



Transformers Committee

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

Treasurer: Troy Tanaka **Awards Chair/Past Chair:** Sue McNelly

Standards Coordinator: Steve Shull

IEEE/PES Transformers Committee

Fall 2021 Meeting Minutes

Virtual Meeting November 15-18, 2021

Unapproved

(These minutes are on the agenda to be approved at the next meeting in Spring 2022)

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 - 9.5.Transactions on Power and Delivery (TPWRD) Editor Liaison - Xose Lopez-Fernandez
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- 12.0 Chair's Remarks and Announcements – Bruce Forsyth
- 13.0 Meetings Planning SC Minutes & Report – Tammy Behrens
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- 15.0 Additional Report from the Standards Coordinator
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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, November 15, 2021: 8:00 am - 9:15 am CDT

(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 Spring 2021 Meeting Bruce Forsyth
5. Chair's Report & Administrative Subcommittee Report Bruce Forsyth
6. Vice Chair's Report Ed teNyenhuis
7. Secretary's Report David Wallach
8. Treasurer's Report Troy Tanaka
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, November 18, 2021: 11:00 am - 12:00 pm CDT

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. Instrument Transformers Thomas Sizemore
 - 3.2. Insulating Fluids Scott Reed
 - 3.3. Insulation Life Sam Sharpless
 - 3.4. Performance Characteristics Rogerio Verdolin
 - 3.5. Power Transformers Bill Griesacker

3.6.	Standards	Dan Sauer
3.7.	Subsurface Transformers & Network Protectors	George Payerle
3.8.	Bushings	Eric Weatherbee
3.9.	Dielectric Tests	Ajith Varghese
3.10.	Distribution Transformers	Ed Smith
3.11.	Dry Type Transformers	Casey Ballard
3.12.	Transformers and Reactors for HVDC Applications	Ulf Radbrandt
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/Given Name	Company	Opening Session	Closing Session
CM	Anderson	Gregory	GW Anderson & Associates, Inc.	X	X
CM	Ansari	Tauhid Haque	Hitachi Energy	X	
CM	Antosz	Stephen	Stephen Antosz & Associates, Inc	X	X
CM	Arteaga	Javier	Hitachi Energy	X	X
CM-LM	Ayers	Donald	Ayers Transformer Consulting	X	X
CM	Ballard	Robert	DuPont	X	X
CM	Barrientos	Israel	Prolec GE	X	X
CM-LM	Beaster	Barry	H-J Family of Companies	X	X
CM	Beauchemin	Claude	TJH2b Analytical Services		X
CM	Betancourt	Enrique	Prolec GE	X	X
CM	Biggie	Kevin	Weidmann Electrical Technology	X	X
CM-LM	Binder	Wallace	WBBinder Consultant	X	X

Member Type	Last Name	First/Given Name	Company	Opening Session	Closing Session
CM	Blaydon	Daniel	Baltimore Gas & Electric	X	X
CM-LM	Boettger	William	Boettger Transformer Consulting LLC	X	X
CM	Boman	Paul	Hartford Steam Boiler	X	X
CM	Brown	Darren	Howard Industries	X	X
CM	Callsen	Thomas	Weldy-Lamont Associates	X	X
CM	Castellanos	Juan	Prolec GE	X	X
CM	Caverly	David	Trench Limited	X	X
CM	Chakraborty	Arup	Delta Star Inc.	X	
CM	Cheema	Muhammad Ali Masood	Northern Transformer	X	
CM	Cheim	Luiz	Hitachi Energy	X	
CM	Chiang	Solomon	The Gund Company	X	
CM	Chrysler	Rhett	ERMCO	X	X
CM	Colopy	Craig	EATON Corporation	X	X
CM	Dauzat	Thomas	General Electric	X	
CM	Davis	Eric	Burns & McDonnell	X	X
CM	Del Rio	J. Arturo	Siemens Energy	X	X
CM	Denzer	Stephanie	Alliant Energy		X
CM	Digby	Scott	Duke Energy	X	X
CM	Dix	Larry	Quality Switch, Inc.	X	X
CM	Dorris	Don	Nashville Electric Service		X
CM	Ferreira	Marcos	Beale AFB	X	
CM	Flores	Hugo	Hitachi Energy	X	X
CM	Foata	Marc	Maschinenfabrik Reinhausen		
CM-LM	Foldi	Joseph	Foldi & Associates, Inc.	X	X
CM	Forsyth	Bruce	Bruce Forsyth and Associates PLLC	X	X
CM	Foster	Derek	Magnetics Design, LLC	X	X
CM-LM	Franchek	Michael	Retired	X	
CM	Frimpong	George	Hitachi Energy	X	X
CM-LM	Ganser	Robert	Transformer Consulting Services, Co.	X	
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	General Electric	X	X
CM-LM	Girgis	Ramsis	Hitachi Energy	X	X
CM	Graham	James	Weidmann Electrical Technology	X	X

Member Type	Last Name	First/Given Name	Company	Opening Session	Closing Session
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	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
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 Energy	X	
CM	Jordan	Stephen	Tennessee Valley Authority	X	X
CM	Kaineder	Kurt	Siemens Energy	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	Kiparizoski	Zan	Howard Industries	X	X
CM	Klaponski	Brian	Carte International Inc.		
CM	Kornowski	Marek	Polycast International	X	X
CM	Kraemer	Axel	Maschinenfabrik Reinhausen	X	X
CM	Kraetge	Alexander	OMICRON electronics Deutschland GmbH	X	X
CM	Kulasek	Krzysztof	Hitachi Energy		
CM	Kumaria	Deepak	Applied Materials	X	X
CM-LM	Lackey	John	PowerNex Associates Inc.	X	X
CM	Levin	Aleksandr	Weidmann Electrical Technology	X	X
CM	Li	Weijun	Braintree Electric Light Dept.	X	X
CM	Lopez-Fernandez	Xose	Universidade de Vigo	X	X
CM	Mai	Tim-Felix	Siemens Energy	X	X
CM	Malde	Jinesh	M&I Materials Inc.	X	X
CM	Mani	Kumar	Duke Energy		
CM-LM	Marek	Richard	Retired	X	X
CM	Matthews	Lee	Howard Industries	X	X

Member Type	Last Name	First/Given Name	Company	Opening Session	Closing Session
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-LM	Miller	Kent	T&R Electric Supply Co.	X	X
CM	Moleski	Hali	SDMyers, LLC.	X	
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 Energy Solutions Inc.	X	
CM	Nambi	Shankar	Bechtel	X	
CM	Narawane	Aniruddha	EATON Corporation		
CM	Parkinson	Dwight	EATON Corporation	X	X
CM	Patel	Poorvi	Electric Power Research Institute (EPRI)		
CM	Patel	Sanjay	Smit Transformer	X	
CM	Payerle	George	Carte International Inc.	X	X
CM	Perjanik	Nicholas	Weidmann Electrical Technology		X
CM	Pointner	Klaus	Trench Austria GmbH	X	X
CM-LM	Poulin	Bertrand	Hitachi Energy	X	X
CM	Radbrandt	Ulf	Hitachi Energy	X	X
CM	Rasco	Jimmy	Rasco Consulting LLC		
CM	Rasor	Robert	SDMyers, LLC.	X	
CM	Rave	Martin	ComEd	X	X
CM	Ray	Jeffrey	JLR Consulting, Inc.	X	X
CM	Reed	Scott	MVA	X	X
CM	Riffon	Pierre	Pierre Riffon Consultant Inc.	X	X
CM	Robalino	Diego	Megger	X	X
CM	Roman	Zoltan	GE Grid Solutions	X	
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/Given Name	Company	Opening Session	Closing Session
CM	Schroeder	Stephen	Hitachi Energy		
CM	Schweiger	Ewald	Siemens Energy	X	X
CM	Selvaraj	Pugal	Virginia Transformer Corp.	X	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	Enterpy	X	X
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 Energy	X	X
CM	Solano	William	Instrument Transformer Equip Corp	X	X
CM	Som	Sanjib	Pennsylvania Transformer		X
CM	Spitzer	Thomas	City Transformer Service Co.	X	
CM	Spurlock	Mike	Spurlock Engineering Services, LLC	X	X
CM	Stank	Markus	Maschinenfabrik Reinhausen	X	X
CM	Stankes	David	3M	X	X
CM	Stinson	Robert	General Electric		
CM	Subramany	Shankar	KEMA Labs	X	X
CM	Sweetser	Charles	OMICRON electronics Corp USA	X	X
CM	Swinderman	Craig	Mitsubishi Electric Power Products	X	
CM	Tanaka	Troy	Burns & McDonnell	X	X
CM	teNyenhuis	Ed	Hitachi Energy	X	X
CM	Thibault	Michael	Pacific Gas & Electric	X	X
CM	Thompson	James	T&R Service Company	X	X
CM	Thompson	Ryan	Burns & McDonnell	X	X
CM	Tillery	Timothy	Howard Industries	X	X
CM	Tostrud	Mark	Dynamic Ratings, Inc.	X	X
CM	Traut	Alan	Howard Industries	X	X
CM	Van Der Walt	Alwyn	Electrical Consultants, Inc.	X	X
CM	Varghese	Ajith	SPX Transformer Solutions, Inc.	X	X

Member Type	Last Name	First/Given Name	Company	Opening Session	Closing Session
CM	Varnell	Jason	Doble Engineering Co.	X	X
CM	Vedante	Kiran	Ritz Instrument Transformers	X	
CM	Verdell	Joshua	ERMCO	X	X
CM	Verdolin	Rogério	Verdolin Solutions Inc.	X	X
CM	Vijayan	Krishnamurthy	PTI Transformers	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.	X	X
CM	Weatherbee	Eric	PCORE Electric	X	X
CM	Webb	Bruce	Knoxville Utilities Board	X	X
CM	Weisensee	Matthew	PacifiCorp		
CM	Welton	Drew	Intellirent		X
CM	Wicks	Roger	DuPont	X	X
CM-LM	Wilks	Alan	Consultant	X	X
CM-LM	Wright	Jeffrey	Duquesne Light Co.	X	X
CM	Yang	Baitun	R.E. Uptegraff	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 (160/208=77%).

Quorum was achieved at Thursday Closing Session (140/208=67%).

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/Given Name	Company	Opening Session	Closing Session
II	Adams	Kayland	SPX Transformer Solutions, Inc.	X	X
PCM	Ahuja	Raj	Raj Ahuja Consulting	X	X
II	Aldenlid	Jennie	Hitachi Energy	X	X
II	Ali	Rehan	Siemens Energy		X
II	Arevalo	Edmundo	Bonneville Power Administration	X	X
AP	Arnold	Elise	SGB	X	X
II	Babanna	Suresh	SPX Transformer Solutions, Inc.		X
AP	Bargone	Gilles	FISO Technologies Inc.	X	X
AP	Baumgartner	Christopher	We Energies	X	X
		Tammy	SPX Transformer Solutions, Inc.	X	X
PCM	Blackburn	Thomas	Gene Blackburn Engineering	X	X
AP	Bolliger	Alain	HV TECHNOLOGIES, Inc.		X
AP	Bolliger, Ph.D.	Dominique	HV TECHNOLOGIES, Inc.	X	X
AP	Bradshaw	Jeremiah	Bureau of Reclamation	X	X
AP	Brannen	Randy	Southern Company Services	X	X
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	X	X
AP	Burde	Jagdish	Virginia Transformer Corp	X	X
AP	Calitz	David	Siemens Energy	X	X
II	Carrizales	Juan Alfredo	Prolec GE		X
II	Cassery	Edward	Ergon, Inc.		X
AP	Christodoulou	Larry	Electric Power Systems	X	X
AP	Craven	Michael	Phoenix Engineering Services	X	X
PCM-LM	Crouse	John	Roswell Alliance		X
AP	Cruz	Jorge	PTI Transformers	X	X
II	Cruz Valdes	Juan Carlos	Prolec GE	X	X
AP	Dahlke	Michael	Central Moloney, Inc.	X	X
AP	Davydov	Valery	Mr. Valery Davydov		X
II	Dent	Brandon	Memphis Light, Gas & Water	X	X
AP	Dulac	Hakim	Qualitrol Company LLC	X	X

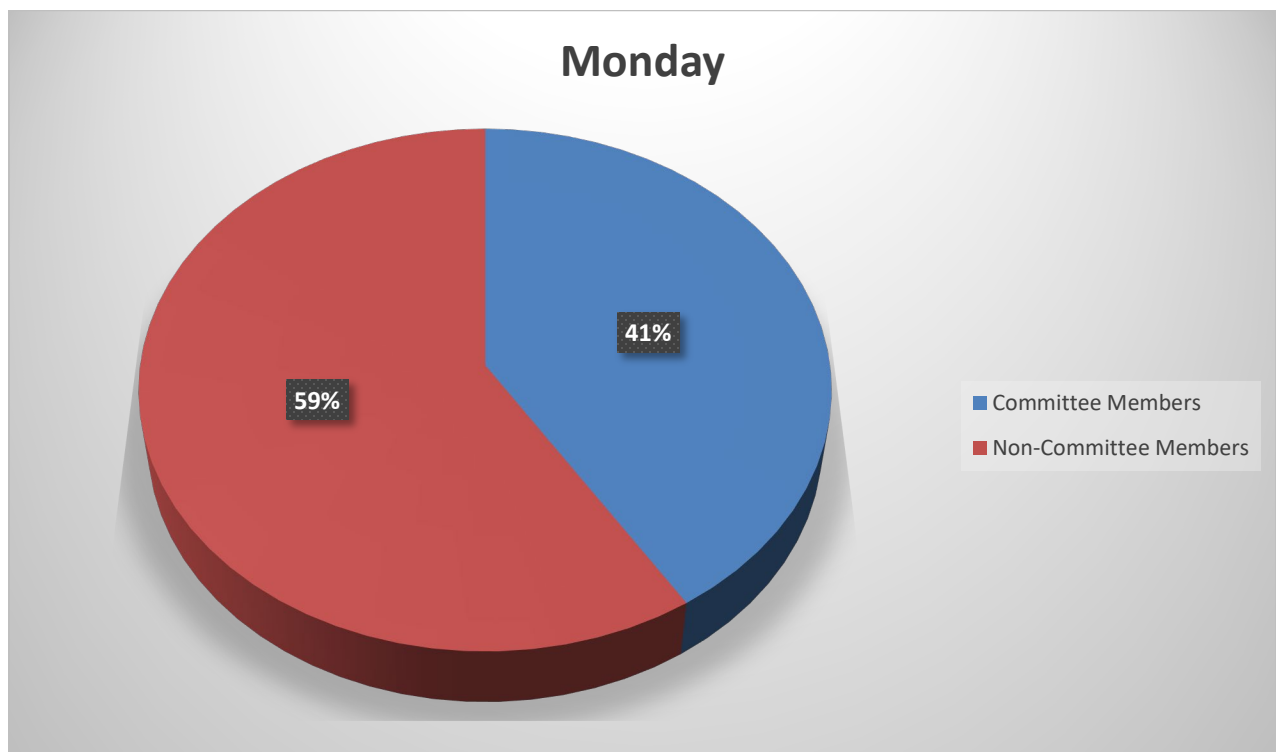
Member Type	Last Name	First/Given Name	Company	Opening Session	Closing Session
II	Eagle	Thomas	SPX Transformer Solutions, Inc.	X	X
AP	Elliott	William	Prolec GE	X	X
II	Ermakov	Evgenii	Hitachi Energy	X	X
II	Espindola	Marco	Hitachi Energy	X	X
II	Falkenburger	Thomas	Coil Innovation USA, Inc.	X	X
II	Fattal	Feras	Manitoba Hydro	X	X
AP	Fausch	Reto	RF Solutions	X	X
AP	Fenton	Roger	Fenton Solutions	X	X
AP	Field	Norman	Stantec	X	X
AP	Franchitti	Anthony	PECO Energy Company	X	X
II	Frazier	Raymond	Ameren	X	X
AP	Gamboa	Jose	H-J Family of Companies	X	X
AP	Gaun	Alexander	Coil Innovation GMBH	X	X
II	Goncin	Zoran	PTI Transformers		X
II	Gossett	Shawn	Ameren	X	X
AP	Gross	Detlev	Power Diagnostix Consult GmbH		X
AP	Gustavsson	Niklas	Hitachi Energy	X	X
AP	Hartmann	Thomas	Pepco Holdings Inc.	X	X
II	Hernandez	Giovanni	Virginia Transformer Corp.	X	X
II	Hernandez Cano	Sergio	Hammond Power Solutions	X	X
II	Hoffman	Saramma	PPL Electric Utilities	X	X
II	Hogg	Ryan	Bureau of Reclamation	X	X
II	Huenger	Daniel	PCORE Electric	X	X
AP	Jarman	Paul	University of Manchester	X	X
AP	Johnson	Toby	Hunt Electric	X	X
II	Kadar	Laszlo	Hatch	X	X
AP	Karas	Jon	SDMyers, LLC.	X	X
AP	Kessler	Stacey	TC Energy	X	X
AP	Klein	Ken	Grand Power Systems	X	X
AP	Kleine	Peter	US Army Corps of Engineers	X	X
II	Klempner	Dmitriy	Southern California Edison		X
AP	Lamontagne	Donald	Arizona Public Service Co.	X	X
II	Larison	Andrew	Hitachi Energy	X	X
AP	Lee	Moonhee	Hammond Power Solutions	X	X
AP	Lovins	Colby	Federal Pacific	X	X
II	Lucas, P.E.	Tiffany	SPX Transformer Solutions, Inc.	X	X
AP	Macdonald	Nigel	Trench Limited	X	X
AP	Macias	Alejandro	CenterPoint Energy	X	X
II	Magee	Rosamie	PSE&G	X	X

Member Type	Last Name	First/Given Name	Company	Opening Session	Closing Session
II	Mani	Balakrishnan	Virginia Transformer Corp.	X	X
PCM	Marlow	Dennis	DenMar TDS Transformers	X	X
AP	McBride	James	JMX Services, Inc.	X	X
II	McFadden	Matthew	Oncor Electric Delivery	X	X
II	Menter	Timothy	Lincoln Electric System		X
II	Millard	Zachary	Great River Energy	X	X
AP	Minhaz	Rashed	Transformer Consulting Services Inc.		X
II	Mishra	Manoj Kumar	ASAsoft (Canada) Inc	X	X
II	Morakinyo	Paul	PSEG		X
AP	Morales-Cruz	Emilio	Qualitrol Company LLC	X	X
II	Mudryk	Anatoliy	Camlin Power		X
AP	Munoz Molina	Martin	Orto de Mexico	X	X
II	Neder	Frank	Trench Germany GmbH	X	X
AP	Neild	Kristopher	Megger	X	X
II	Nesvold	Brady	Xcel Energy	X	X
II	Nunes, Jr	Jayme	Nynas AB	X	X
II	Ocon	Rodrigo	Industrias IEM	X	X
AP	O'Malley	Anastasia	Consolidated Edison Co. of NY	X	X
II	Padmawar	Rajkumar	ASAsoft (Canada) Inc		X
II	Panesar	Parminder	Virginia Transformer Corp.		X
II	Patel	Dipakkumar	Instrument Transformer Equip Corp	X	X
AP	Pepe	Harry	Phenix Technologies, Inc.	X	X
II	Peterson	Caroline	Xcel Energy	X	X
II	Peterson	Timothy	N. American Substation Services		X
II	Picher	Patrick	Hydro-Quebec IREQ	X	X
II	Plante	Sylvain	Hydro-Quebec	X	X
II	Polson	Adam	Arizona Public Service Co.	X	X
II	Powell	Chris	Intermountain Electronics	X	X
AP	Prince	Jarrod	ERMCO	X	X
II	Rackley	Donnell	RESA Power	X	X
AP	Radu	Ion	Hitachi Energy	X	X
AP	Ramirez	Juan	CELECO	X	X
PCM	Raymond	Timothy	Electric Power Research Institute (EPRI)	X	X
II	Reagan	John	RWE Renewables	X	X
II	Reepe	Robert	Georgia Power Co.	X	X
AP	Reiss IV	Clemens	Custom Materials, Inc.	X	X
AP	Rock	Patrick	American Transmission Co.	X	X
II	Rocque	Tim	SPX Transformer Solutions, Inc.	X	X

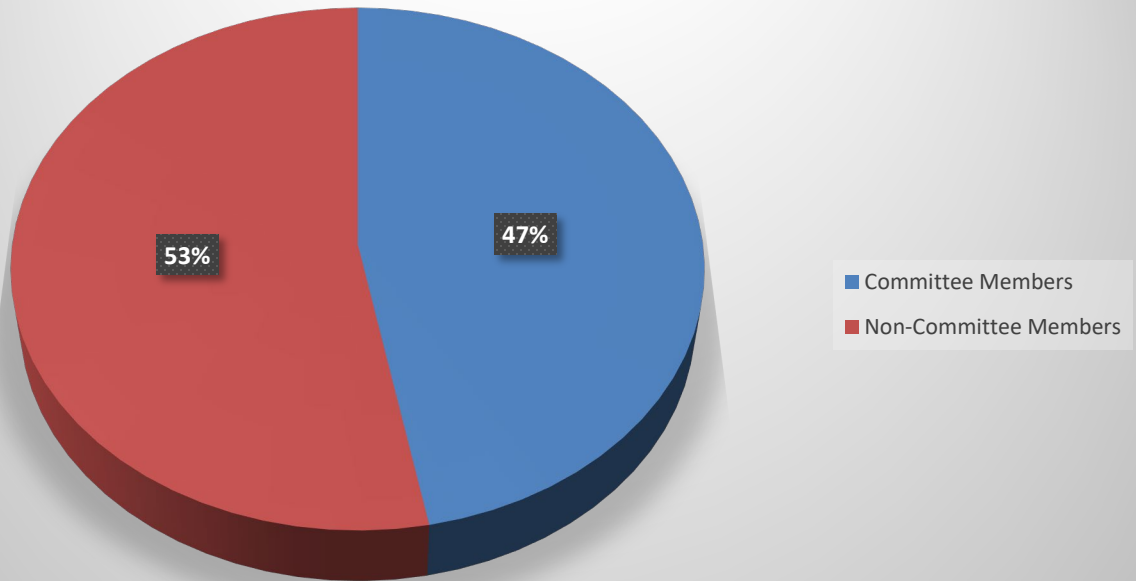
Member Type	Last Name	First/Given Name	Company	Opening Session	Closing Session
II	Rodriguez	Josue	Prolec GE	X	X
AP	Roizman	Oleg	IntellPower Pty Ltd	X	X
AP	Rottenbacher	Andre	Ritz Instrument Transformers	X	X
AP	Saad	Mickel	Hitachi Energy	X	X
AP	Sahin	Hakan	Virginia/Georgia Transformer	X	X
II	Sanchez	Albert	Knoxville Utilities Board	X	X
AP	Sauls	Roderick	Southern Company Services	X	X
II	Sawant	Anil	Virginia Transformer Corp.	X	X
AP	Schiessl	Markus	SGB	X	X
II	Schindler	Stefan	Maschinenfabrik Reinhausen	X	X
AP	Schleismann	Eric	Southern Company Services	X	X
II	Schrom	Wesley	Carolina Dielectric Maint & Testing Co.	X	X
AP	Schwartz	Dan	Quality Switch, Inc.	X	X
AP	Sheridan	Peter	SGB USA, Inc.	X	X
II	Shingari	Avijit	Pepco Holdings Inc.	X	X
II	Silgado	Adrian	IFD Corporation	X	X
AP	Simonov	Igor	Toronto Hydro	X	X
II	Sinclair	Jonathan	PPL Electric Utilities	X	X
AP	Slattery	Christopher	FirstEnergy Corp.	X	X
AP	Sonnenberg	Brian	Instrument Transformers, LLC	X	X
AP	Stacy	Fabian	Hitachi Energy	X	X
AP	Staley	Brad	Salt River Project		X
II	Stechschulte	Kyle	American Electric Power	X	X
II	Steele	Hampton	Tennessee Valley Authority	X	X
AP	Steeves	Gregory	Baron USA, LLC	X	X
AP	Steineman	Andrew	Delta Star Inc.		X
II	Stretch	Kerwin	Siemens Energy	X	X
II	Su	Paul	FM Global	X	X
AP	Sundin	David	Engineered Fluids, Inc.	X	X
AP	Szczechowski	Janusz	Maschinenfabrik Reinhausen	X	X
AP	Taylor	Marc	JFE Shoji Power Canada Inc.	X	X
AP	Tedesco	Joseph	Hitachi Energy	X	X
AP	Theisen	Eric	Metglas, Inc.	X	X
II	Tranum	John	Siemens Energy		X
II	Trifunoski	Risto	Trench Limited	X	X
II	Van Dreel	Cole	American Transmission Co.	X	X
AP	Van Horn	Jeremy	IFD Corporation		X
AP	Veens	Jos	SMIT Transformatoren B.V.	X	X
AP	Villagran	Deniss	GE Grid Solutions	X	X

Member Type	Last Name	First/Given Name	Company	Opening Session	Closing Session
AP	vonGemmingen	Richard	Dominion Energy	X	X
II	Vyas	Pragnesh	Sunbelt-Solomon Solutions		X
II	Wagner	Dieter	Hydro One	X	X
II	Waldrop	Hugh	Memphis Light, Gas & Water	X	X
II	Washburn	Alan	Burns & McDonnell	X	X
AP	Werelius	Peter	Megger	X	X
AP	Weyer	Daniel	Nebraska Public Power District	X	X
AP	Whitehead	William	H2scan Corporation	X	X
II	Whitten	Christopher	Hitachi Energy	X	X
AP	Williams	Trenton	Advanced Power Technologies	X	X
AP	Winter	Dr. Alexander	HIGHVOLT Pruftechnik Dresden	X	X
II	Yazdani	Mana	Trench Limited	X	X
II	Zarnowski	Michael	Carte International	X	X

In addition to the above totals, there were **272** of the total attendees that attended **both** the Monday and Thursday Sessions and **143** that attended **either** the Monday or the Thursday Session.



Thursday



Monday Opening Session

3 APPROVAL OF AGENDA AND PREVIOUS MINUTES – BRUCE FORSYTH

At 8:01 AM CST the Chair (Bruce Forsyth) called the meeting to order. He thanked participants for joining with this restructured meeting after we had to change plans to meet in Milwaukee. Bruce reviewed the process of logging in and establishing quorum. Quorum by definition is 50% of the voting membership. We have polls to establish if quorum is achieved. Motions should be captured word-for-word in the minutes. Preparing a motion in writing in advance is a good practice or work with the meeting secretary during the meeting to document the motion. Meetings will be recorded for the purpose of creating the minutes then deleted. Please keep yourself muted unless speaking.

The Chair reviewed the names and affiliations of the officers of the Committee.

The Chair showed the slides with the names of committee members. At the time the quorum poll was taken, 326 participants were logged in; 127 members, 117 non-members, 9 did not know status and 73 did not answer.

Meeting minute from Tammy; Encore is our meeting partner and thanked them for their support of our meetings. We have 526 registrants for this meeting which is down some from the Spring possible due to date change. We are scheduled for Denver Spring 2022, Charlotte Fall 2022, and Milwaukee Spring 2023. These are all rescheduled sites. Please update your Webex profile to include your first and last name as registered in AMS to help with attendance list. The newcomers orientation is available on demand. The awards presentation will be live for this meeting on Tuesday at 12:15. The Meetings SC will be an on demand meeting. There will be a new password announced this Thursday.

The agenda was reviewed. There were no comments on the agenda so it is approved.

The Spring 2021 minutes were posted. The Chair requested any comments or changes. There were no comments so the Spring 2021 minutes are approved as published.

4 CHAIR’S REMARKS & REPORT – BRUCE FORSYTH

Chair’s Remarks – Presented at the Monday General Session – Fall 2021

4.1 IEEE PES TECHNICAL COUNCIL

The IEEE Power Energy Society (PES) Technical Council 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 can be found on the PES website (<https://www.ieee-pes.org>). 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. The Technical Committees work directly with the IEEE-SA Standards Board and the PES Standards Coordinating Committees for standards relating to their respective technical scopes. For further details on the

Statement of Purpose and Scope of Activities for the PES Technical Council please see the following website; www.ieee-pes.org/statement-of-purpose-and-scope-of-activities-for-the-pes-technical-council .

4.1.1 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 ChairHong Chen

Secretary.....Diane Watkins (Xcel Energy)

Past ChairFarnoosh 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)Johanna Mathiue

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)	Jim Follum
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.....	Todd Irwin
Technical Sessions Committee	Hong Chen
Entity Proposal Management Committee	Farnoosh Rahamatian

4.1.2 PES Technical Council Activities

Upcoming Technical Council meetings include the following:

- November 11-12, 2021 – Technical Council Retreat
- January 9, 2022 – JTCM
- July 17-21 – PES General Meeting

4.1.3 123Signup Replacement Update

In early 2021 the owners of the 123Signup system informed the PES that the platform would be discontinued but later agreed to keep the system running until December 31, 2021. The PES created an ad hoc committee to develop the needs and basic specification for a new platform. Proposals were solicited and were due back to PES in early October. PES expects to notify the successful bidder in mid-November and final contract negotiations are expected to take place in late November and December. The new service is expected to begin in January 2022.

4.2 TRANSFORMERS COMMITTEE ACTIVITIES

4.2.1 Officer Transition for 2022-2023 Term

In accordance with the Transformers Committee's Policies and Procedures, the term of the Chair, Vice Chair, Secretary, and Past Chair positions are each 2-years, after which a transition shall occur from Secretary to Vice Chair, from Vice Chair to Chair, and from Chair to Past Chair. Such a rotation shall occur on January 1, 2022. In addition, the outgoing Chair has the privilege of appointing the incoming Secretary, with the concurrence of the outgoing Past Chair. The terms and appointments of the Treasurer and Standards Coordinator are outlined in Committee's Policies and Procedures and are not affected by the officer rotation. The Committee officers for the 2022-2023 term will be as follows:

Chair Ed teNyenhuis
 Vice Chair David Wallach
 Secretary Bill Griesacker
 Treasurer Troy Tanaka
 Standards Coordinator Steve Shull
 Past Chair Bruce Forsyth

With this transition Sue McNelly will complete her 8-year commitment as an officer and will roll off the officer list. The Committee thanks Sue for her contributions and selfless service during the 8 years she has served as an officer.

4.2.2 Upcoming Subcommittee Leadership Changes

Two subcommittees will have leadership changes starting on January 1, 2022.

Dielectric Test Subcommittee: On December 31, 2021, **Ajith Varghese** completes a 5-year term as Chair and will step down. **Poorvi Patel** (EPRI) has agreed to accept a 3-year term as Chair starting January 1, 2022.

Power Transformer Subcommittee: On December 31, 2021, **Bill Griesacker** completes a 5-year term as Chair and will step down. **Ryan Musgrove** (OG&E) has agreed to accept a 3-year term as Chair starting January 1, 2022.

The Committee thanks Ajith and Bill for their dedication and service over the past five years and welcomes Poorvi and Ryan to the Administrative Subcommittee with best wishes for success in their new roles.

4.2.3 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

4.2.4 Committee Schedule

The Fall 2021 Transformers Committee meeting was switched from an in-person meeting in Milwaukee, WI 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. Encore has provided similar support for the Fall 2020 and Spring 2021 meetings. Future meetings are expected to be in-person meetings, subject to a review of then-current conditions. The location and dates of future meetings that are currently planned are as follows:

Spring 2022	Denver, CO	March 27-31, 2022
Fall 2022	Charlotte, NC	October 16-20, 2022
Spring 2023	Milwaukee, WI	Specific date is not yet confirmed

Check the Committee website (www.transformerscommittee.org) regularly for information on upcoming meetings.

4.2.5 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 past two years, several Transformers Committee working groups and task forces have made effective use of virtual meetings between the spring and fall main Committee meetings. This has allowed them to make timely progress on their respective documents. 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 Committee's Association management System (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.

4.2.6 Avoiding PAR Extensions

Working Group Chairs are encouraged to pay close attention to the progress of their documents and to strive to complete their assignment(s) within the standard 4-year life of the PAR. To do so, WG Chairs should be careful to avoid scope creep and to plan to complete the substantial work on the document in about 3 years in order to allow sufficient time for the balloting and comment resolution processes.

4.2.7 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.

4.2.8 Association Management System (AMS) Records

In accordance with the IEEE PES Technical Council's Organization and Procedures Manual, all subcommittees, working groups, and task forces must use AMS to track their membership and meeting attendance.

All activity leaders are asked to ensure their groups are using AMS and that the Fall 2021 information is entered before the current system is no longer available (i.e., before December 31, 2021). In addition, activity leaders are encouraged to create a backup of their rosters and attendance records in case these are needed to populate the new system. **Any backups are confidential and shall be maintained in a manner that protects the privacy of the participant information.** All backup records shall be permanently deleted or destroyed after the system that replaces 123Signup is up and running reliably.

4.2.9 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 implemented immediately after each fall meeting with an announcement made to share the new password during the closing session.

4.2.10 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.

4.2.11 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.

4.2.12 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. Table 1 lists the thirteen (13) Letters of Assurance pertain to our committee as of November 8, 2022.

Table 1: Letters of Assurance

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
C57.167	ZTZ Services International	Daniel Berler – CEO berlerdaniel@ztzservices.us	Not indicated	23 Apr 2021	yes	23 Apr 2021

Respectfully submitted,



Bruce Forsyth

Chair, IEEE PES Transformers Committee

Rev. 0, November 8, 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](#)
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 was <http://pes-gm.org/2021/>.

The theme for the 2021 IEEE PES General Meeting was “Managing Energy Business During a Pandemic”.

