - MEMBERS PRESENT					
VIRTUAL MEETING - Spring 2021					
	First Name	Last Name		First Name	Last Name
1	Sanket	Bolear	11	Pierre	Riffon
2	Feras	Fattal	12	Thomas	Sizemore
3	Reto	Fausch	13	Steven	Snyder
4	Detlev	Gross	14	Fabian	Stacy
5	Thang	Hochanh	15	Eric	Weatherbee
6	Kurt	Kaineder	16	Barrett	Wimberly
7	Marek	Kornowski	17	Shibao	Zhang
8	Ross	McTaggart	18	Robert	Middleton
9	Depak	Patel	19	Risto	????
10	Juan Jose	Ramirez Gomez			

PC 57.160 - GUEST PRESENT					
VIRTUAL MEETING - Spring 2021					
	First Name	Last Name		First Name	Last Name
1	Allan	Bartek	11	George Jr	Partyka
2	Steve	Brzoznowski	12	Johnathan	Reimer
3	Daniela	Ember Baci	13	Markus	Soeller
4	Eric	Euvrard	14	William J.	Solano
5	Neder	Frank	15	Loren	Wagenar
6	Orlando	Giraldo	16	Christoph	Whitten
7	Derek	Hollrah	17	Malia	Zaman
8	Fernando	Leal			
9	Jim	Mcbride			
10	Hosseini	Nabi-Bidhendi			

WG C57.160 PD Guide Bushings/PTs/CTs

Quorum: Yes Meeting MOM: Approved Agenda: Approved

- Since last meeting major work had been made on the resolutions comments following the ballot.
- The high number of comments was reduced to 85 and are related only to technical issues.
- The document have also been revised by Pierre Riffon.
- The working group has identified members who are willing to take time to revised the technical comments from ballot.
- Sanket Bolear accepted to revise the English language of the document.



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

VIRTUAL MEETING | April 27th, 2021 | 2.20pm – 3.45pm CT

Meeting initiated by Chairperson Poorvi Patel at 2:20 PM Central time.

- Attendance verified with the system poll, counted 23 attendees at the beginning of the meeting
- Poorvi indicated that the WG would like to complete the work by August 2021 to initiate ballot process
- Expected WG meeting around end of May for final revision approval of existing document
- Poorvi indicated that there is a conflict with the title of the guide:
 - Existing IEEE documentation refers to Dielectric Frequency Response, but the title as created by the IEEE team in China describes it as Frequency Domain Spectroscopy
 - Evgenii Ermakov and Diego Robalino agreed that DFR and FDS terms are synonyms but to be consistent with existing material from IEEE, it is suggested the use of DFR
 - Poorvi consulted with Malia (IEEE SA) and a change of the Title is allowed. Need to bring this up to the WG.
- Poorvi went through the latest changes in the document. Rev. 07.
 - Evgenii Ermakov explained changes in figures 12 to 15
 - Ronald Hernandez requested the value used for activation energy in those figures. Evgenii indicated that the information was not approved for disclosure.
 - General discussion around the importance of the values to be incorporated in example figures. The value is material specific and it can be measured if someone requires it.
 - Peter Werelius discussed revisions and additions to the Annexes in the document
 - Annex B – Temperature dependence and use of Arrhenius equation
 - Annex C – Influence of stray losses
 - Suggested to add one more figure showing resonant frequency around 0.1 Hz
 - Annex D – Use of HV DFR
 - Suggested to add a paragraph related to noise not only directly related to the Substation Voltage level.
 - Possible additional example of HV DFR measurement from colleagues in China.

There was some discussion about the title change- it was agreed that the suggested title should be Dielectric Frequency Response Measurement of Transformer Bushings. This will be taken to the Chinese WG leader.

TF C57.200 Bushing DFS– P. Patel

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

Highlights:

- ❖ Between Fall meeting and Spring meeting the WG has had meetings twice. Next WG meeting will be in May.
- ❖ Balloting- WG is targeting to email vote to take the document for Ballot in August/September 2021.
- ❖ A 7th version of the DFR guide is being reviewed.
- ❖ The Guide is about 80% complete.
- ❖ Request to change the title from "Frequency Domain Spectroscopy Measurement of Transformer Bushings" to "Dielectric Frequency Response Measurement of Transformer Bushings".
- ❖ Discussion on Chapter 9 and New material in Annex was discussed
- ❖ Meeting Adjourn 3.35pm



b

Attendee list

First Name	Last Name	Company
Peter	Zhao	Hydro One
Charles	Sweetser	OMICRON electronics Corp USA
Shibao	Zhang	PCORE Electric
John	Herron	Raytech USA
Peter	Werelius	Megger
Sebastien	Riopel	Electro Composites ULC
Eric	Weatherbee	PCORE Electric
Poorvi	Patel	Electric Power Research Institute (EPRI)
Mario	Locarno	Doble Engineering Co.
Ali	Naderian	Metsco
Diego	Robalino	Megger
Stephanie	Denzer	Alliant Energy
Hugo	Flores	Hitachi ABB Power Grids
Ronald	Hernandez	Doble Engineering Co.
Fabian	Stacy	Hitachi ABB Power Grids
Ismail	Guner	Hydro-Quebec
Sanket	Bolar	Megger
Wesley	Schrom	Carolina Dielectric Maint & Testing Co.
Feras	Fattal	Manitoba Hydro
Mickel	Saad	Hitachi ABB Power Grids
Janusz	Szczechowski	Maschinenfabrik Reinhausen
George	Partyka	PTI Transformers
Afshin	Rezaei-Zare	York University
Evgenii	Ermakov	Hitachi ABB Power Grids
Olle	Benzler	Megger
Jacques	Vanier	Electro Composites (2008) ULC

Rakesh	Patel	Hitachi-Powergrid
Giovanni	Hernandez	Virginia Transformers Corporation
Muhammad	Sohail	Trench Limited

B.3.6 TF on Revision of Low-Frequency Tests

Virtual Meeting – April 27th , 2021 12:55 p.m,

Chair: Bill Griesacker, Vice Chair: Daniel Blaydon (acting secretary), Secretary: Myron Bell.

1. The meeting was called to order at 12:55 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	80
Total # Of Members	56
Members Present	49
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 2020 Spring Transformers Committee meeting held virtually. 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, April 26th. A quorum was achieved at the meeting. A motion was made to “Establish a section on C57.12.00 to express the agreed acceptance levels for PD for Class I Power Transformers as those contained in C57.12.90-2015 (500 pC for Max Acceptable, and 150 pC for Max Increase)”.

Don Ayers agreed to draft language and proposed section numbering in both C57.12.00 and C57.12.90. The draft language will be circulated to the voting membership for comments and vote for approval.

6. PD Limits in Factory Testing

Language for factory PD limits was sent to the C57.12.90 members for comment.

A study group will be formed for the further development of the Class II power transformer partial discharge testing procedure and limits. These additional developments

would be for the next revision of the C57.12.90 standard after the current revision is published. The chair asked for volunteers for this new study group.

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, with proposed wording to be added to standards.

The proposed wording was as follows:

“If the 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 the 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.”

Eric Weatherbee, Bushing SC chair, joined the meeting at 2:59 PM and was read a synopsis of the discussion, along with proposed wording for addition to standards. Eric suggested Bill Griesacker should present the wording to the Bushing SC on Thursday, 4/28/21. This proposal was accepted.

Further discussion was tabled until feedback is received from the Bushing SC.

8. Old business

None.

9. New business

C57.12.90 Ballot Comment resolution

- 14 comments were received, regarding low frequency tests

Raj Ahuja made a motion to, “Form a study group to resolve all ballot comments for low frequency dielectric tests.”

A 2nd for the motion was received from Akash Joshi.

This motion passed without objection.

The chair asked for volunteers for this study group, and for the comment resolution to be completed within the next 30 days.

10. The meeting was adjourned at 2:08pm CDT

11. Our next meeting will occur in October of 2021, during the fall committee meeting.

Meeting Attendance

First Name	Last Name	Company	Member?
Raj	Ahuja	Raj Ahuja Consulting	Yes
Tauhid Haque	Ansari	Hitachi ABB Power Grids	Yes
Elise	Arnold	SGB	
Javier	Arteaga	Hitachi ABB Power Grids	
Donald	Ayers	Ayers Transformer Consulting	Yes
Suresh	Babanna	SPX Transformer Solutions, Inc.	
Christopher	Baumgartner	We Energies	Yes
Myron	Bell	Delta Star Inc.	Yes
Daniel	Blaydon	Baltimore Gas & Electric	Yes
William	Boettger	Boettger Transformer Consulting LLC	Yes
Jeffrey	Britton	Phenix Technologies, Inc.	Yes
David	Calitz	Siemens Energy	Yes
Juan	Carrizales	Prolec GE	
Nikolaus	Dillon	Dominion Energy	
Thomas	Eagle	SPX Transformer Solutions	
Megan	Eckroth	EATON Corporation	
Feras	Fattal	Manitoba Hydro	
Reto	Fausch	RF Solutions	Yes
John	Foschia	SPX Transformer Solutions, Inc.	Yes
Anthony	Franchitti	PECO Energy Company	Yes
Eduardo	Garcia Wild	Siemens Energy	
Shawn	Gossett	Ameren	Yes
Bill	Griesacker	Duquesne Light Co.	Yes
Detlev	Gross	Power Diagnostix	Yes
Kyle	Heiden	EATON Corporation	
Sergio	Hernandez Cano	Hammond Power Solutions	Yes
John	Herron	Raytech USA	Yes
Philip	Hopkinson	HVOLT Inc.	Yes
John	John	Virginia Transformer Corp.	Yes
Stephen	Jordan	Tennessee Valley Authority	Yes
Akash	Joshi	Black & Veatch	Yes
Anton	Koshel	Delta Star Inc.	
Axel	Kraemer	Maschinenfabrik Reinhausen	
Mark	Lachman	Doble Engineering Co.	Yes
Fernando	Leal	Prolec GE	Yes
Yaquan (Bill)	Li	BC Hydro	
Weijun	Li	Braintree Electric Light Dept.	Yes
Dennis	Marlow	DenMar TDS Transformers	
James	McBride	JMX Services, Inc.	

Matthew	McFadden	Oncor Electric Delivery	
James	Mciver	Siemens Energy	
Vinay	Mehrotra	SPX Transformer Solutions, Inc.	Yes
Thomas	Melle	HIGHVOLT	
David	Murray	Tennessee Valley Authority	Yes
Hossein	Nabi-Bidhendi	ABB Inc.	
Ali	Naderian	Metsco	Yes
George	Partyka	PTI Transformers	Yes
Sanjay	Patel	Royal Smit Transformers	
Monil	Patel	Pacific Gas & Electric Company	
Brian	Penny	American Transmission Co.	
Harry	Pepe	Phenix Technologies, Inc.	Yes
Mark	Perkins	D4EnergySolutions LLC	
Sylvain	Plante	Hydro-Quebec	
Bertrand	Poulin	Hitachi ABB Power Grids	Yes
Ulf	Radbrandt	Hitachi ABB Power Grids	
Ion	Radu	Hitachi ABB Power Grids	Yes
Pierre	Riffon	Pierre Riffon Consultant Inc.	
Leopoldo	Rodriguez	Transformer Testing Services LLC	Yes
Marnie	Roussell	Entergy	Yes
Hakan	Sahin	Virginia and Georgia Transformers	Yes
Daniel	Sauer	EATON Corporation	Yes
Markus	Schiessl	SGB	Yes
Jeffrey	Schneider	Power Partners/Spire Power Solutions	Yes
Christopher	Slattery	FirstEnergy Corp.	Yes
Steven	Snyder	Hitachi ABB Power Grids	Yes
Sanjib	Som	Pennsylvania Transformer	Yes
Mike	Spurlock	Spurlock Engineering Services, LLC	Yes
Kyle	Stechschulte	American Electric Power	Yes
Janusz	Szczechowski	Maschinenfabrik Reinhausen	Yes
Ajith	Varghese	SPX Transformer Solutions, Inc.	Yes
Krishnamurthy	Vijayan	PTI Transformers	Yes
Dharam	Vir	SPX Transformer Solutions, Inc.	Yes
Pragnesh	Vyas	Sunbelt-Solomon Solutions	
Loren	Wagenaar	WagenTrans Consulting	
Michael	Warntjes	American Transmission Co.	
Dr. Alexander	Winter	HIGHVOLT Pruftechnik Dresden	Yes
Baitun	Yang	R.E. Uptegraff	Yes
Anand	Zanwar	Siemens Energy	
Michael	Zarnowski	Carte International	
Kris	Zibert	Allgeier, Martin and Associates	Yes

Appendix A

Minutes for Task Force on PD Testing of Class 1 Power Transformers

Chair: Don Ayers

Vice Chair: Javier Arteaga

Secretary: Israel Barrientos

Meeting Date: Monday 26th April 2021

Time: 10:45

Attendance:

Members: 23

Guests: 75

Total attendance: 98

The meeting was called to order at 10:45 AM and attendance was recorded via a Poll.

Membership requirements were explained.

The Patent and Copyright Slides were presented, no comments were made.

Current TF Membership is 35.

Quorum is 18, or more TF Members.

As the Member attendance reached 23, Quorum was attained.

The Chair then presented the Meeting Agenda, and was shown in the screen Ajith Varghese moved to approve the Agenda as shown. James Cross seconded. After no further discussion, the Agenda was approved as submitted.

The Nov 2020 Meeting Minutes as published were presented.

James Cross moved for them to be approved. Peter Kleine seconded the motion.

After no further discussion, the Meeting Minutes were approved as submitted.

The Chair presented the Scope of the TF, and a list of Subjects to Consider.

After some initial discussion, a motion was made by John Foschia:

“Classify PD Tests for Class I Power Transformers as Other Tests”.

Pougazhenthil Selvaraj seconded.

After a brief discussion and some explanation by Don Ayers and Bertrand Poulin, John Foschia withdrew his motion.

Some additional discussion ensued on the Need for Notes for Bushings or other items.

No motion was made.

Discussion moved to the topic of how to further define the PD acceptance values in C57.12.90-2015, as Don Ayers indicated that the newest C57.12.90-2021 Draft 4, included different (reduced) values to those agreed by TF.

Phil Hopkinson made a motion to:

“Establish a section on C57.12.00 to express the agreed acceptance levels for PD for Class I Power Transformers as those contained in C57.12.90”

As Phil Hopkinson was not a member of the TF at this time, Ajith Varghese made an identical motion and after some discussion, he agreed to a friendly amendment as follows:

“Establish a section on C57.12.00 to express the agreed acceptance levels for PD for Class I Power Transformers as those contained in C57.12.90-2015 (500 pC for Max Acceptable, and 150 pC for Max Increase)”.

Sergio Hernandez seconded the motion.

After some discussion, a call for opposition was made, hearing none, the motion passed.

At 11:59 Peter Kleine moved to adjourn the meeting.
Onome Avanoma seconded.

A request for those against was made, hearing non, the motion carried unanimously.

The meeting was adjourned at 12:00.

Respectfully submitted
Israel Barrientos
TF Secretary.

Role	First Name	Last Name	Company
Guest	Tauhid Haque	Ansari	Hitachi ABB Power Grids
Vice-Chair	Javier	Arteaga	Hitachi ABB Power Grids
Member	Onome	Avanoma	MJ Consulting
Chair	Donald	Ayers	Ayers Transformer Consulting
Guest	Suresh	Babanna	SPX Transformer Solutions, Inc.
Secretary	Israel	Barrientos	Prolec GE
Guest	Allan	Bartek	Spruce Run Engineering LLC
Guest	Wallace	Binder	WBBinder Consultant
Guest	Ryan	Bishop	Minnesota Power
Guest	Piotr	Blaszczyk	Specialty Transformer Components LLC
Guest	Daniel	Blaydon	Baltimore Gas & Electric
Guest	William	Boettger	Boettger Transformer Consulting LLC
Guest	Joshua	Bohrn	PacifiCorp
Guest	Sanket	Bolar	Megger
Guest	Alain	Bolliger	HV TECHNOLOGIES, Inc .
Guest	Jeffrey	Britton	Phenix Technologies, Inc.
Member	David	Calitz	Siemens Energy
Guest	Jaroslav	Chorzepa	ABB Inc .
Member	James	Cross	Kinectrics
Member	Jorge	Cruz	PTI Transformers
Guest	Larry	Dix	Quality Switch, Inc.
Guest	Eric	Doak	D4EnergySolutions LLC
Guest	Evgenii	Ermakov	Hitachi ABB Power Grids
Guest	Marco	Espindola	Hitachi ABB Power Grids
Guest	Feras	Fattal	Manitoba Hydro
Guest	Reto	Fausch	RF Solutions
Guest	Paul Gabriel	Florida	Howard Industries, Inc.
Member	John	Foschia	SPX Transformer Solutions, Inc.
Member	Jose	Gamboa	H-J Family of Companies
Member	Carlos	Gaytan	Protec GE
Member	Zoran	Goncin	PTI Transformers
Guest	Shawn	Gossett	Ameren
Guest	Jeffrey	Gragert	Xcel Energy
Member	Detlev	Gross	Power Diagnostix
Guest	Attila	Gyore	M&I Materials Ltd
Guest	Kyle	Heiden	EATON Corporation
Member	Sergio	Hernandez Cano	Hammond Power Solutions
Guest	John	Herron	Raytech USA
Guest	Steve	Holsomback	Southern Company Services
Guest	Philip	Hopkinson	HVOLT Inc.
Guest	Akash	Joshi	Black & Veatch
Guest	Sheldon	Kennedy	Niagara Transformer
Guest	Gary	King	Howard Industries
Member	Peter	Kleine	US Army Corps of Engineers
Guest	Mark	Lachman	Doble Engineering Co.

Role	First Name	Last Name	Company
Member	David	Larochelle	NDB Technologies
Guest	Fernando	Leal	Prolec GE
Guest	Moonhee	Lee	Hammond Power Solutions
Guest	Aleksandr	Levin	Weidmann Electrical Technology
Guest	Tiffany	Lucas	SPX Transformer Solutions, Inc.
Guest	Dennis	Marlow	DenMar TDS Transformers
Guest	Lee	Matthews	Howard Industries
Member	Matthew	McFadden	Oncor Electric Delivery
Guest	James	Mciver	Siemens Energy
Guest	Thomas	Melle	HIGHVOLT
Guest	Zachary	Millard	Great River Energy
Guest	Martin	Munoz Molina	Orto de Mexico
Member	Ali	Naderian	Metsco
Guest	Kristopher	Neild	Megger
Guest	Rodrigo	Ocon	Industrias IEM
Guest	Rudolf	Ogajanov	ABB Inc.
Member	Parminder	Panesar	Virginia Transformer Corp.
Guest	Harry	Pepe	Phenix Technologies, Inc.
Guest	Mark	Perkins	D4EnergySolutions LLC
Guest	Chris	Pitts	Howard Industries
Guest	Alvaro	Portillo	Ing. Alvaro Portillo
Guest	Bertrand	Poulin	Hitachi ABB Power Grids
Guest	Jeffrey	Ray	JLR Consulting, Inc.
Member	Leopo Ido	Rodriguez	Transformer Testing Services LLC
Guest	Daniel	Sauer	EATON Corporation
Member	Pugal	Selvaraj	Virginia Transformer Corp.
Guest	Adam	Sewell	Quality Switch, Inc.
Guest	Peter	Sheridan	SGB USA, Inc.
Guest	Hemchandra	Shertukde	University of Hartford
Guest	Christopher	Slattery	FirstEnergy Corp.
Guest	Steven	Snyder	Hitachi ABB Power Grids
Guest	Markus	Soeller	Power Diagnostix
Guest	Brian	Sonnenberg	Instrument Transformers, LLC
Guest	Hampton	Steele	TVA
Member	Charles	Sweetser	OMICRON electronics Corp USA
Member	Janusz	Szczechowski	Maschinenfabrik Reinhausen
Guest	Dervis	Tekin	Meramec Instrument Transformer Co.
Guest	Risto	Trifunoski	Trench Limited
Member	Ajith	Varghese	SPX Transformer Solutions, Inc.
Guest	Dharam	Vir	SPX Transformer Solutions, Inc.
Member	Pragnesh	Vyas	Sunb elt -Solomon Solutions
Guest	Loren	Wagenaar	WagenTrans Consulting
Guest	Nicholas	Walder	EATON Corporation
Guest	Hugh	Waldrop	Memphis Light, Gas & Water
Guest	Evanne	Wang	DuPont

Role	First Name	Last Name	Company
Guest	Daniel	Weyer	Nebraska Public Power District
Guest	Dr. Alexander	Winter	HIGHVOLT Pruftechnik Dresden
Guest	Jeffrey	Wright	Duquesne Light Co.
Guest	Baitun	Yang	R.E. Uptegraft
Guest	Mana	Yazdani	Trench Limited
Guest	Joshua	Yun	Virginia Transformer Corporation
Guest	Anand	Zanwar	Siemens Energy
Guest	Michael	Zarnowski	Carte International

S21 Update: TF Revision to Low Frequency Test

Quorum: Achieved MOM: Approved Agenda: Approved

- **TF Class I PD Test**
 - Previously passed motion stating: “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.”
 - **CHANGE:** Members reconsidering using old limits (500 pC limit, 150 pC change) since changes to 12.90 are with lower limits (250/50 pC)
- **Factory PD Limits** – Plan to start Study Group since no significant negative comments to new limits in C57.12.90.
- **PD in Bushings** – Reviewed survey summary, negatives exist with the proposed text allowing “venting” when PD is present.
- **C57.12.90 ballot comment resolution study group.**



Role	First Name	Last Name	Company

B.3.7 Task Force for Impulse Guide – PC57.98

TF Chair: Pierre Riffon

VIRTUAL MEETING | April 27th, 2021 | 10.50 am – 12.05 CET

The TF met on April 27, 2021, from 10:50 am to 12:05 pm (CET). Twenty-one (21) members and twenty-six (26) guests attended the meeting. Eleven (11) guests requested membership but only 4 are eligible having attended to at least two meetings.. The meeting was chaired by Pierre Riffon, Chair of the TF. Mr. Daniel Sauer was the vice-chair.

Meeting has been called to order by the Chair at 10:50 am (CET).

Attendance has been recorded in the AM system.

Required quorum was met, presence of at least 21 members was required. The TF membership roster has been reviewed after the Anaheim (CA) meeting and members who did not attend one of the last three meetings have been moved as guests. Guests who have not attended one of the last five meetings have been removed from the TF roster. Twenty-two (22) guests have been removed from the TF roster.

The meeting agenda and the Anaheim (CA) meeting minutes have been approved unanimously. Motion have been made by J. John and was seconded by Tauhid Ansari.

The first item of business was related to the review of the comments related to impulse testing received on the Sponsor Ballot of PC57.12.00 D1.0 dated January 2021. There were no comments received on impulse testing during this ballot.

The second item of business was related to the review of the comments related to impulse testing received on the Sponsor Ballot of PC57.12.90 D4 dated February 2021. A total of eighteen (18) comments were received, 12 were editorial and 6 technical.

Seven (7) of the comment received have been discussed during the meeting. The other comments are simple editorial comments that could be easily fixed. The main outcomes of the discussion are:

- Comment no.1 related to surge impedance of cables, GIS and GIL: Chair resolution proposal accepted by the TF, a note will be included in Table 3.
- Comment no.2 related to examples of transformers having induced switching impulse level less than 83% of the BIL value on LV terminals has been accepted in principle. This should be part of the impulse guide IEEE C57.98, not part of the standard. Following a motion from B. Poulin and seconded by J. McBride, this comment will be sent to the Chair of the WG in charge of the revision of IEEE C57.98 for inclusion of such examples.

Role	First Name	Last Name	Company

- Comment no.3 related to possible redundant sentence is rejected, both sentences are needed. Chair resolution proposal accepted by the TF.
- Comment no,4 related to the use of the term "peak voltage" instead of "overshoot" has been rejected. Chair resolution proposal accepted by the TF.
- Comment no.5 related to shorten a sentence of line 25 of clause 10.3.1.3 has been rejected. This sentence cannot be shortened. Chair resolution proposal accepted by the TF.
- Comment no.6 related to the measurement of the voltage collapsed during chopped-wave tests has been accepted in principle. This comment will be sent to the WG Chair responsible to the revision of IEEE C57.98 for inclusion of a proper explanation.
- Comment no. 7 related to a change of a sentence in clause 10.3.2.1 been rejected because actual sentence is needed. Chair resolution proposal accepted by the TF.

There were no old businesses.

On new business, D, Sauer highlighted an inconsistency between design and routine lightning impulse tests for distribution transformers rated 15 kV and less having series connected windings. D. Sauer will prepare a proposal for discussion at the next meeting.

The meeting adjourned at 11:30 am on April 27, 2020.

The next meeting is planned to be held in Milwaukee, Wisconsin on October 19, 2021.

Pierre Riffon P. Eng.
April 27, 2021

TF : Revision of Impulse Tests..

Quorum: Achieved MOM: Approved Agenda: Approved

Highlights:

- The first item of business was related to the review of the comments related to impulse testing received on the Sponsor Ballot of PC57.12.00 D1.0 dated January 2021. There were no comments received on impulse testing during this ballot.



Role	First Name	Last Name	Company

TF : Revision of Impulse Tests (Cont'd)

Highlights:

- The second item of business was related to the review of the comments related to impulse testing received on the Sponsor Ballot of PC57.12.90 D4 dated February 2021. A total of eighteen (18) comments were received, 12 were editorial and 6 technical.
- Seven (7) of the comment received have been discussed during the meeting. Resolutions for these 7 comments have been achieved.



TF : Revision of Impulse Tests (Cont'd)

Highlights:

- On new business, D. Sauer highlighted an inconsistency between design and routine lightning impulse tests for distribution transformers rated 15 kV and less having series connected windings. D. Sauer will prepare a proposal for discussion at the next meeting.
- The meeting adjourned at 11:30 am on April 27, 2020.



Attendee list

First Name	Last Name	Company
Raj	Ahuja	Raj Ahuja Consulting
Tauhid Haque	Ansari	Hitachi ABB Power Grids
Onome	Avanoma	MJ Consulting
Christopher	Baumgartner	We Energies
William	Boettger	Boettger Transformer Consulting LLC
Alain	Bolliger	HV TECHNOLOGIES, Inc.
Jeffrey	Britton	Phenix Technologies, Inc.
Steven	Brzoznowski	Bonneville Power Administration
Erich	Buchgeher	Siemens Energy
David	Calitz	Siemens Energy
Juan	Carrizales	Prolec GE
David	Caverly	Trench Limited
Jaroslav	Chorzepa	ABB Inc.
Eric	Davis	Burns & McDonnell
Everton	De Oliveira	Siemens Ltda
Scott	Dennis	Hitachi ABB Power Grids
Don	Dorris	Nashville Electric Service
Daniela	Ember Baciu	Hydro-Quebec - Laboratoire Haute Tension
Reto	Fausch	RF Solutions

Role	First Name	Last Name	Company
	Michael	Franchek	Retired
	Eduardo	Garcia Wild	Siemens Energy
	Shawn	Gossett	Ameren
	Jeffrey	Gragert	Xcel Energy
	Sergio	Hernandez Cano	Hammond Power Solutions
	John	John	Virginia Transformer Corp.
	Stephen	Jordan	Tennessee Valley Authority
	Akash	Joshi	Black & Veatch
	Gael	Kennedy	GR Kennedy & Associates LLC
	Peter	Kleine	US Army Corps of Engineers
	Dmitriy	Klempner	Southern California Edison
	Mark	Lachman	Doble Engineering Co.
	Fernando	Leal	Prolec GE
	Yaquan (Bill)	Li	BC Hydro
	Tim-Felix	Mai	Siemens Energy
	James	McBride	JMX Services, Inc.
	David	Murray	Tennessee Valley Authority
	Dwight	Parkinson	EATON Corporation
	Harry	Pepe	Phenix Technologies, Inc.
	Sylvain	Plante	Hydro-Quebec
	Bertrand	Poulin	Hitachi ABB Power Grids
	Chris	Powell	Intermountain Electronics
	Jarrold	Prince	ERMCO
	Pierre	Riffon	Pierre Riffon Consultant Inc.
	Leopoldo	Rodriguez	Transformer Testing Services LLC
	Hakan	Sahin	Virginia and Georgia Transformers
	Amitabh	Sarkar	Virginia Transformer Corp.
	Daniel	Sauer	EATON Corporation
	Jeffrey	Schneider	Power Partners/Spire Power Solutions
	Pugal	Selvaraj	Virginia Transformer Corp.
	Michael	Sharp	Trench Limited
	Christopher	Slattery	FirstEnergy Corp.
	Mike	Spurlock	Spurlock Engineering Services, LLC
	Kyle	Stechschulte	American Electric Power
	Ajith	Varghese	SPX Transformer Solutions, Inc.
	Jason	Varnell	Doble Engineering Co.
	Krishnamurthy	Vijayan	PTI Transformers
	Loren	Wagenaar	WagenTrans Consulting
	Hugh	Waldrop	Memphis Light, Gas & Water
	David	Walker	MGM Transformer Company
	Dr. Alexander	Winter	HIGHVOLT Pruftechnik Dresden
	Shibao	Zhang	PCORE Electric
	Kris	Zibert	Allgeier, Martin and Associates

Role	First Name	Last Name	Company

B.3.8 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 4.27.2021: 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 26+1 (one member accidentally selected guest option) members present out of 41. Based on the attendance, quorum was established.
4. Agenda was approved Unanimously. (Motion: Mickel Saad, Second: Dan Sauer)
5. Minutes of Fall 2020 meetings were approved Unanimously. (Motion Daniel Sauer, Second: Dave Wallach)
6. Chairman explained the work carried out by the TF members since last meeting in F20.
 - a. IEEE SA revised the population of the usable data
 - b. Important categorization was made based on transformer Class I and II.
 - c. Testing temperature was analyzed, information separated in groups ever 5 C.
 - d. With the revision carried out the total usable data reached ~ 143k samples.
 - e. Approximately 5000 samples were not possible to classify due to lack of clear information.
 - f. Additional Statistical para meter were incorporated to the plots provided: max, min, average, std. deviation, 90th percentile and median.
7. TF members met during the last two months to prepare a final report for the Dielectric Tests SC.
8. The text in the report was presented to all members and guests.
 - a. Important highlights:
 - i. Update latest revisions of technical references
 - ii. Accuracy of instrumentation
 - iii. Section includes factors affecting Power factor values during factory and/or field measurements.
9. The construction of the transformer was also discussed and the impact of processing of insulation and construction.
 - a. Dan Sauer mentioned that a transformer with properly processed insulation can achieve a PF of about 0.5%.
 - b. It was also mentioned that type of insulation especially on LV winding close to core may also impact the results.
10. Chairman also presented data of PF and impact on it with reference to different temperature and for different classes of transformers.
11. There was a comment made by Evgenii Ermakov about PI/IR and readings after 10 min and test procedure. Chairman mentioned that it is an important aspect however it is not in scope of the TF. Nevertheless, recommendations can be always addressed.
12. After looking at the information and the documentation in the report, Chairman presented the recommendations to be made to the Dielectric Subcommittee:

Role	First Name	Last Name	Company

- a. Line-frequency PF limits are better presented as a range. Members agreed with the approach. Members also mentioned that it can be recommended to use this data to harmonize the information in:
 - i. C57.152. – Field test guide
 - ii. C57.12.90 – Test Code
 - iii. C57.168 – WG LF Test Guide.
13. It was requested to have a motion to send the recommendations regarding Power Factor Limits to the Dielectric subcommittee and was unanimously approved. (Motion: Poorvi, Second: Mario)
14. Chairman indicated that IEEE SA is making a final revision of the data related to IR. Suggested complete this task before making a final statement for IR to the Dielectric Test SC.
15. Chairman thanked all those who contributed and made a special mention of IEEE SA representative Mr. Ernesto Vega for helping in data management and analysis.
16. Meeting adjourned at 9.15 am.

Annex A: attendance from PSAV report

Total attendance was 85 (76 at the time of Quorum Poll)

Annex B:

Quorum established. As reported by PSAV at the beginning of the meeting, out of 41 members there were 27 members (1 member accidentally selecting a guest option)

- A. Member 26/76 (34%)
- B. Guest 38/76 (50%)
- C. Requesting Membership 9/76 (12%)
- D. No Answer 3/76 (4%)

Annex C: Relevant chat recorded during the meeting:

April 27, 2021 8:08 AM from David Wallach to everyone: David Wallach - Duke Energy April 27, 2021 8:08 AM from Dinu A to everyone: Dinu Amarasinghe - Bruce Power April 27, 2021 8:08 AM from Israel Barrientos to everyone: Israel Barrientos - ProlecGE April 27, 2021 8:08 AM from Eric Doak to everyone: Eric Doak - D4EnergySolutions April 27, 2021 8:08 AM from David Calitz Guest to everyone: David Calitz - Siemens Energy April 27, 2021 8:09 AM from John K John to everyone: John K John, Virginia Transformer Corp. April 27, 2021 8:10 AM from Mickel Saad to everyone: Mickel Saad - HAPG April 27, 2021 8:10 AM from Roger Hayes to everyone: Roger Hayes, GE Grid Solutions April 27, 2021 8:11 AM from Evgenii Ermakov to everyone: Evgenii Ermakov, Hitachi ABB Power Grids April 27, 2021 8:11 AM from Aniruddha Narawane to everyone: Sanket..Noted April 27, 2021 8:11 AM from Cihangir Sen to everyone: Cihangir J. Sen - Duke Energy April 27, 2021 8:11 AM from Aleksandr Levin to everyone: Aleksandr Levin - Weidmann Electrical Technology April 27, 2021 8:12 AM from Parminder to everyone: Parminder Panesar, Virginia Transformer Corp. April 27, 2021 8:12 AM from Rodrigo Ocon to everyone: Rodrigo Ocon, IEM-Condumex April 27, 2021 8:14 AM from Marco Espindola to everyone: Marco Espindola - HAPG April 27, 2021 8:16 AM from Alan Sbravati to everyone: Alan Sbravati (guest) - Cargill April 27, 2021 8:37 AM from Don Dorris to everyone: They are both core & shell. April 27, 2021 8:55 AM to Diego Robalino (privately): 20 minutes left in this session April 27, 2021 9:00 AM from ISMAIL GUNER to everyone: Is the trend analysis in any of the scope of any C57 dielectric testing guides? April 27, 2021 9:00 AM from Thomas Hartmann to everyone: Thomas Hartmann - Exelon April 27, 2021 9:10 AM to Diego Robalino (privately): 5 minutes left

Role	First Name	Last Name	Company

The Chair suggested to circulate the documents to the DTSC members and guests and chairs for C57.152. – Field test guide, C57.12.90 – Test Code, C57.168 – WG LF Test Guide and take the discussion in the fall meeting were the information should reside.

TF Winding Insulation PF/Resistance Limits

Minutes of the meeting

Virtual Meeting
April 27, 2021
TF Chair: Diego Robalino (MEGGER)
TF Secretary: Aniruddha Narawane (EATON)



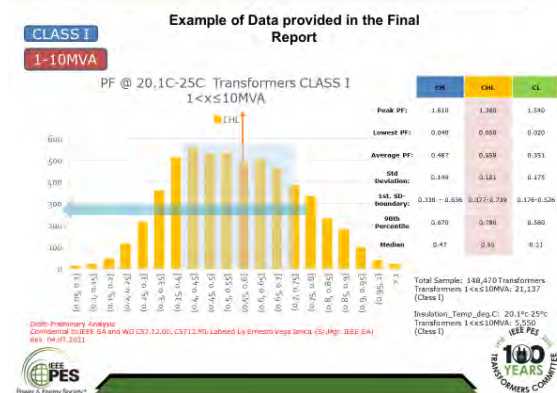
- Meeting was called to order at 8.00 am by Chairman Diego Robalino
 - Quorum established = 27 members out of 41 listed
 - Number of attendees = 85
- Agenda for F21 and Minutes from S20 were approved unanimously.
- Chairman explained the work carried out by the TF members since last meeting in F20.
 - IEEE SA revised the population of the usable data
 - With the revision carried out the total usable data reached ~ 143k samples out of ~148k.
 - Additional Statistical parameters were incorporated to the plots including: max, min, average, std. deviation, 90th percentile and median.
- Motion made to present the PF results to the SC and corresponding recommendations. Motion was approved unanimously.



Temperature effect (average value of PF @ 60 Hz)



Role First Name Last Name Company



- **Recommendations regarding Insulation PF limits from this TF:**
 - Line-frequency PF limits are better presented as a range. Members agreed with the approach.
 - Take advantage of the data acquired and make additional analysis related to influence of temperature.
 - Members also mentioned that it can be recommended to use this data to harmonize the information about ranges and factors influencing PF measured values in:
 - C57.152 – Field test guide
 - C57.12.90 – Test Code
 - C57.168 – WG LF Test Guide.
 - Instrument accuracy to be updated in C57.12.90 and C57.15
 - IEEE C57.12.90-2015 Section 10.10.2.
 - IEC 60076-21 / IEEE C57.15-2018 Section 9.7.6.4
 - Original Text: The insulation power factor may be measured by special bridge circuits or by the voltampere-watt method. The accuracy of measurement should be within **±0.25% insulation power factor**, and the measurement should be made at or near a frequency of 60 Hz.
 - Suggested for the document:
 - Below 1% PF: ±2% of reading ± 0.05% absolute
 - Above 1% PF: ±5% of reading ± 0.05% absolute
- **Recommendations regarding Insulation Resistance limits from this TF:**
 - Final recommendations will be provided as data in under additional evaluation with IEEE SA.
 - The final revision of the report will be submitted to SC Chair for distribution and further comments from members of the Dielectric Tests SC.
 - Suggested to publish a summary of this work for industry benefit (IEEE SA / PES publication)



Next Steps

- TF Report will be forwarded to DTSC Members and Guest, Chair of C57.152.– Field test guide and C57.168 – WG LF Test Guide.
- Chair will work with TF chair to separate out activities that needed to be addressed by DTSC and respective WGs.
- Chair plan to come up with recommendation for next step during Fall 2021 meeting



Role First Name Last Name Company

Role	First Name	Last Name	Company
Chair	Diego	Robalino	Megger
Guest	Joe	Nims	Allen & Hoshall, Inc.
Guest	Lee	Matthews	Howard Industries
Guest	Michael	Franchek	Retired
Guest	Ewald	Schweiger	Siemens Energy
Guest	Kumar	Mani	Duke Energy
Guest	James	Cross	Kinectrics
Guest	Rogelio	Martinez	Georgia Transformer
Guest	Jean-Noel	Berube	Rugged Monitoring Inc.
Guest	Thomas	Spitzer	City Transformer Service Co.
Guest	Clemens	Reiss IV	Custom Materials, Inc.
Guest	Neil	Strongosky	Memphis Light, Gas & Water
Guest	Donald	Lamontagne	Arizona Public Service Co.
Guest	Rodrigo	Ocon	Industrias IEM
Guest	Marco	Espindola	Hitachi ABB Power Grids
Guest	Anthony	Natale	HICO America
Guest	Huan	Dinh	Hitachi ABB Power Grids
Guest	Ali	Naderian	Metsco
Guest	Marc	Foata	Maschinenfabrik Reinhausen
Guest	Parminder	Panesar	Virginia Transformer Corp.
Guest	Egon	Kirchenmayer	Siemens Energy
Guest	Stephanie	Denzer	Alliant Energy
Guest	Anil	Sawant	Virginia Transformer Corp.
Guest	Christopher	Steineman	Delta Star Inc.
Guest	Erich	Buchgeher	Siemens Energy
Guest	Kevin	Biggie	Weidmann Electrical Technology
Guest	Thomas	Hartmann	Pepco Holdings Inc.
Guest	Ismail	Guner	Hydro-Quebec
Guest	Jeffrey	Gragert	Xcel Energy
Guest	Piotr	Blaszczyk	Specialty Transformer Components LLC
Guest	Anand	Zanwar	Siemens Energy
Guest	Nigel	Macdonald	Trench Limited
Guest	Attila	Gyore	M&I Materials Ltd
Guest	Jinesh	Malde	M&I Materials Inc.
Guest	Alan	Sbravati	Cargill, Inc.
Guest	Martin	Munoz Molina	Orto de Mexico
Guest	Ryan	Bishop	Minnesota Power
Guest	Brady	Nesvold	Xcel Energy
Guest	Israel	Barrientos	Prolec GE
Guest	Drew	Welton	Intellirent

Role	First Name	Last Name	Company
Guest	Shiva	Rampersad	Dow Chemical Company
Guest	Brad	Staley	Salt River Project
Guest	Muhammad Ali Masood	Cheema	Northern Transformer
Guest	Kyle	Heiden	EATON Corporation
Guest	Suleman	Khan	Ontario Power Generation
Guest	Hugh	Waldrop	Memphis Light, Gas & Water
Guest	Samraghi	Dutta Roy	Siemens Energy
Guest	Eric	Doak	D4EnergySolutions LLC
Guest	Jonathan	Sinclair	PPL Electric Utilities
Guest	Tim	Rocque	SPX Transformer Solutions, Inc.
Guest	William	Knapek	OMICRONelectronics Corp USA
Guest	Onome	Avanoma	MJ Consulting
Guest	Kayland	Adams	SPX Transformer Solutions, Inc.
Guest	Zachary	Millard	Great River Energy
Guest	Evgenii	Ermakov	Hitachi ABB Power Grids
Guest	Brandon	Dent	Memphis Light, Gas & Water
Guest	Brandon	Dent	Memphis Light, Gas & Water
Guest	Derek	Holrah	Burns & McDonnell
Guest	Balakrishnan	Mani	Virginia Transformer Corp.
Guest	Nicholas	Walder	EATON Corporation
Guest	Mauricio	Soto	Hitachi ABB Power Grids
Guest	Dinu	Amarasinghe	Bruce Power
Guest	Taylor	Gray	Portland General Electric (PGE)
Guest	Rakesh	Patel	Hitachi-Powergrid
Guest	Thomas	Eagle	SPX Transformer Solutions
Guest	ANDY	DOWNEY	SPX TRANSFORMER SOLUTIONS
Guest	George	Jalhoum	PPI
Member	William	Boettger	Boettger Transformer Consulting LLC
Member	Charles	Sweetser	OMICRONelectronics Corp USA
Member	Don	Dorris	Nashville Electric Service
Member	David	Wallach	Duke Energy
Member	Roger	Hayes	General Electric
Member	Peter	Werelius	Megger
Member	Zan	Kiparizoski	Howard Industries
Member	Poorvi	Patel	Electric Power Research Institute (EPRI)
Member	David	Sheehan	HICO America
Member	Daniel	Sauer	EATON Corporation
Member	Aleksandr	Levin	Weidmann Electrical Technology
Member	Ajith	Varghese	SPX Transformer Solutions, Inc.
Member	Mario	Locarno	Doble Engineering Co.
Member	Krishnamurthy	Vijayan	PTI Transformers
Member	David	Murray	Tennessee Valley Authority

Role	First Name	Last Name	Company
Member	Fernando	Leal	Prolec GE
Member	John	John	Virginia Transformer Corp.
Member	Kristopher	Neild	Megger
Member	Lorne	Gara	Shermco
Member	Rhea	Montpool	Schneider Electric
Member	Sanket	Bolar	Megger
Member	Mickel	Saad	Hitachi ABB Power Grids
Member	Cihangir	Sen	Duke Energy
Member	Jaber	Shalabi	VanTran Industries, Inc.
Member	David	Calitz	Siemens Energy
Secretary	Aniruddha	Narawane	Power Distribution, Inc. (PDI)

Role	First Name	Last Name	Company

B.3.9 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 4.27.2021: Virtual Meeting via WebEx 2.20-3.35 PM Central Time

Meeting called to order at 2:20 PM Central Time.

Welcome and Chair's Remarks

2) Attendance Poll was taken at 2:25 PM. 102 Attendees were present (66 Guests)? 36 of 54 Members present (quorum was achieved)

3) IEEE Patent Policy and Copyright slides (no essential patent claims or copyright issues)

4) 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 (<https://ieeexplore.ieee.org/document/9161400>).

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

6) Switchgear Liaison Task Force Update – Dave Caverly

The WG continues to receive excellent comments from Switchgear experts via the Switchgear Liaison TF. The present Draft 9B was created to address all prior comments. The Switchgear task force met on April 21, 2021 and reviewed changes made in D9B. All prior comments were resolved to the satisfaction of the SG task force. There was a motion by the SG TF to take the current document to Ballot. The TF had a quorum and the motion passed by consensus with no objections or abstentions (The comments and conclusions were presented to the WG in this meeting and will be posted on the WG website).

7) Status of Draft 9B and comments – Jim McBride

A copy of the present draft of the guide (D9B) was provided to all WG members prior to the meeting and is posted on the WG webpage of the Transformers Committee (PCS) website. In summary, the old guide focused on primarily MV systems. The new guide adds HV systems as well as additional related examples and mitigations. The excitation mechanisms are now based on steep front voltages and/or repetitive “pulse train” excitations which may “line up” and coincide with transformer internal resonance frequencies.

The revision to the Guide is complete and the draft is ready to proceed to ballot. The Chair noted the WG has filed for a PAR extension as a precaution (since all work must be completed by the end of 2021).

Role	First Name	Last Name	Company

A motion was made by Phil Hopkinson / 2nd by Rogerio Verdolin to take the present Draft 9B to ballot. The motion was approved by online ballot with 36 members approving (0 disapproving / 0 abstentions).

8) Mitigation methods task force update and presentation – Phil Hopkinson

The presentation is posted on the WG webpage. Following the presentation there was discussion on several topics, including the DEIS feature article from September 2016 IEEE Electrical Insulation Magazine 32(5):32-40 “Impulse voltage distribution and frequency response of inter-shield windings”. There was also a lengthy discussion of the guidance requested from the Switchgear committee for fast/very fast reignition transients from the Transformers Committee.

9) New Business: the WG authorized the formation of the Ballot Resolution Group without objection.

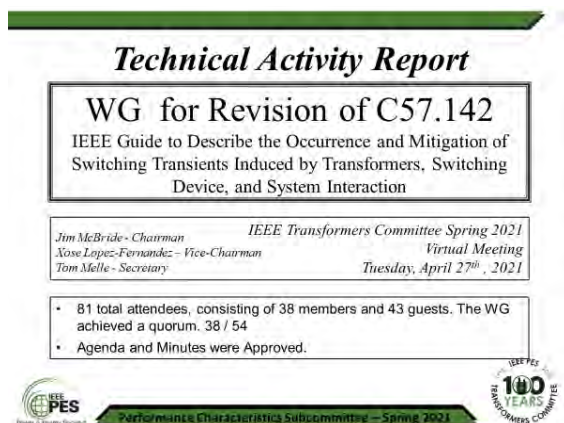
10) Next Meeting: (Fall 2021 – Milwaukee, WI the week of October 17-21)

11) Motion to Adjourn made by Phil Hopkinson / 2nd by Tom Melle. Meeting was adjourned at 3:37 PM without objection.

Respectfully,

Thomas R. Melle

Secretary



Technical Activity Report

WG for Revision of C57.142

IEEE Guide to Describe the Occurrence and Mitigation of Switching Transients Induced by Transformers, Switching Device, and System Interaction

Jim McBride - Chairman
Xose Lopez-Fernandez - Vice-Chairman
Tom Melle - Secretary

IEEE Transformers Committee Spring 2021
Virtual Meeting
Tuesday, April 27th, 2021

- 81 total attendees, consisting of 38 members and 43 guests. The WG achieved a quorum, 38 / 54
- Agenda and Minutes were Approved.

IEEE PES
Power & Energy Society

Performance Characteristics Subcommittee – Spring 2021

IEEE 100 YEARS
TRANSFORMERS COMMITTEE

Role First Name Last Name Company

- IEEE Transactions Paper developed by those in the C57.142 WG has been published and is now available at <https://ieeexplore.ieee.org/document/9161400>.
- Switchgear Committee Task Force met on April 21, 2021. The group had a quorum and has review changes made in Draft 9B of C57.142. All comments to the drafts have been addressed and resolved. Those present at this meeting voted unanimously that Draft 9B is ready to ballot.
- Draft 9B was posted on the Transformers Committee website last week. This draft contains all changes to the C57.142-2010 highlighted in blue. The working group voted unanimously to take to ballot Draft 9B. (36/0/0) The WG authorized of the formation of a ballot resolution group.
- Phil Hopkinson gave a presentation on interwinding shields and interaction mitigation methods. Some very good discussion followed after the presentation. This presentation is posted on the Transformers Committee website.
- A paper on Interwinding Shielding influence to FRA resonance point was present by the chair, "Impulse Voltage Distribution and Frequency Response of Interwinding Windings" Author: Bagheri Phung, Naseri
- Next Meeting: Fall 2021 – Milwaukee, WI the week of October 19.
- The meeting was Adjourned at 3:35pm Central Time.



Role	First Name	Last Name	Company
Chair	James	McBride	JMX Services, Inc.
Vice-Chair	Xose	Lopez-Fernandez	Universidade de Vigo
Secretary	Thomas	Melle	HIGHVOLT
Member	Israel	Barrientos	Prolec GE
Member	Enrique	Betancourt	Prolec GE
Member	William	Boettger	Boettger Transformer Consulting LLC
Member	Jeffrey	Britton	Phenix Technologies, Inc.
Member	David	Caverly	Trench Limited
Member	Huan	Dinh	Hitachi ABB Power Grids
Member	Eduardo	Garcia Wild	Siemens Energy
Member	Kyle	Heiden	EATON Corporation
Member	Sergio	Hernandez Cano	Hammond Power Solutions
Member	Philip	Hopkinson	HVOLT Inc.
Member	John	John	Virginia Transformer Corp.
Member	Akash	Joshi	Black & Veatch
Member	Egon	Kirchenmayer	Siemens Energy
Member	Moonhee	Lee	Hammond Power Solutions
Member	Colby	Lovins	Federal Pacific Transformer
Member	Nigel	Macdonald	Trench Limited
Member	Ross	McTaggart	Trench Limited
Member	Vinay	Mehrotra	SPX Transformer Solutions, Inc.
Member	Harry	Pepe	Phenix Technologies, Inc.
Member	Klaus	Pointner	Trench Austria GmbH
Member	Bertrand	Poulin	Hitachi ABB Power Grids
Member	Afshin	Rezaei-Zare	York University
Member	Pierre	Riffon	Pierre Riffon Consultant Inc.
Member	Marnie	Roussell	Entergy
Member	Amitabh	Sarkar	Virginia Transformer Corp.
Member	Cihangir	Sen	Duke Energy
Member	Michael	Sharp	Trench Limited
Member	Hemchandra	Shertukde	University of Hartford
Member	Thomas	Sizemore	ABB Inc.
Member	Steven	Snyder	Hitachi ABB Power Grids
Member	Mike	Spurlock	Spurlock Engineering Services, LLC
Member	Shankar	Subramany	KEMA Labs
Member	Vijay	Tendulkar	Power Distribution, Inc. (PDI)
Member	Kiran	Vedante	Ritz Instrument Transformers
Member	Rogério	Verdolin	Verdolin Solutions Inc.
Member	Dharam	Vir	SPX Transformer Solutions, Inc.
Member	Sukhdev	Walia	New Energy Power Co.
Member	Baitun	Yang	R.E. Uptegraff

Role First Name Last Name Company

Member	Waldemar	Ziomek	PTI Transformers
Guest	Tauhid Haque	Ansari	Hitachi ABB Power Grids
Guest	Suresh	Babanna	SPX Transformer Solutions, Inc.
Guest	Christopher	Baumgartner	We Energies
Guest	Jeff	Benach	Consultant
Guest	Steven	Brzoznowski	Bonneville Power Administration
Guest	Muhammad Ali Masood	Cheema	Northern Transformer
Guest	Michael	Craven	Phoenix Engineering Services
Guest	James	Cross	Kinectrics
Guest	John	Crouse	Roswell Alliance
Guest	Don	Dorris	Nashville Electric Service
Guest	Feras	Fattal	Manitoba Hydro
Guest	Reto	Fausch	RF Solutions
Guest	Raymond	Frazier	Ameren
Guest	John	Harley	FirstPower Group LLC
Guest	Charles	Johnson	Hitachi ABB Power Grids
Guest	Stephen	Jordan	Tennessee Valley Authority
Guest	Laszlo	Kadar	Hatch
Guest	Axel	Kraemer	Maschinenfabrik Reinhausen
Guest	Tim-Felix	Mai	Siemens Energy
Guest	Susan	McNelly	Xcel Energy
Guest	Randolph	Mullikin	ABB Inc.
Guest	Hossein	Nabi-Bidhendi	ABB Inc.
Guest	Anthony	Natale	HICO America
Guest	Sylvain	Plante	Hydro-Quebec
Guest	Christoph	Ploetner	Hitachi ABB Power Grids
Guest	Tejasvi	Prakash	Schweitzer Engineering Labs
Guest	Samuel	Reed	EATON Corporation
Guest	Leopoldo	Rodriguez	Transformer Testing Services LLC
Guest	Andre	Rottenbacher	Ritz Instrument Transformers
Guest	Daniel	Sauer	EATON Corporation
Guest	Brian	Sonnenberg	Instrument Transformers, LLC
Guest	Joseph	Tedesco	Hitachi ABB Power Grids
Guest	Ajith	Varghese	SPX Transformer Solutions, Inc.
Guest	Jason	Varnell	Doble Engineering Co.
Guest	Jos	Veens	SMIT Transformatoren B.V.
Guest	Kannan	Veeran	Georgia Transformer
Guest	Loren	Wagenaar	WagenTrans Consulting
Guest	Alan	Washburn	Burns & McDonnell
Guest	Malia	Zaman	IEEE

Role	First Name	Last Name	Company

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 10th of January 2021.

- ❖ The HVTT Subcommittee and its active working groups met virtually during the week of 10th of January, 2021

Active Projects Include

- ❖ IEEE P1122 – Impulse Digitizer Standard. PAR extended to end of 2022. Will seek WG approval to go to ballot with Draft 6.1. Expected to go to ballot mid 2021. – Chair: Jeff Britton, Phenix Technologies, Inc.
- ❖ IEEE P510 – High Voltage Safety Guide. PAR extended to end of 2022. Draft development complete with Draft 4. Currently in editing by editorial TF. Expected to go to ballot before the end of 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 comment resolution at Subcommittee level. Expected to go to ballot in 2021. PAR will need extended. – Chair: Shijin Xie, State Grid Corporation China.
- ❖ WG P454 – “Guide for the Detection, Measurement and Interpretation of Partial Discharges”. Draft in development. PAR expires end of 2023. – Chair: Glenn Behrmann, Hitachi ABB Power Grids.
- ❖ WG P4.1 – “Guide for the Practical Implementation of IEEE Std 4 on High-Voltage and High-Current Measurement Systems”. Draft in development. Chair: Bill Larzelere, Evergreen High Voltage.
- ❖ IEEE Std. 4 Revision PAR to be opened before end of 2021 – Target Date for Completion: End of 2023
- ❖ Next HVTT Meetings
- ❖ Planned for Fall of 2021 – Exact meetings dates, format and location (if an in-person meeting is held) to be announced by end of May.
- ❖ 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=ieee-psim>

Role	First Name	Last Name	Company

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.

- C57.138 Recommended guide for Impulse Testing (Distribution transformers) – Standard valid 2026
 - Is there an opportunity to adapt/incorporate requirement into C57.98- Impulse guide for power transformers ? General feedback was to keep distribution Xmer guide separate from Power

The test procedures and current monitoring methods included in this document were developed by manufacturers of small pole mount, and pad mount transformers that required a simple, and fast routine impulse test (not a design test), that could easily be incorporated into the "conveyor belt" production line test routines used to process these units.

A motion was made to set-up a TF and initiate a PAR: 1st motion was Jim McBride and 2nd was Dan Sauer. The motion was unanimously approved. A new chair is to be decided.

B.6 New Business

A question of new business from Ronnie Minhaas was mentioned -should standard adopt a limit for Insulation resistance between core and Frame? Should this value be 1000 megaohm minimum during final factory acceptance test.

There was some discussion on this topic however due to short of time this item was parked to be further discussed in the Fall DTSC in Milwaukie.

B.7 Adjournment

Meeting adjourned 12.20 PM.

Minutes respectfully submitted by:

Poorvi Patel

Secretary DTSC.

Role	First Name	Last Name	Company

Attendee List- April 28th 2021- INCLUDING NEW MEMBERS

Role	First Name	Last Name	Company
Guest	Mubarak	Abbas	Siemens Industry
Guest	Kayland	Adams	SPX Transformer Solutions, Inc.
Member	Raj	Ahuja	Raj Ahuja Consulting
Member	Gregory	Anderson	GW Anderson & Associates, Inc.
Member	Tauhid Haque	Ansari	Hitachi ABB Power Grids
Member	Elise	Arnold	SGB
Member	Javier	Arteaga	Hitachi ABB Power Grids
Member	Onome	Avanoma	MJ Consulting
Guest	Hugo	Avila	Hitachi ABB Power Grids
Member	Donald	Ayers	Ayers Transformer Consulting
Guest	Gilles	Bargone	FISO Technologies Inc.
Guest	Israel	Barrientos	Prolec GE
Guest	Jared	Bates	Oncor Electric Delivery
Member	Christopher	Baumgartner	We Energies
Guest	Barry	Beaster	H-J Family of Companies
Guest	Myron	Bell	Delta Star Inc.
Guest	Ramon	Benedict	SPX Transformer Solutions, Inc.
Guest	Olle	Benzler	Megger
Guest	Mats	Bernesjo	Hitachi ABB Power Grids
Guest	Jean-Noel	Berube	Rugged Monitoring Inc.
Member	Enrique	Betancourt	Prolec GE
Member	Daniel	Blaydon	Baltimore Gas & Electric
Member	William	Boettger	Boettger Transformer Consulting LLC
Guest	Joshua	Bohm	PacifiCorp
Guest	Sanket	Bolar	Megger
Guest	Alain	Bolliger	HV TECHNOLOGIES, Inc.
Member	Dominique	Bolliger, Ph.D.	HV TECHNOLOGIES, Inc.
Guest	Jeremiah	Bradshaw	Bureau of Reclamation
Member	Jeffrey	Britton	Phenix Technologies, Inc.
Guest	Darren	Brown	Howard Industries
Guest	Steven	Brzozowski	Bonneville Power Administration
Member	David	Calitz	Siemens Energy
Guest	Edward	Casserly	Ergon, Inc.
Member	Juan	Castellanos	Prolec GE
Guest	Jaroslav	Chorzepa	ABB Inc.
Guest	Rhett	Chrysler	ERMCO
Member	Craig	Colopy	EATON Corporation
Guest	Michael	Craven	Phoenix Engineering Services
Member	Jorge	Cruz	PTI Transformers
Guest	Juan Carlos	Cruz Valdes	Prolec GE
Member	Eric	Davis	Burns & McDonnell
Member	Everton	De Oliveira	Siemens Ltda

Role	First Name	Last Name	Company
Member	J. Arturo	Del Rio	Siemens Energy
Member	Scott	Dennis	Hitachi ABB PowerGrids
Guest	Stephanie	Denzer	Alliant Energy
Guest	Scott	Digby	Duke Energy
Guest	Nikolaus	Dillon	Dominion Energy
Member	Huan	Dinh	Hitachi ABB PowerGrids
Member	Eric	Doak	D4EnergySolutions LLC
Guest	Jeffrey	Door	H-J Family of Companies
Member	Don	Dorris	Nashville Electric Service
Guest	ANDY	DOWNEY	SPX TRANSFORMER SOLUTIONS
Member	Samraghi	Dutta Roy	Siemens Energy
Guest	Thomas	Eagle	SPX Transformer Solutions
Guest	Megan	Eckroth	EATON Corporation
Guest	Daniela	Ember Baci	Hydro-Quebec - Laboratoire Haute Tension
Member	Evgenii	Ermakov	Hitachi ABB PowerGrids
Guest	Marco	Espindola	Hitachi ABB PowerGrids
Member	Feras	Fattal	Manitoba Hydro
Member	Reto	Fausch	RF Solutions
Member	Hugo	Flores	Hitachi ABB PowerGrids
Guest	Paul Gabriel	Florida	Howard Industries, Inc.
Member	Joseph	Foldi	Foldi & Associates, Inc.
Member	Bruce	Forsyth	Bruce Forsyth and Associates LLC
Member	John	Foschia	SPX Transformer Solutions, Inc.
Member	Michael	Franchek	Retired
Member	Anthony	Franchitti	PECO Energy Company
Guest	Raymond	Frazier	Ameren
Member	George	Frimpong	Hitachi ABB PowerGrids
Guest	Jose	Gamboa	H-J Family of Companies
Member	Eduardo	Garcia Wild	Siemens Energy
Guest	James	Gardner	SPX Transformer Solutions, Inc.
Member	David	Geibel	Hitachi ABB PowerGrids
Member	Rob	Ghosh	General Electric
Guest	Orlando	Giraldo	H-J Family of Companies
Member	Shawn	Gossett	Ameren
Guest	Jeffrey	Gragert	Xcel Energy
Member	James	Graham	Weidmann Electrical Technology
Guest	Taylor	Gray	Portland General Electric (PGE)
Member	Bill	Griesacker	Duquesne Light Co.
Member	Detlev	Gross	Power Diagnostix
Guest	Attila	Gyore	M&I Materials Ltd
Guest	Kendrick	Hamilton	Power Partners, Inc.
Member	John	Harley	FirstPower Group LLC
Guest	Thomas	Hartmann	Pepco Holdings Inc.
Member	Roger	Hayes	General Electric

Role	First Name	Last Name	Company
Member	Kyle	Heiden	EATON Corporation
Guest	Giovanni	Hernandez	Virginia Transformers Corporation
Member	Sergio	Hernandez Cano	Hammond Power Solutions
Member	John	Herron	Raytech USA
Vice-Chair	Thang	Hochanh	Surplec Inc.
Member	Saramma	Hoffman	PPL Electric Utilities
Guest	Ryan	Hogg	Bureau of Reclamation
Guest	David	Holland	ExxonMobil
Guest	Derek	Hollrah	Burns & McDonnell
Member	Philip	Hopkinson	HVOLT Inc.
Guest	George	Jalhoum	PPI
Guest	Paul	Jarman	University of Manchester
Guest	Nicholas	Jensen	Delta Star Inc.
Member	John	John	Virginia Transformer Corp.
Member	Toby	Johnson	Pacificorp
Member	Stephen	Jordan	Tennessee Valley Authority
Member	Akash	Joshi	Black & Veatch
Guest	Laszlo	Kadar	Hatch
Member	Kurt	Kaineder	Siemens Energy
Member	Sheldon	Kennedy	Niagara Transformer
Guest	Gael	Kennedy	GR Kennedy & Associates LLC
Member	Stacey	Kessler	Basin Electric Power Cooperative
Guest	Gary	King	Howard Industries
Member	Egon	Kirchenmayer	Siemens Energy
Guest	Ken	Klein	Grand Power Systems
Guest	Peter	Kleine	US Army Corps of Engineers
Guest	Dmitriy	Klempner	Southern California Edison
Guest	William	Knapek	OMICRON electronics Corp USA
Guest	Anton	Koshel	Delta Star Inc.
Member	Axel	Kraemer	Maschinenfabrik Reinhausen
Guest	Donald	Lamontagne	Arizona Public Service Co.
Guest	Fernando	Leal	Prolec GE
Member	Moonhee	Lee	Hammond Power Solutions
Member	Aleksandr	Levin	Weidmann Electrical Technology
Member	Weijun	Li	Braintree Electric Light Dept.
Guest	Chao	Li	EATON Corporation
Member	Yaquan (Bill)	Li	BC Hydro
Member	Mario	Locarno	Doble Engineering Co.
Guest	Tiffany	Lucas	SPX Transformer Solutions, Inc.
Guest	Nigel	Macdonald	Trench Limited
Member	Tim-Felix	Mai	Siemens Energy
Member	Darrell	Mangubat	Siemens Power Operations Inc.
Guest	Kumar	Mani	Duke Energy
Guest	Balakrishnan	Mani	Virginia Transformer Corp.

Role	First Name	Last Name	Company
Guest	Richard	Marek	Retired
Guest	Dennis	Marlow	DenMar TDS Transformers
Member	James	McBride	JMX Services, Inc.
Guest	Matthew	McFadden	Oncor Electric Delivery
Guest	James	Mciver	Siemens Energy
Guest	Susan	McNelly	Xcel Energy
Member	Vinay	Mehrotra	SPX Transformer Solutions, Inc.
Member	Thomas	Melle	HIGHVOLT
Guest	Zachary	Millard	Great River Energy
Member	Kent	Miller	T&R Electric Supply Co.
Member	Rashed	Minhaz	Transformer Consulting Services Inc.
Guest	Paul	Morakinyo	PSEG
Member	Emilio	Morales-Cruz	Qualitrol Company LLC
Member	David	Murray	Tennessee Valley Authority
Guest	Ryan	Musgrove	Oklahoma Gas & Electric
Guest	Hossein	Nabi-Bidhendi	ABB Inc.
Member	Ali	Naderian	Metsco
Guest	Shankar	Nambi	Bechtel
Guest	Kristopher	Neild	Megger
Guest	Ashmita	Niroula	Ergon, Inc.
Member	Rodrigo	Ocon	Industrias IEM
Guest	Rudolf	Ogajanov	ABB Inc.
Guest	Anastasia	O'Malley	Consolidated Edison Co. of NY
Member	Parminder	Panesar	Virginia Transformer Corp.
Member	Dwight	Parkinson	EATON Corporation
Guest	Sanjay	Patel	Royal Smit Transformers
Secretary	Poorvi	Patel	Electric Power Research Institute (EPRI)
Member	Nitesh	Patel	Hyundai Power Transformers USA
Guest	Rakesh	Patel	Hitachi-Powergrid
Guest	Monil	Patel	Pacific Gas & Electric Company
Member	Brian	Penny	Retired
Member	Harry	Pepe	Phenix Technologies, Inc.
Guest	Mark	Perkins	D4Energy Solutions LLC
Member	Sylvain	Plante	Hydro-Quebec
Guest	Cornelius	Plath	OMICRON Energy Solutions GmbH
Member	Bertrand	Poulin	Hitachi ABB PowerGrids
Guest	Chris	Powell	Intermountain Electronics
Guest	Tejasvi	Prakash	Schweitzer Engineering Labs
Member	Jarrod	Prince	ERMCO
Member	Ulf	Radbrandt	Hitachi ABB PowerGrids
Member	Ion	Radu	Hitachi ABB PowerGrids
Member	Timothy	Raymond	Electric Power Research Institute (EPRI)
Guest	John	Reagan	Oncor Electric Delivery
Guest	Larry	Rebman	EMLS, Inc.

Role	First Name	Last Name	Company
Guest	Jonathan	Reimer	FortisBC
Member	Pierre	Riffon	Pierre Riffon Consultant Inc.
Member	Diego	Robalino	Megger
Guest	Tim	Rocque	SPX Transformer Solutions, Inc.
Guest	Leopoldo	Rodriguez	Transformer Testing Services LLC
Guest	Andre	Rottenbacher	Ritz Instrument Transformers
Member	Mickel	Saad	Hitachi ABB Power Grids
Member	Hakan	Sahin	Virginia and Georgia Transformers
Guest	Mahesh	Sampat	EMS Consulting Inc.
Guest	Lina	Sandsten	Hitachi Power Grids
Guest	Dinesh	Sankarakurup	Duke Energy
Member	Amitabh	Sarkar	Virginia Transformer Corp.
Member	Daniel	Sauer	EATON Corporation
Guest	Roderick	Sauls	Southern Company Services
Member	Alan	Sbravati	Cargill, Inc.
Member	Markus	Schiessl	SGB
Member	Jeffrey	Schneider	Power Partners/Spire Power Solutions
Member	Ewald	Schweiger	Siemens Energy
Member	Pugal	Selvaraj	Virginia Transformer Corp.
Guest	Cihangir	Sen	Duke Energy
Guest	Jaber	Shalabi	VanTran Industries, Inc.
Member	Devki	Sharma	Entergy
Member	Hemchandra	Shertukde	University of Hartford
Guest	Kunal	Shukla	PECO Energy Company
Guest	Stephen	Shull	BBC Electrical Services, Inc.
Member	Jonathan	Sinclair	PPL Electric Utilities
Guest	Kushal	Singh	ComEd
Member	Kenneth	Skinger	Scituate Consulting, Inc.
Guest	Christopher	Slattery	FirstEnergy Corp.
Member	Steven	Snyder	Hitachi ABB Power Grids
Guest	Markus	Soeller	Power Diagnostix
Guest	William	Solano	Instrument Transformer Equip Corp
Member	Sanjib	Som	Pennsylvania Transformer
Member	Fabian	Stacy	Hitachi ABB Power Grids
Member	Brad	Staley	Salt River Project
Member	Kyle	Stechschulte	American Electric Power
Guest	Hampton	Steele	TVA
Guest	Neil	Strongosky	Memphis Light, Gas & Water
Member	Babanna	Suresh	Southwest Electric Co.
Member	Charles	Sweetser	OMICRON electronics Corp USA
Member	Janusz	Szczechowski	Maschinenfabrik Reinhausen
Member	Troy	Tanaka	Burns & McDonnell
Guest	Marc	Taylor	Cogent Power Inc.
Guest	Dervis	Tekin	Meramec Instrument Transformer Co.

Role	First Name	Last Name	Company
Member	Vijay	Tendulkar	Power Distribution, Inc (PDI)
Guest	Risto	Trifunoski	Trench Limited
Guest	Parag	Upadhyay	ABB Inc.
Guest	Jacques	Vanier	Electro Composites (2008) ULC
Chair	Ajith	Varghese	SPX Transformer Solutions, Inc.
Member	Jason	Varnell	Doble Engineering Co.
Member	Kiran	Vedante	Ritz Instrument Transformers
Guest	Kannan	Veeran	Georgia Transformer
Member	Rogério	Verdolin	Verdolin Solutions Inc.
Member	Krishnamurthy	Vijayan	PTI Transformers
Member	Dharam	Vir	SPX Transformer Solutions, Inc.
Member	Pragnesh	Vyas	Sunbelt-Solomon Solutions
Guest	Loren	Wagenaar	WagenTrans Consulting
Member	Hugh	Waldrop	Memphis Light, Gas & Water
Member	Sukhdev	Walia	New Energy Power Co.
Member	David	Wallach	Duke Energy
Guest	Evanne	Wang	DuPont
Guest	Michael	Warntjes	American Transmission Co.
Guest	Alan	Washburn	Burns & McDonnell
Guest	Joe	Watson	JD Watson and Associates Inc.
Member	Eric	Weatherbee	PCORE Electric
Member	Bruce	Webb	Knoxville Utilities Board
Guest	Drew	Welton	Intellirent
Member	Peter	Werelius	Megger
Member	Daniel	Weyer	Nebraska Public Power District
Guest	William	Whitehead	Siemens Energy
Guest	Barrett	Wimberly	GE Grid Solutions
Member	Dr. Alexander	Winter	HIGHVOLT Pruftechnik Dresden
Guest	Jeffrey	Wright	Duquesne Light Co.
Member	Baitun	Yang	R.E. Uptegraff
Member	Joshua	Yun	Virginia Transformer Corporation
Guest	Malia	Zaman	IEEE
Guest	Anand	Zanwar	Siemens Energy
Member	Peter	Zhao	Hydro One
Member	Kris	Zibert	Allgeier, Martin and Associates
Member	Waldemar	Ziomek	PTI Transformers

Annex C Distribution Subcommittee – Chair: Ed Smith

April 28, 2021

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 52 members in attendance by count of those identified on a slide presented in the meeting. Recorded attendance gave 150 in attendance and 51 members. List of attendees and affiliation attached below.

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

The Fall 2020 meeting minutes were reviewed, a motion was made to approve by John John, seconded by Phil Hopkinson, and approved by unanimous acclamation of the members in attendance.

At this time, Josh Verdell reviewed the membership changes. 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

C.2.1 C57.12.20 – Overhead Distribution Transformers – Al Traut

Al presented the following minutes from the working group meeting on April 26, 2021 at 11:45 a.m. with 55 in attendance.

1. Call to order
The meeting was called to order by the Chair (Al Traut) at 10:45AM on Monday, April 26, 2021.
2. Confirmation of the essential patent statement and responses
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.
3. Quorum Verification
A members list was displayed and members were asked to complete digital poll. 28 of 53 members were present. A Quorum was declared. Attendance for this meeting is included below.
4. Approval of agenda for this meeting
The Chair sent out the Agenda prior to the meeting for review. Agenda was approved without any opposition.
5. Approval of minutes of the previous meeting

The Chair sent out the minutes prior to the meeting for review. Minutes were approved without any opposition.

6. Chair Report

The Chair announced the active PAR expires in 2023.

7. Old Business

a. Discussion: Section 7.5.1 Covers

- i. Motion: Dan Mulkey motions to remove the wording “preferred” from “Annex B describes a preferred method...”. Steve Shull seconds. 25 of the 27 members present voted “For”. Motion passes.

b. Discussion: Table 6 – Electrical characteristics of bushings

- i. Comments: Steve Shull brought to attention of the working group that C57.19.02 group will discuss topic further in tomorrow’s 4/27/21 meeting

c. Discussion: Dielectric Strength of Covers

- i. Question: from Thomas Dauzat regarding 25kV Dielectric strength of covers
- ii. Comments: Al references Appendix B which gives informative material that is not required. There is currently no standard.

8. New Business

No new business

9. Next meeting--date and location

The Next meeting will be the **2021 Fall: March 22 – 26; Milwaukee, Wisconsin, USA**

10. **Adjournment**

The meeting was adjourned at 12:22 PM

Submitted by: Kendrick Hamilton

Date: 26/04/2021

C57.12.20 WG Meeting Attendance
Spring 2021 On-line
April 26, 2021

	Role	First Name	Last Name	Company
1	Guest(R)	Angela	Amador	EATON Corporation
2	Guest	Gregory	Ante	Southern California Edison
3	Guest	Kevin	Biggie	Weidmann Electrical Technology
4	Member	Darren	Brown	Howard Industries
5	Member	Rhett	Chrysler	ERMCO
6	Member	Michael	Dahlke	Central Moloney, Inc.
7	Guest	Thomas	Dauzat	General Electric
8	Guest(R)	Benjamin	Garcia	Southern California Edison
9	Guest	James	Gardner	SPX Transformer Solutions, Inc.
10	Member	Carlos	Gaytan	Prolec GE
11	Member	Ali	Ghafourian	H-J Enterprises, Inc.
12	Member	Said	Hachichi	Hydro-Quebec
13	Secretary	Kendrick	Hamilton	Power Partners, Inc.
14	Member	Kenneth	Hampton	Baltimore Gas & Electric
15	Guest	David	Holland	ExxonMobil
16	Member	Ramadan	Issack	American Electric Power
17	Guest	Kristin	James	Eaton
18	Member	Gael	Kennedy	GR Kennedy & Associates LLC
19	Guest	Andrew	Larison	Hitachi ABB Power Grids
20	Guest	Christopher	Lianides	Southern California Edison
21	Guest	Justin	Minikel	EATON Corporation
22	Member	Michael	Morgan	Duke Energy
23	Member	Daniel	Mulkey	Mulkey Engineering Inc.
24	Guest	Martin	Munoz Molina	Orto de Mexico
25	Member	Dwight	Parkinson	EATON Corporation
26	Member	Jarrold	Prince	ERMCO
27	Member	Juan	Ramirez	CELECO
28	Guest(R)	Kevin	Rapp	Cargill, Inc.
29	Member	Martin	Rave	ComEd
30	Guest	Robert	Reepe	Georgia Power Co.
31	Guest(R)	Afshin	Rezaei-Zare	York University
32	Guest	Albert	Sanchez	Knoxville Utilities Board
33	Guest	Stefan	Schindler	Maschinenfabrik Reinhausen
34	Guest	Jeffrey	Schneider	Power Partners/Spire Power Solutions
35	Guest	Avijit	Shingari	Pepco Holdings Inc.
36	Member	Stephen	Shull	BBC Electrical Services, Inc.
37	Member	Audrey	Siebert-Timmer	IFD Corporation
38	Member	Igor	Simonov	Toronto Hydro
39	Vice-Chair	Edward	Smith	H-J Family of Companies
40	Guest(R)	Markus	Stank	Maschinenfabrik Reinhausen
41	Guest	Christopher	Sullivan	Westmark Partners
42	Guest	Radoslaw	Szewczyk	Specialty Products Poland Sp. z o.o.
43	Member	Eric	Theisen	Metglas, Inc.
44	Member	Michael	Thibault	Pacific Gas & Electric
45	Guest	Timothy	Tillery	Howard Industries
46	Chair	Alan	Traut	Howard Industries
47	Member	Jeremy	Van Horn	IFD Corporation
48	Guest(R)	John	Vartanian	National Grid
49	Member	Joshua	Verdell	ERMCO
50	Guest	Rogério	Verdolin	Verdolin Solutions Inc.
51	Guest	Duy	Vo	Central Maine Power (AVANGRID)
52	Member	Pragnesh	Vyas	Sunbelt-Solomon Solutions
53	Guest	Shelby	Walters	Howard Industries
54	Member	Bruce	Webb	Knoxville Utilities Board
55	Member	Alan	Wilks	Consultant

Guest(R) = Guest requesting membership

C.2.2 C57.12.28, .29, .30, .31 & C57.12.32 – Enclosure Integrity – Dan Mulkey

Dan Mulkey presented the following minutes from the working group meeting on April 27, 2021 at 8:00 a.m. in with 68 in attendance.

1. Dan Mulkey called the meeting to order at 8:01 AM CST.
2. Opening remarks and announcements
 - a. Dan Mulkey commented that the group has a request from the C57.12.38 1-ph pad group which will be discussed in new business.
3. Dan Mulkey reviewed IEEE SA Copyright Policy and Essential Patent Claims. No issues were raised.
4. Membership changes were noted:
 - a. Added: Ramadan Issack
 - b. Changed to Guest: Anil Dhawan, Lee Welch and Bill Wimmer
 - c. It was brought up that Donnie Trivett will no longer be attending meetings and will be removed from roster.
5. Quorum was verified. The working group consisted of **56** members, requiring **28** for quorum. **37** members were confirmed through the WebEx poll. **43** members confirmed afterwards through attendance records.
6. Dan Mulkey requested approval of the agenda. Jerry Murphy made a motion, seconded by Steve Shull, for approval of the agenda. Agenda was unanimously approved.
7. Dan Mulkey requested approval of the minutes. Marty Rave made a motion, seconded by Al Traut for approval of the minutes. Minutes were unanimously approved.
8. Status of Standards:
 - a. C57.12.28 Standard for Pad-Mounted Equipment – Enclosure Integrity, Published July 15, 2014
 - i. Expires: **12/31/2024**
 - ii. PAR expiration: **12/31/2024**
 - iii. Status: **in progress, draft 1.3**
 - b. C57.12.29 Standard for Pad-Mounted Equipment – Enclosure Integrity for Coastal Environments, Published August 8, 2014
 - i. Expires: **12/31/2024**
 - ii. PAR expiration: **12/31/2024**
 - iii. Status: **in progress, draft 1.3**
 - c. C57.12.30 Standard for Pole-Mounted Equipment – Enclosure Integrity for Coastal Environments, Published March 4, 2021
 - i. Expires: **12/31/2030**

- d. C57.12.31 Standard for Pole Mounted Equipment – Enclosure Integrity, Published February 26, 2021
 - i. Expires: 12/31/2030
 - e. C57.12.32 Standard for Submersible Equipment – Enclosure Integrity, Published Aug 8, 2019
 - i. Expires: 12/31/2029
- 9. Old business:
 - a. Dan Mulkey updated the group on C57.12.30
 - i. Standard was approved as a revised standard by the IEEE SA Standards Board on Dec 3, 2020 and published March 4, 2021.
 - b. Dan Mulkey updated the group on C57.12.31
 - i. Standard was approved as a revised standard by the IEEE SA Standards Board on Dec 3, 2020 and published February 26, 2021.
 - c. Dan Mulkey reviewed status of standards, next up is revising and updating the C57.12.28 and C57.12.29.
 - d. Taskforce Report: Stainless Steel Definitions
 - i. The task force of Will Elliott & Tiffany Lucas on steel definitions prepared proposed definitions for carbon steel, copper bearing steel and AISI 304, 304L, 316 316L, 409 stainless steels as well as a table summarizing national stainless-steel standards. These were displayed for discussion.
 - ii. Dan Mulkey reminded the group that in the pad-mount standards the only term used is carbon steel. This term was defined using an out-of-print black book in the pole-mounted standards.
 - iii. Zoran Goncin commented that any copper steel can be copper bearing as it is related to copper content.
 - iv. Tiffany Lucas commented proposed definitions reflect copper steel as having < 0.6% copper and copper bearing steel having 0.2% minimum copper with specified minimum yield strength.
 - v. Justin Minikel commented that these definitions may work better if they were included in the SNTP Taskforce Corrosion Effects work.
 - vi. Will Elliot agreed but commented that the timing / next steps for this Taskforce is undefined at the moment.
 - vii. Dan Mulkey proposed the group should include the definitions and references as an informative annex for now. We can review the annex again before the standard goes out to ballot.
 - viii. Jerry Murphy made a motion, second by Marty Rave to include an informative annex in C57.12.28 and C57.12.29 that provides a short description of commonly used transformer steels and references national steel standards.
 - 1. Ali Ghafourian asked if there was any ASTM reference number for carbon steel. Will Elliot commented there may be an SAE reference.
 - 2. Jerry Murphy commented that A36 is the ASTM reference. ASTM also has a A568 for rolled steel.
 - 3. Dan asked if there were any objections to the motion. Hearing none the **motion passed unanimously.**
 - e. Taskforce Request: Special Pad-mount Tests (pry-bar, wire probe)

- i. Dan Mulkey requested a taskforce to be formed to review the special security tests in C57.12.28 / .29 (pry-bar, wire probe, etc.) to confirm special parts are available and if not specify a substitute (i.e. referenced Iron Man scales No. 1756T4 seem to be obsolete).
 - ii. **Taskforce Members: Gary King, Shelby Walters, Michael Zarnowski, Carlos Gaytan, Zoran Goncin**
- f. Coating Tests Discussion: continued from Fall 2020 meeting
 - i. Dan Mulkey reviewed list of people that volunteered in the Fall 2020 meeting to run tests including: Jane Hall and Chris Guertin from Cloverdale Paint, Scott Abbott from PPG, Brian Klaponski from Carte International Inc and Carlos Gaytan from Prolec GE.
 - ii. Dan Mulkey asked if anyone else would like to volunteer to run coating tests. Josh Verdell from ERMCO volunteered.
 - iii. Dan Mulkey asked the group what kind of tests should we consider performing / evaluating.
 - iv. Discussion on Corrosion Tests
 - 1. Justin Minikel commented that a NEETRAC project was recently approved which will evaluate corrosion test methods including the SCAB test. Project findings will be presented to this group once complete.
 - 2. Jane Hall commented we should consider running corrosion tests depending on the expected environment. For example, ISO 12944 has different tests for different environments.
 - 3. Justin commented that will be addressed in the NEETRAC project.
 - 4. Jerry Murphy asked if adhesion and pitting tests will be included in the NEETRAC project. Justin Minikel stated that they are not.
 - v. Discussion on Adhesion Tests
 - 1. Jane Hall suggested we run pull-off adhesion tests and compare results to the current tape test method.
 - 2. Justin Minikel agreed but commented equipment costs are high for pull-off tests.
 - 3. Zoran Goncin commented the current tape test method is very practical / provide good results.
 - 4. Justin Minikel agreed, but commented there are lots of factors that come into play.
 - 5. Dan Mulkey requested a taskforce to be formed to evaluate coating adhesion test methods.
 - 6. **Taskforce Members: Justin Minikel (chair), Jane Hall, Chris Guertin, Zoran Goncin, Scott Abbot**
- g. C57.12.28 and C57.12.29 Revision
 - i. Justin Minikel converted both standards into the new IEEE template and redline text with previous approved changes from C57.12.30 / 31 / 32. Drafts 1.3 of each are posted on the web page.
 - ii. Dan Mulkey reviewed recommended changes to the Scope and Purpose for both these documents which differ from what is on the approved PAR.
 - iii. Al Traut made a motion, second by Ben Garcia to accept recommended scope and purpose changes. Motion passed unanimously.
 - iv. **Review of C57.12.28/.29 Draft 1.3 will be continued next meeting.**

10. New business:

- a. SCAB Testing Clarification Request
 - i. Between meetings, Lestrade George of Protech Power in Saint-Laurent, Quebec, Canada had submitted a request through IEEE liaison to clarify SCAB procedure.
 - ii. Dan Mulkey proposed to modify Annex A to make the prescribed week equal to one cycle, and in 5.4.6 adjust the “15 cycles” to “3 week-long cycles”.
 - iii. Dan Mulkey presented options to change 15 cycles, and clarifying wording in Annex A Monday
 - iv. Justin Minikel asked if we needed to update 31 with a corrigendum. After some discussion this was tabled.
 - v. Justin Minikel made a motion, second by Jerry Murphy to accept the proposed changes to Annex A. **The motion passed unanimously.**
- b. C57.12.38 Request: Tank Touch Temperatures Cautionary Note
 - i. Dan Mulkey asked the group if we should consider adding a cautionary note about tank touch temperatures to the enclosure integrity standards. Should we also consider adding tests to verify coatings can withstand these temperatures?
 - ii. Jane Hall commented Cloverdale has performed temperature gradient tests on coatings.
 - iii. Justin Minikel commented that failure criteria will need to be clearly defined if we run coating temperature tests.
 - iv. Scott Abbott asked what types of temperatures are we concerned with. Elevated temperatures from sunlight or elevated operating temperatures or both? Dan Mulkey responded both.
 - v. Gary King commented there are two components we need to define
 - 1. Maximum allowable tank touch temperature
 - 2. Integrity of coating at these temperatures
 - vi. Dan requested a taskforce to be formed to look at tank touch temperatures and maximum allowable coating temperatures.
 - vii. **Taskforce Members: Jerry Murphy (chair), Steve Shull, Dan Mulkey, Jeremy Van Horn, Justin Minikel, Jane Hall, Chris Geuterin, Scott Abbott**
- c. Substrate Surface Preparation
 - i. Tom Dauzat brought up surface preparation on stainless, carbon and polymer material prior to coatings like SSPC-SP6
 - ii. **This discussion was tabled and will be continued next meeting.**

11. Next meeting: is planned for October 18, 2021 in Milwaukee, Wisconsin USA

- a. The following attendees requested membership and will be added to membership for the Fall 2021 meeting: Chris Guertin, Andrew Larison, Jeff Schneider, Avijit Shingari

12. The meeting was adjourned at 9:18 AM CST.

Submitted by: Audrey Siebert-Timmer

Date: 05/04/2021

List of Members:

Scott Abbott (PPG)
Martin Bachand (Cloverdale Paint Inc.)
Darren Brown (Howard Industries)
John Chisholm (IFD Corporation)
Rhett Chrysler (ERMCO)
Douglas Craig (Richards Manufacturing Co.)
Michael Dahlke (Central Moloney, Inc.)
Thomas Dauzat (General Electric)
William Elliott (General Electric)
Benjamin Garcia (Southern California Edison)
James Gardner (SPX Transformer Solutions, Inc.)
Carlos Gaytan (Prolec GE)
Ali Ghafourian (H-J Enterprises, Inc.)
Said Hachichi (Hydro-Quebec)
Kenneth Hampton (Baltimore Gas & Electric)
Ramadan Issack (American Electric Power)
Gael Kennedy (GR Kennedy & Associates LLC)
Gary King (Howard Industries)
Brad Kittrell (Consolidated Edison Co. of NY)
Alejandro Macias (CenterPoint Energy)
Justin Minikel (EATON Corporation)
Michael Morgan (Duke Energy)
Daniel Mulkey (Mulkey Engineering Inc.)
Jerry Murphy (Reedy Creek Energy Services)
Dwight Parkinson (EATON Corporation)
Ion Radu (Hitachi ABB Power Grids)
Juan Ramirez (CELECO)
James Ratty (Electronic Technology Inc.)
Martin Rave (ComEd)
Pedro Salgado (Electronic Technology Inc.)
Stephen Shull (BBC Electrical Services, Inc.)
Audrey Siebert-Timmer (IFD Corporation)
Igor Simonov (Toronto Hydro)
Edward Smith (H-J Family of Companies)
James Spaulding (Fort Collins Utilities)
Travis Spoone (EATON Corporation)
Michael Thibault (Pacific Gas & Electric)
Alan Traut (Howard Industries)
Jeremy Van Horn (IFD Corporation)
John Vartanian (National Grid)
Joshua Verdell (ERMCO)
Shelby Walters (Howard Industries)
Alan Wilks (Consultant)

List of Guests:

Gregory Ante (Southern California Edison)
Paul Gabriel Florida (Howard Industries, Inc.)
Zoran Goncin (PTI Transformers)
Chris Guertin (Cloverdale Paint Inc.)
Jane Hall (Cloverdale Paint Inc.)
Kristin James (Eaton)
Andrew Larison (Hitachi ABB Power Grids)
Christopher Lianides (Southern California Edison)
Tiffany Lucas (SPX Transformer Solutions, Inc.)
Kent Miller (T&R Electric Supply Co.)
Nitesh Patel (Hyundai Power Transformers USA)
Vinay Patel (Consolidated Edison Co. of NY)
Chris Pitts (Howard Industries)
Robert Reepe (Georgia Power Co.)
Albert Sanchez (Knoxville Utilities Board)
Jeffrey Schneider (Power Partners/Spire Power Solutions)
Jeremy Sewell (Quality Switch, Inc.)
Jaber Shalabi (VanTran Industries, Inc.)
Avijit Shingari (Pepco Holdings Inc.)
Kunal Shukla (PECO Energy Company)
Adrian Silgardo (IFD Corporation)
Christopher Sullivan (Westmark Partners)

C.2.3 C57.12.34 – Three Phase Pad-Mount Transformers – Steve Shull

Jerry Murphy, for Steve Shull, presented the following minutes from the working group meeting on April 26, 2021 at 2:20 p.m. with 73 in attendance.

1. The meeting was called to order by the Chair at 2:20 P.M. CST on April 26, 2021. A Poll was taken to identify WG members and guests. A Quorum was established.
2. Agenda approval
The Chair displayed the Agenda for this meeting. Jerry Murphy made a motion to “approve Agenda as presently shown”; Alex Macias seconded the motion. The Chair asked for verbal opposition to motion, where no verbal opposition was recorded. Therefore, the Agenda was approved as shown.
3. Minutes approval
The Chair commented that the Meeting Minutes of the last meeting were posted on the Transformer Committee website. Dan Mulkey made a motion to “approve the last Meeting Minutes”; Marty Rave seconded the motion. The Chair asked for verbal opposition to motion, where no verbal opposition was recorded. Therefore, the last Meeting Minutes were approved.
4. Confirmation of IEEE SA Essential Patent Statement
The Chair displayed the Essential Patent information. The Chair asked for any claim of known Patents associated with this work. No patent information was verbally expressed.

5. IEEE SA Copyright Policy Statement
The Chair displayed the IEEE SA Copyright Policy information. The Chair asked for any comments to which no comments were recorded.
6. Old Business
 - 6.1 Section A.7 – Task Force Report
 - 6.1.1 Carlos Gaytan (Task Force Chair) presented slides depicting how the terms “box”, “enclosure”, “cabinet”, “weather-resistant”, “pad-lockable”, “lockable”, “hinged”, and “other securing methods” were used in existing standards IEEE Std C57.12.10 and IEEE Std C57.12.36. Carlos presented his proposed wording for Section A.7 along with modifications to Figure A.3 to the WG for discussion. The WG had much discussion on the proposed changes. A question was asked if the “accessory box” should be shown in the Cable Termination Cabinet versus the Transformer Tank. There was much discussion pertaining to this question between WG members. The WG decided that the Annex should only specify the location of the accessory box(es) for new installations not retrofit situations. A comment was made to the WG that showing the accessory box(es) in Figure A.3 would give the end user a point to start a conversation with the specific manufacturer. The Chair made modifications to the proposed wording of A.7 and Figure A.3 per the WG direction. Jerry Murphy made a motion to “accept A.7 wording and Figure A.3 as shown”; Rhett Chrysler seconded the motion. The Chair asked for verbal opposition to motion, no verbal opposition was recorded. Therefore, the motion to “accept A.7 wording and Figure A.3 as shown” passed unanimously. These would be placed in a draft of the document as they were shown.
 - 6.2 Section A.9.2 – Task Force Report
 - 6.2.1 Israel Barrientos presented to the WG the list of active standards he found pertaining to Current Sensors. After discussion with the WG, Israel Barrientos made motion to “add IEEE C37.235, IEC 60688 Ed. 3.0 b:2012, IEC 61869-8, and IEC 61869-12 to Section A.9.2”; Jerry Murphy seconded the motion. Discussion with the WG ended with Israel Barrientos and Jerry Murphy accepting a friendly amendment to the original motion resulting in the following wording “add IEEE C37.235, IEC 60688 Ed. 3.0 b:2012, IEC 61869-8, and IEC 61869-12 to be shown in section A.9.2 or the bibliography, whichever is appropriate”. The Chair asked for verbal opposition to the motion, no verbal opposition was recorded. Therefore, the motion to ““add IEEE C37.235, IEC 60688 Ed. 3.0 b:2012, IEC 61869-8, and IEC 61869-12 to be shown in section A.9.2 or the bibliography, whichever is appropriate” passed unanimously.
7. New Business
 - 7.1 The chair displayed section 7.2 Dielectric Tests to address a comment from a WG member. The Chair displayed three slides for WG discussion. There was much discussion within the WG, however due to time restraints the Chair tabled the discussion on this section until the next meeting.
8. The meeting adjourned at 3:35 P.M. CST.

Submitted by: Scott Dahlke.

Date: 4/28/2021

Attendance:

NAME	Affiliation	M or G
Scott Abbott	PPG	Guest
Kayland Adams	SPX Transformer Solutions, Inc.	Guest
Angela Amador	EATON Corporation	Guest
Glenn Andersen	Fayetteville PWC	Guest
Gregory Ante	Southern California Edison	Guest
Hugo Avila	Hitachi ABB Power Grids	Guest
Israel Barrientos	Prolec GE	Member
Wallace Binder	WBBinder Consultant	Guest
John Chisholm	IFD Corporation	Member
Rhett Chrysler	ERMCO	Member
Michael Dahlke	Central Moloney, Inc.	Secretary
Eric Doak	D4EnergySolutions LLC	Guest
Jose Gamboa	H-J Family of Companies	Member
Benjamin Garcia	Southern California Edison	Member
Carlos Gaytan	Prolec GE	Member
Ali Ghafourian	H-J Enterprises, Inc.	Member
Monty Goulkhah	Kinectrics	Guest
Said Hachichi	Hydro-Quebec	Member
Kenneth Hampton	Baltimore Gas & Electric	Member
Ramadan Issack	American Electric Power	Guest
Gael Kennedy	GR Kennedy & Associates LLC	Member
Gary King	Howard Industries	Member
Brian Klaponski	Carte International Inc.	Member
John Kotula	Dominion Energy	Guest
Andrew Larison	Hitachi ABB Power Grids	Guest
Weijun Li	Braintree Electric Light Dept.	Member

Name	Affiliation	M or G
Christopher Lianides	Southern California Edison	Guest
Alejandro Macias	CenterPoint Energy	Member
Lee Matthews	Howard Industries	Guest
Kent Miller	T&R Electric Supply Co.	Guest
Justin Minikel	EATON Corporation	Guest
Rhea Montpool	Schneider Electric	Member
Michael Morgan	Duke Energy	Member
Daniel Mulkey	Mulkey Engineering Inc.	Member
Jerry Murphy	Reedy Creek Energy Services	Member
Dwight Parkinson	EATON Corporation	Member
Chris Pitts	Howard Industries	Guest
Juan Ramirez	CELECO	Member
Kevin Rapp	Cargill, Inc.	Guest
Martin Rave	ComEd	Member
Samuel Reed	EATON Corporation	Guest
Robert Reepe	Georgia Power Co.	Guest
Atshin Rezaei-Zare	York University	Guest
Albert Sanchez	Knoxville Utilities Board	Guest
Steven Schappell	SPX Transformer Solutions, Inc.	Member
Jeffrey Schneider	Power Partners/Spire Power Solutions	Member
Jaber Shalabi	VanTran Industries, Inc.	Member
Hamid Sharifnia	Consultant	Guest
Avijit Shingari	Pepco Holdings Inc.	Guest
Stephen Shull	BBC Electrical Services, Inc.	Chair
Audrey Siebert-Timmer	IFD Corporation	Member
Igor Simonov	Toronto Hydro	Member

Name	Affiliation	M or G
Edward Smith	H-J Family of Companies	Member
Muhammad Sohail	Trench Limited	Guest
James Spaulding	Fort Collins Utilities	Member
Christopher Sullivan	Westmark Partners	Member
Radoslaw Szewczyk	Specialty Products Poland Sp. z o.o.	Guest
Stephen Taipala	Eaton Corporation	Guest
Eric Theisen	Metglas, Inc.	Member
Michael Thibault	Pacific Gas & Electric	Member
Timothy Tillery	Howard Industries	Guest
Alan Traut	Howard Industries	Member
Jeremy Van Horn	IFD Corporation	Member
John Vartanian	National Grid	Member
Joshua Verdell	ERMCO	Guest
Duy Vo	Central Maine Power (AVANGRID)	Guest
Pragnesh Vyas	Sunbelt-Solomon Solutions	Member
Alan Washburn	Burns & McDonnell	Guest
Bruce Webb	Knoxville Utilities Board	Member
Alan Wilks	Consultant	Member
Joshua Yun	Virginia Transformer Corporation	Member
Malia Zaman	IEEE	Guest
Michael Zarnowski	Carte International	Guest

C.2.4 C57.12.36 – Distribution Substation Transformers – Jerry Murphy

This working group did not meet.

C.2.5 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 April 26, 2021 at 12:55 p.m. with 66 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 to the Working Group.

Quorum was established with 32 out of 51 Working Group members present per poll results generated. Note: (2) - Guests marked as being Members during the poll for Quorum and the attendance was adjusted accordingly.

The agenda for the meeting was presented. Jerry Murphy offered a motion with a second from Steve Shull to approve the agenda. The agenda was unanimously approved.

The meeting minutes for the Fall 2020 virtual meeting were posted on the Distribution Subcommittee website after the meeting for the Working Group members to review. There were no proposed changes to the meeting minutes brought forth. Jerry Murphy offered a motion with a second from Jeremy Van Horn to approve the meeting minutes. The meeting minutes 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 – Internal Components

Jarrold Prince presented a revised informative Annex proposal for transformer accessories developed by Task Force of Craig DeRouen, Jim Spaulding, and Mike Thibault with Craig as the Task Force lead. The Task Force presentation is included as a separate file accompanying the meeting minutes (C57.12.38-Components Definitions-Rev 3 with No Images.pdf). This revised informative Annex proposal 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 – Review of Figures

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 with Israel as the Task Force lead. The Task Force presentation is included as a separate file accompanying the meeting minutes (S18-C57.12.38-TaskForce-FiguresReview.pdf). The updated figures will be added into the current Draft before for the next revision of C57.12.38.

Task Force – Tank Touch Temperature

Jeremy Van Horn presented information regarding research of tank touch temperature developed by Task Force of Jeremy Van Horn, Dan Mulkey, and Bruce Webb with Jeremy as the Task Force lead. The presentation included findings from review of various industry standards and recommendations regarding surface touch temperature including NASA: A New Approach to Defining Human Touch Temperature Standards, ASTM C1055-03 (Reapproved 2014), UL 1561, and IEEE C57.12.01. Monty Goulkhah during the discussion referenced CSA

C22.2 No 295-15 to be considered. Also, Dan Mulkey mentioned at what temperature does Withdrawal Reflex of Humans occur to protect us? 1st Degree Burn. This could be a limit to consider. After some discussion on this topic, Jerry Murphy recommended information regarding tank touch temperature be incorporated into the Enclosure Integrity standards therefore it will cover all types of distribution transformers. The Task Force will propose a note to the WG at the next meeting to be voted on to bring forth to the Enclosure Integrity standards for possible inclusion into those standards. The Task Force presentation is included as a separate file accompanying the meeting minutes (Presentation to C57.12.38 Working Group V3.2 - Tank Touch Temperature.pptx).

New Business:

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

A total of 7 guests requested Working Group membership which will be reviewed to determine who is eligible for membership before the next meeting.

The Chair announced the Working Group will meet at the Fall 2021 meeting in Milwaukee, WI or in a virtual meeting.

The Chair adjourned the meeting at approximately 2:05 pm CDT.

Submitted by: Jarrod Prince and Martin Rave

Date: 05/03/2021

List of Attendees and Affiliations:

1	Adrian Silgado	IFD Corporation
2	Afshin Rezaei-Zare	York University
3	Alan Wilks	Consultant
4	Albert Sanchez	Knoxville Utilities Board
5	Alejandro Macias	CenterPoint Energy
6	Ali Ghafourian	H-J Enterprises, Inc.
7	Andrew Larison	Hitachi ABB Power Grids
8	Angela Amador	EATON Corporation
9	Avijit Shingari	Pepco Holdings Inc.
10	Baitun Yang	R.E. Uptegraff
11	Benjamin Garcia	Southern California Edison
12	Bruce Webb	Knoxville Utilities Board
13	Carlos Gaytan	Prolec GE
14	Chris Pitts	Howard Industries
15	Christopher Lianides	Southern California Edison
16	Christopher Sullivan	Westmark Partners
17	Daniel Mulkey	Mulkey Engineering Inc.
18	Duy Vo	Central Maine Power (AVANGRID)
19	Dwight Parkinson	EATON Corporation

20	Edmundo Arevalo	Bonneville Power Administration
21	Eric Theisen	Metglas, Inc.
22	Gael Kennedy	GR Kennedy & Associates LLC
23	Glenn Andersen	Fayetteville PWC
24	Gregory Ante	Southern California Edison
25	Hamid Sharifnia	Consultant
26	Igor Simonov	Toronto Hydro
27	Israel Barrientos	Prolec GE
28	Jaber Shalabi	VanTran Industries, Inc.
29	James Edward Smith	H-J Family of Companies
30	James Gardner SPX	Transformer Solutions, Inc.
31	James Spaulding	Fort Collins Utilities
32	Jared Bates	Oncor Electric Delivery
33	Jarrod Prince	ERMCO
34	Jeffrey Schneider	Power Partners/Spire Power Solutions
35	Jeremy Van Horn	IFD Corporation
36	Jerry Murphy	Reedy Creek Energy Services
37	John Vartanian	National Grid
38	Jorge Cruz	PTI Transformers
39	Joshua Verdell	ERMCO
40	Juan Ramirez	CELECO
41	Justin Minikel	EATON Corporation
42	Kendrick Hamilton	Power Partners, Inc.
43	Kenneth Hampton	Baltimore Gas & Electric
44	Kent Miller	T&R Electric Supply Co.
45	Lesther Alex Quispe Cuadrado	EATON Corporation
46	Malia Zaman	IEEE SA
47	Martín Muñoz	Orto de Mexico
48	Martin Rave	ComEd
49	Michael Dahlke	Central Moloney, Inc.
50	Michael Hardin	H-J Enterprises, Inc.
51	Michael Morgan	Duke Energy
52	Michael Thibault	Pacific Gas & Electric
53	Monty Goulkhah	Kinectrics
54	Paul Florida	Howard Industries, Inc.
55	Pedro Salgado	Electronic Technology Inc.
56	Pragnesh Vyas	Sunbelt-Solomon Solutions
57	Ramadan Issack	American Electric Power
58	Rhett Chrysler	ERMCO
59	Robert Reepe	Georgia Power Co.
60	Said Hachichi	Hydro-Quebec
61	Sami Debass	Electric Power Research Institute (EPRI)
62	Scott Abbott	PPG
63	Shelby Walters	Howard Industries
64	Stephen Shull	BBC Electrical Services, Inc.
65	Stephen Taipala	Eaton Corporation
66	Timothy Tillery	Howard Industries

C.2.6 C57.12.39 – Tank Pressure Coordination – Carlos Gaytan

This working group did not meet

C.2.7 Task Force on Transformer Efficiency and Loss Evaluation – Phil Hopkinson

Phil presented the following minutes from the task force meeting on April 26, 2021 at 9:10 a.m.

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. Technical Topic

- i. Phil Hopkinson Introduction**
- ii. Dan Mulkey Report on Utility Loading Data**
- iii. Steve Rosenstock report on future utility outlook**
- iv. Kevin Rapp on insulation thermal class**
- v. Tom Prevost report on Thermally Upgraded Kraft Paper**
- vi. Case Ballard report on Tehrmally Upgraded solid materials**
- vii. Al Traut report on Dual Nameplate Designs**

7. Documents

All documents from this meeting will be posted on the IEEE Distribution Transformers Subcommittee website

8. Next meeting--date and location

No additional comments before adjournment at 10:35am EDT.

C.2.8 PC57.167 – Guide for Monitoring Distribution Transformers – Gary Hoffman

Gary presented the following minutes from the working group meeting on April 27, 2021 at 4:45 p.m. with 61 in attendance.

1. Call to order and Chair's remarks – Called to Order at 2:00PM by Gary Hoffman
2. Quorum Verification – Took count with 37 members and had a Quorum.

3. Approval of agenda for this meeting. No Objections. Motion by Jerry Murphy, and Second by Steve Shull– Unanimously Approved
4. Approval of the meeting of Fall 2019 were approved. No Objections. Motion by Trenton Williams, and Second by Hakim Dulac.
5. Task Force Reports was presented as follows:
 - 8.1.1 Cathodic Protection on distribution transformers- Brad Kittrell
 - 8.1.2 Discuss Air monitor for Combustible or non-Habitable gases
 - 8.2 Clause 6: Method of alert, and Telemetry- Thibault/Shull
6. New Business No new business
7. Next meeting is in September 2021
8. Adjournment

C.2.9 C57.12.35 – Bar Coding for Transformers and Regulators– Rhett Chrysler

Rhett Chrysler presented the following minutes from the working group meeting on April 27, 2021 at 12:55 p.m. with 39 in attendance.

1. Chair called the meeting to order at 12:55pm CDT.
2. Total attendance of 39 is listed below. 18 of 24 members present and quorum was verified (75%). 1 guest requested membership.
3. Chair called for identification of essential patents pertaining to the work of this WG. None brought forward to the TF. Copyright policy presented.
4. Motion to approve meeting agenda by Ed Smith, 2nd by Lee Matthews, Approved unanimously.
5. Motion to approve Fall 2020 (Virtual) meeting minutes by Steve Shull, 2nd by Ed Smith, Approved unanimously
6. Chair Report
 - a. Chair announced that Jerry Murphy has volunteered to be vice chair of this working group.
 - b. PAR for revision of C57.12.35 approved on 6/13/19 with an expiration date of 12/31/2023. The current published document also expires 12/31/2023.
7. Old Business
 - a. TF Report on QR Code – Israel Barrientos, Issack Ramadan, Dan Mulkey, Ken Hampton.

- i. Israel presented an example of converting the C57.12.37 electronic test data to QR codes, one with the standard data set, one with the extended data set.
 - ii. Steve Shull suggested adding a unique de-limiting character to differentiate the fields in the file, eg, a pipet symbol.
 - iii. Steve Shull made a motion to form a new task force to survey users in the Distribution Subcommittee to get feedback on the use of QR codes, what information should be included in the permanent code and the temporary code. New TF includes Rhett Chrysler, Israel Barrientos and Mike Thibault. A proposed questionnaire will be developed and circulated within the WG for comment. Rhett to develop a timeline for this TF.
 - b. TF Report on Editorial Review – Darren Brown, Ed Smith, Alan Traut (carryover from F20 meeting)
 - i. Figure 7 missing side location for label placement, Alex Macias volunteered to create side view for inclusion
 - ii. TF raised the issue regarding use of “manufacturer” vs “producer” in the document, especially regarding the identification of the serial number.
 - iii. Motion made by Steve Shull, 2nd by Alex Macias to use “manufacturer” throughout the 12.35 document in place of “producer”. Motion carried 16 for, 0 against, 1 abstain.
8. New Business
- a. A request for a new manufacturer code ‘NS’ from Gilbert Kozar of Northeast Transformer Services. The code NS is presently unassigned. Since the list of manufacturer codes is in a separate file and not part of the 12.35 document, Rhett Chrysler will follow up with Malia Zaman of IEEE to determine what process should be used to add a new code.
9. Next meeting October 17-21, 2021 Milwaukee, WI
10. Meeting adjourned at 2:10pm CDT.

Submitted by: Alan Traut, Secretary

Date: 04/27/2021, Revised attendance 05/27/2021

Attendance:

First Name	Last Name	Affiliation	Role
Glenn	Andersen	Fayetteville PWC	Member
Gregory	Ante	Southern California Edison	Guest
Israel	Barrientos	Prolec GE	Member
Darren	Brown	Howard Industries	Member
Rhett	Chrysler	ERMCO	Chair
Carlos	Gaytan	Prolec GE	Member
Ali	Ghafourian	H-J Enterprises, Inc	Guest
Kenneth	Hampton	Baltimore Gas & Electric	Member
Ramadan	Issack	American Electric Power	Member

Kristen	James	EATON Corporation	Guest
Gary	King	Howard Industries	Member
Andrew	Larison	Hitachi ABB Power Grids	Guest(R)
Christopher	Lianides	Southern California Edison	Guest
Alejandro	Macias	CenterPoint Energy	Member
Lee	Matthews	Howard Industries	Member
Kent	Miller	Consultant	Guest
Michael	Morgan	Duke Energy	Member
Dan	Mulkey	Mulkey Engineering	Member
Jerry	Murphy	Reedy Creek Energy Services	Vice Chair
Dwight	Parkinson	EATON Corporation	Guest
Chris	Pitts	Howard Industries	Guest
Jimmy	Rasco	Rasco Consulting, LLC	Guest
Martin	Rave	ComEd	Guest
Robert	Reepe	Georgia Power Co.	Guest
Albert	Sanchez	Knoxville Utilities Board	Guest
Avijit	Shingari	Pepco Holdings Inc.	Member
Stephen	Shull	BBC Electrical Services, Inc.	Member
Adrian	Silgado	IFD Corporation	Guest
Edward	Smith	H-J Family of Companies	Member
James	Spaulding	Fort Collins Utilities	Guest
Eric	Theisen	Metglas, Inc	Guest
Michael	Thibault	Pacific Gas & Electric	Member
Alan	Traut	Howard Industries	Secretary
Jeremy	Van Horn	IFD Corporation	Guest
Joshua	Verdell	ERMCO	Guest
Duy	Vo	Central Maine Power (AVANGRID)	Guest
Shelby	Walters	Howard Industries	Guest
Bruce	Webb	Knoxville Utilities Board	Guest
Alan	Wilks	Consultant	Guest

C.3 Old Business

- No old business was discussed

C.4 New Business

- Phil Hopkinson brought forth a talking point regarding classification of various types of transformers. He noted that he was working with NEMA to establish new transformer classifications.
 - o Proposal was:
 - Class 1 Distribution transformer 2500 kVA and below

- Class 2 Distribution transformer larger
- o Ed Smith instructed Phil to gather his data and we could look into establishing a task force.

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:

Role	First Name	Last Name	Company
Guest	Nabi	Almeida	Prolec GE USA LLC
Guest	Glenn	Andersen	Fayetteville PWC
Guest	Gregory	Ante	Southern California Edison
Guest	Edmundo	Arevalo	Bonneville Power Administration
Member	Javier	Arteaga	Hitachi ABB Power Grids
Guest	Hugo	Avila	Hitachi ABB Power Grids
Member	Donald	Ayers	Ayers Transformer Consulting
Guest	Suresh	Babanna	SPX Transformer Solutions, Inc.
Guest	Gilles	Bargone	FISO Technologies Inc.
Member	Israel	Barrientos	Prolec GE
Guest	Jared	Bates	Oncor Electric Delivery
Guest	Olle	Benzler	Megger
Guest	Jean-Noel	Berube	Rugged Monitoring Inc.
Guest	Kevin	Biggie	Weidmann Electrical Technology
Guest	Piotr	Blaszczyk	Specialty Transformer Components LLC
Guest	William	Boettger	Boettger Transformer Consulting LLC
Guest	Sanket	Bolar	Megger
Guest	Dominique	Bolliger, Ph.D.	HV TECHNOLOGIES, Inc.
Guest	Jeffrey	Britton	Phenix Technologies, Inc.
Member	Darren	Brown	Howard Industries
Member	John	Chisholm	IFD Corporation
Member	Rhett	Chrysler	ERMCO
Guest	Bobby	Clift	Xcel Energy
Member	Craig	Colopy	EATON Corporation
Member	John	Crouse	Roswell Alliance
Guest	Jorge	Cruz	PTI Transformers
Member	Thomas	Dauzat	General Electric
Guest	Scott	Dennis	Hitachi ABB Power Grids
Guest	Eric	Doak	D4EnergySolutions LLC
Guest	Lee	Doyle	Vaisala
Guest	Hakim	Dulac	Qualitrol Company LLC
Guest	Samraghi	Dutta Roy	Siemens Energy
Guest	William	Elliott	Prolec GE
Guest	Reto	Fausch	RF Solutions
Member	Roger	Fenton	Fenton Solutions
Guest	Paul Gabriel	Florida	Howard Industries, Inc.
Guest	George	Frimpong	Hitachi ABB Power Grids
Guest	Benjamin	Garcia	Southern California Edison
Member	James	Gardner	SPX Transformer Solutions, Inc.
Member	Carlos	Gaytan	Prolec GE

Member	Ali	Ghafourian	H-J Enterprises, Inc.
Guest	Rob	Ghosh	General Electric
Guest	Zoran	Goncin	PTI Transformers
Guest	Luis	Gonzalez	Conduct Industries Limited
Guest	James	Graham	Weidmann Electrical Technology
Guest	Attila	Gyore	M&I Materials Ltd
Member	Said	Hachichi	Hydro-Quebec
Guest	Kendrick	Hamilton	Power Partners, Inc.
Guest	Didier	Hamoir	Transformer Protector Corp
Guest	Kenneth	Hampton	Baltimore Gas & Electric
Member	Michael	Hardin	H-J Enterprises, Inc.
Guest	Kyle	Heiden	EATON Corporation
Guest	Giovanni	Hernandez	Virginia Transformers Corporation
Guest	Sergio	Hernandez Cano	Hammond Power Solutions
Member	Gary	Hoffman	Advanced Power Technologies
Guest	Ryan	Hogg	Bureau of Reclamation
Guest	David	Holland	ExxonMobil
Member	Philip	Hopkinson	HVOLT Inc.
Guest	Ramadan	Issack	American Electric Power
Guest	Kristin	James	Eaton
Member	John	John	Virginia Transformer Corp.
Guest	Jon	Karas	SDMyers, LLC.
Member	Gael	Kennedy	GR Kennedy & Associates LLC
Member	Gary	King	Howard Industries
Guest	Brad	Kittrell	Consolidated Edison Co. of NY
Member	Brian	Klaponski	Carte International Inc.
Guest	John	Lackey	PowerNex Associates Inc.
Guest	Andrew	Larison	Hitachi ABB Power Grids
Guest	Moonhee	Lee	Hammond Power Solutions
Guest	Aleksandr	Levin	Weidmann Electrical Technology
Member	Weijun	Li	Braintree Electric Light Dept.
Guest	Christopher	Lianides	Southern California Edison
Guest	Colby	Lovins	Federal Pacific Transformer
Guest	Tiffany	Lucas	SPX Transformer Solutions, Inc.
Member	Alejandro	Macias	CenterPoint Energy
Member	Tim-Felix	Mai	Siemens Energy
Guest	Jinesh	Malde	M&I Materials Inc.
Guest	Darrell	Mangubat	Siemens Power Operations Inc.
Guest	Richard	Marek	Retired
Member	Lee	Matthews	Howard Industries
Guest	James	McBride	JMX Services, Inc.
Guest	Thomas	Melle	HIGHVOLT
Member	Kent	Miller	T&R Electric Supply Co.

Member	Rhea	Montpool	Schneider Electric
Member	Daniel	Mulkey	Mulkey Engineering Inc.
Vice-Chair	Jerry	Murphy	Reedy Creek Energy Services
Guest	Ali	Naderian	Metsco
Member	Dwight	Parkinson	EATON Corporation
Guest	Chris	Pitts	Howard Industries
Guest	Alvaro	Portillo	Ing. Alvaro Portillo
Guest	Chris	Powell	Intermountain Electronics
Member	Jarrold	Prince	ERMCO
Guest	Lesther Alex	Quispe Cuadrado	EATON Corporation
Member	Ion	Radu	Hitachi ABB Power Grids
Guest	Kevin	Rapp	Cargill, Inc.
Guest	Jimmy	Rasco	Rasco Consulting LLC
Member	Martin	Rave	ComEd
Guest	Samuel	Reed	EATON Corporation
Guest	Leopoldo	Rodriguez	Transformer Testing Services LLC
Guest	Maresh	Sampat	EMS Consulting Inc.
Guest	Albert	Sanchez	Knoxville Utilities Board
Member	Daniel	Sauer	EATON Corporation
Guest	Alan	Sbravati	Cargill, Inc.
Guest	Stefan	Schindler	Maschinenfabrik Reinhausen
Guest	Jeffrey	Schneider	Power Partners/Spire Power Solutions
Guest	Dan	Schwartz	Quality Switch, Inc.
Guest	Pugal	Selvaraj	Virginia Transformer Corp.
Guest	Jaber	Shalabi	VanTran Industries, Inc.
Guest	Samuel	Sharpless	Rimkus Consulting Group
Member	Hemchandra	Shertukde	University of Hartford
Guest	Avijit	Shingari	Pepco Holdings Inc.
Guest	Kunal	Shukla	PECO Energy Company
Member	Audrey	Siebert-Timmer	IFD Corporation
Member	Adrian	Silgardo	IFD Corporation
Chair	Edward	Smith	H-J Family of Companies
Guest	Adam	Smith	Commonwealth Associates, Inc.
Member	Steven	Snyder	Hitachi ABB Power Grids
Guest	Markus	Soeller	Power Diagnostix
Guest	James	Spaulding	Fort Collins Utilities
Guest	Markus	Stank	Maschinenfabrik Reinhausen
Guest	David	Stankes	3M
Member	Janusz	Szczecowski	Maschinenfabrik Reinhausen
Guest	Marc	Taylor	Cogent Power Inc.
Guest	Dervis	Tekin	Meramec Instrument Transformer Co.
Member	Vijay	Tendulkar	Power Distribution, Inc. (PDI)
Guest	Michael	Thibault	Pacific Gas & Electric

Member	Timothy	Tillery	Howard Industries
Member	Alan	Traut	Howard Industries
Guest	Parag	Upadhyay	ABB Inc.
Member	Jeremy	Van Horn	IFD Corporation
Guest	Jacques	Vanier	Electro Composites (2008) ULC
Guest	John	Vartanian	National Grid
Secretary	Joshua	Verdell	ERMCO
Member	Rogerio	Verdolin	Verdolin Solutions Inc.
Guest	Duy	Vo	Central Maine Power (AVANGRID)
Guest	Pragnesh	Vyas	Sunbelt-Solomon Solutions
Member	Sukhdev	Walia	New Energy Power Co.
Guest	Shelby	Walters	Howard Industries
Guest	Evanne	Wang	DuPont
Guest	Alan	Washburn	Burns & McDonnell
Member	Bruce	Webb	Knoxville Utilities Board
Guest	Leon	White	H2scan
Guest	William	Whitehead	Siemens Energy
Member	Alan	Wilks	Consultant
Guest	Trenton	Williams	Advanced Power Technologies
Member	Baitun	Yang	R.E. Uptegraff
Member	Joshua	Yun	Virginia Transformer Corporation
Guest	Malia	Zaman	IEEE
Guest	Anand	Zanwar	Siemens Energy
Guest	Michael	Zarnowski	Carte International

Annex D Dry Type Transformers Subcommittee

May 28, 2021

Virtual Meeting

Chair: Casey Ballard

Vice-Chair: Vacant

Secretary: David Stankes

D.1 Introductions, Chairs Remarks and Approval of Agenda and Minutes

The Dry-type Transformers Subcommittee (DTS) met virtually on May 28, 2020 at 12:55 PM (CST).

No individual introductions were made, but Chair reminded participants to announce one's name and affiliation prior to speaking at this virtual meeting.

The Chair displayed the proposed agenda containing some minor modifications compared to the copy that had been previously sent to the group. (Attendance and Quorum moved to later in schedule, addition of WG report on Terminology C57.12.80, addition of LV standards from NEMA in Old Business.)

The meeting was convened with 54 people in attendance. Chair was not aware of any changes in the membership of the DTS since the last meeting. 26 of the 31 members of the DTS were present, so quorum was reached. Twelve guests requested membership. Qualifications for those requesting membership will be reviewed by the Chair and Secretary. Notification e-mails will be sent to those who meet membership requirements. It was requested that new members confirm their interest in becoming members as final step before being added to the roster. The attendance roster will be recorded in the AMS.

Motions to entertain the approval of the Agenda and the Fall 2020 DTSC Meeting minutes was proposed by Chair. Both Agenda (Motion to Approve – Joe Tedesco, 2nd - Tim-Felix Mai) and Fall 2020 minutes (Motion to Approve - Colby Lovins, 2nd – Vijay Tendulkar) were unanimously approved.

Chair noted that WG and TF meeting chairs have done a good job of reviewing IEEE copyright and patent policies as part of their meetings. Chair reminded the SC that the copyright policies for sharing documents also extends to NEMA and IEC documents.

Chair encouraged the continued use of virtual meetings in addition to the Fall and Spring meetings to help projects finish on time. Reminded SC that an invitation with meeting agenda should be sent out at least 2 weeks prior to the meeting using AMS system. Invitations/agenda may also be posted on the IEEE website with assistance from Sue McNelly. Virtual meeting attendance should be recorded in AMS and meeting minutes should be made available. Please send these to both Casey Ballard and Dave Stankes so they can be included in the next meeting record submittal. A question was raised regarding how business can be conducted if a quorum at these virtual meetings is not attained. Chair commented that although binding votes may not be possible, progress can still be made. The possibility of forming smaller membership Task Forces was proposed, with TF charged with coming up with specific proposals that could be submitted to larger Working Group. Meeting platforms such as iMeet and Webex accounts are available, and Malia Zaman can help facilitate the use of these tools. Although any communication platform is acceptable, it was acknowledged that a common platform used by all may help facilitate improve productivity.

In an effort to promote diversity, equity, and inclusion the Chair requested the use of Chair and Vice Chair in meeting minutes as a replacement to previously used Chairman and Vice Chairman.

Chair informed SC that a PAR extension must be approved by both the Working Group and the DTS before it is submitted. The meeting minutes must record the details of the approval process (person who made the motion, 2nd, etc.)

Chair noted that it is very easy for a guest to request WG membership, especially during virtual meetings. He asked that before a new member is added that the requestor confirm their intent with WG Chair to actively participate in the WG activity.

Chair reminded SC that attendance must be included as part of the WG/TF meeting minutes, and that Name, affiliation, and status (Member or Guest) be included as part of this record. Members are asked to update their affiliation in AMS as needed, and to identify their current affiliation (in Chat for virtual meeting) if they are aware that their affiliation in AMS is not correct. It was requested that people log into virtual meetings with their full name as it makes it easier for Chair to record attendance.

Meeting minutes should include key discussions as well as detailed records of any motion proposals. Minutes do not need to include the names of all individuals who contribute to the discussions.

Attendees who participate in the attendance poll (virtual meetings) are to be recorded as attending meeting regardless of length of time person is logged in at meeting.

There was comment regarding attendance poll not recording attendance properly (2 individuals experienced this problem). Chair recommended reporting this problem to Bruce F. as part of post meeting review questionnaire that should be sent out in the next few weeks.

D.2 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.2.1 Revision of IEEE PC57.12.01 - Dry Type General Requirements Chair Casey Ballard

The virtual meeting on 4/26/21 was called to order at 12:55 PM CT by Chair Casey Ballard.

Chair made opening comments.

This is the first meeting of the new TF to prepare PAR request for the next round of IEEE C57.12.01 continuous revision.

The meeting was convened with 35 participants, 21 requested and granted membership. The list of attendees is presented at the end of this report. The attendance will be reported in the AMS.

Chairman requested patent disclosure, no patent claims were made. IEEE Copyright policy has been reviewed and understood.

There was no ability to approve the Agenda for the first meeting as there were no existing members.

Old Business

None.

New Business

- WG reviewed PAR: Title, Scope and Purpose.
- **Title** – proposed to be same as IEEE C57.12.01-2020 :

“Draft Standard for General Requirements for Dry-Type Distribution and Power Transformers”.

It was asked whether differences between distribution and power transformers exist and shall be addressed (similar as in liquid-filled transformers as for the dielectric tests, etc.). Chair answered that this standard covers both power and distribution transformers, but doesn't differentiate between them so far and is limited to 72 kV voltage class with no limit in kVA. This topic can be discussed in more details in a work of upcoming WG.

- **Scope** – proposed to be same as IEEE C57.12.01-2020:

“This standard describes electrical and mechanical requirements of single and polyphase ventilated, non-ventilated, and sealed dry-type distribution and power transformers or autotransformers, with a voltage of 601 V or higher in the highest voltage winding. This standard applies to all dry-type transformers, including those with solid-cast and/or resin encapsulated windings except as follows:

- o Instrument transformers
- o Step- and induction-voltage regulators
- o Arc-furnace transformers
- o Rectifier transformers
- o Specialty and general-purpose transformers
- o Mine transformers
- o Testing transformers
- o Welding transformers”

NOTE—Where IEEE standards do not exist for the transformers mentioned above or for other special transformers, this standard may be applicable as a whole or in parts subject to agreement between the parties responsible for the application and for the design of the transformer.

- While NEMA and UL cover general purpose transformers of 600 V and below voltage, customers often referencing to C57.12.01 in their specification on such transformers. Dave thought that, as NEMA didn't show much interest in maintaining standards related to such transformers, maybe it would be appropriate to expand application of C57.12.01 to transformers below 600 V.

- It was noted that we have just removed these voltages classes from the standard (1.2 kV is the lowest class which would cover 601-1200 V and referred to NEMA in the introduction for 600 V and below).

- NEMA ST20 is sufficient and it would be no value to expand C57.12.01 to include these transformers.

- At the Spring 21 AdCom meeting, NEMA announced they are going to expand their efforts on standards development to broaden their portfolio of transformer standards and asked IEEE members to participate. There is no reason to maintain similar standards (same scope) that will require constant synchronization. Maybe by moving the reference and clarification on NEMA to the body of C57.12.01 will cover what we need.

- Confusion is between 600 V and 690 V that are of close voltage, but don't belong to the same voltage class.

- Changes of voltages would require revision of our PAR and Dry-Type SC shall be consulted. As there is TF's interest in this topic, it will be discussed in the SC meeting (**ACTION**).

- **Scope exceptions.**

- If we decide to expand down to 120 V, the exclusion of general purpose transformers shall be removed.

- Group also discussed definition of rectifier transformers and decided that drive and inverter transformers shall be specifically mentioned in the exclusion from the standard for clarity. Tim-Felix (as liaison to C57.12.80) checked the definition of rectifier transformers and found that neither drive, nor inverter transformers are defined in C57.12.80.

- We shall propose definitions for drive and inverter transformers to C57.12.80 before excluding them from C57.12.01 – V. Tendulkar will propose these definitions (**ACTION**). As this also related to PAR, Chair will discuss with Dry-Type SC (**ACTION**). It was noted that all changes (if any) shall be synchronized with C57.12.91.

- One more time a disagreement was expressed with expanding the scope as we could create more confusion than improvement. There are many applications for small general-purpose transformers. NEMA and UL have more information on such transformers that IEEE doesn't have – enclosures, safety, protection, etc.

- **Scope Note (part of the Scope).**

The Note already allows to use C57.12.01 information for the group of transformers that aren't covered by IEEE standards or have a special application, in case of agreement between users and manufacturers.

At the end of the discussion, Chair concluded that we are not ready to present a PAR for approval and will request the SC to continue as TF until next Fall 2021 meeting.

WG will meet in Fall and will plan for the intermediate meeting sometime at the end of the Summer 2021. The Purpose of the Standard was not discussed.

- Chair also presented a list of potential new topics from the previous revision and the balloting process for discussion during this revision cycle and asked TF to provide additional topics of interest to include in that list. The topics included:
 - Solid cast pole mounted transformers
 - Environmental Requirements
 - Thermal Shock
 - Salt Fog
 - Fire Performance
 - Online tap changers
 - Thermal calculations for short circuit – any updates from IEC?
 - 100kV class equipment
 - Impulse levels pending Dielectric Test SC report
 - Differentiation of Power vs Distribution transformers (like liquid filled)
 - Average Ambient Temperature harmonization with IEC
 - Remove the short circuit current limitation of 25 times
 - Include 50Hz requirements wherever 60Hz currently appears in the document
 - Synchronization with new C57.12.91 test names. Consider negative impulse to match IEC.
 - Transient voltage protection technology for dry-type transformers, i.e. special accessories and their applications

With no further business, the meeting was adjourned at 2:10 PM CT.

Chair: Casey Ballard
Secretary: Sasha Levin

Meeting Participants List

First Name	Last Name	Company
Charles	Johnson	Hitachi ABB Power Grids
Mohammad	Iman	MGM Transformer Company
Derek	Foster	Magnetics Design, LLC
Vijay	Tendulkar	Power Distribution, Inc. (PDI)
Robert	Ballard	DuPont
Aleksandr	Levin	Weidmann Electrical Technology
Shawn	Nunn	Hitachi ABB Power Grids
Rob	Ghosh	General Electric
John	John	Virginia Transformer Corp.
Aniruddha	Narawane	Power Distribution, Inc. (PDI)
Kerwin	Stretch	Siemens Energy
Larry	Rebman	EMLS, Inc.
Solomon	Chiang	The Gund Company
David	Walker	MGM Transformer Company
Tim-Felix	Mai	Siemens Energy
Rhea	Montpool	Schneider Electric
William	Whitehead	Siemens Energy
	Andrade	
Juan Pablo	Medina	Olsun Electrics Corporation
Feras	Fattal	Manitoba Hydro
Stephen	Antosz Jr.	Siemens Industry
Ken	Klein	Grand Power Systems
Caroline	Peterson	Xcel Energy
Joseph	Tedesco	Hitachi ABB Power Grids

Dervis	Tekin Hernandez	Meramec Instrument Transformer Co.
Sergio	Cano	Hammond Power Solutions
Colby	Lovins	Federal Pacific Transformer
Brian	Sonnenberg	Instrument Transformers, LLC
Justin	Shrewsbury	AMR PEMCO
Moonhee	Lee	Hammond Power Solutions
Joaquin	Martinez	Siemens Energy
Manish	Saraf	Hammond Power Solutions
Chris	Powell	Intermountain Electronics
Jeremy	Johnson	Intermountain Electronics
Giovanni	Hernandez	Virginia Transformers Corporation
Muhammad	Sohail	Trench Limited

D.3.2 Revision of IEEE PC57.12.91 - Standard Test Code

Chair David Walker

The Working Group met virtual on 4/27/21 via WEBEX. The meeting was called to order at 3:45 PM by Chair David Walker.

Chair made opening comments.

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.

Poll for membership:

- 22 total participants
- 18 guests requesting membership
- 4 guest

As this was the first meeting of the TF, a quorum was established.

As the vice chair is acting as secretary the chair was asking for a volunteer to be the new secretary: Rhea Montpool volunteered

The agenda was approved unanimously without discussion.

The chair presented the information on Patent Disclosures and asked the group to report any relevant patent issues – None were communicated.

Old Business

- Ballot process:
 - o 161 comments
 - o Editorial changes
 - Temperature rise test
 - Excitation Losses and current

New Business:

- **PAR Review**
Proposed Scope should match C57.12.01. As there have been discussion the change the scope of C57.12.01 Casey pointed out that there will be a discussion tomorrow in the SC. New scope will be shared in the next meeting.
- **Topics for Consideration in new revision**
 - o **Temperature rise test**
 - Update exponents used in eqns. 25, 26, 27 and 42 (baes on Hammond data)
 - Define “free from drafts”
 - AF Testing – Shut off fans or leave on

- o **Metering phase angle correction like C57.12.90**
- o **Add Scott-T figure**
- o **Impulse Test**
 - Change to match C57.12.90 (rFCCFFF waves, min-nominal-max taps)
 - Change to negative polarity to match IEC dry and IEEE liquid. This must be aligned with C57.12.01 and test levels must be adjusted.
 - Define QC with rF like C57.12.90 section 10.4.2.1 Method 1
- o **Short Circuit Test**
Match with C57.12.90
- o **Distribution and Power same / different**
- o **Environmental**
Fire / climatic / environmental
- o **AFWF Testing WF? WF/XX?**

With no further business, the meeting was adjourned, without objection, at 5:00 PM.

The Task Force will meet again at the Fall 2021 meeting in Milwaukee, Wisconsin, October 17-21.

Chair: David Walker

Vice Chair: Tim-Felix Mai (acting as Secretary)

Participation list:

First Name	Last Name	Company
William	Boettger	Boettger Transformer Consulting LLC
Charles	Johnson	Hitachi ABB Power Grids
Derek	Foster	Magnetics Design, LLC
David	Stankes	3M
Vijay	Tendulkar	Power Distribution, Inc. (PDI)
Robert	Ballard	DuPont
Shawn	Nunn	Hitachi ABB Power Grids
Aniruddha	Narawane	Power Distribution, Inc. (PDI)
Kerwin	Stretch	Siemens Energy
Kerwin	Stretch	Siemens Energy
David	Walker	MGM Transformer Company
Tim-Felix	Mai	Siemens Energy
Rhea	Montpool	Schneider Electric
Ken	Klein	Grand Power Systems
Caroline	Peterson	Xcel Energy
Joseph	Tedesco	Hitachi ABB Power Grids
Sergio	Hernandez Cano	Hammond Power Solutions
Colby	Lovins	Federal Pacific Transformer
Brian	Sonnenberg	Instrument Transformers, LLC
Justin	Shrewsbury	AMR PEMCO
Moonhee	Lee	Hammond Power Solutions
Manish	Saraf	Hammond Power Solutions
Chris	Powell	Intermountain Electronics
Olle	Benzler	Megger

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 April 26, 2021, 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 a welcome and opening remarks.
- The WG Chair, Art Del Rio, did a call for potentially essential patents. None was reported.

2. Verification of Quorum

- The attendance was checked with a Poll.
- There were a total of 25 participants: 9 Members and 16 Guests out of which 1 guest requested membership.
- 10 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 April 23, 2021 by email, was presented to the participants.
- There were no objections but one comment to change October to April. With that change, the agenda was approved unanimously.

3. Approval of the minutes of the October 19, 2020, virtual meeting

- The minutes from the F20 virtual meeting, which were circulated on April 23, 2021 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 within the Liaison with a joint TF that has been started together with the Switchgear Committee and the Transformers Committee.
- The Annexes are considered to be good in general and only a cleanup should be performed, e.g. correct formulas, figures, labels, etc.
- We should aim for Ballot this summer.

4.a Annex B - Dry-type air-core shunt capacitor reactors. Update on TF from Switchgear Committee

- Dave Caverly presented the latest draft.
- Explanation added that it is often advantageous to locate the current limiting reactor at the source side of the breaker in order to enable the use of a breaker with lower current breaking capability.
- Mike Sharp has provided text regarding mechanical short circuit test. It might not be necessary to have it in this annex since it is present in the main part of the standard.

4.b Annex B1 – Informative. Supplementary to Annex B

- Dave Caverly presented the latest draft.
- The annex is now quite unsynched with IEC but with the latest changes it will be more synched again.
- Explanation is added that frequency and rate of rise are not critical to SF6 or vacuum breakers.

- Pierre Riffon pointed out that the peak current due to switching of adjacent banks are often smaller than the peak system fault current.
- Shankar Subramany pointed out that the inrush frequency must be considered. For capacitive banks it can often be over 3 kHz.
- Risks for mechanical resonances should be considered.
- The shunt capacitor reactor does normally have a quite low BIL level. Some kind of overvoltage protection, e.g. a MOV across the reactor. Is normally needed. This should be reflected in the Figure Y and in the text.
- Dave Caverly will do the updates with support by Pierre Riffon.

4.c Annex F - System considerations, TRV section update; feedback from Switchgear Committee

- Dave Caverly presented the latest draft.
- There is a request from the Switchgear Committee that we should add HF models of the reactors. Mike Sharp has added a section regarding this. The reactor should be modeled as a PI model. The capacitance to ground or mounting height should be provided by the end user since the reactor manufacturer does often not know the mounting height of the reactor. The models should be created for the frequency range of a few kHz.

5. Additional meeting

- Chair Art Del Rio will call for a supplementary Teams meeting on Monday May 10 to finalize Annex B, B-1 discussion as time run short. All WG members and guests will be invited.

5. New Business

- There were no new business.

6. Adjournment

- The meeting was adjourned at 10:35 AM.

Respectfully submitted,

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

Secretary: Ulf Radbrandt (ulf.radbrandt@ieee.org)

Attendance list and membership status.

Role	First Name	Last Name	Company
Guest	Edmundo	Arevalo	Bonneville Power Administration
Member	David	Caverly	Trench Limited
Chair	J. Arturo	Del Rio	Siemens Energy
Guest	Thomas	Falkenburger	Coil Innovation USA, Inc.
Member	Alexander	Gaun	Coil Innovation GMBH
Guest	Andrea	Glynn	Xcel Energy
Guest	Jeremy	Johnson	Intermountain Electronics
Guest	Christopher	Lianides	Southern California Edison

Member	William	Munn	Southern Company Services
Guest	Martin	Munoz Molina	Orto de Mexico
Guest	Aniruddha	Narawane	Power Distribution, Inc. (PDI)
Guest	Paulette	Payne-Powell	Retired
Guest	Caroline	Peterson	Xcel Energy
Member	Sylvain	Plante	Hydro-Quebec
Member	Klaus	Pointner	Trench Austria GmbH
Guest	Chris	Powell	Intermountain Electronics
Secretary	Ulf	Radbrandt	Hitachi ABB Power Grids
Guest	Juan	Ramirez	CELECO
Guest	Eduardo	Ramirez Bettoni	Xcel Energy
Member	Pierre	Riffon	Pierre Riffon Consultant Inc.
Guest	Patrick	Rock	American Transmission Co.
Member	Devki	Sharma	Entergy
Member	Michael	Sharp	Trench Limited
Guest	Adam	Smith	Commonwealth Associates, Inc.
Guest	Shankar	Subramany	KEMA Labs

D.3.4 IEEE PC57.124 – Dry Type Partial Discharge Guide Chair**Tom Prevost**

WG Dry Type Transformers PD Testing
PC.57.124
Virtual Meeting
April 27, 2021
8:00 am CT (9:00 am EST)

Co-Chairman: Tom Prevost

Co-Chairman: Rick Marek

Secretary: Hemchandra Shertukde

Meeting was called to order at 9:00 am with agenda displayed by Chair.

Membership poll started at 9:03 am. Poll results:

Members 9/22

We have 22 members of this WG so no quorum was achieved at this time. The chair decided to continue the meeting by presenting the patent policy. No one responded to the request for essential patents.

The chair then presented the copyright policy. There was no comments or questions regarding the copyright policy.

AS there was not a quorum, the chair presented the proposed agenda and asked for comments. There were no comments, so the chair followed the agenda as distributed before the meeting.

Agenda:

- Welcome & Chairs Remarks
- Introduction of Attendees
- Quorum
- Approval of minutes from Fall, 2020
- Approval of Agenda
- Call for patents
- Review of copyright policy
- Review of Scope & Purpose
- Task Force Reports
 - Normative and References, Definitions etc. – Casey Ballard, Chair
 - PD detection Systems and Test Procedure – Detlev Gross, Chair
 - Annexes – Raja Kuppuswamy, Chair
 - Bibliography – Joe Tedesco, Chair
- New Business
- Adjourn

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. IEC 60270 is being revised so there is some coordination involved which Detlev is taking care of.