Below is a listing of the approved papers that were presented at the conference (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

Paper	Title	Type
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 2022 IEEE PES TRANSMISSION AND DISTRIBUTION CONFERENCE AND EXHIBITION, APRIL 25 - 28, 2022, NEW ORLEANS, LA

5.3.1 Conference Theme

The weblink is <https://ieeet-d.org/>

The theme of the conference is *Power in Discovery*.

5.3.2 Conference Paper Submittals

The paper submission period opened to authors on July 8, 2021 and closed on August 15, 2021. Papers were then distributed to various Technical Committees for peer review based upon the paper content. The Transformer Committee peer review process ended on October 28, 2021. Below is a summary of the submission status:

Total Submissions 13

Accepted 9

Rejected 3

Still in process 1 (waiting for author revision)

Below are the conference papers accepted so far (transaction and conference)

Paper	Title	Type
2022TD0033	How to Improve IEEE C57.104-2019 DGA Fault Severity Interpretation	Conference
2022TD0042	Resilient substations – concepts and applications	Conference
2022TD0053	Innovative Condition Monitoring Solutions Using Integrated Sensing Enabled by a New Generation of Dry Type Insulation Technologies	Conference
2022TD0076	Introduction of Clean Air Insulation for High Voltage Instrument Transformers	Conference
2022TD0120	Evaluation of GIC Thermal Capability of Power Transformers – Part I: Core Form Transformers	Conference

Paper	Title	Type
2022TD0121	Evaluation of GIC Thermal Capability of Power Transformers – Part II: Shell Form Transformers	Conference
2022TD0147	Power flow control of carbon-neutral energy to industrialized urban areas	Conference
2022TD0181	Improved Gyrator-Capacitor Modeling of Magnetic Circuits with Inclusion of Magnetic Hysteresis	Conference
2022TD0026	Assessment of In-Service Synthetic Ester Filled Transformers at 33 kV and Below	Transaction

5.3.3 Panel Sessions

There have been 3 panel sessions proposed for the Transformers Committee activities. They are still being reviewed by the Technical Program Chair.

5.3.4 Tutorial Sessions

There are no tutorial submissions planned by the Transformers Committee.

5.3.5 Paper Reviewer Recognition

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

Tauhid Ansari	Philip Hopkinson	Ali Naderian	Kenneth Skinger
Steve Antosz	Akash Joshi	Shankar Nambi	Mike Thibault
Claude Beauchemin	Sheldon Kennedy	Poorvi Patel	Jim Thompson
Enrique Betancourt	Zan Kiparizoski	Christoph Ploetner	Kiran Vedante
Daniel Blaydon	Vijayan Krishnamurthy	Tom Prevost	Dharam Vir
Ali Cheema	Raja Kuppuswamy	Bob Rasor	Joe Watson
Marc Foata	Weijun Li	Scott Reed	Bruce Webb
George Frimpong	Xose Lopez-Fernandez	Diego Robalino	Drew Welton
Eduardo Garcia	Kumar Mani	Zoltan Roman	Kris Zibert
Jack Harley	Sue McNelly	Ewald Schweiger	Waldemar Ziomek
Gary Hoffman	Ross Mctaggart	Jin Sim	

5.4 2022 IEEE PES GENERAL MEETING, JULY 17 - 21, 2022, DENVER, COLORADO

5.4.1 Conference Theme

The weblink for the event is <http://pes-gm.org>

The theme of the conference is *Powering a Sustainable Future in a Changing World*.

5.4.2 Conference Paper Submittals

The paper submission is presently open to authors and will close on Nov 10, 2021. Papers will then be distributed to various Technical Committees for peer review based upon the paper content. The Transformer Committee peer review process will begin after that.

5.4.3 Panel Sessions

There are no panel sessions planned by the Transformer Committee at this time.

5.4.4 Tutorial Sessions

There are no tutorial submissions planned by the Transformers Committee at this time.

Respectfully submitted,

Ed teNyenhuis

Vice-Chair

Nov 1, 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.

6.1.1 New Committee Member Approvals

At the Spring 2021 Administrative Subcommittee meeting, two new committee member applications were submitted for consideration. Both applications were approved. The new members are listed in the following table.

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

6.1.2 New Member Applications

Four 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.

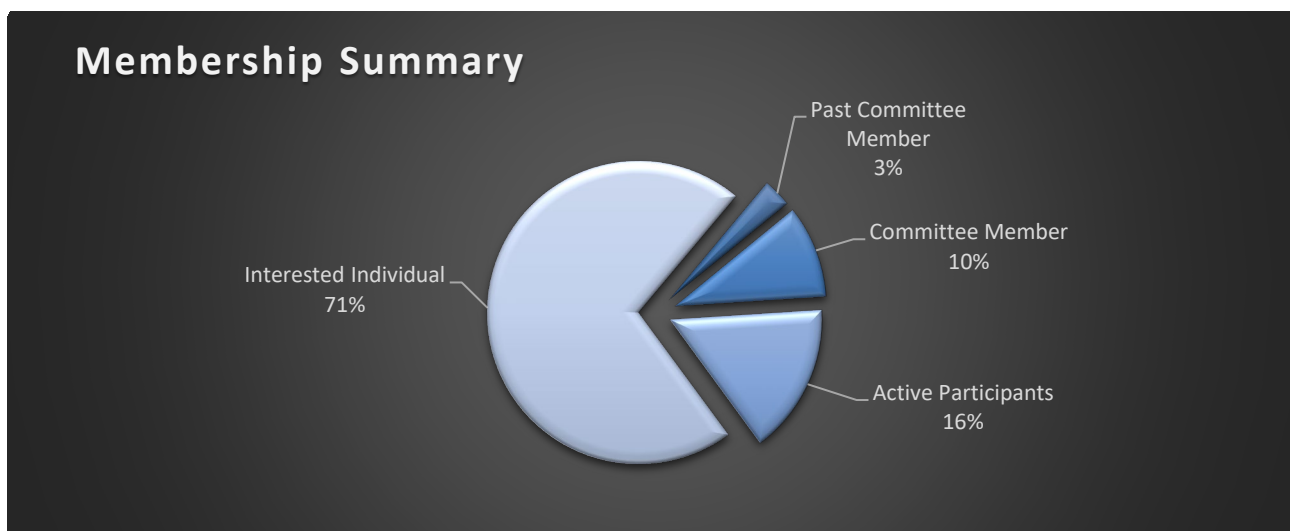
Name	Affiliation	Sponsor #1	Sponsor #2	Sponsor #3	Membership Category
Darrell Mangubat IEEE – Yes PES – Yes SA – Yes	Siemens Energy	Ajith Varghese Dielectric Test SC 2 yrs.	Scott Digby WG PC57.169 2 yrs.	Mike Spurlock WG PC57.143 2 yrs.	Consumer
Colby Lovins IEEE – Yes PES – Yes SA – Yes	Federal Pacific	Casey Ballard Dry Type SC 3 yrs.	David Walker WG PC57.12.91 3 yrs.	Joseph Tedesco WG PC57.12.52 14 months	Producer
Gilles Bargone IEEE – Yes PES – Yes SA – Yes	FISO Technologies	Sam Sharpless Insulation Life SC 3 yrs.	Mark Tostrud WG PC57.165 3 yrs.	Scott Digby WG PC57.169 2 yrs.	Producer
Joseph Tedesco IEEE – Yes PES – Yes SA – Yes	Hitachi ABB Power Grids	Casey Ballard Dry Type SC 4+ yrs.	David Walker WG PC57.12.91 4+ yrs.	David Stankes 259 2+ yrs.	Producer

6.1.3 Association Management System (AMS) Database

The Transformers Committee AMS database of people currently has three general categories of participation in our activities. These are: **Interested Individual**, **Active Participant**, and **Committee Member**. In addition, the Committee Secretary maintains a list of **Past Committee Members**. Anyone can join the AMS 123 system as the system is designed for self-registration. A new participant will automatically be assigned the role of Interested Individual when they first sign up. It is the responsibility of 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>	F16	S17	F17	S18	F18	S19	F19	S20	F20	S21	F21*
<i>Interested Individual</i>	1507	1554	1550	1552	1551	1582	1632	1579	1563	1611	1581
<i>Interested Individual - IEEE Life Member</i>	11	11	11	13	12	12	12	11	12	12	12
Total Interested Individuals	1520	1565	1561	1565	1563	1594	1644	1590	1575	1623	1593
<i>Active Participant</i>	258	275	302	321	324	349	362	365	362	360	350
<i>Active Participant - IEEE Life Member</i>	5	5	5	5	5	6	7	6	6	6	6
Total Active Participants	263	280	307	326	329	355	369	371	368	366	356
<i>Committee Member</i>	175	180	169	175	181	191	182	179	179	173	175
<i>Committee Member – Emeritus</i>	9	9	9	10	10	10	10	11	11	11	12
<i>Committee Member - IEEE Life Member</i>	27	29	28	33	33	33	32	33	33	32	33
Total Committee Members	211	218	206	216	224	234	224	223	223	216	220
<i>Past Committee Member</i>	31	30	42	38	38	38	50	48	48	59	56
<i>Past Committee Member - IEEE Life Member</i>	5	5	7	6	6	6	8	12	10	12	12
Total Past Committee Members	36	35	49	44	44	44	58	60	58	71	68
TOTAL IN AMS DATABASE	2028	2098	2123	2151	2160	2227	2295	2244	2224	2276	2237



6.2 COMMITTEE, SUBCOMMITTEES, AND WORKING GROUP ROSTERS

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

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

6.3 IEEE/PES AND IEEE/SA MEMBERSHIP REQUIREMENTS

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

WG Chairs must be members in good standing of the Standards Association (IEEE/SA).

6.4 COMMITTEE MEMBERSHIP MAINTENANCE

The last membership audit was performed October 2020 prior to the Fall 2020 Virtual Meeting. Changes to the Committee Membership statuses were reported in the Spring 2021 Secretary's Report. The next scheduled audit for membership requirements in accordance with the Committee P&P will be in 2022 (IEEE-PES and IEEE-SA). Past Committee Members can be reinstated to Committee Members if their status changes and they are able to regularly participate within two years of being changed to Past Committee Member.

6.5 SENIOR MEMBERSHIP REMINDER

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

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

6.6 ESSENTIAL PATENT CLAIMS

All registrants were asked to agree with the following statement:

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

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

6.7 AFFILIATION

According to the IEEE Standards Board Bylaws, there is a requirement that participants of an IEEE meeting disclose their employer and affiliation. Consultants must state if they are sponsored or not. It is not sufficient to simply announce “My name is John Smith, and I’m a consultant.” If a consultant is sponsored by a client, it must be disclosed. If the consultant does not have a sponsor, the proper introduction is something such as “My name is John Smith, I am a consultant, and I represent myself at this meeting.”

6.8 MEETING MINUTES

The minutes of the Spring 2021 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 Fall 2021 Virtual meeting to the Committee Secretary no later **December 30, 2021**, 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

October 11, 2021

7 TREASURER'S REPORT – TROY TANAKA

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

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

8 STANDARDS REPORT – STEVE SHULL

The Standard Report was presented at the Monday General Session.

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

9 LIAISON REPORTS

9.1 CIGRE – CRAIG SWINDERMAN

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

9.2 IEC TC-14 – CHRISTOPH PLOETNER

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

9.3 STANDARDS COORDINATING COMMITTEE NO. 4 (ELECTRICAL INSULATION) – EVANNE WANG (NOT PRESENT) – UPDATE BY BRUCE FORSYTH

Evanne Wang was not present so the Chair presented the update. The presentation is available in **Appendix 5**.

9.4 ASTM – TOM PREVOST (NOT PRESENT – UPDATE BY BRUCE FORSYTH)

Tom Prevost presented an overview of ASTM D27 activities. His presentation is available in **Appendix 6**.

9.5 TRANSACTIONS POWER DELIVERY (XOSE LOPEZ-FERNANDEZ)

Xose Lopez-Fernandez presented an overview of Transaction Power Delivery activities. His presentation is available in **Appendix 7**.

10 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.

11 OPENING SESSION ADJOURNMENT

The meeting adjourned with motion by Phil Hopkinson and seconded by Rogerio Verdolin at 09:15 AM CST.

Thursday Closing Session

12 CHAIR'S REMARKS AND ANNOUNCEMENTS

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

The Agenda was reviewed and approved on Monday. The chair thanked everyone for attending this virtual meeting as our work is important. The chair thanked the activity leaders. Extra hours are put in to prepare for these meetings.

Meeting data uploads will be available in the File Repository. Reminder names and affiliation of attendees must be included in your meeting minutes. There was some discussion about best methods to correlate Webex chat names to AMS. It still requires some manual effort.

The Chair requested a membership poll for this closing session in case any votes were necessary. 122 members, 101 nonmembers, 5 'I Don't Know' and 49 no answer per the poll. We had a quorum.

13 MEETINGS PLANNING SC MINUTES & REPORT – TAMMY BEHRENS

See Appendix 6.

A question was brought up from the floor why we are not scheduling hybrid meetings in rotation. The Chair explained how previous meetings had to be rescheduled to allow cancelation due to Covid-19. It has been discussed to rotate in some Hybrid meetings, but no firm decisions have been made. We don't have a hybrid arrangement. It has been discussed and there are logistic issues with equipment. Hotels may not have bandwidth for this. Fees are an issue. It is an ongoing discussion as technology evolves.

14 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.

14.1 INSTRUMENT TRANSFORMERS THOMAS SIZEMORE

ITSC highlights for the F2021 TC meeting

A vote took place to start a working group for the revision of C57.13. David Wallace will chair; I will be the vice-chair and Igor Ziger will be the secretary. The membership should be approached in the next several weeks about comments on the existing standard. This input may be useful in establishment of task force groups to work on specific issues that need attention.

C57.13.9 the CCVT standard was approved to go the balloting stage. Coordination has to happen with another group so it will likely not start until January.

The joint IEEE/IEC working group working on a standard for SSVTs provided a status report. They intend to move forward for balloting in the upcoming months.

I am looking for a volunteer to act as a liaison with a guide being developed in China. The title they have right now is "Guide for live line calibrator of current transformer in distribution network". I have a presentation and some related materials if you have an interest.

Jim McBride brought up that there has been interest including instrument transformers in the mitigation methods portion of his WG regarding steep waveform transients. A presentation may be given at the spring meeting.

14.2 INSULATING FLUIDS SCOTT REED

IFSC met on November 17, 2021 started at 2:20 pm

a. 26 Members of 43 signed in so a quorum was achieved. There were a total of 108 attendees. I did a call for Patent claims and also posted the copyright statement. I reminded the working group/task force chairs to back up records from AMS by year end to preserve our records.

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

WG C57.166—Consolidation of Insulating Liquids Guide, Vice Chairman Scott Reed led the meeting as Chairman Tom Prevost was not in attendance at the meeting.

24 of 37 members were present so a quorum was achieved.

1. Scott reported that in order to meet the PAR deadline by year end, the guide must go out to ballot before the spring meeting.
2. The working group finalized the threshold values for LTC fluid qualities and in service synthetic esters for transformer.
3. The next step is to compile the various drafts by year end so that the task force chairs can meet in early January to resolve any lingering issues before the guide is sent out for ballot
4. The goal is to have a draft guide prepared prior to the spring meeting.

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

1. For the second meeting in a row they did not have a quorum.
2. The guide is set to expire at the end of this year and will become inactive until the new guide is finished and approved.
3. The working group analyzed DGA data and developed a 90% percentile similar to C57.104. The working group decided

to also develop a 95% classification and see what value there may be to establish table 3 and table 4 limits.

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

1. 31 of 59 members attended so there was a quorum. 110 total attendees.
2. A patent claim was submitted and a presentation was given regarding online monitoring analytical techniques.
3. Next, an update was provided regarding CIGRE's Working Group project to have a repository database for all DGA results, but there are privacy and legal issues that need to be resolved.

WG C57.637 for Reclamation and Reconditioning of Insulating Liquids. Chairwoman Stephanie Denzer led the meeting.

1. This WG held its first meeting so a quorum was not necessary. There were 58 attendees.
2. The Chair divided the guide into different four task forces and volunteers were taken to start the process to review and modify the guide.

WG C57.155 Gases Generated in Natural and Synthetic Esters Liquid Type Transformers. Chairman Alan Sbravati led the meeting.

1. This WG held its first meeting so a quorum was not necessary. There were 82 attendees.
2. The WG discussed the procedure for collecting data on historical values of dissolved gas content. A task force was created to develop this procedure.
3. A second task force was created to review the content of the standard to avoid duplications / conflicts with the current version of IEEE C57.104

TF C57.139 Dissolved Gas Analysis in Transformer Load Tap Changers. Rainer Frotscher is the Chair.

1. This TF held its first meeting so a quorum was not necessary. There were 43 attendees.
2. The task force wants to expand DGA analysis for fluids beyond mineral oil and make the guide a more useful tool for users to interpret gas results.
3. The task force revised the title, scope and purpose for this revised guide.
4. During the Subcommittee meeting, a motion was passed to modify the title that was passed by the Task Force and remove the word immersed. The new title is "Guide for Interpretation of Gases Generated in Liquid Type Load Tap Changers. A motion was passed by the subcommittee for the Task Force to submit a PAR.

14.3 INSULATION LIFE SAM SHARPLESS

C57.154 - Design, Testing and Application of Liquid-Immersed Transformers with High- Temperature Insulation is in Ballot

PC57.169 IEEE Guide for Determination of Maximum Winding Temperature Rise in Liquid-Immersed Transformers [replacing IEEE 1538] was previously approved for ballot by email vote.

C57.100 - IEEE Standard Test Procedure for Thermal Evaluation of Liquid-Immersed Distribution and Power Transformers plans to wrap up and have ballot vote by the end of the year.

C57.162 – Guide for the Interpretation of Moisture Related Parameters in Dry, Gas Insulated and Liquid Immersed Transformers and Reactors is wrapping up and plans ballot vote at years end.

IEEE 1276 – Guide for the Application of High Temperature Insulation Materials in Liquid-Immersed Power Transformers Task force recommended amendment of Annex B. Motion to approve PAR for this purpose was made and approved.

14.4 PERFORMANCE CHARACTERISTICS ROGERIO VERDOLIN

The PCS Subcommittee met and had a quorum with 85 members present with the total attendance of 185 participants. The status of the active PARs were presented as well as reports from 5 working groups and task forces.

The first report was for Working Group Guide for the Application and Interpretation of Frequency Response Analysis for Oil Immersed Transformers, C57.149. The working group had a quorum and the document revision tasks are wrapping up with the focus on grounding connection tables and analysis with the latest work included consolidation of failure mode considerations and a new analysis section added. Connection tables will be added for two-winding, three-winding, and autotransformers.

The next report was from the Task Force for Audible Sound Revision Test Code C57.12.90. The task force discussed the impact of temperature and tap position on core and load noise. These topics are now discussed in the new noise guide C57.136. The Task Force also reviewed comments on C57.12.00 and C57.12.90. The portion of the meeting dedicated to C57.136 reviewed the background and the status of the guide was led by WG C57.136 chair. Comments now received will be added to the next draft to be circulated

The next report was the task force for continuous revisions to C57.12.00 which discussed the topic of core type information on name plate the discussion. This discussion is not finished with more work to be done. Effort will be placed on defining the shell type D-core vs conventional core as these terms are not clearly defined.

The next report with the Task Force for continuous revisions to the test code C57.12.90. Revisions to three different sections have been generated we've been passed on to the PCS Subcommittee. The next steps will be to work with the PCS Subcommittee chair to route the information.

Working Group C57.142, A Guide To Describe The Occurrence And Mitigation Of Switching Transients Induced By Transformer-Breaker Interaction, had developed an IEEE transaction paper has been published and it was approved. This paper will be used by C37 Switchgear Committee in response to a request for assistance under Old Business.

14.5 POWER TRANSFORMERS BILL GRIESACKER

Power Transformer SC met and had a quorum.

PAR study group C57.17 arc transformer and plan to proceed with request to revise.

PAR Study group C57.93 did not meet, plan to in 2022.

WG C57.116 revision is moving along well and hope to finalize work by Spring of 2022 so the draft may be submitted by the end of 2022.

WG C57.125 – Question if factory test failures should be included. Factory test failures is not in the document scope. Starting work on revising the document.

WG C57.131 – working to harmonize by adding references to IEC documents to IEC 6214-1. Adding references to tap changes, SF6 tap changers and voltage regulators. The WG is planning for some virtual meetings before the Spring 2022 meeting. Check the committee website calendar if you are interested.

WG C57.143 – Monitoring guide. Received a PAR extension expiring in 2023. A straw ballot is planned for January 2022.

WG C57.135 – Recommending a PAR to revise the document and was accepted by Power Transformer SC.

WG C57.150 – PAR extension requested for two years expiring Dec 2023. The goal is to have some virtual meetings and circulate the current draft before the Spring 2022 meeting with plans to begin ballot.

WG C57.170 – continue work on document

WG C57.107 – Volts per Hz curve document. PAR expires in 2025. Discussed the need to develop a philosophy for temperature limits. Some work has been done on this topic by other WG and TF and that information will be collected.

IEEE 638 PAR Study Group was formed. They will likely meet in the spring.

Liaison to PC57.93 Entity – had a meeting in July in China. The WG has created a guide for cold startup of transformers with esters and plans to perform testing, including fiber optics, into transformers to evaluate temperature at different loading. More information will be provided after testing is complete.

There was no old business.

Under new business, C57.135 there are plans to revise this document. There are additional documents that should be considered for revision including C57.153, C57.156, and C57.157. An email vote will be sent out on these three for vote.

14.6 STANDARDS DAN SAUER

The highlights from the Standards SC as reported in today's general meeting are as follows:

Met on 11/17 @ 3:45 CST

Quorum was achieved at 44/81 members (to be verified)

Competition from the IEC TC14 coordinating meeting is impacting our quorum and the TC14 meeting never used to be at our time slot

C57.12.00 & C57.12.90 were approved and will be published in the coming months with a 2021 date

PAR requests were approved for continuous revision of C57.12.00 & C57.12.90

Steve Snyder is stepping down as chair of the WG for C57.12.00 and we thank him for his years / decades of service to this document

We are looking for a replacement chair – please direct emails to me if interested

The PAR for C57.12.80 expires at the end of the year, but an extension is on the last NESCOM agenda and we expect that it will be approved

C57.12.80 has closed new info and is working to finalize and get a draft to ballot

The remainder of the info for our meeting will be in our minutes

The Standards SC wants to thank the Encore team for their assistance this week in making our meetings run smoothly

14.7 SUBSURFACE TRANSFORMERS & NETWORK PROTECTORS GEORGE PAYERLE

SC Chair's report on STNP SC meeting that was held on Wed November 17, 2021, as presented at closing session of the F21 Transformers Committee meeting on November 18, 2021 at 11 AM CT

The STNP SC met on Wed at 10:50 AM CT.

The chair mentioned that 12.23 is still inactive but will be resuming meetings at S23.

WG reports:

C57.12.24, Three phase submersibles

Work continued on revision of the spec. Introduction of 5000 kVA into Figure 1 would require a scope change so that issue will be dealt with in the next revision. Other details are contained in the minutes which will be on the web site.

C57.12.40 Secondary network transformers

Work continued on the spec. Among the items discussed were bushing standardization, and harmonization of C57.12.24 and C57.12.40. Other details are contained in the minutes which will be on the web site.

C57.12.44 Network protectors

The working group was able to get a PAR extension to the end of 2022. Sixty-nine comments were received from the ballot. They were divided into 7 sections and a different task group is working on each of them. Other details are contained in the minutes which will be on the web site.

Task Force – Corrosion effects on subsurface transformers

The task force had 3 interim meetings since S21 and has made great progress. They reviewed a 1991 GE/ConEd study. It details results of testing on a variety of materials including copper bearing steel and various grades of stainless steel. Results of this and much more are posted on the IEEE Collabratec website: <https://iee-collabratec.ieee.org/app/workspaces/6222/IEEE-Transformer-STNP-Corrosion-Task-Force/files>

The TF chair then made a motion to approve the following Title and Scope to submit to NesCom to become an official working group towards development of a guide:

Title: Guide for Mitigating Corrosion on Subsurface Transformers and Network Protectors

Scope: Provide guidance and technical references for users of transformers and network protectors in subsurface structures. This includes testing, measurements, and classifications to define corrosive environments, as well as strategies to mitigate corrosion in subsurface environments, guidance on equipment enclosure specifications, and cathodic protection.

Discussion followed and it was pointed out that once a PAR is established, it can be very hard to change. A suggestion was made that we conditionally approve the title and scope and give the TF leadership a little time to be sure this is the wording they want. Any changes would be conveyed to the SC Chair by Dec 12, 2021 for approval before being sent to NesCom for consideration in their Dec 16 meeting. The motion was passed by 20 of 36 members with one abstention.

Respectfully submitted by George Payerle. Chair STNP SC November 19, 2021.

14.8 BUSHINGS ERIC WEATHERBEE

The Bushing Subcommittee met yesterday morning, at the time of the final quorum check there were 124 attendees with 38 of 87 members in attendance and therefore a quorum was NOT reached. Our VC checked the final poll results following the meeting found 11 members had no registered response.

The Bushing Subcommittee has 4 active PARS with 5 active groups that held meetings during this conference, and only 3 were able to obtain quorums.

PC57.19.02 – Which is a new Standard for Distribution Bushings, they were able to obtain a quorum and voted to seek the Bushings Subcommittee’s approval to proceed to ballot. Unfortunately, due to the lack of a Subcommittee quorum a vote was not obtainable. We will attempt a quorum approval through email so that 19.02 progress is not delayed.

A Task Force reviewing Dry Bushing class and performance was able to obtain a quorum and completed their work, with their conclusions being that they did not identify a need to create a new document (guide, standard, or technical paper) addressing dry bushing technology. The consensus is that content applicable to dry bushings would best be addressed within the existing C57.19 documents to develop and incorporate content for those respective documents within the existing WGs.

14.9 DIELECTRIC TESTS AJITH VARGHESE

The DiTest SC met this week and had a quorum.

Core to Ground Insulation – a lot of interest. It was agreed to create a study group to develop a proposal.

TF Insulation Resistance – paper has been developed and the TF finished their work. The recommendation is to keep the existing C57.12.00 and C57.12.90 as-is. Reviewed recommendations including recommended values to go into C57.152 and C57.168. Suggested a new TF to review factors influencing the power factor

insulation resistance. Another recommendation concerning instrument accuracy did not have time to consider and will be emailed.

TF Low Frequency Tests – Class I PD procedures with continuing discussion planned. Reviewing modified Class II PD limit for 1.1 pu voltage.

TF on Impulse Testing – there is a conflict where the routine testing of distribution transformers with multiple windings is more stringent than the type test. Adjusted wording will be surveyed. The topic of suppliers using the low side of the voltage tolerance for routine impulse tests was brought up and the wording will be considered as this is not the intent.

TF Entity C57.200 – information session. The plan is to ballot this document in 2022.

WG C57.168 – draft is almost ready and will be circulated with plans to ballot.

WG C57.113 – Annex A work

WG C57.98 – test voltage procedures for chop with more discussions planned.

WG C57.160 – is in ballot resolution but activity has been slow and planning to divide the work into two CRGs to speed up the work.

14.10 DISTRIBUTION TRANSFORMERS ED SMITH

The Distribution Transformer Subcommittee met this week. A quorum established.

Please refer to the individual WG and TF minutes for details. Most of the current work on documents are editorial in nature.

Seven WG and TF met.

C57.12.20

C57.12.38

C57.12.34 – was voted in the WG to move to ballot. The Distribution Transformer SC received this motion to move to ballot and approved.

C57.12.28, C57.12.29, C57.12.30, C57.12.31, C57.12.32

C57.167 - DT monitoring clauses 4, 5, and 6 are suggested to be circulated to the network transformer group for comment.

C57.12.35

New business - Phil Hopkinson had some interesting topics and may make a good tutorial session. This is planned for Spring 2022.

Another topic was a suggestion that the IEEE Transformers Committee send a letter targeting executives in the user's community to encourage attendance/participation. Bruce indicated this will be investigated.

14.11 DRY TYPE TRANSFORMERS CASEY BALLARD

The Dry Type Transformers SC met this week.

WG C57.16 – wrapping up for ballot. Planning for PAR extension as the current PAR expires December 2022.

WG C57.12.52 – work is progressing. The exclusion for dry-type pad mount transformers was voted to be removed.

WG C57.134 – Hottest spot determination – first meeting

WG C57.259 – LV thermal aging – reviewing other documents in this space

WG C57.96 – on schedule

WG C57.124 – Dry type PD – PAR extension has been requested and is behind schedule.

TF C57.12.01 and TF C57.12.91 – have aligned on their scopes. TF of each will both include a definition then exclude drive and inverter transformers.

WG C57.94 – PAR will be submitted

TF C57.12.59 – will generate information for a PAR

14.12 TRANSFORMER AND REACTORS FOR HVDC APPLICATIONS ULF RADBRANDT

The SC met this week. There are no active Working Groups currently. Reviewed future work plans for the two documents in this SC. Condition assessment topics being discussed.

15 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.

16 NEW BUSINESS

No new business items were brought up.

17 CLOSING SESSION ADJOURNMENT

The meeting was adjourned at 12:17 PM CST.

18 RECOGNITION AND AWARDS REPORT – SUE MCNELLY

19 RECOGNITION & AWARDS REPORT – SUSAN MCNELLY

November 16, 2021, Virtual Meeting

This report is a for the Fall 2021 Virtual meeting. The Awards presentation will again be presented virtually live in lieu of the normal Awards Luncheon.

19.1 IN MEMORIAM

Dr. C Clair Claiborne



Dr. C Clair Claiborne, age 69, of Apex, North Carolina passed away October 24, 2021. Clair is survived by his wife Patricia.

Clair initially wanted to be a chemist and began his career in 1973 as a chemotechnician with Sud-Chemie A.G. in Moosburg, Germany. After two years he decided to continue his studies in the field of materials. He received a BA in chemistry from the University of Kansas specializing in electrical transformers. He served as an engineer at James Manufacturing Inc., a research assistant at Northwestern University and a research chemist at Phillips Petroleum. In 1984, with a PhD in material science from Northwestern, he became a senior scientist at Westinghouse Electric Company between 1984 and 1991. Clair spent 26 years with ABB progressing through several positions during this time, before starting his own consulting company, Claiborne Consulting, LLC.

One of his biggest achievements, along with Dr. T.V. Oommen, was the invention of Biotemp, a biodegradable vegetable oil used to deliver high performance power transformer insulation. He was the author of two industry texts “Working with Metals” and “Working with Non-Metals” in 1981, as well as more than 75 articles in various peer-reviewed journals. He holds 10 US patents and 4 European patents

Clair was an ASTM Fellow. He was also an IEEE PES Transformer Committee member from 2009 to his passing. He was actively involved in the Insulating Fluids SC for many years, and was the Vice Chair of C57.147, Natural Ester Guide

He enjoyed Amateur Radio (KC3WJ), traveling, and had a great joy in is Audi cars.

Clair was an ASTM Fellow and was an IEEE PES Transformers Committee Member from 2009 to his passing. He was actively involved in the Insulating Fluids SC and its associated WGs for many years. He was the Vice Chair of C57.147, Natural Ester Guide.

19.2 GENERAL SERVICE AWARDS

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

19.2.1 Transformers Committee Treasurer

A Certificate of Appreciation was presented to Paul Boman for his service as Transformers Committee Treasurer from 2018 through 2021. Paul stepped up to fill this critical role with no advance notice. His contributions are greatly appreciated.

Thank you to Paul for his 3 years of service in this role.

19.2.2 Transformers Committee Chair

A Certificate of Appreciation was presented to Bruce Forsyth for his service as Committee Chair from 2020 through 2021. In addition to his latest role, the Committee also recognizes his additional contributions as Secretary and Vice Chair as part of the Officer Progression.

Bruce had a daunting task steering the Committee through cancelled meetings and a new virtual venue. We thank Bruce for his leadership in guiding us through these previously uncharted waters so successfully.

19.2.3 Transformers Committee Awards & Recognition Chair

A Certificate of Appreciation was presented to Susan McNelly by Bruce Forsyth for her service as Committee Awards & Recognition Chair from 2020 through 2021.

19.3 NEW MEMBERS OF THE TRANSFORMERS COMMITTEE

The Transformers Committee welcomes the following 4 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. Gilles Bargone | FISO Technologies Inc. |
| 2. Colby Lovins | Federal Pacific Transformer |
| 3. Darrell Mangubat | Siemens Power Operations Inc. |
| 4. Joseph Tedesco | Hitachi ABB Power Grids |

19.4 IEEE SA STANDARDS MEDALLION AWARD



We are happy to announce that Tom Prevost was granted the IEEE SA Standards Medallion Award in December of 2020 for ongoing leadership and contributions to the development of IEEE transformer standards and the standards development process. We were remiss in making this announcement at the Spring meeting, but wanted to congratulate Tom on this prestigious award. A recording of the IEEE SA awards program can be found at

<https://www.youtube.com/watch?v=HvH7i3ZQjMg>.

19.5 OUTSTANDING SERVICE AWARDS

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



Craig Colopy - Craig has been a Transformers Committee Member since April 18, 2002. He has been involved extensively for more than 2 decades in LTC, DETC, and Voltage Regulator standards and guides. Craig played a large part in the efforts to create a joint IEEE Standards with IEC Standards.



Phil Hopkinson – Phil has been a longstanding very involved member of our Committee. He has led the way in creation of a new standard for wind turbine transformers, led C57.157 (DETC functional life testing), and continues to be a driving force behind the DOE transformer efficiency and loss efforts. Phil's broad reach covers multiple SCs both as a leader and major contributor.

We are proud to present these awards to Craig and Phil!

19.6 IEEE STANDARDS ASSOCIATION STANDARDS BOARD WORKING GROUP AWARDS

The IEEE SA SB presents Awards 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 C57.104™-2019 (Published 6/2019)– IEEE Guide for the Interpretation of Gases Generated in Mineral Oil-Immersed Transformers
WG Chair: Claude Beauchemin
WG Vice Chairs: Don Platts & Norm Field
WG Secretary: Susan McNelly
Certificates of Appreciation: Paul Boman, Muhammad Ali Masood Cheema, Luiz Cheim, Donald Dorris, James Dukarm, Michel Duval, Marcos Ferreira, David Hanson, Mani Kumar, Richard Ladroga, Thomas Lundquist, Hali Moleski, Jerry Murphy, Arturo Nunez, Thomas Prevost, Robert Rasor, & David Wallach

2. IEEE Std C57.105™-2019 (published 3/2020)– IEEE Guide for Application of Transformer Connections in Three-Phase Electrical Systems
WG Chair: Rogerio Verdolin
WG Vice Chair: Ben Garcia
Certificates of Appreciation: David Jacobson, John John, Dan Mulkey, Samuel Sharpless, David Walker

19.7 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

November 16, 2021

20 ADMINISTRATIVE SUBCOMMITTEE – BRUCE FORSYTH

The Administrative Subcommittee met virtually on November 9, 2021. The following are the unapproved minutes of that meeting.

20.1 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	Troy Tanaka
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
HVDC.....	Ulf Radbrandt
Instrument Transformers.....	David Wallace for Thomas Sizemore
Insulation Fluids.....	Scott Reed
Insulation Life	Sam Sharpless
Performance Characteristics	Rogério Verdolin
Power Transformers	Bill Griesacker
Standards	Dan Sauer
Subsurface Transformers & Network Protectors	George Payerle
Meetings.....	Tammy Behrens
Guests: Malia Zaman, Peter Balma, Poorvi Patel, Ryan Musgrove	

Affiliation Changes: Tammy Behrens remains with SPX Transformer Solutions but was purchased by Prolec GE. Hitachi ABB Power Grids name change was updated to Hitachi Energy.

20.2 APPROVAL OF PREVIOUS MEETING MINUTES

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

20.3 ADDITIONS TO AND/OR APPROVAL OF THE AGENDA

The preliminary agenda was previously distributed in advance of the meeting. There were no objections to approval of the revised agenda, therefore the below agenda was approved.

Approved Agenda:

1. **Administrative Topics (:15)**Bruce Forsyth 1:00
 - 1.1. Introductions and Attendance
 - 1.2. Affiliation Change Updates
 - 1.3. Review and Approval of the Agenda
 - 1.4. Approval of Spring 2021 Minutes
2. **Officer Reports.....** 1:15
 - 2.1. Chair's Report (:15).....Bruce Forsyth
 - 2.2. Vice Chair's Report (:05)Ed teNyenhuys
 - 2.3. Secretary's Report & New Committee Membership Approval (:10).....David Wallach
 - 2.4. Treasurer's Report (:05).....Troy Tanaka
 - 2.5. Recognition & Awards Report (:05).....Sue McNelly
 - 2.6. Standards Coordinator's Report (:10).....Steve Shull
 - 2.6.1. Standards Report

2.6.2. Entity Proposal Report

3.	IEEE Report	2:05
3.1.	IEEE Staff Update (:10).....	Malia Zaman
4.	Meeting Planning Report	2:15
4.1.	Meeting Planning Report (:05)	Tammy Behrens
4.2.	S21 Meeting Format Discussion (:05)	Tammy Behrens
5.	Subcommittee Reports (<i>please limit your report to 4 minutes or less</i>).....	2:25
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	3:25
6.1.	Publication of the Next Digital CD (:05).....	Peter Balma
6.2.	Other (0:05)	All
7.	New Business (:15)	3:35
7.1.	SCC04 – Proposal to absorb activities into Transformers Committee.....	Bruce Forsyth
8.	Wrap Up & Adjournment	3:55
8.1.	Wrap Up & Adjournment (:05)	Bruce Forsyth

20.4 CHAIR’S REPORT – BRUCE FORSYTH

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

20.5 VICE CHAIR’S REPORT – ED TENYENHUIS

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

20.6 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 four new member applications:

- Darrell Mangubat, Siemens Energy
- Colby Lovins, Federal Pacific
- Gilles Bargone, FISO Technologies
- Joseph Tedesco, Hitachi Energy

Dan Sauer seconded the motion. The two new member applications were approved unanimously without opposition.

20.7 TREASURER'S REPORT – TROY TANAKA

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

20.8 RECOGNITION & AWARDS REPORT – SUSAN McNELLY

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

20.9 STANDARDS REPORT AND NEW PAR REQUESTS – STEVE SHULL

Refer to Section 10.0 of the Main Minutes for a complete "Standards Report." Steve Shull discussed options to address inactive documents. We should reexamine inactive documents and presuming it is stable, a PAR can be opened to ballot the document. We can also withdraw them if we don't want to keep them valid. Inactive documents are available for sale but might not be useful to users if they are not current. Documents might stay in inactive reserve indefinitely. SC should review inactive reserve documents and consider a PAR or withdraw.

We need to keep work on documents moving. Working Groups that spread activity into parallel paths with Task Forces seems to be a best practice. PAR extension requests are becoming more common, but we need to get our work done within the life of the PAR.

20.10 IEEE STAFF UPDATE – MALIA ZAMAN

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

20.11 MEETING PLANNING REPORT – TAMMY BEHRENS

- 20.11.1** Current Meeting (F21): There are 482 registered as of November 9 but we are expecting more registrants. This will be smaller attendance than our previous with individual feedback point to the moving of the meeting dates as the driver.
- 20.11.2** 123Signup has been working well for registration. Some company servers have had issues.
- 20.11.3** Meeting Login credentials were sent November 8 for the virtual meeting. Late registrants will go out by Friday.
- 20.11.4** We will use WEBEX again with similar portal. We have more techs assigned and meeting rooms to pull reports quicker, etc. Training sessions will be conducted later this week (Nov 11-12).
- 20.11.5** We are still seeing some old email addresses on the schedule. We don't review those emails. WG and SC chairs should review this with the schedule review.
- 20.11.6** Note: There are quite a few WG officers not yet registered for the meeting.
- 20.11.7** Jennifer Quandel's contract is complete with IEEE's latest structure and is valid through end of 2022.

20.12 SUBCOMMITTEE REPORTS/HOT TOPICS

Brief reports were received from all the subcommittee chairs.

Bushings Subcommittee | Eric Weatherbee

- 20.12.1 PC57.19.02 Distribution Bushings ready for balloting soon.
- 20.12.2 PC57.19.03 DC Bushings: The chair had to step down and Eric is serving as an interim chair. PAR is approved and working with IEC.
- 20.12.3 Dielectric Test Subcommittee | Ajith Varghese
- 20.12.4 Core and Frame insulation resistance will be discussed as unfinished business. Draft report has been completed. Discussion will include what to do with the report.
- 20.12.5 PC57.160: Expired in 2020 and is on PAR Extension. It is not making much progress in comment resolution.
- 20.12.6 Distribution Transformers Subcommittee | Ed Smith
- 20.12.7 PC57.12.35 Bar Coding: Additional input is requested from the user community. Get the word out to support this needed input.

20.13 DRY TYPE TRANSFORMERS SUBCOMMITTEE| CASEY BALLARD

- 20.13.1 Six WG and three TF will meet.
- 20.13.2 PC57.124 is overdue. It is meeting with plans to get approval for SA ballot.
- 20.13.3 PC57.12.01 and PC57.12.91 PAR: Many want to extend the range below 600 V having been left to NEMA and UL in the past. If there are any restrictions or concerns, please let the SC know. Nothing prevents us from doing so per Malia Zaman's guidance.

- 20.13.4 HVDC Converter Transformers & Smoothing Reactors Subcommittee | Ulf Radbrandt
- 20.13.5 This SC has two standards that are valid until 2027 and 2030
- 20.13.6 There will be a presentation this meeting for condition monitoring of HVDC transformers.

20.14 INSTRUMENT TRANSFORMERS SUBCOMMITTEE | DAVID WALLACE FOR THOMAS SIZEMORE

- 20.14.1 PC57.13.9 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.
- 20.14.2 IEC-IEEE 63245-57.13.8: Meetings to review CD comments ongoing.
- 20.14.3 TF IT Accuracy: This TF continues to meet regarding potential changes to the standard burdens and accuracy definitions. A presentation was given at the last meeting for how VT accuracy can be determined through a combination of measurements and calculations.
- 20.14.4 PC57.13 Looking at PAR and perhaps making it continuous revision.

20.15 INSULATING FLUIDS SUBCOMMITTEE | SCOTT REED

- 20.15.1 PC57.166 continues to make progress. PAR expires in 2022.
- 20.15.2 PC57.146 will expire
- 20.15.3 637 WG formed
- 20.15.4 PC57.155 WG formed
- 20.15.5 C57.130 Will need to TF chair
- 20.15.6 C57.139 Rainer Frotscher will take on TF Chair role
 - 20.15.6.1 Insulation Life Subcommittee | Sam Sharpless
 - 20.15.6.2 Two documents going to ballot PC57.154 and PC57.169 approved for balloting
 - 20.15.6.3 1276 Annex B PAR for revision being looked at
 - 20.15.6.4 PC57.162 is in year seven and needs to get wrapped up.
- 20.15.7 Performance Characteristics Subcommittee | Rogerio Verdolin
 - 20.15.7.1 Two WG and three TF will be meeting next week.

- 20.15.7.2 TF Audible Sound discussing draft and will combine meeting with WG.
- 20.15.7.3 PC57.12.00 Continuous Revision: Core information on nameplate and tolerance on ratio is being discussed.
- 20.15.7.4 PC57.12.90 Continuous Revision: Status of the revision of the ratio test methods and survey results will be reviewed.

20.15.8 Power Transformers Subcommittee | Bill Griesacker

- 20.15.8.1 New WG C57.125 PAR.
- 20.15.8.2 Five new PAR study groups: C57.117, C57.93, C57.135, 638 and Volts/Hertz (Recommended practice per SC vote)

20.15.9 Standards Subcommittee | Dan Sauer

- 20.15.9.1 PC57.12.00 and PC57.12.90 were on REVCOM for ballot with SASB.
- 20.15.9.2 PC57.12.80 PAR extension was requested

20.15.10 Subsurface Transformers & Network Protectors Subcommittee | George Payerle

- 20.15.10.1 Not too much to report.

20.16 UNFINISHED BUSINESS

- 20.16.1 CD Standards Collection Plan: Peter shared a spreadsheet with a list of proposed standards. It would be a good time to do this with C57.12.00 and C57.12.90 being updated and should be available for this collection. Some items on the spreadsheet list may be published soon. Some on the previous CD collection documents are now inactive. Review of the list should note if these inactive documents should be included or struck. SC Chairs should review the list and add to the list with green highlight. Please address for feedback at the F21 Virtual meeting. Provide final feedback by the first week of January 2022 directly to Peter Balma. Inactive Reserve documents will be removed unless we request to maintain. IEEE 4 will be added to the list. Bruce will send the full list after today's ADCOM meeting. The compilation will now be a login to the collection.

20.17 NEW BUSINESS

- 20.17.1 SCC 04 Activities (see slide deck from Bruce). The scope of the three documents were reviewed. The scope of each versus the scope of the Transformers Committee is a concern. There was general conversations about participation from the various industries. Transformers Committee is a large contributor to SCC04. The scope of the documents would have to modified or manage a joint development with other committees. The Transformer Committee could take it on a lead the efforts but work on revisions as joint development. SCCs were used for broader topics spanning committees. NSI can take the SCC04 document then they could move into the Transformers Committee

Motion by Steve Shull: ~~The Transformers Committee will accept the these three documents into our auspices if SCC04 will consider changing the scope of the active PAR and scope of the other two documents when they are due to match the scope of the transformers committee.~~

~~Seconded by Dan Sauer.~~—[Struct text was the first motion and then amended as follows below]

Motion to Amend by Dan Sauer: The Transformers Committee will accept the documents from SCC04 if SCC04 will modifies the scope of the active PAR to fall within the scope of the Transformers Committee.

Seconded by Steve Shull.

The amendment was approved. There was no discussion on the amended motion. There was no opposition to unanimous approval. Evanne Wang will take this Transformer Committee response back to SCC04 for discussion. Malia will share this response with the SASB.

20.17.2 Another adhoc for Entity standards that may be more open. More to come.

20.17.3 George Payerle suggested we consider having ADCOM regularly meet virtually ahead of the traditional Sunday meeting slot to allow more preparation before the weekday meetings. Dan Sauer made the motion with George Payerle seconding that we make ~~the next~~ all ADCOM meetings virtual ahead of the week of the meeting. [Eric Weatherbee offered an amendment to the motion and George Payerle seconded change word next to 'all' future.] Of the voting members, two opposed, one abstained, and the balance approved to the change the word 'next' to 'all. A vote was taken for the amended motion and five opposed (Troy Tanaka, Ed Smith, Steve Shull, Tammy Behrens, Scott Reed), and two abstentions (Sue McNelly and Ajith Varghese), and the balance approved. The motion carried.

20.18 ADJOURNMENT

The meeting was adjourned at 4:12 PM CST.

Submitted by:

David Wallach,
Secretary, Transformers Committee

November 12, 2021

November 9, 2021 Adcom Meeting Attendance

Last Name	First Name	Affiliation	Meeting Date 11/09/2021
Ballard	Robert	DuPont	X
Behrens	Tammy	SPX Transformer Solutions, Inc.	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 Energy	X
Reed	Scott	MVA	X
Sauer	Daniel	EATON Corporation	X
Sharpless	Samuel	Rimkus Consulting Group	X
Shull	Stephen	BBC Electrical Services, Inc.	X
Sizemore	Thomas	ABB Inc.	
Smith	Edward	H-J Family of Companies	X
Tanaka	Troy	Burns & McDonnell	X
teNyenhuis	Ed	Hitachi Energy	X
Varghese	Ajith	SPX Transformer Solutions, Inc.	X
Verdolin	Rogério	Verdolin Solutions Inc.	X
Wallace	David	Mississippi State University	X
Wallach	David	Duke Energy	X
Weatherbee	Eric	PCORE Electric	X
Zaman	Malia	IEEE	X

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, NOVEMBER 9

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

MONDAY, NOVEMBER 15

TIME	ACTIVITY	TRACK	MTG CHAIR	STATUS	ROOM (FLOOR)
On – demand	Newcomers Orientation		E. teNyenhuis	–	Pre-recorded
8:00 AM – 9:15 AM	Opening Session		B. Forsyth	-	Session 1
	- All registered meeting participants are encouraged to attend - See separate document on website for meeting agenda - Attendance required to maintain Committee Member status				
9:15 AM – 9:25 AM	Break				
9:25 AM – 10:40 AM	WG Dry Type Reactors PC57.16	Dry Type	A. Del Rio	I	Session 1
9:25 AM – 10:40 AM	WG Guide of FRA for Liquid Filled Transf. C57.149	PCS	C. Sweetser	I	Session 2
9:25 AM – 10:40 AM	WG Standard Requirements for Tap Changers - C57.131	Power	C. Colopy	I	Session 3
9:25 AM – 10:40 AM	WG Std Transf. Terminology C57.12.80	Stds	J. Graham	I	Session 4
9:25 AM – 10:40 AM	TF Transf Efficiency & Loss Evaluation (DOE Activity)	Distr	P. Hopkinson	I	Session 5
9:25 AM – 10:40 AM	WG Moisture in Insulation PC57.162 CANCELLED	Ins Life	T. Prevost	+	Session 6
10:40 AM – 10:50 AM	Break				
10:50 AM – 12:05 PM	WG Overhead Distr. Transf. C57.12.20	Distr	A. Traut	I	Session 1
10:50 AM – 12:05 PM	WG C57.116 Guide for Trfs Direct Connect to Generators	Power	W. Li	I	Session 2
10:50 AM – 12:05 PM	WG Bushings Gen. Require. C57.19.00	Bush	P. Zhao	I	Session 3
10:50 AM – 12:05 PM	WG Sealed Dry-Type Transf. PC57.12.52	Dry Type	J. Tedesco	I	Session 4
10:50 AM – 12:05 PM	TF Partial Discharge Tests for Class I Transformers	DiTests	D. Ayers	I	Session 5
10:50 AM – 12:05 PM	WG Guide for DGA in Silicone PC57.146	IF	J. Karas	N	Session 6
12:05 PM – 12:55 PM	Lunch Break				
12:55 PM – 2:10 PM	WG 1-ph Padmount Dist Transf. C57.12.38	Distr	A. Ghafourian	I	Session 1
12:55 PM – 2:10 PM	WG Dry Type Gen. Requirements C57.12.01	Dry Type	C. Ballard	N	Session 2
12:55 PM – 2:10 PM	WG PC57.152 Guide for Field Testing	Stds	M. Ferreira	I	Session 3
12:55 PM – 2:10 PM	WG Partial Discharge Test - C57.113	DiTests	A. Naderian	I	Session 4
12:55 PM – 2:10 PM	TF Audible Sound Revision to Test Code	PCS	R. Girgis	I	Session 5
12:55 PM – 2:10 PM	TF Application of High-Temp Insulation Matrs 1276 Annex B	Ins Life	K. Biggie	N	Session 6
2:10 PM – 2:20 PM	Break				
2:20 PM – 3:35 PM	WG 3-ph Padmount Dist Transf. C57.12.34	Distr	S. Shull	I	Session 1
2:20 PM – 3:35 PM	WG Transformer Monitoring C57.143	Power	M. Spurlock	I	Session 2
2:20 PM – 3:35 PM	WG Transformer Impulse Test Guide PC57.98	DiTests	T. Hochanh	I	Session 3
2:20 PM – 3:35 PM	TF C57.134 Guide for Hottest-spot in Dry-type	Dry Type	C. Lovins	I	Session 4
2:20 PM – 3:35 PM	WG Bushing Applicat. Guide C57.19.100	Bush	T. Spitzer	I	Session 5
2:20 PM – 3:35 PM	TF PCS Cont. Revisions to C57.12.00	PCS	T. Ansari	I	Session 6
3:35 PM – 3:45 PM	Break				
3:45 PM – 5:00 PM	WG Sec. Network Protectors C57.12.44	STNP	M. Faulkner	I	Session 1
3:45 PM – 5:00 PM	TF Dry Bushing Class and Perf.	Bush	A. Del Rio	N	Session 2
3:45 PM – 5:00 PM	WG Failure Investigation & Reporting PC57.125	Power	H. Sahin	N	Session 3
3:45 PM – 5:00 PM	TF Next Revision to C57.104 Guide for DGA in Mineral Oil	IF	C. Beauchemin	N	Session 4
3:45 PM – 5:00 PM	TF IEEE 259 Test for Eval of Insulation for Dry-Type Transfs	Dry Type	D. Stankes	I	Session 5
3:45 PM – 5:00 PM	SC HVDC Converter Transfs & Smoothing Reactors	HVDC	U. Radbrandt	-	Session 6

TUESDAY, NOVEMBER 16

TIME	ACTIVITY	TRACK	MTG CHAIR	STATUS	ROOM (FLOOR)
8:00 AM – 9:15 AM	TF Rises other than windings C57.12.00, Clause 5.11.1.4	Ins Life	T. Johnson	I	Session 1
8:00 AM – 9:15 AM	WG Condition Assessment Guide PC57.170	Power	K. Mani	I	Session 2
8:00 AM – 9:15 AM	WG Station Service Volt. Transf. C57.13.8	Instr TR	D. Wallace	I	Session 3
8:00 AM – 9:15 AM	WG Practice for Install & Operation of Dry Type PC57.94	Dry Type	J. Medina	I	Session 4
8:00 AM – 9:15 AM	TF on Winding Insulation PF	DiTests	D. Robalino	I	Session 5
8:00 AM – 9:15 AM	WG Encl Int C57.12.28, C57.12.29, C57.12.31, C57.12.32	Distr	D. Mulkey	I	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	Session 1
9:25 AM – 10:40 AM	WG Submersible Transf. C57.12.24	STNP	B. Garcia	I	Session 2
9:25 AM – 10:40 AM	TF Instrument Transf. Accuracy	Instr TR	I. Ziger	I	Session 3
9:25 AM – 10:40 AM	WG Temp Measurement PC57.165	Ins Life	M. Tostrud	I	Session 4
9:25 AM – 10:40 AM	TF PCS Cont. Rev. to Test Code C57.12.90	PCS	H. Sahin	I	Session 5
9:25 AM – 10:40 AM	TF Guide for the Reclamation of Mineral Oil - C57.637	IF	S. Denzer	N	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	Session 1
10:50 AM – 12:05 PM	WG Liquid-immersed Sec. Network TRs C57.12.40	STNP	D. Blew	I	Session 2
10:50 AM – 12:05 PM	WG PLC Caps & CCVTs PC57.13.9	Instr TR	Z. Roman	I	Session 3
10:50 AM – 12:05 PM	WG Thermal Evaluation C57.100	Ins Life	R. Wicks	I	Session 4
10:50 AM – 12:05 PM	TF Continuous revision of Impulse Test C57.12.90	DiTests	P. Riffon	I	Session 5
10:50 AM – 12:05 PM	TF Guide DGA for Factory Temp Rise Test C57.130 CANCELLED	IF	J. Foschia	N	Session 6
12:15 PM – 12:45 PM	Awards Presentation				Look for live session
	Awards Presentation - Live VIRTUAL presentation by Susan McNelly. Grab your lunch and listen as we celebrate the work we have done.				
12:55 PM – 2:10 PM	WG Consolidation Insulating Fluid Guides PC57.166	IF	T. Prevost	I	Session 1
12:55 PM – 2:10 PM	TF Bar Coding for Distr Transf. C57.12.35	Distr	R. Chrysler	I	Session 2
12:55 PM – 2:10 PM	TF Cont. Revision to Low Frequency Tests	DiTests	B. Griesacker	I	Session 3
12:55 PM – 2:10 PM	WG Guide for Loading Dry Type Transformers C57.96	Dry Type	A. Narawane	I	Session 4
12:55 PM – 2:10 PM	TF Continuous Rev Clause 11 Temp Rise Tests C57.12.90	Ins Life	D. Sankarakurup	I	Session 5
12:55 PM – 2:10 PM	WG Volts per Hertz	Power	J. Watson	I	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	Session 1
2:20 PM – 3:35 PM	TF Effects of Corrosion on Transformers	STNP	W. Elliott	I	Session 2
2:20 PM – 3:35 PM	WG Geomagnetic Disturbances PC57.163	Stds	D. Blaydon	N	Session 3
2:20 PM – 3:35 PM	WG Dry Type PD Detection PC57.124	Dry Type	T. Prevost	I	Session 4
2:20 PM – 3:35 PM	WG Sw Transients Ind by TR/Bkr Interaction PC57.142	PCS	J. McBride	I	Session 5
2:20 PM – 3:35 PM	WG Guide DGA in Ester-Immersed Transformers PC57.155	IF	A. Sbravati	N	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	Session 1
3:45 PM – 5:00 PM	WG Guide for Monitoring Distr Transf PC57.167	Distr	G. Hoffman	I	Session 2
3:45 PM – 5:00 PM	TF Revision of Guide for DGA in LTCs C57.139	IF	R. Frotscher	N	Session 3
3:45 PM – 5:00 PM	WG Loading Guide PC57.91	Ins Life	D. Wallach	I	Session 4
3:45 PM – 5:00 PM	WG Bushings IEC/IEEE 65700.19.03 Dual Logo	Bush	L. Recksiedler	I	Session 5
3:45 PM – 5:00 PM	WG Dry Type Test Code C57.12.91	Dry Type	D. Walker	N	Session 6

WEDNESDAY, NOVEMBER 17

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

THURSDAY, NOVEMBER 18

TIME	ACTIVITY	TRACK	MTG CHAIR	STATUS	ROOM (FLOOR)
8:00 AM – 9:15 AM	Technical Presentation 1 - IEEE 693 Power Transformer Amendment: Power Transformer Structural Dynamics Requirement for Seismic Qualification Presented by: Michael J. Riley and Jon Bender**	Tutorial			Session 1
9:15 AM – 9:30 AM	Break				
9:30 AM – 10:45 AM	Technical Presentation - HVDC Part 2, HVDC System Aspects (LCC and VSC) (Part 1 was presented at the Spring 2021 Meeting) Presented by: Alexander Gaun, Klaus Pointner, Pierre Riffon and Waldemar Ziomek **	Tutorial			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		Session 1

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

FUTURE COMMITTEE MEETINGS

Spring 2022: Denver, Colorado USA, March 27 – 31, 2022
Fall 2022: Charlotte, North Carolina USA, October 16 – 20, 2022
Spring 2023: Milwaukee, Wisconsin USA, Spring 2023
Fall 2023: Kansas City, Missouri USA, October 2023

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SUBCOMMITTEE MEETING LIST

FALL 2021 MEETING: NOVEMBER 15 TO NOVEMBER 18

On-Line Meeting; Virtual, Central Time Zone USA

Date	Time Start	Time End	Session Title	Track	Chair	Room/Location
11/9/2021	1:00 PM	4:00 PM	Administrative Subcommittee - Closed meeting, by invitation only	Admin	B. Forsyth	Session 1
11/15/2021	10:50 AM	12:05 PM	WG Bushings Gen. Require. C57.19.00	Bush	P. Zhao	Session 3
11/15/2021	2:20 PM	3:35 PM	WG Bushing Applicat. Guide C57.19.100	Bush	T. Spitzer	Session 5
11/15/2021	3:45 PM	5:00 PM	TF Dry Bushing Class and Perf.	Bush	A. Del Rio	Session 2
11/16/2021	10:50 AM	12:05 PM	WG Distrib. Transf. Bushings PC57.19.02	Bush	S. Shull	Session 1
11/16/2021	3:45 PM	5:00 PM	WG Bushings IEC/IEEE 65700.19.03 Dual Logo	Bush	L. Recksiedler	Session 5
11/17/2021	9:25 AM	10:40 AM	SC Bushings	Bush	E. Weatherbee	Session 2
11/15/2021	9:25 AM	10:40 AM	TF Transf Efficiency & Loss Evaluation (DOE Activity)	Distr	P. Hopkinson	Session 5
11/15/2021	10:50 AM	12:05 PM	WG Overhead Distr. Transf. C57.12.20	Distr	A. Traut	Session 1
11/15/2021	12:55 PM	2:10 PM	WG 1-ph Padmount Dist Transf. C57.12.38	Distr	A. Ghafourian	Session 1
11/15/2021	2:20 PM	3:35 PM	WG 3-ph Padmount Dist Transf. C57.12.34	Distr	S. Shull	Session 1
11/16/2021	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 6
11/16/2021	12:55 PM	2:10 PM	TF Bar Coding for Distr Transf. C57.12.35	Distr	R. Chrysler	Session 2
11/16/2021	3:45 PM	5:00 PM	WG Guide for Monitoring Distr Transf PC57.167	Distr	G. Hoffman	Session 2
11/17/2021	9:25 AM	10:40 AM	SC Distribution Transformers	Distr	E. Smith	Session 1
11/15/2021	10:50 AM	12:05 PM	TF Partial Discharge Tests for Class I Transformers	DiTests	D. Ayers	Session 5
11/15/2021	12:55 PM	2:10 PM	WG Partial Discharge Test - C57.113	DiTests	A. Naderian	Session 4
11/15/2021	2:20 PM	3:35 PM	WG Transformer Impulse Test Guide PC57.98	DiTests	T. Hochanh	Session 3
11/16/2021	8:00 AM	9:15 AM	TF on Winding Insulation PF	DiTests	D. Robalino	Session 5
11/16/2021	9:25 AM	10:40 AM	WG Low Frequency Test Guide PC57.168	DiTests	D. Sauer	Session 1
11/16/2021	10:50 AM	12:05 PM	TF Continuous revision of Impulse Test C57.12.90	DiTests	P. Riffon	Session 5
11/16/2021	12:55 PM	2:10 PM	TF Cont. Revision to Low Frequency Tests	DiTests	B. Griesacker	Session 3
11/16/2021	2:20 PM	3:35 PM	Freq Domain Spec Bush C57.12.200	DiTests	P. Patel	Session 1
11/16/2021	3:45 PM	5:00 PM	WG Guide for PD Measure HV Bushings & Inst Trf C57.160	DiTests	T. Hochanh	Session 1
11/17/2021	10:50 AM	12:05 PM	SC Dielectric Test	DiTests	A. Varghese	Session 2
11/15/2021	9:25 AM	10:40 AM	WG Dry Type Reactors PC57.16	Dry Type	A. Del Rio	Session 1
11/15/2021	10:50 AM	12:05 PM	WG Sealed Dry-Type Transf. PC57.12.52	Dry Type	J. Tedesco	Session 4
11/15/2021	12:55 PM	2:10 PM	WG Dry Type Gen. Requirements C57.12.01	Dry Type	C. Ballard	Session 2
11/15/2021	2:20 PM	3:35 PM	TF C57.134 Guide for Hottest-spot in Dry-type	Dry Type	C. Lovins	Session 4
11/15/2021	3:45 PM	5:00 PM	TF IEEE 259 Test for Eval of Insulation for Dry-Type Transfs	Dry Type	D. Stankes	Session 5
11/16/2021	8:00 AM	9:15 AM	WG Practice for Install & Operation of Dry Type PC57.94	Dry Type	J. Medina	Session 4
11/16/2021	12:55 PM	2:10 PM	WG Guide for Loading Dry Type Transformers C57.96	Dry Type	A. Narawane	Session 4
11/16/2021	2:20 PM	3:35 PM	WG Dry Type PD Detection PC57.124	Dry Type	T. Prevost	Session 4
11/16/2021	3:45 PM	5:00 PM	WG Dry Type Test Code C57.12.91	Dry Type	D. Walker	Session 6
11/17/2021	12:55 PM	2:10 PM	SC Dry Type Transformers	Dry Type	C. Ballard	Session 1
11/15/2021	3:45 PM	5:00 PM	SC HVDC Converter Transfs & Smoothing Reactors	HVDC	U. Radbrandt	Session 6
11/15/2021	10:50 AM	12:05 PM	WG Guide for DGA in Silicone PC57.146	IF	J. Karas	Session 6
11/15/2021	3:45 PM	5:00 PM	TF Next Revision to C57.104 Guide for DGA in Mineral Oil	IF	C. Beauchemin	Session 4
11/16/2021	9:25 AM	10:40 AM	TF Guide for the Reclamation of Mineral Oil - C57.637	IF	S. Denzer	Session 6
11/16/2021	10:50 AM	12:05 PM	TF Guide DGA for Factory Temp Rise Tst C57.130 CANCELLED	IF	J. Foschia	Session 6
11/16/2021	12:55 PM	2:10 PM	WG Consolidation Insulating Fluid Guides PC57.166	IF	T. Prevost	Session 1
11/16/2021	2:20 PM	3:35 PM	WG Guide DGA in Ester-Immersed Transformers PC57.155	IF	A. Sbravati	Session 6
11/16/2021	3:45 PM	5:00 PM	TF Revision of Guide for DGA in LTCs C57.139	IF	R. Frotscher	Session 3
11/17/2021	2:20 PM	3:35 PM	SC Insulating Fluids	IF	S. Reed	Session 1
11/15/2021	9:25 AM	10:40 AM	WG Moisture in Insulation PC57.162 CANCELLED	Ins Life	T. Prevost	Session 6
11/15/2021	12:55 PM	2:10 PM	TF Application of High-Temp Insulation Matr 1276 Annex B	Ins Life	K. Biggie	Session 6
11/16/2021	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
11/16/2021	9:25 AM	10:40 AM	WG Temp Measurement PC57.165	Ins Life	M. Tostrud	Session 4
11/16/2021	10:50 AM	12:05 PM	WG Thermal Evaluation C57.100	Ins Life	R. Wicks	Session 4
11/16/2021	12:55 PM	2:10 PM	TF Continuous Rev Clause 11 Temp Rise Tests C57.12.90	Ins Life	D. Sankarapur	Session 5
11/16/2021	3:45 PM	5:00 PM	WG Loading Guide PC57.91	Ins Life	D. Wallach	Session 4
11/17/2021	8:00 AM	9:15 AM	SC Insulation Life	Ins Life	S. Sharpless	Session 2
11/16/2021	8:00 AM	9:15 AM	WG Station Service Volt. Transf. C57.13.8	Instr TR	D. Wallace	Session 3
11/16/2021	9:25 AM	10:40 AM	TF Instrument Transf. Accuracy	Instr TR	I. Ziger	Session 3
11/16/2021	10:50 AM	12:05 PM	WG PLC Caps & CCVTs PC57.13.9	Instr TR	Z. Roman	Session 3
11/17/2021	8:00 AM	9:15 AM	SC Instrument Transformers	Instr TR	T. Sizemore	Session 1
11/17/2021	On	demand	SC Meetings Planning - All interested individuals welcome	Mtgs	T. Behrens	Pre-recorded