TF 3 - Annexes - Raja Kuppuswamy
Raja was not present for this meeting. Due to a change in employment it is likely that he will not be able to continue as a member of this working group. Hemchandra Shertukde will take over this task force.

TF 4 Bibliography Joe Tedesco

At 9:47 another membership poll was taken. The results were as follows:

12 members present out of 22. A quorum was achieved.

A motion to approve the agenda was made by Casey Ballard and seconded by Detlev Gross. The motion passed with unanimous approval.

A motion to approve the minutes from the Fall 2020 meeting was made by Detlev Gross and seconded by Tim Felix. The motion passed with unanimous approval.

A motion to request a two year PAR extension was made by Casey Ballard and seconded by Detlev Gross. The motion passed with unanimous approval.

New Business:

The following motion was presented by Detlev Gross and seconded by Hemchandra Shertukde....

Motion: To follow the format of PC57.113 for the PC57.124 document noting the difference between liquid-immersed transformers in a tank and dry type transformers either in or without an enclosure with the intention of having the first draft ready for the Fall 2021 WG meeting. This includes the main body and annexes.

The motion passed with unanimous approval.

Meeting adjourned at 10:15 am

Next meeting: October 19, 2021 Milwaukee, Wisconsin

Annex 1 Membership Report

Last Name	First Name	Affiliation	Membership Status
Prevost	Thomas	Weidmann Electrical Technology	Chair
Marck	Richard	Retired	Vice-Chair
Shertukde	Hemchandra	University of Hartford	Secretary
Ballard	Robert	DuPont	Member
Bolliger, Ph.D.	Dominique	HV TECHNOLOGIES, Inc.	Member
Burle	Jagdish	Virginia Transformer Corp	Member
Cawley	David	Trench Limited	Member
Goulkhah	Monty	Kinectrics	Member
Gromlonts	Mark	EMC OEM Products Division	Member
Gross	Detlev	Power Diagnostix	Member
Hopkinson	Philip	HVOLT Inc.	Member
Iman	Mohammad	MGM Transformer Company	Member
Kraetge	Alexander	OMICRON electronics Deutschland G	Member
Kuppuswamy	Raja	Dynamic Ratings, Inc.	Member
Larochelle	David	NDB Technologies	Member
Larzeler	William	Evergreen High Voltage	Member
Mai	Tim-Felix	Siemens Energy	Member
Morales-Cruz	Emilio	Qualitrol Company LLC	Member
Szczechowski	Janusz	Maschinenfabrik Reinhausen	Member
Tedesco	Joseph	Hitachi ABB Power Grids	Member
Walker	David	MGM Transformer Company	Member
Wicks	Roger	DuPont	Member
Andrade Medina	Juan Pablo	Olsun Electric Corporation	Guest
Antosz Jr.	Stephen	Siemens Industry	Guest
Attard	Jason	Consolidated Edison Co. of NY	Guest
Barnes	Jeff	Norplex-Micarta	Guest
Benzler	Olle	Megger	Guest
Bereza	Emil	Power Diagnostix	Guest
Blaszczyk	Piotr	Specialty Transformer Components LL	Guest
Bolliger	Alain	HV TECHNOLOGIES, Inc.	Guest
Brinkman	Steve	Cindus Corp.	Guest
Britton	Jeffrey	Phenix Technologies, Inc.	Guest
Brown	Chris	Tempel	Guest
Brouetti	Robert	Doble Engineering Co.	Guest
Bush	Carl	AMR PEMCO	Guest
Chiang	Solomon	The Gund Company	Guest
Chorzepa	Jaroslaw	ABB Inc.	Guest
Cumella	Arthur	NWL Transformers	Guest
Di Biasi	Antonio	Tempel	Guest
Dua	Yogesh	Quality Transformers & Electronics	Guest
Etheridge	James	Kinectrics	Guest
Euvard	Eric	RHM International	Guest
Fausch	Reto	RF Solutions	Guest
Ferreira	Marcos	Beale AFB	Guest
Ford	Gary	PowerNex Associates, Inc.	Guest
Foster	Derek	Magnetics Design, LLC	Guest
Fyrer	Bob	DuPont	Guest
Gara	Lorne	Shermco	Guest
Garneau	Jean	Essex Wire	Guest
Gian	Alexander	Carl Innovation GMBH	Guest
Ghosh	Rob	GE	Guest
Golarz	Jeffrey	PJ Associates	Guest
Gonzalez Ceballos	Jose Antonio	Meramec Instrument Transformer Co.	Guest
Goydich	Shane	Roehling	Guest
Haas	Michael	Instrument Transformers, LLC	Guest
Hammer	Mark	Jordan Transformer	Guest
Henry	Jeffrey	Mapes & Sprowl	Guest
Hernandez	Ronald	Doble Engineering Co.	Guest
Hernandez Cano	Sergio	Hammond Power Solutions	Guest
Hinze	Aaron	American Electric Power	Guest
Hochstetler	Thang	Surplex Inc.	Guest
Holdaway	Timothy	Retired	Guest
Huang	Chenglin	Power Monitoring & Diagnostic Techn	Guest
Johnson	Charles	Hitachi ABB Power Grids	Guest
Johnson	Jeremy	Intermountain Electronics	Guest
Kittrell	Brad	Consolidated Edison Co. of NY	Guest
Klein	Ken	Grand Power Systems	Guest
Knapek	William	OMICRON electronics Corp USA	Guest
Knapp	Catherine	Cogent Power Inc.	Guest
Lau	Michael	Self Employed	Guest
Lee	Moanhee	Hammond Power Solutions	Guest
Li	Jianming	Sichuan Electric Power Research Inst	Guest
Lively	Patty	Tempel	Guest
Lopes	Ricardo	Elacac Energia, SA	Guest
Lovins	Colby	Federal Pacific Transformer	Guest
Lu	John	Shanghai Huaming Power Equipment	Guest
Martinez	Joaquin	Siemens Energy	Guest
Martinez	Rogelio	Georgia Transformer	Guest
Mattison	Trevor	Schweitzer Engineering Labs	Guest
Mayne	Thomas	Mayne Consultants	Guest
McKinney	Kenneth	UL LLC	Guest
Meton	Therence	METLAB Research Inc.	Guest
Middleton	Robert	RHM International	Guest
Nabi-Bidhendi	Hosseini	ABB Inc.	Guest
Naderian	Ali	Metsco	Guest
Nguyen	Nam Tran	ABB Inc.	Guest
Nunn	Shawn	Hitachi ABB Power Grids	Guest
Ohanian	Vahe	UNION Partners LLC	Guest
Ojeda	Sam	LumaSense Technologies	Guest
Owen	John	Powertech Labs Inc.	Guest
Papp	Klaus	Klaus Papp	Guest
Patel	Dhiru	Retired	Guest
Patil	Ankita	Olsun Electric Corporation	Guest
Pepe	Harry	Phenix Technologies, Inc.	Guest
Pierate	Nicolas	Hydro-Quebec IREQ	Guest
Pointner	Klaus	Trench Austria GmbH	Guest
Powell	Chris	Intermountain Electronics	Guest
Rasor	Robert	SDMyers, LLC.	Guest
Raymond	Mark	UL LLC	Guest
Reiss IV	Clemens	Custom Materials, Inc.	Guest
Rico	Anthony	FirstEnergy Corp.	Guest
Roizman	Oleg	IntelPower Pty Ltd	Guest
Russwurm	Dirk	DTM Instruments, LLC	Guest
Saraf	Manish	Hammond Power Solutions	Guest
Sarkar	Subhas	Retired	Guest
Scarborough	Mark	DuPont	Guest
Schram	Bruce	Acme Electric	Guest
Schwartz	Dan	Quality Switch, Inc.	Guest
Schwarz	Carl	Phoenix Electric Corporation	Guest
Selvaraj	Pugazhenth	Virginia Transformer Corp.	Guest
Sexton	Aron	Kinectrics	Guest
Shawli	Masoud	Siemens Gamesa Renewable Energy	Guest
Sharp	Michael	Trench Limited	Guest
Shin	Jane	Consolidated Edison Co. of NY	Guest
Simons	Andre	Cogent Power Inc.	Guest
Som	Sanjib	Pennsylvania Transformer	Guest
Song	Y. C.	JSHF Transformer	Guest
Sonnenberg	Brian	Instrument Transformers, LLC	Guest
Splawak	Erin	IEEE	Guest
Stacy	Fabian	Hitachi ABB Power Grids	Guest
Stankes	David	3M	Guest
Stretch	Kenwin	Siemens Energy	Guest
Subramany	Shankar	KEEMA Labs	Guest
Sun	Yunhan	Shenyang Transformer Research Instit	Guest
Tabakovic	Dragan	Hubbell Power Systems	Guest
Taylor	Marc	Cogent Power Inc.	Guest
Tendulkar	Vijay	Power Distribution, Inc. (PDI)	Guest
Thomas	Thomas	-	Guest
Tozzi	Marco	Camlin Power	Guest
Vaagensmith	Bjorn	Idaho National Laboratory	Guest
Vanier	Jacques	Electro Composites (2008) ULC	Guest
Viereck	Karsten	Maschinenfabrik Reinhausen	Guest
Whipple	Bradley	Idaho National Laboratory	Guest
Whitehead	William	Siemens Energy	Guest
Zaman	Maha	IEEE	Guest

Tom Prevost made a motion at the SC meeting requesting approval “for the Chair of the WG to request a 2 year PAR extension for C57.124”. The motion was seconded by Tim-Felix Mai. With no further discussion received regarding this motion, the Chair asked if there was any objection to unanimous approval of the motion. Hearing none, the motion was approved unanimously with no abstentions.

D.3.5 IEEE PC57.12.52 – WG for Sealed Dry-Type

Chair Joe Tedesco

The Working Group met virtually on 4/26/21 over Webex. The meeting was called to order at 10:45 AM CDT by Chairman Joseph Tedesco.

Patent call was given. Nobody responded to the patent call. Copyright policy info was shown.

Membership List was shown, and a poll was taken to determine attendance. Poll Results were:
Members- 8, Guests-10, Guests requesting membership- 2.
8/10 members were present, so there was a quorum.

David Walker moved to accept the minutes and agenda as written, Chuck Johnson seconded. 7 of 8 members approved.
Agenda and minutes are approved

Old Business:

Joe Tedesco reviewed the changes in the redlined draft that was sent out.

Sections 5.1 and 5.2. Section 5.1 – changed to refer to C57.12.01 definitions of maximum hot spot temperatures rather than defining within this standard. 5.2- included a list of preferred ratings. Other ratings are not prevented on being used. Manish Saraf asked why there was a note about voltages being delta unless otherwise indicated. Joe Tedesco said that it was a holdover from the previous version. David Walker suggested that Note 1 be removed. Chuck Johnson agreed and suggested removing “Voltage Rating” from the section title. Roger Wicks commented that 5.1 needed more detail on “insulation system” maybe “limiting insulation system” to match C57.12.60. David Walker moved that Note 1 of Section 5.2 be deleted. Chuck Johnson seconded. No opposition so Note 1 will be deleted. Chuck Johnson moved that that Section 5.1 “limiting system” be replaced by “limiting insulation system” Colby Lovins seconded. No opposition so motion accepted.

Sections 5.3, 5.4, and 5.5- 5.3, 5.4, and 5.5 modified to say that they were to be in accordance with C57.12.01 rather than a detailed specification in this standard for taps, insulation level, and angular displacement. No discussion about these changes. In the absence of opposition to the changes they will be retained and become part of the next draft version.

Sections 5.6 and 6.1- Section 5.6 on impedance voltages now refers to C57.12.01 rather than have details in C57.12.52. Manish Saraf suggested that having standard impedances might be useful. Joe Tedesco reminded the group that this discussion happened in the C27.12.01 meeting and it was decided there to remove standard impedances. Chuck Johnson said that impedance is always a customer prerogative. Shawn Nunn said that C57.12.51 had had the same discussion and removed the table. Chuck Johnson and Casey Ballard both were OK as is. David Walker suggested that sections that only refer to C57.12.01 be removed. Casey Ballard felt that removing statements that just referred to C57.12.01 was OK. Chuck Johnson felt that duplicated information in standards created potential conflict as version changed. Casey Ballard agreed. David Walker moved that we accept the redlined version as written. Chuck Johnson seconded. Alex Macias said that they have a standard table for their customers. Roger Wicks asked how many units are new versus replacement? Alex Macias asked about impedance tolerances. David Walker pointed out that C57.12.01 contains the tolerances. Manish Saraf suggested that the title match C57.12.01 as “Impedance”. David Walker amended the motion to include changing the title. Alex Macias said the C57.12.01 used the term “impedance rating”. David Walker amended the amended motion to change the title of 5.6 to “Impedance” and the text to “The Impedance rating” shall be in accordance with C57.12.01.

Section 6.1- Dave Stankes asked about the term “limiting temperature”. Chuck Johnson said that was the terminology used in C57.12.01. David Walker asked how this is different than in C57.12.01. It is the same as C57.12.01 according to Chuck Johnson. Chuck Johnson suggested that there should be a reference to C57.12.01 but perhaps refer to a specific part of C57.12.01. Casey Ballard suggest that a reader needs to be familiar to C57.12.01. David Walker said that 5.1 has all the information in 6.1 and 6.1 may not be necessary. Chuck John suggested that 6.1 be left as is and just refer to C57.12.01. Chuck Johnson moved that we change 6.1 read “The insulation system of the transformer shall be suitable for operation at the specified limiting temperature in accordance with C57.12.01”. Colby Lovins seconded. Manish Safar asked if the word

“winding” should be included. After discussion, it was determined that “winding” wasn’t needed. Motion passed unanimously.

Alex Macias asked if there were interim meetings planned. Joe Tedesco said that none were currently planned. David Walker suggested an interim before the next bi-annual meeting would be useful to help meet the desire to has a revision balloted before the expiration of the current version. Joe Tedesco will investigate how to hold an interim meeting.

Chuck Johnson and others mentioned that they did not get the redlined draft in email. Joe Tedesco will investigate it.

Joe Tedesco adjourned the meeting at 12:06 pm CDT.

The Working Group will meet again in Fall 2021, unless there is an interim meeting before that.

Chairman: Joseph Tedesco

Secretary: David Walker

Attendance List

Subgroup Name	Role	First Name	Last Name	Company	10/19/2020	4/26/2021
C57.12.52	Guest	Dieter	Wagner	Hydro One		X
C57.12.52	Member	Charles	Johnson	Hitachi ABB Power Grids	X	X
C57.12.52	Guest	Roger	Wicks	DuPont		X
C57.12.52	Guest	Derek	Foster	Magnetics Design, LLC		X
C57.12.52	Member	David	Stankes	3M	X	X
C57.12.52	Guest	Clemens	Reiss IV	Custom Materials, Inc.		X
C57.12.52	Member	Robert	Ballard	DuPont	X	X
C57.12.52	Member	Shawn	Nunn	Hitachi ABB Power Grids	X	
C57.12.52	Guest	Alejandro	Macias	CenterPoint Energy		X
C57.12.52	Guest	Aniruddha	Narawane	Power Distribution, Inc. (PDI)		X
C57.12.52	Guest	Kenneth	Harden	Schneider Electric	X	
C57.12.52	Secretary	David	Walker	MGM Transformer Company	X	X
C57.12.52	Member	Tim-Felix	Mai	Siemens Energy	X	X
C57.12.52	Member	Juan Pablo	Andrade Medina	Olsun Electrics Corporation	X	X
C57.12.52	Guest	Ken	Klein	Grand Power Systems		X
C57.12.52	Chair	Joseph	Tedesco	Hitachi ABB Power Grids	X	X
C57.12.52	Member	Sergio	Hernandez Cano	Hammond Power Solutions	X	
C57.12.52	Member	Colby	Lovins	Federal Pacific Transformer	X	X
C57.12.52	Guest	Justin	Shrewsbury	AMR PEMCO		X
C57.12.52	Guest	Manish	Saraf	Hammond Power Solutions		X
C57.12.52	Member	Chris	Powell	Intermountain Electronics	X	X
C57.12.52	Guest	Jeremy	Johnson	Intermountain Electronics	X	X
C57.12.52	Guest	Kyle	Knous	EATON Corporation	X	
C57.12.52	Guest	Adam	Smith	Commonwealth Associates, Inc.	X	
C57.12.52	Guest	Hossein	Nabi-Bidhendi	ABB Inc.		X
C57.12.52	Guest	Giovanni	Hernandez	Virginia Transformers Corporation		X

Note: Names and company affiliations are those listed in AMS as of April 27, 2021.

D.3.6 IEEE 259 – Low Voltage Thermal Aging Chair David Stankes

Chair: David Stankes

Secretary: Joseph Tedesco

This was the first meeting of the IEEE 259 Working Group; the PAR having been approved by RevCom on December 3, 2020 meant that the work of the preceding task force was finished. The meeting was held virtually via Webex and David Stankes called the meeting to order at 3:45 PM.

The patent slides were shown, and the copyright policy was discussed. There were no essential patent claims.

There were 30 people present in the meeting. Of those that voted in the poll, 6 people identified as members, 11 people identified as guests requesting membership, and there were 10 guests. Three did not answer and were recorded as guests. Because this was the first meeting, there was no quorum, and everyone requesting membership would become a member.

A motion to approve the agenda was made by Casey Ballard and seconded by Tim-Felix Mai. There was unanimous approval of the motion. Dave asked if there were any concerns about the minutes from the Fall 2020 Task Force meeting; there were five members of the Task Force present, but none had complaints. The minutes were approved unanimously.

Old Business:

- Because this was the first Working Group meeting, there was no old business.

New Business:

- A brief overview of the background of the standard was provided.
 - It hadn't been revised in over 30 years, and it was decided that it would just be withdrawn due to lack of use before it was realized that it was referenced in C57.12.60.
 - The decision was made to revive the standard and to make a serious effort to do a good job revising it and bringing it up to date.
- The title, scope, and purpose from the PAR and highlighted some of the key points of the existing version of the standard.
- There was a short discussion regarding sample type because both full size coils and representative model coils would be allowed, and the names from C57.12.60 would be used. If the test samples used as full-size transformer coils, then extreme care must be taken to ensure that 259 does not end up identified as a transformer standard but remains an EIS standard. The group was then reminded that whoever works on the sections regarding test samples and methods must include verbiage to reinforce that this is an EIS standard.
- A comparison was shown between the Table of Contents of the current version of 259 and a "standard" EIS test method. He stated that there's a lot of good material in the standard, especially considering this is a 30-year old standard. The overall testing and its purpose were described.
- There was mention that the requirements of IEEE 259 are different from other aging standards. The stresses in 259 are higher than in UL 1446, so it's possible that an insulation system qualified under UL 1446 might not pass the tests in 259. Furthermore, an insulation system in 259 is meant to be compared to a reference system, while an insulation system aged C57.12.60 does not necessarily have to have a reference. IEEE 259 is for comparison to a known system.
- There was then a discussion about the reference systems. The question was asked that if no one has used 259 for years, what if a company doesn't have a reference insulation system? The question was asked whether the standard would dictate a reference insulation system, or whether it would be unique to each company? The response was that the job of the working group is to share best practices with the industry and offer suggestions, not to dictate. The key would be to make the guidance useful without opening the standard to abuse. The working group should provide guidance on samples and determining a reference insulation system.
- The group was also reminded that we would need to ensure that there are minimum life requirements for the reference insulation system.
- An outline of the improvements that would be needed to 259 was outlined:
 - appropriate terminology
 - definitions
 - the relationship to UL 1446

- o the screening test (similar to the screening test in C57.12.60)
 - o flow chart for the test order
 - o updated recommended temperature tables
- The current draft of 259 was shown, which led to questions regarding which transformers would 259 apply and whether the definition of applications in the scope needed to be so specific? The suggestion was made that the definition be expanded to go beyond transformers. The group was reminded that 259 was meant to be an insulation system standard, which prompted the statement that, while that was true, the two were certainly related, because the insulation system would be used in a particular type of equipment, so the insulation system would need to be suitable for that equipment.
- The development plan was announced. The work would be split up into a series of task forces covering the major sections and appendices. Volunteers were solicited to develop different sections of the standard as individual task forces. Several attendees volunteered to work on the various sections.
- There was an inquiry regarding whether the meetings would be held at a different time, because this time conflicted with other working groups, and that is possible.
- A question was asked if a draft would be circulated, and it would be.
- There was a request for anyone who was interested in being Secretary to contact the Chair.

The date of the next meeting will be no later than the Fall 2021 meeting on either October 18 or October 19, 2021. It is possible that there could be a meeting prior to the Fall meeting, but that decision was not final. The Fall meeting will either be in Milwaukee, Wisconsin or will be held virtually.

The meeting was adjourned at 5:01 PM CDT.

Attendance List

Role	First Name	Last Name	Company
Member	Robert	Ballard	DuPont
Guest	Olle	Benzler	Megger
Member	Piotr	Blaszczyk	Specialty Transformer Components LLC
Member	Solomon	Chiang	The Gund Company
Guest	Feras	Fattal	Manitoba Hydro
Member	Derek	Foster	Magnetics Design, LLC
Guest	Rob	Ghosh	GE
Guest	Sergio	Hernandez Cano	Hammond Power Solutions
Member	John	Herron	Raytech USA
Member	Charles	Johnson	Hitachi ABB Power Grids
Guest	Ken	Klein	Grand Power Systems
Member	Moonhee	Lee	Hammond Power Solutions
Member	Aleksandr	Levin	Weidmann Electrical Technology
Member	Colby	Lovins	Federal Pacific Transformer
Member	Tim-Felix	Mai	Siemens Energy
Guest	Joaquin	Martinez	Siemens Energy
Member	Aniruddha	Narawane	Power Distribution, Inc. (PDI)

Guest	Chris	Powell	Intermountain Electronics
Member	Manish	Saraf	Hammond Power Solutions
Guest	Markus	Soeller	Power Diagnostix
Guest	Brian	Sonnenberg	Instrument Transformers, LLC
Chair	David	Stankes	3M
Guest	Radoslaw	Szewczyk	Specialty Products Poland Sp. z o.o.
Secretary	Joseph	Tedesco	Hitachi ABB Power Grids
Guest	Dervis	Tekin	Meramec Instrument Transformer Co.
Member	Vijay	Tendulkar	Eaton
Member	Edward	Van Vooren	ELTEK International Laboratories
Guest	Peter	Werelius	Megger
Member	Roger	Wicks	DuPont
Guest	Malia	Zaman	IEEE

D.3.7 IEEE C57.134 Chair Colby Lovins

The working group met via webex on 4/26/21.

The meeting was called to order at 2:20 PM by Chair Colby Lovins.

Chair made opening comments.

The meeting was convened with 24 participants, 4 requesting membership , 14 members and 5 guests. 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

- PAR being reviewed, still a task force but seems like good to go to be a WG on the next meeting.
- Reviewing changes on title and scope discussed on the last meeting with no additional comments.
- Text removed from existing purpose was discussed. Chair questioned if it made sense to move that text to the excerpt on the introduction, since it seems like with different words, the same idea is already written there. The group agreed to add the deleted text into the introduction.
- Same text being proposed to be added to section 1.3. A. Levin motions to add the entire excerpt text to section 1.3. J Tedesco second. Motion was approved. Amendment to change the title of section 1.3 as well. Many friendly amendments later the group agreed to a new title for section 1.3.

New Business

- Discussion regarding section 4.
 - o Motion by C. Johnson to remove resistance bridges from the list. Vijae second. Motion is approved. Vijay motion to remove Temp labels and infrared temp detectors as well. C. Johnson seconds. Motion is approved.
 - o Discussion about splitting sensor category into two sections, Internal and Surface Sensors.
 - o Recommendations to check Annex D on C57.12.60 to see text applies to this std as well as C57.165.

Attendees:

Last Name	Frist Name	Company	Role
Andrade Medina	Juan Pablo	Olsun Electrics Corporation	Secretary
Ballard	Robert	DuPont	Member
Rezael-Zare	Afshin	York University	Guest
Foster	Derek	Magnetics Design, LLC	Guest
Stretch	Kerwin	Siemens	Guest
Saraf	Manish		Guest
Johnson	Charles	Hitachi ABB Power Grids	Member
Payne-Powell	Paulette	Retired	Guest
Klein	Ken	Grand Power Systems	Member
Lee	Moonhee	Hammond Power Solutions	Member
S. Levin	Aleksandr	Weidmann Electrical Technology	Member
Marek	Richard	Retired	Guest
Lovins	Colby	Federal Pacific Transformer	Chair
McTaggart	Ross	Trench Limited	Guest
Martinez	Joaquin	Siemens Energy	Guest
Chiang	Solomon	The Gund Company	Guest
Nunn	Shawn	Hitachi ABB Power Grids	Member
Powell	Chris	Intermountain Electronics	Member
Mai	Tim-Felix	Siemens Energy	Member
Stankes	David	3M	Member
Tedesco	Joseph	Hitachi ABB Power Grids	Member
Tendulkar	Vijay	Power Distribution, Inc. (PDI)	Member
Wicks	Roger	DuPont	Member
Vinay	Patel	Consolidated Edison Co. of NY	Guest

With no further business, the meeting was adjourned at 3:35 PM. WG will plan to meet again at Fall Transformer Committee meeting.

Chair: Colby Lovins

Secretary: Juan Pablo Medina

- Meeting called to order on Tuesday April 27 at 12:55pm 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.
- The chair presented the information on the IEEE Copyright – No question, comments, or concerns were raised.
- The PAR for C57.96 was approved, and the TF is now transitioned to a Working Group.
- A poll to establish a quorum was taken based on previous participation. 15 task force members were present out of 26 previous attendees thus a quorum was achieved.
- The chair shared the agenda with the membership and Casey made a motion to accept the WG agenda as shown. The motion was seconded by Vijay and passed unanimously without discussion.
- A poll was conducted to establish membership in the new Working Group. As this is the first meeting for the WG any guest requesting membership is automatically approved. Results as follows –
 - o 15 members (carried over from TF)
 - o 5 guests
 - o 12 guests requesting membership
- As this was the first meeting of the TF, a quorum was established based on this poll.

- The chair presented a breakdown of the five sections to be reviewed in Draft D1 and asked for volunteers review and evaluate each section. Great support from the membership and several volunteers came forward. Results were as follows –

TF or Subgroups for review of Draft D1

	Clause to Review	Sections	Volunteer
1	Normative Reference, Definitions and Overview	2, 3, 4	Joe Tedesco, Tim-Felix Mai, Colby Lovins , Dave Stankes , Aleksandr Levin
2	Loading Equations	5	David Walker, Ryan Hoog, Manish Saraf, Justin Shrewsberry
3	Loading Based on Life Expectancy	6	Roger Wicks, Chuck Johnson
4	Annex B (Update programming to latest platform)	Annex B	Chuck Johnson
5	Annex C (Example Calculations)	Annex C	Hemchandra Shertukde

- The chair will redistribute the Draft D1 to all members and guests after the meeting.
- Draft D1 of C57.96 was shown on screen at 1:15pm and discussion was started.
 - o Section 1, Scope and Purpose based on the PAR was reviewed with no comments.
 - o Section 2, Normative References was presented
 - Comment from chair was that no changes were known but this assumption must be checked.
 - A suggestion was made to review if C57.12.56 should move to the bibliography.
 - Casey proposed that Section 2 could be reviewed in further detail after the Draft was further along in the review process.
 - o Section 3, Definitions was shown on the screen
 - Tim-Felix commented that definitions are fully covered by C57.12.80 and thus the text of this section could be replaced with a reference to 12.80
 - Casey mentioned that in the newest templates for standards this section is covered by a boilerplate that refers back to C57.12.80
 - Chair will check with IEEE (Malia) and request that the draft be upgraded to the new template.
 - o Section 4, Overview was shown
 - Vijay commented that the dates on all standards referred to should be checked. David Walker suggested that standards should be referenced in the simplest and most generic way.
 - Lengthy discussion regarding the inclusion of C57.12.56. Main topics were-
 - Casey – Generally a bad practice to address withdrawn standards such as 12.56
 - Chuck – Some users may need to be able link back to these withdrawn standards to evaluate previous qualifications.
 - Some discussion about if C57.12.56 was still available for purchase. This was checked by Joe Tedesco during the discussion and was found to still be available in IEEE Xplore

- Ryan Hoog proposed that the volunteers working on this section of the review will have a deeper look and make some proposals.
- Dave Stankes pointed out that both Section 1 and Section are titled “Overview”. This could cause some confusion but appears to be in the standard template so no action needed.
- Additional discussions on text related to Loading above Rated
 - Ryan Hoog – this topic is being heavily discussed in the DOE / Efficiency group specifically related to dual nameplates.
 - Roger Wicks – suggested to check in with the WG for the Liquid Immersed Loading guide and align where possible.
 - Joe Tedesco – Standard is more directed toward end users than manufacturers. Manufacturers must ensure that the whole system including components must be suitable for any intended overloading. Comment supported by Ryan Hoog who also mentioned that the standard is helpful for altitude correction and de-rating.
 - Several representatives of transformer manufacturers also mentioned that they rely on this document for customer discussion and as a guide for designing transformers with special overload conditions requested by some customers.
 - Chuck Johnson mentioned that the intended focus and purpose of the loading guide is the insulation system and more specifically the windings. All other accessories (tap changers, leads, etc.) should be excluded.
- Discussions of Draft D1 were stopped at 2:05pm.
- Chair asked the review volunteers connect with each other between now and the next meeting to ensure progress on the review. Additionally, the chair plans for an interim meeting of the WG with time and date to be determined.
- Vijay made a motion at 2:20pm to adjourn the meeting. Motion was seconded by Chuck and passed unanimously.

First Name	Last Name	Role	Company
Juan Pablo	Andrade Medina	Member	Olsun Electrics Corporation
Robert	Ballard	Member	DuPont
Solomon	Chiang	Guest	The Gund Company
Derek	Foster	Guest	Magnetics Design, LLC
Giovanni	Hernandez	Guest	Virginia Transformers Corporation
Ryan	Hogg	Guest	Bureau of Reclamation
Mohammad	Iman	Vice-Chair	MGM Transformer Company
John	John	Guest	Virginia Transformer Corp.
Charles	Johnson	Member	Hitachi ABB Power Grids
Ken	Klein	Member	Grand Power Systems
Moonhee	Lee	Member	Hammond Power Solutions
Aleksandr	Levin	Guest	Weidmann Electrical Technology
Colby	Lovins	Member	Federal Pacific Transformer
Tim-Felix	Mai	Member	Siemens Energy
Richard	Marek	Member	Retired
Aniruddha	Narawane	Chair	Power Distribution, Inc. (PDI)
Shawn	Nunn	Member	Hitachi ABB Power Grids
Vinay	Patel	Guest	Consolidated Edison Co. of NY
Caroline	Peterson	Guest	Xcel Energy
Chris	Powell	Member	Intermountain Electronics
Afshin	Rezaei-Zare	Guest	York University
Manish	Saraf	Guest	Hammond Power Solutions
Stefan	Schindler	Guest	Maschinenfabrik Reinhausen
Hemchandra	Shertukde	Guest	University of Hartford
Justin	Shrewsbury	Guest	AMR PEMCO
Adam	Smith	Guest	Commonwealth Associates, Inc.
Brian	Sonnenberg	Guest	Instrument Transformers, LLC
David	Stankes	Guest	3M
Kerwin	Stretch	Secretary	Siemens Energy
Radoslaw	Szewczyk	Guest	Specialty Products Poland Sp. z o.o.
Joseph	Tedesco	Member	Hitachi ABB Power Grids
Dervis	Tekin	Guest	Meramec Instrument Transformer Co.
Vijay	Tendulkar	Member	Power Distribution, Inc. (PDI)
John	Vartanian	Guest	National Grid
David	Walker	Guest	MGM Transformer Company
Roger	Wicks	Member	DuPont

Chairman: Aniruddha Narawane
Vice-Chairman: Iman Mohamed
Secretary: Kerwin Stretch

D.3.9 IEEE C57.12.80 WG Terminology Chair Tim-Felix Mai

Tim-Felix Mai provided update to the Dry Type subcommittee and asked our SC to refer to the C57.12.80 minutes posted as part of the Standards SC. He noted that he did review definitions related to Dry Type in the

12.80 document and recommended some definition changes related to Cooling Classes at the WG meeting which were accepted.

Chair and Tim-Felix Mai recommended that WG Chairs review their documents and use reference to C57.12.80 where possible to eliminate duplicate definitions.

D.3 Old Business

D.4.1 Status of Standards

Chair identified two standards that are coming up for revision soon (Revision due dates in 2025).

- IEEE C57.12.59 Guide for Dry-Type Transformer Through-Fault Current Duration
- IEEE C57.94 Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers

Chair asked for volunteers for Chair and Secretary for C57.12.59. Paulette Payne-Powell who lead previous revision effort offered her assistance, but may be limited in the amount of help she may be able to offer for this revision.

Dave Stankes and Juan Medina offered to lead TF for C57.94 as Chair and Vice Chair respectively. Tim-Felix Mai offered to serve as Secretary.

D4.2 NEMA Low Voltage (LV) Standards

Chair informed the SC that the NEMA update would be provided in writing to the SC. Update is as follows:

NEMA has decided that they are not interested in transferring the copyright of their LV dry-type transformer standards, including ST20, to IEEE. They have changed their process from the previous documents they transferred now called IEEE C57.12.50, IEEE 57.12.51, IEEE C57.12.52, and ANSI C57.12.55 and others. Instead NEMA is interested in opening up participation into their standards development beyond OEMs which are paying members. Jonathan Steward from NEMA made a presentation to the Administrative Committee prior to the Spring 21 meetings and delivered that message. No details were provided on the procedures for revision of existing documents nor the creation of new standards would be organized between NEMA and IEEE. As more details are available the Chair will share them with the Dry-Type Subcommittee.

D.4 New Business

Chair will be sending out poll to the Subcommittee members prior to our fall meeting asking for comments related to suggested topics to be covered in the next revisions of C57.12.01 and C57.12.91. Chair will also provide some background regarding these standards related to the poll request.

A question was made by a Joe Tedesco on whether C57.12.55 should be opened again, as this was brought up in previous SC meeting. The Chair agreed to add this question to the same poll that will be circulated regarding the 12.01 and 12.91 topics.

With no further business, the meeting was adjourned at 2:12 PM.

Chairman: Casey Ballard

Vice Chairman: Open

Secretary: David Stankes

Attendees of April 29, 2021 Dry-type Transformer Subcommittee Meeting

Role	First Name	Last Name	Company
Guest	Mubarak	Abbas	Siemens Industry
Member	Juan Pablo	Andrade Medina	Olsun Electrics Corporation
Chair	Robert	Ballard	DuPont
Guest	William	Boettger	Boettger Transformer Consulting LLC
Guest	David	Caverly	Trench Limited
Member	Solomon	Chiang	The Gund Company
Member	J. Arturo	Del Rio	Siemens Energy
Member	Derek	Foster	Magnetics Design, LLC
Guest	Alexander	Gaun	Coil Innovation GMBH
Guest	Rob	Ghosh	General Electric
Guest	Detlev	Gross	Power Diagnostix
Guest	Michael	Haas	Instrument Transformers, LLC
Guest	Giovanni	Hernandez	Virginia Transformers Corporation
Guest	Sergio	Hernandez Cano	Hammond Power Solutions
Guest	Mihai	Huzmezan	Power Diagnostix
Member	Mohammad	Iman	MGM Transformer Company
Guest	Ramadan	Issack	American Electric Power
Member	John	John	Virginia Transformer Corp.
Member	Charles	Johnson	Hitachi ABB Power Grids
Member	Ken	Klein	Grand Power Systems
Member	Moonhee	Lee	Hammond Power Solutions
Member	Aleksandr	Levin	Weidmann Electrical Technology
Member	Colby	Lovins	Federal Pacific Transformer
Guest	Alejandro	Macias	CenterPoint Energy
Member	Tim-Felix	Mai	Siemens Energy
Member	Richard	Marek	Retired
Member	Rhea	Montpool	Schneider Electric
Guest	Hossein	Nabi-Bidhendi	ABB Inc.
Guest	Shawn	Nunn	Hitachi ABB Power Grids
Member	Paulette	Payne-Powell	Retired
Guest	Caroline	Peterson	Xcel Energy
Member	Klaus	Pointner	Trench Austria GmbH
Guest	Chris	Powell	Intermountain Electronics
Member	Thomas	Prevost	Weidmann Electrical Technology
Guest	Ulf	Radbrandt	Hitachi ABB Power Grids

Guest	Afshin	Rezaei-Zare	York University
Guest	Manish	Saraf	Hammond Power Solutions
Guest	Hamid	Sharifnia	Consultant
Member	Michael	Sharp	Trench Limited
Guest	Hemchandra	Shertukde	University of Hartford
Guest	Avijit	Shingari	Pepco Holdings Inc.
Member	Justin	Shrewsbury	AMR PEMCO
Guest	Adam	Smith	Commonwealth Associates, Inc.
Guest	Markus	Soeller	Power Diagnostix
Guest	Brian	Sonnenberg	Instrument Transformers, LLC
Secretary	David	Stankes	3M
Guest	Kerwin	Stretch	Siemens Energy
Member	Joseph	Tedesco	Hitachi ABB Power Grids
Guest	Dervis	Tekin	Meramec Instrument Transformer Co.
Member	Vijay	Tendulkar	Power Distribution, Inc. (PDI)
Guest	Parag	Upadhyay	ABB Inc.
Member	David	Walker	MGM Transformer Company
Member	Roger	Wicks	DuPont
Guest	Malia	Zaman	IEEE

Annex E HVDC Converter Transformers and Smoothing Reactors Subcommittee

April 26, 2021, 3.45 pm Central Time USA
Virtual Webex meeting

Chair: Ulf Radbrandt (ulf.radbrandt@hitachi-powergrids.com)
Vice Chair: Les Recksiedler (absent)
Secretary: Klaus Pointner (klaus.pointner@ieee.org)

E.1 Introduction / Attendance

Introductions were made and the attendance was checked by a poll.

There was a total of 24 persons in the meeting, 8 members and 16 guests present. 4 new requests for membership were received. Qualification for membership in the SC will be verified by the SC Chair.

Membership:

Short Name	Member ID	First Name	Last Name	Company Name	Role
HVDC		9 Leslie	R	M	Vice-Chair
HVDC		12 Michael	S	Ti	Member
HVDC		9 Christoph	P	H	Member
HVDC		12 Peter	H	V	Member
HVDC		11 Klaus	P	Ti	Secretary
HVDC		11 Pierre	R	P	Member
HVDC		15 Waldemar	Z	P	Member
HVDC		13 Eric	D	B	Member
HVDC		15 Rogerio	V	V	Member
HVDC		10 Ulf	R	H	Chair
HVDC		14 David	C	Ti	Member
HVDC		9 John	Jr	V	Member
HVDC		13 Solomon	C	Ti	Member
HVDC		12 Alexander	G	C	Member

Answers	Results	%
A Member	8/24	33
B Guest	10/24	42
C Guest requesting membership	4/24	17
No Answer	2/24	8

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 April 14, was presented. The agenda was unanimously approved.

The list of all attendees of the meeting is shown here:

First Name	Last Name	Company	Role
Ulf	Radbrandt	Hitachi ABB Power Grids	Chair
Klaus	Pointner	Trench Austria GmbH	Secretary
David	Caverly	Trench Limited	Member
Eric	Davis	Burns & McDonnell	Member

Alexander	Gaun	Coil Innovation GMBH	Member
Christoph	Ploetner	Hitachi ABB Power Grids	Member
Pierre	Riffon	Pierre Riffon Consultant Inc.	Member
Michael	Sharp	Trench Limited	Member
Waldemar	Ziomek	PTI Transformers	Member
Robert	Berland	Kiewit Power Engineers	Guest
Thomas	Blackburn	Gene Blackburn Engineering	Guest
William	Boettger	Boettger Transformer Consulting LLC	Guest
Steven	Brzoznowski	Bonneville Power Administration	Guest
Domenico	Corsi	Doble Engineering Co.	Guest
Daniela	Ember Baci	Hydro-Quebec - Laboratoire Haute Tension	Guest
Thomas	Falkenburger	Coil Innovation USA, Inc.	Guest
Feras	Fattal	Manitoba Hydro	Guest
Kurt	Kaineder	Siemens Energy	Guest
Dennis	Marlow	DenMar TDS Transformers	Guest
Sylvain	Plante	Hydro-Quebec	Guest
Alvaro	Portillo	Ing. Alvaro Portillo	Guest
Adnan	Rashid	Measurement Canada / ISED	Guest
Afshin	Rezaei-Zare	York University	Guest
Hemchandra	Shertukde	University of Hartford	Guest

E.2 Approval of the minutes of the October 19, 2020 virtual meeting

The minutes from the virtual Fall 20 meeting, that was distributed via email April 14, 2021 were presented and then unanimously approved.

E.3 Brief report on the meeting of the Administrative SC by Ulf Radbrandt

Proposal of the new name of the SC has been presented to the Administrative SC. However, the name must be approved by the Transformers Committee (TC) members by a vote – this will probably happen at the Thursday closing session.

Proposal of the new scope was also presented, but needs be confirmed by the TC members as well. The Administrative SC recommended to coordinate with the Dry Type SC regarding converter reactors as well as with the Performance Characteristics SC regarding Shunt Reactors (C57.21). The HVDC SC Chair

does currently not see any overlap and action required. The reason is that we already have coordinated with the Dry Type SC so that we include converter reactors, in IEEE 1277, that are located at the converter arms (with DC current) and Dry Type SC, in C57.16, include converter reactors that are located in series with the AC bus (without DC current). We don't need to coordinate with the Performance Characteristics SC since converter reactors never are shunt connected .

E.4 Name of this Subcommittee

As discussed at the Fall 2020 meeting the name of the SC shall be amended to:

TRANSFORMERS AND REACTORS FOR HVDC APPLICATIONS SUBCOMMITTEE

to also include converter reactors, which are included in IEEE 1277, Dry-Type and Oil-Immersed Smoothing Reactors and Dry-Type Converter Reactors

This item was also discussed at the Administrative SC meeting on April 20 and needs to be agreed by the Transformer Committee by a poll on Thursday – The Chair will make a motion at the closing session to initiate a voting.

E.5 Scope of this Subcommittee

The proposed update of the scope as discussed at the April 20, 2021 Administrative SC meeting is:

- Studying and reviewing engineering aspects of the requirements, design, testing, and installation of HVDC converter transformers, smoothing reactors and converter reactors. Only converter reactors for dc transmission located at the converter arms are dealt with;
- Developing and maintaining related standards, recommended practices, and guides for such product;
- Coordinating with other technical committees, groups, societies, and

Chris Ploetner questioned if it is required to limit ourselves by mentioning the converter reactors – if a new equipment comes up, then another revision might be required. The SC Chair stated that the change is in line with the information in the currently published standards of the SC.

Dave Caverly questioned, if cross reference to the C57.16 and vice versa shall be made. Klaus Pointner explained that the references are made in the relevant standards, thus no further clarification required.

Pierre Riffon made a motion, seconded by Hemchandra Shertuke to vote on:

- *Studying and reviewing engineering aspects of the requirements, design, testing, and installation of HVDC converter transformers, smoothing reactors and converter reactors. Only converter reactors for dc transmission located at the converter arms are included.*

After a short discussion a second proposal was brought on the floor.

- *Studying and reviewing engineering aspects of the requirements, design, testing, and installation of HVDC converter transformers, smoothing reactors and converter reactors. Only converter reactors for dc transmission located at the converter arms are dealt with herein.*

Pierre Riffon withdrew his initial motion and made motion to vote on the two alternatives: A - ending with “included”; B – ending with “dealt with herein”.

Result of the online poll:

	Answers	Results	%
A	variant - "Included"	7/27	26
B	variant - "dealt with herein"	2/27	7
C	Abstain	1/27	4
	No Answer	17/27	63

The SC Chair will forward this proposal again to Bruce Forsyth for vote at the closing session. The Chair also mentioned that this change might impact the scope of the Transformers Committee, as the HVDC Converter Transformers and Smoothing Reactors (without the Converter Reactors) are mentioned in the TC scope as well.

E.6 HVDC Tutorial

Two tutorials are approved:

Part 1 (the second tutorial in the agenda for Thursday) will be at this Spring 21 meeting.

Scope:

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	10	Ulf Radbrandt
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	Carsten Bartzsch
Different types of topologies 1/2 Bridge, Full Bridge, Hybrids, DC breakers	15	Carsten Bartzsch
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	

Unfortunately, Les Recksiedler is on sick leave for this meeting. Therefore, his part is split between Carsten and Ulf. Four alignment meeting have been held prior the tutorial. Tutorial material is in a good shape and a good presentation is expected by the SC Chair

Part 2 will be held at the Fall 21 meeting (Milwaukee)

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	10	

E.7 Working Group Reports

Currently no active working group.

E.8 Secretary of this Subcommittee

After the Fall 2020 meeting, Klaus Pointner has volunteered to act as the Secretary for the Subcommittee.

E.9 Future Work of this Subcommittee

As there is currently no active WG, question about possible tasks has been raised by the SC Chair. Waldemar Ziomek proposed to wait until the first tutorial if some topics are coming up by the attendees. All members and guests are welcome to raise topics in this context. Input may be dropped any time after the meeting to the SC Chair or the SC Secretary.

E.10 Old Business

There was no old business

E.11 New Business

There is no new business

E.12 Adjournment

The meeting was adjourned at 4:27 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 at the time of the meeting and roles in the ITSC.

First Name	Last Name	Company/Affiliation	Role
Dinu	Amarasinghe	Bruce Power	Guest
Gregory	Ante	Southern California Edison	Guest
Edmundo	Arevalo	Bonneville Power Administration	Guest
Allan	Bartek	Spruce Run Engineering LLC	Guest
Mats	Bernesjo	Hitachi ABB Power Grids	Guest
Jean-Noel	Berube	Rugged Monitoring Inc.	Guest
Lee	Bigham	Instrument Transformer Equip Corp	Member
Sanket	Bolar	Megger	Guest
Jeffrey	Britton	Phenix Technologies, Inc.	Guest
Steven	Brzoznowski	Bonneville Power Administration	Guest
Jaroslav	Chorzepa	ABB Inc.	Guest
Michael	Craven	Phoenix Engineering Services	Guest
Juan Carlos	Cruz Valdes	Prolec GE	Guest
Rolando	Demes	Arteche	Member
Brandon	Dent	Memphis Light, Gas & Water	Guest
Huan	Dinh	Hitachi ABB Power Grids	Member
David	Ellis	PSEG	Guest
Eric	Euvrard	RHM International	Member
Feras	Fattal	Manitoba Hydro	Guest

Reto	Fausch	RF Solutions	Guest
Lorne	Gara	Shermco	Guest
Ali	Ghafourian	H-J Enterprises, Inc.	Guest
Rob	Ghosh	General Electric	Guest
Michael	Haas	Instrument Transformers, LLC	Guest
Michael	Hardin	H-J Enterprises, Inc.	Guest
Ryan	Hogg	Bureau of Reclamation	Guest
Ramadan	Issack	American Electric Power	Guest
William	Knappek	OMICRON electronics Corp USA	Guest
Ivan	Konta	KONCAR - Instrument Transformers	Member
Marek	Kornowski	Polycast International	Member
John	Kotula	Dominion Energy	Guest
Christopher	Lianides	Southern California Edison	Guest
Colby	Lovins	Federal Pacific Transformer	Guest
Nigel	Macdonald	Trench Limited	Secretary
Rebecca	Manderfield	Xcel Energy	Guest
Lee	Matthews	Howard Industries	Guest
James	McBride	JMX Services, Inc.	Guest
Scott	McCloskey	Amran Inc.	Member
Matthew	McFadden	Oncor Electric Delivery	Guest
Ross	McTaggart	Trench Limited	Member
Robert	Middleton	RHM International	Member
Slobodan	Misur	Trench Limited	Guest
Paul	Morakinyo	PSEG	Guest
Randolph	Mullikin	ABB Inc.	Guest

Hossein	Nabi-Bidhendi	ABB Inc.	Guest
Frank	Neder	Trench Germany GmbH	Guest
Rudolf	Ogajanov	ABB Inc.	Member
Ron	Pate	ABB Inc.	Guest
Dipakkumar	Patel	Instrument Transformer Equip Corp	Guest
Caroline	Peterson	Xcel Energy	Guest
Sylvain	Plante	Hydro-Quebec	Guest
Adnan	Rashid	Measurement Canada / ISED	Member
Pierre	Riffon	Pierre Riffon Consultant Inc.	Member
Diego	Robalino	Megger	Member
Patrick	Rock	American Transmission Co.	Member
Zoltan	Roman	GE Grid Solutions	Member
Andre	Rottenbacher	Ritz Instrument Transformers	Member
Daniel	Sauer	EATON Corporation	Guest
Devki	Sharma	Entergy	Guest
Kunal	Shukla	PECO Energy Company	Guest
Stephen	Shull	BBC Electrical Services, Inc.	Guest
Thomas	Sizemore	ABB Inc.	Chair
Adam	Smith	Commonwealth Associates, Inc.	Guest
Steven	Snyder	Hitachi ABB Power Grids	Member
Muhammad	Sohail	Trench Limited	Guest
William	Solano	Instrument Transformer Equip Corp	Guest
Brian	Sonnenberg	Instrument Transformers, LLC	Guest
Mauricio	Soto	Hitachi ABB Power Grids	Guest

Dervis	Tekin	Meramec Instrument Transformer Co.	Member
Risto	Trifunoski	Trench Limited	Guest
Kiran	Vedante	Ritz Instrument Transformers	Guest
Deniss	Villagran	GE Grid Solutions	Member
Dieter	Wagner	Hydro One	Guest
David	Wallace	Mississippi State University	Vice-Chair
Leon	White	H2scan	Guest
Barrett	Wimberly	GE Grid Solutions	Member
Mana	Yazdani	Trench Limited	Member
Joshua	Yun	Virginia Transformer Corporation	Guest
Malia	Zaman	IEEE	Guest
Igor	Ziger	KONCAR - Instrument Transformers	Member

F.2 Quorum

25 of 35 members were present quorum was attained. 45 guests were also in attendance. The total number of attendees was 80 and 14 requested membership. These requests for membership will be reviewed.

F.3 Agenda

An agenda was displayed by the chair. It was approved unanimously.

F.4 Approval of minutes – Fall 2020 meeting

Minutes were approved unanimously.

F.5 Essential Patent Claims & IEEE Copyright Policy

A slide was displayed as a reminder to all WG/TF leaders that it is necessary to display the essential patent claim and IEEE copyright policy slides.

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: 56 people attended the meeting with 23 members present. Quorum was met. 13 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. Thomas Sizemore made a motion to approve the minutes and Igor Ziger seconded the motion. The agenda was approved with no objections made.

Summary: Minutes of the Fall 2020 Virtual meeting were presented. Pierre Riffon made a motion to accept the minutes and Rudolf Ogajanov seconded the motion. The minutes were approved by the members of the working group with no objections.

Ross McTaggart provided a status update on the current revision of the draft. The group decided to send the draft to CDV.

Ross McTaggart led a discussion concerning the use of materials from other standards in the draft.

David Wallace pointed out that the PAR for the workgroup was set to expire in December. He proposed asking for an extension. The WG agreed. David will submit the request.

Discussion was held on the 60% requirement for the internal arc test. Pierre Riffon agreed to send out a CIGRE paper with relevant information on the topic for the group to review. The comment resolution performed by the JWC will be presented to the TC38 WG on May 12 for review.

It was brought to attention that Table 8 in the draft needed to be corrected. David Wallace will make the requested corrections.

Kenneth Skinger made a motion to adjourn the meeting, Rudolf Ogajanov seconded the motion. No objections were made.

Next Meeting: The WG will meet to continue work at the Fall 2021 meeting in Milwaukee, Wi.

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 Mike Craven as Secretary. The Agenda was displayed, and introductions were made.

Attendees: A poll showed that 19 members were present and that was a quorum of greater than 13 of the 24 members. There were 37 total attendees.

Essential Patent Claims: The patent notice was made and there were no patent claims. Attendees were notified of copyright rules.

IEEE Copyright Policy: Attendees were notified of copyright rules.

Agenda: A motion was made by Tom Sizemore to accept the agenda and it was seconded by Barrett Wimberly. No one opposed; it was accepted.

Minutes: A motion was made by Barrett Wimberly and was seconded by Tom Sizemore to approve the minutes for the Fall meeting of 20 October 2020. No one opposed; it was accepted.

A motion was made by Barrett Wimberly and was seconded by Tom Sizemore to approve the minutes for the electronic meeting of 30 November 2020. No one opposed; it was accepted.

Summary: Zoltan began by reviewing the almost complete status of the standard, but not everything has been added to Draft 9. Draft 10 should then be the version for balloting. A discussion of the need for a PAR extension followed and Tom said it would need to be done by about the summer. He made a motion to approve requesting an extension, the motion was seconded by Steve Snyder and Zoltan displayed the membership list. No one opposed so the application for an extension is approved.

Zoltan continued with consideration of two surveys that may need to be sent out. Capacitance ranges Table for Annex B and dielectric tests by users. The Table led to discussion about line tuner specification ranges and the names of the columns conflicting with the names of manufacturer ranges. Finally, a motion was made to “Include the capacitance range table in Annex B with the headings changed to Range 1 and Range 2 and Range 3.” Andre Rottenbacher formally made the motion and Steve Snyder seconded it. A poll of the members was taken. 16 of 19 members present accepted it and it will be included in Annex B.

There was a request to consider guidance on capacitance for PLC applications. Annex A about drain coils is now from C93.1. There was also a request for TRV capacitance guidance, but after discussion there will be no addition.

Back to “New survey questions” and the “dielectric tests by user” led to much more discussion. Barrett recalled that it involved the variance between field measurements versus nameplates. He also pointed out the users do not do full voltage tests, but typically do 10 kV power factor tests, for example. No one opposed adding this guidance and volunteers were asked to write the text. Diego Robalino and Patrick Rock volunteered.

As at other meetings there was discussion of PD levels at different capacitances and the difficulties of achieving Table 8 limits. Zoltan had a slide showing the actual PD data measuring 10 and 25 nF.

The meeting presentation and Draft 9 will be distributed.

Zoltan expects the next meeting to be the end of May to the beginning of June timeframe and after input by the ‘test by user’ group.

With a motion by Steve Snyder and a second by Patrick Rock the meeting was adjourned.

F.7.5 TF for Instrument Transformers Accuracy – Igor Ziger

Attendees: A total of 56 people attended. 23 members were present, and quorum was attained. 9 people requested membership.

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

Agenda: was displayed without any objections

Summary:

This was the fourth meeting of TF Instrument Transformer Accuracy and it was held virtually at 9:25 am Central Time as convened by chair Igor Ziger and Thomas Sizemore, serving in place of Deepak Kumaria who was unable to attend.

A presentation was given by Hossein Nabi-Bidhendi entitled “Voltage transformer errors at different burdens and power factors”, which took up most of the time. There were

discussion points throughout the presentation. The main comments will be present in the TF minutes.

I. Ziger presented and led a brief discussion about the formation of sub-task force group to investigate the effect on burdens at amperage other than 5 amps. A meeting will be planned between this meeting and the fall meeting. So far 8 people expressed interest through the chat.

The main action items are:

- I. Ziger and D. Kumaria will reach out and search for volunteers to work on a new informative annexure
- Web meetings to be scheduled to specifically cover the work done so far
- A subgroup to resolve the effect on burdens at amperage other than 5 amps will be assembled and meet in between meetings. I. Ziger and D. Kumaria will reach out to the TF body to collect other interested individuals aside from those that applied through the chat.
- I. Ziger to upload all previous materials to the IEEE server

Motion to adjourn: The meeting adjourned at 10:40 AM with no objections.

Next Meeting: The next meeting is Milwaukee, USA Fall 2021 meeting.

F.8 Old Business

No old business was displayed or discussed.

F.9 New Business

Zoltan Roman presented 3 new topics; polarity and terminal markings when multiple primary windings are provided, requirement for an autopsy after the endurance test in C57.13.5 and consideration of implementing C57.13 under a continuous revision PAR.

In C57.13 4.9.1 the text indicates that when multiple primary windings are provided that the leads or terminals shall be designated with the letter H along with pairs of associated numbers. It is not clear if connections that are not customer accessible are required to be marked in this manner or not. Considerable conversation took place, but consensus was not reached in the meeting as to the next step.

Discussion took place concerning the endurance chopped wave test as specified in C57.13.5 12.1 item C. This section indicates that "The inspection and autopsy of the complete internal insulation structure for the dismantled transformer reveal no trace of tracking or burnt mark". It was questioned if it is necessary to perform an autopsy if DGA results are satisfactory. A discussion took place primarily between Zoltan Roman, Pierre Riffon, Igor Ziger and Huan Dinh. Pierre provided an example in which an autopsy was able to find an issue in an oil filled CT which was damaged at a

capacitance tap. A majority of people speaking on this topic were in favor of not making a change at this time.

Two issues (CTs with the same dielectric requirements as circuit breakers and burden for non 5 A secondary CTs) observed in the C57.13 standard that have not yet been acted on were discussed as background information for a discussion of starting a revision to the standard using a continuous revision PAR. It was also discussed if a normal PAR should be used but then when work concludes on the next version immediately initiate another PAR which in many ways has a similar effect to a continuous revision PAR. The chair is to discuss each approach with Malia Zamen and Steve Shull. When relative merits of each approach are determined further discussion will take place with the ITSC before initiating a PAR for a new WG to be formed to revise the C57.13 standard. An online meeting or survey is likely to take place on this topic prior to the Fall meeting.

Thomas Sizemore presented a slide concerning if a Task Force should be created to start work on some of the issues that have been brought up in the C57.13 standard. No vote was taken on this topic as a WG may be formed in the coming months for revising this standard. Creation of one or more task force groups may be taken up later in support the C57.13 revision. Additionally, it will be investigated how revisions can be made by corrigendum or other means.

Adnan Rashid presented work on a DC transducer standard. The ANSI C12 committee has created a subgroup to develop a DC transducer standard which is now in the planning phase and is looking for experts to participate.

F.10 ITSC Adjournment

The meeting concluded after a motion to adjourn which was approved unanimously.

The next meeting is to be held in Milwaukee, WI, USA, Canada, in the Fall of 2021.

Annex G Insulating Fluids Subcommittee

April 28, 2021
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. The chair reminded the task force and working group chairs that a 'New Meeting' needs created in AMS and the meeting attendance needs entered under 'View Calendar.' Some of the task force have not done this for past meetings and they need to update the records so it is documented.
- c. Reminded that the SC minutes are due June 11, 2021- 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 (May 19, 2021).

G.1.2 Roll Call of SC members: (Quorum requirement: 20 minimum)

- a. 31 Members signed in, from a total of 44 members. Quorum was achieved.
- b. Total of 114 attendees. 83 Guests attended, and 16 requested membership, whose eligibility will be verified.
- c. Registered Attendance:

Gregory Ante	- Guest	Eric Doak	- Guest
Edmundo Arevalo	- Guest	Don Dorris	- Member
Elise Arnold	- Guest	Lee Doyle	- Guest
Suresh Babanna	- Guest	James Dukarm	- Member
Claude Beauchemin	- Member	Florin Faur	- Guest
Jean-Noel Berube	- Guest	Norman Field	- Guest
William Boettger	- Guest	Paul Gabriel Florida	- Guest
Joshua Bohrn	- Guest	John Foschia	- Member
Paul Boman	- Member	George Frimpong	- Guest
Mike Bonn	- Member	Rainer Frotscher	- Guest
Jeremiah Bradshaw	- Guest	James Gardner	- Guest
David Calitz	- Member	Ali Ghafourian	- Guest
Juan Carrizales	- Guest	Rob Ghosh	- Guest
Edward Casserly	- Member	Orlando Giraldo	- Guest
Juan Castellanos	- Member	James Graham	- Member
Stuart Chambers	- Member	Attila Gyore	- Member
Luiz Cheim	- Member	David Hanson	- Guest
Rhett Chrysler	- Guest	Robert Harper	- Guest
Brandon Dent	- Guest	Roger Hayes	- Member
Stephanie Denzer	- Member	Samma Hoffman	- Guest
Larry Dix	- Guest	Andrew Holden	- Guest

David Holland	- Guest	Kevin Rapp	- Guest
Derek Hollrah	- Guest	Robert Rasor	- Guest
John John	- Member	Timothy Raymond	- Guest
Toby Johnson	- Member	Scott Reed	- Chair
Kurt Kaineder	- Member	Jonathan Reimer	- Guest
Jon Karas	- Member	Clemens Reiss IV	- Guest
Gary King	- Guest	Afshin Rezaei-Zare	- Guest
Zan Kiparizoski	- Member	Diego Robalino	- Guest
Michelle Kutzleb	- Guest	Patrick Rock	- Guest
John Lackey	- Guest	Josue Rodriguez	- Guest
Donald Lamontagne	- Guest	Andre Rottenbacher	- Guest
Andrew Larison	- Guest	Mickel Saad	- Member
Christopher Lianides	- Guest	Albert Sanchez	- Guest
Nigel Macdonald	- Guest	Anil Sawant	- Guest
Alejandro Macias	- Guest	Alan Sbravati	- Secretary
Jinesh Malde	- Member	Jeffrey Schneider	- Guest
Darrell Mangubat	- Guest	Jaber Shalabi	- Guest
Kumar Mani	- Member	Hamid Sharifnia	- Guest
Balakrishnan Mani	- Guest	Stephen Shull	- Guest
Rogelio Martinez	- Guest	Igor Simonov	- Guest
Lee Matthews	- Guest	Jonathan Sinclair	- Guest
James Mciver	- Guest	Brian Sparling	- Guest
Justin Minikel	- Guest	Fabian Stacy	- Member
Hali Moleski	- Guest	Gregory Steeves	- Member
Paul Morakinyo	- Guest	James Thompson	- Guest
Jerry Murphy	- Vice-Chair	Ryan Thompson	- Member
Ashmita Niroula	- Guest	Risto Trifunoski	- Guest
Jayme Nunes, Jr	- Guest	Duy Vo	- Guest
Anastasia O'Malley	- Guest	Evanne Wang	- Guest
Parminder Panesar	- Guest	William Whitehead	- Guest
Dwight Parkinson	- Member	Christopher Whitten	- Guest
Nitesh Patel	- Guest	Roger Wicks	- Guest
Arismendis Pena	- Guest	Helena Wilhelm	- Guest
Nicholas Perjanik	- Member	Malia Zaman	- Guest
Tejasvi Prakash	- Guest	Anand Zanwar	- Guest
Thomas Prevost	- Member		

G.1.3 Agenda Approval:

- a. A motion was made by Mike Bonn and seconded by Jon Karas to approve the agenda. The agenda was approved unanimously without objection.

G.1.4 Approval of minutes from the F20 meeting (virtual):

- a. A motion was made by Mike Bonn and seconded by Luiz Cheim 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 of the 11 guides under the Sub-Committee Insulating Fluids. C57.106, C57.111, C57.121, C57.147 will be superseded by C57.166, so no activity is required at this point for these standards.
- b. C57.155 will expire in 2024. C57.637, C57.130, C57.139 will expire in 2025.
- c. C57.104 was published in November 1, 2019.

- d. C57.146, C57.162 and C57.166 have active PAR's.

G.2 WG & TF Reports Presented at the SC Meeting

G.2.1.1 IEEE C57.166 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 ~~XX~~ attendees. Of these, 29 of 36 members were present so a quorum was achieved.
- b. Call for patents was presented without any claim.
- c. Six Task Forces chairs each gave a status report of their respective sections. TF1, with Jinesh Malde, is doing a very good job and the first draft of the document will be shared within one month. The group is already interacting with Toby, for adjusting the format of the tables.
- d. TF2 is with Scott Reed. Most of the work is completed and a draft will be circulated before the F21 meeting.
- e. TF3 is with Alan Sbravati. Work is completed, and there was a discussion around the annex for transformers retrofill procedure.
- f. TF4 was canceled, as the revision of the IEEE 637 will cover the reconditioning / reclaiming procedures, based on the limits given in C57.166.
- g. TF5 is with Rainer Frotscher. The document is also almost finalized. A discussion point was around the voltage classes used in the document, as Rainer used the values from IEC. A motion was presented to have only the IEEE voltage classes used throughout the document. Rainer acknowledge that and he will implement the changes.

See **Appendix I** for the S21 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 32 attendees, but only 11 members, not getting quorum.
- b. The guide will expire by the end of this year, so the group acknowledge the guide will expire until the publication of the new version.
- c. Claude Beauchemin presented preliminary analysis of owner provided DGA data, but sources of the data are pending. The Duval triangle for silicone will be include.
- d. They are searching for case studies.

See **Appendix II** for the S21 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 118 attendees. Out of the 59 members, 35 attended the meeting, confirming quorum.

- Annex G
- b. The main discussion was around the possibility of expanding the analysis performed for the development of guide, aiming to reach a transformer assessment rather than DGA status. Discussion around the efficiency of the methods, the time between the failure and the DGA and other parameters.
 - c. Zack Draper provided a PowerPoint presentation on a methodology that could be used with transformer in-service and failure DGA data to evaluate the different industry interpretation methodologies.
 - d. Meeting was adjourned.

See **Appendix III** for the S21 Minutes (unapproved) of C57.104 TF Meeting as submitted.

G.2.1.4 TF C57.637 – Guide for the Reclamation of Mineral Insulating Oil and Criteria for Its Use

TF Chair: Stephanie Denzer

- a. Being the first meeting, they have no members for quorum verification. Scott Reed served as the secretary provisionally.
- b. The group discussed expanding the application of the guide for insulating liquids other than mineral oil. Reclamation of ester fluids will be included.
- c. Next topic was the discussion of the Title, Scope and Purpose. Motions were presented and the three items were modified accordingly.
- d. Stephanie presented a motion for the Task Force to submit a PAR and become a Working Group. The motion was seconded by Jinesh Malde. Motion was approved unanimously.

See **Appendix IV** for the S21 Minutes (unapproved) of C57.637 TF Meeting as submitted.

G.2.1.5 TF C57.155 – Guide for Interpretation of Gases Generated in Natural Ester and Synthetic Ester-Immersed Transformers

TF Chair: Alan Sbravati

- a. Being the first meeting, they have no members for quorum verification. Scott Reed served as the secretary provisionally.
- b. The group the motivations for the revision.
- c. Next topic was the discussion of the Title, Scope and Purpose. Motions were presented and the three items were modified accordingly.
- d. Alan presented a motion for the Task Force to submit a PAR and become a Working Group. The motion was seconded by Jinesh Malde. Motion was approved unanimously.

See **Appendix V** for the S21 Minutes (unapproved) of C57.155 TF Meeting as submitted.

G.2.1.6 TF C57.130 – Guide for the Use of Dissolved Gas Analysis Applied to Factory Temperature Rise Tests for the Evaluation of Mineral Oil-Immersed Transformers and Reactors

TF Chair: John Foschia

- a. Being the first meeting, they have no members for quorum verification. Scott Reed served as the secretary provisionally.
- b. The group had some discussions around the history of the standard.
- c. Next topic was the discussion of the Title, Scope and Purpose. Motions were presented to keep the items as they are currently.
- d. A friendly amendment to the title was presented by the Chair Scott Reed, which was accepted by John.
- e. A motion was presented for the submission of a PAR by John Foschia and seconded by Claude Beauchemin.
- f. A survey will be presented for verifying the availability of test results of transformers insulated with ester liquids. Depending on the availability of additional data, the title and the scope will be modified for including this information as an annex to the standard.

- g. Discussions were presented around the convenience of already adjusting the title and scope. As the group expectation is not to have sufficient data available, they preferred to keep the current verbiage and, eventually submit a request for modifying the PAR later.
- h. No objections were presented. Motion carries.

See **Appendix VI** for the S21 Minutes (unapproved) of C57.130 TF Meeting as submitted.

G.3 Old Business

- a. Rainer Frotscher volunteered for becoming the task force chair for C57.139 Guide for Dissolved Gas Analysis in Transformer Load Tap Changers.

G.4 New Business

- a. No new business

G.5 Next IFSC Meeting:

October 20, 2021 – Milwaukee, WI

G.6 Adjournment

A motion for the meeting to be adjourned was presented by Claude Beauchemin and seconded by Stuart Chambers.

The subcommittee adjourned at 3:26 p.m.

Respectively Submitted, Alan Sbravati, Secretary IFSC

Unapproved Minutes from the S19 IFSC WG and TF meetings

Appendix I

Working Group for Acceptance and Maintenance of Insulting Liquids PC57.166

**Tuesday, April 27th, 2021
12:55 – 2:10 PM (central time)
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 33 of 39 members present. There were 75 guests. A membership quorum was achieved.