SUBCOMMITTEE MEETING LIST

FALL 2021 MEETING: NOVEMBER 15 TO NOVEMBER 18

On-Line Meeting; Virtual, Central Time Zone USA

Date	Time Start	Time End	Session Title	Track	Chair	Room/Location
11/15/2021	9:25 AM	10:40 AM	WG Guide of FRA for Liquid Filled Transf. C57.149	PCS	C. Sweetser	Session 2
11/15/2021	12:55 PM	2:10 PM	TF Audible Sound Revision to Test Code	PCS	R. Girgis	Session 5
11/15/2021	2:20 PM	3:35 PM	TF PCS Cont. Revisions to C57.12.00	PCS	T. Ansari	Session 6
11/16/2021	9:25 AM	10:40 AM	TF PCS Cont. Rev. to Test Code C57.12.90	PCS	H. Sahin	Session 5
11/16/2021	2:20 PM	3:35 PM	WG Sw Transients Ind by TR/Bkr Interaction PC57.142	PCS	J. McBride	Session 5
11/17/2021	2:20 PM	3:35 PM	SC Performance Characteristics	PCS	R. Verdolin	Session 2
11/15/2021	9:25 AM	10:40 AM	WG Standard Requirements for Tap Changers - C57.131	Power	C. Colopy	Session 3
11/15/2021	10:50 AM	12:05 PM	WG C57.116 Guide for Trfs Direct Connect to Generators	Power	W. Li	Session 2
11/15/2021	2:20 PM	3:35 PM	WG Transformer Monitoring C57.143	Power	M. Spurlock	Session 2
11/15/2021	3:45 PM	5:00 PM	WG Failure Investigation & Reporting PC57.125	Power	H. Sahin	Session 3
11/16/2021	8:00 AM	9:15 AM	WG Condition Assessment Guide PC57.170	Power	K. Mani	Session 2
11/16/2021	12:55 PM	2:10 PM	WG Volts per Hertz	Power	J. Watson	Session 6
11/17/2021	12:55 PM	2:10 PM	SC Power Transformers	Power	B. Griesacker	Session 2
11/15/2021	9:25 AM	10:40 AM	WG Std Transf. Terminology C57.12.80	Stds	J. Graham	Session 4
11/15/2021	12:55 PM	2:10 PM	WG PC57.152 Guide for Field Testing	Stds	M. Ferreira	Session 3
11/16/2021	2:20 PM	3:35 PM	WG Geomagnetic Disturbances PC57.163	Stds	D. Blaydon	Session 3
11/17/2021	3:45 PM	5:00 PM	SC Standards	Stds	D. Sauer	Session 1
11/15/2021	3:45 PM	5:00 PM	WG Sec. Network Protectors C57.12.44	STNP	M. Faulkner	Session 1
11/16/2021	9:25 AM	10:40 AM	WG Submersible Transf. C57.12.24	STNP	B. Garcia	Session 2
11/16/2021	10:50 AM	12:05 PM	WG Liquid-immersed Sec. Network TRs C57.12.40	STNP	D. Blew	Session 2
11/16/2021	2:20 PM	3:35 PM	TF Effects of Corrosion on Transformers	STNP	W. Elliott	Session 2
11/17/2021	10:50 AM	12:05 PM	SC Submersible Transf. & Network Protectors	STNP	G. Payerle	Session 1

APPENDIX 2

Semi-Annual Standards Report

IEEE PES Transformers

Chair: Bruce Forsyth

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

Past Chair: Susan McNelly Standards Coordinator: Stephen Shull

Administrative

Chair: Bruce Forsyth

Pg 7

Insulating Fluids

Chair: Scott Reed

Pg 5

Bushings

Chair: Eric Weatherbee

Pg 2

Insulation Life

Chair: Sam Sharpless

Pg 5

Dielectric Tests

Chair: Ajith Varghese

Pg 2

Meeting Planning

Chair: Tammy Behrens

Pg 7

Distribution Transformers

Chair: Ed Smith

Pg 3

Performance Characteristics

Chair: Rogerio Verdolin

Pg 6

Dry Type Transformers

Chair: Casey Ballard

Pg 3

Power Transformers

Chair: Bill Griesacker

Pg 7

HVDC Converters & Smoothing Reactors

Chair: Ulf Radbrandt

Pg 4

Standards

Chair: Dan Sauer

Pg 8

Instrument Transformers

Chair: Thomas Sizemore

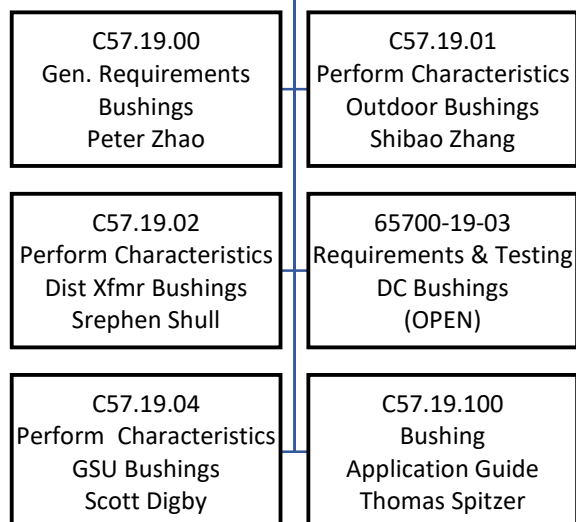
Pg 4

Subsurface Transformers & Network Protectors

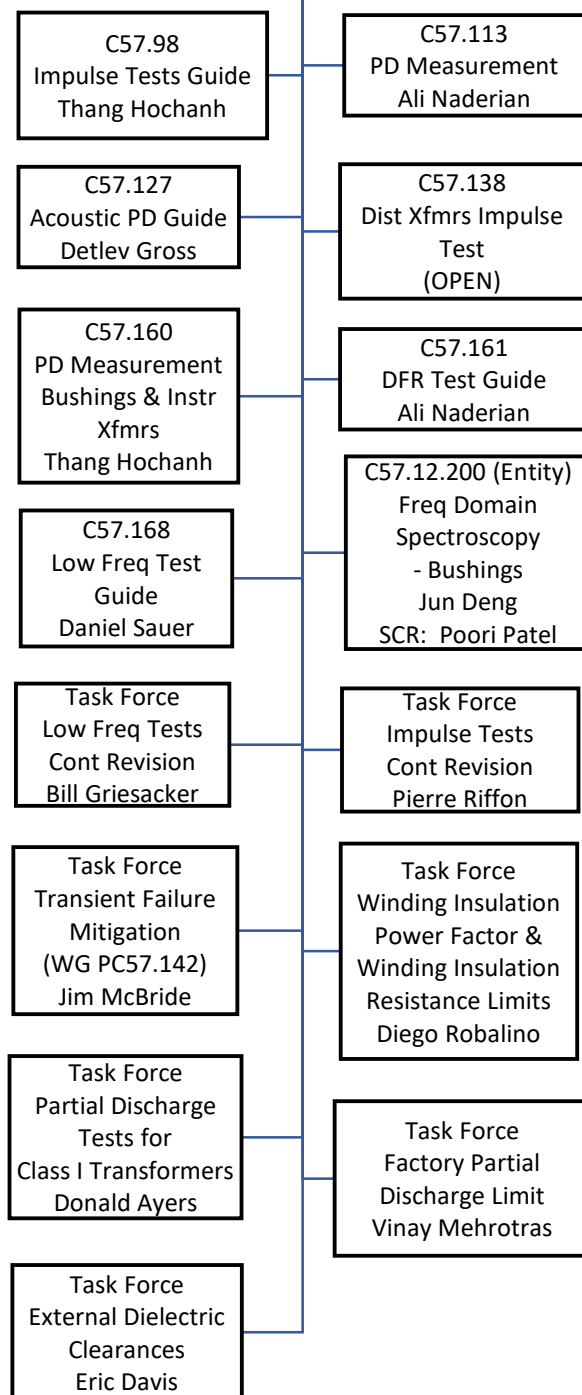
Chair: George Payerle

Pg 4

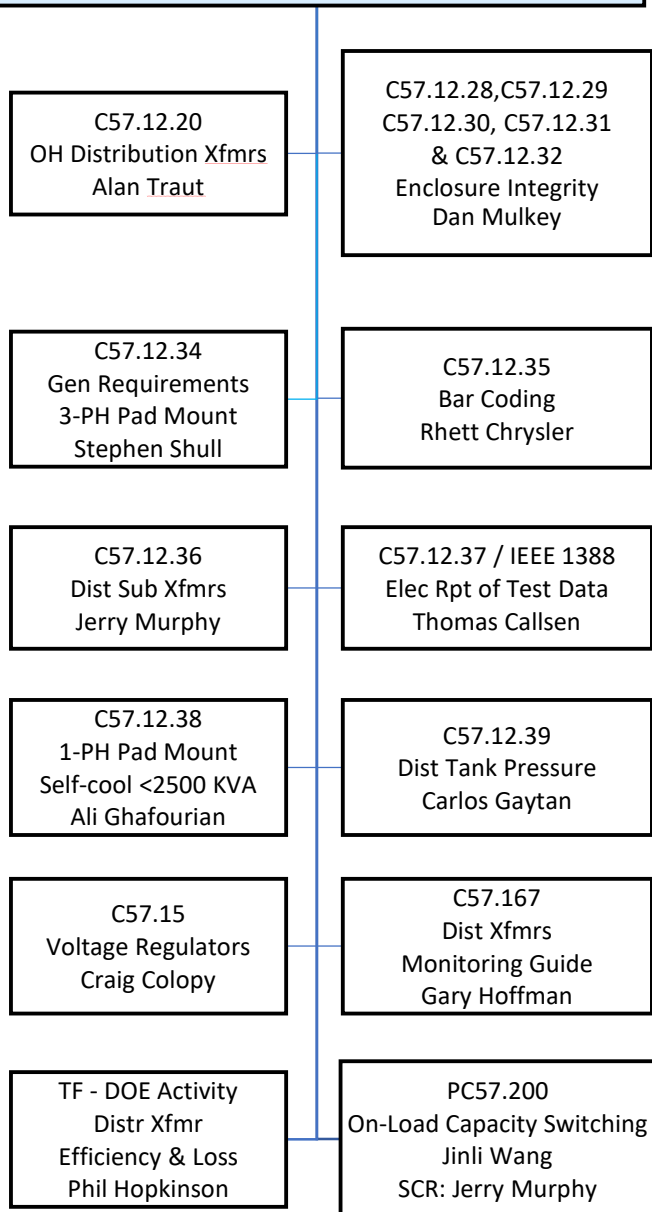
Bushings Chair - Eric Weatherbee



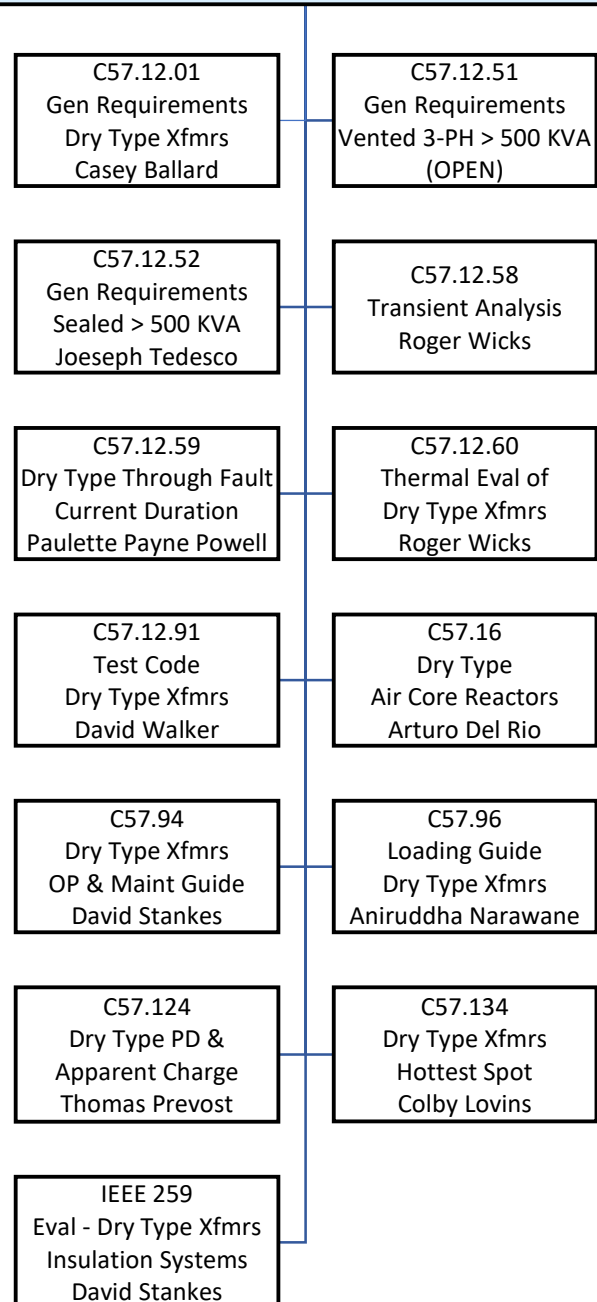
Dielectric Tests Chair - Ajith Varghese



Distribution Transformers Chair - Ed Smith



Dry Type Transformers Chair - Casey Ballard



HVDC Converter Transformers & Smoothing Reactors Chair - Ulf Radbrandt

IEEE 1277
Requirements & Test
Code for Smoothing
Reactors
Klaus Pointner

IEC_ IEEE 60076-57-12
Requirements
& Test Code for HVDC
Converter Xfmrs
Ulf Radbrandt

IEEE 638
IEEE Standard for
Qualification of Class 1E
Transformers for Nuclear
Power Generating
Stations
(OPEN)

Subsurface Transformers & Network Protectors Chair - George Payerle

C57.12.23
Cont. Revision
Submersible 1Ø Xfmrs
Allan Traut

C57.12.24
Cont Revision
Submersible 3Ø Xfmrs
>2500 KVA
Benjamin Garcia

C57.12.40
Cont Revision
Sec Network Xfmrs
David Blew

57.12.44
Cont Revision
Sec Network
Protectors
Mark Faulkner

C57.12.57
Ventilated Dry-Type
Network Transformers
2500 kVA and Below
(OPEN)

Task Force
Corrosion effects on
Subsurface Transformers
Will Elliot

Instrument Transformers Chair - Thomas Sizemore

C57.13
Requirements
Instrument Xfmrs
Ross McTaggart

C57.13.2
Test Procedures
Instrument Xfmrs
Thomas Sizemore

C57.13.5
Test Requirements
Instr Xfmrs ≥ 115 kV
Pierre Riffon

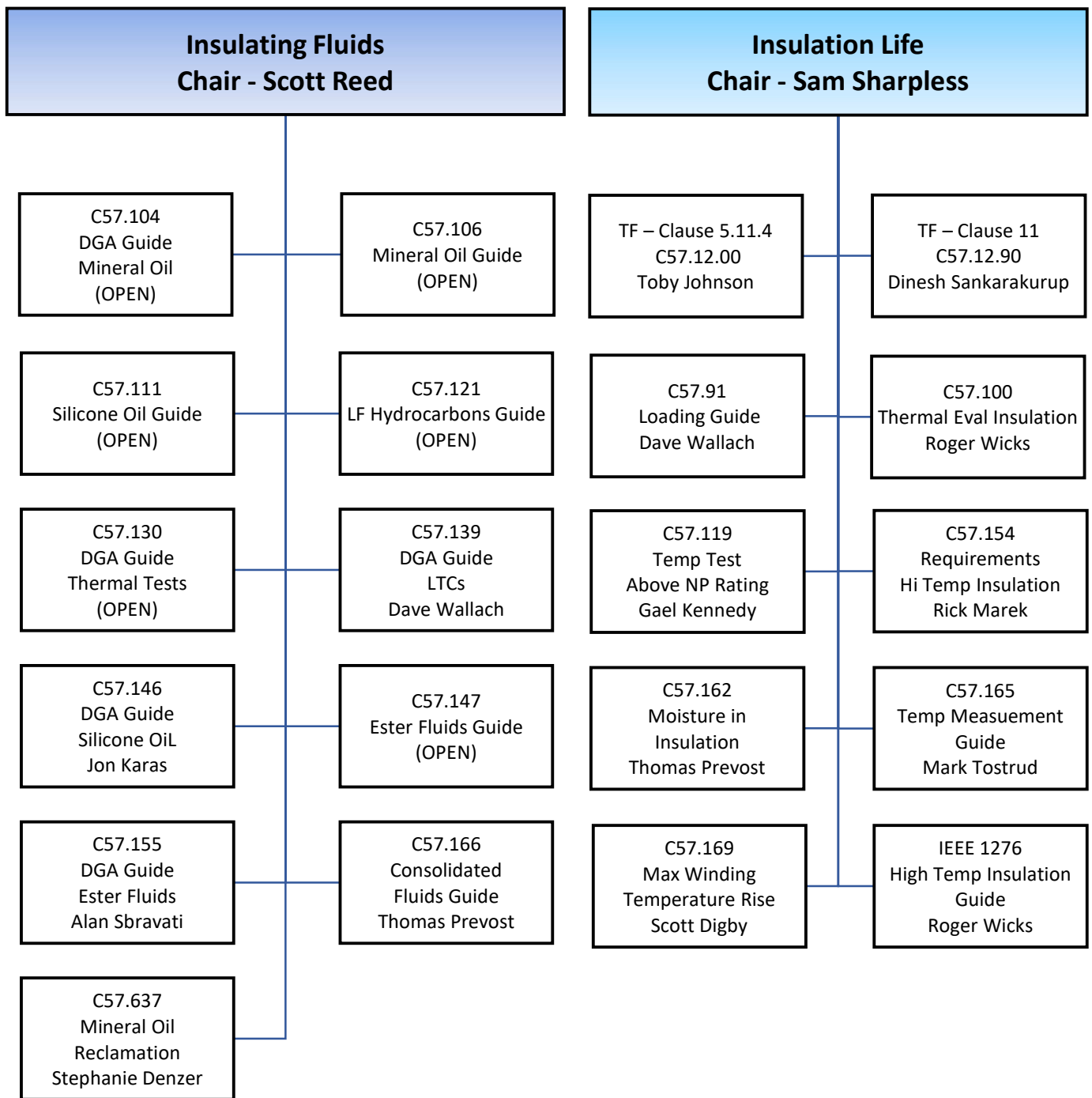
C57.13.6
Requirements
High Accuracy
Instr Xfmrs
(OPEN)

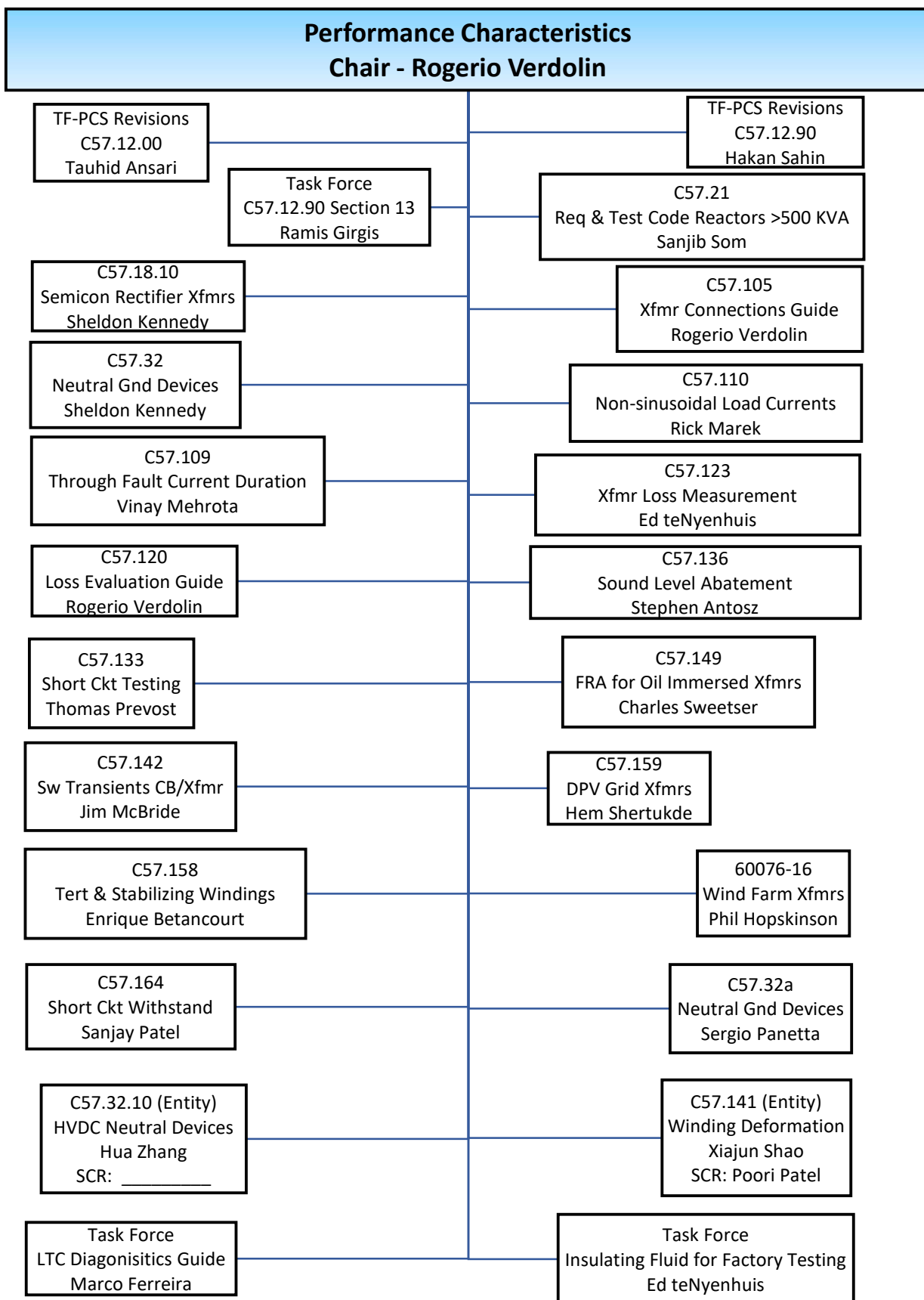
C57.13.7
Requirements mA CT
Henry Alton

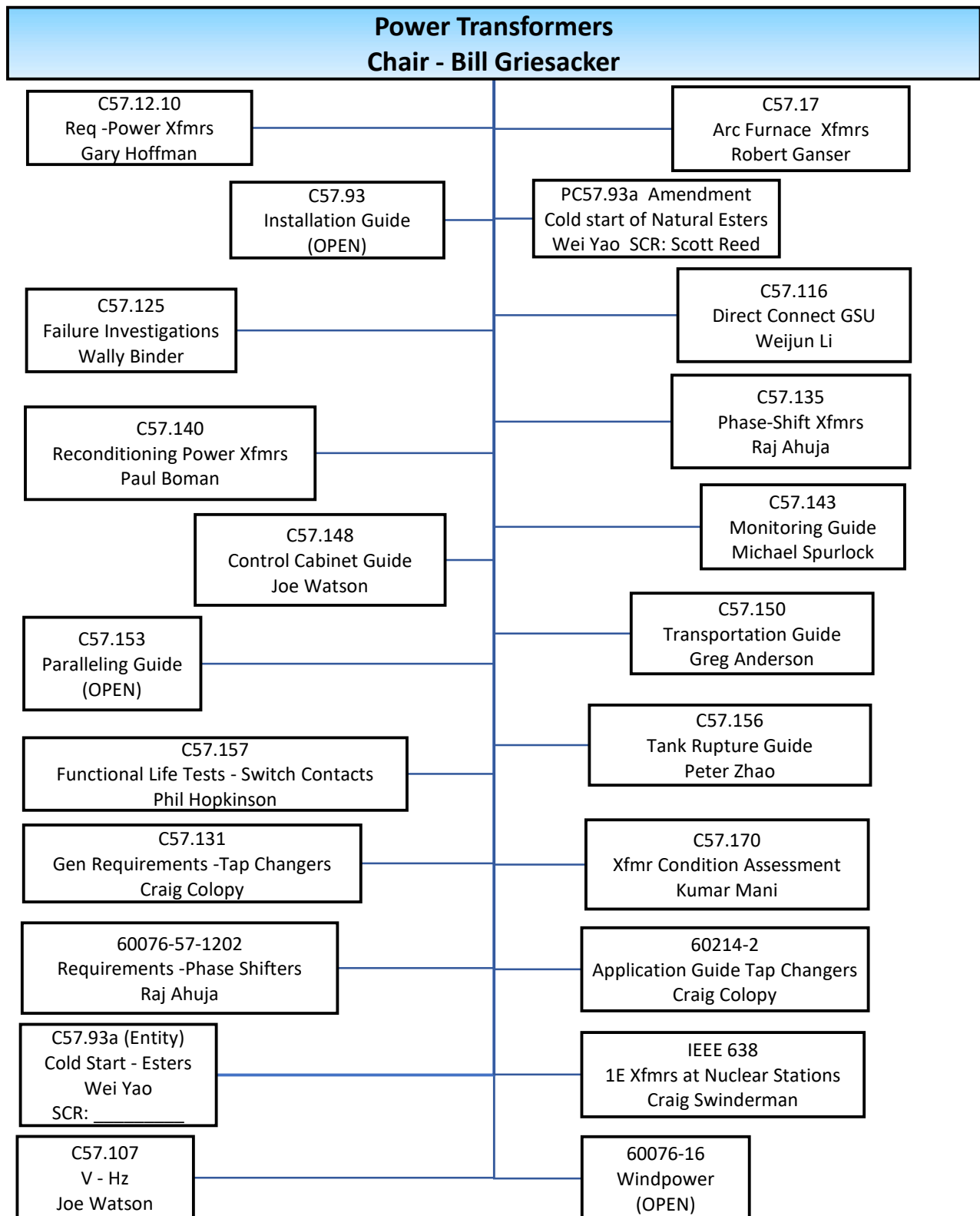
IEC-IEEE 63245-5713-8
Requirements SSVTs
Dave Wallace

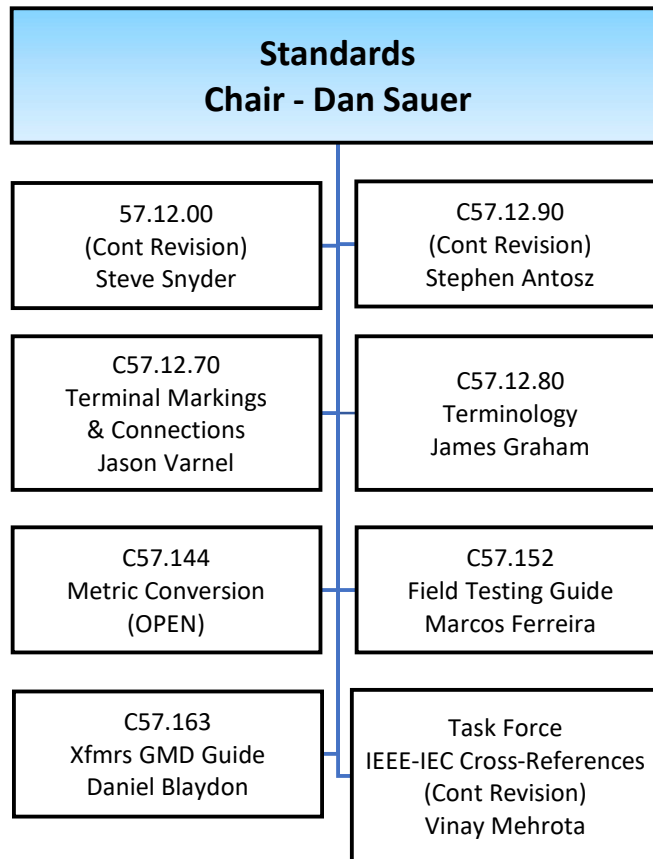
C57.13.9
Requirements CCVTs
Zoltan Roman

Task Force
Instrument
Transformers Accuracy
Igor Ziger









IEEE/PES TRANSFORMERS COMMITTEE

Status Report of Transformers Standards

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	Active PAR + 1 PAR Extension
PC57.19.02				12/31/2022	
65700-19-03	IEC/IEEE International Standard -- Bushings for DC application	Eric Weatherbee (585) 768 - 1272 eweatherbee@hubbell.com	2014	9/23/2021	ACTIVE + PAR for Revision
Individual			12/31/2024		
P65700-19-03				12/31/2025	
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	INACTIVE-RESERVED + PAR for Revision
Individual			12/31/2020		
PC57.19.00				12/31/2022	
C57.19.01	IEEE Standard Performance Characteristics and Dimensions for Outdoor Apparatus Bushings		2017		ACTIVE
Individual			12/31/2027		
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		ACTIVE
Individual			12/31/2028		
C57.19.100	IEEE Guide for Application of Power Apparatus Bushings	Thomas Spitzer (817) 584 - 6567 t.spitzer@sbcglobal.net	2012	5/21/2019	ACTIVE + PAR for Revision
Individual			12/31/2022		
PC57.19.100				12/31/2023	

IEEE/PES TRANSFORMERS COMMITTEE

Status Report of Transformers Standards

STANDARD		Working Group Chair	Pub Year	PAR Issue Date	Standard Status
BALLOT TYPE		Phone			Remark
PROJECT		Email	Rev Due Date	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	SCR: Poori Patel
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 closed 1/9/2019 with 520 comments to resolve. Currently 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	INACTIVE-RESERVED + PAR Revision +1 PAR Extension
Individual		(647) 300 - 8836 ali.naderian@ieee.org	12/31/2020	12/31/2023	
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		ACTIVE
Individual			12/31/2028		
C57.138	IEEE Recommended Practice for Routine Impulse Test for Distribution Transformers		2016		ACTIVE
Individual			12/31/2026		
C57.161	IEEE Guide for Dielectric Frequency Response Test		2018		ACTIVE
Individual			12/31/2028		
C57.98	IEEE Guide for Transformer Impulse Tests	Thang Hochanh	2011	10/27/2018	ACTIVE + PAR for Revision
Individual		(819) 821-3636 thanghochanh@surplec.com	12/31/2021	12/31/2022	
PC57.98					

IEEE/PES TRANSFORMERS COMMITTEE

Status Report of Transformers Standards

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 PC57.12.210	Recommended Practice for On-load Capacity Switching Distribution Transformers	Jinli Wang		2/10/2021	Active PAR
	 wangjinli@epri.sgcc.com.cn		12/31/2025	SCR: Jerry Murphy
Individual PC57.167	Guide for Monitoring Distribution Transformers	Gary Hoffman		6/14/2018	Active PAR
		(973) 474 - 2171 grhoffman@advpowertech.co		12/31/2022	
C57.12.20 Individual PC57.12.20	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	2017	2/8/2019	ACTIVE + PAR for Revision
		(601) 422 - 1198 atraut@ieee.org	12/31/2027	12/31/2023	
C57.12.28 Individual PC57.12.28	Standard for Pad Mounted Equipment - Enclosure Integrity	Daniel Mulkey	2014	3/5/2020	ACTIVE + PAR for Revision
		(707) 776 - 7346 dhmulkey@ieee.org	12/31/2024	12/31/2024	
C57.12.29 Individual PC57.12.29	Standard for Pad Mounted Equipment - Enclosure Integrity for Coastal Environments	Daniel Mulkey	2014	3/5/2020	ACTIVE + PAR for Revision
		(707) 776 - 7346 dhmulkey@ieee.org	12/31/2024	12/31/2024	
C57.12.30 Individual	Std for Pole-Mounted Eqpt - Enclosures for Coastal Environment		2020		ACTIVE
			12/31/2030		
C57.12.31 Individual	IEEE Standard for Pole Mounted Equipment - Enclosure Integrity		2020		ACTIVE
			12/31/2030		
C57.12.32 Individual	Standard for Submersible Equipment - Enclosure Integrity		2019		ACTIVE
			12/31/2029		

IEEE/PES TRANSFORMERS COMMITTEE

Status Report of Transformers Standards

STANDARD		Working Group Chair	Pub Year	PAR Issue Date	Standard Status
BALLOT TYPE		Phone	Rev Due Date	PAR Expiration	Remark
PROJECT		Email			
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	ACTIVE + PAR for Revision + 1 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	ACTIVE + PAR for Revision
Individual					
PC57.12.35					
C57.12.36	Standard Requirements for Liquid-Immersed Distribution Substation Transformers		2017 12/31/2027		ACTIVE
Individual					
C57.12.37	IEEE Standard for the Electronic Reporting of Transformer Test Data		2015 12/31/2025		ACTIVE
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 12/31/2023	ACTIVE + PAR for Revision + 1 PAR Extension Corrigenda PAR is currently active until 2024. Corrigenda PAR will be allowed to expire.
Individual					
PC57.12.38					
C57.12.39	IEEE Standard for Requirements for Distribution Transformer Tank Pressure Coordination		2017 12/31/2027		ACTIVE
Individual					
C57.15	IEEE Standard Requirements, Terminology, and Test Code for Step-Voltage Regulators		2017 12/31/2027		ACTIVE
Individual					

IEEE/PES TRANSFORMERS COMMITTEE

Status Report of Transformers Standards

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: Casey Ballard		robert.c.ballard@ieee.org		(804) 292 - 5207	
259	IEEE Standard Test Procedure for Evaluation of Systems of Insulation for Dry-Type Specialty and General-Purpose Transformers	Juan-Pablo Andrade Medina	1999	12/3/2020	INACTIVE-RESERVED+ PAR for Revision
Individual		(815) 678-2421	12/31/2020		Standard was allowed to expire by the SC. However, when revising IEEE C57.12.60, the need for this standard was recognized.
P259		jmedina@olsun.com		12/31/2024	
C57.12.01	IEEE Standard for General Requirements for Dry-Type Distribution and Power Transformers		2020		ACTIVE
Individual			12/31/2030		This has been submitted to SASB for final approval. This standard is under continuous revision.
C57.12.51	IEEE Guide for Mechanical Interchangeability of Ventilated Dry-Type Transformers		2019		ACTIVE
Individual			12/31/2029		
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	2012	3/5/2020	ACTIVE + PAR for Revision
Individual		(276) 688-1675	12/31/2022		
PC57.12.52		joseph.l.tedesco@hitachi-pow		12/31/2024	
C57.12.58	IEEE Guide for Conducting a Transient Voltage Analysis of a Dry-Type Transformer Coil		2017		ACTIVE
Individual			12/31/2027		
C57.12.59	IEEE Guide for Dry-Type Transformer Through-Fault Current Duration		2015		ACTIVE
Individual			12/31/2025		Dereck Foster has been appointed to TF Chair to study the need for revision.
C57.12.60	IEEE Standard for Thermal Evaluation of Insulation Systems for Dry-Type Power and Distribution Transformers		2020		ACTIVE
Individual			12/31/2030		
C57.12.91	IEEE Standard Test Code for Dry-Type Distribution and Power Transformers		2020		ACTIVE + PAR for Revision
Individual			12/31/2030		This standard is under continuous revision with a planned PAR submittal in 2021.