Attendance list:

Juan Acosta	- Guest	Roger Hayes	- Member
Jeff Benach	- Guest	Ronald Hernandez	- Guest
Enrique Betancourt	- Guest	Saramma Hoffman	- Guest
Kevin Biggie	- Guest	Andrew Holden	- Guest
William Boettger	- Guest	David Holland	- Guest
Sanket Bolar	- Guest	Derek Holrah	- Guest
Dominique Bolliger, Ph.D.	- Member	John John	- Guest
Paul Boman	- Member	Toby Johnson	- Member
Mike Bonn	- Member	Kurt Kainerder	- Member
Jeremiah Bradshaw	- Member	Jon Karas	- Member
Erich Buchgeher	- Guest	Gael Kennedy	- Guest
Edward Casserly	- Member	Robert Kinner	- Guest
Stuart Chambers	- Member	Zan Kiparizoski	- Member
James Cross	- Guest	Peter Kleine	- Guest
Michael Dahlke	- Guest	Michelle Kutzleb	- Guest
Brandon Dent	- Guest	Donald Lamontagne	- Guest
Stephanie Denzer	- Guest	Lance Lewand	- Guest
Eric Doak	- Guest	Chao Li	- Guest
Don Dorris	- Member	Tiffany Lucas	- Guest
Zachary Draper	- Guest	Nikola Lukenda	- Member
Evgenii Ermakov	- Guest	Nigel Macdonald	- Guest
Florin Faur	- Guest	Jinesh Malde	- Member
George Frimpong	- Guest	Kumar Mani	- Member
Rainer Frotscher	- Member	Balakrishnan Mani	- Guest
Eduardo Garcia Wild	- Member	Paul Morakinyo	- Guest
James Gardner	- Member	Ali Naderian	- Guest
Rob Ghosh	- Guest	Anthony Natale	- Guest
James Graham	- Member	Brady Nesvold	- Guest
Taylor Gray	- Guest	Ashmita Niroula	- Guest
Ismail Guner	- Guest	Jayme Nunes, Jr	- Guest
Attila Gyore	- Guest	Rodrigo Ocon	- Guest
Didier Hamoir	- Guest	Anastasia O'Malley	- Guest
David Hanson	- Guest	Parminder Panesar	- Guest
Robert Harper	- Guest	Nicholas Perjanik	- Member
Thomas Hartmann	- Guest	Thomas Prevost	- Chair

John Pruente	- Guest	Jonathan Sinclair	- Member
Kevin Rapp	- Member	Gregory Steeves	- Member
Jimmy Rasco	- Guest	Paul Su	- Guest
Robert Rasor	- Member	Christopher Sullivan	- Guest
Timothy Raymond	- Member	Troy Tanaka	- Guest
Scott Reed	- Vice-Chair	Marc Taylor	- Guest
Clemens Reiss IV	- Guest	James Thompson	- Guest
Diego Robalino	- Member	Ryan Thompson	- Guest
Patrick Rock	- Member	Timothy Tillery	- Guest
Josue Rodriguez	- Guest	Risto Trifunoski	- Guest
Mickel Saad	- Member	Richard vonGemmingen	- Guest
Albert Sanchez	- Guest	Dejan Vukovic	- Guest
Lina Sandsten	- Guest	David Wallach	- Guest
Alan Sbravati	- Secretary	Evanne Wang	- Member
Pugal Selvaraj	- Member	Peter Werelius	- Guest
Jaber Shalabi	- Guest	William Whitehead	- Guest
David Sheehan	- Guest	Mana Yazdani	- Guest
Peter Sheridan	- Guest	Malia Zaman	- Guest
Igor Simonov	- Guest	Peter Zhao	- Guest

Introductions

Approval of Agenda

Approval of Fall 2020 Minutes

Call for Patents

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

Voltage Levels within Acceptance Tables- Discussion

New Business

Adjourn

The agenda of the meeting was presented by the coordinator. A motion for a approval was presented by Diego Robalino and seconded by Kumar Mani. Without objection, the agenda was unanimously approved.

A motion for a approving the minutes of meeting from F20 was presented Tim Raymond, second Kumar Mani. No comments were presented, minutes from Fall 2020 were approved unanimously.

Chairman Prevost posted the Patent Claim. No claims were made.

Chairman Prevost presented the copyright policy slides.

TF 1 – Jinesh Malde

- The task force has been working for two years. Since a few months having biweekly meetings, with very good attendance.
- The proposed text and tables were reviewed line by line with the TF participants.
- Expectation is completed it during the next month. The secretary will share with the other task forces for using as their template. It will also be sent to Toby for starting the integration of the other texts into a full draft.
- Sessions for storage and handling were also incorporated in TF1.

TF 2 – Scott Reed

- Document is very almost complete. Pending definitions of in-service limits for synthetic esters liquids as IEC revision of IEC61203 is not completed yet.
- It requires updating the tables and format according to the template from TF 1.
- Draft circulation can be ready by F21. If necessary, provisional values will be included but clearly marked.
- In the IEC working group they are having discussions around the characterization of the acids. Some of the tests and parameters in IEC will not match the IEEE methods. A database with information of some synthetic ester cases in North America will be provided to the TF.

TF 3 – Alan Sbravati

- Text is finalized. It requires adjusting the format to the template from TF1
- A new item for sampling will be included (reference to ASTM D923)
- As per the suggestion from C57.154, we will include some items C4 and C5 from the Annex C of their previous version, as this annex is being excluded. These items will be included in the informative annex about transformers retrofit.

TF 4 – Andy Holden

- The chapter will be a reference to IEEE Std. 637, for the sake of avoiding repetition.
- TF was discontinued

TF 5 – Toby Johnson

- All drafts will be sent to Toby for combining in a single document

TF 6 – Rainer Frotscher

- Text is completed, pending the formatting according to the template.
- As per the decisions there will be a need to adjust the tables for matching the voltage classes to the IEEE standards.

Voltage classes discussion:

- A decision around the harmonization of voltage classes was pending from last meeting. TF1 did an analysis of the reasons for the voltage classes used in IEEE and concluded it would not be possible to change.
- It was clarified that the voltage classes allow for a range of voltage regulation, for instance, having the 230kV as the reference value for the definition of basic impulse levels and other tests. This is different from IEC where the definition considers the maximum voltage and some small variations of regulation may imply the utilization of the next class.
- Jinesh presents a motion to use only IEEE voltage class levels in the whole document: $\leq 69\text{kV}$, $> 69\text{kV}$ & $< 230\text{kV}$, $\geq 230\text{kV}$.
- Motion as seconded by Kumar Mani.
- Rainer Frotscher abstained. No one opposed. Motion stands.
- As previously mentioned, the text from TF 6 will be adjusted accordingly.

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 Oct 17-21, 2021 in Milwaukee, Wisconsin.

Alan Sbravati, Secretary
Scott Reed, Vice Chair

Appendix II

Working Group C57.146 IEEE Guide for DGA in Silicone

**Monday, April 26th, 2021
10:45 PM to 12:00 PM (central time)
Virtual Meeting**

Minutes of Working Group Meeting

Chair Jon Karas / Vice Chair Toby Johnson
Secretary Paul Boman

Attendance total 32, members 11, guest 15 and 6 requested membership

Name	Member		
1. Thang Hochanh		17. Eric Davis	X
2. Scott Reed	X	18. Bill Whitehead	
3. Florin Faur	X	19. Ramon Benedict	
4. Juan Castellanos		20. Zack Draper	X
5. Hali Moleski		21. Stephanie Denzer	X
6. Jim Graham	X	22. Roger Fenton	
7. George Jalhoum		23. David Hanson	
8. Edward Casserly		24. Rob Ghosh	X
9. Marc Taylor		25. Toby Johnson	Vice-Chair
10. James Dukarm		26. Helena Wilhelm	
11. Claude Beauchemin	X	27. Jon Karas	Chair
12. Nick Perjanik		28. Paul Boman	Secretary
13. Hakim Dulac		29. Juan Acosta	
14. Mauricio Soto		30. Josue Rodriguez	
15. Andy Holden	X	31. Michelle Kutzleb	
16. Ashmita Niroulaa		32. John Prunte	X

Call for patents – none at this time

Copyright discussed

Membership roll call where quorum was not met for this meeting

Chair gave timeline of Guide progress with the Guide expiration at the end of 2021.

Claude Beauchemin presented preliminary analysis of owner provided DGA data

Data categories for oxygen to nitrogen ratio for <0.2 and ≥ 0.2 along with total mean values.

Comparison was also provided to CIGRE TB433 and C57.146-2005 Edition data

Currently 4 data sources with one source pending

Adding Section 6.5 for analytic tools using the Duval Triangle with an annex using wording from C57.104.

Chair requested case studies from silicon fluid filled transformers.

Planning a WG teleconference for next month

Meeting adjourned

Appendix III

TF Next Revision to C57.104: Guide for Interpretation of Gases Generated in Mineral Oil-Immersed

Monday, April 26th, 2021
3:45 PM - 5:00 PM (central time)
Virtual Meeting

Minutes of Task Force Meeting

The virtual meeting was called to order by Chair Claude Beauchemin at 3:45 PM central time. Claude introduced himself, Norman Field (Vice Chair) and Hali Moleski (Secretary). There were 118 attendees at the start of the meeting. There are 59 members. Quorum was made with 35 of the 59 members according to the poll (in italic and highlighted in blue below). There were 23 attendees that requested membership, corrected to 24 post meeting. If all membership requests were accepted, the new membership count would be 83 members.

Members:

1. <i>Anand Zanwar</i>	36. <i>Marco Espindola</i>
2. Anastasia O'Malley	37. Markus Schiessl
3. Bill Whitehead	38. Michael Botti
4. Bob Rasor	39. Mickel Saad
5. Brad Staley	40. Monty Goulkhah
6. <i>Brady Nesvold</i>	41. <i>Nick Perjanik</i>
7. <i>Cihangir Sen John</i>	42. Nitesh Patel
8. <i>Claude Beauchemin (Chair)</i>	43. <i>Norman Field (Vice Chair)</i>
9. <i>David Calitz</i>	44. Oleg Roizman
10. David Murray	45. <i>Paul Boman</i>
11. David Wallach	46. <i>Roger Hayes</i>
12. <i>Diego Robalino</i>	47. <i>Samraghi Dutta Roy</i>
13. <i>Dmitriy Klempner</i>	48. <i>Scott Reed</i>
14. <i>Don Dorris</i>	49. Shiva Rampersad
15. <i>Donald Lamontagne</i>	50. Stacey Kessler
16. <i>Dwight Parkinson</i>	51. <i>Stephanie Denzer</i>
17. <i>Emilio Morales-Cruz</i>	52. <i>Stuart Chambers</i>
18. Eric Doak	53. Sukhdev Walia
19. Erich Buchgeher	54. <i>Susan McNelly</i>
20. <i>Florin Faur</i>	55. Timothy Raymond
21. <i>Hali Moleski (Secretary)</i>	56. Ashmita Niroulaa
22. <i>James Dukarm</i>	57. <i>William Boettger</i>
23. <i>Jayme Nunes</i>	58. <i>Zack Draper</i>
24. <i>Jerry Murphy</i>	59. <i>Zan Kiparizoski</i>
25. Jim Graham	
26. <i>John K John</i>	
27. <i>John Prunte</i>	
28. John Sinclair	
29. <i>Jon Karas</i>	
30. <i>Juan Acosta</i>	
31. Kris Zibert	
32. <i>Mani Kumar</i>	
33. Larry Christodoulou	
34. Lee Doyle	
35. <i>Luiz Cheim</i>	

Attendees requesting membership are:

1. Afshin Rezaei-Zare	13. George Frimpong
2. Ali Naderian	14. Ion Radu
3. Amitahh Sarkar	15. Israel Barrientos
4. Anatoliy Mudryk	16. James Gardner
5. Anthony Franchitti	17. Jeff Benach
6. Ashmita Niroulaa	18. Josh Bohrn
7. Balakrishnan	19. Juan Castellanos
8. Branimir Petosic	20. Mark Perkins
9. Brian Sparling	21. Mike Waldrop
10. Edward Casserly	22. Onome Avanoma
11. Egon Kirchenmayer	23. Robert Harper
12. Evanne Wang	24. Stephan Brauer

The agenda was reviewed along with patent call and copywrite policy. The motion to approve the Fall 2020 meeting minutes was made by Jerry Murphy and seconded by Luiz Cheim. There was unanimous approval of the past meeting minutes.

Claude reviewed the scope of the task force and reiterated that more work was needed after the publication of the revised C57.104 Gas Guide. The purpose of the task force is to evaluation the way forward for the next Gas Guide updating with the six (6) items listed in the scope. Current C57.104 used statistical normalization but could be improved by having transformer failure data and tool(s) to evaluate if the purely statistical approach used in the 2019 revision is ‘doing the job’.

With that, Claude introduced Zack Draper who provided a PowerPoint presentation. This presentation introduced a tool (statistical screening tool) that could be used with transformer in-service and failure DGA data to evaluate the different industry interpretation methodologies (i.e., IEC, IEEE). Data from five (5) utilities (roughly 15k transformers in service and 300 failures) was used in conjunction with IEEE (2008, 2019), IEC (2015 with CIGRE TB 771 values), and a proprietary method to compare the various interpretation methods graphically. The tool uses statistics to compare the different methodologies (indicates if method has good performance).

1. Collect failure data (history, date, and reason of failure)
2. Use screening test/tool to evaluate the method that better classifies failure
3. Evaluate the curve to see what method has greater performance (area)
4. Change steps to see if method improves statistically

After the presentation, the virtual floor was opened for discussion:

- Bertrand Poulin: Is there a way to include more than failures, such as when a monitor prevents failure. Some anomalies can lead to quick failures. Zack – they did not include this but would be interesting and would give a better sense of time scale. Fault type could be compared to how quickly it failed. Could investigate further.
- Luiz Cheim: Two key points need to be elaborated.
 - Was it that the 300 failures were major failures (arcing, etc.)? Seventy percent of failures are not catastrophic type. How do we define failures and if we are excluding non catastrophic type?
 - Timing of sampling and determination if DGA results have anything to do with the failure. Interval of last DGA sample and the failure is important.

Zack: Agree in principle, but 6 months to 1 year is routine sampling therefore we can assume that interval unless online DGA data is provided. Monitor data would be beneficial.

Claude: Agreed interval/time is a contribution. Of the failures, some DGA data was more than a year old at the time of the failure and had a lower "success" rate than the one closer to the failure date. More work is needed to look at the sample time interval. Data is key. For this presentation, failure was defined as that the transformer had to be pulled from service.

Luiz: Would like to see distribution of catastrophic and those taken out of service.

Claude: Very true and will keep us busy. Though, at least we have a tool to evaluate.

- James Dukarm: Zack has shown statistical approach Tool. This tool is not an improvement of the method in itself, but it is used to compare various DGA screening methods efficiency to each other. A future thought is to look at more data on maintenance records and do analysis. The tool presented is more versatile than just what was presented (it can be used to compare things other than methodologies).
- Bertrand Poulin: Reminded that DGA interpretation is not an exact science yet.
- Donald Lamontagne: Encourage looking at confirmed kills and actual failure reports with photos. Validate each failure (1st hand). Offered to discuss algorithm used in own fleet – artificial neural network.
- Claude thanked Zack for the presentation.

Claude presented the scope of CIGRE D1/A2.77 Working Group and how it has several points in common with IEEE work. The CIGRE WG tasks were listed, and it was shared that the CIGRE WG was made aware of the work performed for the update of C57.104.

Last item shared was that there is a running list of corrections in C57.104 and two items were added since the last meeting:

1. Typo in Table D3: In first line of fault C, the entry for C₂H₆ should be <24, not ≥24
2. T₂ and T₃ in Table and figure D.4 should really read "T₂-H" and "T₃-H"

Claude reminded that the working group on DGA in Esters was meeting Tuesday 4:45 pm and that it would be informative for those that want to attend. Meeting was opened for any other discussion.

Amitahh Sarkar: Data should include operating conditions as these conditions can be cumulative.

Claude: Agreed, operating data was poor as load, temperature, etc. was not known in the data set used for the 2019 revision. Hopeful that future data will have more operational data.

No other discussion was brought forward. The presentation from Zack Draper is soon to be published in IEEE Access. Donald Lamontagne offered to present his neural network work.

Meeting was adjourned.

Appendix IV

Task Force C57.637 Guide for the Reclamation of Mineral Insulating Oil and Criteria for Its Use

**Tuesday, April 27, 2021
9:25 AM – 10:40 AM (central time)
Virtual Meeting**

Minutes of Working Group Meeting

The meeting was called to order at 9:25 am by Chair Stephanie Denzer.

This was the first meeting of the Task Force, so there are no current members. There were 34 people in attendance. The Chair shared that Scott Reed will serve as Vice Chair of the group and Andy Holden as the Secretary.

Attendees:

1. Greg Steeves	18. Marc Foata
2. Helena Wilhelm	19. Mike Bonn
3. Paul Boman	20. Jimmy Rasco
4. Jon Karas	21. Ronald Hernandez
5. Onome Avanoma	22. Anand Zanwar
6. Chao Li	23. Claude Beauchemin
7. Thomas Hartman	24. Perry Reeder
8. Evanne Wang	25. Israel Barrientos
9. Ryan Thompson	26. Ed Casserly
10. David Hanson	27. Juan Acosta
11. Bill Whitehead	28. Jim Thompson
12. Florin Faur	29. Ed teNyenhuus
13. Ashmita Niroula	30. Rainer Frotscher
14. Jinesh Malde	31. Josue Rodriguez
15. Tom Prevost	32. Stephani Denzer (chair)
16. Andy Holden (secretary)	33. Eric Doak
17. Sanket Bolar	34. Scott Reed (vice chair)

Agenda

- 1) Introductions
- 2) Call for Patents
- 3) Copyright Notification.
- 4) Title, Scope and Purpose
- 5) Call for Volunteers and Members

Due to the time constraints, attendees did not introduce themselves.

Chair's Remarks:

Chair's Remarks:

Chairwoman Denzer requested a call for patents and no claims were made. Next, she reviewed with the Task Force the IEEE's copyright policy, of which no comments were made.

The Chair announced that this guide is set to expire 12/31/25 so it is time to start the renewal process. In accordance with the request of the Insulating Fluids Subcommittee vote on October 21, 2020, the task force debated expanding the guide to extend beyond mineral oil and include other insulating fluids such as natural esters and synthetic esters. Chairwoman Denzer shared that while reclaiming esters has occurred over the past ten years, there is no documented procedure.

There were numerous comments shared amongst the group. Jinesh Malde commented that there is a need for the guide to include reclamation and reconditioning of esters. Jim Thompson initially thought it was covered under C57.106 but Andy Holden explained that C57.166, which supersedes C57.106, voted to remove it from the guide and defer to C57.673 for reclamation and reconditioning. There was also discussion about the mixture of fluids and Jim Thompson stated that it was important to discuss not mixing fluids during reclamation. Jimmy Rasco made it a point that this new guide should exclude re-refined mineral oil as ASTM still has not developed a standard for this fluid.

Next, the task force discussed what the new title should be. Ed teNyenhuys stated that it was important to leave reclamation as part of the title. There was agreement amongst the task force. As a result, Jim Thompson made a motion that the title should be change to:

"IEEE Guide for Reclamation and Reconditioning of Insulating Liquids."

Jimmy Rasco seconded the motion. The motion passed unanimously.

Then the task force discussed the new scope. Jim Thompson made a motion that the scope should be change to:

"The scope of this guide applies to mineral oil, natural esters, synthetic esters, silicone and less flammable hydrocarbon (LFH) insulating liquids used in electrical equipment. The scope covers definition and description of reclaiming and reconditioning procedures; the test methods used to evaluate the progress and end point of the process. This guide does not cover the use of insulating liquids in new apparatus under warranty and re-refining of insulating liquids."

Andy Holden seconded the motion. The motion passed unanimously.

Finally, the task force reviewed the purpose. Claude Beauchemin made a motion that the purpose should be change to:

"The purpose of this guide is to provide detailed procedures for reclaiming and reconditioning insulating liquids by chemical and/or mechanical means, making them suitable for reuse as insulating liquids."

Jim Thompson seconded the motion. The motion passed unanimously.

The next step is to request a PAR at the IFSC meeting on April 28, 2021,

No New Business was discussed, and the meeting was adjourned at 10:40 am.

Appendix V

Task Force C57.155 – Guide for Interpretation of Gases Generated in Natural Ester and Synthetic Ester-Immersed Transformers

**Tuesday, April 26, 2021
4:45 – 6:00 PM (central time)
Virtual Meeting**

Minutes of Task Force Meeting

The meeting was called to order at 4:45 pm by Chair Alan Sbravati.

This was the first meeting of the Task Force, so there are no current members. There were 62 attendees at the meeting and 22 requested membership, which will be granted. The Chair asked those who wish to be a member of the task force place a comment in the chat group. Scott Reed will serve as Vice Chair of the group and they will need a Secretary.

Attendance list (all guests):

Juan Acosta
Tauhid Haque Ansari
Elise Arnold
Suresh Babanna
Claude Beauchemin
Paul Boman
Jeremiah Bradshaw
Stephan Brauer
Edward Casserly
Stuart Chambers
Luiz Cheim
James Cross
Brandon Dent
Stephanie Denzer
Eric Doak
Don Dorris
Hugo Flores
John Foschia
George Frimpong
Rainer Frotscher
James Graham

Ismail Guner
Attila Gyore
Didier Hamoir
David Hanson
Robert Harper
David Holland
Philip Hopkinson
Andrew Holden
Jon Karas
Robert Kinner
Peter Kleine
Michelle Kutzleb
Lance Lewand
Jinesh Malde
Ashmita Niroula
Chukwuemeka Okafor
Gylfi Olafsson
Juan Olmedo
Parminder Panesar
Sanjay Patel
Vinay Patel

Nicholas Perjanik
Branimir Petosic
Kevin Rapp
Jimmy Rasco
Scott Reed
Afshin Rezaei-Zare
Leopoldo Rodriguez
Josue Rodriguez
Hakan Sahin
Anil Sawant
Alan Sbravati
Markus Schiessl
Wesley Schrom
Mauricio Soto
Neil Strongosky
Dejan Vukovic
Pragnesh Vyas
William Whitehead
Helena Wilhelm
Mana Yazdani
Michael Zarnowski

Agenda

- 1) Introductions
- 2) Call for Patents
- 3) Title, Scope and Purpose
- 4) Review of Document Structure
- 5) New Business

Due to the time constraints, attendees did not introduce themselves.

Chair's Remarks:

Chairman Sbravati requested a call for patents and no claims were made. Next, he discussed the IEEE's copyright policy, of which no comments were made.

The Chair opened talking about C57.155 and how the guide will expire 12/31/2024. He commented about adopting C57.104 DGA approach for mineral oil where it is applicable to esters and referenced CIGRE's D1/A2.77 work that was developing DGA techniques. Luiz Cheim suggested adopting the approach that C57.104 took towards data analysis.

Next, the Chair announced that there is a need to fill the Vice Chair and the Secretary position. Attila Gyore and Lance Lewand offered to be the Vice Chair. Josue Rodriguez offered to be the Secretary but then later said he would have to find out from his company if he would be allowed to travel. Finally, an agreement was found having Lance Lewand as the Vice Chair and Attila Gyore as the Secretary.

There was a general discussion regarding the guide to include statements such as trace acetylene in the fluid as a result of welding the transformer lid to the tank before the task force discussed the Title, Scope and Purpose. Claude Beauchemin made a motion that the title should be revise to:

"IEEE Guide for the Interpretation of Gases Generated in Natural and Synthetic Ester Liquid Type Transformers."

Jinesh Malde seconded the motion. The motion passed unanimously.

Then the task force discussed the scope. Claude Beauchemin made a motion that the scope should be revised to:

"The guide's application is for natural and synthetic ester-immersed transformers. This guide addresses the following:

"The theory of combustible gas generation in a natural and synthetic ester-filled transformer.

- Interpretation of the gas analysis.
- Suggested operating procedures.
- Various diagnostic techniques.
- Case studies and examples.
- Evaluation criteria and guidelines.
- A bibliography of related literature"

Lance Lewand seconded the motion. The motion passed unanimously.

Finally, the task force reviewed the purpose. Claude Beauchemin made a motion that the purpose should be revised to:

"The purpose of this guide is to assist the transformer operator in evaluating dissolved gas analysis (DGA) results obtained from natural and synthetic ester liquid type transformers."

Jinesh Malde seconded the motion. The motion passed unanimously.
Discussion began on the document limitations but time expired.

No New Business was discussed, and the meeting was adjourned at 6:00 pm.

Appendix VI

Task Force C57.130 – Guide for the Use of Dissolved Gas Analysis Applied to Factory Temperature Rise Tests for the Evaluation of Mineral Oil-Immersed Transformers and Reactors

Tuesday, April 26, 2021
10:50 AM – 12:05 PM (central time)

Virtual Meeting

Minutes of Task Force Meeting

The meeting was called to order at 11:50 am by Chair John Foschia.

This was the first meeting of the Task Force, so there are no current members. There were 70 people in attendance. The Chair asked those who wish to be a member of the task force place a comment in the chat. A total of 21 attendees requested membership through the chat window and are shown in the below attendance listing in blue italicized text. These individuals will be considered members for the next meeting.

Attendees (as reported via WebEx roster)

Those who membership is shown in *blue italicized* text.

1. Andrew Larison	25. <i>Juan Carlos Cruz Valdes</i>	49. William Boettger
2. Alvaro Portillo	26. Anil Sawant	50. Taylor Gray
3. Jarrod Prince	27. <i>Robert Mayer</i>	51. Scott Reed
4. Raj Ahuja	28. Nicholas Jensen	52. Ryan Musgrove
5. Amitabh Sarkar	29. Erich Buchgeher	53. <i>Hugo Flores</i>
6. John John	30. Claude Beauchemin	54. John Lackey
7. Oleg Roizman	31. Suresh Babanna	55. Sheldon Kennedy
8. Stephanie Denzer	32. Thomas Hartmann	56. David Mangubat
9. Radek Sqewczyk	33. Dinesh Sankarakurup	57. Jim Thompson
10. James Nunes	34. Anand Zanwar	58. <i>Samragini Dutta Roy</i>
11. <i>Ronnie Minhaz</i>	35. <i>László Kádár</i>	59. Rodrigo Ocon
12. Juan Pablo Medina	36. <i>Edward Casserly</i>	60. Andy Downey
13. <i>Norman Field</i>	37. Vijay Tendulkar	61. <i>Nick Perjanik</i>
14. <i>Elise Arnold</i>	38. <i>Egon Kirchenmayer</i>	62. <i>Jon Karas</i>
15. Richard Marek	39. <i>Lance Lewand</i>	63. John Foschia
16. J. Dennis Marlow	40. <i>Juan Castellanos</i>	64. George Jalhoum
17. Dharam Vir	41. Toby Johnson	65. <i>Attila Gyore</i>
18. Rob (SGHROB?)	42. Brad Staley	66. Josue Rodrigues
19. Gael Kenne	43. Jinesh Malde	67. Jonathan Reimer
20. George Frimpong	44. David Hanson	68. James Gardner
21. <i>Eduardo Garcia</i>	45. <i>Juan Acosta</i>	69. Michelle Kutzleb
22. <i>Ryan Thompson</i>	46. Thomas Eagle	70. <i>Darrel Mangubat</i>
23. <i>Asmita Niroulaa</i>	47. Tejasvi Prakash	
24. <i>Helena Wilhelm</i>	48. Joseph Foldi	

Agenda

- 1) Introductions
- 2) Call for Patents
- 3) Copyright Notification.
- 4) Title, Scope and Purpose
- 5) Call for Volunteers and Members

Due to the time constraints, attendees did not introduce themselves.

Chair's Remarks:

Chairman Foschia requested a call for patents and no claims were made. Next, he reviewed with the Task Force the IEEE's copyright policy, of which no comments were made.

The Chair informed the attendees that the vice chair and secretary positions are unfilled and if a member of the Insulating Fluids Subcommittee would be interested in filling one of these roles to make this known.

The Chair announced that this guide is set to expire 12/31/25 so it is time to start the renewal process. The task force debated expanding the guide to extend beyond mineral oil and include other insulating fluids such as natural esters and synthetic esters. There was consensus amongst the group that there is a need for a guide that includes data for ester fluids, but the lingering question is how much data is available. Jim Thompson suggested having the subcommittee entertain a new guide for ester DGA temperature rise test. Scott Reed stated that if the subcommittee needs to have an esters DGA temperature rise test guide, then it would be appropriate to have it as part of the C57.130 revision. After discussion, it was decided that even if there is not enough data yet to develop factory rise temperature test data for ester fluids, the group would consider placing the information in an appendix to the guide.

As a result, Chairman Foschia proposed taking a survey amongst the OEM's and utilities to see who would be willing to share data. Those in attendance to this first task group were supportive of this approach. Elise Arnold of SGB offered to check with her OEM about sharing data. Robert Mayer of Siemens also offered to check about sharing data.

Next the task force discussed the Table 2 limits. Juan Castellanos commented that he would like to see a separation of the H-C gas formation during the temperature rise test instead of a generic H-C value. There was discussion regarding the value of this data. As a result, Chairman Foschia proposed expanding the survey to include additional mineral oil data. This was agreed to by the task force and both Lance Lewand and Juan Castellanos offered to share data so the idea could be explored in greater detail.

Finally, the task force discussed the Title, Scope and Purpose. Jim Thompson made a motion that the title should be:

"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."

Juan Castellanos seconded the motion. The motion passed unanimously.

Then the task force discussed the scope. Jim Thompson made a motion that the scope should be:

"This document provides guidance in the application of dissolved gas analysis (DGA) to transformers and reactors subjected to factory temperature rise tests. This document consists of evaluation procedures and

guidelines for acceptable levels of gases generated in conventional mineral oil-filled transformers and reactors during factory temperature rise tests.”

Ryan Musgrove seconded the motion. The motion passed unanimously.

Finally, the task force reviewed the purpose. Jim Thompson made a motion that the purpose should be:

“The Purpose of this Guide is to provide guidance in the application of dissolved gas analysis (DGA) to transformers and reactors subjected to factory temperature rise tests. This document consists of evaluation procedures and guidelines for acceptable levels of gases generated in conventional mineral-oil filled transformers and reactors during factory temperature rise tests.”

Ryan Musgrove seconded the motion. The motion passed unanimously.

No New Business was discussed, and the meeting was adjourned at 1:05 pm.

Insulation Life Subcommittee

April 28th, 2021
Virtual Meeting

Chair: Sam Sharpless
Vice-Chair: Jinesh Malde
Secretary: Anastasia O'Malley

The Insulation Life Subcommittee (ILSC) was called to order by the Chair in the virtual meeting on April 28, 2021 at 8:01 AM CST. The Chair introduced the subcommittee officers. 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.

H.1 Chair's Report/Remarks

The chair emphasized the timely completion, technical accuracy, and usefulness of quality projects through the participation of working group leaders, subject matter experts and the general membership.

The Chair discussed the membership requirements and recognized the following new members: Juan Acosta, Onome Avanoma, David Calitz, Don Dorris, Michael Franchek, Anatoliy Mudryk, Kevin Rapp, Tim Raymond, Scott Reed, Oleg Roizman, Dinesh Sankarakurup, Pragnesh Vyas and Drew Welton.

The Chair also reviewed the people who requested membership, but did not respond to the verification email: Hakim Dulac, Kris Zibert, Parminder Panesar, Piotr Blaszyk, Rainer Frotscher, Kuppuswamy Raja and Vijay Tendulkar. If you are requesting membership, please email the secretary and you will receive a verification email for the next meeting.

The Chair stated that the following members had been moved to guest status due to lack of attendance: Hamid Abdelkamel, Roger Fenton, Brian McBride and Joshua Yun.

The Chair also noted that no guests were removed by request.

The Chair encouraged working groups to conduct on-line meetings between the regular Transformer Committee Meetings to move projects along. Notice must be sent out to all members, attendance recorded and minutes taken. Any PAR extension requests need to be approved by the working group and documented in the minutes. 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 showed the essential patent claim notice and requested that any person with knowledge of an essential patent that meets the requirements of any subcommittee standard to bring the issue forward for discussion. No one responded to this request.

The Chair displayed the copyright policy and advised the subcommittee that permission would be required from the authors or organizations for use of information.

H.2 Project Status Reports. The Chair reported the status of each project as follows:

H.2.1.1 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.2.1.2 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.2.1.3 C57.119 IEEE Recommended Practice for Performing Temperature Rise Tests on Oil-Immersed Power Transformers at Loads Beyond Nameplate Rating

C57.119 is valid until December 31st 2028. The former Working Group Chair is Gael Kennedy.

H.2.1.4 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.2.1.5 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, 2022. The working group Chair is Thomas Prevost.

H.2.1.6 C57.165 IEEE Guide for Temperature Measurements for Liquid Immersed Transformers and Reactors

PAR expires December 31, 2021 and will be making an extension request during today's meeting. The working group Chair is Mark Tostrud.

H.2.1.7 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.2.1.8 1276 Guide for the Application of High Temperature Insulation Materials in Liquid-Immersed Power Transformers

1276 expires Dec 31, 2030. The former working group Chair for this document is Roger C. Wicks.

H.3 Secretary's Report

The attendance poll reported that 91 out of 149 members were present in the meeting along with 126 guests and that a quorum had thus been achieved. For the Spring 2021 virtual meeting, only the poll roster was used. Participants requesting membership for the subcommittee were advised to request in the poll to be a member and to email the Chair, Vice-Chair or Secretary. 29 guests requested membership. List of attendees is provided at the end of this report.

The agenda for the meeting had been provided to participants in advance of the meeting for review. Gary Hoffman made a motion to approve the agenda and it was seconded by Rogerio Verdolin. After hearing no objection from the attendees, the meeting agenda was approved. The Fall 2020 subcommittee meeting minutes had been provided to participants in advance of the meeting for review. Tom Prevost made a motion to approve the minutes. Markus Ferreira seconded the motion. The Fall 2020 meeting minutes were approved after hearing no objection from the attendees.

H.4 Working Group (WG) and Task Force (TF) Reports:

H.4.1.1 Working group on C57.91 IEEE Guide for Loading Mineral-Oil-Immersed Transformers – David Wallach

Working Group PC57.91 Guide for Loading Mineral-Oil-Immersed Transformers and Step-Voltage Regulators Meeting Minutes

April 27, 2021, 3:45 PM – 5:00 PM (EST)

Virtual Webex Meeting

1. The Chair made his opening remarks and proposed a meeting agenda.
2. The chair requested unanimous approval of the Spring 2021 Meeting Agenda as emailed prior to the meeting by acclamation (subject to quorum being present later in the roll call). The agenda was approved unopposed.
3. **Call for Patents:** The chair asked if anyone was aware of any patents and there were none claimed.
4. **Copyright Policy:** The IEEE copyright policy was reviewed.
5. Establishment of quorum- Number of Current Members = 53; Number of Members Present in Meeting= 31; Quorum Present = 58.5 % and with a total number of 85 attendees (see attached list) at the meeting.
6. The chair requested unanimous approval of the Fall 2020 Meeting Minutes (as posted on the IEEE TC Website) by acclamation. The meeting minutes was approved unopposed.
7. **Chair- David Wallach:** The chair informed the group that on December 4, 2020 a Webex meeting was held (minutes emailed to working group) to discuss PAR extension and path forward. The minutes of the Dec 4, 2020 was approved by a subsequent electronic ballot send to the members of the working group. The chair stated that the members present in the December 4, 2020 meeting voted to submit a 2-year PAR extension. The extension request was submitted on March 29, 2021 for the June 15, 2021 NESCOM agenda. If approved, the PAR will expire on Dec 31, 2023. We will need to go for a straw ballot by Fall 2022 and then submit the revised guide for final approval in Oct 2023. The current draft 3 document of the PC 57.91 guide is posted on the TC.

The chair opened the floor to continue the discussion on interchanging Clause 7 with Annex G, a topic that was taken up in Fall 2020. In his opinion, he felt that Clause 7 should be retained in the guide since many utilities were still following Clause 7.

Discussion on interchanging Clause 7 and Annex G:

Tim Raymond felt that this was long overdue. The Annex G requires some revisions, but it is particularly useful for short duration over-load, but we need to keep Clause 7 in the existing document somewhere. The Annex G requires uses a bottom oil rise model developed in the late 1990s but in reality, the overload numbers are not changing much. When we have the data for bottom oil rise, it is advantageous to use Annex G model.

Chair: We need to rename Clause 7 like a classical model or something.

Tim R: My background is with PT Load software. We always called it bottom and top oil models.

Chair: We could consider calling Clause 7 as top and Annex G as bottom oil models.

Wally Binder: Will we run into copyrights issues with using PT Load terms?

Tim Raymond offered offer to get the copyright issue with EPRI clarified for our guide use if this working group had any concerns.

Jason Varnell wanted to know the basis behind swapping Annex G with Clause 7.

Chair: With the improvements being made to Annex G, it may be beneficial if we have bottom oil temperature.

Tim R: He stated that the bottom oil rise model in Annex G model considered two main improvements. It is recognized that duct oil temperature rises faster than the bulk oil temperature. Clause 7 was based upon winding rise over bulk oil temperature but did not include rapidly rising duct oil temperature. In reality, the hot spot temperature rises faster than what the Clause 7 model predicts. The bottom conductor temperature rises more rapidly than the top conductor when there is a step change in the loading. There are a couple of ancillary corrections that need to be made. Clause 7 assumes that increased resistance and losses is offset by decrease in viscosity and thereby more cooling. This applies to cooling in oil directed flow Transformers. There are significant improvements with the Annex G model.

Jason V pointed out that Annex G requires a lot more inputs to perform these calculations. His concern was that users will need to have many input values to perform these calculations. While it is true that oil temperature adjacent to the hot spot conductor in the winding is higher than the top oil temperature, in some models the hot spot temperature is calculated using hotspot gradient over top oil rise. He was concerned about making changes to the current methodology and the impact those changes will have in making overload calculations using Annex G.

Tim Raymond agreed that a lot more parameters were required while using Annex G. In reality, the only one piece of information you need in Annex G that you do not need in Clause 7 is the rated bottom oil rise. For everything else we can make equivalent assumptions like we already do for Clause 7. For example, in Clause 7 now, we calculate oil thermal time constant with an equation while we do not need to calculate that in Annex G. Annex G allows you to break load losses into eddy and stray losses. In reality, 90% of the time you cannot segregate eddy and stray losses. We have to assume losses to be all stray type and you will need to make some assumptions for which we could provide guidance. Annex G will provide answers for equivalent assumptions like the Clause 7 model, but it will have more flexibility,

Jason V: We focused mainly on eddy and stray losses while using Clause 7 and have used it for calculating hot spot rise for specific overload profiles while designing transformers. He felt that there may not be uniformity with OEMs using different values for inputs while using Annex G to get more desirable results.

Javier Ortega: There is an IEEE C57.169 guide that provides a procedure to determine hot spot rise and hotspot gradient. He added that C57.91 takes that information from the C57.169 guide to calculate the hot spot.

Jason V observed that Clause 7 hotspot gradient varies based upon load and the losses.

Oleg Roizman stated that Jason probably missed his presentation about Clause 7 in a previous C57.91 meeting. In that presentation, he had pointed out that Clause 7 is based upon a number of assumptions that are not valid. Annex G is based upon classical thermodynamics, heat transfer and the law of conservation of energy principals. Annex G is a classical thermal model. We need inputs like dynamic load, ambient temperature and some parameters that are fixed like losses. If we have all the parameters for the Annex G

model, then we can go with it. If we do not have some information, then we need to provide guidance on what users need to do. We can use some formulae from Clause 7 to come with the parameters to address limitations of Annex G.

Jason V stated that it would be beneficial if guidance is provided to perform Annex G calculations so that there is uniformity on how OEM's perform this calculation.

Oleg R confirmed that we will provide that guidance in Annex G.

The Chair stated that the plan is to maintain present Clause 7 top oil model as many utilities will still use this information as reference.

Patrick Picher of Hydro Quebec started a discussion about whether IEC 76-6 equations will be added to this guide or whether there will be one set of equation from IEC and the other from IEEE. Thermal overshoot is covered in this IEC guide and is simpler to use than Annex G. IEC has constants for cooling that are better than IEEE for overshoot for a load duration of 30 minutes. Unlike Annex G, the IEC guide does not require as many parameters.

Oleg R stated that he has looked at the latest IEC edition. We should provide reference to the IEC model while discussing the classical the thermal model. IEC has attempted to solve a second-order dynamic model equation. We will refer to that but there are some problems with the IEC model which will be discussed in Annex G.

Tim Raymond expressed that he has concerns using the IEC model.

Oleg R stated not only Tim, but there are many others who have concerns about the IEC model. He invited Patrick to join the task force.

Patrick P offered Hydro Quebec's help with conducting overload tests in their Hydro Quebec lab using fiber optics. He thought that it may be interesting to perform these tests to compare Annex G & IEC-76-7 models and publish the results in this guide.

The Chair noted that Oleg R has been asking for fiber optic top, bottom oil temperature and load data to validate his model and use that information in the guide revision.

Oleg R confirmed examples, block diagrams and code will be provided to demonstrate the model and for everyone to use for free. Zach Draper of Delta-X has offered to write the code for the Annex G model. The HQ lab test can provide us with an opportunity to compare different techniques.

Tim Raymond: I had an Excel sheet about most of the parameters for Annex G back then.

Dan Blaydon: He agrees with maintaining Clause 7 as a user but would like to express concern that Annex G may require OEM's to have knowledge about various inputs required to perform the calculations. He wondered whether end users will have the data, additional parameters and assumptions to perform Annex G calculations like they do now for Clause 7 for validating the information they get from the OEMs.

Tim Raymond mentioned that information like rated bottom oil rise can be obtained from the OEM's. This has been required since 2000.

Dan Blaydon asked whether the parameters and exponentials will be available to the end user.

Tim R confirmed that the assumptions used in the Annex G document are not much different than the default ones we currently have in the Clause 7 model. We have more parameters because we are trying to address the over-simplification in the Clause 7 model. We cannot rule the possibility of overload ratings changing while using the Annex G model. We can possibly guard against the ratings being very vastly different, but we must never stop making improvements to the models in the guide. We need to come up with a model that is technically the best and not based upon past practices.

Oleg Roizman agreed with Tim Raymond.

Tim Raymond: For Annex G, values inputs can be determined during factory tests using test methods in current IEEE standards. There are certain assumptions on how certain exponents vary with losses of that system in Clause 7. But there is information available

out there which we could use to get equivalent results to Clause 7.

David Wallach stated that we do not want to discount the importance of Clause 7 but Annex G is a different way to approach overload calculation. We probably need to come up with a new nomenclature for Clause 7.

David Blaydon mentioned that by moving to Annex G you are making get the Clause 7 the alternate method.

The Chair mentioned that any member who may have information for improving Annex G and Clause 7 may please let him know. He mentioned that Oleg is leading a task force to revise Annex G. The Chair will swap the two sections physically in the guide. He emphasized the need for the WG members to stay engaged between TC meetings to get the guide finally done by end 2023. We probably need to have frequent TF meetings and WG meetings.

Oleg R mentioned that Tim Raymond, Patrick, Kayland Adams and Zach are part of this task force (Brad Staley has also volunteered to be on this task force subsequent to this meeting).

Discussion About Moving Bubble Evolution Temperature Annex A to C57.162:

The Chair mentioned that this topic was brought up at the end of the last meeting. The discussion was about whether the science behind this phenomenon belongs in C57.162 and the application part in this C57.91 guide or vice versa. It is possible that except for the example A4 in Annex A, the other parts will move to C57.162. And so, do we want to have discussion or have a motion to recommend moving parts A1 thru A3 of Annex A to C57.162 and keeping A4 in C57.91? The Chair mentioned that the C57.162 WG is supportive of this idea.

Sam Sharpless (Insulation Life Subcommittee Chair) mentioned that this was discussed in the C57.162 working group and they are supportive of this move.

The Chair added that the Insulation Life SC approval was not required if the two WGs agreed to the transfer. It seems that this transaction is a done deal.

Sam Sharpless agreed.

The Chair asked whether we now need a motion in this WG to release sections A1-A3 in Annex A to C57.162 WG, while keeping the application part in C57.91.

Oleg R: Annex A has only a couple of pages and a formula that needs correction. He agreed to handle the revision and submit it to this WG during the next meeting. But was fine with moving the science part to C57.162. We need to talk about the origins of the bubble equation in A2 of Annex A and correct that equation. The example in A4 should also be revised based on the revised equation. The equation correction will result in 10K difference at 2% moisture content.

The Chair asked if the Bibliography also needs to go to the C57.162 guide.

Oleg R agreed with that and added that there were a few additions made to it.

David Wallach again asked to hear a motion for moving the contents of Annex A to C57.162 after updating the equation and example in this guide.

Oleg R stated that no motion is required since both working groups have agreed to moving the science Annex A to C57.162. It was agreed in the C57.162 WG to add a dynamic angle to the Bubble Equation along with uncertainties and the science behind it. He stated that Tom Prevost the Chair of C57.162 was good with that and so we there is no need for a motion at all.

Sam S stated this topic was included as an item in the Fall 2020 minutes SC meeting and it was agreed that C57.91 will retain the equation and example while the science and theory will be moved to C57.162. This was discussed in the C57.162 WG yesterday.

Oleg R confirmed that the bubble equation with its assumptions will be covered in Annex

A of C57.91 while the section in C57.162 will be quite different.

Sam S stated he is good with not moving a motion as long as both the C57.91 and C57.162 WG chairs are coordinated about what their respective contents are going to be.

David Wallach mentioned that in the last WG meeting Tim R was hesitant to give the bubble equation to another Guide.

Tim Raymond stated that he was outvoted in many meetings on moving bubble evolution to C57.162. He feels that it is a natural fit for this guide, but he is OK if it is covered in a different IEEE document.

Oleg R remarked that Annex A was a normative and not an informative reference.

David Wallach confirmed that no motion is required, and we are going to revise Annex A. He will coordinate with Tom Prevost of C57.162 so that they can pick up more in-depth treatment of this topic.

Sam S summarized that he will report to the subcommittee that the bubble equation is being discussed by the C57.91 and the C57.162 WGs and the bubble equation topic will be split up between these two guides.

Discussion About Revising Annex I and Clause 5:

David Wallach mentioned in a previous WG meeting there was a discussion about Annex I and Clause 5 needing to be revised with respect to the presence of oxygen in oil like the latest IEC guide. He asked if there is going to be treatment of this topic elsewhere. Recent research indicated it's impact on DP / Tensile strength.

Oleg R stated that if C57.162 does not look into it, then we need to decide if we want to treat it in this guide. Clause 5 revision could be done by somebody else.

Tim R stated he could take a look at Clause 5 and Annex I and if there are specific things to be looked at then Oleg could provide that input.

Oleg R stated that we need to deal with terms like expected life, normal life, normal life expectancy, normal insulation life and life expectancy etc. in these sections. We need to get some consistent terminology defined and the life expectancy term should not be used. These are statistical terms and transformers are normally taken out of service before their end of life.

Tim R agreed that there are things that can be tightened up and brought in line with other standards and documents. This can be tricky since there is a lot of historical perspectives for many of these terms.

The Chair asked if there were volunteers to help Tim R clean it up. Zach and Kayland Adams offered to help Tim with revising Clause 5 (Kumar Mani subsequently volunteered after this meeting).

David Wallach: We should plan to have a WebEx working group meeting in June and October this year to see how the drafting is going and to iron out any possible conflicts.

8. Unfinished and New Business: There was none.

9. Adjournment

The meeting was adjourned at 11:53 AM^[WD1]. The chair mentioned that a survey will be sent out in June regarding location preference for the Fall 2020 meeting whether it will be Virtual or in person at Milwaukee.

Chair: David Wallach

Vice-Chair: Javier Arteaga

Secretary: Kumar Mani

Meeting Attendance and Membership Status gathered from the WebEx Quorum Poll:

Attendee Name	Affiliation	Member	Guest	Guest Requesting Membership
James Dukarm	Delta-X Research Inc.		X	
Kayland Adams	SPX Transformer Solutions, Inc.		X	
Mickel Saad	Hitachi ABB Power Grids	X		
Zack Draper	Delta-X Research Inc.			X
Ismail Guner	Hydro-Quebec			X
Taylor Gray	Not known		X	
Dmitriy Klempner	Southern California Edison			X
Sebastien Riopel	Electro Composites ULC		X	
William Boettger	Boettger Transformer Consulting LLC		X	
J.Dennis Marlow	DenMar TDS Transformers		X	
Roger Hayes	General Electric	X		
Peter Zhao	Hydro One	X		
Gilles Bargone	FISO Technologies Inc.	X		
Afshin Rezaei-Zare	York University			X
Patrick Picher	Hydro-Quebec IREQ			X
YaquanBill Li	BC Hydro		X	
Brad Staley	Salt River Project	X		
Juan Castellanos	Prolec GE	X		
David Calitz	Siemens Energy	X		
Steve Jordan	Not known			
Matthew Mcfadden	Oncor Electric Delivery			

Attendee Name	Affiliation	Member	Guest	Guest Requesting Membership
Craig Colopy	Eaton Corporation	X		
Troy Tanaka	Burns & McDonnell		X	
Ryan Musgrove	Oklahoma Gas & Electric			
Emilio Morales-Cruz	Qualitrol Company LLC	X		
Eduardo Garcia	Siemens Energy	X		
Will Elliott	Prolec GE		X	
Eric Davis	Burns & McDonnell		X	
Jared Bates	Oncor Electric Delivery		X	
Kumar Mani	Duke Energy Inc.	X		
Javier Arteaga	Hitachi ABB Power Grids	X		
Bruce Webb	Knoxville Utilities Board	X		
David Wallach	Duke Energy Inc	X		
Anthony Franchitti	PECO Energy Company			
Kyle Stechschulte	American Electric Power			X
Gene Blackburn	Gene Blackburn Engineering		X	
Weijun Li	Braintree Electric Light Dept.	X		
Bruce Forsyth	Bruce Forsyth and Associates LLC	X		
Jeff Ray	JLR Consulting		X	
Evanne Wang	DuPont		X	
Timothy Raymond	EPRI	X		
Jason Varnell	Doble Engineering		X	
Jeff Schneider	Power Partners		X	
Daniel Blaydon	Baltimore Gas & Electric	X		

Attendee Name	Affiliation	Member	Guest	Guest Requesting Membership
Dinesh Sankarakurup	Duke Energy Inc		X	
Jeffrey Wright	Duquesne Light Co.	X		
Javier Del Rio	Siemens Energy		X	
John K John	VA Transformers	X		
Sam Sharpless	Rimkus Consulting Group	X		
Richard Marek	Retired		X	
Rogelio Martinez	Georgia Transformers	X		
Rod Sauls	Southern Company Services		X	
Suleman Khan	Ontario Power Corp.		X	
Sanjib Som	Pennsylvania Transformer		X	
Adam Smith	Commonwealth Associates Inc		X	
Susan McNeily	Xcel Energy		X	
Lee Matthews	Howard Industries	X		
Kent Miller	T&R Electric Supply Co		X	
Mike Warntjes	Not known		X	
Raymond Curtiss Frazier	Ameren		X	
Brian Penny	American Transmission Co.		X	
Alex Quispe	Eaton Corporation	X		
Barry Beaster	H-J Family of Companies		X	
Gary King	Howard Industries		X	
Stacey Kessler	Basin Electric Power Cooperative	X		
Megan Kell	Eaton Corporation		X	
Evgenii Ermakov	Hitachi ABB Power Grids			

Attendee Name	Affiliation	Member	Guest	Guest Requesting Membership
Radek Szewczyk	Specialty Products Poland			
Kerwin Stretch	Siemens Energy			X
Egon Kirchenmayer	Siemens Energy	X		
Paul Florida	Howard Industries		X	
Tom Prevost	Weidmann Electrical Technology		X	
Sukhdev Walia	New Energy Power Co.	X		
Aleksandr Levin	Weidmann Electrical Technology	X		
Tommy Eagle	SPX Transformer Solutions, Inc.		X	
Anthony Franchitti	PECO Energy Company			X
Mario Locarno	Doble Engineering			X
Anastasia O'Malley	Consolidated Edison Co. of NY		X	
Saramma Hoffman	PPL Electric Utilities	X		
Mark Tostrud	Dynamic Ratings	X		
Roger Wicks	DuPont	X		
Sheldon Kennedy	Niagara Transformer	X		
Paul Morakinyo	PSEG		X	
Oleg Roizman	IntellPower Pty Ltd	X		
Valery Davydov	Mr Valery Davydov		X	

H.4.1.2 C57.100 IEEE Standard Test Procedure for Thermal Evaluation of Liquid-Immersed Distribution and Power Transformers – Roger Wicks

WG C57.100: IEEE Standard Test Procedure for Thermal Evaluation of Insulation Systems for Liquid-Immersed Distribution and Power Transformers

Spring 2021 “Virtual” Meeting – 27 April 2021, 3:20 p.m. – 4:35 p.m. CDT, Webex
Chairman: Roger Wicks, Secretary: Kevin Biggie

The Chair called the meeting to order at 3:20 p.m. and welcomed attendees. The meeting agenda, Essential Patent Claims information (none were noted), and copyright information were reviewed. A quorum poll was then taken indicating 34 members were present (of 69), thus a quorum was not achieved (35 needed). Full attendance details were provided separately by the Encore virtual meeting service.

Subsequently, attendance was confirmed to be a total of 112 attendees, with 38 members and 74 guests present. There were 11 guests requesting membership, with 8 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: Erich Buchgeher, Eric Doak, Samragni Dutta Roy, Saramma Hoffman, Chao Li, Ashmita Niroula, Pragnesh Vyas, and Daniel Weyer. The other 3 guests requesting membership will be reconsidered upon achieving the meeting attendance membership requirements. In addition, a review of participation identified 21 current members not at either of the previous two, nor three of the last five meetings. Thus, to keep membership current, they were reverted back to Guest status and will be contacted accordingly. Given these changes, the new total number of members is 56, including the Chair and Secretary. Final attendance was recorded in AMS, and rosters are listed at the end of the minutes.

The Chair then proceeded with a review of a prepared meeting presentation, beginning with an overview of the recently completed draft, which was distributed with the meeting agenda last week. The bulk of the work on the draft was completed by the Sealed Tube Test Task Force (TF 3). The chair thanked TF3 for all the hard work on updating the draft, and Jinesh Malde, TF3 leader added his thanks to his team of Brad Greaves, Kevin Biggie and Stu Chambers who have done the bulk of this work.

Slides summarizing the changes included in the latest draft proposed by TF 3 were reviewed by TF 3 Leader, Jinesh Malde, and TF 3 contributors, with highlights as follows:

- Jinesh - the order of the sections of the document were revised to improve layout and flow.
- Kevin Biggie - the sealed tube test procedures were adapted from the active Liquids Aging Task Force in C57.154, and are currently being used by five labs in the ongoing TF lab aging studies.
- Roger – the dual temperature test section was also expanded and clarified.
- Jinesh – the 3-point aging test sections were carried over from the 2011 version and clarified.
- Kevin – reviewed the proposed new Annex for a modified sealed tube aging test for enameled wires in liquids, as an adaptation of a recently published paper on the topic. Sasha Levin added that end of life criteria for enameled wires in liquids is a key topic for further discussion to improve the proposal in the annex. Radek Szewczyk asked about the apparent large amount of wires in the material ratio, and Sasha responded that it was taken from an analysis of actual transformer designs, and is explained in the draft annex.
- Jinesh – introduced that a new single set of material ratios is proposed, vs. the separate distribution and power transformer ratios in the 2011 version. Sasha provided a detailed

explanation of the analysis and examples used to develop the new single set of ratios proposed, including a review of the tables in a new annex with the analysis and recommendation. Sasha explained the main drivers for the single set of ratios as follows:

- The power ratio has shown to have much faster and different aging than the distribution ratio, which does not reflect real world experience.
- The current power ratio included a portion of “cooler” board materials outside of windings, which are not representative of the hot spot, to which the test relates. Removal of such a cool board portion would bring it closer to the distribution ratio.
- The current power ratio has a very small amount of paper. As the paper to board ratio has been shown to be important to aging results, thus a new paper to board ratio is proposed.
- Jinesh – there is a new thermal screening test annex used to provide an initial indication for expected thermal class of a candidate system, which is used to help choose candidate system aging temperatures.
- Jinesh – additional clarifications about testing in cases of changes to an already qualified candidate system were put in a new annex also.

Alan Sbravati commented that he would like to introduce a different additional method of analyzing aging test data, involving data fitting of all available data to unit life. Jinesh proposed that such a method could perhaps be discussed in the continuing work of TF 3. Roger requested that Alan develop and make a proposal for consideration.

Roger reviewed comments about the proposal for initial water content of the solid insulation at the start of aging in the latest draft, being 0.1 % – 0.3 %, which is a change from the 0.25 % - 0.5 % in the 2011 version. A concern is that such a level may be lower than what is observed in practice. Sasha commented that such lower water content is a practical level for lab testing, but that an expanded range compromise of 0.15 % - 0.4 % could be considered if needed. Alan commented the term should be “water content” and not “moisture content.” Tom Prevost added that although 0.5 % is mentioned in industry as a target starting water content level, that this number represents the entire insulation system, including thicker, e.g. laminated material, “cool” insulation, and that actually the “hot” insulation, e.g. wire insulation paper and winding spacer pressboard would be much drier than 0.5 %. Luiz Cheim asked if the recommendation could just be simply less than 0.5%. Sasha recommended not, in that a narrow range of starting moisture is needed to get consistent results. Tom added that practically you can’t achieve such “higher” water contents (approaching 0.5%) in actual lab conditions, and requested to stick with the 0.1% - 0.3% original recommendation. Roger concluded that he will send out the meeting slides, which have additional comments on this topic also.

Regarding next steps on the draft, Jinesh said that TF 3 would need perhaps a couple more months to complete all final recommendations on the draft before presenting a version that could be considered by the WG for a ballot. Roger requested that anyone in the WG with comments on the latest draft should submit them to Jinesh for consideration by TF 3.

Roger also noted, that since we had run out of time to conduct a second quorum poll, that he would send out an email survey to the working group members requesting approval of the minutes from the fall’s virtual meeting.

The virtual meeting was adjourned at 4:35 p.m. Next planned meeting is in the Fall of 2021.

Respectfully submitted,

Kevin Biggie
Secretary

Roger Wicks
Chair

Attendance WG C57.100 Spring 2021 Virtual Meeting:

Members (38)

Robert	Ballard	DuPont
Gilles	Bargone	FISO Technologies Inc.
Kevin	Biggie	Weidmann Electrical Technology
Edward	Cassery	Ergon, Inc.
Juan	Castellanos	Prolec GE
Stuart	Chambers	PowerTech Labs Inc.
Luiz	Cheim	Hitachi ABB Power Grids
Solomon	Chiang	The Gund Company
Bruce	Forsyth	Bruce Forsyth and Associates LLC
George	Frimpong	Hitachi ABB Power Grids
Rob	Ghosh	GE
Attila	Gyore	M&I Materials Ltd
Kurt	Kaineder	Siemens Energy
Jon	Karas	SDMyers, LLC.
Sheldon	Kennedy	Niagara Transformer
Stacey	Kessler	Basin Electric Power Cooperative
Aleksandr	Levin	Weidmann Electrical Technology
Jinesh	Malde	M&I Materials Inc.
Richard	Marek	Retired
Rogelio	Martinez	Georgia Transformer
Emilio	Morales-Cruz	Qualitrol Company LLC
Tom	Prevost	Weidmann Electrical Technology
Ion	Radu	Hitachi ABB Power Grids
Kevin	Rapp	Cargill, Inc.
Jimmy	Rasco	Rasco Consulting LLC
Timothy	Raymond	Electric Power Research Institute (EPRI)
Tony	Reiss	Custom Materials, Inc.
Afshin	Rezaei-Zare	York University
Dinesh	Sankarakurup	Duke Energy
Amitabh	Sarkar	Virginia Transformer Corp.
Alan	Sbravati	Cargill, Inc.
Steve	Schappell	SPX Transformer Solutions, Inc.
Sam	Sharpless	Rimkus Consulting Group
Dave	Stankes	3M
Paul	Su	FM Global
Radek	Szewczyk	Specialty Products Poland Sp. z o.o.
Evanne	Wang	DuPont
Roger	Wicks	DuPont

Guests (74)

Juan	Acosta	Ergon, Inc.
Juan Pablo	Andrade Medina	Olsun Electrics Corporation
Javier	Arteaga	Hitachi ABB Power Grids
Jean-Noel	Berube	Rugged Monitoring Inc.
Gene	Blackburn	Gene Blackburn Engineering
William	Boettger	Boettger Transformer Consulting LLC
Josh	Bohrn	PacifiCorp
Jeremiah	Bradshaw	Bureau of Reclamation
Erich	Buchgeher	Siemens Energy
Valery	Davydov	Mr. Valery Davydov
Brandon	Dent	Memphis Light, Gas & Water
Eric	Doak	D4EnergySolutions LLC
Zack	Draper	Delta-X Research Inc.
Samraghi	Dutta Roy	Siemens Energy
Megan	Eckroth(Kell)	EATON Corporation
Marco	Espindola	Hitachi ABB Power Grids
Joseph	Foldi	Foldi & Associates, Inc.
Michael	Franchek	Retired
Rainer	Frotscher	Maschinenfabrik Reinhausen
Orlando	Giraldo	H-J Family of Companies
Shawn	Gossett	Ameren
Tim	Gradnik	Elektroinsitut Milan Vidmar
Jim	Graham	Weidmann Electrical Technology
Thomas	Hartmann	Pepco Holdings Inc.
Saramma	Hoffman	PPL Electric Utilities
David	Holland	ExxonMobil
Derek	Hollrah	Burns & McDonnell
Paul	Jarman	University of Manchester
Marion	Jaroszewski	Delta Star Inc.
Toby	Johnson	Pacificorp
Gael	Kennedy	GR Kennedy & Associates LLC
Gary	King	Howard Industries
Ken	Klein	Grand Power Systems
Dmitriy	Klempner	Southern California Edison
John	Lackey	PowerNex Associates Inc.
Donald	Lamontagne	Arizona Public Service Co.
Fernando	Leal	Prolec GE
Yaquan(Bill)	Li	BC Hydro
Chao	Li	EATON Corporation
Lee	Matthews	Howard Industries
Zach	Millard	Great River Energy
Kent	Miller	T&R Electric Supply Co.
Paul	Morakinyo	PSEG

Martín	Muñoz Molina	Orto de Mexico
Ryan	Musgrove	Oklahoma Gas & Electric
Shankar	Nambi	Bechtel
Aniruddha	Narawane	Power Distribution, Inc. (PDI)
Brady	Nesvold	Xcel Energy
Ashmita	Niroula	Ergon, Inc.
Anastasia	O'Malley	Consolidated Edison Co. of NY
Parminder	Panesar	Virginia Transformer Corp.
Patrick	Picher	Hydro-Quebec IREQ
Jarrold	Prince	ERMCO
John	Reagan	Oncor Electric Delivery
Tim	Rocque	SPX Transformer Solutions, Inc.
Josue	Rodriguez	Prolec GE
Hakan	Sahin	Virginia and Georgia Transformers
Albert	Sanchez	Knoxville Utilities Board
Rod	Sauls	Southern Company Services
Eric	Schleismann	Southern Company Services
Pugal	Selvaraj	Virginia Transformer Corp.
Adam	Smith	Commonwealth Associates, Inc.
Muhammad	Sohail	Trench Limited
Mauricio	Soto	Hitachi ABB Power Grids
Brad	Staley	Salt River Project
Dervis	Tekin	Meramec Instrument Transformer Co.
Pragnesh	Vyas	Sunbelt-Solomon Solutions
Daniel	Weyer	Nebraska Public Power District
Bill	Whitehead	Siemens Energy
Helena	Wilhelm	Vegoor Tecnologia Aplicada
Trenton	Williams	Advanced Power Technologies
Mana	Yazdani	Trench Limited
Malia	Zaman	IEEE
Kris	Zibert	Allgeier, Martin and Associates

H.4.1.3 C57.154 IEEE Standard for Liquid Immersed Transformers Designed to Operate at Temperatures Above Conventional Limits Using High-Temperature Insulation Systems – Richard Marek

**PC57.154 – IEEE Standard for Liquid-Immersed Transformers Designed to Operate at
Temperatures Above Conventional Limits Using High-Temperature Insulation Systems**

**Minutes of S21 Virtual WG Meeting (originally planned in Toronto, ON, Canada)
Monday, April 26, 2021**

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 fifth meeting as a WG.

A total of 101 people connected to the virtual meeting.

7 of the total 90 attendees requested membership: Juan Acosta, Waldemar Ziomek, Robert Harper, vbaniroula (assumed to be Niroula Ashmita), Fabian Durand Stacy, Tim Gradnik and Balakrishnan Mani.

Data from the online poll provided by the meeting host:

Number of Members in WG = 59

Number of Members Present = 36

Quorum was met with 61% of membership present

Ten members had been changed to guest status. These are Craig DeRouen, William Elliott, Peter Heinzig, Brian McBride, Barry McGlew, Paul Morakinyo, Masaharu Murata, Jimmy Rasco, Jeff Valmus, Kwasi Yeboah

Five members, who requested membership had been changed to member status. These are Nitin Adiseshadrirao, Piotr Blaszczyk, Antoine Lecomte, Daniel Sauer, Timothy Tillery

Introductions of the Chair, Vice Chair and Secretary were made. Due to the large number of attendees and the virtual 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.

Alan Sbravati gave a report on TF1 as shown in the presentation slides in Annex 1.

Kevin Biggie gave a report on TF2 as shown in the presentation slides in Annex2.

The chair mentioned that a motion made at a previous ILSC meeting to add new information to IEEE Std 1276 was not valid, since there was no active project for this document. Bruce Forsyth explained that another WG can only make proposals and this is only possible if this WG is actively working on this standard. Therefore, a revised motion will be presented in the ILSC meeting to include a PAR for the proposed TF to amend Annex B in IEEE Std 1276.

The chair expressed his appreciation for the work which was achieved in the three meetings held by each TF. The very good progress on the standard would not have been possible without these efforts.

A quorum was established via the online poll (details see above).

The agenda was approved unanimously as well as approval of the minutes from the previous meeting in the fall of 2020.

The chair opened a discussion requesting comments on Draft 4 which was previously sent out via email before the meeting took place.

Rainer Frotscher brought up two topics on Draft 4. The first concerned the definitions in chapter 3 which were removed during the development of the document. He felt that definitions should be brought back into the document since these are important to the application of the standard. After some discussion the conclusion was to leave the current version Draft 4 as it is, since reference is made to these definitions in IEEE Std 1276.

Phil Hopkinson suggested making a list of definitions that are used in the document, but are defined in IEEE Std 1276. The chair will consider this suggestion and will come back to the WG.

Shankar Nambi offered that some of the definitions could be moved to C57.12.80 if the WG would like to do so. Since he leads this WG he is willing to consider these wishes.

The second topic Rainer suggested, was to remove annex C since this is already part of IEEE Std 1276 and duplications should be avoided. Only the clauses C4 & C5 should be kept since this information is not documented in any other standard.

Rainer Frotscher brought up another topic, that the standard needs to provide typical tap changer contact temperature profiles, requirements for tap changer life, number of operations and values of temperature rise of contacts.

The chair stated that C57.154 is a transformer standard and the tap changer information is valuable as an important accessory. However, if much more R&D is needed to complete the guide information, this standard cannot be postponed until these long-lasting R&D efforts are finished. If there is a strong need for these values, a separate guide should be considered. Alan Sbravati stated that some of the values are considered in the table proposed by TF2 for IEEE Std 1276.

Bruce Forsyth suggested a vote on the next steps and therefore Rainer Frotscher made the motion to remove Annex C from Draft 4 and to propose shifting clauses C4 & C5 from Annex C to C57.166. Alan Sbravati seconded the motion.

Data from the online poll provided by the meeting host:

Number of Members voted for = 29

Number of Members voted against = 1

Abstained = 8

The motion carried since 29 of the 36 members present voted in favor of the motion

The chair outlined the intention to go out for ballot in order to get a bigger group to look at the document and receive additional valuable feedback and input. The chair will update Draft 4 removing Annex C and will consider incorporating the comments received from Alan via email during the meeting. Draft 5 will then be circulated within the WG. If there are no significant comments after about 30 days for the review of the document, the chair will ask the WG for approval to go for ballot. If this vote is positive the chair will request approval from the ILSC.

There was no additional new business and the meeting was adjourned at 2:10PM (CDT).

Richard Marek
WG ChairAnastasia O'Malley
WG Vice-ChairEwald Schweiger
WG Secretary

Annex 1

Task Force 1
Thermal Class of Liquids

- TF Chair: Alan Sbravati
- Active members:

• Aleksandr Levin	• Attila Gyore	• Paul Su
• Kevin Biggie	• Chao Li	• Radek Szweczyk
• Brad Greaves	• Helena Wilhelm	• Jon Karas
• Kevin Rapp	• Anastasia O'Malley	• Dan Sauer
• Roger Wicks	• Phil Hopkinson	• Mary Slovachek
• Nikola Lukenda	• Muhammad Ali	• Stu Chambers
• Ed Casserly	Masood Cheema	



Second Round of Tests

- During the week of April 12th, 5 laboratories started another accelerated aging
- Two sets of "metal options" were defined the testing of the three liquids x metal option were sorted among the labs

	Mineral oil	Natural Ester	Synthetic Ester	Extra Vessels
Weidmann	Metal Options 1	Metal Options 1	Metal Options 1	2 liq (MO + NE) Metal Options 2 / 2 temp x 3 dur
Cargill	Metal Options 2	Metal Options 2	-	-
Vegoor	Metal Options 2	Metal Options 2	Metal Options 2	1 liq (SE) / Metal Options 1 / 1 temp x 3 dur
Eaton	-	Metal Options 1	Metal Options 1	-
Powertech	Metal Options 1	-	Metal Options 2	-

Metal Option # 1:
copper enameled wires;
non-insulated copper strip
non-insulated aluminum strip
strip of transformer steel

Metal Option # 2:
non-insulated copper strip.



Second Round of Tests

- The two different sets of "metals" are:

— Metal Option # 1:

- copper enameled wires;
- non-insulated copper strip
- non-insulated aluminum strip
- strip of transformer steel

— Metal Option # 2:

- non-insulated copper strip.

- Test duration x temperatures are:

165 °C		180 °C	
Vessel#	Time, h	Vessel #	Time, h
1	Control		
2	432	5	336
3	840	6	672
4	Tbd	7	Tbd

Additional texts suggested by TF#1

- Section 6.3 of the current draft of C57.154 already includes some information for considering the impacts of the hotspot temperature on the liquid.
- From C57.154 (partial): The temperature of the liquid in the winding cooling duct being higher than that of the liquid in the top of the tank.
- From C57.154 (partial): The liquid needs to withstand the **maximum surface temperature without accelerated aging, unacceptable gas generation or bubble generation**.
- To be added in Std. 1276: The liquid's flash point subtracted of 10°C can be used as the limit for the surface temperature ($T_{\text{coil surface}} = T_{\text{hotspot}} - \Delta T_{\text{solid insulation}}$)

Additional texts suggested to Std.
1276

- Additional table with some typical temperature rise limits. Main question was the top liquid limits. The new table proposed in TF#2 may address this:

	High-temperature insulation systems ^b			
Insulation system thermal class	130	140	155	180
Top liquid temperature rise ^a , (°C)	75	85	95	115
Average winding temperature rise, (°C)				
Cooling classes: KN, KF, LN, LF,	75	85	95	115
Cooling classes: KD, LD	80	90	100	120
Hottest spot temperature rise, (°C)	90	100	115	140



Annex 2

Task Force 2 - Comment Review Overview

- TF Chair: Kevin Biggie
- TF Members: Aleksandr Levin, Alan Sbravati, Stuart Chambers, George Frimpong, Roger Wicks, Ewald Schweiger, Anastasia O'Malley, Rick Marek, Attila Gyore, Jinesh Malde, Radek Szweczyk, Paul Su, Jon Karas, Kwasi Yeboah
- TF Scope: Review submitted comments received to date on PC57.154 and consolidate changes agreed by consensus as a recommendation back to the WG
- Approach: Consolidate agreed changes onto working copy of Draft 3, as TF input to Draft 4



Task Force 2 - Comment Review Activities Summary Since F20 (1 of 2)

- Held 3 TF meetings: 10 DEC, 4 FEB, 25 FEB
- Remaining submitted changes to Draft 2 and new changes to Draft 3 were consolidated into a single comments summary table for discussion
- Over the 3 meetings, the group proceeded through the comments summary table and achieved decisions on all remaining comments
- The decisions were added to a markup copy of D3, which was submitted to the WG Chair as input for D4



Task Force 2 - Comment Review Activities Summary Since F20 (2 of 2)

- Notable change regarding input to Draft 4:
 - Clarified top liquid temperature rise limits in Tables 3 & 5 (e.g. from general " $\geq 65^{\circ}\text{C}$ " statement to specific temperatures based on average winding temp. rise)
- Other clarifying content & editorial changes input also
- Work of the Task Force has been completed, and no future meetings planned
- However, in case of a requirement to review future Draft change recommendations, this TF could be considered for such work



Task Force 2 - Comment Review Next Steps

- In Section 5.1, Atilla and Jinesh recommended to add an additional table with some typical temperature rise limits as was proposed for IEC 60076. The Task Force decided to propose to the Working Group that such a table be considered for the next revision of IEEE 1276.



Task Force 2 -1276 Proposed Table

Insulation system typical materials	Insulation system thermal class	Maximum continuous operation liquid temperature ($^{\circ}\text{C}$)	Typical top liquid temperature rise ($^{\circ}\text{C}$)
Cellulose Kraft paper and mineral oil ^a	105	105	60
Thermally upgraded and mineral oil ^b	120	105	65
Cellulose Kraft paper and natural ester ^c	120	130	65
Cellulose Kraft paper and synthetic ester ^d	120	130	65
Thermally upgraded and natural ester ^c	140	130	85
Thermally upgraded and synthetic ester ^c	140	130	85
Elevated Temperature Solid Insulation and mineral oil ^c	130	105	65
Elevated Temperature Solid Insulation and ester ^c	140	130	85
High Temperature Solid Insulation and mineral oil ^a	155	105	65
High Temperature Solid Insulation and ester ^a	155	135	95
High Temperature Solid Insulation and ester ^a	180	135	95
High Temperature Solid Insulation and silicone ^a	180	155	115

^a Historical thermal parameters for the conventional insulation system

^b Typical thermal parameters for some countries, especially in North America

^c With suitable liquid manufacturer's test evidence of thermal class since the combination of Kraft or thermally upgraded paper and the many different ester liquids does not necessarily result in the same thermal performance

^d Additional support information to be included in Annex B of IEEE Std. 1276

<u>Role</u>	<u>First Name</u>	<u>Last Name</u>	<u>Company</u>	<u>Country</u>
Guest	Juan	Acosta	Ergon, Inc.	USA
Guest	Donald	Ayers	Ayers Transformer Consulting	USA
Guest	Suresh	Babanna	SPX Transformer Solutions, Inc.	USA
Member	Gilles	Bargone	FISO Technologies Inc.	Canada
Guest	Claude	Beauchemin	TJH2b Analytical Services	Canada
Guest	Jean-Noel	Berube	Rugged Monitoring Inc.	Canada
Member	Kevin	Biggie	Weidmann Electrical Technology	USA
Member	Piotr	Blaszczyk	Specialty Transformer Components LLC	USA
Member	William	Boettger	Boettger Transformer Consulting LLC	USA
Member	Mike	Bonn	Soltex Inc.	Canada
Guest	Jeremiah	Bradshaw	Bureau of Reclamation	USA
Member	Edward	Casserly	Ergon, Inc.	USA
Member	Juan	Castellanos	Prolec GE	Mexico
Member	Stuart	Chambers	Powertech Labs Inc.	Canada
Guest	Huan	Dinh	Hitachi ABB Power Grids	USA
Guest	Jeffrey	Door	H-J Family of Companies	USA
Guest	ANDY	DOWNEY	SPX TRANSFORMER SOLUTIONS	USA
Guest	Hakim	Dulac	Qualitrol Company LLC	Canada
Guest	William	Elliott	General Electric	USA
Guest	Marco	Espindola	Hitachi ABB Power Grids	USA
Member	Bruce	Forsyth	Bruce Forsyth and Associates LLC	USA
Guest	Michael	Franchek	Retired	USA
Member	George	Frimpong	Hitachi ABB Power Grids	USA
Member	Rainer	Frotscher	Maschinenfabrik Reinhausen	Germany
Guest	Jose	Gamboa	H-J Family of Companies	USA
Guest	Rob	Ghosh	GE	USA
Guest	Orlando	Giraldo	H-J Family of Companies	USA
Guest	Tim	Gradnik	Elektroinsitut Milan Vidmar	Slovenia
Member	Attila	Gyore	M&I Materials Ltd	UK
Guest	Robert	Harper	Soltex Inc.	Canada
Guest	Thomas	Hartmann	Pepco Holdings Inc.	USA
Guest	David	Holland	ExxonMobil	USA
Member	Philip	Hopkinson	HVOLT Inc.	USA
Guest	George	Jalhoum	PPI	USA
Guest	Paul	Jarman	University of Manchester	UK
Member	Marion	Jaroszewski	Delta Star Inc.	USA
Guest	Toby	Johnson	Pacificorp	USA
Guest	Laszlo	Kadar	Hatch	Canada
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Member	Jon	Karas	SDMyers, LLC.	USA
Member	Sheldon	Kennedy	Niagara Transformer	USA

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Member	Nikola	Lukenda	Petro-Canada Lubricants Inc.	Canada
Guest	Nigel	Macdonald	Trench Limited	Canada
Member	Jinesh	Malde	M&I Materials Inc.	USA
Guest	Balakrishnan	Mani	Virginia Transformer Corp.	USA
Chair	Richard	Marek	Retired	USA
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Guest	James	Mciver	Siemens Energy	USA
Guest	Randolph	Mullikin	ABB Inc.	USA
Guest	Shankar	Nambi	Bechtel	USA
Guest	Ashmita	Niroula	Ergon, Inc.	USA
Guest	Rodrigo	Ocon	Industrias IEM	Mexico
Vice-Chair	Anastasia	O'Malley	Consolidated Edison Co. of NY	USA
Guest	Monil	Patel	Pacific Gas & Electric Company	USA
Guest	Patrick	Picher	Hydro-Quebec IREQ	Canada
Guest	Christoph	Ploetner	Hitachi ABB Power Grids	Germany
Guest	Tejasvi	Prakash	Schweitzer Engineering Labs	USA
Member	Thomas	Prevost	Weidmann Electrical Technology	USA
Member	Kevin	Rapp	Cargill, Inc.	USA
Guest	Jeffrey	Ray	JLR Consulting, Inc.	USA
Guest	Larry	Rebman	EMLS, Inc.	USA
Guest	Samuel	Reed	EATON Corporation	USA
Member	Clemens	Reiss IV	Custom Materials, Inc.	USA
Guest	Tim	Rocque	SPX Transformer Solutions, Inc.	USA
Guest	Josue	Rodriguez	Prolec GE	Mexico
Guest	Mahesh	Sampat	EMS Consulting Inc.	USA
Guest	Anil	Sawant	Virginia Transformer Corp.	USA
Member	Alan	Sbravati	Cargill, Inc.	USA
Secretary	Ewald	Schweiger	Siemens Energy	Germany
Member	Jaber	Shalabi	VanTran Industries, Inc.	USA
Member	Samuel	Sharpless	Rimkus Consulting Group	USA
Guest	Adam	Smith	Commonwealth Associates, Inc.	USA
Guest	William	Solano	Instrument Transformer Equip Corp	USA
Guest	Mike	Spurlock	Spurlock Engineering Services, LLC	USA
Guest	Fabian	Stacy	Hitachi ABB Power Grids	USA
Member	David	Stankes	3M	USA
Guest	Christopher	Steineman	Delta Star Inc.	USA
Guest	David	Stockton	Stockton Consulting	USA
Member	Paul	Su	FM Global	USA

Member	Radoslaw	Szewczyk	Specialty Products Poland Sp. z o.o.	Poland
Guest	Dervis	Tekin	Meramec Instrument Transformer Co.	USA
Member	Alan	Traut	Howard Industries	USA
Guest	Kannan	Veeran	Georgia Transformer	USA
Guest	Dejan	Vukovic	Hitachi ABB Power Grids	Germany
Chair	Loren	Wagenaar	WagenTrans Consulting	USA
Guest	Dieter	Wagner	Hydro One	Canada
Member	Evanne	Wang	DuPont	USA
Member	Bruce	Webb	Knoxville Utilities Board	USA
Guest	William	Whitehead	Siemens Energy	USA
Member	Roger	Wicks	DuPont	USA
Guest	Helena	Wilhelm	Vegoor Tecnologia Aplicada	Brazil
Guest	Mana	Yazdani	Trench Limited	Canada
Guest	Joshua	Yun	Virginia Transformer Corporation	USA
Guest	Malia	Zaman	IEEE	USA
Guest	Michael	Zarnowski	Carte International	Canada
Guest	Waldemar	Ziomek	PTI Transformers	Canada

H.4.1.4 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

Working Group: Moisture in Insulation PC57.162
Monday, April 26, 2021
10:45AM – 12:00 PM
Virtual Web-Ex meeting

Chairman: Tom Prevost
Vice Chair: Valery Davydov
Secretary: Stephanie Denzer

The meeting was called to order at 10:45 am by Chair Tom Prevost.

38 members out of 42 were present. A membership quorum was achieved.
Total attendees including guests 134 attendees

Agenda:

1. Introduction of attendees
2. Establishment of Quorum
3. Approval of Agenda
4. Approval of Minutes from Fall 2020 and Fall 2019
5. Call for Patents
6. Copyright Policy
7. Chair's Remarks
8. Project Timeline
9. Membership Review
10. Document Status

11. Task Force Activities

a. TF 9

- i. Bubble Equations and Discussion
- ii. Dielectric Risk- Maximum Moisture Value in Solid

Update on Task Force Activity

TF1: Terminology and definitions

TF2: Moisture migration, distribution and equilibrium charts

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

TF8: Factory/workshop application of knowledge on moisture; establishing baselines

TF9: Field application of knowledge on moisture

Minutes:

A call for patents was completed and there were NO responses.

IEEE Copyright policy was reviewed and there were no questions or comments.

A quorum was established. This allowed the chair to conduct official business.

The agenda was approved unanimously.

A motion was made by Mike Spurlock and seconded by David Wallach to approve the minutes of the Fall 2019 meeting of PC57.162. There were no comments and the motion passed with unanimous approval.

A motion was made by Luiz Chiem and seconded by Oleg Roizman to approve the minutes of the Fall 2020 meeting of PC57.162. There were no comments and the motion passed with unanimous approval.

Chairs Remarks:

Project Timeline:

- Original PAR was approved on August 23, 2013
- A Two Year PAR extension was approved by NESCom in December 2020.
 - Project approved until Dec 31, 2022
- PAR revision to revise title, scope and purpose to address only liquid immersed transformers was approved by NESCom in January 2021.
- Balloting has to be completed by the end of 2021.
 - This means that we need to complete the document by July 2021 latest.

Document Status:

- Draft 6 has been compiled and edited by editor- Stephanie Denzer
- A Two-Year PAR extension was approved by NESCom in December 2020.
 - Project approved until Dec 31, 2022
- Balloting has to be completed by the end of 2021.
 - This means that we need to complete the document by July 2021 latest.
- Remaining chapters:
 - Chapter 7, Evaluation of aging and end of life of solid insulation parameters
 - Chapter written, Needs to be put into IEEE template style
 - Chair to review with chapter owner, Bob Raser
 - Chapter 9, Field application of knowledge on moisture
 - This chapter includes discussion on risks of moisture

Bubble equations and discussion:

The chair reviewed a motion that was prepared for the Insulation Life Subcommittee meeting stating that the detailed explanation of the bubble evolution phenomenon should be in C57.162, not C57.91, the loading guide. Bruce Forsyth, chair of the IEEE Transformers Committee stated that this motion was out of order because one working group cannot decide what another working group can put in their document. After discussion the working group agreed that C57.162 should include detailed discussion on bubble evolution. Dave Wallach, chair of the revision of C57.91 was present at this meeting. He stated that this topic will be discussed at the meeting of C57.91. Sam Sharpless, chair of the Insulation Life Subcommittee (ILSC) was present for this discussion as well. He will discuss the decision at the ILSC, and remove the motion prepared by Chair Prevost from the agenda. Oleg Roizman has agreed to work with Tom Prevost to add information on bubble evolution phenomenon as a risk of moisture in chapter 9.

Dielectric Risk, - Maximum Moisture Value in Solid

Chair Prevost presented three graphs which showed the relationship between the dielectric strength of the liquid, the solid surface and the solid paper (turn to turn). Jinesh Malde and Claude Beauchemin have offered help to find the source of the technical paper that these graphs came from. There was discussion on the limits suggested by chair Prevost of 4% moisture in the solid insulation and 50% rH for the liquid. Oleg Roizman suggested that we consider relative saturation of the solid insulation rather than percent moisture. Emilio Morales questioned whether we need to consider the temperature of the solid insulation. There was consensus that this chapter SHOULD give maximum levels for moisture for risks of dielectric integrity of the insulation system.

New Business:
None

The meeting was adjourned at 12:15 pm.
Next meeting is scheduled for October 18, 2021

Respectfully Submitted,

Tom Prevost
Chair

Valery Davydov
Vice-Chair

Stephanie Denzer
Secretary

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H.4.1.5 Working group on C57.165 IEEE Guide for Temperature Measurements for Liquid Immersed Transformers and Reactors – Mark Tostrud

Officers:
Chair – Mark Tostrud
Vice Chair – Vacant
Secretary – Zan Kiparizoski

Approved Meeting Minutes
PC57.165 WG Guide for Temperature Measurements for Liquid Immersed Transformers and Reactors
Minutes from Fall 2020 Virtual Meeting

Officers

Chair – Mark Tostrud

Vice Chair/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.

2. 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.

3. 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.

4. 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.

5. Attendance

There were 41 attendees in the meeting

13 members

28 guest

7 guests requested membership

6 were added as guests since it was their first meeting

1 was attending his second consecutive meeting and will be added as a member for the spring meeting

Quorum check

The first electronic poll showed 12 of 25 members were present

The 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

6. 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 2020.

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 to 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

WG PC57.165 – Participation List, Virtual Fall 2020 Meeting			
Role	First Name	Last Name	Company
Member	Gilles	Bargone	FISO Technologies Inc.
Member	Jean-Noel	Berube	Rugged Monitoring Inc.
Member	Juan	Castellanos	Prolec GE
Member	Hakim	Dulac	Qualitrol Company LLC
Member	Sheldon	Kennedy	Niagara Transformer
Secretary	Zan	Kiparizoski	Howard Industries
Member	Martin	Munoz Molina	Orto de Mexico
Member	Ryan	Musgrove	Oklahoma Gas & Electric
Member	Steven	Schappell	SPX Transformer Solutions, Inc.
Member	Samuel	Sharpless	Rimkus Consulting Group
Member	Babanna	Suresh	Southwest Electric Co.
Chair	Mark	Tostrud	Dynamic Ratings, Inc.
Member	Trenton	Williams	Advanced Power Technologies
Guest	Kayland	Adams	SPX Transformer Solutions, Inc.
Guest	Onome	Avanoma	Transformer Consulting Services Inc.
Guest	Jean-Noel	Berube	Rugged Monitoring Inc.
Guest	Thomas	Blackburn	Gene Blackburn Engineering
Guest	Nicolas	Blais	Nomos Systems
Guest	Jeremiah	Bradshaw	Bureau of Reclamation
Guest	Darren	Brown	Howard Industries
Guest	Solomon	Chiang	The Gund Company
Guest	Scott	Digby	Duke Energy
Guest	Samragni	Dutta Roy	Siemens Energy
Guest	Daniela	Ember Baci	Hydro-Quebec IREQ
Guest	Shamaun	Hakim	WEG Transformers USA Inc.
Guest	Ronald	Hernandez	Doble Engineering Co.
Guest	John	John	Virginia Transformer Corp.
Guest	Tiffany	Lucas	SPX Transformer Solutions, Inc.
Guest	Jinesh	Malde	M&I Materials Inc.
Guest	Anatoliy	Mudryk	Camlin Power
Guest	Anastasia	O'Malley	Consolidated Edison Co. of NY
Guest	Parminder	Panesar	Virginia Transformer Corp.
Guest	Vijay	Pargaonkar	Virginia Transformer Corp.
Guest	Nitesh	Patel	Hyundai Power Transformers USA
Guest	Homero	Portillo	Advanced Power Technologies

Guest	Oleg	Roizman	IntellPower Pty Ltd
Guest	Roderick	Sauls	Southern Company Services
Guest	Stefan	Schindler	Maschinenfabrik Reinhausen
Guest	Jacques	Vanier	Electro Composites (2008) ULC
Guest	Zachery	Weiss	WEG Transformers USA Inc.
Guest	Abderrahmane	Zouaghi	Hitachi ABB Power Grids

A PAR extension request had been discussed and approved during the working group meeting. Mark Tostrud made a motion to request a PAR extension. The motion was seconded by Zan Kiparizoski. With no objections, the motion carried.

Mark Tostrud made a motion to make a scope change to the PAR to add a purpose statement as reviewed and approved by the working group. Zan Kiparizoski seconded the motion. The Chair requested whether there were any objections. There were no objections and the motion carried. The working group will amend the purpose statement and bring a revised version to the next meeting.

H.4.1.6 Working group on C57.169 Maximum Winding Temperature Rise in Liquid-Filled Transformers (PC57.169 replacing IEEE 1538) – Scott Digby

Unapproved Meeting Minutes VIRTUAL MEETING | April 27th, 2021 | 12:55pm – 2:10pm Central Time

Chair: Scott Digby

Secretary: Cihangir John Sen

The Working Group for Determination of Maximum Winding Temperature Rise in Liquid-Immersed Transformers met for the fourth time on Tuesday, April 27, 2021 after the Fall 2020 meeting that was also held virtually.

This new standard will be replacing the existing Std. 1538 that will be expiring in 2021.

- The meeting started on time with the participation of 65 attendees according to the electronic polling system. The Chair requested a quorum check for the approval of the Agenda and the minutes of the last Fall 2020 meeting. According to the poll results 20 of the 47 members were present so the quorum was not established after the first attempt. The Chair decided to move on and try another poll later in the meeting (24 WG members needed to establish the quorum).
- The Chair presented the Patents and Copyrights policies. No essential patent claims or copyright violations were reported.
- It was noted that the PAR for this WG was approved in January 2019 and the expiration date is December 31, 2023.

The WG meeting continued with the Review of Activities Since Fall 2020 Meeting.

- First activity was to review the Section 4.1 of the document that provides details about direct temperature measurement with fiber optic probes. Several WG members commented that section being not clear about how to specify the number of probes and their recommended

locations in the windings. The Chair noted that this section of the document cited the CIGRE document.

Two volunteers (Jason Varnell and Gary Hoffmann) from our WG members have reviewed the originally cited CIGRE document (A2-307_2010) and found out that the section was also published in a CIGRE Technical Brochure (659-Transformer Thermal Modelling). The Chair confirmed that Copyright permission has already been granted by CIGRE for citation of the sections that are related with direct temperature measurement methods. Revisions have been received from the volunteers and incorporated in the Draft 4 of the document.

- Second group of volunteers (Gilles Bargone, Jean-Noel Berube, Hakim Dulac) reviewed the Annex-D section of the document for adding new content including the information on anchoring disc method. Updated content was finalized by these contributors and incorporated into the Draft D4 document.
- Draft #4 of the document was circulated within the members of the group between March 23rd and April 12th timeframe and several comments were received. Total of 41 comments were received from the volunteers and have been shared with the WG members in a spreadsheet one week before the meeting.
 - Thirty of those comments were editorial changes that are already incorporated into Draft D5 of the document.
 - Three of the comments were technical and were addressing the same item that was already discussed and agreed upon during the meeting.
 - Eight items in the General comments also needed further discussion within the group and all were closed with consensus.

The Chair went through the only comment that are technical in nature:

- This comment was about the Section 4.1.1 that provides some background information about the direct measurement. Below sentence in that section was defining the OD cooling as natural convection, which is an incorrect definition for the directed oil flow cooling method, so it was agreed to revise the sentence without the “natural convection” part.

“...the load current is sinusoidal, and that the transformer has natural convection through cooling equipment and in windings (e.g., ON-, OF-, or OD).”
- The Chair presented the Draft 5 of the P57.169 and went through the four comments that were received during the circulation of Draft 4 and asked for the WG opinion:
 - First comment was suggesting adding “rating” at the end of maximum winding temperature. It was agreed not to add since it defines an absolute temperature.
 - One comment suggested to change the wording “perpendicular to the limb” as “perpendicular to yoke” since the limb is a circular structure and perpendicularity is not possible. It was agreed to change the definition as “perpendicular to core plane”
 - Another comment was about the frame MVA of the autotransformers. It was suggested to use “equivalent” in place of “frame”. The Chair mentioned that the “equivalent MVA” is already described in the Annex-A of C57.12.00. It was agreed to use “equivalent MVA” instead of “frame MVA”.
 - Last comment was about the paragraph under Section 4.1.3.1 that specifies Winding A as the inner winding and Winding B as the outer winding. The reviewer suggested to include additional wording that shows inner winding as “typically the LV winding” and outer winding as “typically the HV winding”. That suggestion was agreed upon and will be implemented in the final revision.

- The Chair requested another poll for quorum check after the number of participants has reached to 85 but the quorum was not established after this second poll.
- The quorum was not established after the third attempt so the Agenda and the F2020 minutes were not approved.
- A motion to send the Draft D5 document to Ballot could not be entertained since the quorum was not achieved. According to the last (3rd) poll results: 23 members and 31 guests were present. 12 guests requested membership. 24 members were needed for the quorum.
- The Chair advised that he will seek approval of the Fall 2020 meeting minutes via letter ballot (email).
- The Chair also advised that he will seek approval via letter ballot (via email) from the WG to send the Draft D5 version of the document to ballot. If the required 2/3 majority is attained, the Chair will seek further guidance from the Insulating Fluids SC Chair on the next step towards obtaining SC approval to send the document for ballot.
- The Chair asked for volunteers to form a Ballot Resolution Group (BRG) before adjourning the meeting. Three of the WG members -also listed below- volunteered for the BRG t. Input from other WG participants will be sought throughout the process as the need arises.

First Name	Last Name	Company
Emilio	Morales-Cruz	Qualitrol Company LLC
Ryan	Musgrove	Oklahoma Gas & Electric
Jason	Varnell	Doble Engineering Co.

No new businesses were requested at the end of the meeting.

The need for a meeting time slot at the F21 Transformers Committee meetings will depend on the status of the potential balloting process.

The meeting was adjourned at 1:55pm Central.

Membership Requests: 13			New Members: 9		
1	Onome	Avanoma	1	Onome	Avanoma
2	Erich	Buchgeher	2	Erich	Buchgeher
3	Everton	De Oliveira	3	Everton	De Oliveira
4	Samraghi	Dutta Roy	3	Samraghi	Dutta Roy
5	Evgenii	Ermakov	5	Evgenii	Ermakov
6	Norman	Field	6	Norman	Field
7	Laszlo	Kadar	7	Laszlo	Kadar
8	Dmitriy	Klempner	8	Dmitriy	Klempner
9	Hugh	Waldrop	9	Hugh	Waldrop
10	Rashed	Minhaz			

11	Patrick	Picher				
12	Amitabh	Sarkar				
13	Drew	Welton				

Final Membership Status after the S2021 Meeting (36 Members):

First Name	Last Name	First Name	Last Name	First Name	Last Name
Onome	Avanoma	Gary	Hoffman	Cihangir	Sen
Gilles	Bargone	Laszlo	Kadar	Brad	Staley
Jean-Noel	Berube	Sheldon	Kennedy	Babanna	Suresh
Erich	Buchgeher	Egon	Kirchenmayer	Mark	Tostrud
Juan	Castellanos	Dmitriy	Klempner	Jason	Varnell
Eric	Davis	Darrell	Mangubat	Pragnesh	Vyas
Everton	De Oliveira	Emilio	Morales-Cruz	Hugh	Waldrop
Scott	Digby	Anatoliy	Mudryk	Sukhdev	Walia
Hakim	Dulac	Ryan	Musgrove	Matthew	Webb
Samraghi	Dutta Roy	Afshin	Rezaei-Zare	Mana	Yazdani
Evgenii	Ermakov	Oleg	Roizman		
Norman	Field	Dinesh	Sankarakurup		
Bruce	Forsyth	Steven	Schappell		

WG C57.169 – WG Participants List, Virtual, Spring 2021 Meeting				
	Role	First Name	Last Name	Company
1	Chair	Scott	Digby	Duke Energy
2	Secretary	Cihangir	Sen	Duke Energy
3	Member	Gilles	Bargone	FISO Technologies Inc.
4	Member	Jean-Noel	Berube	Rugged Monitoring Inc.
5	Member	Juan	Castellanos	Prolec GE
6	Member	Hakim	Dulac	Qualitrol Company LLC
7	Member	Sheldon	Kennedy	Niagara Transformer
8	Member	Egon	Kirchenmayer	Siemens Energy
9	Member	Darrell	Mangubat	Siemens Power Operations Inc.
10	Member	Emilio	Morales-Cruz	Qualitrol Company LLC
11	Member	Anatoliy	Mudryk	Camlin Power
12	Member	Ryan	Musgrove	Oklahoma Gas & Electric
13	Member	Afshin	Rezaei-Zare	York University
14	Member	Oleg	Roizman	IntellPower Pty Ltd

15	Member	Dinesh	Sankarakurup	Duke Energy
16	Member	Steven	Schappell	SPX Transformer Solutions, Inc.
17	Member	Brad	Staley	Salt River Project
18	Member	Babanna	Suresh	Southwest Electric Co.
19	Member	Mark	Tostrud	Dynamic Ratings, Inc.
20	Member	Jason	Varnell	Doble Engineering Co.
21	Member	Sukhdev	Walia	New Energy Power Co.
22	Member	Matthew	Webb	SPX Transformer Solutions, Inc.
23	Member	Mana	Yazdani	Trench Limited
24	Guest	Kayland	Adams	SPX Transformer Solutions, Inc.
25	Guest	Nabi	Almeida	Prolec GE USA LLC
26	Guest	Edmundo	Arevalo	Bonneville Power Administration
27	Guest	Onome	Avanoma	MJ Consulting
28	Guest	Jared	Bates	Oncor Electric Delivery
29	Guest	Olle	Benzler	Megger
30	Guest	Mats	Bernesjo	Hitachi ABB Power Grids
31	Guest	William	Boettger	Boettger Transformer Consulting LLC
32	Guest	Erich	Buchgeher	Siemens Energy
33	Guest	Muhammad Ali Masood	Cheema	Northern Transformer
34	Guest	Jaroslav	Chorzepa	ABB Inc.
35	Guest	Juan Carlos	Cruz Valdes	Prolec GE
36	Guest	Everton	De Oliveira	Siemens Ltda
37	Guest	Huan	Dinh	Hitachi ABB Power Grids
38	Guest	ANDY	DOWNEY	SPX TRANSFORMER SOLUTIONS
39	Guest	Samragani	Dutta Roy	Siemens Energy
40	Guest	Evgenii	Ermakov	Hitachi ABB Power Grids
41	Guest	Marco	Espindola	Hitachi ABB Power Grids
42	Guest	Norman	Field	Teshmont Consultants LP
43	Guest	Paul Gabriel	Florida	Howard Industries, Inc.
44	Guest	Raymond	Frazier	Ameren
45	Guest	Rob	Ghosh	GE
46	Guest	Tim	Gradnik	Elektroinsitut Milan Vidmar
47	Guest	Jeffrey	Gragert	Xcel Energy
48	Guest	Said	Hachichi	Hydro-Quebec
49	Guest	Thomas	Hartmann	Pepco Holdings Inc.
50	Guest	Saramma	Hoffman	PPL Electric Utilities
51	Guest	George	Jalhoum	PPI
52	Guest	Paul	Jarman	University of Manchester
53	Guest	Nicholas	Jensen	Delta Star Inc.
54	Guest	Laszlo	Kadar	Hatch
55	Guest	Gael	Kennedy	GR Kennedy & Associates LLC

56	Guest	Stacey	Kessler	Basin Electric Power Cooperative
57	Guest	Dmitriy	Klempner	Southern California Edison
58	Guest	John	Lackey	PowerNex Associates Inc.
59	Guest	Xose	Lopez-Fernandez	Universidade de Vigo
60	Guest	Rogelio	Martinez	Georgia Transformer
61	Guest	Robert	Mayer	Siemens Energy
62	Guest	Rashed	Minhaz	Transformer Consulting Services Inc.
63	Guest	Shankar	Nambi	Bechtel
64	Guest	Kristopher	Neild	Megger
65	Guest	Nitesh	Patel	Hyundai Power Transformers USA
66	Guest	Vinay	Patel	Consolidated Edison Co. of NY
67	Guest	Patrick	Picher	Hydro-Quebec IREQ
68	Guest	Alvaro	Portillo	Ing. Alvaro Portillo
69	Guest	Tejasvi	Prakash	Schweitzer Engineering Labs
70	Guest	Jarrold	Prince	ERMCO
71	Guest	Jeffrey	Ray	JLR Consulting, Inc.
72	Guest	John	Reagan	Oncor Electric Delivery
73	Guest	Larry	Rebman	EMLS, Inc.
74	Guest	Samuel	Reed	EATON Corporation
75	Guest	Perry	Reeder	SPX Transformer Solutions, Inc.
76	Guest	Tim	Rocque	SPX Transformer Solutions, Inc.
77	Guest	Amitabh	Sarkar	Virginia Transformer Corp.
78	Guest	Samuel	Sharpless	Rimkus Consulting Group
79	Guest	Muhammad	Sohail	Trench Limited
80	Guest	Arthur	Speegle	Entergy Services, Inc.
81	Guest	Christopher	Steineman	Delta Star Inc.
82	Guest	Jos	Veens	SMIT Transformatoren B.V.
83	Guest	Kannan	Veeran	Georgia Transformer
84	Guest	Richard	vonGemmingen	Dominion Energy
85	Guest	Hugh	Waldrop	Memphis Light, Gas & Water
86	Guest	Alan	Washburn	Burns & McDonnell
87	Guest	Bruce	Webb	Knoxville Utilities Board
88	Guest	Drew	Welton	Intellirent

Respectfully submitted,

Scott Digby – **Chair**

Cihangir John Sen – **Secretary**

**H.4.1.7 Task Force C57.12.90 Clause 11, Temperature Rise Tests –
Dinesh Sankarakurup**

Virtual Meeting - April 27, 2021 at 5:10 PM

Chair: Dinesh Sankarkurup – Duke Energy
Vice Chair: TBD
Secretary: John Reagan – Oncor

Attendance

There were 38 attendees. Since this was the first meeting, all present were considered members for this meeting.

Discussions

1. Since this was the first meeting, it was determined no need for Agenda Approval. Bruce Forsyth confirmed.
2. No essential patent claims or copyright violations were noted.
3. Scope was reviewed. No comments from attendees.
4. Jason Varnell’s initial comments for Clause 11 were displayed and reviewed for attendees.
 - a. Jason had observed few manufacturers who had taken an average over the last 4 hours of the heat run to get the “Ultimate Temperature”.
5. Ajith asked if scope of TF was limited to TF Scope or if the TF would be updating other discrepancies in Clause 11.
 - a. The group concluded the TF would prioritize Clause 11.3.2 then move on to sub clauses as needed.
6. Jason brings up that his initial proposal was to add wording at the end of the paragraph for clarity.
 - a. Dinesh reminds that Correction factors need to be applied to measured value
 - i. Juan Castellanos (Prolec GE) asks if it is the practice for manufacturer to show the measured value, correction factor, and final corrected value on test reports.
 1. Not standardized within industry how they are presented
7. Jason states his initial intent was to tie C57.12.90 to C57.12.00 test reporting TOR. Without statement nothing to tie it back to TOR. He wants to ensure there is no grey area.
8. Tim Raymond Motions to add sentence add end of paragraph
 - a. Proposed Text: *The final liquid temperature rise, shall be taken, at the end of the total loss run, and shall not be averaged over time.*
 - b. Jason seconds if we add “The” at the beginning of sentence.
 - c. Dennis Marlow asks for clarification of where the sentence will be added.
 - d. Dinesh Confirmed it would be at end of first paragraph of 11.3.2.
 - e. Dennis Marlow asks to strike the word “final” from the proposed text. Concerns over consistency with other standards and how the word “final” could be interpreted.
 - f. After some discussion a second motion to edit the proposed first motion text was made.
9. Bruce Forsyth adds motion: Strike “taken” and replace with “the final temperature rise measured”
 - a. Bruce – Calls for motion and wants to get second

- b. Sheldon Kennedy – Seconds motion
 - c. John K John - suggests below
 - d. Motion 1
 - i. Slight modification to Tim’s initial proposed statement
 - ii. “The final liquid temperature rise shall be ~~taken~~ the ~~final~~ liquid temperature measured at the end of the total loss run and shall not be averaged over time”
 - iii. This will be added to end of first paragraph of 11.3.2
 - iv. Juan Castellanos suggested it should say “liquid temperature Rise”.
10.
 - a. Motion 2: (to propose word changes in Motion 1)
 - i. Bruce - Add “Rise” after temperature, per Juan’s suggestion
 - ii. “The final liquid temperature rise shall be ~~taken~~ the ~~final~~ liquid temperature **Rise** measured at the end of the total loss run and shall not be averaged over time”
 - iii. Sheldon agrees with above
11. Motion 2 Vote
- a. Results
 - i. For = 25
 - ii. Against = 1
 - iii. Abstain = 2
 - iv. No Answer = 10
12. Motion 1 Vote
- a. Results
 - i. For = 24
 - ii. Against = 1
 - iii. Abstain = 4
 - iv. No Answer = 9
13. Dinesh calls for new Business
- a. Bertrand Poulin
 - i. C57.12.119-2018 guide for overload tests
 - ii. Shows typical profile, with differences in top oil temperature for OFAF and OFWF compared to ONAN and ONAF
 - iii. Later in document shows calculations for difference, but in 12.90 there is not mention of the differences
 - iv. Propose to ensure 12.90 makes this reference to difference between OFAF and others.
14. Motion to Adjourn
- a. John K. John
 - b. Sam Sharpless seconds
15. Meeting concluded at 6:29 pm

Based on the Task Force’s discussions, Dinesh Sankarakurup made a motion to consider amending clause:

11.3.2 Liquid Temperature Rise Determination

Liquid temperature rise is the difference between the liquid temperature and ambient temperature. The ultimate liquid temperature rise above ambient shall be considered to be reached when the top liquid temperature rise does not vary more than 2.5% or 1°C, whichever is greater during a consecutive 3-h period. **The final liquid temperature rise shall be the liquid temperature rise measured at the end of the total loss run and shall not be averaged over time.**

David Wallach seconded the motion. After further discussion of the proposed wording, the motion was withdrawn to be further worked on by the Task Force.

H.4.1.8 Task Force C57.12.00 Clause 5.11.1.4, Rises of Metallic Parts Other than Windings – Toby Johnson

Task Force discussions recommend adding text to clarify Clause 5.11.1.4 as:

5.11.1.4 Rises of Metallic Parts Other than Windings

Metallic parts in contact with current-carrying conductor insulation shall not attain a temperature rise in excess of the winding hottest-spot temperature rise.

The core hot spot temperature shall be limited to 130°C for the condition of highest core over-excitation, rated load, and the maximum average daily ambient temperature for transformers filled with mineral oil. For example, if the average daily temperature is 30°C, the core hot spot temperature rise shall be limited to 100°C for the condition of highest core excitation. This is to avoid the problem of gas generation in the core caused by thermal breakdown of the thin film between the core laminations. Under the same operating conditions, the core surface temperatures shall be limited by the temperature capability of the insulation materials in contact with the core surfaces.

Metallic parts other than those previously described shall not attain excessive temperature rises at maximum rated load. Excessive temperature rise shall be interpreted to mean a temperature rise that results in an operating temperature that would exceed the temperature limits of the insulation material that is in contact with the metallic part.

Toby Johnson made a motion to amend clause 5.11.1.4 as stated above. Jeff Ray seconded the motion. With no objections, the motion carried.

H.4.1.9 Liaison Report

Liaison report for Volts/Hz Task Force presented by Jeff Ray.

The Volts/Hz Task Force met on April 27th. They agreed on wording to be sent to C57.116 Working Group for discussion of volts/hz effects on transformers on generator trip and coast down. The current wording needs to be expanded. Dr. Ramsis Girgis made a presentation focusing on the volts/hz capability during the first two minutes of coast down. Further work is needed to develop a methodology and parameters to develop such a curve for transformers. The Volts/Hz Task Force will continue to work on this effort reporting to the Power Transformer Subcommittee.

H.5 Old Business

The Chair reported to the subcommittee that he was unable to execute a motion passed at the last committee meeting, “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”, because there was no active IEEE 1276 working group. The chair asked for a valid replacement motion and some alternatives were discussed. Ultimately, Alan Sbravati made the following motion “To form a Task Force to consider amendment of IEEE 1276 annex B and develop a corresponding PAR, if merited.” The motion was seconded by Marcos Ferreira. With no objections, the motion was approved. After the meeting, the Chair appointed Kevin Biggie to lead this Task Force.

H.6 New Business

There was no new business items discussed.

H.7 Adjournment

Toby Johnson made a motion to adjourn the meeting. The motion was seconded by Marcos Ferreira. There were no objections to adjournment. The meeting was adjourned at 9:20AM.

Attendance Roster

Last Name	First Name	Role	Company
Adams	Kayland	Guest	
Arnold	Elise	Guest	SGB-SMIT Group
Arteaga	Javier	Member	ABB Enterprise Software Inc
Avanoma	Onome	Member	Transformer Consulting Services Inc.
Ayers	Donald	Member	Ayers Transformer Consulting
Ballard	Robert	Member	DuPont
Bargone	Gilles	Member	FISO Technologies Inc.
Barrientos	Israel	Guest	Prolec GE
Baumgartner	Christopher	Guest	We Energies
Beaster	Barry	Member	H-J Enterprises, Inc.
Beauchemin	Claude	Member	TJH2b Analytical Services
Benzler	Olle	Guest	
Biggie	Kevin	Member	Weidmann Electrical Technology
Bishop	Ryan	Guest	Minnesota Power
Blackburn	Thomas	Guest	Gene Blackburn Engineering
Blaydon	Daniel	Guest	
Boettger	William	Member	Boettger Transformer Consulting LLC
Bolliger	Alain Dominique	Guest	
Bonn	Mike	Guest	Soltex Inc.

Bradshaw	Jeremiah	Guest	
Brown	Darren	Guest	Howard Industries
Calitz	David	Guest	Siemens Energy
Carrizales Baaldua	Juan Alfredo	Guest	
Casserly	Edward	Member	Ergon, Inc.
Castellanos	Juan	Member	Prolec GE
Chambers	Stuart	Member	Powertech Labs Inc.
Cheim	Luiz	Member	Hitachi ABB Power Grids
Chiang	Solomon	Member	The Gund Company
Chrysler	Rhett	Guest	ERMCO
Crouse	John	Guest	Roswell Alliance
Davis	Eric	Guest	Burns & McDonnell
De Oliveira	Everton	Member	
Denzer	Stephanie	Guest	Alliant Energy
Dillon	Nik	Guest	
Digby	Scott	Member	Duke Energy
Dix	Larry	Guest	Quality Switch, Inc.
Doak	Eric	Guest	D4EnergySolutions LLC
Dorris	Don	Guest	Nashville Electric Service
Downey	Andy	Guest	
Dulac	Hakim	Guest	Qualitrol Company LLC
Eagle	Tommy	Guest	
Espindola	Marco	Guest	ABB Enterprise Software Inc.
Fenton	Roger	Guest	
Ferreira	Marcos	Member	Advisian-Worley Parsons
Florida	Paul	Guest	
Forsyth	Bruce	Member	Bruce Forsyth and Associates LLC
Foschia	John	Guest	
Franchek	Michael	Guest	Retired
Franchitti	Anthony	Guest	PECO Energy Company
Frazier	Curtiss	Guest	
Frimpong	George	Member	Hitachi ABB Power Grids
Frotscher	Rainer	Guest	Maschinenfabrik Reinhausen
Garcia	Eduardo	Member	
Gardner	James	Guest	SPX Transformer Solutions, Inc.
Gaytan	Carlos	Guest	Prolec GE
Giraldo	Orlando	Guest	
Gossett	Shawn	Guest	

Gragert	Jeff	Guest	
Graham	James	Member	Weidmann Electrical Technology
Gray	Taylor	Guest	
Griesacker	Bill	Member	Duquesne Light Co.
Guner	Ismail	Guest	Hydro-Quebec
Gyore	Attila	Member	M&I Materials Ltd
Hampton	Kenneth	Guest	Baltimore Gas & Electric
Hanson	David	Guest	TJH2b Analytical Services
Hartmann	Thomas	Member	
Hayes	Roger	Member	General Electric
Heiden	Kyle	Guest	EATON Corporation
Hernandez Cano	Sergio	Guest	Hammond Power Solutions
Hoffman	Gary	Member	Advanced Power Technologies
Hoffman	Saramma	Member	PPL Electric Utilities
Holden	Andrew	Guest	Ergon, Inc.
Hollrah	Derek	Guest	Burns & McDonnell
Hopkinson	Phillip	Guest	
Jalhoum	George	Guest	PPL Electric Utilities
Jarman	Paul	Guest	University of Manchester
Jensen	Nicholas	Guest	
John	John	Member	Virginia Transformer Corp.
Johnson	Toby	Guest	
Jordan	Stephen	Member	Tennessee Valley Authority
Joshi	Akash	Member	Black & Veatch
Kadar	Laszlo	Guest	Hatch
Kaineder	Kurt	Member	Siemens Energy
Kell	Megan	Guest	
Kennedy	Sheldon	Member	Niagara Transformer
Kennedy	Gael	Member	GR Kennedy & Associates LLC
Kessler	Stacey	Member	Basin Electric Power Cooperative
King	Gary	Guest	Howard Industries
Kinner	Robert	Guest	FirstPower Group LLC
Kiparizoski	Zan	Member	Howard Industries
Kirchenmayer	Egon	Member	Siemens-Energy
Klein	Ken	Guest	
Kleine	Peter	Guest	US Army Corps of Engineers
Klempner	Dmitriy	Guest	
Kutzleb	Michelle	Guest	

Lamontagne	Donald	Guest	Arizona Public Service Co.
Larison	Andrew	Guest	Hitachi ABB Power Grids
Lee	Moonhee	Member	Hammond Power Solutions
Levin	Aleksandr	Member	Weidmann Electrical Technology
Li	Yaquan (Bill)	Guest	BC Hydro
Li	Weijun	Member	Braintree Electric Light Dept.
Locarno	Mario	Member	Doble Engineering Co.
Lucas	Tiffany	Guest	SPX Transformer
Macias	Alejandro	Guest	
Malde	Jinesh	Vice Chair	M&I Materials Inc.
Mani	Balakrishnan	Guest	Virginia Transformer Corp.
Mani	Kumar	Member	Duke Energy
Marek	Richard	Member	Retired
Marlow	Dennis	Guest	DenMar TDS Transformers
McNelly	Susan	Member	Xcel Energy
Mehrotra	Vinay	Member	SPX Transformer Solutions, Inc.
Millard	Zach	Guest	
Minhaz	Ronnie	Guest	
Montpool	Rhea	Guest	Schneider Electric
Morakinyo	Paul	Guest	PSE&G
Murray	David	Member	Tennessee Valley Authority
Musgrove	Ryan	Guest	Oklahoma Gas & Electric
Nambi	Shankar	Member	Bechtel
Natale	Anthony	Guest	HICO America
Neild	Kristopher	Guest	Megger
Nunes	Jayme	Guest	
O'Malley	Anastasia	Secretary	Consolidated Edison Co. of NY
Panesar	Parminder	Guest	Virginia Transformer Corp.
Parkinson	Dwight	Member	
Patel	Nitesh	Guest	Hyundai Power Transformers USA
Patel	Rakesh	Guest	
Patel	Moni	Guest	
Patel	Poorvi	Member	Electric Power Research Institute (EPRI)
Penny	Brian	Guest	American Transmission Co.
Ploetner	Christoph	Guest	Hitachi ABB Power Grids
Pointner	Klaus	Member	Trench Austria GmbH
Powell	Chris	Guest	Intermountain Electronics
Prevost	Thomas	Member	Weidmann Electrical Technology

Prince	Jarrold	Guest	ERMCO
Quispe Cuadrado	Lesther Alex	Guest	EATON Corporation
Rapp	Kevin	Member	Cargill, Inc.
Rasco	Jimmy	Member	
Ray	Jeffrey	Member	JLR Consulting, Inc.
Raymond	Timothy	Guest	Electric Power Research Institute (EPRI)
Reagan	John	Guest	Oncor Electric Delivery
Rebman	Larry	Guest	
Reed	Scott	Guest	MVA
Reeder	Perry	Guest	
Reiss IV	Clemens	Guest	Custom Materials, Inc.
Rocque	Tim	Guest	SPX Transformer Solutions, Inc.
Roy	Samraghi Dutta	Guest	
Polo	Rodriguez	Guest	
Roizman	Oleg	Guest	IntellPower Pty Ltd
Saad	Mickel	Member	Hitachi ABB Power Grids
Sanchez	Albert	Guest	Knoxville Utilities Board
Sankarakurup	Dinesh	Guest	Duke Energy
Sarkar	Amitabh	Member	
Sauls	Roderick	Guest	Southern Company Services
Sawant	Anil	Guest	
Sbravati	Alan	Member	Cargill, Inc.
Schappell	Steve	Guest	
Schiessl	Markus	Guest	SGB
Schindler	Stefan	Guest	
Schleismann	Eric	Guest	Southern Company Services
Schneider	Jeffrey	Guest	EATON Corporation
Schwartz	Dan	Guest	Quality Switch, Inc.
Schweiger	Ewald	Member	Siemens Energy
Sen	Cihangir	Guest	Duke Energy
Shalabi	Jaber	Guest	
Sharma	Devki	Guest	Entergy
Sharpless	Samuel	Chair	Rimkus Consulting Group
Shertukde	Hemchandra	Member	University of Hartford
Shingari	Avijit	Guest	
Siebert-Timmer	Audrey	Guest	IFD Corp
Sinclair	Jonathan	Guest	PPL Electric Utilities
Skinger	Kenneth	Guest	Scituate Consulting, Inc.

Slattery	Christopher	Guest	FirstEnergy Corp.
Sparling	Brian	Guest	
Staley	Brad	Member	
Stankes	David	Guest	3M
Stechschulte	Kyle	Guest	American Electric Power
Steel	Hampton	Guest	
Steineman	Chris	Guest	
Suresh	Babanna	Member	Southwest Electric Co.
Sweetser	Charles	Guest	
Szczechowski	Janusz	Member	Maschinenfabrik Reinhausen
Tanaka	Troy	Member	Burns & McDonnell
Taylor	Marc	Guest	Cogent Power Inc.
Thompson	Jim	Guest	
Tostrud	Mark	Member	Dynamic Ratings, Inc.
Traut	Alan	Member	
Varghese	Ajith	Member	SPX Transformer Solutions, Inc.
Varnell	Jason	Member	Doble Engineering Co.
Verdell	Joshua	Guest	ERMCO
Verdolin	Rogério	Member	Verdolin Solutions Inc.
Vijayan	Krishnamurthy	Guest	PTI Transformers
Vir	Dharam	Member	SPX Transformer Solutions, Inc.
Vo	Duy	Guest	Central Maine Power (AVANGRID)
Vyas	Pragnesh	Guest	Sunbelt-Solomon Solutions
Wagenaar	Loren	Guest	WagenTrans Consulting
Waldrop	Mike	Guest	
Walia	Sukhdev	Member	New Energy Power Co.
Wallach	David	Member	Duke Energy
Walters	Shelby	Guest	Howard Industries
Wang	Evanne	Guest	DuPont
Warntjes	Michael	Guest	American Transmission Co.
Washburn	Alan	Guest	Burns & McDonnell
Webb	Bruce	Guest	Knoxville Utilities Board
Welton	Drew	Guest	Intellirent
Werelius	Peter	Guest	
Whitehead	William	Member	
Wicks	Roger	Member	DuPont
Williams	Trenton	Guest	Advanced Power Technologies
Yang	Baitun	Member	

Zanwar	Anand	Guest	
Zhao	Peter	Member	Hydro One
Zibert	Kris	Guest	Allgeier, Martin and Associates
Ziomek	Waldemar	Guest	PTI Transformers

Respectfully submitted,

Anastasia O'Malley
Secretary, Insulation Life Subcommittee

Meeting Planning Subcommittee Minutes

Spring 2021

Tammy Behrens provided updates during the General Session with information included in the main body of the minutes in Appendix 6.

Meeting Planning Subcommittee minutes were not provided.

Annex J Performance Characteristics Subcommittee (PCS)

April 28th, 2021, In the Cloud

UNAPPROVED MINUTES

Chair: Rogerio Verdolin

Vice Chair: Sanjib Som

Secretary: Kris Zibert

J.1 Introduction / Attendance

There were 85 of the 114 PCS members in attendance so quorum was achieved (% in attendance). In addition, 100 guests were present at the meeting. The total attendance at the meeting was 185. There were 20 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 Milwaukee, Wisconsin, October 17-21, 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.

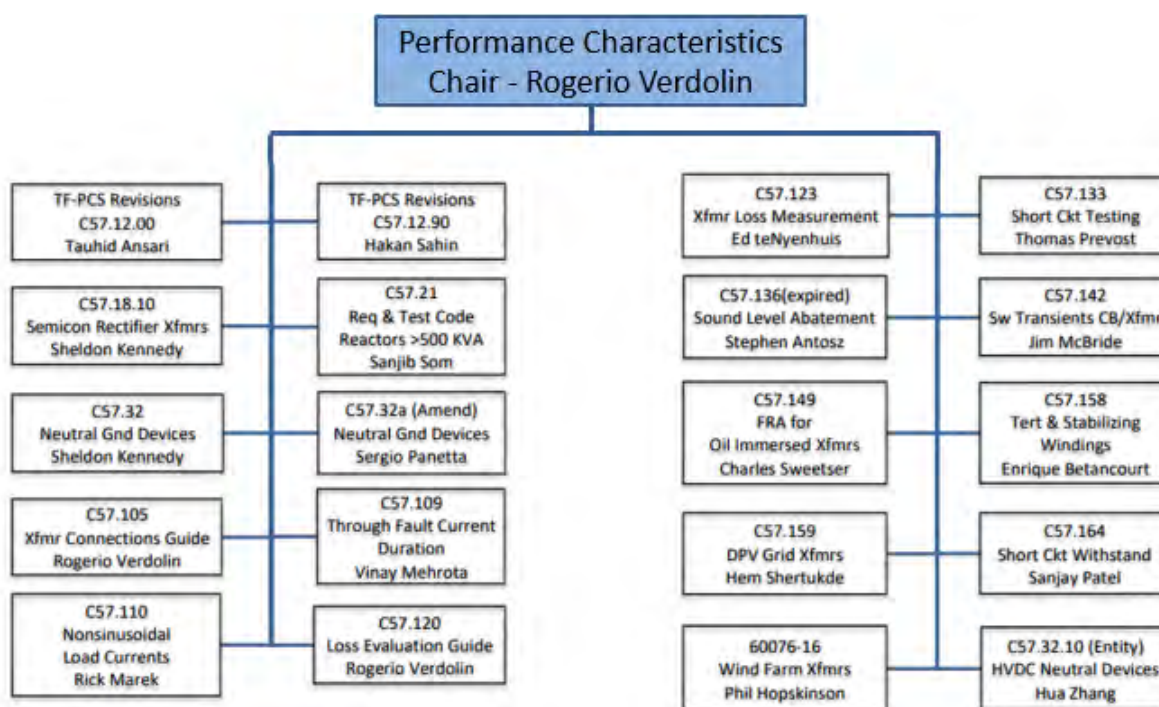
The Chair asked everyone to state any affiliation changes since last meeting in the chat window.

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

Status of Active PAR's:

- **2021 PAR's**
 - C57.21 Shunt Reactors over 500kVA (in Comment Resolution phase)
 - C57.142 Transient Guide (awaiting Sponsor Ballot)
 - C57.164 Short Circuit Withstand Guide (awaiting Sponsor Ballot)
- **2022 PAR's**
 - C57.18.10 Semiconductor Rectifier Transformers (in Comment Resolution phase)
 - C57.32.10 Entity WG Guide for the Selection of Neutral-Grounding Devices for HVDC Converter Transformers (WG in draft development)
 - C57.149 SFRA Guide (WG in draft development)
- **2024 PAR's**
 - C57.105-2019/Cor 1 (New WG)
- **2025 PAR's**
 - C57.136 Audible Sound Guide (New WG)

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 three of the last five 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.
- Refer to TC P&P 4.3.1 for more information.

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 – moved to Guest status

The following 12 Members missed the past 2 meetings and have been moved to “Guest” status:

▪ Hamid Abdelkamal	▪ Amitabh Sarkar
▪ Jeffrey Britton	▪ Devki Sharma
▪ Roger Fenton	▪ Yong Tae Sohn
▪ Thang Hochanh	▪ Craig Stiegemeier
▪ Alexander Kraetge	▪ Robert Thompson
▪ Harry Pepe	▪ Joshua Yun

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 7 former Guests requested membership at the Fall 2019 meeting and have attended the past 2 of the last 3 meetings:

▪ Steven Brzoznowski	▪ Samraghi Dutta Roy
▪ Anthony Franchitti	▪ Kyle Heiden
▪ Moonhee Lee	▪ Colby Lovins
▪ Sylvan Plante	

Welcome the New Members: We look forward to your contributions to the Subcommittee

Attendance / Membership – Quorum determination

- Current breakdown of the Subcommittee:
 - o 114 Members
 - o 58 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. 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. 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 Audible Sound Revision to Clause 13 of C57.12.90** **R. Girgis**
- **TF PCS Continuous Revisions to C57.12.00** **T. Ansari**
- **TF PCS Continuous Revisions to Test Code C57.12.90** **H. Sahin**
- **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: April 26, 2021 10:10 AM

Vice-Chair: Poorvi Patel (EPRI)

Secretary: James Cross (Kinectrics)

44 total attendees, consisting of 12 members and 32 guests. The WG did not achieved a quorum.

Highlights:

- Collected and Reviewed Case Studies (New)
- 3 - Radial Deformation 2 - Axial
- Proposed new template for collecting additional case studies
- Transportation Issues, Short Circuit Failure, Design Related Issues, Measurement Problems
- New Analysis and Interpretation Template was presented
- This will be used to reformat the Analysis and Interpretation section
- Presented newly reformatted connection tables:

Transformer vector Diagram	Phase	HV winding	Phase group/LV winding connection					
			0	2	4	6	8	10
1ph	A	H1-H2	X1-X2	n/a	n/a	n/a	n/a	n/a
	B	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	C	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Ybno	A	H1-H0	X1-X0	X0-X2	X3-X0	X0-X1	X2-X0	X0-X3
	B	H2-H0	X2-X0	X0-X3	X1-X0	X0-X2	X3-X0	X0-X1
	C	H3-H0	X3-X0	X0-X1	X2-X0	X0-X3	X1-X0	X0-X2

Dd	A	H1-H3	X1-X3	X1-X2	X3-X2	X3-X1	X2-X1	X2-X3
	B	H2-H1	X2-X1	X2-X3	X1-X3	X1-X2	X3-X2	X3-X1
	C	H3-H2	X3-X2	X3-X1	X2-X3	X2-X1	X1-X3	X1-X2

Transformer Vector Diagram	Phase	HV winding	Phase group/LV winding connection					
			1	3	5	7	9	11
Ynd	A	H1-H0	X1-X2	X3-X2	X3-X1	X2-X1	X2-X3	X1-X3
	B	H2-H0	X2-X3	X1-X3	X1-X2	X3-X2	X3-X1	X2-X1
	C	H3-H0	X3-X1	X2-X1	X2-X3	X1-X3	X1-X2	X3-X2

Ddo	A	H1-H3	X1-X0	X0-X2	X3-X0	X0-X1	X2-X0	X0-X3
	B	H2-H1	X2-X0	X0-X3	X1-X0	X0-X2	X3-X0	X0-X1
	C	H3-H2	X3-X0	X0-X1	X2-X0	X0-X3	X1-X0	X0-X2

Autotransformer Vector Diagram	Phase	Series Winding	Common Winding	Phase group/Tertiary winding connection					
				1	3	5	7	9	11
1phA	OC	H1-X1	X1-H2X2	n/a	n/a	n/a	n/a	n/a	n/a
	SC	H1-H0X0	*X1-H2X2	n/a	n/a	n/a	n/a	n/a	n/a

1phA+T	OC	H1 X1	X1-H2X2	Y1-Y2	n/a	n/a	n/a	n/a	n/a
	SC	H1-H2X2	*X1-H2X2	n/a	n/a	n/a	n/a	n/a	n/a
	SC	H1-H2X2	n/a	*Y1-Y2	n/a	n/a	n/a	n/a	n/a
	SC	n/a	X1-H2X2	*Y1-Y2	n/a	n/a	n/a	n/a	n/a

Yna	A	H1-X1	X1-H0X0	n/a	n/a	n/a	n/a	n/a	n/a
	B	H2-X2	X2-H0X0	n/a	n/a	n/a	n/a	n/a	n/a
	C	H3-X3	X3-H0X0	n/a	n/a	n/a	n/a	n/a	n/a
	A	H1-H0X0		n/a	n/a	n/a	n/a	n/a	n/a
	B	H2-H0X0	*X1-X2-X3	n/a	n/a	n/a	n/a	n/a	n/a
	C	H3-H0X0		n/a	n/a	n/a	n/a	n/a	n/a

2) TF on Audible Sound Revision to Clause 13 of C57.12.90

R. Girgis

- The TF met on Monday.
 - 27 members attended, out of a total of 66 total attendance.
 - The TF has 42 members now.
- First technical item on the Agenda :
 - Discussed resolutions of 3 items previously discussed in the TF to be included in Clause 13 of C57.12.90 which deals with measuring transformer noise.
 - Impact of temperature on core noise
 - Impact of temperature on load noise
 - Impact of tap position on load noise
- For each of the 3 items, the chairman reviewed:
 - Originally proposed text
 - Feedback from the TF
 - Proposed resolution
- These were discussed. It was agreed to:
 - Handle these items in more detail in the new Noise Guide C57.136
 - With the understanding that statements on these 3 items would be considered to be added in a future revision of the C57.12.90 Standard.
- Second technical item on the Agenda:
 - Resolutions of comments received on ballots of the C57.12.00 and C57.90
 - Comment # 1: There is an overlap between:
 - Table C.1 – “No load sound levels of power Transformers”, starting at 700 kVA
 - Table C.2: “No load sound levels of Distribution Transformers”, covering ratings up to 3000 kVA.
 - Comment # 2: The definition of distribution transformers in IEEE Standards => 10 MVA
 - Resolution:
 - Expand Table C.1 to include sound levels of distribution transformers that were originally included in Table C.2 and refer to it as “No load sound levels of power and Distribution Transformers”
 - Remove original Table C.2
 - **Comment # 3:**
 - Require measuring transformer noise at the highest noise producing tap position
 - **Resolution**
 - Will be considered as a proposed change in the next revisions of the C57.12.00 and C57.12.90 Standards.
 - In the meantime, impact of tap position on both core and load noise will be explained in detail in the new Noise Guide.
 - Resolution of rest of Comments from the ballot is planned for a virtual meeting of TF
 - Since there are still updates that need to be considered for audible sound revisions in the C57.12.00 and C57.12.90 Standards, this TF will meet again at the Fall 2021
 - Noise Guide WG will have a separate time slot for its meeting

- o 39 of the attendees of the TF meeting expressed interest in joining the new C57.136 Noise Guide WG.

3) TF on PCS Continuous Revisions to C57.12.00

T. Ansari

Meeting Date/Time: April 26th , 2021 14:20 Hr

Acting Secretary: Enrique Betancourt (Prolec GE)

- 81 total attendees, consisting of 35 members and 46 guests. The TF did achieve a quorum (31Members required). 12 Guest requested membership. (Subject to verification from AMS)
- We are requesting a volunteer to join TF as Secretary. Please contact Tauhid or Enrique.

Highlights:

- Old Business
 1. Core information on nameplate was discussed in remote meeting on March 4th , 2021 and continued in Meeting on April 26th.
 2. A motion Not to include the core information was rejected by majority
 3. Second motion to include the core information passed by majority
 4. The table to add in the nameplate was not finalized. Ramsis Girgis is requested to prepare the table. A remote meeting will be held before Fall 2021 meeting to finalize the table and present in Fall 2021 meeting
 5. Meeting adjourned at 15:35 hr.

4) TF on PCS Continuous Revisions to Test Code C57.12.90

H. Sahin

- Quorum was achieved confirmed with a second poll after the meeting started with 36/70 members present in the meeting. Total attendees was 106
- New proposal for Section 7.1.2, Ratio test frequency with new tolerances to the frequency band of the test equipment survey result, which had passed, was presented
- New revised sections 8.7 and 9.6 for OLTC tests were presented with many discussions on abnormal sound and DGA. Chair will send the new test sections proposals for a survey within the Task Force
- New proposal to modernize the section 7.3, Ratio Methods to add Electronic Ratiometer as first option, keeping the voltmeter and comparison methods as 7.3.2 and 7.3.3 was voted and passed as proposed. To be handed over to PCS
- New proposal to revise the section 12.3.4, “Number of Short Circuit test” was discussed. Chair agreed to send the new proposal for survey within the TF
- New business request to bring clarity to sections 9.3.a and 9.3.b were reviewed. Chair agreed to write the new proposal and send to the TF for survey
- Meeting adjourned on time

6) WG on HV & EHV Breaker & Transformer Sw. Transients C57.142 J. McBride

- 81 total attendees, consisting of 38 members and 43 guests. The WG achieved a quorum. 38 / 54
- Agenda and Minutes were Approved.
- IEEE Transactions Paper developed by those in the C57.142 WG has been published and is now available at <https://ieeexplore.ieee.org/document/9161400>.
- Switchgear Committee Task Force met on April 21, 2021. The group had a quorum and has review changes made in Draft 9B of C57.142. All comments to the drafts have been addressed and resolved. Those present at this meeting voted unanimously that Draft 9B is ready to ballot.

- Draft 9B was posted on the Transformers Committee website last week. This draft contains all changes to the C57.142-2010 highlighted in blue. Most of the content from the TF Transactions Paper and several other additions are included in the draft.
- The working group voted unanimously to take to ballot Draft 9B. (36/0/0)
- We have applied for a PAR extension to be sure to complete the balloting process. The WG approved of this extension.
- Phil Hopkinson gave a presentation on interwinding shields and interaction mitigation methods. Some very good discussion followed after the presentation. This presentation is posted on the Transformers Committee website.
- A paper on Interwinding Shielding influence to FRA resonance point was present by the chair. “Impulse Voltage Distribution and Frequency Response of Inter-shield Windings”
Authors: Bagheri, Phung, Naderi
- The WG authorized of the formation of a ballot resolution group.
- Next Meeting: Fall 2021 – Milwaukee, WI the week of October 19.
- The meeting was Adjourned at 3:35pm Central Time.

7) **WG Short Circuit Withstand Design Criteria C57.164**

S. Patel

- Draft 6 is the latest draft of C57.164
- The Guide was Approved to Ballot by the WG via email vote
- The Guide was Approved to Ballot by the PCSC via email vote
- C57.164D6 has been sent to IEEE SA for MEC review and Balloting
- The Ballot Pool is currently being formed
- Please join the Ballot pool for C57.164

J.6 Unfinished (Old) Business

• **Status of WG Shunt Reactors C57.21**

S. Som

- 12/13 RevCom voters have approved, waiting for last vote.
- S. Som thanks all participants for their hard work.

J.7 New Business

• **Status of new PAR for PC57.136 Audible Sound Guide**

S. Antosz

- First WG meeting will be in the fall.

• **Loading of three winding Transformer (Auto-Transformer)**

R. Minhaz

- R. Minhaz presented example cases of arithmetic, vector and simultaneous loading.
- S. Patel stated he believes standards are clear about mfr and specifier requirements for loading.
- S. McNelly stated they have had trouble with the wording of “simultaneous loading”.
- B. Poulin stated that the loading is always vectorally for three winding transformers.
- Further discussion took place.
- J. Wright pointed out that these terms do not appear in C57.12.80.
- D. Sauer made a motion to table the discussion until the next meeting. Seconded by K. Zibert. Passed by unanimous consent.

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: April 26, 2021 1010 H

Meeting Location: Virtual – On-Line

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 47 total attendees, consisting of 12 members and 35 guests. A quorum was not achieved.

AGENDA

1. Introduction and Member confirmation / Attendance poll
2. Meeting Guidelines and Patent information.
3. Review Agenda
4. Approval of minutes of Oct. 19, 2020
5. Discussions
 - a. Case Study Collection – Inventory
 - i. Mario Locarno (Doble)
 - ii. Charles Sweetser (Omicron)
 - b. Update/Presentation – Analysis and Interpretation (New Radial Format)
 - i. Peter Werelius (Megger) - Lead
 - c. Connection Table Discussion – Presentation of Edits and Changes
 - i. Diego Robalino (Megger)
6. Old Business
7. New Business
8. Adjourn

CS reviewed the IEEE Working Group meeting guidelines and the standard patent disclosure info. (No response from attendees to request for patent info.)

CS showed a slide showing the WG membership in preparation for the electronic polling of attendance. Attendees of the virtual meeting were instructed to confirm whether or not their name was on the membership roster. CS noted that at the Fall/20 virtual meeting there were two ballots conducted for attendance and it took a lot of effort to cross-reference and sort out the list.

CS waited 5 minutes before triggering the attendance poll to allow people to sign into the meeting.

The membership list shows 32 WG members.

CS noted that three members of the WG were at risk for removal due to non-attendance with the outcome dependent on participation in this meeting.

Only 12 members were present at this meeting, so quorum was not achieved and so no motions are possible.

Lack of quorum means that we could not formally approve the minutes of the Oct. 19/20 meeting. This will have to be done by email later. CS asked if there were any issues with the previous minutes.

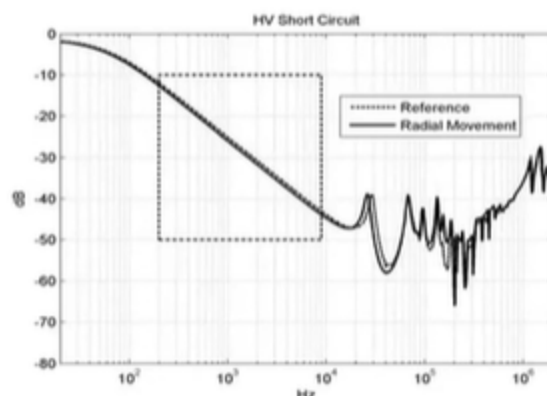
CS noted that there is a 1 ½ years left on the PAR and so we need to get the draft prepared this year for balloting.

Discussions:

- Case Study Collection

- o We have a total of five cases studies at the moment.
- o Three cases are radial deformation, and two cases are axial deformation.
- o CS noted that Radial deformation are the hard cases to determine.
- o CS noted that we need people to come forward with more case studies.
- o Cases studies need to be reviewed/approved by the working group and would be input for the “Analysis” section.
- o Poorvi Patel noted that a lot of case studies (~150) were collected during writing of the CIGRE guide. She submitted a couple of case studies with clear radial deformation.
- o Poorvi asked if there would be benefit to develop a kind of template to aid others in coming forward with their case studies.
- o CS said that he envisioned data in Excel or ASCII format with full minimum required tests (open-circuit and short-circuit)
- o Poorvi noted that photographs of the deformations would be very helpful to relate to the data.
- o Poorvi volunteered to put together such a template to guide others in the kind of information required.
- o Mario Locarno committed to sending some case studies next week.
- o PP noted that it would be helpful to have a list to identify the kinds of case studies that we are looking for.
- o Additional cases needed are transportation and core movement related.
- o J. Cross offered to look into Kinectrics’ database at our High-Current Lab where we perform short-circuit testing on transformers < 2 MVA and always perform before/after SFRA.
- o Evgenii Ermakov (Hitachi-ABB) thought that a list of desired case studies would be helpful.
- o PP: Case studies with dimensional measurements corresponding to FRA signatures are the best – but the most rare.
- o CS offered that if we want to identify four types of different deformation cases we need eight cases studies to support these...but more would be better to be able to choose the best ones.
- o Mario Locarno asked about whether a spreadsheet would be used to gather case study data.
- o PP: gather many case studies first – identify the missing cases – then identify the associated data in a spreadsheet.
- o PP noted that many cases are mixed-mode failures and so identifying specific failure modes require simpler
- o PP will create a PPT with a list of cases to share.
- o CS noted that he wants a group to review the case studies...PP and Mario L. to participate. Volunteers:
 - Diego Robalino (Megger)
 - Sanket Bolar (Megger)
 - Peter Werelius
 - Evgenii Ermakov
- o The list of cases will be reviewed at the fall/2021 meeting.