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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:	Casey Ballard	robert.c.ballard@ieee.org		(804) 292 - 5207	
C57.124	IEEE Recommended Practice for the Detection of Partial Discharge and the Measurement of Apparent Charge in Dry-Type Transformers	Thomas Prevost (802) 751 - 3458 tprevost@ieee.org	1991 12/31/2019	6/15/2017 12/31/2021	INACTIVE-RESERVED + PAR for Revision 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 currently on the DEC 2021 NesCom agenda requesting a 2 year extension.
Individual					
PC57.124					
C57.134	IEEE Guide for Determination of Hottest Spot Temperature in Dry Type Transformers	Colby Lovins colby.lovins@ieee.org	2013 12/31/2023	5/25/2021 12/31/2025	ACTIVE + PAR for Revision
Individual					
PC57.134					
C57.16	IEEE Standard Requirements, Terminology, and Test Code for Dry-Type Air- Core Series- Connected Reactors	J. Arturo Del Rio (919) 449 - 5675 a.delrio@ieee.org	2011 12/31/2021	2/5/2016 12/31/2022	ACTIVE + PAR for Revision + 1 PAR Extension PAR for new Revision approved Feb 2016
Individual					
PC57.16					
C57.94	IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers		2015 12/31/2025		ACTIVE
Individual					
C57.96	IEEE Guide for Loading Dry-Type Distribution and Power Transformers	Aniruddha Narawane (804) 229 - 5956 aniraj200@yahoo.com	2013 12/31/2023	2/10/2021 12/31/2025	ACTIVE + PAR for Revision
Individual					
PC57.96					

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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 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		ACTIVE
Individual		12/31/2030		
60076-57-129	IEC/IEEE International Standard - Power transformers--Part 57-129: Transformers for HVDC applications	2017		ACTIVE
Individual		12/31/2027		

IEEE/PES TRANSFORMERS COMMITTEE

Status Report of Transformers Standards

STANDARD		Working Group Chair	Pub Year	PAR Issue Date	Standard Status
BALLOT TYPE		Phone	Rev Due Date	PAR Expiration	Remark
PROJECT		Email			
SubCommittee INSTRUMENT TRANSFORMERS					
CHAIR: Thomas Sizemore		thomas.sizemore.us@ieee.org		(252) 827 - 3235	
Individual P63253-5713-8	Standard Requirements for Station Service Voltage Transformers	David Wallace (662) 325 - 2009 daweleceng@aol.com	12/31/2021	12/11/2013 12/31/2021	Active PAR The original PAR was approved on 12/11/2013. The original Project was called PC57.13.8. It was extended on 6/15/2017, modified to a dual logo on 3/21/2019 and then extended on 11/07/2019. It is currently on the 12/7/2021 REVCOM agenda for an extension to Dec/2022.
Individual PC57.13.9	Standard for Power-Line Carrier Coupling Capacitors and Coupling Capacitor Voltage Transformers	Zoltan Roman (706) 360 - 4964 zoltan.roman@ge.com		3/23/2017 12/31/2023	Active PAR + 1 PAR Extension
C57.13 Individual PC57.13-2016	IEEE Standard Requirements for Instrument Transformers		2016 12/31/2026	3/20/2019 12/31/2023	ACTIVE + PAR for Corrigenda
C57.13.2 Individual PC13.2	Conformance Test Procedure for Instrument Transformers	Shibao Zhang (585) 768-1273 szhang@hubbell.com	2005 12/31/2020	12/6/2017 12/31/2021	ACTIVE + PAR for Revision Currently in Ballot - Scheduled to close 11/06/2021. It is currently on the Dec 2021 NesCom agenda requesting a 2 year extension.
C57.13.5 Individual	Standard of Performance and Test Requirements for Instrument Transformers of a Nominal System Voltage of 115 kV and Above		2019 12/31/2029		ACTIVE
C57.13.6 Individual	Standard for High Accuracy Instrument Transformers		2005 12/31/2020		INACTIVE-RESERVED
C57.13.7 Individual	IEEE Standard for Current Transformers with Maximum Milliampere Secondary Current of 250 mA		2018 12/31/2028		ACTIVE

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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 INSULATING FLUIDS					
CHAIR:	Scott Reed	sreed@mvadiagnostics.com		(330) 498 - 6259	
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	Active PAR + PAR for Revision
PC57.166				12/1/2022	
C57.104	IEEE Guide for the Interpretation of Gases Generated in Mineral Oil-Immersed Transformers		2019		ACTIVE
Individual			12/31/2029		
C57.106	IEEE Guide for Acceptance and Maintenance of Mineral Insulating Oil in Electrical Equipment		2015		ACTIVE
Individual			12/31/2025		
C57.111	IEEE Guide for Acceptance of Silicone Insulating Fluid and Its Maintenance in Transformers		1989		INACTIVE-RESERVED
Individual			3/19/2019		
C57.121	IEEE Guide for Acceptance and Maintenance of Less-Flammable Hydrocarbon Fluid in Transformers		1998		INACTIVE-RESERVED
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		ACTIVE
Individual			12/31/2025		
C57.139	Guide for Dissolved Gas Analysis in Transformer Load Tap Changers		2015		ACTIVE
Individual			12/31/2025		
C57.146	Guide for Interpretation of Gasses Generated in Silicone-Immersed Transformers	Jon Karas (216) 213-0987 jon.karas@sdmyers.com	2005	3/5/2020	ACTIVE + PAR for Revision
Individual			12/31/2021		
PC57.146				12/31/2024	
C57.147	Guide for Acceptance and Maintenance of Natural Insulating Liquid in Transformers		2018		ACTIVE
Individual			12/31/2028		

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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 INSULATING FLUIDS					
CHAIR:	Scott Reed	sreed@mvadiagnostics.com		(330) 498 - 6259	
C57.155	IEEE Guide for Interpretation of Gases Generated in Natural Ester and Synthetic Ester-Immersed Transformers	Alan Sbravati	2014	10/23/2021	ACTIVE + PAR for Revision
Individual		(612) 413 - 4599	12/31/2024		
PC57.155		alan_sbravati@cargill.com		12/31/2025	
C57.637	IEEE Guide for the Reclamation of Mineral Insulating Oil and Criteria for Its Use	Stephanie Denzer	2015	9/2/2021	ACTIVE + PAR for Revision
Individual		(330) 581 - 4103	12/31/2025		
PC57.637		stephaniedenzer@alliantenerg		12/31/2025	

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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 INSULATION LIFE					
CHAIR: Samuel Sharpless		slsharpless@rimkus.com		(407) 661 - 1245	
Individual PC57.162	Guide for the Interpretation of Moisture Related Parameters in Liquid Immersed Transformers and Reactors	Thomas Prevost (802) 751 - 3458 tprevost@ieee.org		8/23/2013 12/31/2022	Active PAR + 2 PAR Extensions This will not get another extension without significant extenuating circumstances.
Individual PC57.165	Guide for Temperature Measurements for Liquid Immersed Transformers and Reactors	Mark Tostrud (262) 746 - 1230 mark.tostrud@dynamicratings.		2/17/2017 12/31/2021	Active PAR It is currently on the DEC 2021 NesCom agenda requesting a 2 year extension.
Individual PC57.169	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 12/31/2023	Active PAR
1276 Individual	IEEE Guide for the Application of High-Temperature Insulation Materials in Liquid-Immersed Distribution, Power, and Regulating Transformers		2020 12/31/2030		ACTIVE
1538 Individual	IEEE Guide for Determination of Maximum Winding Temperature Rise in Liquid Filled Transformer		2000 12/31/2021		ACTIVE Please note that this document will be allowed to go inactive as it is being replaced by C57.169. SHOULD THIS BE WITHDRAWN?
1538a Individual	IEEE Guide for Determination of Maximum Winding-Temperature Rise in Liquid Immersed Transformers -- Amendment 1		2015 12/31/2021		ACTIVE Please note that this document will be allowed to go inactive as it is being replaced by C57.169. SHOULD THIS BE WITHDRAWN?
C57.100 Individual PC57.100	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 12/31/2021	10/30/2018 12/31/2022	ACTIVE + PAR for Revision
C57.119 Individual	IEEE Recommended Practice for Performing Temperature Rise Tests on Liquid Immersed Power Transformers at Loads Beyond Nameplate Ratings		2018 12/31/2028		ACTIVE

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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 INSULATION LIFE					
CHAIR: Samuel Sharpless		slsharpless@rimkus.com		(407) 661 - 1245	
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 12/31/2022	10/27/2018 12/31/2022	ACTIVE + PAR for Revision Currently out for Ballot to close on 11/18/2021.
Individual					
PC57.154					
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 12/31/2021	10/28/2017 12/31/2023	ACTIVE + PAR for Revision
Individual					
PC57.91					

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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 PERFORMANCE CHARACTERISTICS					
CHAIR: Rogério 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	Zhang Hua		10/30/2018	Active PAR
C57.32.10		zhanghua002@163.com		12/31/2022	SCR: ****NEED NAME****
Entity	Guide for Detection, Monitoring, and Evaluation of Winding Deformation in Liquid-Immersed Power Transformers	Xianjun Shao		9/23/2021	Active PAR
PC57.141		shaonianjun0575@163.com		12/31/2025	SCR: Poori Patel
Individual	Guide for Establishing Short Circuit Withstand Capabilities of Liquid Immersed Power Transformers, Regulators, and Reactors	Sanjay Patel		6/30/2016	Active PAR + 1 PAR Extension
PC57.164		(843) 871 - 3434 s.patel@smitusa.com		12/31/2022	This has been submitted to SASB for final approval.
C57.105	IEEE Guide for Application of Transformer Connections in Three-Phase Distribution Systems	Rogério Verdolin	2019	12/3/2020	ACTIVE + PAR for Corrigenda
Individual		(403) 850 - 4304 roger.verdolin@ieee.org	12/31/2029	12/31/2024	Corrigenda for the 2019 version of the standard
C57.109	IEEE Guide for Liquid-Immersed Transformers Through-Fault-Current Duration		2018		ACTIVE
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		ACTIVE
Individual			12/31/2028		
C57.120	IEEE Guide for Loss Evaluation of Distribution and Power Transformers and Reactors		2017		ACTIVE
Individual			12/31/2027		
C57.123	IEEE Guide for Transformer Loss Measurement		2019		ACTIVE
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	2000	2/10/2021	INACTIVE-RESERVED + PAR for Revision
Individual		(647) 300 - 8836 ali.naderian@ieee.org	12/31/2018	12/31/2025	
PC57.136					

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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 PERFORMANCE CHARACTERISTICS					
CHAIR: Rogério Verdolin		roger.verdolin@ieee.org		(403) 850 - 4304	
C57.142	A Guide To Describe The Occurrence And Mitigation Of Switching Transients Induced By Transformer-Breaker Interaction	Jim McBride	2010	3/23/2017	INACTIVE-RESERVED+PAR Revision+1 PAR Extension
Individual		(770) 460-6626	12/31/2020		
PC57.142		jim@jmxhv.com		12/31/2023	
C57.149	Guide for the Application and Interpretation of Frequency Response Analysis for Oil Immersed Transformers	Charles Sweetser	2012	6/14/2018	ACTIVE + PAR for Revision
Individual		(617) 901 - 6180	12/31/2022		
PC57.149		charles.sweetser@omiconene		12/31/2022	
C57.158	IEEE Guide for the Application of Tertiary and Stabilizing Windings in Power Transformers		2017		ACTIVE
Individual			12/31/2027		
C57.159	IEEE Guide on Transformers for Application in Distributed Photovoltaic (DPV) Power Generation Systems		2016		ACTIVE
Individual			12/31/2026		
C57.18.10	IEEE Standard Practices and Requirements for Semiconductor Power Rectifier Transformers	Sheldon Kennedy	1998	6/30/2016	INACTIVE-RESERVED + PAR for Revision
Individual		(716) 896 - 6500	12/31/2019		This has been submitted to SASB for final approval.
PC57.18.10		skennedy@niagaratransformer		12/31/2022	
C57.21	IEEE Standard Requirements, Terminology, and Test Code for Shunt Reactors Rated Over 500 kVA		2021		ACTIVE
Individual			12/31/2031		
C57.32	IEEE Standard Requirements, Terminology, and Testing Procedures for Neutral Grounding Devices		2015		ACTIVE
Individual			12/31/2025		
C57.32a	IEEE Standard for Requirements, Terminology, and Test Procedure for Neutral Grounding Devices--Amendment 1: Neutral Grounding Resistors Clause (AM)		2020		ACTIVE
Individual			12/31/2025		

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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 POWER TRANSFORMERS					
CHAIR:	Bill	Griesacker			
		bgriesacker@verizon.net		(412) 916 - 6446	
Individual	Recommended Practice for Developing Design-Specific Operational Limits for Transformers Connected to Generators or Power Systems Subject to Significant Short-Term Changes in Voltage or Frequency	Joe Watson (561) 371 - 9138 joe_watson@ieee.org		9/23/2021	Active PAR
PC57.107				12/31/2025	
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 SCR: Scott Reed
PC57.93a				12/31/2024	
60076-16	IEC/IEEE International Standard - Power transformers - Part 16: Transformers for wind turbine applications		2018		ACTIVE
Individual			12/31/2028		
60076-57-1202	IEC/IEEE International Standard Power transformers --Part 57-1202: Liquid immersed phase-shifting transformers		2016		ACTIVE
Individual			12/31/2026		
60214-2	IEEE Draft Standard for Tap-Changers - Part 2: Application Guide		2019		ACTIVE
Individual			12/31/2029		
638	IEEE Standard for Qualification of Class 1E Transformers for Nuclear Power Generating Stations		2013		ACTIVE
Individual			12/31/2023		
C57.116	IEEE Guide for Transformers Directly Connected to Generators	Weijun Li (781) 348 - 1076 wli@beld.com	2014	11/7/2019	ACTIVE + PAR for Revision
Individual			12/31/2024		
PC57.116				12/31/2023	

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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 POWER TRANSFORMERS					
CHAIR:	Bill	Griesacker	bgriesacker@verizon.net		(412) 916 - 6446
C57.117	IEEE Guide for Reporting Failure Data for Power Transformers and Shunt Reactors on Electric Utility Power Systems		1987		INACTIVE-RESERVED
Individual			12/31/2018		
C57.12.10	Standard Requirements for Liquid-Immersed Power Transformers		2017		ACTIVE
Individual			12/31/2027		
C57.125	IEEE Guide for Failure Investigation, Documentation, Analysis, and Reporting for Power Transformers and Shunt Reactors	Hakan Sahin (208) 220-6963 hakanshaun@gmail.com	2015	5/21/2021	ACTIVE + PAR for Revision
Individual			12/31/2025	12/31/2025	
PC57.125					
C57.131	IEEE Standard Requirements for Tap Changers	Craig Colopy (262) 896 - 2342 craigacolopy@eaton.com	2012	12/3/2020	ACTIVE + PAR for Revision
Individual			12/31/2022	12/31/2024	
PC57.131					
C57.135	IEEE Guide for the Application, Specification and Testing of Phase- Shifting Transformers		2011		ACTIVE
Individual			12/31/2021		
C57.140	IEEE Guide for Evaluation and Reconditioning of Liquid Immersed Power Transformers		2017		ACTIVE
Individual			12/31/2027		
C57.143	Guide for Application for Monitoring Equipment to Liquid-Immersed Transformers and Components	Mike Spurlock (614) 933 - 2284 mspurlock@ieee.org	2012	2/17/2017	ACTIVE + PAR for Revision
Individual			12/31/2022	12/31/2023	
PC57.143					
C57.148	Standard for Control Cabinets for Power Transformers		2020		ACTIVE
Individual			12/31/2030		
C57.150	IEEE Guide for the Transportation of Transformers and Reactors Rated 10 000 kVA or Higher	Gregory Anderson (402) 680 - 1111 gwanderson@ieee.org	2012	3/23/2017	ACTIVE + PAR for Revision
Individual			12/31/2022	12/31/2021	It is currently on the Dec 2021 NesCom agenda requesting a 2 year extension.
PC57.150					

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

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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 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	2015	2/17/2017	ACTIVE + PAR for Revision
Individual		(859) 219 - 6057	12/31/2025		This has been submitted to SASB for final approval. This standard is under continuous revision.
PC57.12.00		slsnyder@ieee.org		12/31/2021	
C57.12.70	IEEE Standard For Standard Terminal Markings and Connections for Distribution and Power Transformers		2020		ACTIVE
Individual			12/31/2030		
C57.12.80	IEEE Standard Terminology for Power and Distribution Transformers	James Graham	2010	3/23/2017	INACTIVE-RESERVED + PAR for Revision
Individual		(412) 478 - 4450	12/31/2020		
PC57.12.80		jimgraham@ieee.org		12/31/2021	
C57.12.90	IEEE Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers	Stephen Antosz	2015	12/7/2017	ACTIVE
Individual		(412) 498 - 3916	12/31/2025		This has been submitted to SASB for final approval. This standard is under continuous revision.
PC57.12.90		santos@ieee.org		12/31/2021	
C57.144	Guide for Metric Conversion of Transformer Standards		2004		INACTIVE-RESERVED
Individual			12/31/2020		This was to be incorporated into P947 but this project has been withdrawn. This needs to be reviewed in light of SCC 14 documents.
C57.152	IEEE Guide for Diagnostic Field Testing of Fluid-Filled Power Transformers, Regulators, and Reactors	Marcos Ferreira	2013	6/13/2019	ACTIVE + PAR for Revision
Individual		(971) 703 - 0777	12/31/2023		
PC57.152		mdferreira@comcast.net		12/31/2023	
C57.163	IEEE Guide for Establishing Power Transformer Capability while under Geomagnetic Disturbances	Daniel Blaydon	2015	3/5/2014	ACTIVE + PAR for Revision
Individual		(410) 470 - 8827	12/31/2025		Corrigenda 1 will be included with this Revision. C57.163-2015-Corrigenda 1 will be allowed to expire.
PC57.163		dblaidon@ieee.org		12/31/2024	

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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 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		ACTIVE
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	ACTIVE + 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	ACTIVE + 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 markafaulkner@eaton.com	2014	3/26/2015	ACTIVE + PAR for Revision + 1 PAR Extension
Individual			12/31/2024		Ballot is closed with 62 comments to resolve.
PC57.12.44				12/31/2022	
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		INACTIVE-RESERVED
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-
Fall 2021 Meeting
November 15, 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: Improvements to PD Measurements for Factory and Site Acceptance Tests of Power Transformers**
 - From Joint Working Group A2/D1.51
 - Brochure to be published by Dec. 2021

SC A2 WG Activities

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

SC A2 WG Activities

No.	Working Group	Topic	Status
8	A2.59	On-site assembly, On-site Rebuild, and On-site Testing of Power Transformers	Completed
9	A2.60	Dynamic Thermal Performance of Power Transformers	Active
10	A2.61	Best Practices for On-Load Tap Changers (OLTC)	Active
11	A2.62	Analysis of AC Transformer Reliability	Active
12	A2.63	Transformer Impulse Testing	Active
13	A2.64	Condition of Cellulose Insulation in Oil Immersed Transformers After Factory Acceptance Tests	Active
14	D1/A2.77	Tests for Insulating Fluids	Active

TF and AG activities

- 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 early 2022

Upcoming New Working Groups

- **“Transformer Digital Twin”**
 - Completion 2025
 - WG approved 9/16/2021.

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

CIGRÉ Session 2022

Preferential Subjects for Papers:

1. Experience and new requirements for transformers for renewable generation
2. Beyond the mineral oil-immersed transformers and reactor
3. Best practices in transformer and reactor procurement

Paper Submissions Due: January 24, 2022

Upcoming Events

- **CIGRÉ Symposium**
 - Ljubljana, Slovenia, November 21-24, 2021
 - Grand Hotel Union Congress Centre
- **CIGRÉ Session 2022**
 - Palais des Congrès, Paris, France, Aug. 28-Sep. 2, 2022
- **CIGRÉ Symposium**
 - Cairns, Australia, September 4-7, 2023
 - Cairns Convention Center
- **CIGRÉ A2 Study Committee Colloquium**
 - Split, Croatia, October 2023



IEEE Liaison Report

THANK YOU!

APPENDIX 4

IEC TC14 Liaison Report

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

TAG Administrator:
National Electrical Manufacturers Association
1300 North 17th Street, Suite 900, Rosslyn, VA 22209
Tel: 703-841-3231

PLACE OF MEETING: Virtual

DATE AND TIME: Session 2, Wednesday, November 17, 2021 from (3:45pm-5pm Central)

PRESIDING OFFICER: P. Hopkinson, Technical Advisor

SECRETARY: Paul Orr, NEMA

1 Call to Order (Hopkinson)

Call to order, review meeting guidelines, and record attendance. Introductions and welcoming remarks. A poll was conducted. 11 USNC TAG members present, 17 non-members, 5 no response



Attendees List USNC
TAG on IEC TC 14 11-

2 Approval of the Agenda (Hopkinson)

Review and approve the agenda. Members are requested to submit proposals for new business.

3 Approval of Previous Minutes

The minutes of the April 28, 2021 meeting are submitted for approval.

The minutes for the April meeting were approved as submitted.

4 USTAG TC14 MEMBERSHIP

The USTAG TC14 roster (members and guests) was circulated for attendance. The ANSI dues paying members are listed below. Please inform the secretary if you believe you are a voting member and your name is not included. Raj Ahuja requested an invoice and be re-added to the Roster.



USNC_TAG_Roster_T
C14%20Sept%202021

5 **Review of IEC TC14 Activities**

Rick Marek's presentation on update of revision of IEC 60076-1



F2021 TC14
Presentation.pdf

IEC TC14 Chair, Christoph Ploetner, and USTAG TC 14 Chair, Phil Hopkinson, are invited to report on the activities of IEC TC14. Axel Kraemer will be presenting in place of Chris Ploetner.



Status%20report%20
of%20TC14%20to%20

Emilio Morales noted that he would like to be on the Advisory Group "Monitoring equipment for on-line power transformer surveillance". Franck Thomas from EDF DTG Grenoble is the chair.

Action: Phil Hopkinson to review Emilio's request and respond. It was also noted by Axel that there is an Advisory Group 7 close to what Emilio mentioned.

Chair Hopkinson noted we always encourage joint WGs between IEC and IEEE.

6 **Working Documents**

For information only, the attached table shows the a historical list of documents issued by TC14 since the plenary meeting in September 2018.



2020-10 IEC TC14
Report for IEEE UST/

7 **Next IEC TC 14 plenary meeting**

The plenary will not meet this year. Considering planning to meet in conjunction with IEC main general meeting October 31-November 4 meeting in San Francisco in 2022.

8 **New Business**

Identify any additional items meriting discussion. No new items.

9 **Schedule Next Meeting**

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

10 **Adjourn**

Having no further business, the meeting was adjourned at 5:06 pm.

Recorded by

Paul Orr 11-18-21

APPENDIX 5

Standards Coordinating Committee No. 4

November 15, 2021

IEEE PES Transformers Committee
Liaison Report for General Session Meeting [Virtual] – November 15, 2021
Standards Coordinating Committee on Electrical Insulation – SCC 04

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

1. Scope:

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

2. Standards:

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

3. Current Activities:

- **IEEE 1** – Standard expires 12/31/2021. PAR expires 12/31/2024. Standard will expire prior to PAR expiration, but document revision is in progress.

Interested in participating?

- SCC04 – Evanne Wang (evanne.wang@dupont.com)
- IEEE 1 – Brad Greaves (brad.greaves@weidmann-group.com)

Respectfully submitted,
Evanne Wang

APPENDIX 6

ASTM

ASTM Committee D27 Electrical Insulating and Gases Liaison Report

Thomas Prevost

IEEE/PES Transformers Committee
November 15, 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: May, 17-18 2021 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

Nov 14th -16th 2021; VIRTUAL

APPENDIX 7

Transactions Power Delivery

Opening Session

Monday, November 15, 2021: 8:00 am - 9:15 am CST (UTC-06:00)

10.5. Transactions on Power and Delivery (TPWRD) Editor Liaison

Editor's Report (15.11.21)

Xose M. LOPEZ-FERNANDEZ

During 2021 until October 15, a total of 57 papers were in editorial review in the transformer area of IEEE Transactions on Power Delivery for possible publication. For all of these papers the recommendations were as follows:

Accept: 15
Reject (Administrative/Editorial/Technical): 42
The above numbers include reviews managed by all editors.

The papers which were accepted for publication are shown below:

DOI	Title
10.1109/TPWRD.2021.3106709	Load Transfer Optimization Considering Hot-spot and Top-oil Temperature Limits of Transformers
10.1109/TPWRD.2021.3098701	Inclusion of Neutral Points in Measurement-Based Frequency-Dependent Transformer Model
10.1109/TPWRD.2021.3100602	Method for Extracting Stray Capacitance and Hysteresis Curves of Potential Transformers Based on Frequency Referring
10.1109/TPWRD.2021.3119272	New Compact White-Box Transformer Model for the Calculation of Electromagnetic Transients
10.1109/TPWRD.2021.3085961	Ladder Network Synthesis in Wide Frequency Range for Transformer Winding From its Driving-Point Admittance Data
10.1109/TPWRD.2021.3067863	Double-End Excitation of A Single Isolated Transformer Winding: An Improved Frequency Response Analysis for Fault Detection
10.1109/TPWRD.2021.3054059	Modified Preisach model of hysteresis in multi air gap ferrite core medium frequency transformer
10.1109/TPWRD.2021.3070075	Fast and Complete Mitigation of Residual Flux in Current Transformers Suitable for Auto-Reclosing Schemes Using Jiles-Atherton Modeling
10.1109/TPWRD.2021.3076871	Vibration and Noise characteristics of Air-Core Reactor Used in HVDC Converter stations
10.1109/TPWRD.2021.3049505	Ageing Analysis of Solar Farm Inverter Transformers
10.1109/TPWRD.2021.3102075	Prediction of Insulation Sensitive Parameters of Power Transformer using Detrended Fluctuation Analysis Based Method
10.1109/TPWRD.2021.3092397	Improved Approach for Identification of Inter-Turn Fault Location in Transformer Windings using Sweep Frequency Response Analysis
10.1109/TPWRD.2021.3103455	Early Warning of Incipient Faults for Power Transformer Based on DGA Using a Two-Stage Feature Extraction Technique
10.1109/TPWRD.2021.3103455	A Top-Oil Thermal Model for Power Transformers that Considers Weather Factors
10.1109/TPWRD.2021.3111709	A Novel Methodology to Estimate the Nonlinear Magnetizing Characteristic of Single-Phase Transformers using Minimum Information

It is important for all interested individuals to follow the norm for writing papers as provided in IEEE. The link is <https://cmte.ieee.org/tpwrdr/>, particularly helpful is “How to Write for Technical Periodicals and Conferences”: <http://ieeethauthorcenter.ieee.org/wp-content/uploads/How-to-Write-for-Technical-Periodicals-and-Conferences-1.pdf>

I would like to thank all of the reviewers who volunteered for this effort and donated their time. In particular, those CM and AP who have participated in the review process during 2021:

Attila Gyore
David Wallach
Del Vecchio
Ed teNyenhuis
Enrique Betancourt
Igor Žiger
Jim McBride
Joseph Tedesco

Their important contribution helps to maintain the high standards for our papers and it gives back to the industry their expert knowledge.

I would like to encourage everyone associated with IEEE Transformers Committee activities to consider becoming a Reviewer. Who are interested, please, send me an e-mail to xmlopez@ieee.org specifying any “Specialty / Area of Expertise” of interest, such as:

Power Transformers
Instrument Transformers
Insulating fluids category
Insulation life
Audible Noise and Vibration
Transformer Modeling Techniques
HVDC Converter Transformers
Reactors
Monitoring
Design
Heating
Etc.

APPENDIX 8

IEEE Staff Update Presentation

IEEE STANDARDS ASSOCIATION - TRANSFORMER COMMITTEE

PE/ TRANSFORMERS ADMINISTRATIVE SUBCOMMITTEE

FALL 2021

MALIA ZAMAN

M.ZAMAN@IEEE.ORG

AGENDA

- SA Updates
- PAR/Standards Status Update
- SCC04 Transition Discussion
- Policy Updates
 - IEEE SA Working Group Awards
 - Policy update on Adoption of Specifications (e.g. Cigre)
 - Consent to IEEE Privacy Policy
 - WG Chair Fundamental Training
 - IEEE SA template training modules
- IEEE/IEC Dual Logo Status
- Annex : Draft Sharing steps

IEEE-SA UPDATES – PAR/STANDARDS STATUS

Expiring PARS:

2021 – 8 PARS are expiring

- 1 PARs in SA Ballot stage
- 5 PARS are on the NesCom for PAR extensions
- 3 PARs recommended for Approval Oct 23rd
- 4 in WG development stage

2022 - 17 PARS are expiring

- 3 in Comment resolution/SA ballot
- 13 in WG Development stage
- 1 on Dec. 7th RevCom Agenda

Expiring Standards in 2021

- 8 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

STANDARDS COORDINATING COMMITTEE OVERVIEW

- There has been an IEEE SASB Ad Hoc Evaluating SCCs within IEEE SA Governance that has been reviewing the structure of SCC's.
- The consensus of the SASB Ad Hoc is to consider
 - unsettling those SCCs that have no past or current IEEE standards
 - Vibrant SCCs should consider moving under an IEEE SA Board of Governors committee as full-fledged Standards Committees
 - Those that struggle with volunteers should consider moving to an existing Society or Council
- Over the past year conversations have been had about a possible transition from SCC04 reporting into the SASB as a Standards Coordinating
- Committee to a Standards Committee. If TR does not accept the transition because the scope may be a concern, SASB will then look at placing SCC04 in a Standards and Standards Innovation (S&SI) SMDC which reports directly to the IEEE SA Board of Governors.
- Strategic Management and Delivery Committees (SMDCs) are established by the IEEE SA Board of Governors (BOG) to address strategic focus areas that are necessary and critical for the IEEE SA to achieve long-term organizational objectives.
- **SCC04 is a small SCC that typically meets in conjunction with the Transformers Committee**
 - 1 Active PAR (P1)
 - 3 Active Standards (IEEE 1, IEEE 98, IEEE 99)

SCC04 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.

SCC04 ACTIVE PAR

- **Active PAR – P1**

- Title: Recommended Practice - General Principles for Temperature Limits in the Rating of Electrical Equipment and for the Evaluation of Electrical Insulation

- **IEEE 98 – 2016**

- Title : IEEE Standard for the Preparation of Test Procedures for the Thermal Evaluation of Solid Electrical Insulating Materials

- **IEEE 99 – 2019**

- Title: IEEE Recommended Practice for the Preparation of Test Procedures for the Thermal Evaluation of Insulation Systems for Electrical Equipment

POSSIBLE TRANSITION OF SCC04

- SCC04 has a small membership, several members are also members of PE/TR
- SCC04 could transition as a Working Group or a new Subcommittee
 - **Working Group:** Possibly within
 - Administrative Subcommittee,
 - Insulation Life or
 - Standards Subcommittee
 - Working Group Chair could oversee all PARs/Standards that SCC04 currently maintains, and create Project Groups to maintain the individual projects

WORKING GROUP AWARDS



- On 1 July 2021, IEEE SA added a Working Group Awards Submission feature to its myProject application.
- This feature allows a Working Group Chair or Vice-Chair to populate a list of award recipients based on the participation levels set for your Working Group participant list.
- The system will automatically pull the recipient's address from their IEEE account profile if they have provided one.
- You can then select the type of award the individual should receive and a delivery method.
- Plaques are typically provided to the Working Group Officers and certificates to the members. Once all selections are made, the information can be submitted to the IEEE SA Awards Administrator for processing.
- The feature will be available for standards approved after 22 September 2021, and is preferred. [Working Group Awards](#) submissions via the existing method will continue to be available until further notice.
- For detailed instructions on how to use the new feature, please see the following document:
<https://sagroups.ieee.org/myproject-help/wp-content/uploads/sites/135/2021/07/Working-Group-Awards-Help.pdf>.
- If you have any questions, please contact WG-Awards@ieee.org or your Program Manager

ADOPTIONS

- A Procedures Committee (ProCom) change request was reviewed and approved by the SASB to update the existing P&P language which was ambiguous with respect to IEEE SA adopting documents

IEEE SASB Operations Manual

- **5.6 Adoption:** The adoption processes within IEEE allow for IEEE standards to be adopted by recognized standards organizations (see 5.6.1) and for IEEE to adopt standards and specifications from other organizations (see 5.6.2).
 - **5.6.1 Process for adoption of IEEE Standards**
 - **5.6.2.4 Adoption of standards and specifications**
 - This text removes the ambiguity and allows for the potential adoption of specifications, such as CIGRE

Note: Changes to take effect in January 2022

CONSENT TO IEEE PRIVACY POLICY

- 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>.
- If you find that your iMeet account has been deactivated for not consenting to the IEEE Privacy Policy, please contact; **standards-support@ieee.org**
- 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 SA STANDARDS WORKING GROUP CHAIR FUNDAMENTALS

- There are 14 Modules available for Working Group Chairs , it is available via the following link :

<https://iln.ieee.org/Public/ContentDetails.aspx?id=AE404C2328DA4A39AAD7AB5117681F05>

- There are also 12 modules available Working group chairs available in Mandarin
<https://iln.ieee.org/Public/ContentDetails.aspx?id=C08D783819D24C5A9EF37CF41DD17DC7>
- These modules are free for IEEE and IEEE non members as long as you have an IEEE Web account. For non members you may need to create a web account
- The following print screen go through some of the initial process.