- o CS stated that the recommendation is to test in the extreme raise tap position unless you are studying a fault situation.
- o PW asked if we had enough cases to include these more specialized cases (buried tertiaries, autotransformers, etc.) in a separate chapter. CS noted that we are just after the basics at this point and that more advanced “tips and tricks” might come later.
- Analysis and Interpretation Template – Peter Werelius
 - o Peter had a brief PPT showing Radial Winding deformation definition and a table summarizing the frequency effects observed. The table is the same as the existing standard.
 - o He took the LV Open-Circuit test and the HV Short-Circuit test (Figures 2 and 3 in the current guide) and added some verbiage explaining the observed effects in the FRA curve for radial winding deformation.
 - o Cases would be added to this section – open for discussion.
 - o CS asked the group for feedback on the 0.25 dB deviation noted by PW.
 - o ML asked about the short-circuit test...
 - Haven’t we concentrated on the low-frequency inductive roll-off region?
 - Many tests come in at < 0.25 dB.
 - o PP noted that large variations can occur in different types of transformers. Question: should a number be included?
 - o CS noted that the leakage reactance figure is $\pm 3\%$
 - o PW noted that measurements are temperature dependent so there is variability, but some guidance should be provided to users of the guide in terms of dB deviation limits.
 - o PP wondered if a range of values could be given, still providing guidance without hard limits.
 - o ML noted a couple of recent cases where sister units were tested and one showed a 0.38 dB change due to manufacturing tolerances in the leakage channel. How can this be addressed in the guide?
 - o E. Ermakov: Do we mean deviation between phases or the fingerprint curve? CS: Phase to phase.
 - o ML: It’s always been phase-to-phase.
 - o PP: We should state that it is phase-to-phase.
 - o PW: He will tweak the wording, remove the deviation value, and send the section to CS before going out to the WG.
 - o PW: Remove the box in the low-frequency range of the figure in the existing standard



- PW – asked if we should be following the reference measurement if it available, or the phase-to-phase measurement, or both.
- CS: case studies should state clearly that we are looking at Phase-to-Phase deviations.
- ML: The OC and SC analysis are interpreted differently. The short-circuit test is for the phase-to-phase measurement.
- ML: noted an error in the existing document... the Page 39, Figure 9... the figure is SC test but the text calls it a OC test....needs to be corrected.
- Connection Tables – Diego Robalino
 - (Note: at Diego's request, at this point the membership attendance poll was taken again. Number of members on-line now down to 10... still no quorum)
 - Diego showed a PPT slide with the connection table for single-phase and three-phase units with different vector groups, and another for autotransformers.
 - The autotransformer table shows the connections for the series and common windings.

List of meeting participants with membership status at the end of the meeting:

Dinu Amarasinghe	Bruce Power	
Elise Arnold	SGB	
Suresh Babanna	SPX Transformer Solutions, Inc.	
Israel Barrientos	Prolec GE	Member
Sanket Bolar	Megger	
James Cross (M)	Kinectrics	Member
John Crouse	Roswell Alliance	
Eric Davis	Burns & McDonnell	
Huan Dinh	Hitachi ABB Power Grids	
Evgenii Ermakov	Hitachi ABB Power Grids	
Ismail Guner	Hydro-Quebec	Member
Thang Hochanh	Surplec Inc	
Paul Jarman	University of Manchester	
Megan Kell	EATON Corporation	
Gael Kennedy	GR Kennedy & Associates LLC	
Gary King	Howard Industries	
Will Knapek	OMICRON electronics Corp USA	Member
Donald Lamontagne	Arizona Public Service Co.	
Fernando Leal	Prolec GE	Member
Mario Locarno	Doble Engineering Co.	Member

Darrell Mangubat	Siemens Power Operations Inc.	Member
Jim McBride	JMX Services, Inc.	Member
Matthew Mcfadden	Oncor Electric Delivery	
Tony McGrail	Doble Engineering Co.	
Kris Neild	Megger	
Parminder Panesar	Virginia Transformer Corp.	Member
Poorvi Patel	Electric Power Research Institute (EPRI)	Member
Mark Perkins	D4EnergySolutions LLC	
Cornelius Plath	OMICRON Energy Solutions GmbH	
John Pruento	SPX Transformer Solutions, Inc.	
Sam Reed	EATON Corporation	
Scott Reed	MVA	Member
Perry Reeder	SPX Transformer Solutions, Inc.	
Diego Robalino	Megger	Member
Tim Rocque	SPX Transformer Solutions, Inc.	
Wes Schrom	Carolina Dielectric Maint & Testing Co.	
Cihangir Sen	Duke Energy	Member
Peter Sheridan	SGB USA, Inc.	Member
Kenneth Skinger	Scituate Consulting, Inc.	
Charles Sweetser	OMICRON electronics Corp USA	Member
Tim Tillery	Howard Industries	
Jason Varnell	Doble Engineering Co.	Member
Jos Veens	SMIT Transformatoren B.V.	
Rogerio Verdolin	Verdolin Solutions Inc.	Member
Krishnamurthy Vijayan	PTI Transformers	
Peter Werelius	Megger	Member
Baitun Yang	R.E. Uptegraff	

Respectfully submitted,

James Cross
Secretary
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

1. The meeting started on time at 8:00 am central US time, over virtual meeting platform.
2. Chair discussed the agenda, provided details of patent policy, copy right policy and membership criteria
3. Chair updated the group about the membership changes. Total number of members in the TF is 70.
4. First poll conducted had 33 members. Agenda and previous meeting's unapproved minutes approved anonymously with no rejection from the group. Quorum requirement is 35. Chair suggested to have another poll later. Later poll conducted had 36 members. Quorum met
5. Chair discussed on the old business related to Ratio tests voltage and frequency updated section and the survey results, which was related to the updating the frequency range during ratio test. He presented the survey results and reported that 31 approved, 7 disapproved, no abstain. During floor discussion David Walker from MGM remarked that the test shall be conducted at rate V/F

or less and his comment back to the survey to be considered. Chair commented on looking into this.

6. Next topic discussed was the old business of OLTC Voltage and current tests. Chair provided background on the OLTC and presented the proposal on the OLTC tap changer test. He opened the floor for discussion on the OLTC test and acceptance criteria comments. Amit Sarkar suggested to provide defined Sound levels instead of general abnormal noise. Joseph Foldi commented to reword the OLTC operation at normal sound level instead of stating abnormal noise.

Javier Arteaga, Rainer Frischer had comments regarding DGA criteria. Per chair's request, Rainer spoke for 5 minutes giving background on the original DGA study on this topic and different OLTC types. After many discussions, Chair proposed to send the OLTC Test proposal to the TF members for their voting and comments

7. Next topic was on the Ratio test methods section 7.3 to be revised (modernized). Chair presented his new section proposal and reviewed with the group. Tauhid Ansari initiated motion to accept section 7.3 approved as Written. Since we had the quorum, chair asked the meeting host to post a poll to approve the section as written, which was motioned by Tauhid. The poll was to approve or disapprove the section 7.3 Ratio Tests Method to be changed as proposed by the Chair during the meeting. 40 members approved the poll. Since the members at the beginning of the meeting was only 36, chair assured to verify the poll result for accuracy. Once the member vote count on this motion is confirmed by the chair, this section will be handed over to PCS.
8. Next topic discussed was the old business of the number of short circuit tests under section 12.3.4. Chair showed the background and the new number of tests proposal to the group. Javier Arteaga had good comments, which Chair agreed to. Chair proposed to send the short circuit test proposal to the members for survey and comments
9. Chair discussed on the typo error in cl 8.3 in 2015 revision, noted by Waldsmer Z. This was shared during the meeting for information purposes.
10. Chair presented the new business of request to section 9.3a and 9..3 for better clarity. Chair shared Jason Vernell's comments on why these sections may need to be revised for better clarity. Javier Arteaga asked for chair to send the new proposal for survey before the next meeting, which Chair agreed.
11. Meeting adjourned on time at 9:15 am Central US time.

ATTENDANCE

Name	Affiliation
glenn andersen	Anderson Associates
Hosseini Nabi-Bidhendi	ABB
Thomas (Tom) Dauzat	GE
Jaber Shalabi	Vantran
Gregory Ante (SCE)	Southern Cal. Edison
Rhett Chrysler	Ermco
jhall@cloverdalepaint.com	Cloverdale Paint
Ken Hampton	BGE
Scott Abbott	PPG
vinay	Coned
Douglas Craig	Richard Manufacturing

James Spaulding	FCgov
Paul Chisholm	IFD corporation
Chris Guertin	Cloverdale Paint
Nitesh Patel	Hyundai Power America
Ramadan A Issack	AEP
Will Elliott - Prolec|GE	GE Prolec
Christopher Lianides	SCE
Dwight Parkinson	Eaton
Carlos Gaytan	GE Prolec
Kunal V Shukla	Exelon
Josh Verdell	Ermco
Paul Florida	Howard Industries
Tyler Morgan	Duke Energy
Kristin James	Eaton
Andrew Larison	ABB
Ben Garcia	SCE
Michael S Dahlke	Cenral Moloney
Ali Ghafourian	HJ Enterprises
Jeremy Sewell	Quality Switch
USIORAD	ABB
Travis Spoone	Eaton
Robert Reepe	Southern Company
James Edward Smith	HJ Enterprises
Justin Minikel	Eaton
Mike Thibault	PGE
Martin Rave	Comed
Adrian Silgado	IFD Corporation
Shelby Walters	Howard Industries
Brad Kittrell	Coned
Chris	Howard Industries
Zoran	Pennsylvania Transformer
Alan Traut	Howard Industries
Darren Brown	Howard Industries
USER	T&R Electric Supply
duy vo	Avangrid
Martin Bachand	Colverdale paint
James Gardner	Compuserve
Michael Zarnowski	Carte Internatioanl
Alejandro Macias	Centerpoint
Audrey Siebert-Timmer (IF	IFD Corpoaration
Ramadan A Issack	AEP
glenn andersen	Anderson Associates

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, April 26, 2021. 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 2020 meeting, the membership was adjusted to 42 members. There were 27 of 42 members with a total of 66 persons in attendance. A quorum was established with 64.3 % of the membership. A call was made for any objections for an unanimous approval of the Fall 2020 TF minutes; no objections were raised so minutes are approved as written. The proposed agenda was presented without objections for approval. Ten requests for membership have been reviewed.

The first agenda item requiring resolution was the items previously considered to be included in Clause 13 of C57.12.90. The following bullets describe these three subjects with the agreed upon resolution for each item.

1. Impact of temperature on Core Noise:

o Originally proposed text

Generally, core temperature has a small impact on core noise. However, cores made of core materials that have lower quality coating with lower surface tension have been seen to experience an increase in core sound level of several dBs at higher core temperatures. This is more noticeable for high loss core steels operating at high operating flux densities.

o Main consideration / feedback

We can't confirm whether the increase in core noise due to temperature, observed in factory tests in the case of some core steels, occurs when the transformer is in operation when the whole temperature of the core is elevated.

o Proposed resolution

More appropriate to include and explain in more detail in the proposed Noise Guide (C57.136). This will also avoid unnecessarily exposing this issue in C57.12.90.

o Discussion and agreed upon resolution

Dr. Girgis suggested that the ability to explain the subject in greater detail would be better covered in the noise Guide rather than in the C57.12.90 Standard. The group unanimously agreed.

2. Impact of temperature on Load Noise

o Starting point

Load noise data of a number of transformers, measured before and after the heat-run test, showed a small increase in some designs and a small decrease in other designs.

o Main feedback

Need to quantify the impact, $\pm$ (1 to 2) dB

o Proposed resolution

- Introduce a short statement in C57.12.90
- Can be explained in more detail in the Noise Guide

o Discussion and agreed upon resolution

Krishnamurthy Vijayan, Sanjay Patel, and Enrique Betancourt expressed viewpoints on the need for more detail in the noise guide as well as the merit of having some statement in C57.12.90. It was recognized that the magnitude of this impact is within the range of measuring variability.

Pierre Riffon raised the question why load noise shouldn't be required to be performed on conjunction with the heat-run test. It was commented that there are cases where noise measurements need to be performed in sound rooms not equipped to handle a heat-run. Also, there are other more significant impacts on load

noise levels that cause load noise levels measured on site to differ from what is measured in the factory; for example, transformer mounting. This will be discussed in more detail in the new Noise Guide. Adding a statement on the impact of temperature on load noise should be considered in a next revision of the C57.12.90 Standard

3. Impact of Tap position on load noise

o Starting point

Load noise data of a number of transformers generally showed an increase of a maximum of 3 dB with all tap turns in versus the neutral tap position. With all tap turns out, the measured load noise level was slightly higher for some transformers and slightly lower for other transformers.

o Originally proposed text

Load sound level experiences small differences with tap position

o Main feedback

Need to quantify the impact, $\pm$ (1 to 3) dB. The impact can be much greater in some designs. Already have short encompassing statements in the C57.12.90 Standard regarding testing of core and load noise at other than rated tap changer positions upon purchaser's request.

o Proposed resolution

The impact of tap position can be explained in more detail in the new noise guide. There is much more to say about this item for core and load noise.

o Discussion and agreed upon resolution

Ajith Varghese, Sanjay Patel, Krishnamurthy Vijyan, and Markus Schiess, offered comments that the impact of tap position on Load noise is design dependent. A suggestion offered by Joe Foldi to require measuring load noise at maximum ampere turns loading condition. It was discussed that load noise is not always highest at that condition. Manufacturers would be able to determine what the highest load noise tap position is for a design. It was agreed that the best location for this discussion is in the new noise guide rather than trying to expand this in the C57.12.90 Standard.

The next agenda item was to start with resolution of already received ballot comments on C57.12.00 and C57.90.

Noise sections of C57.12.00

Comment received from Eaton Corporation:

o Comment:

- Table C.2 for distribution transformers only covers transformers to 3 MVA, but C57.12.36 for distribution substation transformers has a scope up to 10 MVA.

o Proposed Change:

- Change table C.1 to cover all transformers, or, expand table C.2

o Issue

- Table C.1 starts at 700 kVA and refers to "Power Transformers" and Table C.2 refers to "Distribution Transformers", covers up to 3000 kVA.

o Suggested Resolutions:

- Start Table C.1 at 10 MVA and expand Table C.2 to 10 MVA.
- Start Table C.1 at 3 MVA and refer to Table C.2 as "Small distribution transformers".

o Discussion and agreed-upon resolution

- After some discussion and a proposal by Javier Arteaga, Dan Sauer, and Sanjay Patel, it was agreed to incorporate the first five rows from Table C.2 into Table C.1 with a starting kVA of ≤ 50 kVA. Also, change the title of Table C.1 to "Audible sound pressure levels for No-Load noise of liquid-immersed distribution and power transformers".

Comment received from Westwood Professional Services

- o Comment:
 - Table C.3 specifies audible sound levels of load noise without the consideration of BIL, and these levels are much lower than the no-load levels specified in Table C.1.
- o Proposed change:
 - Add additional details when these values may be applicable and provide a reason why they are considerably lower than Table C.1.
- o Suggested and agreed upon Resolution:
 - To add such an explanation into the Noise Guide with a few clarifying sentences.

Noise sections of C57.12.90

Comment received from Scott Digby – Duke Energy

- o Comment:
 - No-Load sound level measurements should be required to be made (and guaranteed) at the highest sound producing tap position combinations and not on the rated tap position.
- o Issue:
 - Presently, section 13.3.3.1 No-load audible sound level states that core noise is to be measured at rated tap position and only upon request by the Customer that the transformer is tested at highest noise producing tap position.
- o Proposed change:
 - Require the no-load audible sound level measurement to be made and guaranteed at the highest sound producing tap position combination.
- o Suggested and agreed upon Resolution:
 - o There is a need to consider the proposed change in the next revisions of the C57.12.00 and C57.12.90 Standards. In the meantime, all of the above will be explained in the Noise Guide. The chairman stated that this is most observed in the case of high noise PA typically caused by quality issues with manufacturing PAs.

As the meeting time had expired, it was suggested to continue this ballot resolution process in another virtual meeting to be scheduled in the next few weeks. This will be arranged in accordance with the IEEE Transformers virtual meeting announcement. Details will be communicated with the TF as they are developed.

Since there are still updates that need to be considered for audible sound revisions in the C57.12.00 and C57.12.90 Standards, this Task Force will meet again at the Fall 2021 meeting and the Noise Guide WG will have a separate time slot for its meeting.

Finally, a poll was undertaken requesting attendees of the TF meeting to express their interest in joining the new C57.136 Noise Guide WG. The results were forwarded to Steven Antosz, Chairman. 39 of the attendees expressed interest in joining the new WG.

The meeting was adjourned at 2:12 PM.

Respectfully submitted,
Barry Beaster, TF Secretary

Meeting Attendance on following page:

Role	First Name	Last Name	Company
Guest	Raj	Ahuja	Raj Ahuja Consulting
Member	Stephen	Anthony	--
Member	Elise	Arnold	SGB
Member	Javier	Arteaga	Hitachi ABB Power Grids
Member	Onome	Avanoma	MJ Consulting
Member	Suresh	Babanna	SPX Transformer Solutions, Inc.
Secretary	Barry	Beaster	The H-J Family of Companies
Member	Mats	Bernesjo	Hitachi ABB Power Grids
Member	Enrique	Betancourt	Prolec GE
Guest	Thomas	Blackburn	Gene Blackburn Engineering
Member	William	Boettger	Boettger Transformer Consulting LLC
Guest	Darren	Brown	Howard Industries
Member	Steven	Brzoznowski	Bonneville Power Administration
Guest	David	Calitz	Siemens Energy
Guest	Everton	De Oliveira	Siemens Ltda
Member	Scott	Digby	Duke Energy
Guest	Thomas	Eagle	SPX Transformer Solutions
Guest	Daniela	Ember Baciú	Hydro-Quebec - Laboratoire Haute Tension
Member	Hugo	Flores	Hitachi ABB Power Grids
Guest	Anthony	Franchitti	PECO Energy Company
Member	Eduardo	Garcia Wild	Siemens Energy
Chair	Ramsis	Girgis	Hitachi ABB Power Grids
Guest	Shawn	Gossett	Ameren
Guest	Ismail	Guner	Hydro-Quebec
Member	Thomas	Hartmann	Pepco Holdings Inc.
Guest	Nicholas	Jensen	Delta Star Inc.
Guest	John	John	Virginia Transformer Corp.
Guest	Stephen	Jordan	Tennessee Valley Authority
Member	Akash	Joshi	Black & Veatch
Member	Zan	Kiparizoski	Howard Industries
Guest	Mark	Lachman	Doble Engineering Co.
Member	Fernando	Leal	Prolec GE
Guest	Yaquan (Bill)	Li	BC Hydro
Guest	Dennis	Marlow	DenMar TDS Transformers
Member	Vinay	Mehrotra	SPX Transformer Solutions, Inc.
Guest	Rashed	Minhaz	Transformer Consulting Services Inc.
Guest	Paul	Morakinyo	PSEG
Guest	George	Partyka	PTI Transformers
Member	Nitesh	Patel	Hyundai Power Transformers USA
Member	Sanjay	Patel	Royal Smit Transformers

Member	Christoph	Ploetner	Hitachi ABB Power Grids
Member	Klaus	Pointner	Trench Austria GmbH
Guest	Bertrand	Poulin	Hitachi ABB Power Grids
Member	Afshin	Rezaei-Zare	York University
Guest	Pierre	Riffon	Pierre Riffon Consultant Inc.
Guest	Hakan	Sahin	Virginia and Georgia Transformers
Guest	Dinesh	Sankarakurup	Duke Energy
Member	Daniel	Sauer	EATON Corporation
Member	Markus	Schiessl	SGB
Member	Cihangir	Sen	Duke Energy
Member	Michael	Sharp	Trench Limited
Guest	Kyle	Stechschulte	American Electric Power
Guest	Marc	Taylor	Cogent Power Inc.
Guest	Ryan	Thompson	Burns & McDonnell
Member	Ajith	Varghese	SPX Transformer Solutions, Inc.
Guest	Jason	Varnell	Doble Engineering Co.
Member	Kiran	Vedante	Ritz Instrument Transformers
Guest	Jos	Veens	SMIT Transformatoren B.V.
Member	Krishnamurthy	Vijayan	PTI Transformers
Member	Dharam	Vir	SPX Transformer Solutions, Inc.
Guest	David	Wallach	Duke Energy
Guest	Daniel	Weyer	Nebraska Public Power District
Guest	Jeffrey	Wright	Duquesne Light Co.
Guest	Kris	Zibert	Allgeier, Martin and Associates

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*

*April 26, 2021 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, April 26, 2021. The Chair Tauhid Ansari 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 TF's activities. According to the on-line system (two polls), **33** Members and **48** guests were present. The quorum to conduct regular business was achieved, as **59** members are registered in the Task Force.

The following (identifiable) **11** guests requested membership:

Amitabh Sarkar	Virginia Transformers
Aniruddha Narawane	PDI
Elise Arnold	SGB-Smit
Javier Arteaga	Hitachi-ABB
Mark Lachman	Doble Engineering
Nitesh Patel	Hyundai Power Transformers USA
Phillip Hopkinson	HVOLT Inc.
Samraghi Dutta	Siemens Energy
Shawn Gosset	Ameren
Sylvain Plante	Hydro-Quebec
Vinay Mehrotra	SPX Transformer Solutions

The Agenda proposed for the TF Chair was approved by the Group (John K.K., E.Garcia), the Columbus (Fall 2019) minutes and the Fall 2020 minutes were next unanimously approved by the Group.

The Chair gave the Group quick update about status of old business items still open.

1. OLD BUSINESS

A. Inclusion of Core information on Nameplate

The Chair provided brief report from TF's online meeting held on past March 4th. Purpose of that meeting was to share with the Group new material collected from discussions with specialists and users of transformers. The comments were collected by the WG Chair and summarized in form of new version of proposed additions to Table 6 "Nameplate Information" of C57.12.00. On new rows 25, 26 of the Table it would be specified type of core (shell/ 'core') and number of wound legs, only for "C" type nameplate. No other design information would be requested. The floor was open to discussion.

It was explained (D.Sauer/Eaton) that the WG C57.12.80 had not achieved consensus yet regarding a new definition of shell/core type transformers. Other participants expressed opinions against and in favor of providing core type information on nameplate. It was clarified (R.Girgis) that if the expectation was to draw conclusions about GIC performance just from that core information it would not be possible.

The Chair asked for a motion to include the new proposed extensions to C57.12.00 Table 6. Sanjib Som(/Eduardo Garcia) made the motion "not to include core information on C57.12.00" requirements. The Group went to vote with 6 "in favor", 32 votes "against", and 7 abstentions. The motion did not pass.

Next step was discussion about further interest on including the information, for with an alternate format. Ryan Musgrove (/Chris Slattery) made the motion "to include core information on ("C" class) transformer nameplate". The count gave 27 "in favor", 4 "against" and 10 abstentions; the motion passed.

R.Girgis agreed to develop a new text for extension of Table 6 of C57.12.00, with a description of core type.

Next the TF Chair called for Group's approval for an on-line meeting in approximately one month, to vote on final modifications to Table 6. The request was unanimously approved.

Being at the end of the meeting time slot, the Chair called for a motion to adjourn (Rogerio Verdolin/Eduardo Garcia).

The meeting was adjourned at 15:35 PM.

Respectfully submitted,

Tauhid Ansari
WG Chair

Enrique Betancourt
Co-Chair and Acting Secretary

First Name	Last Name	Company
Gregory	Anderson	GW Anderson & Associates, Inc.
Dennis	Marlow	DenMar TDS Transformers
Bruce	Forsyth	Bruce Forsyth and Associates LLC
Marion	Jaroszewski	Delta Star Inc.
William	Boettger	Boettger Transformer Consulting LLC
Joe	Nims	Allen & Hoshall, Inc.
Bill	Griesacker	Duquesne Light Co.
Joseph	Foldi	Foldi & Associates, Inc.
Mark	Perkins	D4EnergySolutions LLC
Javier	Arteaga	Hitachi ABB Power Grids
Javier	Arteaga	Hitachi ABB Power Grids
Eduardo	Garcia Wild	Siemens Energy
Steven	Snyder	Hitachi ABB Power Grids
Raj	Ahuja	Raj Ahuja Consulting
Dinesh	Sankarakurup	Duke Energy
Bertrand	Poulin	Hitachi ABB Power Grids
Ed	teNyenhuis	Hitachi ABB Power Grids
Shelby	Walters	Howard Industries
Donald	Ayers	Ayers Transformer Consulting
Ramsis	Girgis	Hitachi ABB Power Grids
Philip	Hopkinson	HVOLT Inc.
Sheldon	Kennedy	Niagara Transformer
Christopher	Baumgartner	We Energies
Enrique	Betancourt	Prolec GE
Allan	Bartek	Spruce Run Engineering LLC
Sanjay	Patel	Royal Smit Transformers
Marnie	Roussell	Entergy
Craig	Colopy	EATON Corporation
Vinay	Mehrotra	SPX Transformer Solutions, Inc.
Rogerio	Verdolin	Verdolin Solutions Inc.
Don	Dorris	Nashville Electric Service
David	Wallach	Duke Energy

James	Graham	Weidmann Electrical Technology
James	Graham	Weidmann Electrical Technology
Dharam	Vir	SPX Transformer Solutions, Inc.
Michael	Craven	Phoenix Engineering Services
John	Herron	Raytech USA
Brian	Penny	American Transmission Co.
Zan	Kiparizoski	Howard Industries
Sanjib	Som	Pennsylvania Transformer
Daniel	Blaydon	Baltimore Gas & Electric
Daniel	Sauer	EATON Corporation
Ajith	Varghese	SPX Transformer Solutions, Inc.
Krishnamurthy	Vijayan	PTI Transformers
Ryan	Musgrove	Oklahoma Gas & Electric
Shankar	Nambi	Bechtel
Shankar	Nambi	Bechtel
Darren	Brown	Howard Industries
Roderick	Sauls	Southern Company Services
Sukhdev	Walia	New Energy Power Co.
Mark	Lachman	Doble Engineering Co.
Myron	Bell	Delta Star Inc.
John	John	Virginia Transformer Corp.
Aniruddha	Narawane	Power Distribution, Inc. (PDI)
Jarrold	Prince	ERMCO
Mats	Bernesjo	Hitachi ABB Power Grids
Marc	Taylor	Cogent Power Inc.
Rainer	Frotscher	Maschinenfabrik Reinhausen
Amitabh	Sarkar	Virginia Transformer Corp.
Markus	Schiesl	SGB
Christopher	Slattery	FirstEnergy Corp.
Toby	Johnson	Pacificorp
Kristopher	Neild	Megger
Jason	Varnell	Doble Engineering Co.
Anthony	Franchitti	PECO Energy Company
William	Elliott	General Electric
Thomas	Dauzat	General Electric
Jeffrey	Gragert	Xcel Energy
Kris	Zibert	Allgeier, Martin and Associates
Anton	Koshel	Delta Star Inc.
Sanket	Bolar	Megger
Feras	Fattal	Manitoba Hydro
Cihangir	Sen	Duke Energy

Daniel	Weyer	Nebraska Public Power District
Nitesh	Patel	Hyundai Power Transformers USA
Everton	De Oliveira	Siemens Ltda
Sylvain	Plante	Hydro-Quebec
Shawn	Gossett	Ameren
Olle	Benzler	Megger
Suresh	Babanna	SPX Transformer Solutions, Inc.

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 April 27, 2021

2:20 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 2:20 PM Central Time.

Welcome and Chair's Remarks

2) Attendance Poll was taken at 2:25 PM.

102 Attendees were present (66 Guests)?

36 of 54 Members present (quorum was achieved)

3) IEEE Patent Policy and Copyright slides (no essential patent claims or copyright issues)

4) 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 (<https://ieeexplore.ieee.org/document/9161400>).

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

6) Switchgear Liaison Task Force Update – Dave Caverly

The WG continues to receive excellent comments from Switchgear experts via the Switchgear Liaison TF. The present Draft 9B was created to address all prior comments. The Switchgear task force met on April 21, 2021 and reviewed changes made in D9B. All prior comments were resolved to the satisfaction of the SG task force. There was a motion by the SG TF to take the current document to Ballot. The TF had a quorum and the motion passed by consensus with no objections or abstentions (The comments and conclusions were presented to the WG in this meeting and will be posted on the WG website).

7) Status of Draft 9B and comments – Jim McBride

A copy of the present draft of the guide (D9B) was provided to all WG members prior to the meeting and is posted on the WG webpage of the Transformers Committee (PCS) website. In summary, the old guide focused on primarily MV systems. The new guide adds HV systems as well as additional related examples and mitigations. The excitation mechanisms are now based on steep front voltages and/or repetitive “pulse train” excitations which may “line up” and coincide with transformer internal resonance frequencies.

The revision to the Guide is complete and the draft is ready to proceed to ballot. The Chair noted the WG has filed for a PAR extension as a precaution (since all work must be completed by the end of 2021).

A motion was made by Phil Hopkinson / 2nd by Rogerio Verdolin to take the present Draft 9B to ballot. The motion was approved by online ballot with 36 members approving (0 disapproving / 0 abstentions).

8) Mitigation methods task force update and presentation – Phil Hopkinson

The presentation is posted on the WG webpage. Following the presentation there was discussion on several topics, including the DEIS feature article from September 2016 [IEEE Electrical Insulation Magazine](#) 32(5):32-40 “Impulse voltage distribution and frequency response of inter-shield windings”. There was also a lengthy discussion of the guidance requested from the Switchgear committee for fast/very fast reignition transients from the Transformers Committee.

9) New Business: the WG authorized the formation of the Ballot Resolution Group without objection.

10) Next Meeting: (Fall 2021 – Milwaukee, WI the week of October 17-21)

11) Motion to Adjourn made by Phil Hopkinson / 2nd by Tom Melle. Meeting was adjourned at 3:37 PM without objection.

Respectfully,
Thomas R. Melle
Secretary

Role	First Name	Last Name	Company
Chair	James	McBride	JMX Services, Inc.
Vice-Chair	Xose	Lopez-Fernandez	Universidade de Vigo
Secretary	Thomas	Melle	HIGHVOLT
Member	Israel	Barrientos	Prolec GE
Member	Enrique	Betancourt	Prolec GE
Member	William	Boettger	Boettger Transformer Consulting LLC
Member	Jeffrey	Britton	Phenix Technologies, Inc.
Member	David	Caverly	Trench Limited
Member	Huan	Dinh	Hitachi ABB Power Grids
Member	Eduardo	Garcia Wild	Siemens Energy
Member	Kyle	Heiden	EATON Corporation
Member	Sergio	Hernandez Cano	Hammond Power Solutions
Member	Philip	Hopkinson	HVOLT Inc.
Member	John	John	Virginia Transformer Corp.
Member	Akash	Joshi	Black & Veatch
Member	Egon	Kirchenmayer	Siemens Energy
Member	Moonhee	Lee	Hammond Power Solutions
Member	Colby	Lovins	Federal Pacific Transformer
Member	Nigel	Macdonald	Trench Limited
Member	Ross	McTaggart	Trench Limited
Member	Vinay	Mehrotra	SPX Transformer Solutions, Inc.
Member	Harry	Pepe	Phenix Technologies, Inc.
Member	Klaus	Pointner	Trench Austria GmbH
Member	Bertrand	Poulin	Hitachi ABB Power Grids
Member	Afshin	Rezaei-Zare	York University
Member	Pierre	Riffon	Pierre Riffon Consultant Inc.
Member	Marnie	Roussell	Entergy
Member	Amitabh	Sarkar	Virginia Transformer Corp.
Member	Cihangir	Sen	Duke Energy
Member	Michael	Sharp	Trench Limited
Member	Hemchandra	Shertukde	University of Hartford
Member	Thomas	Sizemore	ABB Inc.

Member	Steven	Snyder	Hitachi ABB Power Grids
Member	Mike	Spurlock	Spurlock Engineering Services, LLC
Member	Shankar	Subramany	KEMA Labs
Member	Vijay	Tendulkar	Power Distribution, Inc. (PDI)
Member	Kiran	Vedante	Ritz Instrument Transformers
Member	Rogério	Verdolin	Verdolin Solutions Inc.
Member	Dharam	Vir	SPX Transformer Solutions, Inc.
Member	Sukhdev	Walia	New Energy Power Co.
Member	Baitun	Yang	R.E. Uptegraff
Member	Waldemar	Ziomek	PTI Transformers
Guest	Tauhid Haque	Ansari	Hitachi ABB Power Grids
Guest	Suresh	Babanna	SPX Transformer Solutions, Inc.
Guest	Christopher	Baumgartner	We Energies
Guest	Jeff	Benach	Consultant
Guest	Steven	Brzoznowski	Bonneville Power Administration
Guest	Muhammad Ali Masood	Cheema	Northern Transformer
Guest	Michael	Craven	Phoenix Engineering Services
Guest	James	Cross	Kinelectrics
Guest	John	Crouse	Roswell Alliance
Guest	Don	Dorris	Nashville Electric Service
Guest	Feras	Fattal	Manitoba Hydro
Guest	Reto	Fausch	RF Solutions
Guest	Raymond	Frazier	Ameren
Guest	John	Harley	FirstPower Group LLC
Guest	Charles	Johnson	Hitachi ABB Power Grids
Guest	Stephen	Jordan	Tennessee Valley Authority
Guest	Laszlo	Kadar	Hatch
Guest	Axel	Kraemer	Maschinenfabrik Reinhausen
Guest	Tim-Felix	Mai	Siemens Energy
Guest	Susan	McNelly	Xcel Energy
Guest	Randolph	Mullikin	ABB Inc.
Guest	Hosseini	Nabi-Bidhendi	ABB Inc.
Guest	Anthony	Natale	HICO America
Guest	Sylvain	Plante	Hydro-Quebec
Guest	Christoph	Ploetner	Hitachi ABB Power Grids
Guest	Tejasvi	Prakash	Schweitzer Engineering Labs
Guest	Samuel	Reed	EATON Corporation
Guest	Leopoldo	Rodriguez	Transformer Testing Services LLC
Guest	Andre	Rottenbacher	Ritz Instrument Transformers
Guest	Daniel	Sauer	EATON Corporation
Guest	Brian	Sonnenberg	Instrument Transformers, LLC
Guest	Joseph	Tedesco	Hitachi ABB Power Grids
Guest	Ajith	Varghese	SPX Transformer Solutions, Inc.
Guest	Jason	Varnell	Doble Engineering Co.
Guest	Jos	Veens	SMIT Transformatoren B.V.
Guest	Kannan	Veeran	Georgia Transformer
Guest	Loren	Wagenaar	WagenTrans Consulting
Guest	Alan	Washburn	Burns & McDonnell

Guest	Malia	Zaman	IEEE

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, April 27, 2021, 3:45-5:00 PM. The poll of membership showed 26 of the WG's 46 members present and 28 Guests, but the final report showed 26 Members and 54 Guests including 3 unknown attendees. A quorum was achieved.

The patent and copyright questions were addressed with no conflicts noted.

The agenda and previous minutes were approved.

The WG was updated on the status of the Guide. Draft 6 was approved for balloting by the WG and the Performance Characteristics Subcommittee by email ballots in February, March and April with the following results:

	WG Ballot		SC Ballot	
	Number	Percentage	Number	Percentage
WG Members	45	100%	118	100%
Respondents	32	71%	76	64%
Approve	28	87.5%	67	88%
Disapprove	1	3.1%	2	3%
Abstain	3	9.4%	7	9%

The Guide has been submitted to IEEE SA for MEC review and balloting. The ballot pool is being formed at the time of the meeting and all members and guests were encouraged to join the ballot pool.

The meeting adjourned at 4:30PM.

The WG should not need to meet during the Fall 2021 Transformers Committee meeting. Meeting attendance is listed below. It is a shame that we have modern electronic recording of attendance but the process of producing this attendance information for the Minutes takes several hours of effort; copying the pdf report, pasting it into a pdf program where it can be edited, then copying the names and pasting them into a spreadsheet then deleting all of the duplicates and searching for missing names for the numerous folks who only have single names listed or don't type their name correctly and cleaning up all the entries for people with more than a first and last name, then sorting by last name and printing a table so the information can be used to enter the Members' and previous Guest's attendance into AMS after entering a new meeting into AMS, then identifying new attendees who weren't listed in AMS as Members or previous guests and adding them one-by-one to the AMS roster then going back to the meeting attendance and recording their names, then downloading a meeting attendance report in AMS in .csv format, converting it to excel and then deleting out extra columns and further filtering and sorting to just include membership status, name and affiliation, then copying and pasting the table into this document. Note that 3 people or entities were listed on the attendance list that could not be identified and are listed at the bottom of the list.

Status	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	Everton De Oliveira	Siemens Ltda
Member	Samraghi Dutta Roy	Siemens Energy
Member	Eduardo Garcia Wild	Siemens Energy
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	Pierre Riffon	Pierre Riffon Consultant Inc.
Member	Amitabh Sarkar	Virginia Transformer Corp
Member	Markus Schiessl	SGB
Member	Eric Schleismann	Southern Company Services
Member	Cihangir Sen	Duke Energy
Member	Kushal Singh	ComEd
Member	Arthur Speegle	Entergy Services, Inc.
Member	Shankar Subramany	KEMA Labs
Member	Ed teNyenhuis	Hitachi ABB Power Grids
Member	Krishnamurthy Vijayan	PTI Transformers
Member	Dharam Vir	SPX Transformer Solutions, Inc.
Member	Baitun Yang	R.E. Uptegraff
Guest	Onome Avanoma	MJ Consulting
Guest	Suresh Babanna	SPX Transformer Solutions, Inc.
Guest	Mats Bernesjo	Hitachi ABB Power Grids
Guest	Ryan Bishop	Minnesota Power
Guest	Joshua Bohr	PacifiCorp
Guest	Erich Buchgeher	Siemens Energy
Guest	Juan Carrizales	Prolec GE
Guest	Jorge Cruz	PTI Transformers
Guest	Juan Carlos Cruz Valdes	Prolec GE
Guest	Larry Dix	Quality Switch, Inc.
Guest	Marco Espindola	Hitachi ABB Power Grids
Guest	Hugo Flores	Hitachi ABB Power Grids
Guest	Jose Gamboa	H-J Family of Companies
Guest	Robert Ganser	Transformer Consulting Services, Co.
Guest	Rob Ghosh	GE
Guest	Jeffrey Gragert	Xcel Energy

Guest	Bill Griesacker	Duquesne Light Co.
Guest	Ismail Guner	Hydro-Quebec
Guest	Ryan Hogg	Bureau of Reclamation
Guest	Nicholas Jensen	Delta Star Inc.
Guest	Gael Kennedy	GR Kennedy & Associates LLC
Guest	Anton Koshel	Delta Star Inc.
Guest	Rodrigo Ocon	Industrias IEM
Guest	Nitesh Patel	Hyundai Power Transformers USA
Guest	Monil Patel	Pacific Gas & Electric Company
Guest	Caroline Peterson	Xcel Energy
Guest	Sylvain Plante	Hydro-Quebec
Guest	Christoph Ploetner	Hitachi ABB Power Grids
Guest	Alvaro Portillo	Ing. Alvaro Portillo
Guest	Jarrod Prince	ERMCO
Guest	Tim Rocque	SPX Transformer Solutions, Inc.
Guest	Leopoldo Rodriguez	Transformer Testing Services LLC
Guest	Marnie Roussel	Entergy
Guest	Hakan Sahin	Virginia and Georgia Transformers
Guest	Daniel Sauer	EATON Corporation
Guest	Jaber Shalabi	VanTran Industries, Inc.
Guest	Edward Smith	H-J Family of Companies
Guest	Sanjib Som	Pennsylvania Transformer
Guest	Marc Taylor	Cogent Power Inc.
Guest	Dervis Tekin	Meramec Instrument Transformer Co.
Guest	Jason Varnell	Doble Engineering Co.
Guest	Jos Veens	SMIT Transformatoren B.V.
Guest	Kannan Veeran	Georgia Transformer
Guest	Rogério Verdolin	Verdolin Solutions Inc.
Guest	Pragnesh Vyas	Sunbelt-Solomon Solutions
Guest	Dieter Wagner	Hydro One
Guest	Hugh Waldrop	Memphis Light, Gas & Water
Guest	Daniel Weyer	Nebraska Public Power District
Guest	Anand Zanwar	Siemens Energy
Guest	Kris Zibert	Allgeier, Martin and Associates
Guest	Waldemar Ziomek	PTI Transformers
Unknown	Balakrishnan ??	Not in AMS
Unknown	Parminder Panesar	Not in AMS
Unknown	USIORAD	Not in AMS

J.9 Adjournment

The Chair entertained a motion to adjourn. D. Sauer made the motion, seconded by A. Joshi. The meeting was adjourned at 3:37PM

J.10 Performance Characteristics Subcommittee Attendance List

Role	First Name	Last Name	Company
Guest	Gregory	Anderson	GW Anderson & Associates, Inc.
Guest	Susan	McNelly	Xcel Energy
Guest	Dennis	Marlow	DenMar TDS Transformers
Member	Bruce	Forsyth	Bruce Forsyth and Associates PLLC
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	Paulette	Payne-Powell	Retired
Member	Barry	Beaster	H-J Family of Companies
Guest	Mark	Perkins	D4Energy Solutions LLC
Member	Javier	Arteaga	Hita chi ABB Power Grids
Guest	Michael	Sharp	Trench Limited
Member	Eduardo	Garcia Wild	Siemens Energy
Member	Steven	Snyder	Hita chi ABB Power Grids
Guest	Raj	Ahuja	Raj Ahuja Consulting
Member	Bertrand	Poulin	Hita chi ABB Power Grids
Guest	Alan	Traut	Howard Industries
Member	Stephen	Jordan	Tennessee Valley Authority
Guest	Loren	Wagenaar	WagenTrans Consulting
Member	Donald	Ayers	Ayers Transformer Consulting
Member	Ramsis	Girgis	Hita chi ABB Power Grids
Member	Philip	Hopkinson	HVOLT Inc.
Guest	Paul	Jarman	University of Manchester
Member	Sheldon	Kennedy	Niagara Transformer
Guest	Michael	Franchek	Retired
Guest	Axel	Kraemer	Maschinenfabrik Reinhausen
Member	Jeffrey	Britton	Phenix Technologies, Inc.
Member	Christopher	Baumgartner	We Energies
Member	Enrique	Betancourt	Prolec GE
Guest	Christoph	Ploetner	Hita chi ABB Power Grids
Member	Devki	Sharma	Entergy
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	Reto	Fausch	RF Solutions
Member	Marnie	Roussell	Entergy

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.
Guest	Waldemar	Ziomek	PTI Transformers
Member	Vinay	Mehrotra	SPX Transformer Solutions, Inc.
Guest	Eric	Davis	Burns & McDonnell
Chair	Rogério	Verdolin	Verdolin Solutions Inc.
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
Guest	David	Wallach	Duke Energy
Member	Ulf	Radbrandt	Hitachi ABB Power Grids
Guest	Neil	Strongosky	Memphis Light, Gas & Water
Member	Marcos	Ferreira	Beale AFB
Member	James	McBride	JMX Services, Inc.
Member	James	McBride	JMX Services, Inc.
Guest	Laszlo	Kadar	Hatch
Member	Dharam	Vir	SPX Transformer Solutions, Inc.
Guest	Rudolf	Ogajanov	ABB Inc.
Member	Kiran	Vedante	Ritz Instrument Transformers
Guest	Markus	Stank	Maschinenfabrik Reinhausen
Guest	Peter	Werelius	Megger
Guest	Marco	Espindola	Hitachi ABB Power Grids
Guest	Hakan	Sahin	Virginia and Georgia Transformers
Member	Brian	Penny	Retired
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	Tauhid Haque	Ansari	Hitachi ABB Power Grids
Member	Daniel	Blaydon	Baltimore Gas & Electric
Member	Robert	Ballard	DuPont
Member	Xose	Lopez-Fernandez	Universidade de Vigo
Member	Daniel	Sauer	EATON Corporation
Guest	Pugal	Selvaraj	Virginia Transformer Corp.
Member	Aleksandr	Levin	Weidmann Electrical Technology

Member	Ajith	Varghese	SPX Transformer Solutions, Inc.
Member	Kenneth	Skinger	Scituate Consulting, Inc.
Member	Baitun	Yang	R.E. Uptegraff
Guest	Huan	Dinh	Hita chi ABB Power Grids
Member	Harry	Pepe	Phenix Technologies, Inc.
Guest	Mario	Locarno	Doble Engineering Co.
Guest	Troy	Tanaka	Burns & McDonnell
Member	Krishnamurthy	Vijayan	PTI Transformers
Member	Ryan	Musgrove	Oklahoma Gas & Electric
Guest	David	Caverly	Trench Limited
Guest	Roderick	Sauls	Southern Company Services
Member	Egon	Kirchenmayer	Siemens Energy
Guest	Leopoldo	Rodriguez	Transformer Testing Services LLC
Guest	Rob	Ghosh	General Electric
Member	David	Murray	Tennessee Valley Authority
Member	Sukhdev	Walia	New Energy Power Co.
Guest	Myron	Bell	Delta Star Inc.
Member	Scott	Dennis	Hita chi ABB Power Grids
Member	Hugo	Flores	Hita chi ABB Power Grids
Member	Weijun	Li	Braintree Electric Light Dept.
Member	John	John	Virginia Transformer Corp.
Guest	Steven	Brzoznowski	Bonneville Power Administration
Member	Jarrod	Prince	ERMCO
Guest	Mats	Bernesjo	Hita chi ABB Power Grids
Guest	Marc	Taylor	Cogent Power Inc.
Guest	Larry	Rebman	EMLS, Inc.
Guest	Christopher	Steineman	Delta Star Inc.
Member	Amitabh	Sarkar	Virginia Transformer Corp.
Guest	Erich	Buchgeher	Siemens Energy
Guest	Markus	Schiessl	SGB
Guest	Rhett	Chrysler	ERMCO
Member	Thomas	Hartmann	Pepco Holdings Inc.
Member	Christopher	Slattery	FirstEnergy Corp.
Member	Kristopher	Neild	Megger
Member	Jason	Varnell	Doble Engineering Co.
Guest	Ismail	Guner	Hydro-Quebec
Member	Jeffrey	Wright	Duquesne Light Co.
Guest	Anthony	Franchitti	PECO Energy Company
Guest	William	Elliott	Prolec GE
Guest	Rashed	Minhaz	Transformer Consulting Services Inc.
Guest	Jeffrey	Gragert	Xcel Energy

Secretary	Kris	Zibert	Allgeier, Martin and Associates
Member	Tim-Felix	Mai	Siemens Energy
Member	Rhea	Montpool	Schneider Electric
Member	Dr. Alexander	Winter	HIGHVOLT Pruftechnik Dresden
Member	Joshua	Yun	Virginia Transformer Corporation
Guest	William	Whitehead	Siemens Energy
Member	Sanket	Bolar	Megger
Guest	Daniela	Ember Baciú	Hydro-Quebec - Laboratoire Haute Tension
Guest	Feras	Fattal	Manitoba Hydro
Guest	Cihangir	Sen	Duke Energy
Member	Stacey	Kessler	Basin Electric Power Cooperative
Guest	Daniel	Weyer	Nebraska Public Power District
Guest	Janusz	Szczechowski	Maschinenfabrik Reinhausen
Guest	Ken	Klein	Grand Power Systems
Guest	Nitesh	Patel	Hyundai Power Transformers USA
Member	Israel	Barrientos	Prolec GE
Member	Ion	Radu	Hita chi ABB Power Grids
Member	Muhammad Ali Masood	Cheema	Northern Transformer
Guest	Dan	Schwartz	Quality Switch, Inc.
Member	Gilles	Bargone	FISO Technologies Inc.
Guest	Jaber	Shalabi	VanTran Industries, Inc.
Member	Everton	De Oliveira	Siemens Ltda
Member	Bruce	Webb	Knoxville Utilities Board
Guest	Perry	Reeder	SPX Transformer Solutions, Inc.
Guest	Dervis	Tekin	Mera mec Instrument Transformer Co.
Guest	Kyle	Heiden	EATON Corporation
Guest	Sergio	Hernandez 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	Samraghi	Dutta Roy	Siemens Energy
Guest	Kyle	Stechschulte	American Electric Power
Member	Shawn	Gossett	Ameren
Guest	Manish	Sara f	Hammond Power Solutions
Guest	Afshin	Rezaei-Zare	York University
Guest	Matthew	McFadden	Oncor Electric Delivery
Guest	Hugo	Avila	Hita chi ABB Power Grids
Member	Tim	Rocque	SPX Transformer Solutions, Inc.
Guest	Ramadan	Issack	American Electric Power

Guest	William	Knapek	OMICRON electronics Corp USA
Guest	Raymond	Frazier	Ameren
Guest	Onome	Avanoma	MJ Consulting
Guest	Alan	Washburn	Burns & McDonnell
Guest	Avijit	Shingari	Pepco Holdings Inc.
Guest	Pragnesh	Vyas	Sunbelt-Solomon Solutions
Guest	Chris	Powell	Intermountain Electronics
Guest	Parag	Upadhyay	ABB Inc.
Guest	Evgenii	Ermakov	Hita chi ABB Power Grids
Guest	Adam	Smith	Commonwealth Associates, Inc.
Guest	Mubarak	Abbas	Siemens Industry
Guest	Olle	Benzler	Megger
Guest	Michael	Warntjes	American Transmission Co.
Guest	Hossein	Nabi-Bidhendi	ABB Inc.
Guest	Tiffany	Lucas	SPX Transformer Solutions, Inc.
Guest	Mauricio	Soto	Hita chi ABB Power Grids
Guest	Suresh	Babanna	SPX Transformer Solutions, Inc.
Guest	Taylor	Gray	Portland General Electric (PGE)
Guest	Ryan	Hogg	Bureau of Reclamation
Guest	Monil	Patel	Pacific Gas & Electric Company
Guest	Giovanni	Hernandez	Virginia Transformers Corporation
Guest	Hampton	Steele	TVA
Guest	Thomas	Eagle	SPX Transformer Solutions
Guest	ANDY	DOWNEY	SPX TRANSFORMER SOLUTIONS

Annex K Power Transformers Subcommittee

April 28, 2021

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, April 28, 2021 at 12:55 PM CT. The WebEx attendance record indicated that 99 out of 128 members of the subcommittee were in attendance; a quorum at the meeting was achieved. A total of 253 individuals attended the meeting; 33 guests requested membership.

The complete attendance record is provided in Attachment K.1.

K.2 Approval of Agenda and Meeting Minutes

The Chair asked the membership if there was any objection to unanimous approval of the proposed agenda. The agenda was approved without objection. The approved agenda can be found in Attachment K.2.

The Chair asked the membership if there was any objection to unanimous approval of the Fall 2020 meeting minutes. The minutes were approved without objection.

K.3 Chair's Remarks

The Chair provided an overview the future scheduled meetings and proposed locations.

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.

The Chair provided an overview of the present subcommittee membership statistics, including new members and those members which had been moved to guest status.

K.4 Working Group and Task Force Reports

K.4.1 Liaison to PC57.93a IEEE Guide for Installation and Maintenance of Liquid-Immersed Power Transformers – S. Reed

The first meeting was held in September 2020. There has only been one meeting to date and there has been no communication as to when the next meeting will be scheduled. There was discussion at the meeting about natural ester fluid requirements and consideration was given to doing experiments related to cold weather start up procedures.

Scott Reed brought up various scope issues related to transformer kV/MVA ratings in the existing C57.93 under Clause 4. He asked if the subcommittee would open up a PAR study group to consider a revision of C57.93 to address these issues.

Scott Reed made a motion to open a new task force as a PAR study group for C57.93. This motion was seconded by Marcus Ferreira. The motion was approved unanimously by the PTSC.

K.4.2 Revision of C57.125 Guide for Failure Investigation, Documentation, Analysis and Reporting for Power Transformers and Shunt Reactors – W. Binder

This task force met on Monday. A presentation on the history of the guide was provided. Attendees were informed that they will need to attend the Fall 2021 meeting in order to become members of the new Working Group. A motion was approved in the meeting to advance the PAR with a revised purpose statement to the Subcommittee. Several individuals have volunteered to become officers of the new Working Group.

At the conclusion of the task force report, Wallace Binder made a motion that the PTSC establish a Working Group at the Fall 2021 meeting to undertake the revision of C57.125-2015. The motion was seconded by Craig Colopy. The motion was approved unanimously by the PTSC.

The complete meeting minutes can be found in Attachment K.4.2.

K.4.3 Revision of C57.131 Tap Changers – C. Colopy

Craig provided background on IEC 60214-1 and the attempts to make a dual logo standard. Due to some obstacles, it was decided that the revision of C57.131 would proceed without dual logo status and to that end, a Working group was formed with the goal of completing this effort within a couple years. The current standard expires in 2022.

The working group held their first meeting and established its membership. They have an existing PAR that was approved in December 2020 which expires in 2024. They plan to have meetings in between the Spring and Fall meetings to complete the work in 2 years with the goal being to harmonize with 60214-1. The revision will add in both IEC and IEEE references and it was noted that it will address vacuum tap changers, SF6 tap changers and voltage regulators. The draft document will be sent out to working group members.

The complete meeting minutes can be found in Attachment K.4.3.

K.4.4 Revision of C57.143 – Guide for Application of Monitoring Equipment to Liquid-Immersed Transformers and Equipment – M. Spurlock

This working group met on Monday and a quorum was achieved. There was a patent issue in this working group, a Letter of Assurance was sent last week. A 2 year PAR extension was filed in March and they are waiting for resolution from NesCom. All TF leaders gave updates on their sections. There was a discussion on Chapter 4 to be separated into two different sections. It was decided that new Chapter 4 will be kept as it is. The document will be circulated among the working group and they will be holding a virtual working group meeting to discuss further. They are intending to have it ready for ballot at end of 2021.

The complete meeting minutes can be found in Attachment K.4.4.

K.4.5 Revision of C57.148 Guide for Control Cabinets for Power Transformers – J. Watson

This document has been published. They will likely start work again in 5 years. Key contributors to the document should be receiving recognition in the mail and possibly at the next meeting. This document was finished within the allotted time of the PAR.

K.4.6 Revision of C57.150 Guide for the Transportation of Transformers and Reactors Rated 10,000 kVA or Larger – G. Anderson

This group did not meet. They are no longer taking new material and are preparing to send the document to the working group for a straw ballot. The PAR expires at the end of 2021 and an extension is needed to complete the balloting process.

Dan Sauer made a motion that C57.150 has the approval of the PTSC to proceed with the PAR extension request. This motion was seconded by Bruce Forsyth. The motion was approved unanimously by the PTSC.

K.4.7 Task Force on V/Hz Curve – J. Watson

This task force has completed their assignment. They have examined existing V/Hz curves used by the industry and identified issues and have provided recommended text for C57.116 for its next revision. The task force is recommending that a new working group be formed to develop a V/Hz guide to include the impact of V/Hz on power transformers, issues with existing V/Hz curves, methodology to develop V/Hz curves for transformer designs, and temperature/time criteria for manufactures to use to develop V/Hz curves.

Request approval of this recommendation from the SC and allow time for the new working group to meet for the first time at the Fall 2021 meeting.

Joe Watson made a motion to make a recommendation to AdCom for a new working group that will cover effects of V/Hz on power transformers and related topics. This motion did not receive a second and generated discussion under which subcommittee that the working group would exist.

It was mentioned that it should be a PAR study group (TF) under the PTSC to develop a title and scope to create a PAR and that AdCom may recommend that it go to a different subcommittee if necessary.

The PTSC Chair stated that he would appoint a Chair of the PAR study group, provided the PTSC would approve the formation of the group.

Joe Watson made a motion that the SC approve the formation of a task force to create a PAR for the scope and purpose for a new guide on transformer V/Hz. This motion was seconded by Dan Sauer. This motion was approved unanimously by the PTSC.

The PTSC Chair asked if Joe Watson would accept the Chair position of the task force, which he accepted.

The V/Hz presentation will be posted to the Transformers Committee website.

Will post presentation on website.

The complete update can be found in Attachment K.4.7.

K.4.8 Development of PC57.170 Condition Assessment Guide – K. Mani

This working group met Tuesday and a quorum was achieved. There were 4 presentations given by the various TF working on the document. They hope to have the draft ready for the

working group to review by the Spring 2022 meeting. A question was raised about adding financial considerations to the guide. This will be discussed at the next meeting.

Gary Hoffman mentioned that there are anti-trust issues associated with including financial considerations. He offered to send a document to the working group chair about these issues.

The complete meeting minutes can be found in Attachment K.4.8.

K.4.9 Revision of C57.116 GSU Transformers – W. Li

The working group for revising C57.116 met on Monday and achieved a quorum. The PAR for this effort is valid until the end of 2023. This working group is split into 4 task forces to review various sections of document to identify changes that should be made. Each task force provided updates on their work at the meeting. Noted additions the document include a paragraph added for back-feed operation and a new section to address 3 winding auxiliary unit transformers. They are looking for additional members to contribute to these task forces. They plan to review all figures in the document to see if any of them need to be updated or replaced.

The complete meeting minutes can be found in Attachment K.4.9.

K.5 Old Business

No old business.

K.6 New Business

1. The Chair covered 5 documents which are close to expiring, or up for revision.

- C57.17 Arc Furnace Transformers
- C57.135 Phase Shifting Transformers Guide
- C57.153 Paralleling Guide
- C57.156 Tank Rupture Guide
- IEEE 638 Class 1E Xfmrs for Nuclear Stations

The Chair asked if there is anyone interested in working on these as a PAR study group.

C57.17 Arc Furnace - Expires Dec 2022

Dan Sauer made a motion to form a PAR study group to look into PAR issues for C57.17. This motion was seconded by Sheldon Kennedy. The motion was approved unanimously by the PTSC.

A Chair is needed in to lead this group.

C57.135 Phase Shifting Transformers Guide – Expires 2021

Ewald Schweiger made a motion to form a PAR study group to investigate continued use of this document. This motion was seconded by Joe Watson. The motion was approved unanimously by the PTSC.

IEEE 693 Seismic Requirements for Substations:

Michael Riley, mjriley@bpa.gov, the chair, has requested that several manufactures of transformers join this working group to help balance their membership and help revise the seismic design requirements for transformers. This is a very important task.

Input was solicited from transformer manufacturers to provide input into this standard. An email will be sent out regarding this to the subcommittee.

The last 3 documents listed on the meeting slide have 4-5 years before expiration.

2. There was no further new business.

K.7 Adjournment

The meeting adjourned at 2:16pm CT.

K.8 Attachments

Attachment K.1 – Attendance
Attachment K.2 – S21 PTSC Agenda
Attachment K 4.2 – C57.125 Minutes
Attachment K 4.3 – C57.131 Minutes
Attachment K 4.4 – C57.143 Minutes
Attachment K 4.7– V/HZ Minutes
Attachment K 4.8 – C57.170 Minutes
Attachment K 4.9 – C57.116 Minutes

Attachment K.1

Role	First Name	Last Name	Company
Member	Kayland	Adams	SPX Transformer Solutions, Inc.
Member	Raj	Ahuja	Raj Ahuja Consulting
Guest	Nabi	Almeida	Prolec GE USA LLC
Member	Gregory	Anderson	GW Anderson & Associates, Inc.
Member	Tauhid Haque	Ansari	Hitachi ABB Power Grids
Guest	Gregory	Ante	Southern California Edison
Guest	Stephen	Anthony	--
Guest	Edmundo	Arevalo	Bonneville Power Administration
Guest	Elise	Arnold	SGB
Member	Javier	Arteaga	Hitachi ABB Power Grids
Member	Onome	Avanoma	MJ Consulting
Member	Donald	Ayers	Ayers Transformer Consulting
Guest	Suresh	Babanna	SPX Transformer Solutions, Inc.
Member	Gilles	Bargone	FISO Technologies Inc.
Guest	Israel	Barrientos	Prolec GE
Guest	Jared	Bates	Oncor Electric Delivery
Member	Christopher	Baumgartner	We Energies
Member	Myron	Bell	Delta Star Inc.
Guest	Olle	Benzler	Megger
Guest	Mats	Bernesjo	Hitachi ABB Power Grids
Guest	Jean-Noel	Berube	Rugged Monitoring Inc.
Member	Enrique	Betancourt	Prolec GE
Guest	Kevin	Biggie	Weidmann Electrical Technology
Member	Wallace	Binder	WBBinder Consultant
Guest	Ryan	Bishop	Minnesota Power
Secretary	Daniel	Blaydon	Baltimore Gas & Electric
Member	William	Boettger	Boettger Transformer Consulting LLC
Guest	Joshua	Bohrn	PacifiCorp
Member	Paul	Boman	Hartford Steam Boiler
Guest	Michael	Botti	Hyosung HICO
Guest	Jeremiah	Bradshaw	Bureau of Reclamation
Member	Elizabeth	Bray	Southern Company Services
Guest	Jeffrey	Britton	Phenix Technologies, Inc.
Member	Steven	Brzoznowski	Bonneville Power Administration
Guest	Erich	Buchgeher	Siemens Energy
Member	David	Calitz	Siemens Energy
Guest	Juan	Carrizales	Prolec GE
Guest	Juan	Castellanos	Prolec GE
Member	Stuart	Chambers	Powertech Labs Inc.
Member	Luiz	Cheim	Hitachi ABB Power Grids

Member	Craig	Colopy	EATON Corporation
Guest	Michael	Craven	Phoenix Engineering Services
Member	Jorge	Cruz	PTI Transformers
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	Nikolaus	Dillon	Dominion Energy
Guest	Huan	Dinh	Hitachi ABB Power Grids
Guest	Eric	Doak	D4EnergySolutions LLC
Guest	Jeffrey	Door	H-J Family of Companies
Member	Don	Dorris	Nashville Electric Service
Guest	ANDY	DOWNEY	SPX TRANSFORMER SOLUTIONS
Member	Lee	Doyle	Vaisala
Member	Hakim	Dulac	Qualitrol Company LLC
Guest	Samraghi	Dutta Roy	Siemens Energy
Guest	Thomas	Eagle	SPX Transformer Solutions
Guest	Megan	Eckroth	EATON Corporation
Guest	Evgenii	Ermakov	Hitachi ABB Power Grids
Guest	Marco	Espindola	Hitachi ABB Power Grids
Guest	Feras	Fattal	Manitoba Hydro
Member	Reto	Fausch	RF Solutions
Member	Roger	Fenton	Fenton Solutions
Member	Marcos	Ferreira	Beale AFB
Member	Hugo	Flores	Hitachi ABB Power Grids
Guest	Marc	Foata	Maschinenfabrik Reinhausen
Member	Joseph	Foldi	Foldi & Associates, Inc.
Member	Bruce	Forsyth	Bruce Forsyth and Associates LLC
Guest	John	Foschia	SPX Transformer Solutions, Inc.
Guest	Michael	Franchek	Retired
Member	Anthony	Franchitti	PECO Energy Company
Guest	Raymond	Frazier	Ameren
Guest	George	Frimpong	Hitachi ABB Power Grids
Guest	Jose	Gamboa	H-J Family of Companies
Guest	Eduardo	Garcia Wild	Siemens Energy
Guest	James	Gardner	SPX Transformer Solutions, Inc.
Member	David	Geibel	Hitachi ABB Power Grids
Guest	Rob	Ghosh	General Electric
Member	Ramsis	Girgis	Hitachi ABB Power Grids
Guest	Zoran	Goncin	PTI Transformers
Guest	Shawn	Gossett	Ameren

Guest	Jeffrey	Gragert	Xcel Energy
Member	James	Graham	Weidmann Electrical Technology
Guest	Taylor	Gray	Portland General Electric (PGE)
Chair	Bill	Griesacker	Duquesne Light Co.
Guest	Ismail	Guner	Hydro-Quebec
Member	Niklas	Gustavsson	Hitachi ABB Power Grids
Member	Attila	Gyore	M&I Materials Ltd
Guest	Didier	Hamoir	Transformer Protector Corp
Guest	Thomas	Hartmann	Pepco Holdings Inc.
Member	Roger	Hayes	General Electric
Member	Kyle	Heiden	EATON Corporation
Guest	John	Herron	Raytech USA
Member	Gary	Hoffman	Advanced Power Technologies
Guest	Saramma	Hoffman	PPL Electric Utilities
Guest	Ryan	Hogg	Bureau of Reclamation
Guest	David	Holland	ExxonMobil
Guest	Derek	Hollrah	Burns & McDonnell
Guest	George	Jalhoum	PPI
Guest	Paul	Jarman	University of Manchester
Guest	Brad	Jensen	Burns & McDonnell
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
Member	Stacey	Kessler	Basin Electric Power Cooperative
Guest	Suleman	Khan	Ontario Power Generation
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	Anton	Koshel	Delta Star Inc.
Member	Axel	Kraemer	Maschinenfabrik Reinhausen
Guest	Krzysztof	Kulasek	Hitachi ABB Power Grids
Guest	Donald	Lamontagne	Arizona Public Service Co.
Guest	Andrew	Larison	Hitachi ABB Power Grids
Guest	Fernando	Leal	Prolec GE

Guest	Olivier	Lejay	Huaming USA Corp.
Member	Weijun	Li	Braintree Electric Light Dept.
Guest	Mario	Locarno	Doble Engineering Co.
Guest	Xose	Lopez-Fernandez	Universidade de Vigo
Guest	Tiffany	Lucas	SPX Transformer Solutions, Inc.
Guest	Nigel	Macdonald	Trench Limited
Guest	Jinesh	Malde	M&I Materials Inc.
Guest	Darrell	Mangubat	Siemens Power Operations Inc.
Member	Kumar	Mani	Duke Energy
Guest	Balakrishnan	Mani	Virginia Transformer Corp.
Guest	Dennis	Marlow	DenMar TDS Transformers
Guest	Rogelio	Martinez	Georgia Transformer
Guest	Lee	Matthews	Howard Industries
Guest	James	McBride	JMX Services, Inc.
Member	Matthew	McFadden	Oncor Electric Delivery
Guest	James	Mciver	Siemens Energy
Member	Susan	McNelly	Xcel Energy
Member	Vinay	Mehrotra	SPX Transformer Solutions, Inc.
Member	Thomas	Melle	HIGHVOLT
Guest	Paul	Morakinyo	PSEG
Member	David	Murray	Tennessee Valley Authority
Member	Ryan	Musgrove	Oklahoma Gas & Electric
Guest	Shankar	Nambi	Bechtel
Guest	Anthony	Natale	HICO America
Member	Kristopher	Neild	Megger
Guest	Ashmita	Niroula	Ergon, Inc.
Guest	Rodrigo	Ocon	Industrias IEM
Member	Anastasia	O'Malley	Consolidated Edison Co. of NY
Guest	Parminder	Panesar	Virginia Transformer Corp.
Guest	Dwight	Parkinson	EATON Corporation
Guest	Sanjay	Patel	Royal Smit Transformers
Member	Poorvi	Patel	Electric Power Research Institute (EPRI)
Guest	Nitesh	Patel	Hyundai Power Transformers USA
Guest	Monil	Patel	Pacific Gas & Electric Company
Guest	Arismendis	Pena	SDMyers, LLC.
Member	Brian	Penny	Retired
Guest	Mark	Perkins	D4EnergySolutions LLC
Guest	Christoph	Ploetner	Hitachi ABB Power Grids
Guest	Tejasvi	Prakash	Schweitzer Engineering Labs
Member	Ion	Radu	Hitachi ABB Power Grids
Member	Kevin	Rapp	Cargill, Inc.

Member	Timothy	Raymond	Electric Power Research Institute (EPRI)
Guest	John	Reagan	Oncor Electric Delivery
Guest	Larry	Rebman	EMLS, Inc.
Member	Scott	Reed	MVA
Guest	Samuel	Reed	EATON Corporation
Guest	Jonathan	Reimer	FortisBC
Guest	Afshin	Rezaei-Zare	York University
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	Oleg	Roizman	IntellPower Pty Ltd
Guest	Andre	Rottenbacher	Ritz Instrument Transformers
Member	Marnie	Roussell	Entergy
Member	Mickel	Saad	Hitachi ABB Power Grids
Guest	Hakan	Sahin	Virginia and Georgia Transformers
Guest	Albert	Sanchez	Knoxville Utilities Board
Guest	Lina	Sandsten	Hitachi Power Grids
Member	Dinesh	Sankarakurup	Duke Energy
Guest	Subhas	Sarkar	Retired
Member	Daniel	Sauer	EATON Corporation
Guest	Roderick	Sauls	Southern Company Services
Member	Alan	Sbravati	Cargill, Inc.
Member	Steven	Schappell	SPX Transformer Solutions, Inc.
Guest	Markus	Schiessl	SGB
Guest	Stefan	Schindler	Maschinenfabrik Reinhausen
Member	Dan	Schwartz	Quality Switch, Inc.
Guest	Pugal	Selvaraj	Virginia Transformer Corp.
Guest	Cihangir	Sen	Duke Energy
Member	Adam	Sewell	Quality Switch, Inc.
Guest	Devki	Sharma	Entergy
Guest	David	Sheehan	HICO America
Member	Stephen	Shull	BBC Electrical Services, Inc.
Guest	Jonathan	Sinclair	PPL Electric Utilities
Guest	Kushal	Singh	ComEd
Guest	Kenneth	Skinger	Scituate Consulting, Inc.
Guest	Christopher	Slattery	FirstEnergy Corp.
Guest	William	Solano	Instrument Transformer Equip Corp
Member	Sanjib	Som	Pennsylvania Transformer
Guest	Mauricio	Soto	Hitachi ABB Power Grids
Guest	Brian	Sparling	Dynamic Ratings, Inc.