IEEE SA STANDARDS WORKING GROUP CHAIR FUNDAMENTALS

The screenshot shows a web browser window displaying the IEEE Learning Network website. The browser's address bar shows the URL: ln.ieee.org/public/contentdetails.aspx?id=AE404C2328DA4A39AAD7A85117681F05. The website header includes navigation links like 'IEEE.org', 'IEEE Xplore Digital Library', 'IEEE Standards', 'IEEE Spectrum', and 'More Sites'. A search bar is present with the text 'Browse Catalog' and 'Search Catalog'. The main content area features the course title 'IEEE SA Standards Working Group Chair Fundamentals' and a 'Course Program' section. The course description states: 'As Chair of an IEEE Standards Working Group, you play a unique role within the IEEE SA. This course will help you confidently execute the duties of that role by providing the information you need to understand both your responsibilities and the environment in which you will operate. This deeper understanding will position you to lead your Working Group through the challenges of drafting and completing an IEEE Standard! Consisting of twelve modules, Standards Working Group Chair Fundamentals explores the intricacies of Working Group leadership and assists new and aspirational Working Group Chairs in navigating the complexities of the standards development process. You will explore topics such as organizational values, legal considerations, processes, the establishment of policies and procedures, and Working Group meeting best practices. The bottom line? You'll complete this course as a better, stronger Chair, knowing how to serve your Working Group with established best practices.' The audience is listed as 'Working Group Chairs and those aspiring to serve as a Chair; working group members, individuals and entities thinking of participating in the IEEE Standards Development process.' The publication year is 2020. On the right side, there is a pricing table with an 'Add to Cart' button. Below the table, there is a link 'Not a member? Join IEEE'. At the bottom right, there is a video thumbnail titled 'WORKING GROUP CHAIR FUNDAMENTALS' with the subtitle 'VOLUNTEER TRAINING INITIATIVE'.

IEEE.org | IEEE Xplore Digital Library | IEEE Standards | IEEE Spectrum | More Sites

Cart (0) | Create Account | Sign In

IEEE Learning Network

Browse Catalog Search Catalog

IEEE SA Standards Working Group Chair Fundamentals

Course Program

As Chair of an IEEE Standards Working Group, you play a unique role within the IEEE SA. This course will help you confidently execute the duties of that role by providing the information you need to understand both your responsibilities and the environment in which you will operate. This deeper understanding will position you to lead your Working Group through the challenges of drafting and completing an IEEE Standard! Consisting of twelve modules, Standards Working Group Chair Fundamentals explores the intricacies of Working Group leadership and assists new and aspirational Working Group Chairs in navigating the complexities of the standards development process. You will explore topics such as organizational values, legal considerations, processes, the establishment of policies and procedures, and Working Group meeting best practices. The bottom line? You'll complete this course as a better, stronger Chair, knowing how to serve your Working Group with established best practices.

Audience: Working Group Chairs and those aspiring to serve as a Chair; working group members, individuals and entities thinking of participating in the IEEE Standards Development process.

Publication Year: 2020

IEEE member	\$0.00
IEEE student member	\$0.00
Sponsoring society member	\$0.00
Sponsoring society student member	\$0.00
Non-IEEE member	\$0.00

[Add to Cart](#)

[Not a member? Join IEEE](#)

IEEE SA
WORKING GROUP CHAIR FUNDAMENTALS
VOLUNTEER TRAINING INITIATIVE

IEEE SA STANDARDS WORKING GROUP CHAIR FUNDAMENTALS – CONT'D

The screenshot shows a web browser window with the URL iee.org/cart/public/myCart/page.html?refSite=https://iln.ieee.org&refSiteName=ILN. The page header includes navigation links like "IEEE.org", "IEEE Xplore Digital Library", and "IEEE Standards". The user is identified as "MALIA ZAMAN" with a "Cart (1)".

IEEE CHECKOUT

My Cart [Return to ILN](#)

General Items

Description	Quantity	Product Price
IEEE SA Standards Working Group Chair Fundamentals Format: Multimedia	1	\$0.00

[Remove](#)

***Net Amount USD: 0.00**

Items in your cart will remain for up to 30 days and will always reflect the most current price and availability.

[Proceed to Checkout](#) [Questions?](#)

IEEE SA STANDARDS WORKING GROUP CHAIR FUNDAMENTALS – CONT'D

The screenshot shows a web browser window with the URL ieeepc.org/cart/order/viewConfirmation.html?orderId=iThwqMFYwgx86pFLNfL2Mw%3D%3D&transGradeCode=INDV. The page displays a confirmation message and a table of items.

Thank you for your order. You will receive an order confirmation email at malia.zamai. [Expand panel to show video](#)

Please note the following about Resource Center product(s) you just purchased:

- » To view video(s) or download document(s) you purchased, please click on the link(s) below.
- » For webinar registration(s), please note that you will receive additional information regarding the upcoming live event(s) via email shortly.
- » To view or download content included in a bundle, please click on the name of the product in question below.

General Items						
Description	Quantity	Shipping	Product Price	Tax Rate	Tax Amount	Product Total
IEEE SA Standards Working Group Chair Fundamentals Format: Multimedia	1		\$0.00			\$0.00

Order details:
Order number: 1-16737189596
Date 06-Jan-2021
Member/Customer number:
97531823

Discount Available: \$0.00

Agenda_TC109....docx Standards Develo....pptx

Show all

IEEE SA STANDARDS WORKING GROUP CHAIR FUNDAMENTALS – CONT'D

The screenshot shows a web browser displaying the IEEE Standards Working Group Chair Fundamentals course page. The browser's address bar shows the URL: <https://www.ieee.org/ContentDetails.aspx?id=AE404C2328DA4A39AAD7AB5117681F05>. The page header includes the IEEE logo and navigation links. The main content area features a video player with the title "WORKING GROUP CHAIR FUNDAMENTALS" and a description of the course. The course is provided by the Standards Association, has a course number of SAPO0, and is worth 0.4 CEU and 4 PDH. The page also lists the titles within the course program, including "SAPO01 IEEE SA Standards Working Group Chair Fundamentals".

Expand panel to show video

WORKING GROUP CHAIR FUNDAMENTALS
Introduction to the IEEE Standards Working Group Chair Fundamentals course.

Course Provider: Standards Association
Course Number: SAPO0
Credits: 0.4 CEU / 4 PDH

Item Details:

Titles Within Course Program

SAPO01 IEEE SA Standards Working Group Chair Fundamentals

14 of the 14 training activities below are required for completion of the curriculum and may be completed in any order.

Title	Credits	Status	Equivalent Course Completed
IEEE SA Standards Working Group Chair Fundamentals: Course Introduction	None	Not Enrolled	
IEEE SA Standards Working Group Chair Fundamentals Module 1: What is a Working Group?	None	Not Enrolled	
IEEE SA Standards Working Group Chair Fundamentals Module 2: Large Considerations	None	Not Enrolled	
IEEE SA Standards Working Group Chair Fundamentals Module 3: Return to Field Help	None	Not Enrolled	
IEEE SA Standards Working Group Chair Fundamentals Module 4:	None	Not Enrolled	

NEW WG CHAIR GUIDANCE





- **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

NEW MS WORD TEMPLATE TRAINING VIDEOS

- Release of updated and expanded MS Word template training videos, available at: <https://standards.ieee.org/develop/drafting-standard/resources.html>
- These replace the older videos and demonstrate our current practices. They also reflect our current branding and step by step instructions showing how to carry out certain functions within SA's MS Word template.

Microsoft Word® Template: How-to Video Tutorials

Select the titles below to view a video tutorial for a specific topic related to the use of the Microsoft Word® template. During these instructional videos, we'll cover important information to assist Working Groups as they draft an IEEE standard. These tutorials are loosely arranged in the order they will be encountered when working through the template.

 <p>Required Information</p>	<p>Required Information</p> <p>This video tutorial walks you through the process of completing the Required Information section of a draft standard.</p>
 <p>Table of Contents</p>	<p>Table of Contents</p> <p>Learn how to add and update the Table of Contents in a draft standard.</p>
 <p>Definitions</p>	<p>Definitions</p> <p>Provides assistance when adding and formatting definitions of terms in a draft standard.</p>
 <p>Clause and Subclause Headers + Numbered</p>	<p>Clause and Subclause Headers + Numbered</p>

IEEE/IEC DUAL LOGO UPDATE (ACTIVE PROJECTS)

- **Joint Development of standards with IEC**
- **Published Standards**
 - IEC/IEEE 65700-19-03:2014, Standard Requirements, Terminology, and Test Code for Bushings for DC Applications Rated 110 kV BIL and Above
 - Revision work discussed. No PAR submitted yet, IEC has issued questionnaire
 - IEC/IEEE 60076-57-1202:2016, Standard Requirements for Liquid Immersed Phase-Shifting Transformers
 - IEC/IEEE 60076-57-129:2017, Converter Transformers for HVDC Applications
 - IEC/IEEE 60076-16-2018, Standard Requirements for Wind Turbine Generator Transformers
 - IEEE PC57.15/IEC 60076-21, Guide for the Application, Specification and Testing of Phase-Shifting Transformers
- **Standards Under Development**
 - **IEC/IEEE P63253-5713-8**, Standard Requirements for Station Service Voltage Transformers
 - PAR extension has been submitted for the December 2021 NESCom meeting
 - IEC COMPLETED CD, **IEEE SA Ballot will be during CDV stage**

IEEE/IEC DUAL LOGO UPDATE (ACTIVE PROJECTS)

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

ANNEX – PAST TRAINING

DRAFT SHARING POLICY

- 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

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

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.”

- o 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.
- o A list of established relationships for the purposes of draft sharing is available on the [Working Group Draft Sharing List for Coordination](#).
 - o If the IEEE SA WG believes that the draft sharing relationship has already been established, the WG Chair should contact the Program Manager.
- o The Working Group Chair reviews the [Working Group Draft Sharing List for Coordination](#) to determine if the draft sharing relationship has been established.
 - o 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”).
 - o If the draft sharing relationship has been established:
 - o 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.
 - o 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).

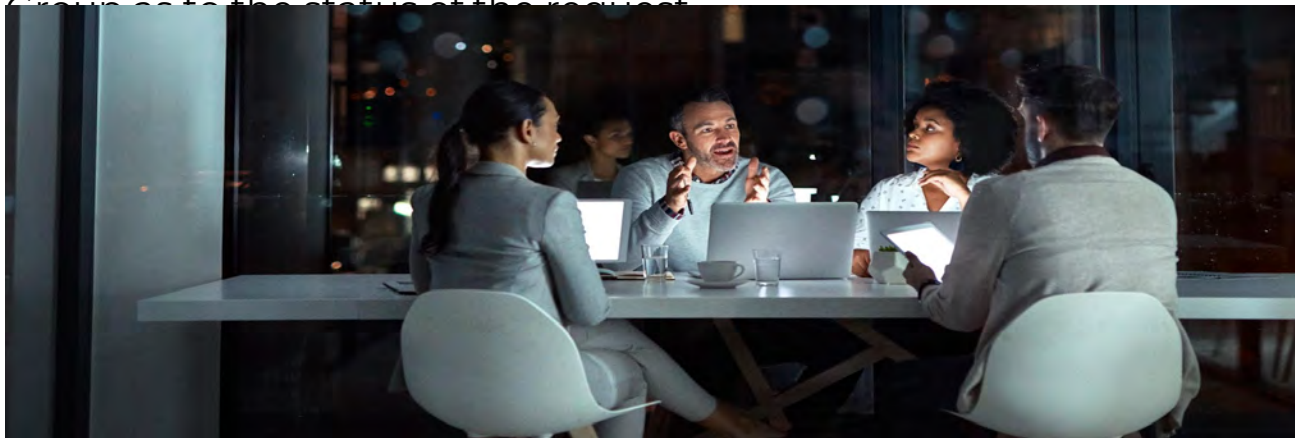
Note: Additional steps may be needed as some organizations external to IEEE have their own processes.

ESTABLISHING THE DRAFT SHARING RELATIONSHIP

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

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.*

QUESTIONS?



CONTACT US!

Malia Zaman

Senior Program Manager

M.zaman@ieee.org

(732) 850 6608

APPENDIX 9

Meeting Planning

Meetings Planning SC

Fall 2021 Meeting

VIRTUAL

Subcommittee Meeting

Report Out

Tammy Behrens

SPX Transformer Solutions

Meetings Subcommittee Chair

Fall 2021 (F21) Virtual Meeting

THANK YOU TO OUR ENCORE MEETING TEAM!

Kevin Franklin

Daniel Lantzy

Cynthia Jordan

Dustin Roberson

ALL THE ROOM, RECORDS, CHIME PORTAL TECHNICIANS:

Nathan Swearingen

Justin Jacobs

David Marett

Glen Conner

Daniel Salazar

Rony Andrade

Paul Vaughn

Jeremy Jones

Kenneth Cole

Patrick Leal

Keith Jackson

Bobby Bosmond

Michael Shipman

Jay Jared

Meeting Attendance

	2019 Spring Anaheim	2019 Fall Columbus	2020 Spring Charlotte	2020 Fall VIRTUAL	2021 Spring VIRTUAL	2021 Fall VIRTUAL
Attendees	596 (605 – 9)	603 (606 – 3)	538 <i>CANCELLED</i>	508	549	526
Spouses/ Companions/ Guests	79 (80 – 1)	47 (48 – 1)				

Newcomers Orientation On Demand Available As Soon As Portal Opened

Awards Presentation

Presented Live via WebEx

Tuesday 12:15 PM

Recording Available on Password-Protected Section of Committee Website and ON DEMAND

Meetings

Subcommittee Mtg

On Demand

Available Wednesday PM

Virtual Meeting FEEDBACK

Feedback Received

- With the exception of some technicians not muting themselves during meetings and one case of a tech not remembering how to launch a poll, no other complaints have been registered during this meeting (so far)
- Despite a number of reminders pre-meeting, we still have a handful of people that did not update their WebEx profiles
 - Push notification was sent out Monday morning as yet another reminder to general attendees to update their WebEx profiles with their full name and email address used to register for the meeting
- Overall, while not as good as in-person meetings, attendees and leaders are utilizing the technology to make progress with few issues

Meetings Subcommittee Volunteer UPDATES

Tasks and Volunteers

- Presentations & Tutorials: Tom Prevost
- Break Sponsors: Ed Smith
- Website: Sue McNelly & Kris Zibert
- Mobile App: David Wallach (no report for this meeting)
- RFID: Kris Zibert & Dan Weyer
- Meeting Schedule: Jerry Murphy

Tom Prevost

TUTORIALS

Tutorial Proposals in the Queue

With none in the queue, **we need more proposals!**

Contact Tom Prevost at tprevost@ieee.org for information on submitting a tutorial proposal.

Ed Smith

BREAK SPONSORS

Break Sponsor Opportunities

- Break sponsors scheduled for the spring and fall 2020 meetings as well as the spring 2021 and fall 2021 meetings were moved to the next in-person meetings, with the rest of the schedule pushed out accordingly
- Spring 2023 – Two available break sponsorships remaining, one on Monday and one on Wednesday
- Fall 2024 – 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.

Sue McNelly & Kris Zibert

WEBSITE

new platform as
of S19 meeting

Committee Website Update

- New design platform starting with the Spring 2019 meeting
- Easier to navigate and send links to specific sections of the site
- Previous IEEE server change resulted in broken links — all have been fixed, but please contact Sue or Kris if you find something that was missed



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

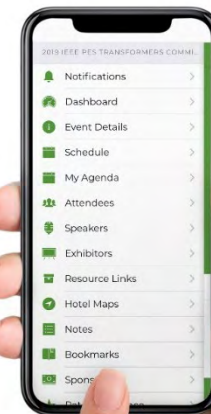
David Wallach

NEW MEETING APP

IEEE

EventHub

when in-person meetings resume



Kris Zibert & Dan Weyer

RFID

RFID System Update

- SerialIO is the company with which we have contracted for the RFID cloud system utilized at in-person meetings to record and communicate attendance and manage paid event entry
- With new meeting management application (replacing 123signup), we will need to evaluate SerialIO compatibility
- Updates to system being investigated before app change
 - 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.

Jerry Murphy

MEETING SCHEDULE

Meeting Schedule Update

- Template developed by Sue McNelly has simplified a number of scheduling tasks
 - Schedule layout
 - Visibility of group leadership, including email addresses
 - Sorting by subcommittee
 - Report distribution from RFID system
 - Meeting room signage
- Immediately following each meeting, Jerry starts compiling the next meeting schedule for early release to group leaders
- Prompt review and better communication between Jerry and WG/TF chairs needed to lessen schedule revisions once published

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

Upcoming Meetings

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



SPRING 2023 — March 19-23

Milwaukee, WI USA

Hyatt Regency

FALL 2023 — October 22-26

Kansas City, MO USA

Westin Kansas City at Crown Center

WEBSITE

Username: (removed - not published in minutes)

Password: (removed - not published in minutes)

effective November 19, 2021

*This new password will also be announced during
Thursday's closing session.*

When this fall 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 10

Treasurer's Report

MEMORANDUM

November 4 2021

To: Bruce Forsyth, Chair
IEEE PES Transformers Committee

RE: IEEE PES Transformers Committee Treasurer's Report
Fall 2021 Meeting
(for reporting period 02/01/2021 to 08/31/2021)

Dear Bruce,

The finances of the Committee are in sound condition. As of August 31st (end of this reporting period), the balance in our account was \$143,299.17.

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

Report period highlights include,

- the Fall 2020 and Spring 2021 meetings reported profits because of lower expenses associated with virtual meetings,
- a 2021 Audit will not be required because we do not meet the minimum revenue/expense threshold,
- the IEEE banking system transitioned to the NextGen Banking System on May 1st,
- the Treasurer Officer position transitioned from Paul Boman Hartford Steam Boiler to Troy Tanaka, Burns & McDonnell on July 1, 2021.

See attached summary of the balance of this reporting period, and the previous periods.

Sincerely,



Troy Tanaka, Treasurer
IEEE PES Transformers Committee

IEEE PES TRANSFORMERS COMMITTEE
Treasurer's Report - Fall 2021
(for reporting period 02/01/2021 to 08/31/2021)

AAAAA	Balance before Fall 2019 Meeting, as of 08/31/2019	\$93,611.60
AAAA	Balance before Spring 2020 Meeting, as of 01/31/2020	\$119,318.89
AAA	Balance before Fall 2020 Meeting, as of 08/31/2020	\$110,945.49
AA	Balance before Spring 2021 Meeting, as of 1/31/2021	\$139,774.19

Misc Income, not related to a specific meeting

B.1	interest, approx 6 months	\$296.22
B.2	misc income; shirt sales, CD-ROM sales, book sales, etc.	\$0.00

B	Total Misc Income, not meeting related	\$296.22
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Misc Expenses, not related to a specific meeting

c.1	subscription fees, 123Signup, Authorized Net, Paypal	(\$180.00)
c.2	awards	(\$170.21)
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	(\$350.21)
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Fall 2020 Meeting

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), Fall 2020 Meeting	\$0.00
	reported prelim. gain/(loss), as of 01/31/2021, from previous Treasurer's Report	\$27,873.63
	Actual Gain/(Loss), Fall 2020 Meeting	\$27,873.63

Spring 2021 Meeting

E.1	income, meeting registrations	\$75,230.00
E.2	income, coffee break sponsors	\$0.00
E.3	meeting expenses	(\$54,417.70)

E	Income minus expenses (between 02/01/2021 and 08/31/2021)	\$20,812.30
	meeting income (expenses), before 01/31/2021	\$0.00
	<u>Preliminary</u> Gain/(Loss), Spring 2021 Meeting	\$20,812.30

Expenses, Future Meetings (deposits paid, etc)

FF	future meeting income (expenses), paid 09/01/2020 to 01/31/2021	\$0.00
FFF	future meeting income (expenses), paid 02/01/2021 to 08/31/2021	\$2,500.00

G	Net Income (loss), between Fall 2020 and Spring 2021 meetings (B+C+D+E)	\$20,758.31
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A	Balance before Fall 2021 Meeting , as of 08/31/2021 [(AA + FFF) + G]	\$163,032.50
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* Note - This balance includes one new meeting sponsorship and the transfer forward of two previous sponsorships.

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

Sum of Credit/(Debit)		Meeting								
Category	Subcategory	22S	21U	21S	20U	20S	20F	19U	19S	19F
1.2	Corporate	\$7,500.00							\$7,500.00	\$7,500.00
1.2 Total		\$7,500.00							\$7,500.00	\$7,500.00
2.1	Commission Meeting			\$75,230.00		\$10.75	\$69,430.00		\$3,551.74	\$2,896.09
2.1 Total				\$75,230.00		\$10.75	\$69,430.00		\$258,055.05	\$238,335.85
3.4	Interest		\$341.11		\$1,120.84			\$2,097.59		
3.4 Total			\$341.11		\$1,120.84			\$2,097.59		
4.1	Meeting Shipping Social Venue 123Signup RFID Award		(\$215.00)	(\$54,417.70)	(\$35.00)	(\$567.66)	(\$40,457.90)		(\$237,177.49)	(\$186,025.19)
						(\$541.56)	(\$631.18)		(\$1,199.65)	(\$858.52)
						(\$500.00)			(\$64,833.01)	(\$25,839.53)
									(\$543.84)	
					(\$703.80)			(\$535.98)		
					(\$270.59)				(\$3,397.99)	(\$3,401.01)
				(\$170.21)		(\$188.91)				
4.1 Total			(\$215.00)	(\$54,587.91)	(\$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		\$7,500.00	\$126.11	\$20,642.09	(\$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 F21 to S22.

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 F21 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

November 17th, 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 (Open):	Open Role

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 noted that the Bushing Subcommittee Secretary position was currently open/vacant due to the prior Secretary having changed industries and thus resigned. It was requested that those interested in serving in this role to contact the SC Chair and/or Vice-Chair.

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 there were 7 new members accepted into the Subcommittee.

A.1.4 Attendance

The Chair presented a list of the 85 current voting members before polling the **138 attendees** as of the final count. Three membership polls were issued and all 3 failed to produce a quorum quantity of responses from attending members. Following the meeting the VC performed a sanity check on the last poll and found 11 members had no response during the poll. Per the final attendance poll 38 members responded however, 11 members had no recorded response during the poll. Refer to [Appendix A](#) for meeting participants, their affiliation, and voting member status.

Table 1 – Virtual Meeting Attendance per Official Poll

	Per Official Poll	Per Final Record**
Total	124	138
Members	38	54
Guests (Not sure)	41 (3)	84
Guests Requesting Membership*		8

*Review of the historical attendance records indicate that of the 8 guests requesting membership, 5 meet the eligibility requirements (Juan Carlos Cruz Valdes, Ismail Guner, Parminder Panesar, Cihangir

John Sen, and Christopher Whitten) and will be added to the membership roster effective at the next SC meeting.

**As recorded in AMS system.

A.1.5 Agenda Approval

The Chair advised that the agenda that had been transmitted prior to the meeting. However, as there was no quorum achieved the Agenda could not be approved. The Chair did ask for any comments in regarding the agenda. It was noted that due to the lack of a quorum 19.02 would give the last report so that a final quorum check could be made so that a motion to proceed to ballot could be issued and voted on. As noted previously a quorum was not achieved in the final poll.

A.1.6 Previous Meeting's Minutes Approval

As a quorum was not achieved the previous meeting minutes could not be 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](#).

A.2 Working Group and Taskforce reports

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

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

Par expires at the end of 2022. The WG Chair indicated that several meetings were held between the S21 and F21 meetings to help accelerate the revision process. The current objective is to request to go to ballot at the S22 conference.

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

With the published document expiring in 2027 and very little response at the S21 meeting the Chair decided to wait a couple more years before holding another meeting. The Chair requested that members of the SC send any suggestions in regard to the next revision to him or the SC officers.

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.

The Chair noted in the spring meeting this Draft 2.0 of the document was posted for comment. The Chair received no comments or revision requests for this document draft. The Chair noted that a quorum of members (33 of 57, 58%) were present during the F21 meeting and a motion was made and seconded to request approval to proceed to ballot from the Bushing Subcommittee. Greater than the required 2/3 supermajority of the quorum of members in attendance voted in agreement with the motion, thus the motions carried. Unfortunately, due to a lack of a quorum in the Bushing Subcommittee meeting it was decided an email poll would be sent out to the Bushing Subcommittee members requesting the approval to proceed to ballot with a 12/08/21 deadline to respond.

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

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

As the Subcommittee Chair is acting as an interim Chair for this WG the WG Secretary Mr. Del Rio gave the report to the SC.

Mr. Del Rio reported that the PAR was approved in August and that the first meeting of the WG had 12 attendees requesting membership. It was noted that the Vice-Chair position is vacant and that the WG is looking to fill the role, so it was requested for those interested to reach out to the WG Chair and/or Secretary. Volunteers were requested to start looking into revisions for areas previously identified by the former TF. The volunteers request a word version of the document which will be requested from IEC following the meeting and sent to the volunteers.

Kurt Kainerd also volunteered to assist as a Liaison between IEEE and IEC as he will attend both groups' meetings. Mr. Kainerd also informed the WG that he believes IEC should hold their first meeting after the 1st of the year.

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 WG PC57.19.100-2012 – Tommy Spitzer, Chair; **VACANT, Vice-Chair; VACANT, Secretary**

See complete WG minutes in Appendix F of this report.

The WG Chair noted that Draft 3 would be sent out for review and comment in January. Major item still being discussed within the WG is bushing overload capability. 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 there were several quorum polls made o the meeting attendees and that quorum was able to be achieved. In summary, it was decided that no specific standalone Dry-Type Bushing Guide or Standard is necessary. It was also decided that there is no need for white paper or tutorial to be given on Dry-Type Bushings. It was agreed that continued review and suggestions should be shared with the 19.00 and 19.100 which both have open PARs and will soon be going to ballot.

The TF Chair stated that he believes the work of the TF is complete, and that the individuals can provide input directly to the WG of 19.00 and 19.100 as they are members.

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.

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

The Chair reported there are two comment resolution groups working on all the comments received during the first ballot vote.

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

Dr. Patel was not present, but Mr. Mario Locarno gave an update to the Subcommittee. Plans are to go to ballot next year. Outstanding amount of collaborative work has gone on with the development of this internationally generated guide. The guide contains many case studies and best practices. It should be an excellent reference for people looking to use this technology. At this time, it doesn't appear to replace any existing technology but should complement the diagnostic processes that are available.

A.3.4 Amendment to IEEE 693, Recommended Practice for the Seismic Design of Substations - Durand Stacy

Mr. Duran Stacy volunteered to act as a Liaison for the Bushing Subcommittee and the WG preparing the Amendment to IEEE 693-2018.

Mr. Stacy gave a brief presentation to the Subcommittee as there was a Technical Presentation also scheduled for the following Thursday that would go into more detail. Mr. Stacy discussed how the WG is currently investigating requiring the Dynamic Analysis on all Transformers rated above 138kV that must include the specific bushings they are using as well as the arrestors. This could be difficult for bushing replacements over the life of transformer. The 693 WG is asking for Transformer Committee members to join their WG to provide feedback and suggestion on how best to address the current issues, citing the need to have the additional diversity of experience of transformer and bushing OEM's and End Users as the current composition of the group is predominantly personnel with structural type backgrounds.

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 essentially complete pending final review. Mr. Locarno reviewed some areas that were added and expanded upon with this revision. This section of guide has expanded from 2 pages to over 8 pages in this current revision. Comprehensive content such as Dielectric Frequency Response, hot-collar and tip-up testing, and the use of IR for diagnostics has been added. This revised document is expected to go out for ballot next year.

A.5 New Business

A.6 Adjournment

A.7 Next Meeting: Spring 2022, Denver Colorado - March 27 – 31, 2022

Role	First Name	Last Name	Company
Guest	Kayland	Adams	SPX Transformer Solutions, Inc.
Guest	Elise	Arnold	SGB
Guest	Suresh	Babanna	SPX Transformer Solutions, Inc.
Guest	Barry	Beaster	H-J Family of Companies
Guest	Enrique	Betancourt	Prolec GE
Guest	Thomas	Blackburn	Gene Blackburn Engineering
Member	William	Boettger	Boettger Transformer Consulting LLC
Member	Sanket	Bolar	Megger
Guest	Jeremiah	Bradshaw	Bureau of Reclamation
Guest	Steven	Brzoznowski	Bonneville Power Administration
Guest	Erich	Buchgeher	Siemens Energy
Member	David	Calitz	Siemens Energy
Guest	Juan Alfredo	Carrizales	Prolec GE
Member	Juan	Castellanos	Prolec GE
Member	Arup	Chakraborty	Delta Star Inc.
Guest	Muhammad Ali Masood	Cheema	Northern Transformer
Guest	Larry	Christodoulou	Electric Power Systems
Guest	Juan Carlos	Cruz Valdes	Prolec GE
Guest	Sami	Debass	Electric Power Research Institute (EPRI)
Member	J. Arturo	Del Rio	Siemens Energy
Guest	Brandon	Dent	Memphis Light, Gas & Water
Guest	Stephanie	Denzer	Alliant Energy
Vice-Chair	Scott	Digby	Duke Energy
Member	Huan	Dinh	Hitachi Energy
Guest	Don	Dorris	Nashville Electric Service
Guest	Evgenii	Ermakov	Hitachi Energy
Guest	Marco	Espindola	Hitachi Energy
Member	Eric	Euvrard	RHM International
Guest	Feras	Fattal	Manitoba Hydro
Guest	Reto	Fausch	RF Solutions
Guest	Norman	Field	Stantec
Member	Hugo	Flores	Hitachi Energy
Guest	Anthony	Franchitti	PECO Energy Company
Guest	Raymond	Frazier	Ameren
Member	Eduardo	Garcia Wild	Siemens Energy
Member	David	Geibel	--
Guest	Rob	Ghosh	General Electric
Guest	Shawn	Gossett	Ameren
Guest	Jeffrey	Gragert	Xcel Energy
Member	Bill	Griesacker	Duquesne Light Co.
Guest	Detlev	Gross	Power Diagnostix Consult GmbH

Guest	Ismail	Guner	Hydro-Quebec
Member	Niklas	Gustavsson	Hitachi Energy
Guest	Thomas	Hartmann	Pepco Holdings Inc.
Member	Roger	Hayes	General Electric
Guest	Ronald	Hernandez	Doble Engineering Co.
Guest	John	Herron	Raytech USA
Member	Thang	Hochanh	Surplec Inc.
Guest	Saramma	Hoffman	PPL Electric Utilities
Guest	Ryan	Hogg	Bureau of Reclamation
Guest	Daniel	Huenger	PCORE Electric
Guest	Nicholas	Jensen	Delta Star Inc.
Member	Toby	Johnson	Hunt Electric
Guest	Stephen	Jordan	Tennessee Valley Authority
Member	Kurt	Kaineder	Siemens Energy
Member	Stacey	Kessler	TC Energy
Member	Marek	Kornowski	Polycast International
Member	Axel	Kraemer	Maschinenfabrik Reinhausen
Member	Deepak	Kumaria	Applied Materials
Guest	John	Lackey	PowerNex Associates Inc.
Guest	Donald	Lamontagne	Arizona Public Service Co.
Member	Mario	Locarno	Doble Engineering Co.
Member	Darrell	Mangubat	Siemens Energy SAE
Guest	Balakrishnan	Mani	Virginia Transformer Corp.
Member	Bruno	Mansuy	Trench France SAS
Guest	Dennis	Marlow	DenMar TDS Transformers
Guest	Robert	Mayer	Siemens Energy
Member	Matthew	McFadden	Oncor Electric Delivery
Member	Susan	McNelly	Xcel Energy
Member	Vinay	Mehrotra	SPX Transformer Solutions, Inc.
Guest	Rashed	Minhaz	Transformer Consulting Services Inc.
Guest	Emilio	Morales-Cruz	Qualitrol Company LLC
Guest	David	Murray	Tennessee Valley Authority
Guest	Ryan	Musgrove	Oklahoma Gas & Electric
Guest	Rodrigo	Ocon	Industrias IEM
Guest	Anastasia	O'Malley	Consolidated Edison Co. of NY
Guest	Parminder	Panesar	Virginia Transformer Corp.
Guest	Dipakkumar	Patel	Instrument Transformer Equip Corp
Guest	Rakesh	Patel	Hitachi Energy
Guest	Timothy	Peterson	N. American Substation Services
Member	Sylvain	Plante	Hydro-Quebec
Guest	John	Poelma	NRG Energy
Guest	Adam	Polson	Arizona Public Service Co.
Guest	Homero	Portillo	Advanced Power Technologies

Guest	Donnell	Rackley	RESA Power
Member	Ulf	Radbrandt	Hitachi Energy
Member	Juan	Ramirez	CELECO
Member	Timothy	Raymond	Electric Power Research Institute (EPRI)
Guest	John	Reagan	RWE Renewables
Member	Scott	Reed	MVA
Guest	Jonathan	Reimer	FortisBC
Guest	Clemens	Reiss IV	Custom Materials, Inc.
Member	Pierre	Riffon	Pierre Riffon Consultant Inc.
Guest	Diego	Robalino	Megger
Guest	Zoltan	Roman	GE Grid Solutions
Guest	Mickel	Saad	Hitachi Energy
Guest	Dinesh	Sankarakurup	Duke Energy
Member	Amitabh	Sarkar	Virginia Transformer Corp.
Guest	Roderick	Sauls	Southern Company Services
Member	Steven	Schappell	SPX Transformer Solutions, Inc.
Guest	Markus	Schiessl	SGB
Member	Ewald	Schweiger	Siemens Energy
Guest	Cihangir	Sen	Duke Energy
Member	Devki	Sharma	Entergy
Guest	Peter	Sheridan	SGB USA, Inc.
Member	Stephen	Shull	BBC Electrical Services, Inc.
Guest	Kenneth	Skinger	Scituate Consulting, Inc.
Guest	William	Solano	Instrument Transformer Equip Corp
Member	Sanjib	Som	Pennsylvania Transformer
Guest	Mauricio	Soto	Hitachi Energy
Guest	Brian	Sparling	Dynamic Ratings, Inc.
Member	Thomas	Spitzer	City Transformer Service Co.
Guest	Mike	Spurlock	Spurlock Engineering Services, LLC
Member	Fabian	Stacy	Hitachi Energy
Member	Brad	Staley	Salt River Project
Guest	Hampton	Steele	Tennessee Valley Authority
Guest	Andrew	Steineman	Delta Star Inc.
Member	Troy	Tanaka	Burns & McDonnell
Guest	Ed	teNyenhuis	Hitachi Energy
Member	Alwyn	Van Der Walt	Electrical Consultants, Inc.
Guest	Jacques	Vanier	Electro Composites (2008) ULC
Member	Ajith	Varghese	SPX Transformer Solutions, Inc.
Member	Jason	Varnell	Doble Engineering Co.
Member	Yves	Vermette	Electro Composites ULC
Guest	Richard	vonGemmingen	Dominion Energy
Guest	Loren	Wagenaar	WagenTrans Consulting
Guest	Dieter	Wagner	Hydro One

Member	Hugh	Waldrop	Memphis Light, Gas & Water
Member	David	Wallach	Duke Energy
Chair	Eric	Weatherbee	PCORE Electric
Member	Peter	Werelius	Megger
Guest	William	Whitehead	H2scan Corporation
Guest	Christopher	Whitten	Hitachi Energy
Guest	Malia	Zaman	IEEE
Member	Shibao	Zhang	PCORE Electric
Member	Peter	Zhao	Hydro One
Corr. Member	Kris	Zibert	Allgeier, Martin and Associates
Guest	Waldemar	Ziomek	PTI Transformers

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		1st review meeting was held during S21 meeting. Evaluate again in ~2 years
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
P65700-19-03	IEC/IEEE International Standard -- Bushings for DC application	Interim Eric Weatherbee	2014 12/2024	2021 12/2025	WG Draft Development
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

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, November 15, 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 not a quorum established by lacking of two votes. There were 81 attendees.