Member	Fabian	Stacy	Hitachi ABB Power Grids
Member	Brad	Staley	Salt River Project
Member	Markus	Stank	Maschinenfabrik Reinhausen
Guest	Kyle	Steckschulte	American Electric Power
Guest	Neil	Strongosky	Memphis Light, Gas & Water
Guest	Charles	Sweetser	OMICRON electronics Corp USA
Member	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
Member	Mark	Tostrud	Dynamic Ratings, Inc.
Guest	Parag	Upadhyay	ABB Inc.
Member	Ajith	Varghese	SPX Transformer Solutions, Inc.
Member	Jason	Varnell	Doble Engineering Co.
Guest	Kiran	Vedante	Ritz Instrument Transformers
Guest	Kannan	Veeran	Georgia Transformer
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)
Member	Pragnesh	Vyas	Sunbelt-Solomon Solutions
Guest	Loren	Wagenaar	WagenTrans Consulting
Guest	Hugh	Waldrop	Memphis Light, Gas & Water
Member	Sukhdev	Walia	New Energy Power Co.
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.
Member	Bruce	Webb	Knoxville Utilities Board
Guest	Drew	Welton	Intellirent
Guest	Peter	Werelius	Megger
Member	Daniel	Weyer	Nebraska Public Power District
Guest	William	Whitehead	Siemens Energy
Guest	Christopher	Whitten	Hitachi ABB Power Grids
Guest	Helena	Wilhelm	Vegoor Tecnologia Aplicada
Guest	Trenton	Williams	Advanced Power Technologies
Member	Dr. Alexander	Winter	HIGHVOLT Pruftechnik Dresden
Member	Jeffrey	Wright	Duquesne Light Co.

Guest	Kipp	Yule	Bechtel
Guest	Joshua	Yun	Virginia Transformer Corporation
Member	Peter	Zhao	Hydro One
Member	Kris	Zibert	Allgeier, Martin and Associates
Guest	Waldemar	Ziomek	PTI Transformers

Attachment K.2

AGENDA

Power Transformers Subcommittee

IEEE PES Transformers Committee

Wednesday, April 28, 2021, 12:55-2:10 PM CDT, Session 2

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. TF Revision of C57.125, Failure Investigating and Reporting W. Binder
 - c. WG Revision of C57-131, Tap Changers C. Colopy
 - d. WG Revision of C57.143, Monitoring Guide M. Spurlock
 - e. WG Revision of C57.148, Control Cabinet Standard J. Watson
 - f. WG Revision of C57.150, Transportation Guide G. Anderson
 - g. WG C57.170, Condition Assessment Guide K. Mani
 - h. TF Transformer Volts per Hertz J. Watson
 - i. Liaison to PC57.93a – Installation and Maintenance Guide S. Reed
6. Old business
7. New business
8. Adjournment

Attachment K 4.2

Meeting Minutes
Task Force on Failure Investigation & Reporting PC57.125
Monday, April 26, 2021
Virtual Meeting via WebEx
3:45pm – 5:00PM CDT

1. Call to Order at 3:45pm CDT / 4:45pm EDT
2. Chair's Remarks
3. Attendees Roster Sign In – Participants
 - 1 Attendance at TF does not automatically mean WG membership
 - 2 Indicate interest in membership in WebEx chat
 - 3 This meeting will be a TF meeting so attendees must return in F21 to honor requests for membership.
 - 4 Attendance was 75 unique names (although 8 spent under 15 minutes of the 45 so actual attendance was probably 67)
- 2 Motion to Approve Agenda made by Tom Melle / Second by James Cross (Approved without objection).
- 3 Call for Patents (no essential patent claims made)
- 4 IEEE SA Copyright Policy (slide presented to TF)
- 5 PAR
 - 1 Motion to Revise the existing C57.125-2015
 - Made by Sam Sharpless
 - Second by Eduardo Garcia
(Motion Carries – approved without objection)
 3. Discussion – Bruce Forsyth commented that the intended purpose of the TF is to function as a PAR study group. Confirmed by Bill Griesacker.
- B. Motion to withdraw new PAR?
(No Motion put forward / Motion Withdrawn)
- C. Motion to advance the Revised PAR to PTSC to approve at the SC level
 - a.i.1. Made by Bill Griesacker
 - a.i.2. Second by Bruce Forsyth
 3. Discussion – None (Motion approved without objection)
8. Motion to revise the Purpose statement of the PARs as follows:

“This document provides a methodology to investigate the cause of any particular transformer failure by applying the scientific method to investigations; . . .”

1. Made by – Bruce Forsyth
2. Second by – Larry Dix
3. Discussion – None (Motion Approved without objection).

9. WG Officers

- A. Chair Volunteers
 - Bill Griesacker
- B. Vice Chair Volunteers
 - Tom Melle
- C. Secretary Volunteers
 - None
- D. Editor Volunteers
 - None

10. Closing Remarks – WB Binder

11. Motion to Adjourn

1. Made by – Kris Neild
2. Second by – James Cross

Adjourned 5:30pm EDT / 4:30pm CDT

Membership Requests:

Wallace Binder (WBBinder Consultant)
 Akash Joshi (Black & Veatch)
 Ali Naderian (METSCO Energy)
 Larry Dix (Quality Switch)
 Eric Doak (D4EnergySolutions)
 Adam Sewell (Quality Switch)
 Axel Kraemer (Maschinenfabrik Reinhausen)
 Eduardo García (Siemens Energy)
 Everton De Oliveira (Siemens Energy)
 Ryan Hogg (Bureau of Reclamation)

Rogério Verdolin (Verdolin Solutions Inc.)

Ronald Hernandez (Doble Engineering)

Jason Varnell (Doble Engineering)

Hakan Sahin (Virginia Georgia Transformers)

Session detail for 'TF Failure Investigation & Reporting PC57.125':		
Participant	Name	Affiliation
1	Kannan Veeran	gatransformer
2	Brandon Dent	mlgw
3	Kannan V	gatransformer
4	Eric Theisen	metglas
5	suresh babanna	spx
6	Pragnesh Vyas	solomoncorp
7	Anastasia	coned
8	Ronald Hernandez	doble
9	Troy Tanaka	Burns & Mac
10	HUAN DINH	abb USA
11	Jaber Shalabi	vantran
12	Ryan Bishop	mnpower
13	Mike Thibault	PG&E
14	Krzysztof Kulasek	hitachi-powergrids
15	Tommy Eagle	SPX Transformers
16	akash joshi	Self
17	Sanket Bolar	Megger
18	Gilles Bargone	Self
19	evanne	Dupont
20	Mana Yazdani	trench-group
21	Sheldon Kennedy	Niagara Transformer
22	Eduardo Garcia	Self
23	Tom Melle	HIGHVOLT
24	Larry Dix	quality switch
25	Fernando Leal	Self
26	Evgenii Ermakov	hitachi-powergrids
27	bill griesacker	Duquesne Light
28	Rodrigo Ocon	condume Mexico

29	HSahin	GA Transformer
30	Brandon Dent	Self
31	mfg18	va transformer
32	ROGERIO VERDOL	Shaw
33	Ali Naderian	METSCO
34	John Reagan	Oncor
35	Olle Benzler	Megger
36	Larry Rebman	Self
37	Ryan Musgrove	OGE
38	Axel Kraemer	reinhausen
39	Kris Neild	megger
40	Kevin Rapp	cargill
41	Everton De Oliveira	siemens
42	James Cross	kinectrics Canada
43	Neil Strongosky	mlgw
44	jos veens	Self
45	Janusz Szczechow	reinhausen
46	Megan Kell	eaton
47	Saramma Hoffman	pplweb
48	Robert Mayer	siemens
49	Ed Feloni	lig consultants
50	Timothy Raymond	traymond@epri
51	John Foschia	spx transformers
52	USIORAD	abb USA
53	Dejan Vuković	hitachi-powergrids
54	Bruce Forsyth	Self
55	Rhea Montpool	SE
56	Jorge Cruz	pti transformers
57	Paul Florida	howard industries
58	Didier Hamoir	transproco
59	Eric Doak	d4energysolutions
60	Sukhdev Walia	Self
61	Gregory Ante (SCE)	sce
62	ADAM SEWELL	qualityswitch
63	Jason Varnell	Doble
64	Kris Zibert	amce
65	ISMAIL GUNER	hydro-quebec Canada
66	sam sharpless	rimkus
67	Polo Rodríguez	Self
68	William Boettger	Self
69	Juan Alfredo Carriz	prolec-ge

70	Parminder	va transformer
71	asarkar	va transformer
72	Ryan Hogg	USBR
73	Martín Muñoz	orto Mexico
74	Jonathan Sinclair -	pplweb
75	Wallace Binder	WB Binder Consultant

Attachment K 4.3

Power Transformer Subcommittee Working Group Report

Document #: C57.131

Document Title: Standard Performance Requirements and Test Methods for Tap-changers

Chair: Craig A. Colopy Vice-Chair: Axel Kraemer

Secretary: Adam M. Sewell Percent Complete: 0% - initial WG meeting

Current Draft Being Worked On: 1.0 Dated: TBD

PAR Expiration Date: December 31, 2024

Meeting Date: 26 April 2021 Time: 12:55pm-2:10pm CST

Location: Virtual Online Meeting

K.9	Attendance:	K.10	Members	<u>3 / 3</u>
K.11	K.12	Guests		<u>16</u>
K.13	K.14	Guests Requesting Membership		<u>24 (all become members)</u>
K.15	K.16	Total*		<u>43</u>

* Attendance list for this meeting is shown at end of meeting minutes

Meeting Minutes / Significant Issues / Comments:

1. Meeting was called to order at 12:55 pm, April 26, 2021.
2. Opening of meeting and officer introductions.
 - a. Chair-Craig Colopy-EATON Corporation, Vice Chair-Axel Kraemer-Maschinenfabrik Reinhausen, Secretary-Adam Sewell-Quality Switch, Inc.
3. Poll - Request for Members
 - a. The chair, vice-chair, and secretary were counted as working group members. Since this was the first meeting as a working group, all guests requesting membership were added as members per the chair.
 - b. Other participants were recorded as guests.
4. Discussion on past goal of IEC/IEEE dual logo (60214-1)

- a. Direct adoption of IEC 60214-1 (2014) was not allowed so a revision and harmonization of existing C57.131-2012 with 60214-1 was next option.
5. PAR approved in December 2020 and expires December 31, 2024.
 - a. Need for the Project: The current standard is expiring in 2022. It is being revised to be in sync with the IEC standard 60214-1 Ed. 2.0. May 2014.
6. Timeline – Expiration of C57.131-2012.
 - a. Current C57.131-2012 expires in 2022 (10 year cycle). This WG is to bring the standard in harmony with the current IEC 60214-1.
7. Draft 1.0 – Harmonize with IEC 60214-1 (2014) --- addition of IEC references, vacuum tap-changers, SF6 tap-changers and voltage regulators.
 - a. Draft will be sent out to WG for review when available
8. Next meeting(s) TBD before the next Transformer Committee Meeting - Oct 18, 2021 in Milwaukee, WI, USA
 - a. Chair was asked and will investigate time slots for this working group at the next Transformer Committee meeting due to the time conflict with WG PC57.152 Guide for Field Testing.
9. Close of meeting
 - a. Meeting adjourned at 1:23 pm.

Meeting Attendance

First Name	Last Name	Company Name	Role
Craig	Colopy	EATON Corporation	Chair
Axel	Kraemer	Maschinenfabrik Reinhausen	Vice-Chair
Adam	Sewell	Quality Switch, Inc.	Secretary
Allan	Bartek	Spruce Run Engineering LLC	Member
Thomas	Dauzat	General Electric	Member
Larry	Dix	Quality Switch, Inc.	Member
Florin	Faur	SPX Transformer Solutions, Inc.	Member
David	Geibel	Hitachi ABB Power Grids	Member
Saramma	Hoffman	PPL Electric Utilities	Member
Peter	Kleine	US Army Corps of Engineers	Member
Olivier	Lejay	Huaming USA Corp.	Member
Weijun	Li	Braintree Electric Light Dept.	Member
Lee	Matthews	Howard Industries	Member
Kristopher	Neild	Megger	Member
Lina	Sandsten	Hitachi Power Grids	Member
Stefan	Schindler	Maschinenfabrik Reinhausen	Member
Eric	Schleismann	Southern Company Services	Member

First Name	Last Name	Company Name	Role
Hugh	Waldrop	Memphis Light, Gas & Water	Member
Alan	Washburn	Burns & McDonnell	Member
Christopher	Whitten	Hitachi ABB Power Grids	Member
Joshua	Yun	Virginia Transformer Corporation	Member
Peter	Zhao	Hydro One	Member
Kayland	Adams	SPX Transformer Solutions, Inc.	Guest
Edmundo	Arevalo	Bonneville Power Administration	Guest
Christopher	Baumgartner	We Energies	Guest
Olle	Benzler	Megger	Guest
William	Boettger	Boettger Transformer Consulting LLC	Guest
Juan	Carrizales	Prolec GE	Guest
Juan Carlos	Cruz Valdes	Prolec GE	Guest
Brandon	Dent	Memphis Light, Gas & Water	Guest
Jeffrey	Gragert	Xcel Energy	Guest
Ryan	Hogg	Bureau of Reclamation	Guest
Gael	Kennedy	GR Kennedy & Associates LLC	Guest
Jayme	Nunes, Jr	Nynas AB	Guest

Dan	Schwartz	Quality Switch, Inc.	Member
Jeremy	Sewell	Quality Switch, Inc.	Member
Brian	Sparling	Dynamic Ratings, Inc.	Member
Markus	Stank	Maschinenfabrik Reinhausen	Member
Timothy	Tillery	Howard Industries	Member

Tejasvi	Prakash	Schweitzer Engineering Labs	Guest
Eduardo	Ramirez Bettoni	Xcel Energy	Guest
Tim	Rocque	SPX Transformer Solutions, Inc.	Guest
Kushal	Singh	ComEd	Guest

Submitted by: Craig A, Colopy

Date: 4/28/2021

Attachment K 4.4

C57.143 – IEEE Guide for Transformer Monitoring**Monday, April 26, 2021****Virtual Meeting****Minutes of WG Meeting**

The meeting was called to order at 2:20 PM by Chair Mike Spurlock. Vice-Chair Poorvi Patel and Secretary Elizabeth Bray (writer of Minutes) were also present.

There were 47 of 120 members present. There were 43 guests, and 21 guests requesting membership. A membership quorum was achieved. The attendance for this meeting was as follows:

- Number of Members in Activity = 88
- Number of Members Present = 47
- Percentage of Members Present = 53.4%
- Number of attendees = 120
- Attendees requesting Membership = 21

List of Meeting Attendees is provided below.

First Name	Last Name	Company	Role
Thomas	Prevost	Weidmann Electrical Technology	Member
James	Gardner	SPX Transformer Solutions, Inc.	Member
William	Boettger	Boettger Transformer Consulting LLC	Member
Juan	Castellanos	Prolec GE	Guest
Mahesh	Sampat	EMS Consulting Inc.	Guest
Stephen	Jordan	Tennessee Valley Authority	Member
Emilio	Morales-Cruz	Qualitrol Company LLC	Member
John	Lackey	PowerNex Associates Inc.	Guest
Paul	Jarman	University of Manchester	Member
John	Harley	FirstPower Group LLC	Member
John	Crouse	Roswell Alliance	Member
Michael	Franchek	Retired	Guest
Axel	Kraemer	Maschinenfabrik Reinhausen	Member
Peter	Zhao	Hydro One	Member
Krzysztof	Kulasek	Hitachi ABB Power Grids	Member
Oleg	Roizman	IntellPower Pty Ltd	Member
Kumar	Mani	Duke Energy	Member
Paul	Boman	Hartford Steam Boiler	Member
Rogério	Verdolin	Verdolin Solutions Inc.	Member
Gary	Hoffman	Advanced Power Technologies	Member
Charles	Sweetser	OMICRON electronics Corp USA	Member
Scott	Reed	MVA	Member

James	Cross	Kinectrics	Member
Douglas	Craig	Richards Manufacturing Co.	Guest
Jean-Noel	Berube	Rugged Monitoring Inc.	Member
Luiz	Cheim	Hitachi ABB Power Grids	Member
John	Chisholm	IFD Corporation	Guest
Roger	Hayes	General Electric	Member
Mike	Spurlock	Spurlock Engineering Services, LLC	Chair
James	McBride	JMX Services, Inc.	Member
Brian	Sparling	Dynamic Ratings, Inc.	Member
George	Frimpong	Hitachi ABB Power Grids	Member
James	Dukarm	Delta-X Research Inc.	Member
James	Dukarm	Delta-X Research Inc.	Member
Donald	Lamontagne	Arizona Public Service Co.	Member
Markus	Stank	Maschinenfabrik Reinhausen	Member
Patrick	Picher	Hydro-Quebec IREQ	Member
Marco	Espindola	Hitachi ABB Power Grids	Member
Claude	Beauchemin	TJH2b Analytical Services	Member
John	Pruente	SPX Transformer Solutions, Inc.	Member
Mark	Tostrud	Dynamic Ratings, Inc.	Member
Poorvi	Patel	Electric Power Research Institute (EPRI)	Vice-Chair
David	Sheehan	HICO America	Member
Ryan	Thompson	Burns & McDonnell	Member
Mark	Faulkner	EATON Corporation	Guest
Xose	Lopez-Fernandez	Universidade de Vigo	Member
Anthony	McGrail	Doble Engineering Co.	Member
Stephanie	Denzer	Alliant Energy	Member
Sukhdev	Walia	New Energy Power Co.	Member
Stephan	Brauer	Morgan Schaffer	Member
Robert	Kinner	FirstPower Group LLC	Member
Anil	Sawant	Virginia Transformer Corp.	Member
Detlev	Gross	Power Diagnostix	Member
Leon	White	H2scan	Guest
Larry	Rebman	EMLS, Inc.	Guest
Elizabeth	Bray	Southern Company Services	Secretary
Christopher	Steineman	Delta Star Inc.	Member
Patrick	Rock	American Transmission Co.	Guest
Robert	Mayer	Siemens Energy	Member
Thomas	Hartmann	Pepco Holdings Inc.	Member
Kristopher	Neild	Megger	Member
Jonathan	Reimer	FortisBC	Guest
Lorne	Gara	Shermco	Member
Ismail	Guner	Hydro-Quebec	Member

Jeffrey	Wright	Duquesne Light Co.	Member
Michael	Frayne	Hammond Power Solutions	Guest
Hakim	Dulac	Qualitrol Company LLC	Member
Paul	Su	FM Global	Member
Attila	Gyore	M&I Materials Ltd	Member
Niklas	Gustavsson	Hitachi ABB Power Grids	Member
Jinesh	Malde	M&I Materials Inc.	Guest
Trenton	Williams	Advanced Power Technologies	Member
Jeremiah	Bradshaw	Bureau of Reclamation	Member
William	Whitehead	Siemens Energy	Member
Anastasia	O'Malley	Consolidated Edison Co. of NY	Member
Florin	Faur	SPX Transformer Solutions, Inc.	Member
Alan	Sbravati	Cargill, Inc.	Guest
Mickel	Saad	Hitachi ABB Power Grids	Member
Travis	Spoone	EATON Corporation	Member
Martin	Munoz Molina	Orto de Mexico	Member
Akash	Joshi	Black & Veatch	Guest
Igor	Simonov	Toronto Hydro	Guest
Malia	Zaman	IEEE	Member
Roger	Fenton	Fenton Solutions	Member
Stuart	Chambers	Powertech Labs Inc.	Member
Stacey	Kessler	Basin Electric Power Cooperative	Member
Janusz	Szczecowski	Maschinenfabrik Reinhausen	Member
Nitesh	Patel	Hyundai Power Transformers USA	Member
Drew	Welton	Intellirent	Member
Caroline	Peterson	Xcel Energy	Member
Lee	Doyle	Vaisala	Member
Gilles	Bargone	FISO Technologies Inc.	Member
John	Reagan	Oncor Electric Delivery	Member
Matthew	Webb	SPX Transformer Solutions, Inc.	Member
Kyle	Heiden	EATON Corporation	Member
David	Calitz	Siemens Energy	Member
Darrell	Mangubat	Siemens Power Operations Inc.	Member
Suleman	Khan	Ontario Power Generation	Guest
Jon	Karas	SDMyers, LLC.	Member
Hugh	Waldrop	Memphis Light, Gas & Water	Guest
Mana	Yazdani	Trench Limited	Member
Dmitriy	Klempner	Southern California Edison	Member
Kyle	Stechschulte	American Electric Power	Member
Jonathan	Sinclair	PPL Electric Utilities	Member
Saramma	Hoffman	PPL Electric Utilities	Member
Matthew	McFadden	Oncor Electric Delivery	Guest
Zachary	Draper	Delta-X Research Inc.	Guest
Stefan	Schindler	Maschinenfabrik Reinhausen	Guest

William	Knappek	OMICRON electronics Corp USA	Guest
Adrian	Silgardo	IFD Corporation	Member
Risto	Trifunoski	Trench Limited	Guest
Tejasvi	Prakash	Schweitzer Engineering Labs	Member
Zlatan	Fazlic	Camlin Power	Member
Anatoliy	Mudryk	Camlin Power	Member
Evgenii	Ermakov	Hitachi ABB Power Grids	Guest
Adam	Smith	Commonwealth Associates, Inc.	Member
Derek	Hollrah	Burns & McDonnell	Member
Balakrishnan	Mani	Virginia Transformer Corp.	Member
Mauricio	Soto	Hitachi ABB Power Grids	Member
Nabi	Almeida	Prolec GE USA LLC	Member
Suresh	Babanna	SPX Transformer Solutions, Inc.	Member
David	Holland	ExxonMobil	Guest
Taylor	Gray	Portland General Electric (PGE)	Guest
Michael	Richardson	Ameren	Guest
Kannan	Veeran	Georgia Transformer	Guest
ANDY	DOWNEY	SPX TRANSFORMER SOLUTIONS	Guest
Markus	Soeller	Power Diagnostix	Guest
George	Jalhoum	PPI	Guest
Bobby	Clift	Xcel Energy	Guest

The WG plans to meet at the Fall October 17 2021 Transformers Committee Meeting in Milwaukee, Wisconsin.

Agenda

1. Welcome & Introduction
2. Call for Patent Disclosure
3. Chair Remarks
4. Recognition and thanks to volunteers
5. Welcome New Members
6. Quorum Check
7. Approval of Agenda
8. Recent Email Ballot Approvals (F2019 and F2020) minutes
9. Task Force Activities:
 - a. Task Force 1 (Chapters 1,2,3,4) – Trent Williams
 - b. Task Force 2 (5.2 Thermal, 5.3 Cooling, 5.4 Loading) – Poorvi Patel
 - c. Task Force 3 (5.5 LTC, 5.6 Tank, 5.7 Conservator, 5.11 Partial Discharge) – Emilo Morales
 - d. Task Force 4 (5.8 DGA, 5.9 Moisture, 5.10 Bushings, 5.12 GIC) – Bill Whitehead
 - e. Task Force 5 (Chapter 6 Communications) – Zlatan Fazlic
 - f. Task Force 6 (Chapter Cost Benefits) – Elizabeth Bray
10. Status of PAR Extension Request
11. Discuss Possible New Chapter to be inserted between Chapters 4 and 5
12. New Business

Chair Mike Spurlock asked of a call for patents disclosure was made and no patent claims were reported. A letter of assurance was received last week from one claimant that had notified the working group of an essential patent claim during the Fall 2020 virtual meeting.

Chair Mike Spurlock reviewed the IEEE Copyright policy.

Chair Mike Spurlock provided chair remarks with accomplishments of 2020 and the March 10, 2021 email ballot approval. The volunteers were also recognized and thanked for their work in supporting this working group. As well as the call for additional volunteers and how to get added to support the areas that need volunteers. Nine new members were welcomed to the working group.

A motion to approve the Spring 2021 Agenda was made by Trent Williams and seconded by Emilio Morales-Cruz. The working group unanimously approved the agenda.

The Fall 2019 and Fall 2020 meeting minutes and agendas were approved by the working group by e-mail ballot on March 10, 2021. On that date, there were 83 members in the Working Group and we needed 42 votes to pass each measure.

Columbus (Fall 2019) Meeting Agenda.

Approved as written: 45

Approved with comments: 0

Disapproved: 0

Abstain: 1

Columbus (Fall 2019) Meeting Minutes.

Approved as written: 44

Approved with comments: 1

Disapproved: 0

Abstain: 1

Virtual (Fall 2020) Meeting Agenda.

Approved as written: 45

Approved with comments: 0

Disapproved: 0

Abstain: 1

Virtual (Fall 2020) Meeting Minutes.

Approved as written: 45

Approved with comments: 0

Disapproved: 0

Abstain: 1

Task forces gave updates to their status as well as a few areas that additional volunteers would be useful.

Task Force 1 - Chair: Trent Williams

Chapter 1 (Overview)

Chapter 2 (Normative References)

Chapter 3 (Definitions)

Chapter 4 (Surveillance Needs)

References definitions are needed to the group. Discussion on the possible split of Chapter 4 was discussed later in the meeting.

Task Force 2 - Chair: Poorvi Patel

Clause 5.2 (Thermal)

Clause 5.3 (Cooling)

Clause 5.4 (Load)

Task force in good shape.

Task Force 3 - Chair: Emilio Morales

Clause 5.5 (LTC)

Clause 5.6 (Tank)

Clause 5.7 (Conservator)

Clause 5.11 (Partial Discharge)

Review close to complete and need support with review. Please contact Emilio to volunteer to support this review.

Task Force 4 - Chair: Bill Whitehead

Clause 5.10 (Bushings)

Clause 5.8 (Dissolved Gas Analyzers)

Clause 5.9 (Moisture)

Clause 5.12 (Geomagnetic Induced Current)

Review is close to complete and most work will be complete in May to early June time frame.

Task Force 5 - Chair: Zlatan Fazlic Chapter 6 (Communications)

Feedback from Brian Sparling stated they are close to having this section ready and asking permission to use Cigre TB 620 and updating to current standards and what does the future look like with future technologies. Brian & Zlatan are working on this alone and ask for any one who would like to volunteer to review please reach out.

Task Force 6 – Chair: Elizabeth Bray Chapter 7 (Cost Benefits)

Requested additional volunteers with utility experience for review the document was requested.

Chair Mike Spurlock mentioned that he had filed for a two-year PAR extension on March 19, 2021 and that the NesCom has this on their agenda for May 4, 2021.

There was discussion about the potential of splitting up chapter 4 into two separate chapters. Work has been done to the proposed chapters and Chair Mike Spurlock will circulate the proposed chapters to the working group members and set up a follow up virtual meeting to discuss the possible Chapter 4 split after the working group members have had a chance to review.

Progress has continued on the C57.143 Guide and the draft version is out on the IEEE Transformers Committee webpage. This will be updated after the next round of revisions.

No other new business was brought up.

A motion to adjourn was made by Poorvi Patel and seconded by Bill Whitehead. The motion passed by unanimous approval. The meeting adjourned at 3:25 pm CST.

Attachment K 4.7

TF on V/Hz Requirements Minutes

Kipp Yule – Chair, Ramsis Girgis, – Vice Chair, Joe Watson – Vice-Chair

The Task Force on Volts/Hz Requirements met on April 27, 2021 at 2:20 PM. The meeting attendance poll indicated 8 Members and 43 Guests with one non-responsive attendee. The final report showed 8 Members and 61 Guests. A quorum was achieved with 8 of the TF's 14 Members in attendance.

The Task Force was assigned by the Power Transformers Subcommittee in the fall 2017 SC meeting to study the topic of V/Hz and to determine if existing Guides or Standards required additional coverage of the topic and/or if a new Guide or Standard was needed. During previous meetings, the TF determined that C57.116, the IEEE Guide for Transformers Directly Connected to Generators could benefit from additional information on V/Hz issues and that a new Guide was recommended to fully cover the subject.

The following text was completed before this meeting and delivered to the C57.116 WG for inclusion as an Annex or in other new or existing sections of the revised document:

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Proposed V / F Text for C57.116

Short-term overexcitation in power transformers

According to IEEE Standard C57.12.00, a transformer is designed to operate indefinitely when excited at least 95 % of rated frequency; and secondary voltage and Volts per Hertz do not exceed 105 % of rated voltage, with a 0.8 power factor, or higher, under load conditions. Depending on a transformer's core design, a significant level of increase in the exciting voltage or a significant reduction in the frequency, or a combination of both, can over-excite the core and increase the core flux density well beyond the saturation level

Overexcitation should be considered when operating transformers directly connected to generators, where the most severe case is normally during generator load rejection when a circuit breaker on the load side of the transformer opens, interrupting the load from a generator and causing the generator voltage to increase significantly while the frequency slows down over 10s of seconds while the generator's rotor gradually spins to a stop.

Relay Practices

Transformers connected to generators are typically protected from moderate over-excitation under normal operating conditions. However, these transformers may not be able to protect from load rejection conditions if a circuit breaker is not located between the generator and the transformer.

Protective relays for this type of very high V/Hz conditions should have inverse time characteristic to allow the transformer to operate under mild overvoltage and/or under-frequency conditions for a longer time than excessive overvoltage and/or under-frequency conditions. Relay settings for this type of protection should be obtained from a V/Hz curve that is applicable for the specific transformer.

Effects of short-term overexcitation on power transformers

The effects of high levels of core overexcitation can vary significantly from one transformer design to another. When such high levels of overexcitation cause magnetic saturation of transformer cores, a portion of the core main flux escapes from the core into and through the active part of the transformer, structural parts, and tank, causing heating of those parts beyond their thermal design limits. This can lead to:

- (1) Damage of solid insulation in contact with these parts leading to loss of insulation life if the insulation is not rated for those temperatures
- (2) Gas bubbles of oil in contact with the overheated structural parts of the transformers, leading to possibly catastrophic dielectric failure of the transformer
- (3) Overheating of the tank walls leading into discoloration of the tank paint.

However, due to the short duration nature of this type of overexcitation and the relatively much longer Thermal Time Constant of the structural parts of transformers, the rise in temperature of these parts caused by this type of over excitation would be small. Also, the short duration of this increase in temperature would significantly decrease the impact of this rise in temperature on insulation life or gas bubble generation

V/Hz Curves

Figure 1 below presents a V/Hz curve that has been used for many types of transformers. It is based on factory measurements conducted in the 1960's on a core-form type transformer that was designed with manufacturers' technology at the time, core steel grade, and with cellulose type insulation to operate indefinitely at approximately 110 % rated V/Hz. The curve has served as an effective damage curve for operation of this type of transformers at various V/Hz values and times. According to this curve, operation of transformers is to be limited to the area below the curve. Also, the transformer should be de-energized if the V/Hz level exceeds the value for the appropriate time to avoid thermal damage. This is a conservative curve that has been used for several types of transformers that did not have a specific V/Hz curve developed or available for the transformer. If a specific V/Hz curve for the transformer is not available and the design of the transformer is unknown, this curve, or another curve from the same manufacturer for a similar transformer, may provide an estimated damage curve for the transformer in question, but the User should recognize that the curve is only an estimate and may want to adjust their relay setting accordingly.

Transformer manufacturers should provide a similar curve that more accurately reflects the specific design of a transformer that will be connected directly to a generator, or other types of transformers when requested.

V/Hz Curve Criteria

A transformer V/Hz curve should accurately estimate the V/Hz levels and the times allowed at those levels when unacceptable insulation aging or oil bubbling may occur over a range from 100-140 % V/Hz. The curve should have the % Excitation or % V/Hz on the Y axis and the time in seconds on the X axis. The manufacturer should consider the following design information when developing the curve:

- Type of core steel, flux densities under the V/Hz range, and corresponding saturation levels
- Temperature rises of all vulnerable structural parts from flux heating over the V/Hz range
- Thermal rating of insulation materials in contact with the core and overheated structural parts
- Bubbling temperature of the insulating fluid
- Maximum oil temperature rise at the worst case load and cooling levels
- Specified maximum ambient temperature

The area below the curve should represent the operating range where the temperatures on any overheated structural parts will not cause oil bubbling or heat the insulation to a temperature greater than the insulation's rated temperature.

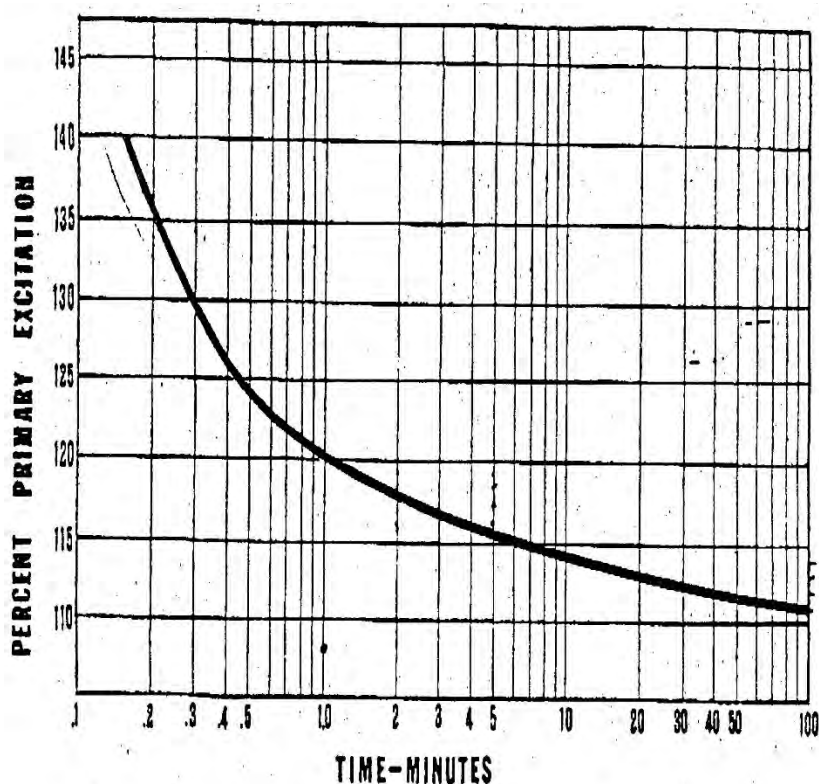


Figure 1: Typical V/Hz Curve

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

The TF also discussed a report that was emailed to the TF Members and Guests with the meeting agenda and viewed a presentation which summarized findings that had been presented previously that explains the need for a new Guide to cover the V/Hz issue for power transformers. The Presentation will be posted on the Transformers Committee website under the TF's section on the Power Transformer SC's page.

The report follows:

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Need for Developing V/Hz Curves for Transformers Directly Connected to Generators

Background on effect of short term overexcitation in Power Transformers

Short term overexcitation typically drives the transformer core into magnetic saturation for the duration of the overexcitation. The consequence of core saturation is typically overheating of structural parts of the transformer. If excessive, and for longer periods, this overheating can cause solid insulation damage and Gas generation that can ultimately result in dielectric failures.

Transformers connected to generators need to be protected from load rejection conditions if a circuit breaker is not located between the generator and the transformer. Protective relays for this type of very high V/Hz conditions should have inverse time characteristic to allow the transformer to be protected under these conditions. Relay settings for this type of protection should be obtained from a V/Hz curve that is applicable for the specific transformer.

V/Hz Curves presently used by the industry and issues with using these curves

V/Hz Curves presently used by the industry are all based on the curve originally presented to the industry by GE in the mid-sixties. That curve was basically developed by measuring the time it took for the core flitch / tie plates of a specific GE core form transformer to reach 180 C at the different levels of over-excitation applied to that transformer during that test. This represents the following significant issues regarding the applicability of this curve:

1. The time to reach 180 C should not have been used as a temperature limit, since 10s of seconds of this temperature (Corresponding to typical durations of short term overexcitation) would not have much of a degrading impact on the transformer; neither on life of insulation materials nor on oil bubbles. The origin of the 180 C is that it is what the IEEE Loading Guide allows for short term emergency loading which could be as long as 30 minutes.
2. This curve was specific to one core form transformer design at a specific core flux density and having a certain tie-plate design made of mild steel. Therefore, it would not apply to:
 - a. Other core form designs with different flitch / tie plates designs, materials, and core flux densities
 - b. Designs with different insulation materials in contact with the flitch / tie plates. e.g., fiberglass, etc.
 - c. Shell form transformers

Development of appropriate V/Hz Curves

In order to develop the appropriate V/Hz Curve for a transformer design, manufacturers need to follow the following steps:

1. Calculating thermal impact of different levels of overexcitation on the transformer design vs. time; from 10s of seconds up to several minutes
2. Using Standard Temperature – duration requirements that consider:
 - How much deterioration of solid insulation, in touch with high temperature structural parts, would be allowed to take place during each over excitation incident.
 - How much Gas generation / bubbles, of oil in touch with high temperature structural parts, would be allowed to take place during each over excitation incident.

Need for a V/Hz Guide

The proposed Guide will mainly include proposed methodology of developing the right V / Hz curve for a transformer design accounting for the thermal impact of short term overexcitation on transformers as discussed in above. The Guide will also have tutorial information on effect of short term overexcitation in Power Transformers and V/Hz Curves presently used by the industry and issues with using these curves.

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Following the presentation, a motion was made by Bill Griesacker and seconded by Drew Welton as follows: “A Motion is made that the TF recommend to the Power Transformers

Subcommittee that a Guide be drafted to cover Transformer V/Hz.” The motion passed unanimously and was presented to the Power Transformers Subcommittee the following day.

The TF reported to the Power Transformers SC on April 28, 2021 that the work of the TF has been completed and Joe Watson made a Motion for the SC to recommend the establishment of a TF to create a PAR for a new WG to create a new Guide. Discussion of the Motion indicated that the new Guide should include the following V/Hz topics:

- The impact of V/Hz on power transformers
- Issues with existing V/Hz curves
- Methodology to develop the V/Hz curves for power transformer designs
- Time-temperature criteria for manufacturers to use to develop V/Hz curves

The Motion passed with unanimous consent.

Bill Griesacker appointed Joe Watson as Chair of this TF and he will work with Kipp Yule and Ramsis Girgis to develop the Scope and Purpose and request the PAR for this project.

Once a PAR is ready, the new WG should be able to meet for the first time in the fall 2021 meeting. We estimate that a room large enough for 75 people should be reserved for this meeting.

The meeting adjourned at 3:35PM.

Meeting attendance:

Hopefully a better process can be developed to provide the meeting attendance data that is listed below. The current process is tremendously work intensive. We recommend that the names of the attendees and their affiliations be reported as listed in AMS under the registered attendee’s files, and the report be in a .csv or similar excel spreadsheet format. The reports should also record the meeting attendance into the AMS system. This would save hours of work for the SC, WG and TF secretaries who need to include the attendance information in these Minutes.

Status	Name	Affiliation
Chair	Kipp Yule	Bechtel
Vice-Chair	Ramsis Girgis	Hitachi ABB Power Grids
Vice-Chair	Joe Watson	JD Watson and Associates Inc.
Member	Javier Arteaga	Hitachi ABB Power Grids
Member	Everton De Oliveira	Siemens Ltda
Member	Bill Griesacker	Duquesne Light Co.
Member	Sanjay Patel	Royal Smit Transformers
Member	Drew Welton	Intellirent
Guest	Kayland Adams	SPX Transformer Solutions, Inc.
Guest	Raj Ahuja	Raj Ahuja Consulting

Guest	Onome Avanoma	MJ Consulting
Guest	Hugo Avila	Hitachi ABB Power Grids
Guest	Suresh Babanna	SPX Transformer Solutions, Inc.
Guest	Jared Bates	Oncor Electric Delivery
Guest	Mats Bernesjo	Hitachi ABB Power Grids
Guest	Piotr Blaszczyk	Specialty Transformer Components LLC
Guest	William Boettger	Boettger Transformer Consulting LLC
Guest	Joshua Bohr	PacifiCorp
Guest	Erich Buchgeher	Siemens Energy
Guest	David Calitz	Siemens Energy
Guest	Juan Carrizales	Prolec GE
Guest	Jorge Cruz	PTI Transformers
Guest	Juan Carlos Cruz Valdes	Prolec GE
Guest	Eric Davis	Burns & McDonnell
Guest	Nikolaus Dillon	Dominion Energy
Guest	Larry Dix	Quality Switch, Inc.
Guest	ANDY DOWNEY	SPX TRANSFORMER SOLUTIONS
Guest	Thomas Eagle	SPX Transformer Solutions
Guest	Eduardo Garcia Wild	Siemens Energy
Guest	Orlando Giraldo	THE H-J FAMILY OF COMPANIES
Guest	Jeffrey Gragert	Xcel Energy
Guest	Thomas Hartmann	Pepco Holdings Inc.
Guest	Roger Hayes	General Electric
Guest	Ryan Hogg	Bureau of Reclamation
Guest	Nicholas Jensen	Delta Star Inc.
Guest	John John	Virginia Transformer Corp.
Guest	Suleman Khan	Ontario Power Generation
Guest	Peter Kleine	US Army Corps of Engineers
Guest	William Knapek	OMICRON electronics Corp USA
Guest	Anton Koshel	Delta Star Inc.
Guest	Mark Lachman	Doble Engineering Co.
Guest	John Lackey	PowerNex Associates Inc.
Guest	Weijun Li	Braintree Electric Light Dept.
Guest	Rebecca Manderfield	Xcel Energy
Guest	Kumar Mani	Duke Energy
Guest	Balakrishnan Mani	Virginia Transformer Corp.
Guest	Dennis Marlow	DenMar TDS Transformers
Guest	Matthew McFadden	Oncor Electric Delivery
Guest	Paul Morakinyo	PSEG
Guest	David Murray	Tennessee Valley Authority
Guest	Kristopher Neild	Megger
Guest	Rodrigo Ocon	Industrias IEM
Guest	George Partyka	PTI Transformers
Guest	Nitesh Patel	Hyundai Power Transformers USA

Guest	Monil Patel	Pacific Gas & Electric Company
Guest	Branimir Petosic	Boiler Inspection & Insurance of Canada
Guest	Chris Powell	Intermountain Electronics
Guest	Jeffrey Ray	JLR Consulting, Inc.
Guest	Larry Rebman	EMLS, Inc.
Guest	Markus Schiessl	SGB
Guest	Sanjib Som	Pennsylvania Transformer
Guest	Ryan Thompson	Burns & McDonnell
Guest	Jason Varnell	Doble Engineering Co.
Guest	Krishnamurthy Vijayan	PTI Transformers
Guest	David Wallach	Duke Energy
Guest	Bruce Webb	Knoxville Utilities Board
Guest	Dr. Alexander Winter	HIGHVOLT Pruftechnik Dresden
Guest	Jeffrey Wright	Duquesne Light Co.
Guest	Anand Zanwar	Siemens Energy

Attachment K4.8

IEEE PC.57.170 Condition Assessment Guide Working Group Meeting Minutes

Date and Venue: 10:25-11:40 AM CST, Apr 27th, 2021 (Virtual Meeting)

Total Attendees: 121

Quorum Poll: Members- 49 (out of 84) 58% quorum achieved; Guest- 64; Guest Requesting Membership- 21; No answer- 8 and Total Attendees- 121.

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 2020 Meeting Minutes: Approved Unanimously by acclamation.
5. Adoption of Spring 2021 Meeting 2020: Approved Unanimously by acclamation.
6. The four task force met a few times in the past few months and reports on the proposed sections for this guide were presented by leaders Dr. Luiz Cheim for TF#1(Section 1-2), Saramma Hoffman for TF#2 (Section 3-4-5), Jonathan Sinclair for TF#3 (Section 6-7-8) and Alan Sbravati for TF#4 (Section 9 and Annexes). The basic guide structure as presented by the TF leaders are as follows:

6.1. Task Force 1:

6.1.1. Section 1: Fundamentals of Transformer Condition Assessment

- o Asset management strategies
- o Transformer failure modes
- o Condition assessment
- o Indices utilized in transformer condition assessment (Intro)
- o Post-Mortem analysis and feedback

6.1.2. Section 2: Transformers condition assessment indexes (TCAI)

- o Main objectives of implementing/developing a *TCAI* (business drivers)
 - Fleet screening
 - Maintenance and operations
 - Budget allocation
 - Repair/replacement
 - System expansion
- o Overview of most common approaches – parameters to consider
- o Advantages and disadvantages of most common approaches
- o 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

6.2. Task Force # 2:

6.2.1. Section3: Dealing with uncertainty in information

- o Dealing with uncertainty (old data, data entry etc.) with available information

- o 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
- 6.2.2. **Section 4: Criticality and Consequence of Failure**
 - o Assessing critically & developing a criticality index
- 6.2.3. **Section 5: Transformer Active Part**
 - o Solid insulation degradation assessment
 - o Dielectric assessment
 - o Mechanical assessment

6.3. Task Force #3:

- 6.3.1. **Section 6: Bushings and Cable Boxes**
 - o Transformer bushings
 - Test and diagnostics
 - Failure mode assessment
 - o Transformer cable boxes
 - Test and diagnostics
 - Failure mode assessment
- 6.3.2. **Section 7: OLTC (LTC) & DETC**
 - o Failure Modes -> IEEE C57.140
 - o Tests and diagnosis
- 6.3.3. **Section 8: Cooling System, Transformer Tank, & Ancillary Components**
 - o Cooling System
 - Failure Modes
 - Tests and Diagnosis
 - o Transformer Tank
 - Failure Modes
 - Tests and Diagnosis
 - o Ancillary Components
 - Failure Modes
 - Tests and Diagnosis

6.4. Task Force #4:

- 6.4.1. **Section 9: Insulating Liquids**
 - o 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).

- o Include insulating liquid condition in the general condition assessment indexes (TCAI)
 - 6.4.2. **Annex A Transformer Condition Assessment Tables (Requires inputs from all sections)**
 - 6.4.3. **Annex B How to develop a TCAI (Requires inputs from all sections)**
 - 6.4.4. **Annex C Literature overview**
7. After the presentations were completed, the floor was opened for questions and discussions about those Sections.
- There was very good discussion about the presentations made.
 - Several recommendations were made regarding the presentation provided. 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.
 - Since the PAR expires in 2023, Bill Griesacker and Hemchandra Shertukde raise the question regarding timeline for the work require to be completed under each TF. The Chair commented that he plans to discuss the timeline with each TF and report back a timeline during the next WG meeting.
 - Tony McGrail suggested considering having a section about the financial aspects of condition assessment. Tim Raymond and Saramma Hoffman stated that this was discussed in Task Force # 2. The Chair suggested that TF #2 further discuss this suggestion within their TF and report back to the WG.
 - Lance Lewand raise the concern about the use of the word moisture in the presentation of TF#4. He suggested the use of the word water for transformer oil in Section 9. Alan agreed with the suggestion.
 - 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 documents and provide references to these documents while writing the guide.
 - A consolidated list of TF volunteer members (with Sections assigned) is being sent with attached with the meeting minutes.
 - There were no new items for consideration.
 - The meeting was adjourned at 11:40 am.

List of attendees (membership status shown during quorum poll):

First Name	Last Name	Member	Guest	Guest Req. Memb.	Company
Raj	Ahuja	X			Raj Ahuja Consulting
Edmundo	Arevalo				Not Known
Hugo	Avila		X		Not Known
Chris	Baumgartner		X		We Energies
Enrique	Betancourt			X	Prolec GE

William	Boettger	X			Boettger Transformer Consulting LLC
Jeremiah	Bradshaw		X		Bureau of Reclamation
Erich	Buchgeher	X			Siemens Energy
Luiz	Cheim	X			Hitachi ABB Power Grids
James	Cross	X			Kinectrics
John	Crouse		X		Roswell Alliance
Eric	Doak			X	D4EnergySolutions LLC
Don	Dorris	X			Nashville Electric Service
Lee	Doyle			X	Vaisala
Zach	Draper		X		Delta-X
James	Dukarm		X		Delta-X
Samraghi	Dutta Roy	X			Siemens Energy
Arnold	Elise				SGB-SMIT Group
Evgenii	Ermakov			X	Hitachi ABB Power Grids
Marco	Espindola		X		ABB Enterprise Software Inc.
Roger	Fenton			X	Fenton Solutions
Norman	Field	X			Teshmont Consultants LP
Bruce	Forsyth	X			Bruce Forsyth and Associates LLC
Michael	Franchek		X		Retired
George	Frimpong	X			Hitachi ABB Power Grids
Eduardo	Garcia		X		Siemens Inc
James	Gardner	X			SPX Transformer Solutions, Inc.
Jonathan	Garrity				Tagup
Monty	Goulkhah			X	Kinectrics
Jeff	Gragert		X		Xcel Energy
James	Graham	X			Weidmann Electrical Technology
Taylor	Gray		X		Not Known
Bill	Griesacker	X			Duquesne Light Co.
Ismail	Guner	X			Hydro-Quebec
Niklas	Gustavsson				Hitachi ABB Power Grids
Attila	Gyore	X			M&I Materials Ltd
Thomas	Hartmann				Pepco Holdings Inc.
Roger	Hayes	X			General Electric
Kyle	Heiden	X			EATON Corporation
Giovanni	Hernandez		X		Virginia Transformers Corporation
Gary	Hoffman	X			Advanced Power Technologies
Saramma	Hoffman	X			PPL Electric Utilities
Derek	Hollrah		X		Burns & McDonnell
Paul	Jarman		X		University of Manchester
Toby	Johnson		X		Pacificorp
Akash	Joshi	X			Black & Veatch
Laszlo	Kadar		X		Hatch

Gael	Kennedy	X			GR Kennedy & Associates LLC
Stacey	Kessler			X	Basin Electric Power Cooperative
Suleman	Khan		X		Ontario Power Generation
Egon	Kirchenmayer	X			Siemens Energy
Peter	Kleine	X			US Army Corps of Engineers
Dmitriy	Klempner		X		Southern California Edison
Axel	Kraemer		X		Maschinenfabrik Reinhausen
Michelle	Kutzleb		X		Not Known
Donald	Lamontagne	X			Arizona Public Service Co.
John	Lackey		X		PowerNex Associates Inc.
Aleksandr	Levin			X	Weidmann Electrical Technology
Lance	Lewand	X			Doble Engineering Co.
Weijun	Li		X		Braintree Electric Light Dept.
Mario	Locarno	X			Doble Engineering Co.
Darrell	Mangubat	X			Siemens Power Operations Inc.
Kumar	Mani	X			Duke Energy
Robert	Mayer		X		Siemens Energy
Matthew	McFadden	X			Oncor Electric Delivery
Tony	McGrail			X	Doble Engineering Co.
Susan	McNelly	X			Xcel Energy
Zach	Millard			X	Great River Energy
Emilio	Morales-Cruz	X			Qualitrol Company LLC
Ed	Not Known			X	Not Known
Anatoly	Mudryk			X	Camlin Power
Ali	Naderian				Metsco
Anthony	Natale		X		HICO America
Kristopher	Neild	X			Megger
Joe	Nims				Allen & Hoshall, Inc.
Rodrigo	Ocon			X	Industrias IEM
Anastasia	O'Malley	X			Consolidated Edison Co. of NY
Poorvi	Patel	X			Electric Power Research Institute (EPRI)
Nitesh	Patel				Hyundai Power Transformers USA
Branimir	Petosic			X	Boiler Inspection & Insurance of Canada
Patrick	Picher	X			Hydro-Quebec IREQ
Klaus	Pointner		X		Trench Austria GmbH
Chris	Powell		X		Intermountain Electronics
John	Pruente		X		SPX Transformer Solutions, Inc.
Kevin	Rapp			X	Cargill, Inc.
Timothy	Raymond	X			Electric Power Research Institute (EPRI)
Larry	Rebman		X		EMLS, Inc.

John	Reagan		X		Oncor Electric Delivery
Jonathan	Reimer				FortisBC
Oleg	Roizman				IntellPower Pty Ltd
Timothy	Rocque				SPX Transformer Solutions, Inc.
Mickel	Saad	X			Hitachi ABB Power Grids
Lina	Sandsten				Hitachi Power Grids
Alan	Sbravati	X			Cargill, Inc.
Eric	Schleismann		X		Southern Company Services
Devki	Sharma		X		Entergy
Hemchandra	Shertukde	X			University of Hartford
Kunal	Shukla		X		PECO Energy Company
Jonathan	Sinclair	X			PPL Electric Utilities
Kenneth	Skinger			X	Scituate Consulting, Inc.
Adam	Smith		X		Commonwealth Associates, Inc.
Markus	Soeller				Power Diagnostix
Maricio	Soto			X	Hitachi ABB Power Grids
Arthur	Speegle				Entergy Services, Inc.
Tommy	Spitzer				City Transformer Service Co.
Mike	Spurlock		X		Consultant
Brad	Staley	X			Salt River Project
Charles	Sweetser		X		OMICRON electronics Corp USA
Janusz	Szzechowski			X	Maschinenfabrik Reinhausen
Troy	Tanaka		X		Burns & McDonnell
Marc	Taylor		X		Cogent Power Inc.
Juan Carlos	Cruz Valdes	X			Prolec GE
Rogério	Verdolin	X			Verdolin Solutions Inc.
Vijayan	Krishnamurthy		X		PTI Transformers
Pragnesh	Vyas	X			Sunbelt-Solomon Solutions
Dieter	Wagner		X		Hydro One
Sukhdev	Walia	X			New Energy Power Co.
Alan	Washburn		X		Burns & McDonnell
Joe	Watson	X			JD Watson and Associates Inc.
Peter	Werelius	X			Megger
Daniel	Weyer	X			Nebraska Public Power District
Leon	White		X		H2scan
William	Whitehead	X			H2scan
Jeffrey	Wright	X			Duquesne Light Co.
Peter	Zhao	X			Hydro One
Kris	Zibert		X		Allgeier, Martin and Associates
Zlatan	Fazlic		X		Camlin Power
Pugal	Selvaraj				Virginia Transformer Corp

Kumar Mani
Chair

James Cross
Vice Chair

Akash Joshi
Secretary

Attachment K4.9

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 working group met on Monday 4/26/2021 at 10:45 a.m. via Webex. A total of 51 attendees participated in the meeting. 16 out of 26 working group members were in attendance, therefore a quorum was achieved. The complete attendance record is included in these minutes and is also available in the AM System. 4 attendees requested membership. These 4 attendees need to attend one more meeting to be eligible for membership.

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.

The meeting agenda was approved. The meeting minutes from the previous meeting held on October 19, 2020 were approved.

The chair presented the PAR scope and purpose and stated that there was no apparent need to revise them. The WG was asked to comment. There were no comments and no discussion from the WG regarding the PAR scope and purpose so no effort will be taken to revise them.

Task Force reports:**Task Force #1 (sections 3, 4, 5, 9, 10, 11) – Shankar Nambi, Chair:**

A number of minor editorial changes were presented in the document sections assigned to this TF. A reference to C57.19.04 on bushings was added. A new paragraph was added for back feed operation to section 11.1. It was stated that a comment should be added on the importance of the purchaser to state intent to operate a transformer in back feed operation to the transformer manufacturer, the wording of this statement will be drafted.

Task Force #2 (section 6) – Toby Johnson, Chair:

The TF chair requested additional members to support the TF and help with revising the section. A request was made to the WG chair to address the MVA equation for VAR loading in section 6.3.4. This will be one of the objectives of the TF.

Task Force #3 (sections 7, 8) – Kayland Adams, Chair:

Minor editorial changes were made to the sections.

Sections were added to address three winding UATs. The material describes the possible under-loading or overloading one terminal during the short circuit test method for temperature rise tests. It also expresses the possible inaccuracies with using the sum losses in the branches of the equivalent three-winding loss network for three winding loss measurement. Section 7.6.1 addresses aspects for three winding axial split windings. Section 7.6.2 addresses 3-winding concentric full height windings. It was questioned if the drafted text would change if the consideration of LTCs designed in each LV circuit was added. The TF chair stated that the text was written in a general enough form that it would not need to be changed, however this would be taken into consideration to see if any changes would be needed.

Task Force #4 (new annex) – Joe Watson, Chair:

A draft of the annex was submitted by the task force. Topics include items to consider when purchasing unit connected transformers, specifying winding voltage ratings, back feeding operation, LV bus considerations, foundation, firewall, and special tests. The document is appended to the end of the minutes.

New Business:

- Sizing GSUs for VAR flow will be addressed by TF #2.
- The TF on Volts/Hertz submitted proposed text to be added to the guide for a new annex; the document is appended to the end of the minutes.
- It was stated that a review will be needed of all figures in the document to determine if any need to be updated or replaced.

The meeting was adjourned at 12 p.m. The group will meet again in Milwaukee, Wisconsin in October 2021.

<u>Role</u>	<u>First Name</u>	<u>Last Name</u>	<u>Company</u>	<u>4/26/2021</u>
Member	Kayland	Adams	SPX Transformer Solutions, Inc.	X
Guest	Raj	Ahuja	Raj Ahuja Consulting	X
Member	Suresh	Babanna	SPX Transformer Solutions, Inc.	X
Member	Peter	Balma	Retired	X
Guest	Gilles	Bargone	FISO Technologies Inc.	X
Guest	Robert	Berland	Kiewit Power Engineers	X

Guest	Mats	Bernesjo	Hitachi ABB Power Grids	X
Guest	Jean-Noel	Berube	Rugged Monitoring Inc.	X
Guest	William	Boettger	Boettger Transformer Consulting LLC	X
Guest	Jeremiah	Bradshaw	Bureau of Reclamation	X
Guest	Michael	Craven	Phoenix Engineering Services	X
Guest	John	Crouse	Roswell Alliance	X
Guest	Everton	De Oliveira	Siemens Ltda	X
Guest	Thomas	Eagle	SPX Transformer Solutions	X
Guest	Norman	Field	Teshmont Consultants LP	X
Guest	Eduardo	Garcia Wild	Siemens Energy	X
Guest	Rob	Ghosh	GE	X
Guest	Ramsis	Girgis	Hitachi ABB Power Grids	X
Guest	Taylor	Gray	Portland General Electric (PGE)	X
Secretary	Bill	Griesacker	Duquesne Light Co.	X
Guest	Didier	Hamoir	Transformer Protector Corp	X
Guest	Ryan	Hogg	Bureau of Reclamation	X
Guest	Nicholas	Jensen	Delta Star Inc.	X
Member	John	John	Virginia Transformer Corp.	X
Member	Toby	Johnson	Pacificorp	X
Guest	Laszlo	Kadar	Hatch	X
Guest	Suleman	Khan	Ontario Power Generation	X
Member	John	Lackey	PowerNex Associates Inc.	X
Guest	Donald	Lamontagne	Arizona Public Service Co.	X
Chair	Weijun	Li	Braintree Electric Light Dept.	X
Guest	Jinesh	Malde	M&I Materials Inc.	X
Member	Kumar	Mani	Duke Energy	X
Guest	Richard	Marek	Retired	X
Member	Vinay	Mehrotra	SPX Transformer Solutions, Inc.	X
Member	Emilio	Morales-Cruz	Qualitrol Company LLC	X
Member	Shankar	Nambi	Bechtel	X
Guest	Nitesh	Patel	Hyundai Power Transformers USA	X
Guest	Monil	Patel	Pacific Gas & Electric Company	X
Guest	Samuel	Reed	EATON Corporation	X
Guest	Michael	Richardson	Ameren	X
Member	Dinesh	Sankarakurup	Duke Energy	X

Guest	Anil	Sawant	Virginia Transformer Corp.	X
Member	Steven	Schappell	SPX Transformer Solutions, Inc.	X
Guest	Adam	Smith	Commonwealth Associates, Inc.	X
Guest	Ryan	Thompson	Burns & McDonnell	X
Guest	Mark	Tostrud	Dynamic Ratings, Inc.	X
Vice-Chair	Jason	Varnell	Doble Engineering Co.	X
Guest	Jos	Veens	SMIT Transformatoren B.V.	X
Guest	Sukhdev	Walia	New Energy Power Co.	X
Member	Joe	Watson	JD Watson and Associates Inc.	X
Member	Kipp	Yule	Bechtel	X (via phone)

Annex XYZ

(normative)

Considerations for Specifying Transformers Directly Connected to Generators**XYZ.1 General**

When ordering new or replacement Unit Transformers (UT) or Unit Auxiliary Transformers (UAT), in addition to the performance characteristics and other requirements included in the specifications for regular power transformers, there are some additional items to consider and information to include in the specifications for UTs and UATs.

These additional items include:

- a) The process used for determining the XV and HV voltage ratings on the original transformer
- b) Back-feed possibilities as covered in 11
- c) Iso-phase or segregated phase bus and bus duct design and dimensions as covered in 10
- d) Foundation and firewall design information
- e) Required special tests and information

It is always good practice to review all of the performance requirements when replacing older existing transformers. The generator and or bus may have been upgraded. The optimal impedance or available fault current may have changed or other requirements such as the sound level may have changed since the existing UT or UAT was specified. New transformers may also need to be specified and designed with requirements that were not considered for the existing transformers such as the ability to withstand seismic and/or GIC events. The following considerations assume that any replacement UT or UAT would be rated closely to the existing transformer, but any significant change to the design could affect weights and dimensions as well as other factors which all need to be considered.

XYZ.2 XV and HV voltage ratings

Some users have changed their practices for specifying the XV and HV voltages on UTs. As covered in Clause 6, it has been common practice to specify the UTs XV rated voltage lower than the generator output voltage and the HV rated voltage at the rated system voltage to compensate for the voltage drop through the transformer and supply an HV voltage that is at the same general voltage level as the system voltage. But some users have changed this practice and now specify the UTs XV rated voltage at the generator's rated output voltage level and specify the rated HV voltage at a value higher than the system voltage to compensate for the voltage drop through the transformer and to avoid operating the UT in an overexcited condition. If the user's practice for determining the required XV and HV rated voltages has changed, and the new UT will replace an existing UT, the replacement UT should not have the same rated voltages as the existing UT.

XYZ.3 Back-feed possibilities

If the UT may be energized when its generator is out of service to provide step-down power to the UATs or other station transformers or loads, this operating condition should be detailed in the specifications. See 11 for details.

XYZ.4 Iso-Phase or Segregated-Phase Bus and Bus Duct Design and Dimensions

For new power plants, with iso-phase or segregated-phase bus connections between the generator and UT and UAT, the bus and bus ducts are often designed after the UT and UAT have been ordered and can be designed to match the dimensions of the bushings and mounting flanges on the UT and/or UAT. Any

available information on the bus and bus ducts should be included with the specifications for the UT and/or UAT, but if the bus and bus duct designs are not complete, the specifications should include, at a minimum,

- a) The general location (cover or side wall) for the generator side bushings (XV for UTs or HV for UATs)
- b) The general layout or location for each generator side bushing, if different from the standard layout as shown in IEEE Std. C57.12.10.
- c) The expected type of bus duct cooling system, pressurized with air flow or not, and maximum air temperature at the UT or UAT bushings.
- d) Requirements for bushings to be suitable for the expected temperatures rises from rated load current and maximum air temperatures in the bus duct.

If the grounding of the bus ducts is not known at the time the transformer is specified, it is recommended to assume that the bus ducts will be electrically isolated from the UT or UAT at the turret/bus duct flange connection and grounded to a ground pad near each turret with a ground cable. The bolt holes in the turret flanges should be sized to accommodate the collar washers or insulated bolts that are expected to be used to connect the bushing turret flanges to the bus duct flanges and the turret flange should be designed to accommodate the isolating gasket or washer.

If the new transformer is being ordered to replace an existing UT or UAT and the existing bus and bus duct should not be replaced or modified, in addition to the information listed above, the following bus duct flange details should also be included in the specifications:

- e) Type of bus duct design, a single-phase bus and bus duct for each bushing or a common enclosure for all 3 generator side bushings (assuming a three-phase transformer).
- f) Exact locations of each generator side bushing on the existing transformer including the heights above the base, distances from the tank centerlines and the phase-to-phase spacing.
- g) Inside diameter or inner dimensions of the bus duct and the required minimum strike distances for the bushings inside the bus ducts.
- h) Inner and outer diameters of the bus duct flange
- i) Bolt circle diameter
- j) Number, size and orientation of the bolt holes. A sketch is recommended.
- k) Grounding and isolation details of the bus duct flanges to turret flanges.
- l) Location of the shorting plate for iso-phase bus ducts

XYZ.5 Foundation and Fire Wall Design Information

For a new powerplant, the foundation can often be designed to accommodate the base, weight and dimensions of the new transformer. In this case, the only information that should be included with the UT or UAT specifications would be any dimensional or layout limitations such as firewalls or similar obstructions and the overall area planned for the transformer bay, along with any user's required clearances between the transformer and the obstructions.

If the new transformer is being ordered to replace an existing UT or UAT and the existing foundation should not be replaced or modified and the transformer bay dimensions will be maintained, in addition to the information listed above, the following information should also be included in the specifications:

The foundation sketch or drawing showing the type of foundation (flat pad, piers, rails or other types), dimensions and locations of all of surfaces in contact with the transformer, locations of all conduits for connections to the control cabinet and any other cabinets or components, and locations of any anchoring points such as plates or bolts in the foundation that the transformer may be welded or bolted to for seismic or other requirements. Additionally, the foundation's designed total transformer weight limit and the footprint for any oil retention area, and the maximum oil volume limit should be included.

It should also be noted that firewalls and transformer bay designs can adversely affect the flow of air around UTs and create micro-environments with significantly higher ambient temperatures than open areas in the same region. If the existing UT has experienced higher than expected operating temperatures or high temperature alarms during its service life, it is recommended to consider the locations of the radiators or heat exchangers and if they are located in areas of poor air circulation on the existing UT, if they can be located on the open side of the transformer bay on the replacement transformer, the ambient air may be cooler in that area and the operating temperatures may be improved. The maximum ambient temperature may also need to be determined and specified at a higher level for the replacement transformer.

XYZ.6 Required special tests and information

In addition to the Routine tests listed in IEEE C57.12.00, the following tests are recommended as Routine tests for all UTs and UATs.

- Sound level
- Sweep Frequency Response Analysis
- Zero sequence impedance

The manufacturer should develop and provide a V/Hz curve for all UTs and UATs that is specific to the UT or UAT and its core design, insulation materials and thermal performance capabilities. The curve should identify operating conditions that could result in oil bubbling, accelerated insulation aging, or any other damaging conditions.

Proposed V / F Text for C57.116

Short-term overexcitation in power transformers

According to IEEE Standard C57.12.00, a transformer is designed to operate indefinitely when excited at least 95 % of rated frequency; and secondary voltage and Volts per Hertz do not exceed 105 % of rated voltage, with a 0.8 power factor, or higher, under load conditions. Depending on a transformer's core design, a significant level of increase in the exciting voltage or a significant reduction in the frequency, or a combination of both, can over-excite the core and increase the core flux density well beyond the saturation level

Overexcitation should be considered when operating transformers directly connected to generators, where the most severe case is normally during generator load rejection when a circuit breaker on the load side of the transformer opens, interrupting the load from a generator and causing the generator voltage to increase significantly while the frequency slows down over 10s of seconds while the generator's rotor gradually spins to a stop.

Relay Practices

Transformers connected to generators are typically protected from moderate over-excitation under normal operating conditions. However, these transformers may not be able to protect from load rejection conditions if a circuit breaker is not located between the generator and the transformer.

Protective relays for this type of very high V/Hz conditions should have inverse time characteristic to allow the transformer to operate under mild overvoltage and/or under-frequency conditions for a longer time than excessive overvoltage and/or under-frequency conditions. Relay settings for this type of protection should be obtained from a V/Hz curve that is applicable for the specific transformer.

Effects of short-term overexcitation on power transformers

The effects of high levels of core overexcitation can vary significantly from one transformer design to another. When such high levels of overexcitation cause magnetic saturation of transformer cores, a portion of the core main flux escapes from the core into and through the active part of the transformer, structural parts, and tank, causing heating of those parts beyond their thermal design limits. This can lead to:

- (1) Damage of solid insulation in contact with these parts leading to loss of insulation life if the insulation is not rated for those temperatures
- (2) Gas bubbles of oil in contact with the overheated structural parts of the transformers, leading to possibly catastrophic dielectric failure of the transformer
- (3) Overheating of the tank walls leading into discoloration of the tank paint.

However, due to the short duration nature of this type of overexcitation and the relatively much longer Thermal Time Constant of the structural parts of transformers, the rise in temperature of these parts caused by this type of over excitation would be small. Also, the short duration of this increase in temperature would significantly decrease the impact of this rise in temperature on insulation life or gas bubble generation

V/Hz Curves

Figure 1 below presents a V/Hz curve that has been used for many types of transformers. It is based on factory measurements conducted in the 1960's on a core-form type transformer that was designed with manufacturers' technology at the time, core steel grade, and with cellulose type insulation to operate indefinitely at approximately 110 % rated V/Hz. The curve has served as an effective damage curve for operation of this type of transformers at various V/Hz values and times. According to this curve, operation of transformers is to be limited to the area below the curve. Also, the transformer should be de-energized if the V/Hz level exceeds the value for the appropriate time to avoid thermal damage. This is a conservative curve that has been used for several types of transformers that did not have a specific V/Hz curve developed or available for the transformer. If a specific V/Hz curve for the transformer is not available and the design of the transformer is unknown, this curve, or another curve from the same manufacturer for a similar transformer, may provide an estimated damage curve for the transformer in question, but the User should recognize that the curve is only an estimate and may want to adjust their relay setting accordingly.

Transformer manufacturers should provide a similar curve that more accurately reflects the specific design of a transformer that will be connected directly to a generator, or other types of transformers when requested.

V/Hz Curve Criteria

A transformer V/Hz curve should accurately estimate the V/Hz levels and the times allowed at those levels when unacceptable insulation aging or oil bubbling may occur over a range from 100-140 % V/Hz. The curve should have the % Excitation or % V/Hz on the Y axis and the time in seconds on the X axis. The manufacturer should consider the following design information when developing the curve:

- Type of core steel, flux densities under the V/Hz range, and corresponding saturation levels
- Temperature rises of all vulnerable structural parts from flux heating over the V/Hz range
- Thermal rating of insulation materials in contact with the core and overheated structural parts
- Bubbling temperature of the insulating fluid
- Maximum oil temperature rise at the worst case load and cooling levels
- Specified maximum ambient temperature

The area below the curve should represent the operating range where the temperatures on any overheated structural parts will not cause oil bubbling or heat the insulation to a temperature greater than the insulation's rated temperature.