The WG Chair presented the agenda with the call for patents, none were received, and that copyright information can be found on the Transformer Committee website. The Chair asked if there were any objections or comments regarding the S21 minutes and none were received. As there was no quorum the approval of the minutes will be delayed until the next meeting.

The chair reported that there were two off-schedule meetings conducted between Spring and Fall meeting, during which, the proposals and recommendations from the review groups were discussed and the dispositions from the discussions were made, pls see notes posted on-line.

Comment	Proposed Change	Disposition Status (accepted/rejected/revise)	Disposition Detail
Need to further clarify the bushing carries the	...such that the bushing carries the current and the rod does not	Rejected	08/25/21 Webex meeting: Unnecessary due to non-current carrying designation in definition.
We have no definition for "ground layer"	add: ground layer : the outermost conductive layer of the internal insulation.	Revised	08/25/21 Webex meeting: Outermost conductive layer of bushing which is intended to be solidly grounded during operation.
We should add a note that dissipation factor used by IEC is practically the same.	Note: Other standards exist which refer to "dissipation factor" which is mathematically different from power factor, but when used to evaluate bushings is virtually identical in value and meaning.	Rejected	08/25/21 Webex meeting: Recommend move to CS 7.15.100. "Note: Dissipation factor and Power factor values are nearly the same when evaluating bushings."
We need to add definition for RIS	add: resin impregnated synthetic insulated bushing : A bushing in which the internal insulation consists of a wound core of untreated synthetic material and subsequently impregnated under vacuum with a filled or unfilled curable resin.	Revised	08/25/21 Webex meeting: A bushing in which the internal insulation consists of a wound core of synthetic material and subsequently impregnated under vacuum with a filled or unfilled curable resin. 09/23/21 Webex meeting: A bushing in which the internal insulation consists of a wound core of synthetic polymer and (subsequently) impregnated with a filled or unfilled curable resin.
Should we define as "C2" and include test taps?	The capacitance between the voltage tap or test tap and the flange and typically referred to as C2.	Revised	08/25/21 Webex meeting: Accept change, and make a change to "main capacitance" in 3.2.4 definition to typically referred to as C1. 09/23/21 Webex meeting: Revise proposal in column 4 as follows: The capacitance between the voltage tap or test tap and the flange and typically referred to as C2. Refer to section 5.2 of this document for further clarification. Revise section 5.2: Since the capacitance from tap to ground (C2) is not controlled and influenced by factors external to the bushing, the tap is not intended for use as a voltage divider during normal operation.

The remaining meeting time focused on review of the comments received from the review group with the attendees.

The chair mentioned that one of the original plan for this Fall's meeting was to conduct a vote process to confirm the dispositions from the review groups. As there was no a quorum established during the meeting, and this vote

Meeting was adjourned at 12:15pm.

Respectfully Submitted,

WG Secretary David Stockton (generated by Peter Zhao)

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.

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

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: D2.0 Dated: April 2021

Meeting Date: November 16, 2021 Time: 10:50 am – 12:05 pm

Attendance:

NAME	Affiliation	M or G	Name	Affiliation	M or G	Name	Affiliation	M or G
Alan Traut	Howard Industries	M	Janusz Szczechowski	Maschinenfabrik Reinhausen	G	Pragnesh Vyas	Sunbelt-Solomon Solutions	M
Alan Wilks	Consultant	M	Jeff Benach	Megger	G	Rakesh Patel	Hitachi Energy	G
Albert Sanchez	Knowlton Utilities Board	G	Jeffrey Door	H-J Family of Companies	G	Ramadan Issack	American Electric Power	M
Ali Ghafourian	H-J Enterprises, Inc.	M	Jerry Murphy	Reedy Creek Energy Services	M	Rehan Ali	Siemens Energy	G
Andrew Larson	Hitachi Energy	G	Jorge Cruz	PTI Transformers	M	Reinaldo Valentin	Duke Energy	M
Angela Amador	EATON Corporation	G	Jose Gamboa	H-J Family of Companies	M	Rhett Chrysler	ERMCO	SEC
Barry Beaster	H-J Family of Companies	M	Joshua Verdell	ERMCO	M	Robert Reece	Georgia Power Co.	G
Carlos Gaytan	Prolec GE	M	Juan Ramirez	CELECO	M	Ronald Hernandez	Doble Engineering Co.	G
Chris Pitts	Howard Industries	G	Katrina Swanson McLeod	Southern Nuclear	G	Said Hachichi	Hydro-Quebec	M
Christopher Whitten	Hitachi Energy	G	Kendrick Hamilton	Power Partners, Inc.	G	Shelby Walters	Howard Industries	M
Daniel Huenger	POORE Electric	G	Lee Matthews	Howard Industries	G	Stefan Schindler	Maschinenfabrik Reinhausen	G
Darren Brown	Howard Industries	M	Malia Zaman	IEEE	G	Stephen Shull	BBC Electrical Services, Inc.	CHR
David Stockton	Stockton Consulting	M	Manoj Kumar Mishra	ASAsoft (Canada) Inc.	G	Thomas Calzen	Weldy-Lamont Associates	M
Donnell Rackley	RESA Power	G	Marek Komowski	Polycast International	M	Timothy Menter	Lincoln Electric System	G
Edward Smith	H-J Family of Companies	VCHR	Mario Locamo	Doble Engineering Co.	G	Timothy Tillery	Howard Industries	M
Eric Weatherbee	POORE Electric	M	Martin Rave	ComEd	M	Troy Tanaka	Burns & McDonnell	G
Fabian Stacy	Hitachi Energy	M	Michael Dahlke	Central Moloney, Inc.	M	Vinay Patel	Consolidated Edison Co. of NY	G
Gary King	Howard Industries	G	Michael Morgan	Duke Energy	M	Kendrick Hamilton	Power Partners, Inc.	G
Huan Dinh	Hitachi Energy	M	Michael Thibault	Pacific Gas & Electric	G	Weijun Li	BrainTree Electric Light Dept.	M
Hugo Flores	Hitachi Energy	M	Orlando Giraldo	H-J Family of Companies	G	William Solano	Instrument Transformer Equip. Corp.	M
Israel Barrientos	Prolec GE	M	Paminder Panesar	Virginia Transformer Corp.	G	Yves Vermette	Electro Composites ULC	M
Jacques Vanier	Electro Composites (2008) ULC	G	Peter Zhao	Hydro One	M	Zoran Goncin	PTI Transformers	G

Meeting Minutes:

The chair called the meeting to order at 10:50 am.

There 68 persons in attendance with 3 guests requesting membership. Attendance is shown in the table above. A quorum was established via a WebEx poll with 33/57 (58%) members participating.

The chair presented the IEEE SA slides for Essential Patent Claims. The chair provided an opportunity for participants to identify patent claim(s)/patent application claim(s) and/or patent

Distribution Transformer Subcommittee Working Group Report

claim(s)/patent application claim(s) of which the participant is personally aware, and that may be essential for the use of this standard. None were identified.

The chair presented the IEEE SA Copyright Policy. He commented that the IEEE-SA's copyright policy is described in Clause 7 of the *IEEE-SA Standards Board Bylaws* and Clause 6.1 of the *IEEE-SA Standards Board Operations Manual*. The Chair stated that any material submitted during standards development, whether verbal, recorded, or in written form, is a Contribution and shall comply with the IEEE-SA Copyright Policy.

The Chair displayed the Agenda for this meeting. The Chair asked for any changes or additions to the displayed Agenda. Hearing none, the Chair declared the Agenda approved as shown.

The Chair stated that the Meeting Minutes of the last meeting were posted on the Transformer Committee website. The Chair asked for any additions or modifications to the Meeting Minutes. Hearing none, the Chair declared the minutes approved as posted.

Old Business

Review of C57.19.02 – Draft 2.0.

The Chair noted in the spring meeting this document was posted for comment. The Chair received no comments or revision requests for this document draft. There was a question regarding document references to C57.19.00, after brief discussion no concerns were noted.

New Business

The Chair asked the group if this document was ready for ballot? Jerry Murphy made a motion to "Move the current draft revision 2.0 of PC57.19.02 to Ballot". The motion was seconded by Hugo Flores. The Chair stated that a 2/3 majority vote of the present WG members would be required for this motion to pass. There was no discussion, and a WebEx poll was presented for the membership vote which resulted in the following results:

The motion passed.

Vote Overview	
FOR	30
AGAINST	1
ABSTAIN	3

No other new business was brought forward and the meeting was adjourned at 11:05 am.

The next meeting is scheduled for the Spring 2022 Transformer Committee meeting.

Submitted by: Rhett Chrysler

Date: 11/17/2021

IEC/IEEE 65700_19_03 DC Bushings WG
 Minutes of 2021 Fall Meeting – Virtual Meeting
 Tuesday, November 16, 2021 Session 5 3:45 – 5:00PM Central time

Eric Weatherbee - Chair

Vacant – Vice Chair

J. Arturo Del Rio – Secretary

This is the first meeting of the WG as the PAR has been approved. The WG for the revision of dual logo 65700.19.03 met virtually in WebEx on Tuesday November 16, 2021, at 3:45 PM

1. Welcoming and Call for Patents, Copyrights

- The meeting was called to order at 3:45 PM by the Chair Eric Weatherbee.
- Currently, the position for Vice Chair is vacant and looking for a volunteer for the roll.
- The call for potentially essential patents and copyrights issues was made. None were reported.

2. Quorum: Not required. First meeting

- The attendance was checked with a Poll from Webex Encore
- There was a total of 16 participants: 12 participants interested in becoming WG members.
- The agenda for the meeting which was circulated by email among previous TF members and guests was approved unanimously.

3. Approval of the previous TF minutes virtual meeting

- There were no objections or comments to the presented minutes from the previous TF meeting, and they were approved.

4. Discussion and Review

The Chair stated that the PAR for the WG has been submitted and approved. The PAR covers the identified topics that according to the IEEE TF need revision.

The Chair made a call for volunteers to start the work on the IEEE-side topics listed in the agenda:

From the IEEE side, the major areas needing standard revision are listed below, followed by the person volunteering to work on the topic:

- A. Incorporating 800 kV DC and 1100 kV DC bushings into the standard including any necessary changes throughout the document: **Kurt Kaineder**

- B. Alignment with 60076-57-129 Transformers for HVDC Applications, such as extended DC polarity reversion test etc.: **Ulf Radbrandt**
- C. Move Voltage Source Converter (VSC) into the standard from Annex: **Ulf Radbrandt**
- D. Resin Impregnated Synthetic (RIS) Bushings to be included. The bushing's core is wound with synthetic fabrics: **Covered under IEC 60137 definition**
- E. Hybrid Insulation Bushings if required: this topic placed on hold as not information available at this time.

5. New Business

- IEC work on the standard revision has not started, awaiting the IEEE PAR and WG approval, now approved.
- IEC Committee Meeting in June 2021 approved the Joint Maintenance Team to revise the DC bushings dual logo standard 65700-19.03.
- Dual Logo Maintenance Team and convenor is being set up. Proposed convenor is Mr Lars Jonsson. IEC call for experts and set up of JMT is scheduled to have responses from the 36A insulated bushings subcommittee by November 26.
- Kurt Kaineder to contact Lars Johnson on timeline details for possible start in January 2022.
- It is expected that joint IEC-IEEE off-cycle meetings be set up to work on the common document, off schedule or just before or after the IEEE Transformer Committee meetings.
- Members have requested a copy of the existing standard document in Word format although it may not be possible to get it from IEC prior to the start of joint meetings.
- Kurt Kaineder has agreed to be liaison between the IEEE and IEC teams since he attends both meetings.

6. Meeting Adjournment @ 4:15 pm

Next meeting:

Spring 2022 – Denver, Colorado USA, March 27 – 31, 2022

Role	First Name	Last Name	Company
Guest	Mubarak	Abbas	Siemens Energy
Member	Steven	Brzoznowski	Bonneville Power Administration
Member	Juan Carlos	Cruz Valdes	Prolec GE
Secretary	J. Arturo	Del Rio	Siemens Energy
Guest	Scott	Digby	Duke Energy
Member	Hugo	Flores	Hitachi Energy
Member	Eduardo	Garcia Wild	Siemens Energy
Member	David	Geibel	--
Member	Kurt	Kaineder	Siemens Energy
Guest	Robert	Middleton	RHM International
Member	Ulf	Radbrandt	Hitachi Energy
Member	Cihangir	Sen	Duke Energy
Member	Fabian	Stacy	Hitachi Energy
Chair	Eric	Weatherbee	PCORE Electric
Member	Peter	Werelius	Megger

C57.19.100 Bushing Application Guide Meeting Minutes

Nov 15, 2021 Virtual Meeting

Tommy Spitzer – Chair

The meeting was called to order at 2:20 with 43 people present but we did not achieve a quorum. I announced that our Secretary Jeff Benach has changed jobs and his new employer is not involved with bushings and wants him attending meetings that are applicable to his new responsibilities so his is forced to resign due to a conflicting meeting. I asked for new volunteers and have a favorable response that has to clear it with his employer.

We performed a second poll but again did not achieve quorum so no business could be conducted, but we did have some open discussions. Durand Stacy pointed out an error in the Spring Meeting Minutes which will be corrected.

The Bushing Committee has determined that this guide is the best place to address bushing loading and Tom Hartman said he is not a member but as a user this issue is important to him and his company if they cannot overload bushings. Steve Brzoznowski also had concerns about how this should be addressed. David Geibel pointed out that overloading is not prohibited but if overloaded there is loss of life, and it will be incumbent on each user to determine their level of acceptance.

There are formulas to determine this loss of life in the current guide. These formulas require the use of a thermal constant that can be obtained from the manufacturer. These formulas were developed for OIP bushings and as such the loss of life is attributed to aging of the paper. Newer solid type bushing will have different reactions to overloading. These also have a thermal constant which can be supplied, and MAY have similar loss of life. They will also have a maximum temperature at which point the material will melt resulting in failure. This issue to be fully addressed would require a change in our PAR scope. Since we are almost ready to ballot this revision it was felt that this should be address in the next revision which should be started soon and not wait for the 10 year life cycle.

It was also pointed out that since bushings are based in steps of current their current rating will be above the maximum current of the transformer so the overload of the transformer and the bushing will not be identical.

I will use this discussion to make a third draft and send out for comments. Due to the upcoming end of the year and holidays I will ask that these comments be back by mid-January and try to get the document in the voting process as soon as possible. I will also be reviewing our member list to remove non-participating members.

We adjourned at 3:05

Reported by: Tommy Spitzer

First Name	Last Name	Company
Kayland	Adams	SPX Transformer Solutions, Inc.
Barry	Beaster	H-J Family of Companies
Thomas	Blackburn	Gene Blackburn Engineering
William	Boettger	Boettger Transformer Consulting LLC
Steven	Brzoznowski	Bonneville Power Administration
Juan Carlos	Cruz Valdes	Prolec GE
Sami	Debass	Electric Power Research Institute (EPRI)
J. Arturo	Del Rio	Siemens Energy
Scott	Digby	Duke Energy
Huan	Dinh	Hitachi Energy
Jeffrey	Door	H-J Family of Companies
Hugo	Flores	Hitachi Energy
Raymond	Frazier	Ameren
Eduardo	Garcia Wild	Siemens Energy
David	Geibel	—
Thomas	Hartmann	Pepco Holdings Inc.
Daniel	Huenger	PCORE Electric
Kurt	Kaineder	Siemens Energy
Gael	Kennedy	GR Kennedy & Associates LLC
Marek	Kornowski	Polycast International
Mario	Locarno	Doble Engineering Co.
Bruno	Mansuy	Trench France SAS
Susan	McNelly	Xcel Energy
Robert	Middleton	RHM International
Zachary	Millard	Great River Energy
Rajkumar	Padmawar	ASAsoft (Canada) Inc
Dipakkumar	Patel	Instrument Transformer Equip Corp
Afshin	Rezaei-Zare	York University
Eric	Schleismann	Southern Company Services
Dan	Schwartz	Quality Switch, Inc.
Devki	Sharma	Entergy
William	Solano	Instrument Transformer Equip Corp
Thomas	Spitzer	City Transformer Service Co.
Fabian	Stacy	Hitachi Energy
Troy	Tanaka	Burns & McDonnell
Dervis	Tekin	Meramec Instrument Transformer Co.
Jacques	Vanier	Electro Composites (2008) ULC
Yves	Vermette	Electro Composites ULC
Loren	Wagenaar	WagenTrans Consulting
Eric	Weatherbee	PCORE Electric
Christopher	Whitten	Hitachi Energy
Shibao	Zhang	PCORE Electric
Peter	Zhao	Hydro One

IEEE/PES TRANSFORMERS COMMITTEE

Bushings Subcommittee

TF Classification and Performance of Dry Type Bushings**Virtual****Monday, November 15, 2021**

The Task Force group met virtually on Monday November 15, 2021, at 3:45 PM Central Time session 2.

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 10 out of 20 members were present.
- In attendance was 12 guests with 4 requesting membership.
- There was a total of 32 participants out of which 10 were members. Attendance list and status is attached in these minutes.

4. Approval of Agenda

- There were no objections to approving the agenda.

5. Approval of the minutes of the April 26, 2021 meeting

- There were no objections to approving the previous minutes.

6. Dry-Type Definitions in existing bushing standards.

Volunteers reviewed existing C57.19.00 and the guide C57.19.100 and provided feedback on what is considered missing definitions or definitions specific to dry type bushings that should be revised on these documents noting that Poorvi Patel and Eric Euvrard not attending this meeting.

- It is noted that a definition of 'dry-type bushing' should be added to the C57.19.00 currently under revision.
- It is noted that a definition of RIS, resin impregnated synthetic, is also missing from the existing C57.19.00 however the WG have already a recommendation for such definition.
- Sebastian Riopel provided the comments, including:
 - Need a definition for RIS (already being discussed in the C57.19.00 WG)
 - Propose to the C57.19.00 WG to add a new definition to C57.19.00: "Dry Type Bushing: A bushing for which the internal insulation does not contain oil

IEEE/PES TRANSFORMERS COMMITTEE

Bushings Subcommittee

or other dielectric liquids and consists of any of the following types of bushings: solid cast insulation (3.10), composite (3.11), resin-bonded paper (3.34), resin-impregnated paper (3.35) or resin-impregnated synthetic (new).” This definition would be complementary to definition 3.27 “Oil Filled Bushing”, while also not excluding the use of a porcelain or similar external insulating envelope.

- On the bushing application guide, the existing document is based on OIP bushing insulation and 105C thermal class. The reference to resin impregnated insulation states that the bushing manufacturer should be contacted.

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

- 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.

Discussion took place around lacking information specific to dry type bushings and what the TF should recommend. As part of the agenda, there were 3 consecutive motions followed by discussions as to decide on further actions and recommendation to the Bushings SC by this TF. Full details are included in the below minutes.

Sebastien Riopel made a motion to create a new document or revise the two existing documents. The motion was not seconded and discussion led to Sebastien withdrawing the motion, in support of the following motions instead.

Mario Locamo made the following motion 1.

Eric Weatherbee made an amendment to make the motion a YES/NO.

Sebastien Riopel seconded the motion 1.

- Motion 1: Move to create a new standard or application guide specific for dry-type bushings.
- Discussion
 - What is the benefit of making this a YES/NO vote. To make a final decision on the need for new documents.
 - Call for vote
- Voting Results - Favor: 2; Against: 7; Abstain: 1. Motion not carried.

IEEE/PES TRANSFORMERS COMMITTEE

Bushings Subcommittee

Mario Locarno made the following motion 2.

Sebastien Riopel seconded the motion 2.

- Motion 2: Move to recommend expediting the needed changes to the existing standard and guide (C57.19.00 and C57.19.100) under revision to include dry-type bushing related material.
- Discussion
 - Call for vote
- Voting Results - Favor: 5; Against: 2; Abstain: 3. Motion carried.

Mario Locarno made the following motion 3.

Kurt Kaineder seconded the motion 3.

Mario Locarno amended his motion to include a presentation, as stated below.

- Motion 3: Move to publish a technical paper or white paper on dry-type bushing aspects and complemented with a technical presentation or tutorial at PES or TC level.
- Discussion
 - What is the purpose of the paper and the presentation? To have an informational paper surrounding the repeated questions surrounding the topic.
 - Specific concerns are noted surrounding different technologies and the potential commercial influence.
 - Call for vote
- Voting Results - Favor: 4; Against: 5; Abstain: 0. 1 no response. Motion not carried.

From these motions, the purpose of this TF will shift based on the outcome of motion 2 which may become redundant or duplicate to the work done at WG level on the revision of those documents. If this is the case, the work of this TF should be considered complete and a new TF under the respective WG be set up with the updated scope.

9. Adjournment

- The Webex meeting was adjourned at 5:10 PM Central Time.

The next meeting:

Spring 2022 – Denver, Colorado USA, March 27 – 31, 2022

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

TF Requirements for Dry Type Bushings – Summary of Chat activity during the Webex meeting

November 15, 2021 3:45 PM from Fabian "Durand" Stacy to everyone: Fabian "Durand" Stacy-Hitachi Energy

November 15, 2021 3:46 PM from Mario Locarno to everyone: Mario Locarno Doble Engineering

November 15, 2021 3:48 PM from Hugo Flores to everyone: Hugo Flores - Hitachi Energy

November 15, 2021 3:48 PM from William J. Solano to everyone: William J. Solano - ITEC -

November 15, 2021 3:49 PM from Kurt Kaineder to everyone: Kurt Kaineder Siemens Energy

November 15, 2021 3:50 PM from Fabian "Durand" Stacy to everyone: Fabian "Durand" Stacy-Hitachi Energy I would like to request membership.

November 15, 2021 3:50 PM from Kendrick Hamilton to everyone: Kendrick Hamilton - Power Partners (Athens, GA)

November 15, 2021 3:50 PM from Juan Carlos Cruz Valdes to everyone: Juan Carlos Cruz Valdes, PROLEC GE, requesting membership

November 15, 2021 3:50 PM from Hugo Flores to everyone: I would also like to request membership

November 15, 2021 3:51 PM from Huan Dinh to everyone: Huan Dinh, Hitachi Energy, requesting membership

November 15, 2021 3:51 PM from Shibao Zhang to everyone: anybody see screen?

November 15, 2021 3:51 PM from Stephen Shull to everyone: Stephen Shull, BBC Electrical Services Inc.

November 15, 2021 3:51 PM from Juan Carlos Cruz Valdes to everyone: There is nothing on screen

November 15, 2021 3:56 PM from Javier Arteaga to everyone: Javier Arteaga - Hitachi Energy

November 15, 2021 4:25 PM from Shibao Zhang to everyone: waht's the purpose of this task force? are we going to make standard or we are part of C57.19.00?

November 15, 2021 4:50 PM from Steve Brzoznowski to everyone: Steve Brzoznowski, BPA, guest

November 15, 2021 4:53 PM from Shibao Zhang to everyone: Can you write down

IEEE/PES TRANSFORMERS COMMITTEE

Bushings Subcommittee

Attendance and membership status

Role	First Name	Last Name	Company
Guest	Edmundo	Arevalo	Bonneville Power Administration
Guest	Javier	Arteaga	Hitachi ABB Power Grids
Guest	Steven	Brzoznowski	Bonneville Power Administration
Guest	Juan Carlos	Cruz Valdes	Prolec GE
Chair	J. Arturo	Del Rio	Siemens Energy
Guest	Brandon	Dent	Memphis Light, Gas & Water
Member	Scott	Digby	Duke Energy
Guest	Huan	Dinh	Hitachi ABB Power Grids
Guest	Feras	Fattal	Manitoba Hydro
Guest	Hugo	Flores	Hitachi ABB Power Grids
Guest	Jose	Gamboa	H-J Family of Companies
Guest	Daniel	Huenger	PCORE Electric
Member	Kurt	Kaineder	Siemens Energy
Guest	Marek	Komowski	Polycast International
Member	Mario	Locarno	Doble Engineering Co.
Guest	Richard	Marek	-
Member	Robert	Middleton	RHM International
Guest	Juan	Ramirez	CELECO
Member	Sebastien	Riopel	Electro Composites ULC
Guest	Eric	Schleismann	Southern Company Services
Guest	Stephen	Shull	BBC Electrical Services, Inc.
Member	William	Solano	Instrument Transformer Equip Corp
Guest	Fabian	Stacy	Hitachi ABB Power Grids
Guest	Hampton	Steele	TVA
Guest	Dervis	Tekin	Meramec Instrument Transformer Co.
Guest	Jacques	Vanier	Electro Composites (2008) ULC
Guest	Yves	Vermette	Electro Composites ULC
Guest	Krishnamurthy	Vijayan	PTI Transformers
Guest	Loren	Wagenaar	WagenTrans Consulting
Member	Eric	Weatherbee	PCORE Electric
Secretary	Christopher	Whitten	Hitachi ABB Power Grids
Member	Shibao	Zhang	PCORE Electric

FALL 2021 MEETING OF IEEE TRANSFORMER BUSHINGS

Location: VIRTUAL Meeting

Date: November 15-18 , 2021

BUSHINGS SUBCOMMITTEE WORKING GROUP AND TASK FORCE MEETINGS

Liaison Reports - IEC Bushing Standardization Activities

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

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. A Preliminary Work Item (PWI) has been opened.
Guide of application for power apparatus bushings	Study the feasibility of this document. A Preliminary Work Item (PWI) has been opened.

IEEE 693 Liaison Report

- IEEE Std 693™, IEEE Recommended Practice for Seismic Design of Substations
 - Current version published 2018
- 1st Technical Presentation on Thursday will cover the open PAR Amendment which will require Structural Dynamics Analysis for Power Transformers above 138kV



IEEE Std 693™-2018

- Transformers are qualified with static analysis
- Bushings >138kV are qualified by performance level time history shake table test
- Arrestors > 90 Duty Cycle Voltage Rating (DCV) are qualified by performance level time history shake table test



Areas of Revision

- Alters the recommendations for Power Transformers, Transformer Bushings, Arrestors and Time Histories (PAR is still in process)
 - Transformers require static analysis, Transformers > 138kV will also require dynamic analysis such that the model is sufficiently detailed to capture the effects of the complete transformer
 - Model shall also include
 - Bushings and Arrestors, Oil Mass, Core and Coil Assembly, Anchorage and Boundary Conditions



Areas of Revision (cont.)

- Standalone qualification for Bushings and Arrestors ~remains the same.
 - However, the specific bushing/arrestor to be used with the Transformer must be included in Transformer analysis
 - Bushing Replacement will be difficult, requiring a new analysis if a bushing or arrestor change is made



693 Amendment WG

- Additional changes are in process
- Working Group is knowledgeable and progressing quickly
- Could use more diversity as far as additional Transformer/Bushing OEMS and End Users
- Contact the WG Chair or Secretary
 - Michael Riley mjriley@bpa.gov
 - Brian Low brian.low@pge.com



Working Group C57.152 Field Test Guide Section 7.3 Bushings

Technical/Editorial Review
November 2021



Field Test Guide Section 7.3 Bushings

Revision of this section is essentially complete pending final review

The Section on *Capacitive bushings, oil or resin impregnated paper, fiber, or synthetic bushings* was revised and DFR was added as a diagnostic test.

The Section on *Field Testing* was revised to add more descriptive content for Power factor or dissipation factor testing.

The Section on *Tip Up testing* was revised.

Also added a chapter on *Dielectric Frequency Response (DFR) for Bushings*

The Section for *Hot Collar testing* was completely re-written.

Added a Section and tables for *Thermal Imaging (infrared) measurements*

In summary the working group has expanded the Bushing Section of this guide from 2 pages of content in the 2013 edition to over 8 pages in the current revision.



Working Group C57.152

Field Test Guide

Section 7.3 Bushings

Any questions?



Dielectric Tests Subcommittee

April 28th, 2021
Virtual meeting

Dielectric Tests Subcommittee		
Chair: Ajith M. Varghese	Vice-Chair: Thang Hochanh	Secretary: Poorvi Patel (not present)
Room: Virtual	Date: April 28 th 2021	Time: 11:00 am to 12:15 pm
Total DTSC Members: 155	Members present at the meeting: 109	Attendance according AMS: 204
Guests present: 95	Membership requested: 3	Membership accepted:2

B.1 Chair's Remarks

The Chair welcomed members and guests to the Fall 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 following three points should be kept in mind for all WG/TF leaders:

- No Commercial activities or discussions of Cost, T&C, patent claims, etc. should be discussed in the meetings
- Discussions should only be of pure technical nature
- Diversity in important – thus Chair, secretary and Vice-chair should not be from the same company.

The Unapproved minutes from the Spring 2021 meeting and the agenda for Fall 2021 meeting was sent out to members and guests 14 days before the Fall 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. Since the Fall meeting was moved the SC Secretary then must submit the SC minutes by December 15th 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- There is a concern of increasing request of PAR extensions, and many may not get extended.

PAR Extensions- before the PAR is requested to be extended please consider the following:

- Focus on timely completion and plan to avoid extensions.
- Encourage Offline meetings – Agenda, Quorum and Minutes are needed
- Avoid scope creep and last minutes additions
- WG should get opportunity to discuss and shall approve extension
- Same shall be documented in minutes

AM Systems will no longer be available from **31st of December 2021**:

- WF/TF leaders and secretary please make sure to backup past information
- AM System **MUST** be used for attendance tracking for now until it goes away.

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

The Chair shared details of upcoming PES sponsored meeting as well as details of next transformer committee. The Spring committee meeting will be held in Denver, CO on the 27th -31th of March 2022. Fall 2022 meeting will be held in Charlotte, NC on the 16th -20th of October 2022 and Spring 2023 Transformer meeting is planned to be March 19th -23th in Milwaukee, WI.

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 2023.

- 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. Par for initiating a WG meeting needs to be established as the guide expire until 2026. There is an opening for Chair and secretary- if you are interested contact DTSC chair or secretary.
- 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.

If PAR extension is needed the last date for that next year is **13 October 2022**.

The chair 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.

If you want to request a membership- please email the secretary 3 guest email requested membership and 2 were granted membership and no members were moved to guest status. The total membership of the Dielectric Subcommittee is today 161 members. To obtain Quorum 80 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 204. Members attendance was 109. And 25 requested membership and 23 members were granted.

Attendance Summary

	Webex
Total Attendees	204
Total # Of Members	161
Members Present	109
Quorum Present	YES (68%)

The virtual DTSC meeting had quorum.

The chair presented the agenda. Pierre Riffon and Dan Sauer moved a motion for approval of the fall agenda. The Agenda was unanimously approved.

The minutes of the Fall 2020 Virtual meeting was presented. Dan Sauer and Hugo Flores made motion to move the minutes for approval. The Spring 2021 minutes was approved unanimously.

B.3 SC Discussions and Motion passed.

In the Fall meeting old business was discussed prior to WG/TF reports. During the meeting there was no time to go over the highlights from all the WG/TF.

The Task force for Winding Insulation Power Factor & Winding Insulation Resistance Limits had brought five motions for approval to the DTSC. A lot of discussion were around the three first motions. Motion 4 and 5 will be brought up in the next DTSC as old business as there was no time to discuss these motions during the Fall 2021 DTSC meeting.