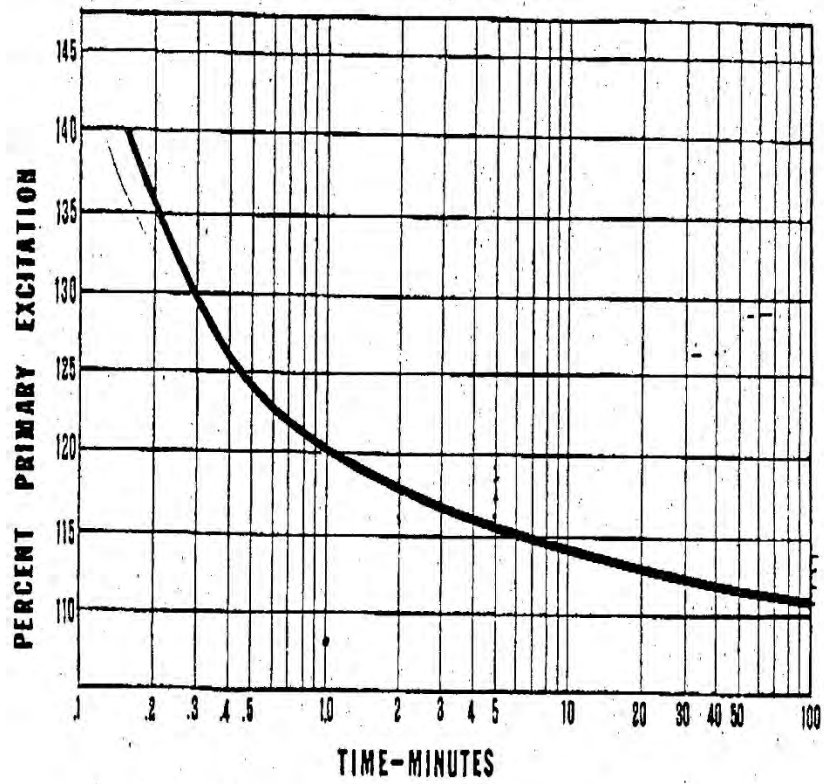


Figure 1: Typical V/Hz Curve

Standards Subcommittee

April 28, 2021 Virtual meeting

Standards Subcommittee		
Chair: Daniel Sauer	Vice-Chair: Marcos Ferreira	Secretary: Ajith Varghese
Standards Coordinator: Steve Shull		
Room: Virtual	Date: April 28 th , 2021	Time: 3:45 PM to 04:45 pm
Members: 67	Present at time of quorum check: 36	Attended per WebEx Record: 39
Guests present: 109	Membership requested: 28	Membership accepted: 20

L.1 Meeting Attendance

The Standards Subcommittee met on Wednesday; April 28th, 2021 and started at 3:45 PM (CST). **36 of 67** members were in attendance at the beginning of the meeting which met the quorum requirement.

Overall, the attendance roll showed according to WebEx pool: there were **148** attendees, **39** members and **109** guests (**28** guest requested membership and **20** met attendance requirement and will be granted membership).

L.2 Chair's Remarks

The Chair welcomed members and guests to the virtual meeting. The Chair thanked Jerry Murphy for the service provided in past as chair and congratulated Steve Shull in moving into new role of standards coordinator. With this change, Marcos moved to position of vice chair and Ajith Varghese, will be the new secretary.

Chair briefly highlighted the requirement that while introducing one need to state their affiliation. Chair noted the meeting is recorded for the purpose of minutes and will be deleted after that.

The Agenda for the Spring 2021 meeting was moved by Jerry Murphy and seconded by Steve Snyder. The motion was carried with unanimous consent. The Minutes for fall 2020 was moved by Kris Zibert and seconded by Kris Neild. The motion was carried with unanimous consent.

Chair presented the IEEE requirement for patent and copyrights. 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

The Chair reminded the WG and TF leaders to submit their minutes from the meetings within **15 days** to the SC secretary. The SC Secretary then must submit the SC minutes within 45 days of the SC meeting.

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

April 28, 2021

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.

Standard C57.12.00 was last published in 2015. A revision ballot was initiated in March 2021 with the following key points from the ballot :

Ballot Opened	3 -19- 2021
Ballot Closed	4 -19- 2021
Number in the Ballot Pool	231
Affirmative Votes	156
Negative Votes with Comment	13
Negative Votes without Comment	2
Abstentions	5
Total Votes Received	176
Total Comments	176
Return Rate	76%
Affirmative Rate	92%

I have begun going through the comments and addressing the editorial issues, and have forwarded some material to PCS Audible Sound WG for their inputs. Most of the technical issues have yet to be sorted before the Ballot Resolution Committee can begin addressing them. I hope to have this sorted and that work to begin within 2 weeks.

Respectfully submitted,
Steven L. Snyder, WG Chair
April 28, 2021

L.3.2 WG Standard Terminal Markings and Connections for Transformers C57.12.70

WG on C57.12.70 did not meet during Spring 21 TF Meeting.

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 vonGemmigem		
Current Draft Being Worked On:	1.0	Dated:	NA
Meeting Date:	2021-04-26	Time:	9:10 AM
Attendance:	Members		13
	Guests:		12
	Total		25

Meeting Minutes / Significant Issues / Comments:

The Chair opened the meeting at 9:10 a.m. (Central) on Monday 26 April, 2021.

- 1) Quorum Check
Quorum was achieved with 13 of 15 members present. 12 non-voting participants also attended. Six 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 2020 minutes
A reference to one member in the minutes was corrected. The revised Fall 2020 meeting minutes were approved unanimously.
- 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
The chair of the task force assigned to develop revised definitions for core form and shell form transformers gave a status report. Consensus was not reached on revised definitions and further work is needed. Points of contention include a performance-based vs. construction-based basis

for the definitions, and whether the definitions should cover both power and distribution transformers.

b) GSU transformer definition

This was not discussed and is a closed item.

7) New Business

a) Dry type definitions review

Proposed definition additions from the dry type transformer standards were submitted by Tim-Felix Mai and reviewed. A motion to accept the proposed dry type definitions to the draft standard was made by Jerry Murphy and seconded by Tim-Felix Mai. The motion passed unanimously.

b) Transformer Class Designations

A request was received to consider creating definitions of Class 1 transformers to clarify the difference between distribution transformers and Class 1 (small power) transformers. The concern is the overlap of transformers defined by C57.12.34 and C57.12.36 may expose distribution substation type transformers to DOE efficiency regulations. This was discussed but no action was taken. This could affect several transformer standards, and may need to be considered at the subcommittee or main committee level.

c) Class 2 transformer definition

The existing definition of a Class 2 transformer was discussed. This definition applies to low energy components included in power supplies and is referenced by the National Electrical Code (NEC). It was determined this definition is out of scope and could be confused with the definition of a Class II transformer as defined in C57.12.00. A motion to delete definition 3.49 for Class 2 transformers was made by Jerry Murphy and seconded by Dan Sauer. The motion passed with 12 for, 1 against, and no abstentions.

d) Standards Review – Volunteers

Volunteers to review standards from the Bushings, Dielectric Test, Distribution, and Performance Characteristics Subcommittees.

7) The meeting was adjourned at 10:35 a.m.(Central)

Next meeting –June 2021 via Webex

Submitted by: Jim Graham, Chair

Date: 04/26/2021

WG C57.12.80 Meeting Attendance List

Role	Last Name	First Name	Company	4/26/2021
Chair	Graham	James	Weidmann Electrical Technology	X
Member	Betancourt	Enrique	Prolec GE	X
Member	Heiden	Kyle	EATON Corporation	X
Member	Hoffman	Gary	Advanced Power Technologies	X
Member	Li	Weijun	Braintree Electric Light Dept.	X
Member	Mai	Tim-Felix	Siemens Energy	X
Member	Matthews	Lee	Howard Industries	X
Member	Murphy	Jerry	Reedy Creek Energy Services	X
Member	Musgrove	Ryan	Oklahoma Gas & Electric	X
Member	Nambi	Shankar	Bechtel	X
Member	Sauer	Daniel	EATON Corporation	X
Member	Wright	Jeffrey	Duquesne Light Co.	X
Member	Zibert	Kris	Allgeier, Martin and Associates	X
Members attending				13

Role	Last Name	First Name	Company	4/26/2021
Guest	Bernesjo	Mats	Hitachi ABB Power Grids	X
Guest	Clift	Bobby	Xcel Energy	X
Guest	Cruz Valdes	Juan Carlos	Prolec GE	X
Guest	Ferreira	Marcos	Beale AFB	X
Guest	Gonzalez	Luis	Conduct Industries Limited	X
Guest	Herron	John	Raytech USA	X
Guest	Issack	Ramadan	American Electric Power	X
Guest	McNelly	Susan	Xcel Energy	X
Guest	Shingari	Avijit	Pepco Holdings Inc.	X
Guest	Shukla	Kunal	PECO Energy Company	X
Guest	Webb	Matthew	SPX Transformer Solutions, Inc.	X
Guest	Zaman	Malia	IEEE	X
Nonvoting attendees				12

L.3.4 WG Standards Transformer on Continuous Revision for C57.12.90

Standards Working Group on the Continuous Revision of C57.12.90
Standards Subcommittee
IEEE/PES Transformers Committee
WG Chair: Stephen Antosz
Spring 2021, April 28, 2021

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: Dinesh Sankarakurup

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. Revision work ensued.

STATUS as of April 20, 2021

Mandatory Editorial Coordination (MEC) began in Jan 2021 and completed Feb 2021.

The ballot group formation was launched on Jan 25, 2021. It closed on Feb 24, 2021. It was extended for 10 days on Mar 1, 2021 to allow some stragglers to sign up.

The ballot was launched on March 18, 2021, for 30 days. The ballot group consisted of 219 volunteers. It closed on April 18, 2021 but did not receive the required 75% Response Rate. We were short by 4 votes, so it was extended for 5 days, and a message sent out seeking more votes. Within one day, the 4 votes were submitted and the ballot automatically closed successfully on April 19, 2021.

Return rate	75%	(166 of 219)
Abstentions	2%	(4 of 219)
Approvals	94%	Approval rate must be at least 75%
		153 Approved without comment
		9 Disapproved with comments
		4 Abstained
		166 Total votes

There were 101 comments. The Ballot Resolution Committee has already begun working to address the comments. An update will be provided as soon as available.

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.

1. Possible future revisions from Hakan Sahin’s PCS TF for Revision of C57.12.90.
 - 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.
 - b) Load Tap Changer performance 8.7 voltage test and 9.6 current test.
 - c) OLTC continuity tests.
 - d) Discussed at Fall 2019 and Fall 2020 meetings.
 - a. Number of short-circuit tests under subclause 12.3.4.
 - b. Ratio test voltage and frequency under subclause 7.1.2. Request to change frequency bandwidth.
 - c. Request to revise the Ratio test methods under subclause 7.3, since these are not used any more. Mostly, ratio meters are used. .
2. Possible changes to Clause 13 sound test from Ramsis’ TF
3. Nothing new from Pierre Riffon’s TF regarding impulse tests
4. 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
 - Clarification of measuring voltage during low frequency tests
 - Venting bushings during PD test,
5. Revise to subclause 11.1 from Dinesh Sankarakurup TF under Insulation Life SC
 - 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.
 - Possible revision to 11.4.1 and 11.4.2, regarding K and L type insulating fluids for temperature rise test corrections.

Respectfully submitted,
 Stephen Antosz, WG Chair
 May 10, 2021

L.3.5 WG Standards Transformer on Revision for C57.152, Guide of Field Tests

*Standards Subcommittee,
WG – C57.152 Revision
IEEE / PES Transformers Committee*

*April 26, 2021, 12:55PM – 2:10PM, CT
Virtual meeting*

UNAPPROVED MINUTES

Welcome

The chair, Marcos Ferreira, opened the meeting at 1:00PM.

1. Attendance and Attendance for Quorum

At the time of the meeting there are 57 Members, including Chair, Vice Chair and Secretary. The poll registered 79 participants, where 34 Members, 14 Guests requesting membership and 27 Guests. No answer from 4.

34 members present of 57 mean requirements for quorum was fulfilled. The list of attendees is shown below:

Name	Affiliation	Status
Ferreira, Marcos	Beale AFB	Chair
Werelius, Peter	Megger	Secretary
Binder, Wallace	WBBinder Consultant	Member
Denzer, Stephanie	Alliant Energy	Member
Dorris, Don	Nashville Electric Service	Member
Dutta Roy, Samraghi	Siemens Energy	Member
Foata, Marc	Maschinenfabrik Reinhausen	Member
Griesacker, Bill	Duquesne Light Co.	Member
Gustavsson, Niklas	Hitachi ABB Power Grids	Member
Hayes, Roger	General Electric	Member
Heiden, Kyle	EATON Corporation	Member
Herron, John	Raytech USA	Member
Lejay, Olivier	Huaming USA Corp.	Member
Locarno, Mario	Doble Engineering Co.	Member
McFadden, Matthew	Oncor Electric Delivery	Member
McNelly, Susan	Xcel Energy	Member
Milojevic, Goran	DV Power	Member
Murray, David	Tennessee Valley Authority	Member
Musgrove, Ryan	Oklahoma Gas & Electric	Member
Naderian, Ali	Metsco	Member
Patel, Poorvi	Electric Power Research Institute (EPRI)	Member
Plath, Cornelius	OMICRON Energy Solutions GmbH	Member
Raymond, Timothy	Electric Power Research Institute (EPRI)	Member
Reed, Scott	MVA	Member

Robalino, Diego	Megger	Member
Saad, Mickel	Hitachi ABB Power Grids	Member
Servaraj, Pugal	Virginia Transformer Corp.	Member
Shertukde, Hemchandra	University of Hartford	Member
Sweetser, Charles	OMICRON Electronics Corp USA	Member
Szczechowski, Janusz	Maschinenfabrik Reinhausen	Member
Tanaka, Troy	Burns & McDonnell	Member
teNyenhuis, Ed	Hitachi ABB Power Grids	Member
Verdolin, Rogerio	Verdolin Solutions Inc.	Member
Walia, Sukhdev	New Energy Power Co.	Member
Welton, Drew	Intellirent	Member
Amarasinghe, Dinu	Bruce Power	Guest
Ayers, Donald	Ayers Transformer Consulting	Guest
Benach, Jeff	Consultant	Guest
Benedict, Ramon	SPX Transformer Solutions, Inc.	Guest
Bishop, Ryan	Minnesota Power	Guest
Boettger, William	Boettger Transformer Consulting LLC	Guest
Bolar, Sanket	Megger	Guest
Boman, Paul	Hartford Steam Boiler	Guest
Buchgeher, Erich	Siemens Energy	Guest
Cheim, Luis	Hitachi ABB Power Grids	Guest
Davis, Eric	Burns & McDonnell	Guest
Doak, Eric	D4EnergySolutions LLC	Guest
Emakov, Evgenii	Hitachi ABB Power Grids	Guest
Fausch, Reto	RF Solutions	Guest
Garcia Wild, Eduardo	Siemens Energy	Guest
Gray, Taylor	Portland General Electric (PGE)	Guest
Guner, Ismail	Hydro-Quebec	Guest
Harley, John	FirstPower Group LLC	Guest
Hollrah, Derek	Burns & McDonnell	Guest
Kessler, Stacey	Basin Electric Power Cooperative	Guest
Klempner, Dmitriy	Southern California Edison	Guest
Knappek, William	OMICRON Electronics Corp USA	Guest
Lamontagne, Donald	Arizona Public Service Co.	Guest
Mangubat, Darrell	Siemens Power Operations Inc.	Guest
Mani, Kumar	Duke Energy	Guest
Mayer, Robert	Siemens Energy	Guest
McBride, James	JMX Services, Inc.	Guest
Melle, Thomas	HIGHVOLT	Guest
Millard, Zachary	Great River Energy	Guest
Nabi-Bidhendi, Hossein	ABB Inc.	Guest
Nesvold, Brady	Xcel Energy	Guest
Panesar, Parminder	Virginia Transformer Corp.	Guest
Patel, Vinay	Consolidated Edison Co. of NY	Guest
Reeder, Perry	SPX Transformer Solutions, Inc.	Guest
Reimer, Jonathan	FortisBC	Guest

Rock, Partick	American Transmission Co.	Guest
Rodriguez, Leopoldo	Transformer Testing Services LLC	Guest
Roizman, Oleg	IntelliPower Pty Ltd	Guest
Sarkar, Amitabh	Virginia Transformer Corp.	Guest
Sinclair, Jonathan	PPL Electric Utilities	Guest
Snyder, Steven	Hitachi ABB Power Grids	Guest
Stacy, Fabian	Hitachi ABB Power Grids	Guest
Steeves, Gregory	Baron USA, LLC	Guest
Thompson, James	T&R Service Company	Guest
Trifunski, Risto	Trench Limited	Guest
Walder, Nicholas	EATON Corporation	Guest
Zanwar, Anand	Siemens Energy	Guest

2. Approval of Agenda

After a motion by Wallace Binder, and seconded by Rogerio Verdolin, the group unanimously approved the Agenda.

3. Approval of Minutes of Meeting from Fall 2020

After a motion by Shertukde Hemchandra, and seconded by Wallace Binder, the group unanimously approved Meeting from Fall 2020.

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 revision. This is second meeting virtually and we are going to try to provide the latest on working progress of each task force.”

“Raka Levi will be announcing his decision to step down as vice chair of this WG. This meeting will be his last one. As a chair I would like to take this opportunity to thank Raka, as my good friend, and I have the privilege to work with him for the last 23 years. Raka is one of most knowledgeable and kind that I have known. Let us give a hand to Raka for all his contribution to this WG as well as IEEE as whole. Thank you Raka”.

“We would like to introduce our new Secretary Goran Milojevic. Peter Werelius will take over the role as Vice Chair.”

7. Task Forces Working Progress Report

TF-1: Section 7.2 – Main Tank Volunteers

Charles Sweetser (team leader)

Charles referred to the decision on F20 meeting.

The text from the F20 MoM:

“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.”

The WG officers will re-send the list of comments to the WG (Guests and Members) for Members to Vote if the group should proceed with draft changes. Response time 30 days.

TF2: Section 7.3 – Bushings Volunteers

Mario Locarno (team leader)

Mario briefly described the work on the section. It is time to send out the draft to the WG for comments.

The WG officers will re-send or post the TF2 draft WG (Guests and Members) to get comments and suggestion to improve the section. Response time 30 days.

TF3: Section 7.4 – Tap Changers Volunteers

Marcos Ferreira (team leader)

Marcos briefly described the work on the section. It is time to send out the draft to the WG for comments.

The WG officers will re-send or post the TF3 draft documents WG (Guests and Members) to get comments and suggestion to improve the section. Response time 30 days.

TF4: New Annexes: Dynamic Resistance and Vibroacoustic Measurements

Goran Milojevic

Goran briefly described the work on the two Annexes. The Annexes were sent out and posted prior the meeting. The WG officers will re-send or post the two Annexes to the WG to get comments and suggestion to improve the section. Response time 30 days.

8. New Businesses (Secretary did recorded any decisions)

New team leaders and task force volunteers are needed for the following sections:

- Section 3 - Definitions
- Section 5 - Maintenance test and information (table 5.1 excluded)
- Section 5 - Maintenance test and information (table 5.1)
- Section 6 - Safety
- Section 7 - Test and Test Techniques
- Section 7.1 - Periodic General Inspections
- Section 7.5 - Auxiliary Equipment
- Section 8 - Diagnostic Chart (Table 20)
- Annexes C and G

Diego Robalino volunteered lead Annex G, DFR Annex. Cornelius, Evgenii, Maria and Poorvi volunteered contribute the DFR section at the meeting. The Secretary has an earlier record Ronald Hernandez has also volunteered to the DFR section.

Also, it was presented as new business to create new annex (L) for, “Diagnostic Test Procedure for LTC Reactors and Series Transformer Devices”.

The Chair asked WG members volunteers are interested in working on any above sections and annexes:

Chair: Marcos Ferreira: mdferreira@comcast.net

Vice-Chair: Peter Werelius: peter.werelius@megger.com

Secretary: Goran Milojevic: goran@dv-power.com

9. Meeting Adjournment

A motion to adjourn the meeting was raised by Diego Robalino and seconded by Poorvi Patel. The meeting adjourned at 2:05PM

Respectfully submitted,

Marcos Ferreira – Chair Peter Werelius – Secretary

L.3.6 WG PC57.163 IEEE Guide for Establishing Power Transformer Capability while under Geomagnetic Disturbances

PC57.163 - WG for the Revision of IEEE Guide for Establishing Power Transformer Capability while under Geomagnetic Disturbances

10:50 AM to 12:05 PM Central, April 27, 2021 (Virtual Session)

Unapproved Meeting Minutes

The WG Chair Dan Blaydon presided over this virtual WG meeting with both the Vice-Chair, Ramsis Girgis, and Secretary, Scott Digby, in attendance. This was the second meeting of this new Working Group. Attendance numbers are as follows:

Total Attendance	99
Members in Attendance	47 (out of 62 members, quorum was achieved)
Guests in Attendance	52
Guests Requesting Membership	4 (3 meeting membership eligibility requirement of attendance at 2 of last 3 meetings)

Guests Requesting Membership (attendance at 2 out of 3 meetings required to qualify for membership):

	Membership Granted? (effective after this meeting)
Evgenii Ermakov	Yes
Raymond (Curtiss) Frazier	Yes
Balakrishnan Mani	Yes
Emilio Morales-Cruz	No

Participants were advised that membership requests could also be made via email requests from attendees to the WG Chair and/or Secretary.

The requisite patent and IEEE-SA copyright policy slides were reviewed. The agenda and the minutes to the Fall-2020 meeting were approved via unanimous consent. The project milestones were reviewed, with key dates being the PAR expiration date of December-2024 and the published document's expiration date of December-2025.

The Chair noted that several documents were posted under the WG section of the Standards SC website. This included the published version of the document (accessed via special password) as well as a proposed reorganization of the document that had recently been circulated to the WG for review. The Chair provided a review of the proposed reorganization of the document, with key points being to expand the content of the background section, including bringing the content related to the GIC signature/profile and definition of effective GIC as sub-sections of the background section to have it more in the forefront of the document, and then having two completely separate sections focusing on the Magnetic response and then the Thermal response rather than their content being included amongst various other sections. The Chair asked if there was any discussion concerning the proposed reorganization but there was none noted.

The WG Vice-Chair then presented an overview of proposed modifications and updates, noting that the industry has made advancements and has learned much since the initial publication of the document since quite a significant number of transformer studies have now been performed, and there is a need to incorporate this new information into the Guide. This material had been circulated to the WG prior to this meeting. Some highlights from the Vice Chair's discussion include:

- that modelling techniques are much improved from when the original document was written such that many of the figures in the current guide show effects to be more than actual occurs, reflecting the more conservative approach used in the development of the original content due to the tight time constraint existing at the time (specific content discussed as included Figure 5, Figure 6, Table 1, Figure 19, Figure 21, Figure 22, and Figure 23).
- that shell form transformer behavior has been further studied and calculations improved, including tank temperature heating at different DC current levels
- that the GIC signature in the current guide should be replaced with the NERC TPL-007 GIC signature (then what to do with the GIC signature in the current IEEE Guide, such as moving to an Annex, will need to be determined)
 - An attendee noted that users need the complete data file rather than just a graph, to which the VChair noted that such data file had been provided to utilities by their RTO.
- adding a real example of a utility's fleet GIC susceptibility assessment using the indexing/categorizing method of section 8 of the published Guide might be beneficial to users
- input from manufacturers is requested.

There was a discussion concerning the type of information related to the modeling techniques themselves that should be included in the Guide. It was noted that specific modeling techniques that companies develop tend to be proprietary in nature, cannot be overgeneralized, and wouldn't be able to be included in a Guide, but that some high-level modelling methodology might be considered for inclusion. This might include discussion of some of the more impacting or significant parameters and their influence. The current, published version of the Guide had been circulated to the WG prior to this WG meeting to begin collecting suggestions for needed revisions and additional content to the Guide. The collection of the revisions proposed by the Vice-Chair were also circulated to the WG to begin soliciting thoughts and comments. The WG officers have responded to reviewer comments received thus far, and the comments and responses have begun to be consolidated into spreadsheets for tracking. These will be posted to the WG's area of the SC website.

The VChair responded to a question by a WG Member that the impact of GIC on oil temperature during a GMD event is negligible since the GIC signature is characterized by short duration pulses.

The Chair made a call for participants to provide and contribute relevant data to further assist in development of the new and/or revised content.

The Chair also made a call for participants to volunteer to assist in the work on expanding the Background section content if interested in contributing.

Under New Business, a WG Member noted the need to discuss Equation 1, to which the Chair requested an associated comment be submitted by email as a follow up item for review and discussion.

The next planned meeting of the WG will be during the Fall Transformers Committee meetings, scheduled to be held in Milwaukee, however, the Chair noted that intermediate, virtual meetings could potentially be scheduled but that proper notification of such would be transmitted.

The meeting adjourned at its scheduled ending time of 12:05 pm central time.

Respectfully Submitted,

Scott Digby, WG Secretary

Role	First Name	Last Name	Affiliation
Chair	Daniel	Blaydon	Baltimore Gas & Electric
Vice-Chair	Ramsis	Girgis	Hitachi ABB Power Grids
Secretary	Scott	Digby	Duke Energy
Member	Hugo	Avila	Hitachi ABB Power Grids
Member	Suresh	Babanna	SPX Transformer Solutions, Inc.
Member	Jeff	Benach	Consultant
Member	Mats	Bernesjo	Hitachi ABB Power Grids
Member	Enrique	Betancourt	Prolec GE
Member	William	Boettger	Boettger Transformer Consulting LLC
Member	Eric	Doak	D4EnergySolutions LLC
Member	Hakim	Dulac	Qualitrol Company LLC
Member	Anthony	Franchitti	PECO Energy Company
Member	Ismail	Guner	Hydro-Quebec
Member	Gary	Hoffman	Advanced Power Technologies
Member	Saramma	Hoffman	PPL Electric Utilities
Member	Akash	Joshi	Black & Veatch
Member	Kurt	Kaineder	Siemens Energy
Member	Stacey	Kessler	Basin Electric Power Cooperative
Member	Zan	Kiparizoski	Howard Industries
Member	Moonhee	Lee	Hammond Power Solutions
Member	Xose	Lopez-Fernandez	Universidade de Vigo
Member	Kumar	Mani	Duke Energy
Member	Vinay	Mehrotra	SPX Transformer Solutions, Inc.
Member	Thomas	Melle	HIGHVOLT
Member	Martin	Munoz Molina	Orto de Mexico
Member	Ali	Naderian	Metsco
Member	Anastasia	O'Malley	Consolidated Edison Co. of NY
Member	Nitesh	Patel	Hyundai Power Transformers USA
Member	Patrick	Picher	Hydro-Quebec IREQ
Member	Ion	Radu	Hitachi ABB Power Grids
Member	Afshin	Rezaei-Zare	York University
Member	Steven	Schappell	SPX Transformer Solutions, Inc.
Member	Markus	Schiessl	SGB
Member	Eric	Schleismann	Southern Company Services
Member	Cihangir	Sen	Duke Energy
Member	Hemchandra	Shertukde	University of Hartford
Member	Marc	Taylor	Cogent Power Inc.
Member	Mark	Tostrud	Dynamic Ratings, Inc.
Member	Jason	Varnell	Doble Engineering Co.
Member	Kiran	Vedante	Ritz Instrument Transformers
Member	Jos	Veens	SMIT Transformatoren B.V.
Member	Rogério	Verdolin	Verdolin Solutions Inc.
Member	David	Wallach	Duke Energy
Member	Joe	Watson	JD Watson and Associates Inc.
Member	William	Whitehead	Siemens Energy
Member	Trenton	Williams	Advanced Power Technologies
Member	Waldemar	Ziomek	PTI Transformers
Guest	Kayland	Adams	SPX Transformer Solutions, Inc.
Guest	Edmundo	Arevalo	Bonneville Power Administration
Guest	Gilles	Bargone	FISO Technologies Inc.
Guest	Olle	Benzler	Megger
Guest	Thomas	Blackburn	Gene Blackburn Engineering
Guest	Jeremiah	Bradshaw	Bureau of Reclamation
Guest	John	Crouse	Roswell Alliance
Guest	Marco	Espindola	Hitachi ABB Power Grids
Guest	Evgenii	Ermakov	Hitachi ABB Power Grids
Guest	Roger	Fenton	Fenton Solutions
Guest	Raymond	Frazier	Ameren

Guest	Jeffrey	Gragert	Xcel Energy
Guest	Bill	Griesacker	Duquesne Light Co.
Guest	Thomas	Hartmann	Pepco Holdings Inc.
Guest	Roger	Hayes	General Electric
Guest	Derek	Hollrah	Burns & McDonnell
Guest	Philip	Hopkinson	HVOLT Inc.
Guest	Paul	Jarman	University of Manchester
Guest	Anton	Koshel	Delta Star Inc.
Guest	Axel	Kraemer	Maschinenfabrik Reinhausen
Guest	Donald	Lamontagne	Arizona Public Service Co.
Guest	Aleksandr	Levin	Weidmann Electrical Technology
Guest	Balakrishnan	Mani	Virginia Transformer Corp.
Guest	Rogelio	Martinez	Georgia Transformer
Guest	James	Mciver	Siemens Energy
Guest	Susan	McNelly	Xcel Energy
Guest	Zachary	Millard	Great River Energy
Guest	Paul	Morakinyo	PSEG
Guest	Emilio	Morales-Cruz	Qualitrol Company LLC
Guest	Anthony	Natale	HICO America
Guest	Frank	Neder	Trench Germany GmbH
Guest	Kristopher	Neild	Megger
Guest	Brady	Nesvold	Xcel Energy
Guest	Sanjay	Patel	Royal Smit Transformers
Guest	Brian	Penny	American Transmission Co.
Guest	Christoph	Ploetner	Hitachi ABB Power Grids
Guest	John	Reagan	Oncor Electric Delivery
Guest	Larry	Rebman	EMLS, Inc.
Guest	Perry	Reeder	SPX Transformer Solutions, Inc.
Guest	Mickel	Saad	Hitachi ABB Power Grids
Guest	David	Sheehan	HICO America
Guest	Adam	Smith	Commonwealth Associates, Inc.
Guest	Brad	Staley	Salt River Project
Guest	Kerwin	Stretch	Siemens Energy
Guest	Troy	Tanaka	Burns & McDonnell
Guest	Vijay	Tendulkar	Power Distribution, Inc. (PDI)
Guest	Kannan	Veeran	Georgia Transformer
Guest	Nicholas	Walder	EATON Corporation
Guest	Michael	Warntjes	American Transmission Co.
Guest	Alan	Washburn	Burns & McDonnell
Guest	Jeffrey	Wright	Duquesne Light Co.
Guest	Peter	Zhao	Hydro One

L.3.7 IEEE / IEC Continuous Cross Reference

TF did not meet during spring 2021 Transformer Committee.

L.4 Old Business

There was no old business to discuss.

L.5 New Business

There was no items to discuss per approved agenda, however there was a short discussion on need to clarify definition between Class I transformer and distribution transformer. There was questions on how were this should be addressed – Standard SC, WG C57.12.80, Distribution SC or Transformer committee itself. Josh Verdell, who is secretary to distribution SC informed that Distribution SC have decided to setup a Task Force to go into this. Based on this it was agreed that no further action is needed from Standard SC at this time and will wait for TF under distribution SC comes up with its report/recommendation.

L.6 Adjournment

The meeting was adjourned by a motion made by Sanjib Som at 4:45 PM CST. The second was by Rogerio Verdolin, and was carried unanimously.

Respectfully submitted,
Ajith M. Varghese
Standards SC Secretary

Standards SC S21 Attendances List

Role	First Name	Last Name	Company	Role	First Name	Last Name	Company
Chair	Daniel	Sauer	EATON Corporation	Guest	Kendrick	Hamilton	Power Partners, Inc.
Vice-Chair	Marcos	Ferreira	Beale AFB	Guest	Paul	Morakinyo	PSEG
Secretary	Ajith	Varghese	SPX Transformer Solutions, Inc.	Guest	Amitabh	Sarkar	Virginia Transformer Corp.
Member	Jerry	Murphy	Reedy Creek Energy Services	Guest	Kurt	Kaineder	Siemens Energy
Member	Susan	McNelly	Xcel Energy	Guest	Erich	Buchgeher	Siemens Energy
Member	Bruce	Forsyth	Bruce Forsyth and Associates LLC	Guest	Markus	Schiessl	SGB
Member	Bill	Griesacker	Duquesne Light Co.	Guest	Orlando	Giraldo	H-J Family of Companies
Member	Eduardo	Garcia Wild	Siemens Energy	Guest	Rhett	Chrysler	ERMCO
Member	Steven	Snyder	Hitachi ABB Power Grids	Guest	Toby	Johnson	Pacificorp
Member	Ed	teNyenhuis	Hitachi ABB Power Grids	Guest	Jonathan	Reimer	FortisBC
Member	Ramsis	Girgis	Hitachi ABB Power Grids	Guest	Ismail	Guner	Hydro-Quebec
Member	Peter	Zhao	Hydro One	Guest	Jeffrey	Wright	Duquesne Light Co.
Member	Vinay	Mehrotra	SPX Transformer Solutions, Inc.	Guest	William	Elliott	Prolec GE
Member	Rogério	Verdolin	Verdolin Solutions Inc.	Guest	Jeffrey	Gragert	Xcel Energy
Member	Hemchandra	Shertukde	University of Hartford	Guest	Samuel	Sharpless	Rimkus Consulting Group
Member	Scott	Digby	Duke Energy	Guest	Jeremiah	Bradshaw	Bureau of Reclamation
Member	Stephen	Shull	BBC Electrical Services, Inc.	Guest	William	Whitehead	Siemens Energy
Member	James	Graham	Weidmann Electrical Technology	Guest	Daniela	Ember Baciú	Hydro-Quebec - Laboratoire Haute
Member	Dharam	Vir	SPX Transformer Solutions, Inc.	Guest	Feras	Fattal	Manitoba Hydro
Member	Tauhid Haque	Ansari	Hitachi ABB Power Grids	Guest	Akash	Joshi	Black & Veatch
Member	Daniel	Blaydon	Baltimore Gas & Electric	Guest	Igor	Simonov	Toronto Hydro
Member	Robert	Ballard	DuPont	Guest	Malia	Zaman	IEEE
Member	Baitun	Yang	R.E. Uptegraff	Guest	John	Foschia	SPX Transformer Solutions, Inc.
Member	Shankar	Nambi	Bechtel	Guest	Cihangir	Sen	Duke Energy
Member	Rob	Ghosh	General Electric	Guest	Stacey	Kessler	Basin Electric Power Cooperative
Member	Sukhdev	Walia	New Energy Power Co.	Guest	Janusz	Szczechowski	Maschinenfabrik Reinhausen
Member	Weijun	Li	Braintree Electric Light Dept.	Guest	Nikolaus	Dillon	Dominion Energy
Member	John	John	Virginia Transformer Corp.	Guest	Ken	Klein	Grand Power Systems
Member	Jarrod	Prince	ERMCO	Guest	Nitesh	Patel	Hyundai Power Transformers USA
Member	Kristopher	Neild	Megger	Guest	Elise	Arnold	SGB
Member	Jason	Varnell	Doble Engineering Co.	Guest	Drew	Welton	Intelligent
Member	Thomas	Dauzat	General Electric	Guest	Brad	Staley	Salt River Project
Member	Kris	Zibert	Allgeier, Martin and Associates	Guest	Jaber	Shalabi	VanTran Industries, Inc.
Member	Tim-Felix	Mai	Siemens Energy	Guest	Bruce	Webb	Knoxville Utilities Board
Member	Joshua	Yun	Virginia Transformer Corporation	Guest	David	Calitz	Siemens Energy
Member	Mickel	Saad	Hitachi ABB Power Grids	Guest	Sergio	Hernandez Cano	Hammond Power Solutions
Member	Joseph	Tedesco	Hitachi ABB Power Grids	Guest	Moonhee	Lee	Hammond Power Solutions
Member	Gilles	Bargone	FISO Technologies Inc.	Guest	Hugh	Waldrop	Memphis Light, Gas & Water
Member	Ramadan	Issack	American Electric Power	Guest	Samragni	Dutta Roy	Siemens Energy
Guest	William	Boettger	Boettger Transformer Consulting LLC	Guest	Shawn	Gossett	Ameren
Guest	Javier	Arteaga	Hitachi ABB Power Grids	Guest	Eric	Doak	D4EnergySolutions LLC
Guest	Lee	Matthews	Howard Industries	Guest	Jonathan	Sinclair	PPL Electric Utilities
Guest	Dinesh	Sankarakurup	Duke Energy	Guest	Saramma	Hoffman	PPL Electric Utilities
Guest	Gary	King	Howard Industries	Guest	Matthew	McFadden	Oncor Electric Delivery
Guest	Loren	Wagenaar	WagenTrans Consulting	Guest	Hugo	Avila	Hitachi ABB Power Grids
Guest	Christopher	Baumgartner	We Energies	Guest	Megan	Eckroth	EATON Corporation
Guest	Devki	Sharma	Entergy	Guest	Ashmita	Niroula	Ergon, Inc.
Guest	Charles	Sweetser	OMICRON electronics Corp USA	Guest	Stefan	Schindler	Maschinenfabrik Reinhausen
Guest	Scott	Reed	MVA	Guest	William	Knapek	OMICRON electronics Corp USA
Guest	Dwight	Parkinson	EATON Corporation	Guest	Raymond	Frazier	Ameren
Guest	Jean-Noel	Berube	Rugged Monitoring Inc.	Guest	Onome	Avanoma	MJ Consulting
Guest	David	Wallach	Duke Energy	Guest	Alan	Washburn	Burns & McDonnell
Guest	Neil	Strongosky	Memphis Light, Gas & Water	Guest	Avijit	Shingari	Pepco Holdings Inc.
Guest	George	Frimpong	Hitachi ABB Power Grids	Guest	Pragnesh	Vyas	Sunbelt-Solomon Solutions
Guest	Donald	Lamontagne	Arizona Public Service Co.	Guest	Chris	Powell	Intermountain Electronics
Guest	Markus	Stank	Maschinenfabrik Reinhausen	Guest	Tejasvi	Prakash	Schweitzer Engineering Labs
Guest	Peter	Werelius	Megger	Guest	Parag	Upadhyay	ABB Inc.
Guest	Michael	Botti	Hyosung HICO	Guest	Duy	Vo	Central Maine Power (AVANGRID)
Guest	Hakan	Sahin	Virginia and Georgia Transformers	Guest	Evgenii	Ermakov	Hitachi ABB Power Grids
Guest	Vijay	Tendulkar	Power Distribution, Inc. (PDI)	Guest	Brandon	Dent	Memphis Light, Gas & Water
Guest	Brian	Penny	Retired	Guest	Andrew	Larison	Hitachi ABB Power Grids
Guest	Poorvi	Patel	Electric Power Research Institute (EPRI)	Guest	Jaroslav	Chorzepa	ABB Inc.
Guest	Juan Carlos	Cruz Valdes	Prolec GE	Guest	Didier	Hamoir	Transformer Protector Corp
Guest	Sanjib	Som	Pennsylvania Transformer	Guest	Michael	Warntjes	American Transmission Co.
Guest	Huan	Dinh	Hitachi ABB Power Grids	Guest	Hossein	Nabi-Bidhendi	ABB Inc.
Guest	Krishnamurthy	Vijayan	PTI Transformers	Guest	Tiffany	Lucas	SPX Transformer Solutions, Inc.
Guest	Ali	Naderian	Metsco	Guest	Albert	Sanchez	Knoxville Utilities Board
Guest	Ryan	Musgrove	Oklahoma Gas & Electric	Guest	Balakrishnan	Mani	Virginia Transformer Corp.
Guest	Alejandro	Macias	CenterPoint Energy	Guest	Suresh	Babanna	SPX Transformer Solutions, Inc.
Guest	Parminder	Panesar	Virginia Transformer Corp.	Guest	David	Holland	ExxonMobil
Guest	Joshua	Verdell	ERMCO	Guest	Christopher	Lianides	Southern California Edison
Guest	Steven	Brzoznowski	Bonneville Power Administration	Guest	Thomas	Eagle	SPX Transformer Solutions
Guest	Mats	Bernesjo	Hitachi ABB Power Grids	Guest	ANDY	DOWNEY	SPX TRANSFORMER SOLUTIONS
Guest	Marc	Taylor	Cogent Power Inc.	Guest	Stephenie	Denzer	Alliant Energy

Subsurface Transformers and Network Protectors Subcommittee Meeting Minutes

Chairman: George Payerle

Vice-Chair: Tony Reiss

Meeting Date: 4/28/2021 Location: Virtual Time: 10:50 – 12:05 CT

Meeting Administration:

Meeting opened at 10:52 CT

- Chairman's Comments

The chair talked about Main Committee membership. Membership in IEEE and SA and PES are all required plus filling out an application listing subcommittee and working group participation and getting references. Forms are under Information on the Transformers Committee website.

Quorum determination – The meeting had 54 participants. There are 36 current members of whom 24 were present so quorum was achieved. . Five guests requested membership.

The agenda was approved and the minutes of F20 were approved without objection.

SC Members present

Israel	Barrientos	Prolec GE
Douglas	Craig	Richards Manufacturing Co.
Thomas	Dauzat	General Electric
Mark	Faulkner	EATON Corporation
Benjamin	Garcia	Southern California Edison
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.
Alejandro	Macias	CenterPoint Energy
Daniel	Mulkey	Mulkey Engineering Inc.
George	Payerle	Carte International Inc.
James	Ratty	Electronic Technology Inc.
Clemens	Reiss IV	Custom Materials, Inc.
Pedro	Salgado	Electronic Technology Inc.
Dan	Schwartz	Quality Switch, Inc.
Jeremy	Sewell	Quality Switch, Inc.
Adam	Sewell	Quality Switch, Inc.
Igor	Simonov	Toronto Hydro

Subsurface Transformers and Network Protectors Subcommittee Meeting Minutes

Michael	Thibault	Pacific Gas & Electric
Alan	Traut	Howard Industries
John	Vartanian	National Grid
Joshua	Verdell	ERMCO

SC Guests Present

Nabi	Almeida	Prolec GE USA LLC
Gregory	Ante	Southern California Edison
Jared	Bates	Oncor Electric Delivery
Kevin	Biggie	Weidmann Electrical Technology
Douglas	Craig	Richards Manufacturing Co.
William	Elliott	General Electric
Benjamin	Garcia	Southern California Edison
Rob	Ghosh	General Electric
Zoran	Goncin	PTI Transformers
Kendrick	Hamilton	Power Partners, Inc.
Kendrick	Hamilton	Power Partners, Inc.
Ramadan	Issack	American Electric Power
Robert	Kinner	FirstPower Group LLC
Andrew	Larison	Hitachi ABB Power Grids
Christopher	Lianides	Southern California Edison
Jinesh	Malde	M&I Materials Inc.
Chris	Pitts	Howard Industries
Kevin	Rapp	Cargill, Inc.
Albert	Sanchez	Knoxville Utilities Board
Jaber	Shalabi	VanTran Industries, Inc.
Hamid	Sharifnia	Consultant
Avijit	Shingari	Pepco Holdings Inc.
Adam	Smith	Commonwealth Associates, Inc.
Radoslaw	Szewczyk	Specialty Products Poland
Timothy	Tillery	Howard Industries
Parag	Upadhyay	ABB Inc.
Duy	Vo	Central Maine Power (AVANGRID)
Shelby	Walters	Howard Industries
Leon	White	H2scan
Michael	Zarnowski	Carte International

Subsurface Transformers and Network Protectors Subcommittee Meeting Minutes

Working Groups Report:

- **C57.12.23 Single-Phase Submersible Transformers** working group –
- **NOT MEETING AT THIS TIME**

Alan Traut, Chairman,

- o Revision due date: 12/31/2028
- o PAR Approval Date: 12/5/2018
- o PAR Expiration Date:

Stage: On break

- **C57.12.24 Three-Phase Submersible Transformers** working group –
Ben Garcia, Chairman; Tom Dauzat, Vice Chair; George Payerle, Secretary

- o Approved: **12/7/2016**
- o Revision Due Date: 12/31/2026
- o PAR Approval Date:
- o PAR Expiration Date: **12/31/23**

Stage: Recently Approved

IEEE/PES Transformers Committee Working Group on Requirements
For Three-Phase Submersible Transformers (C57.12.24)

Virtual Meeting Minutes

Tuesday, April 27, 2021

Members Present

Glenn	Andersen	Fayetteville PWC
Piotr	Blaszczyk	Specialty Transformer
John	Chisholm	IFD Corporation
Rhett	Chrysler	ERMCO
Douglas	Craig	Richards Manufacturing Co.
Michael	Dahlke	Central Moloney, Inc.
Thomas	Dauzat	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
Michael	Hardin	H-J Enterprises, Inc.
John	Harley	FirstPower Group LLC
Ramadan	Issack	American Electric Power
Robert	Kinner	FirstPower Group LLC
Brad	Kittrell	Consolidated Edison Co. of NY
Brian	Klaponski	Carte International Inc.
Andrew	Larison	Hitachi ABB Power Grids
Alejandro	Macias	CenterPoint Energy
Kent	Miller	T&R Electric Supply Co.
Michael	Morgan	Duke Energy
Daniel	Mulkey	Mulkey Engineering Inc.
George	Payerle	Carte International Inc.
Jarrold	Prince	ERMCO
Juan	Ramirez	CELECO
James	Ratty	Electronic Technology Inc.
Pedro	Salgado	Electronic Technology Inc.
Avijit	Shingari	Pepco Holdings Inc.
Audrey	Siebert-Timmer	IFD Corporation
Igor	Simonov	Toronto Hydro
James	Spaulding	Fort Collins Utilities
Christopher	Sullivan	Westmark Partners
Michael	Thibault	Pacific Gas & Electric
Alan	Traut	Howard Industries
Jeremy	Van Horn	IFD Corporation
John	Vartanian	National Grid

Subsurface Transformers and Network Protectors Subcommittee Meeting Minutes

Guests Present

Scott	Abbott	PPG
Nabi	Almeida	Prolec GE USA LLC
Angela	Amador	EATON Corporation
Gregory	Ante	Southern California Edison
Kevin	Biggie	Weidmann Electrical Technology
Jeffrey	Door	H-J Family of Companies
Ali	Ghafourian	H-J Enterprises, Inc.
Zoran	Goncin	PTI Transformers
Jeffrey	Gragert	Xcel Energy
Kendrick	Hamilton	Power Partners, Inc.
Didier	Hamoir	Transformer Protector Corp
Gary	King	Howard Industries
Olivier	Lejay	Huaming USA Corp.
Christopher	Lianides	Southern California Edison
Gerald	Paiva	Consultant
Vinay	Patel	Consolidated Edison Co. of NY
Chris	Pitts	Howard Industries
Clemens	Reiss IV	Custom Materials, Inc.
Albert	Sanchez	Knoxville Utilities Board
Manish	Saraf	Hammond Power Solutions
Dan	Schwartz	Quality Switch, Inc.
Jeremy	Sewell	Quality Switch, Inc.
Adam	Sewell	Quality Switch, Inc.
Jaber	Shalabi	VanTran Industries, Inc.
Stephen	Shull	BBC Electrical Services, Inc.
Edward	Smith	H-J Family of Companies
Radoslaw	Szewczyk	Specialty Products Poland Sp. z o.o.
Joseph	Tedesco	Hitachi ABB Power Grids
Giuseppe	Termini	PECO Energy Company
Timothy	Tillery	Howard Industries
Joshua	Verdell	ERMCO
Duy	Vo	Central Maine Power (AVAN-GRID)
Shelby	Walters	Howard Industries
Bruce	Webb	Knoxville Utilities Board
Helena	Wilhelm	Vegoor Tecnologia Aplicada
Alan	Wilks	Consultant
Michael	Zarnowski	Carte International

Subsurface Transformers and Network Protectors Subcommittee Meeting Minutes

The S21 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 38 members and 37 guests in attendance. Total membership is 51 so there was a quorum. Four guests requested membership.

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, and Ramadan Issack met membership requirements and were members at the S21 meeting. Kyle Zemanovic did not qualify due to the 3 in 5 meeting requirement. Dan Mulkey mentioned that Fred Friend had retired and will no longer be attending meetings.

Previously three people qualified and became members at the F20 virtual meeting -- Larry Dix, Fredric Friend and James Spaulding.

George Payerle moved to approve the agenda and Ken Hampton seconded. The motion passed unanimously. Ken Hampton moved to accept the minutes of the fall 2020 virtual meeting Dan Mulkey seconded. The minutes were approved unanimously. The chair called for essential patents. There were no disclosures. The chair showed and explained the copyright slides. Work on the PAR was begun at the S19 Anaheim meeting. The PAR will expire December 31, 2023. We have 3 working meetings to finalize the draft and get it to review and resolve comments.

Since the F20 meeting, the chair held 2 interim meetings to continue work on the standard. Ben acknowledged the help of the WG members who participated in this effort.

Old Business – the revision of Table 6 was originally meant to reconcile the English and metric dimensions. This has been done. Then it was decided to also address minimum thicknesses of the tank wall, coolers, tank cover, and tank bottom. Once further input from the corrosion task force is received, this work will continue. Will Elliott talked about what will be presented at the corrosion task force meeting.

Next the chair reviewed the items that were discussed at the interim meetings. There was discussion about whether to include the publishing date when citing another standard. Steve Shull pointed out that if we refer to a specific part of a standard, we must include the publishing date since standards are changed over time and the reference might no longer be valid if the standard cited is revised.

Section 5.2 kVA ratings – there was a discussion on the wording of this section as it relates to nonsymmetrical unbalanced loads of wye-wye connected units. Larry Dix said he had seen shunt bundles on small units. Andrew Larison of ABB said that they used 5 leg cores for wye-wye units. Gary King said in smaller units in smaller tanks there would be a tendency to use 3 leg cores.

A motion was made to resolve the issue by referring to C57.105 for information and proper design methods. Brian Klaponski made the motion and Mike Thibault seconded. The motion was passed without objection.

Subsurface Transformers and Network Protectors Subcommittee Meeting Minutes

Table 1 was revised to include applied voltage test and induced voltage test. Ken Hampton made a motion to approve the revision and Brian Klaponski seconded. The motion was passed without objection.

Section 5.4 Insulation levels – A suggestion was made by the taskforce to remove the second sentence (stating that BIL ratings are specified in C527.12.00-2015) as it was in direct conflict with the first sentence (stating that BIL ratings are specified in Table 2). The second sentence was deleted.

Brian moved to make the change in the first sentence and delete the second sentence. The motion was approved without objection.

Table 2 was revised to include 16,340 and 17,200 voltages. George Payerle moved and Ken Hampton seconded a motion to make those changes and it was passed without objection.

Section 6.2 editorial change was made adding the word ‘voltage’ in front of “regulation”.

Section 7.1 several non-technical editorial changes were made to this section.

A comment was made during the meeting that parking stand material should match that of the tank. Will Elliott commented that parking stands are required to be stainless steel because it is bare metal (won’t be painted) and is required for corrosion resistance.

Figure 1: Brian K. moved to add a diagram of a round tank to be placed alongside the pre-existing rectangular tank diagram showing dimensional callouts related to the maximum dimension table below. Will E. seconded. It was passed without objection.

There was no new business.

George P made a motion to adjourn which was seconded by Tom D

Next meeting October 17 to 21 (hopefully) I Milwaukee

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
 - o Published 2017
 - o Revision due date: **12/31/2027**
 - o PAR Approval Date: 8/31/2012
 - o PAR Expiration Date: **12/31/2023**

Stage: Submitted to Revcom on RevCom Agenda 04-May-2017

IEEE Transformers Committee
C57.12.40
Secondary Network Transformer Working Group

Subsurface Transformers and Network Protectors Subcommittee Meeting Minutes

Spring 2021 Virtual Meeting Minutes

WebEx

10:50 AM CST April 27, 2021

Members Present

Dave Blew (Chair)
Dan Schwartz (Secretary)
Douglas Craig
Tom Dauzat
Larry Dix
William Elliott
Mark Faulkner
Brad Kittrell
Brian Klaponski
Alejandro Macias
Dan Mulkey
George Payerle
James Ratty
Pedro Salgado
Avijit Shingari
Igor Simonov
Adam Sewell
Jeremy Sewell
Travis Spoone
John Vartanian

Company

PSE&G
Quality Switch
Richards Manufacturing Co.
Prolec GE
Quality Switch
Prolec GE
Eaton Corporation
Consolidated Edison Co. of NY
Carte International Inc
CenterPoint Energy
Mulkey Engineering Inc.
Carte International Inc.
Richards Manufacturing Co.
Electronic Technology Inc.
Pepco
Toronto Hydro
Quality Switch
Quality Switch
Eaton Corporation
National Grid

Guests Present

Scott Abbott
Gregory Ante
Kevin Biggie
Didier Hamoir
Ken Hampton
Jack Harley
Robert Kinner
Kent Miller
Vinay Patel
Eric Theisen
Bruce Webb
Bill Whitehead
Mike Zarnowski

Company

PPG
Southern California Edison
Weidmann Electrical Technology
Transformer Protector Corp.
Baltimore Gas & Electric
First Power Group LLC
First Power Group LLC
T&R Electric Supply
Consolidated Edison Co. of NY
Metglas, Inc.
Knoxville Utilities Board
Siemens Energy
Carte International Inc.

*Requested Membership

- O The group met on Tuesday, April 27, 2021 at 10:50 AM CST with 20 members and 13 guests. Zero (0) guests requested membership. Quorum was achieved with 20/29 (69%) of members present.

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- o A call for patents was made; none were mentioned.
- o Copyright requirements were reviewed by the Chair.
- o An agenda was presented for approval. Motion to approve was made by Mark Faulkner and seconded by Brian Klaponski. The agenda was approved unanimously.
- o The minutes of the October 20, 2020, meeting on WebEx were reviewed. A motion to approve was made by George Payerle and seconded by Jeremy Sewell. The minutes were approved unanimously.
- o The Chair reviewed that the PAR was approved and became active May 21, 2019 and expires December 31, 2023.
- o 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:
 - o John Vartanian (National Grid) and Brad Kittrell (Consolidated Edison) presented on Cathodic Protection initiatives at each respective company to provide some background on CP methods used at each company. Both presenters fielded multiple questions.
 - o John Vartanian and Brad Kittrell presented on their respective company's primary switch location methodology regarding safety and operational requirements. Both presenters fielded questions on their respective methodologies.
 - o Cory Morgan (Eversource) was to present on primary switch testing requirements; however, he was unable to make this meeting. He will present at the next meeting in the fall.
 - o Will Elliott (Prolec GE) presented on the difference in measurements of the two liquid types in Tables 8 & 9. Mike Zarnowski (Carte) presented a recommendation to update wording in Tables 8 & 9 based on fluid type. It was agreed to make the updates in the draft and have discussion and vote on the changes at a later meeting.
 - o Dave Blew agreed to conduct research to determine if there are any end users that still require fluids other than mineral oil or FR3 in transformer manufacture; other fluids would include silicone and BETA among others. He will also check with manufacturers to determine if there is any requirement for those fluids in orders.
 - o A proposal was provided by Brian Klaponski for removal of Table 7 and updating Section 5.6 wording to accommodate the removal. It was agreed to make the changes in the draft and move any discussion and approval to a later meeting date.
 - o There was discussion on developing wording and scoping on improved bushing standardization in the standard for the group to review, but there was some confusion on what the actual request was at the previous meetings. Dave Blew suggested that we should discuss standardizing primary bushing sizing and capacity. Mike Zarnowski agreed to provide wording for the next meeting.

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- o Dan Schwartz reviewed C57.12.24 compared to C57.12.40 and identified discrepancies between the two standards. Dave Blew, Mike Zarnowski, and Brad Kittrell agreed to review the list and provide suggestions for trying to keep consistency between the two standards.
 - o 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.
- o New Business – The Chair opened the discussion on any new items the group felt needed to be addressed in the next revision. No new items were brought forward.
- o 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.
- o The meeting was adjourned at 12:05 PM CST with the next meeting set for Milwaukee, WI on October 20th, 2021.

Respectfully submitted,
D. Schwartz, Secretary

Document #: C57.12.44

Document Title:

STANDARD REQUIREMENTS FOR SECONDARY NETWORK PROTECTORS

Chair: Mark Faulkner **Vice-Chair** Alex Macias

Secretary n/a

Current Draft Being Worked

On: DRAFT 10 **Dated:** April 26, 2021

Meeting Date: April 26, 2021 **Time:** 3:45PM CT

Meeting Attendance

Activity Name: C57.12.44 WG Secondary Network Protectors
 Activity ID:
 Number of Members in Activity = 20
 Number of Members Present = 16
 Quorum Present = 80%
 Number of attendees = 22

Dan Schwartz	Quality Switch	member
Dan Mulkey	Dan Mulkey Consultant	member
Brian Klaponski	Carte	member
Thomas (Tom) Dauzat	Prolec/GE	member
pedro salgado	ETI-NJ	member
George	Carte	member
James Ratty	ETI-NJ	member
Jeremy Sewell	Quality Switch	member
Travis Spoone	Eaton	member
Alex Macias	CenterPoint Energy	member
DougC	Richard Mfg.	member
john vartanian	National Grid	member
Mark Faulkner	Eaton	member
Igor Simonov	Tornoto Hydro	member
Brad	ConEd	member
Will Elliott	Prolec/GE	member
Malia Zaman	IEEE	guest
Kevin Biggie	Weidmann	guest
Duy Vo	Central Maine Power	guest
Vinay	ConEd	guest
Michael Zamowski	Carte	guest

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Subcommittee Meeting Minutes

Meeting Minutes:

The minutes shall record the essential business of the Working Group, including the following items at a minimum:

1. Meeting called to order
 - a. 3:47 PM
2. Quorum Verification
 - a. Quorum was confirmed via Encore polling process
3. Confirmation of the essential patent statement and responses
 - a. No conflicts presented to group
4. Copyright requirements were reviewed by the Chair
5. Approval of minutes of the previous meeting
 - a. Minutes presented to group
 - b. Motion to approve Dan Mulkey, 2nd George P.
 - c. Minutes approved unanimously
6. Approval of agenda for this meeting.
 - a. Agenda presented to group=
 - b. Agenda approved unanimously
7. Meeting Discussion
 - a. Ballot approval process
 - i. **Chair to make motion to the Subcommittee to obtain approval for ballot**
 1. **Brain K. made a motion (2nd Dan Mulkey) was presented to the WG to send the current draft of the standard to the Subcommittee**
 2. **WG approved unanimously**
 - ii. Deadline to submit is October 18, 2021
 - b. Pending response of MEC review
 - i. Task Group (TG) to make changes recommended by MEC; any conflicts to be address with MEC
 - ii. TG: Mark Faulkner, Doug Craig, Dan Mulkey and Cory Morgan
 - c. Releasing Standard for approval/comments
 - i. TG to address all comments submitted
 - ii. Any technical comments to be addressed by TG and then presented to the WG members
8. PAR expiration confirmed to be 12/31/2021

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9. Meeting adjourned at 5:00 pm

10. Fall meeting--date and location

- a. Milwaukee, Wisconsin, USA
- b. Date: October 17-21, 2021

Submitted by: Mark Faulkner

Date: 04/28/2021

□ **C57.167 Guide for Monitoring Distribution Transformers** working group – Gary Hoffman, Chairman, Mike Thibault, Secretary o Revision due date: **N/A – new standard**

o PAR Approval Date: **6/14/2018**

o 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

Document #:	n/a		
Document Title:	Corrosion Effects on Subsurface Transformers		
Chair:	Will Elliott	Vice-Chair	Justin Minikel
Secretary	Audrey Siebert-Timmer	Per Cent Complete	0
Current Draft Being Worked On:	n/a	Dated:	n/a
Meeting Date:	April 27, 2021	Time:	2:20 PM CST
Attendance:	Members	28	
	Guests	50	
	Total*	78	

* For details of attendance, please refer to AMS system of the Transformers Committee

Attending Members:

Martin Bachand, Cloverdale Paint Inc.
Thomas Dauzat, Prolec GE
William Elliott, Prolec GE
Benjamin Garcia, Southern California Edison
Zoran Goncin, Partner Technologies Inc.
Chris Guertin, Cloverdale Paint Inc.
Said Hachichi, Hydro-Quebec
Jane Hall, Cloverdale Paint Inc.
Ramadan Issack, American Electric Power
Robert Kinner, FirstPower Group LLC
Brad Kittrell, Consolidated Edison Co. of NY
Brian Klaponski, Carte International Inc.
Justin Minikel, EATON Corporation
Tyler Morgan, Duke Energy
Daniel Mulkey, Mulkey Engineering Inc.

Dwight Parkinson, EATON Corporation
George Payerle, Carte International Inc.
James Ratty, Electronic Technology Inc.
Pedro Salgado, Electronic Technology Inc.
Adam Sewell, Quality Switch, Inc.
Avijit Shingari, Pepco Holdings Inc.
Audrey Siebert-Timmer, IFD Corporation
Igor Simonov, Toronto Hydro
Jonathan Sinclair, PPL Electric Utilities
Edward Smith, H-J Family of Companies
Michael Thibault, Pacific Gas & Electric
Alan Traut, Howard Industries
John Vartanian, National Grid

Attending Guests

Scott Abbott, PPG

*Nabi Almeida, Prolec GE

Greg Ante, Southern California Edison

Edmundo Arevalo, Bonneville Power Administration

Elise Arnold, SGB-SMIT Group

Ryan Bishop, Minnesota Power

Darren Brown, Howard Industries
 Erich Buchgeher, Siemens Energy
 *Paul Chisholm, IFD Corporation
 Rhett Chrysler, ERMCO
 Michael Dahlke, Central Moloney, Inc.
 Paul Florida, Howard Industries
 James Gardner, SPX Transformer Solutions,
 Inc.
 Carlos Gaytan, Prolec GE
 Ken Hampton, Baltimore Gas & Electric
 George Jalhoum, PPL Electric Utilities
 Kristin James, EATON Corporation
 Anna Johnson, Arkem
 Krzysztof Kulasek, Hitachi
 ABB Power Grids
 Michelle Kutzleb, TJ|H2B
 Andrew Larison, Hitachi ABB Power Grids
 Christopher Lianides, Southern California Edison
 Tiffany Lucas, SPX Transformer Solutions,
 Inc.
 *Alejandro Macias, Centerpoint Energy
 Nitesh Patel, Hyundai Power Transformers
 USA
 Vinay Patel, Consolidated Edison Co. of NY
 Chris Pitts, Howard Industries
 Jarrod Prince, ERMCO
 Jonathan Reimer, Fortis BC
 (*Attendee requested membership)

Mahesh Sampat, Independent Consultant
 Anil Sawant, Virginia Transformer
 Jeff Schneider, Spire Power Solutions
 *Dan Schwartz, Quality Switch, Inc.
 Jeremy Sewell, Quality Switch, Inc.
 Jaber Shalabi, Virginia Transformer
 Dave Sheehan, HICO America
 Stephen Shull, BBC Electrical Services, Inc.
 James Spaulding, City of Fort Collins
 Neil Strongosky, Memphis Light, Gas &
 Water
 Marc Taylor, Cogent Power Inc.
 Eric Theisen, Metglas
 Timothy Tillery, Howard Industries
 Jeremy Van Horn, IFD Corporation
 D Cenral Maine Power
 *Hugh (Mike) Waldrop, Memphis Light,
 Gas & Water
 Shelby Walters, Howard Industries
 Daniel Weyer, Nebraska Public Power
 District
 Leon White, H2 Scan
 Alan Wilks, Independent Consultant
 *Michael Zarnowski, Carte International
 Inc.
 Kyle Zemanovic, EATON Corporation

Meeting Minutes:

1. Will Elliott called the meeting to order at 2:20 PM CST.
2. Opening remarks and announcements.
3. Will Elliott reviewed IEEE Essential Patent Claims and SA Copyright Policy. No issues were raised.

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4. Membership changes were noted:
 - i. Added: Juan Carlos Cruz Valdes, Zoran Goncin, Said Hachichi, Jane Hall, Micheal Morgan, Aniruddha Narawane, James Ratty, Pedro Salgado, Jonathan Sinclair, Edward Smith
5. Quorum was verified. The working group consisted of 36 members, requiring **19** for quorum. **26** members were confirmed through the WebEx poll. **28** members were confirmed afterwards through the attendance records.
6. Will Elliott requested approval of the minutes. George Payerle made a motion, seconded by Tom Dauzat for approval of the minutes. **Minutes were unanimously approved.**
7. Will Elliott requested approval of the agenda. Martin Bachand made a motion, seconded by Brian Klaponski for the approval of the agenda. **Agenda was unanimously approved.**
8. New Business:
 - i. Historical Corrosion Reports
 - a. Will Elliott review historical corrosion reports that are available including:
 1. 1968 GE corrosion report by Gary Nonken which is likely the origin of AISI 409 for 1-ph submersibles.
 2. 1968 IEEE transaction article “Fundamentals of Corrosion and Corrosion Control for Residential Subsurface Transformers” also by Gary Nonken from GE.
 3. 1972 IEEE transaction article “Corrosion Experience with Subway Transformers” by John Donnelly from Boston Edison.
 4. 1991 GE / ConEd corrosion report. Will Elliott has a request in process to release the this to the taskforce.
 - ii. Material Compatibility Testing: Pitting Corrosion 3D CT-Scan Results
 - a. Will Elliott reviewed 3D CT-scan test method and results performed on samples from the material compatibility tests. This test was performed in attempt to provide a more accurate measurement for pitting depth (vs the caliper method used in the Fall 2020 report). Reviewed report will be posted in the website. Key findings / observations were:
 1. Corrosion Rate was highest with Silicon-Bronze materials (results were comparable to previous findings in the Fall 2020 report). It was noted that measured corrosion rates do not reflect actual service environments, but rather indicate relative performance.
 2. Silicon-Bronze materials had a large percent pitted surface area.
 3. Coating bare Copper cathode reduced corrosion rate.

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4. Easier machinability of stainless-steel alloys come at the cost of corrosion resistance.
- b. Tiffany Lucas asked samples were weight to calculate mass loss. Will Elliott confirmed this measurement was taken; results are included in the Fall 2020 report.
- c. Tom Dauzat commented that the bare copper cathode is simulating exposed copper in the vault.
- d. Zoran Goncin asked if pitting corrosion was observed on the threads. Will Elliott responded that none was observed. Tom Dauzat commented that this may be due to the test set up (bolts torqued together) which likely did not allow the electrolyte solution to go between tthreads.
- e. Zoran Goncin asked why 316 stainless-steel was not included. Will Elliott commented that one of the early questions for the task force was hardware compatibility and the materials tested are explicitly permitted for hardware in the current STNP equipment standards (so the materials selected were the ones they had readily available on hand).
- f. Zoran Goncin commented that they do not use 304 stainless steels because of galling. instead, they used 316 stainless steels. In these cases, they also recommend all components are 316 stainless steel rather than carbon steel.

iii. Taskforce Discission: Next Steps

- a. Will Elliott reviewed the proposed draft which was compiled as an informative guide for the equipment user. Proposed draft was emailed to taskforce members and included the following sections:
 1. Guide Purpose
 2. Methods to Defining the Environment
 3. Vault Design Considerations
 4. Design Considerations for Equipment Enclosures with Superior Corrosion Resistance
 5. Cathodic Protection Guide
 6. Proposed Simulated Vault Corrosion Test Method
- b. Tom Dauzat asked about annealing for stress relaxation and SCC (stress corrosion cracking). Will Elliott commented there is a lot to the welding process.
- c. Tiffany Lucas commented that austenitic stainless steels can be susceptible to SCC and a stress relief heat treatment will help to prevent that. Tiffany commented that this is related to welding guidelines and we may not want to include this.
- d. Tom Dauzat commented that for paint touch-ups it is best to paint the entire affected area as it provides a coating that will limit crevices for corrosion.
- e. Dan Mulkey commented that the vast majority of subsurface transformers are installed in enclosures / chambers / spaces that are very small. Dan Mulkey

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recommended we distinguish the difference between a vault installation (e.g. where there is additional room around the transformer for crews to walk around) vs “surface operable” (e.g. where there is no additional room around the transformer). He stated the available space likely will define what you can or cannot do.

- f. Tom Dauzat commented that for 300 stainless-steel transformers it is difficult for crews to see a pin hole leak versus cooper bearing and/or 409 stainless-steel has a uniform rust/corrosion making it easier for crews to identify when to service the transformer.
- g. Dan Mulkey commented that standard installation processes have a bare copper ground rodver the vast majority installation will have the rod above water. Will Elliott agreed that keeping the copper out of the electrolyte will make a big difference but cautioned what certainty we know where the water level is. commented that corrosion rates will likely be much lower in this case.
- h. Dan Mulkey commented that soil likely will change over time. Something to consider when soil testing water.
- i. Brad Kittrell commented that ConEd replaces anodes all the time (crews have spare parts in the truck). They use a “passive” (galvanic “sacrificial” anode) system.
- j. Tom Dauzat commented that painting the bare copper in the vault would extend the life of the anodes.
- k. Tom Dauzat made a motion for developing a PAR for a guide on corrosion (similar to what is available for Tap Changers). **There was no second, motion did not pass.**
- l. Edmundo Arevalo commented he would like the information to be included in the transformer specification.
- m. Brain Klaponski commented that it may be too early for a PAR. We need to continue gathering data to focus the scope (there is a lot in the proposed draft).
- n. Dan Mulkey commented the best time to submit a PAR in December as you get an extra year.
- o. Discussion was tabled as we ran out of time. **Will Elliott to call a meeting in two months to discuss further and assign out actions.**

9. Next meeting: is planned for October 18, 2021 in Milwaukee, Wisconsin USA

- i. The following seven attendees requested membership, and five will be added to membership for the Fall 2021 meeting: 6 requested membership ... need attendance sheet.
 - a. Attendees requesting membership which were approved based on attendance:
 1. Nabi Almeida, Prolec GE
 2. Paul Chisholm, IFD Corporation
 3. Alejandro Macias, Centerpoint Energy

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4. Dan Schwartz, Quality Switch, Inc.
 5. Mike Waldrop, Memphis Light, Gas & Water
 - b. Attendees requesting membership which did not meet attendance criteria:
 1. Michael Zarnowski, Carte International Inc.
 2. Ashmita Niroulaa, Ergon
10. The meeting was adjourned at 3:35 PM CST.

Submitted by: Audrey Siebert-Timmer

Date: 04/26/2021