Motion 1

Motion 1

- No limits will be added C57.12.00 or C57.12.90 in regard to Limits for insulation PF (Leave standard as is)
- Recommend typical values identified by this TF be included in C57.168 and C57.152

Table 2 Statistical Analysis of Acceptance values for line frequency power factor (%)

Statistical Parameter	Class I (<69 kV)		Class II (>69 kV)	
	≤1 MVA	>1 MVA and ≤ 10 MVA	>10 MVA and ≤100MVA	>100 MVA
Average	0.495	0.558	0.257	0.332
Median	0.5	0.55	0.25	0.31
90 th percentile	0.69	0.78	0.7	0.63
Typical Range	0.3 - 0.6	0.37 - 0.73	0.15 - 0.35	0.21 - 0.45

PF values are temperature dependent and typical values presented are based on measurement performed between 15-25° C



Diego made a motion – No limit will be added in regards of limits of PF but include recommendation typical values in C57.168 and C57.152. Ali Naderian second of the motion. There were some discussions. Bruce Forsyth made a motion to amend the wording to “Recommend typical value identified by this task force to be included in C57.168 and C57.152. Dan Sauer second this amendment. Amended Motion was passed through a poll:

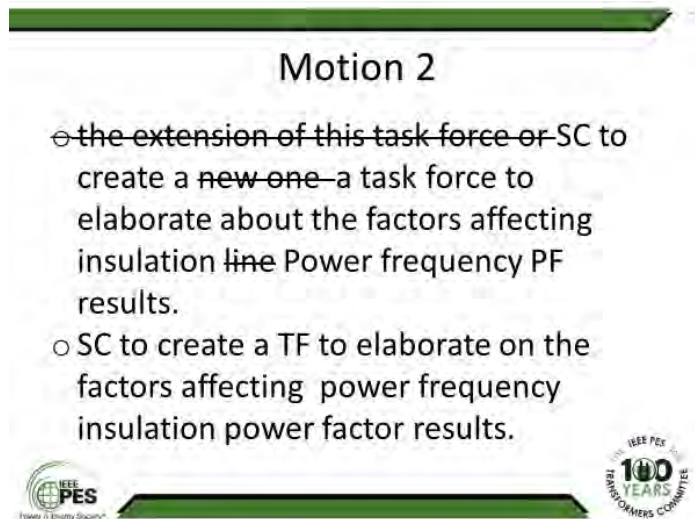
- A.For 54/198 (27%)
- B.Against 7/198 (4%)
- C.Abstain 15/198 (8%)
- No Answer 122/198 (62%)

The Main motion – No limits will be added C57.12.00 or C57.12.90 in regard to Limits for insulation PF (Leave standard as is). Recommend typical values identified by this TF be included in C57.168 and C57.152. Including table. Motion was passed through a poll.

- A.For 57/199 (29%)
- B.Against 9/199 (5%)
- C.Abstain 15/199 (8%)



No Answer 118/199 (59%)

Motion 2



Motion 2

- ~~o the extension of this task force or SC to create a new one~~—a task force to elaborate about the factors affecting insulation line Power frequency PF results.
- o SC to create a TF to elaborate on the factors affecting power frequency insulation power factor results.

Diego made a motion 2- Recommend the extension of this task force or create a new one to elaborate about factors affecting insulation line frequency PF results. Don Dorris second the motion. Discussions- the motion is unclear. Dan Sauer amended the motion to state- SC to create a new TF to elaborate on the factors affecting line frequency insulation power factor results. Hugo Flores second this amendment. Mario Locarno made amendment to Dan Sauer to state Power frequency instead of Line Frequency. Tony Franchetti second that amendment. Dave Geibel suggested to table the main motion to create a new motion. Dan Sauer second that. No opposition on Table the main motion. New wording. SC to create a new TF to elaborate on the factors affecting line frequency insulation power factor results. Dan Sauer motion 1 – Mario Locarno second motion– no opposition – motion approved to create a new TF.

Motion 3

Motion was made by Diego to vote for Motion 3 electronically and park Motion 4 and Motion 5 to the next DTSC meeting. Dave Murrey second that motion. No opposition. Motion was approved. An email will be sent out for Motion 3.

Motion 3

- Modify section 10.10.2 of C57.12.90 and section 9.7.6.4 of C57.15-2018 related to instrumentation accuracy as below:

10.10.2 Instrumentation

The insulation power factor may be measured by special bridge circuits or by the voltampere-watt method. The accuracy of measurement should be within $\pm 0.25\%$ insulation power factor, and the measurement should be made at or near a frequency of 60 Hz.

- a. **Proposed IEEE C57.12.90 Section 10.10.2.**

10.10.2 Instrumentation

The insulation low-frequency power factor or dissipation factor may be measured by special bridge circuits or by the voltampere-watt method. The accuracy of the measurement instrumentation at or near rated frequency should be:

- For Insulation Power Factor (DF) Below 1%: $\pm 2\%$ of reading $\pm 0.05\%$ absolute
- For Insulation Power Factor (DF) Above 1%: $\pm 5\%$ of reading $\pm 0.05\%$ absolute

- b. **Proposed IEC 60076-21 / IEEE C57.15-2018 Section 9.7.6.4**

9.7.6.4 Instrumentation

The insulation low-frequency power factor or dissipation factor (DF) may be measured by special bridge circuits or by the voltampere-watt method. The accuracy of the measurement instrumentation at or near rated frequency should be:

- For Insulation Power Factor (DF) Below 1%: $\pm 2\%$ of reading $\pm 0.05\%$ absolute
- For Insulation Power Factor (DF) Above 1%: $\pm 5\%$ of reading $\pm 0.05\%$ absolute

Motion was passed to vote on this electronically



Planned Motion 4

- No limits will be added to C57.12.00 or C57.12.90 in regard to Limits for insulation Resistance (Leave standard as is)

Due to shortage of time this was not discussed during SC



Planned Motion 5

- Recommend extending this task force or creating a new TF / WG as appropriate to develop a best testing practices for IR testing on transformers including factors affecting IR results.

Due to shortage of time this was not discussed during SC



B.4 Taskforce and Working Group Reports

B.4.1 Working Group Low-Frequency Dielectric Testing for Distribution, Power and Regulating Transformers

Unapproved Meeting Minutes Virtual - WebEx | November 16th, 2021 | 9:25 – 10:40 AM CDT

Chair: Dan Sauer

Vice Chair: -

Secretary: -

Meeting Attendance

The working group met at 9:25AM CST. There were 88 attendees and 18/36 members present. Quorum was not achieved (one short).

Attendance	
	WebEx
Total Attendees	88
Total # Of Members	36
Members Present	18
Quorum Present	50%

Membership

Three guests requested membership, two met the qualifications and will be moved to membership. One volunteered to be our new secretary: Serigo Hernandez Cano – thanks & welcome.

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.

Old Business

- Section 7 – Insulation Power Factor Testing
 - Change “limits” to typical ranges since document is a guide
 - Values from the TF on Insulation Power Factor will be forwarded to us. Diego Robalino volunteer to assist in the rewrite of that section and to include the new values from his TF

New Business

- The chair mentioned that the PAR is valid until December 2022

- Since quorum was not achieved, the previous minutes will be circulated for email approval and the final draft of the document will be circulated for approval to go to ballot.

Meeting ended after the discussion since there was no quorum.

Dan Sauer



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E21 Update: WG PC57.168 LF Di-Test Guide

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

Highlights:

- Submissions were received for Power Factor testing
- Discussion focused on Power Factor limits
 - Document is a guide, so text will be revised to indicate typical ranges, not limits
 - Info from the TF on Power Factor test limits (table) will be added to the guide
- Draft will be updated with this info, and email ballots will be sent out to approve last meetings minutes and the draft for approval to go to sponsor ballot (need 2/3 majority).
- Will look to ballot the SC afterwards as well for approval to go to sponsor ballot



Attendee List:

Name	Company
Stephen Antosz	Stephen Antosz & Associates, Inc
Wallace Binder	WBBinder Consultant
William Boettger	Boettger Transformer Consulting LLC
Sanket Bolar	Megger
Dominique Bolliger, Ph.D.	HV TECHNOLOGIES, Inc.
Jeffrey Britton	Phenix Technologies, Inc.
Jagdish Burde	Virginia Transformer Corp
David Calitz	Siemens Energy
Kurt Carlson	V&F Transformer
Juan Alfredo Carrizales	Prolec GE
Sudip Chanda	Virginia Transformer Corp.
John Crouse	Roswell Alliance
Eric Davis	Burns & McDonnell
Sami Debass	Electric Power Research Institute (EPRI)
Thomas Eagle	SPX Transformer Solutions, Inc.
Marco Espindola	Hitachi Energy
Feras Fattal	Manitoba Hydro
Reto Fausch	RF Solutions
Lorne Gara	Shermco
Eduardo Garcia Wild	Siemens Energy
Rob Ghosh	General Electric
Detlev Gross	Power Diagnostix Consult GmbH
Sergio Hernandez Cano	Hammond Power Solutions
Philip Hopkinson	HVOLT Inc.
Stephen Jordan	Tennessee Valley Authority
Gary King	Howard Industries
Alexander Kraetge	OMICRON electronics Deutschland GmbH
David Larochelle	NDB Technologies
Moonhee Lee	Hammond Power Solutions
Mario Locarno	Doble Engineering Co.
J. Benjamin Lopez	--
Xose Lopez-Fernandez	Universidade de Vigo
Richard Marek	Retired
Robert Mayer	San Diego Gas & Electric
Matthew McFadden	Oncor Electric Delivery
Manoj Kumar Mishra	ASAsoft (Canada) Inc
David Murray	Tennessee Valley Authority
Brady Nesvold	Xcel Energy

Rodrigo Ocon	Industrias IEM
Robert Page	EATON Corporation
Rakesh Patel	Hitachi Energy
Pranav Pattabi	METSCO Energy Solutions Inc.
Harry Pepe	Phenix Technologies, Inc.
Adam Polson	Arizona Public Service Co.
Alvaro Portillo	Ing. Alvaro Portillo
Bertrand Poulin	Hitachi Energy
Ion Radu	Hitachi Energy
Diego Robalino	Megger
Tim Rocque	SPX Transformer Solutions, Inc.
Amitabh Sarkar	Virginia Transformer Corp.
Daniel Sauer	EATON Corporation
Jeffrey Schneider	Power Partners/Spire Power Solutions
Cihangir Sen	Duke Energy
Hemchandra Shertukde	University of Hartford
Christopher Slattery	FirstEnergy Corp.
Mike Spurlock	Spurlock Engineering Services, LLC
Fabian Stacy	Hitachi Energy
Kyle Stechschulte	American Electric Power
Hampton Steele	Tennessee Valley Authority
Janusz Szczechowski	Maschinenfabrik Reinhausen
Ajith Varghese	SPX Transformer Solutions, Inc.
Jos Veens	SMIT Transformatoren B.V.
Loren Wagenaar	WagenTrans Consulting
David Wallach	Duke Energy
Alan Washburn	Burns & McDonnell
Peter Werelius	Megger
Malia Zaman	IEEE
Shibao Zhang	PCORE Electric
Waldemar Ziomek	PTI Transformers

B.4.2 WG C57.113 - Recommended Practice for PD Testing,

Ali Naderian – Chair, Janusz Szczechowski – Vice Chair

John Foschia – Secretary

VIRTUAL MEETING | November 15th, 2021 | 12:55 pm – 13:51 pm CT

Chair: Ali Naderian

Vice Chair/Secretary: Janusz Szczechowski

Meeting Attendance

The working group met virtually at 12:55 pm CT (7:55 pm CET). There were 63 attendees, and 10 members present. Quorum was achieved at 56 %.

Discussions

- The essential patent slides were shown, and no patent claims were noted.
- The copyright policy and important links to additional document were shown.
- Agenda of the meeting (Motion for approval 1. Amitabh Sarkar and 2. Ajith Varghese) and the Spring 2021 Meeting Minutes (Motion for approval 1. Detlev Gross and 2. Reto Fausch) were approved anonymously.
- The chair explained situation with vacant position for working group secretary and asked for volunteers.
- The presentation of Annex A: Coupling methods and circuits was held by Detlev Gross. Basic capacitive coupling circuit was presented with additional information regarding cable connection and impedance matching as well as inductive coupling methods. After presentation there was a short discussion regarding calibration of the circuit.
- Update on the IEC60207 working progress was given to the audience by Detlev Gross. Estimated finalizing of the document during 2022.
- Detlev Gross recommended that chapters 4 and 5 of C57.113 may be useful for inclusion into the IEEE document regarding partial discharge measurements of dry type transformers. Members and the chair agreed to this recommendation.
- Short discussion regarding calibration of the (performance check) of the measuring devices. '
- No new businesses were recorded.
- The meeting was adjourned (Motion 1. Detlev Gross and 2. Reto Fausch) at 01:51 pm CT (08:51 pm CET).

Janusz Szczechowski (11.16.2021)

Role	First Name	Last Name	Company
Guest	Joe	Watson	JD Watson and Associates Inc.
Guest	Steven	Snyder	Hitachi Energy
Guest	Bertrand	Poulin	Hitachi Energy
Guest	Gary	King	Howard Industries
Guest	Jeffrey	Britton	Phenix Technologies, Inc.
Guest	Alain	Bolliger	HV TECHNOLOGIES, Inc.
Guest	Allan	Bartek	Spruce Run Engineering LLC
Member	Reto	Fausch	RF Solutions
Guest	Marnie	Roussell	Entergy
Guest	Waldemar	Ziomek	PTI Transformers
Guest	Ross	McTaggart	Trench Limited
Guest	Mike	Spurlock	Spurlock Engineering Services, LLC
Guest	Alexander	Kraetge	OMICRON electronics Deutschland GmbH
Guest	Rodrigo	Ocon	Industrias IEM
Guest	Hakan	Sahin	Virginia/Georgia Transformer
Guest	Mark	Tostrud	Dynamic Ratings, Inc.
Member	Ajith	Varghese	SPX Transformer Solutions, Inc.
Guest	Baitun	Yang	R.E. Uptegraff
Member	Harry	Pepe	Phenix Technologies, Inc.
Chair	Ali	Naderian	METSCO Energy Solutions Inc.
Guest	Leopoldo	Rodriguez	Transformer Testing Services LLC
Member	Fernando	Leal	Prolec GE
Guest	Eric	Schleismann	Southern Company Services
Guest	William	Solano	Instrument Transformer Equip Corp
Member	Detlev	Gross	Power Diagnostix Consult GmbH
Member	David	Larochelle	NDB Technologies
Member	Amitabh	Sarkar	Virginia Transformer Corp.
Guest	Anthony	Franchitti	PECO Energy Company
Guest	Jeffrey	Gragert	Xcel Energy
Guest	Arup	Chakraborty	Delta Star Inc.
Guest	Peter	Sheridan	SGB USA, Inc.
Guest	Jorge	Cruz	PTI Transformers
Member	Dr. Alexander	Winter	HIGHVOLT Pruftechnik Dresden
Guest	Daniela	Ember Baciu	Hydro-Quebec IREQ
Guest	Feras	Fattal	Manitoba Hydro
Member	Dominique	Bolliger, Ph.D	HV TECHNOLOGIES, Inc.
Vice-Chair	Janusz	Szczechowski	Maschinenfabrik Reinhausen
Guest	Brady	Nesvold	Xcel Energy
Guest	Deepak	Kumaria	Applied Materials
Member	Dan	Schwartz	Quality Switch, Inc.
Member	Dervis	Tekin	Meramec Instrument Transformer Co.
Guest	David	Calitz	Siemens Energy
Guest	Dmitriy	Klempner	Southern California Edison
Guest	Kyle	Stechschulte	American Electric Power
Guest	Shawn	Gossett	Ameren
Guest	Matthew	McFadden	Oncor Electric Delivery
Guest	Jeffrey	Door	H-J Family of Companies
Guest	Risto	Trifunoski	Trench Limited
Guest	Brandon	Dent	Memphis Light, Gas & Water
Guest	Jaroslav	Chorzepa	ABB Inc.
Guest	Michael	Warntjes	American Transmission Co.
Guest	Jacques	Vanier	Electro Composites (2008) ULC
Guest	Taylor	Gray	Portland General Electric (PGE)
Guest	Kannan	Veeran	Georgia Transformer
Guest	Hampton	Steele	Tennessee Valley Authority
Guest	Juan Alfredo	Carrizales	Prolec GE
Guest	Markus	Soeller	Power Diagnostix
Guest	Evan	Knapp	EATON Corporation
Guest	Nathan	Katz	PacifiCorp
Guest	Sudip	Chanda	Virginia Transformer Corp.

F21 Update: WG C57.113 PD Measurement Guide

Quorum: achieved 56% (10 members)

MOM & Agenda: approved

Highlights:

- ❖ Vacant position for secretary
- ❖ Chair shared the PAR extension approval of 2 years
- ❖ Updates to Annex A was presented by Detlev Gross, proposing to add other sensor technologies such as RFCT.
- ❖ Discussion was held regarding the latest development of IEC 60270 and considering harmonization regarding Calibration.



B.4.3 Working Group for Impulse Guide – PC57.98

WG Secretary: John Foschia; WG Chair: Thang Hochanh; WG Vice Chair: Reto Fausch

VIRTUAL MEETING | November 15th, 2021 | 2:20pm – 3:35pm CT

Chair: Thang Hochanh

Vice Chair: Reto Fausch

Secretary: Vacant

Meeting Attendance

The working group met at 2:20pm CT. There were 48 attendees and 12/20 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 12/20 members present.
- No copyright or patent concerns were brought to the attention of the WG.
- It was confirmed with the TF on Impulse Test C57.12.90 (Pierre Riffon) that the limitation of 10% on the k-Factor as per Std-4 2013, is resolved.
- The wording of 2 new sections 4.1., 2.1.1 *Test voltage factor procedure when performing chopped waves* and 4.1.2.1.2 *Test factor and presentation of test results* were discussed within the WG. These clauses will be part of the new revision.
- Some impulses waves which highlight the importance of voltage correction VS the high frequency and high β' of the oscillation of the impulse wave peak, were presented by the chair, Reto Fausch and Jim McBride.

Adjournment

The meeting was adjourned, with a motion by Jim McBride and seconded by Peter Kleine.

Text discussed at the meeting:

4.1.2.1 The transformer effect on the waveshape

.....
.....

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 digital calculation of V_t is **inconsistent**, the following steps are recommended:

- a) Front chopped wave lightning impulse:
There is no correction and V_t is equal to V_e .

b) Tail chopped lightning impulse:

Voltage reduction ratio Method (IEEE Std 4TM 2013, Annex A)

- Apply a reduced full wave (RFW)
- The test voltage procedure provides 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.

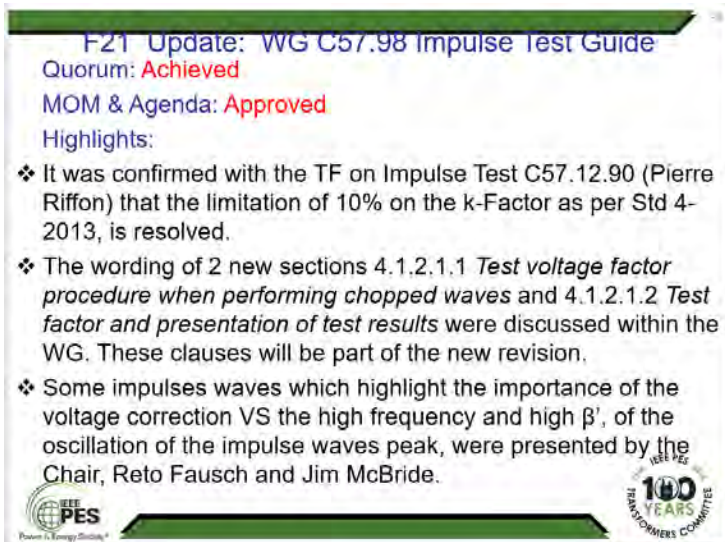
4.1.2.1.2 Test voltage factor procedure and presentation of test results

When the test voltage procedure is enabled, 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.



				Attendance F2021 - C57.98	M.present	Guest	total	Quorum
	Members for Fall 2021 meeting				12	36	48	12/20=60%
1	Active	Ajith	Varghese	Aaron Meyers		1	1	
2	Active	Arup	Chakraborty	Ajith Varghese SPX, Waukesha	1		1	
3	Active	Babanna	Suresh	Alain Bolliger		1	1	
4	Active	David	Calitz	Alan Traut		1	1	
5	Active	Deepak	Kumaria	Alan Washburn		1	1	
6	Active	Dominique	Bolliger, Ph.D.	Alan Wilks		1	1	
7	Active	Dr. Alexander	Winter	Amitabh Sarkar		1	1	
8	Active	Eric	Davis	Antonio Ceballos		1	1	
9	Active	Everton	De Oliveira	Arup Chakraborty	2		1	
10	Active	Fernando	Leal	Barrett Wimberly		1	1	
11	Active	James	McBride	Carlos Gaytan		1	1	
12	Active	Jeffrey	Britton	DANIELA EMBER BACIU		1	1	
13	Active	Leopoldo	Rodriguez	David Holland		1	1	
14	Active	Moonhee	Lee	deepak kumaria	3		1	
15	Active	Peter	Kleine	Dejan Vuković		1	1	
16	Active	Pierre	Riffon	Dominique Bolliger	4		1	
17	Active	Reto	Fausch	Ed Van Vooren		1	1	
18	Active	Sergio	Hernandez Cano	Eric Davis	5		1	
19	Active	Sylvain	Plante	Esuardo García		1	1	
20	Active	Thang	Hochanh	Feras Fattal		1	1	
				Fernando Leal	6		1	
		Members	20	Hampton Allen Steele		1	1	
		Memb. present	12	Hemchandra Shertukde		1	1	
		Quorum	60%	Jaroslav Chorzepa		1	1	
				Jim McBride	7		1	
				John K John		1	1	
				Juan Alfredo Carrizales Baaldua		1	1	
				Kannan Veeran, GTC		1	1	
				Kevin Franklin		1	1	
				Mahesh Sampat		1	1	
				Malia Zaman IEEE SA		1	1	
				Mark Perkins		1	1	
				Mike Waldrop		1	1	
				Parminder Panesar		1	1	
				Patrick Rock		1	1	
				Paul Morakinyo		1	1	
				Peter Kleine	8		1	
				Pierre Riffon	9		1	
				Reto Fausch	10		1	
				Reza Torabi		1	1	
				Ross McTaggart		1	1	
				Sergio Hernandez Cano	11		1	
				sudip chanda		1	1	
				Susan McNelly		1	1	
				Tammy Behrens SPX Transformer Solutions		1	1	
				Terry Wong		1	1	
				Thang Hochanh	12		1	
				William Boettger		1	1	

B.4.4 Working Group for PD in bushings, PTs and CTs – PC57.160, WG Secretary: Reto Fausch; WG Chair: Thang Hochanh -Meeting Minutes: VIRTUAL MEETING | November 16th, 2021 | 3:45pm - 5:00pm CT

Meeting Attendance

The working group met at 3:45pm CT. There were 34 attendees and 8/20 members present. Quorum was not met.

Discussions

- An updated membership list was presented.
- IEEE Copyright and Patent claim slides were presented. No Copyright or Patent concerns were brought to the attention of the working group.
- The chair mentioned that the Draft was verified by Sanket Bolar (English language).
- To confirm the accuracy of the PRPD patterns mentioned in the Draft, the chair has presented the practical/verified PRPD patterns of a floating part and a bad contact in transformers.
- To accelerate the work of the CRG (Comments Resolution Group), the CRG is split in 2 halves. Detlev Gross accept to lead the first group and Reto Fausch, the second group. This process is necessary to advance quickly in resolving the high number of comments.

Adjournment

The meeting was adjourned, without a motion.

F21: WG C57.160 PD Guide Bushings/PTs/CTs

Quorum: **Not achieved**

MOM & Agenda: Will seek electronic approval

Highlights:

- ❖ The last version of the Draft was verified by Sanket Bolar (English).
- ❖ To confirm the accuracy of the PRPD pattern in the Draft, the chair has presented to the WG the (practical) verified PRPD pattern of a floating part and a PRPD pattern of a bad contact, in transformers.
- ❖ To accelerate the work of the CRG, the CRG is split in 2 halves. Detlev Gross lead the first group and Reto Fausch the second group. This process is necessary to process the high number of comments.

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100 YEARS
TRANSFORMERS COMMITTEE

PC 57.160 - MEMBERS FALL 2021		
	First Name	Last Name
1	Bill	Whitehead
2	Daniel	Weyer
3	David	Wallace
4	Deepak	Kumaria
5	Detlev	Gross
6	Eric	Weatherbee
7	Jacques	Vanier
8	Januz	Szczechowski
9	Jonathan	Cheatham
10	Juan Jose	Ramirez Gomez
11	Lee	Bigham
12	Marcos	Ferreira
13	Pierre	Riffon
14	Reto	Fausch
15	Robert	Middleton
16	Stephen	Oakes
17	Steven	Snyder
18	Thang	Hochanh
19	Thomas	Sizemore
20	Zoltan	Roman

PC 57.160 - MEMBERS & Guests		Members		QUORUM
VIRTUAL MEETING - FALL 2021		20		8/20=40%
First Name	Last Name	Members present	Guest	Attendees
	Count =>	8	26	34
Alain	Bolliger		1	1
Alexander	Kraetge		1	1
Brandon	Dent		1	1
Daniel	Huenger		1	1
David	Wallace	1		1
David	Larochelle		1	1
David	Ellis		1	1
Deepak	Kumaria	1		1
Detlev	Gross	1		1
Dipak	Patel		1	1
Dominique	Bolliger		1	1
Fabian	Stacy		1	1
Feras	Fattal		1	1
Fernando	Leal		1	1
Hampton	Steele		1	1
Jacques	Vanier	1		1
Jaroslav	Chorzepa		1	1
Jim	McBride		1	1
Jose	Gamboa		1	1
Juan Jose	Ramirez Gomez	1		1
Loren	Wagenaar		1	1
Marek	Kornowski		1	1
Mike	Waldrop		1	1
Muhammad	Abdullah Sohail		1	1
Orlando	Giraldo		1	1
Reto	Fausch	1		1
Risto	Trifunowski		1	1
Rogelio	Martinez		1	1
Rogelio	Verdolin		1	1
Ross	McTaggart		1	1
Sanket	Bolar		1	1
Thang	Hochanh	1		1
Thomas	Sizemore	1		1
William J	Solano		1	1

B.4.5 Task Force for Bushing DFR – PC57.12.200, TF Secretary: Diego Robalino; TF Chair: Poorvi Patel; TF Vice Chair: Charles Sweetser.

VIRTUAL MEETING | November 16th, 2021 | 2.20pm – 3.35pm CT

Meeting initiated by Vice Chairperson Sweetzer at 2:20 PM Central time.

- Attendance verified with the system poll, counted 24 attendees at the beginning of the meeting
- The Vice-Chair presented the agenda and went through the Chairs remark.
- The TF reviewed and addressed editorial comments of draft Rev. 8 of the Guide- presented by Mario Locarno and Mikel Saad.
- The Guide is about 95% complete.
- A WG meeting is planned for December 13th and 14th to complete the document. WebEx information will be sent out to members as we get closer to the WG meeting.
- The Guide should be ready for Ballot at January 2022 meeting.
- Meeting was adjourned at 3.35 pm Central time.

TF C57.12.200 Bushing DFS– P. Patel

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

Highlights:

- ❖ A TF meeting was held on November 16th
- ❖ This was an informational session.
- ❖ The TF reviewed and addressed comments of draft Rev. 8 of the Guide.
- ❖ The Guide is about 95% complete.
- ❖ A WG meeting is planned for December 13th and 14th to complete the document. WebEx information will be sent out to members as we get closer to the WG meeting.
- ❖ The Guide should be ready for Ballot at January 2022 meeting.

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Attendee list

First Name	Last Name	Company
Peter	Zhao	Hydro One
Charles	Sweetser	OMICRON electronics Corp USA
J. Arturo	Del Rio	Siemens Energy
Shibao	Zhang	PCORE Electric
John	Herron	Raytech USA
Peter	Werelius	Megger
Mario	Locarno	Doble Engineering Co.
Diego	Robalino	Megger

Fernando	Leal	Prolec GE
Hugo	Flores	Hitachi Energy
William	Solano	Instrument Transformer Equip Corp
Ronald	Hernandez	Doble Engineering Co.
Christopher	Whitten	Hitachi Energy
Alvaro	Portillo	Ing. Alvaro Portillo
Christopher	Slattery	FirstEnergy Corp.
Matthew	Weisensee	PacifiCorp
Ismail	Guner	Hydro-Quebec
Sanket	Bolar	Megger
Wesley	Schrom	Carolina Dielectric Maint & Testing Co.
Mickel	Saad	Hitachi Energy
Evgenii	Ermakov	Hitachi Energy
Olle	Benzler	Megger
Jacques	Vanier	Electro Composites (2008) ULC
Rakesh	Patel	Hitachi Energy
Giovanni	Hernandez	Virginia Transformer Corp.
Daniel	Huenger	PCORE Electric
Cole	Van Dreel	American Transmission Co.

B.4.6 TF on Revision of Low-Frequency Tests

Virtual Meeting – November 16th, 2021 12:55-2:10PM CT,

Chair: Bill Griesacker, Vice Chair: Daniel Blaydon (acting secretary), Secretary: Myron Bell (not present).

1. The meeting was called to order at 12:56 PM.
2. A poll was conducted via Webex to determine whether a quorum was present. Based on the preliminary results, a quorum was achieved.

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

Attendance	
	Webex
Total Attendees	71
Total # Of Members	58
Members Present	33
Quorum Present	57%

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 Spring 2021 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, November 16th. Proposed wording changes to PD testing requirements in C57.12.00 have been developed. This will require changes to Table 4 to include lower voltage classes not presently in the table. It was discussed that completing all columns of this table (including BIL, applied voltage test, etc) would be outside the scope of this TF. Proposed changes to the PD testing procedures have also been developed for C57.12.90. It was noted that due to the new PD limits introduced in the new standard revision, it will be suggested to split out the PD limits for Class I transformers into a different section with potentially different limits.

Additional discussion took place on insertion of Class I transformers into Table 4 of C57.12.00. The Chair suggested that this TF develop further recommendations on how to incorporate this.

The Chair suggested that a survey be conducted within the RLFTF to determine the level of acceptance of the recommendations.

A suggestion was offered to provide more than two options for Class I PD testing. Now there is no test, a Class II type test and it was questioned if a third short PD test would be appropriate for high volume production environments, such as a 5 minute PD test.

6. PD In Bushings During Factory Testing

The chair provided a summary of the past surveys on this topic and update on current status. At the last meeting, the topic was given back to the Dielectric test and Bushing Subcommittees. This topic is no longer being discussed within this TF.

7. Study Group – Factory PD Limits (Appendix B – Meeting Minutes)

The chair provided a summary of the past TF actions on this topic. A summary of the study group's proposal was presented, which at a high level has the objective that no detectable PD be present at maximum system voltage following the 1 hour test. The proposed PD limit at this test level is 100 pC, which is based on the IEC standard for PD testing. Also included are some revisions to the current test procedure such as making measurements every 3 minutes.

The Task Force offered various comments on this proposal, focused on the proposed test levels and durations. The details of this proposal will be sent out for comment and the results will be reviewed during the next meeting.

8. Old business

C57.12.90 Ballot Resolution Group

Comments from the balloting of this standard relating to low frequency tests were reviewed by members of this task force and the resolution to these comments was incorporated into the new C57.12.90 standard. This resolution group work is completed.

9. New business

A comment was brought before the TF that there are inconsistencies in the multiplication factors applied in the Table 4 PD test levels. It was noted that these inconsistencies are recognized as the current industry practice and there has not been interest in revising these factors.

10. The meeting was adjourned at 2:12 p.m.

Appendix A

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

Document: Partial Discharge Testing of Class 1 Power Transformers

Chair: Don Ayers

Vice Chair: Javier Arteaga

Secretary: Israel Barrientos

Meeting Date: Monday 19th of October 2020

Time: 15:45

Attendance:

Members:	19
Guests:	43
Guests Requesting membership:	11
No answer:	03
Total attendance:	76

The meeting was called to order at 15:45 and attendance was recorded via a Poll.

As the Member attendance reached 19, Quorum (>18) was attained.

At this time, the TF heard notice of the recent decease of Member Jitka Fuhr.

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

The Agenda was presented and approved as submitted.

The Ohio Meeting Minutes as published were presented and approved.

A name correction of the minutes was requested (Foscia -> Foschia).

The Bushing Subcommittee help had been requested and the attendance of Stephen Shull (Chair of the WG PC57.19.02 Standard for the Design and Performance Requirements of Bushings Applied to Liquid Immersed Distribution Transformers) was gratefully acknowledged.

When asked for help with the question of Bushing Ratings, Stephen requested some clarification on the Class I Power Transformer Definition.

D. Sauer, P. Hopkinson, D. Ayers, B. Poulin, D. Gross participated in a lively discussion that ensued. No conclusion was reached on this item.

A. Joshi indicated that Black & Veatch tests PD in transformers in a one-per-batch basis and assumes the same performance for the batch.

D. Sauer indicated his concern that the Transformer Components can produce high levels of PD and do not represent a test failure for the transformer.

Z. Weiss indicated that he sees customer requests for PD testing requesting Class II method but carried out at 130% Voltage and 150 pC as limits. And having a 115% Extinction Level.

D. Gross questioned what happened to nuisance trips of PD-affected fuses.

J. Arteaga indicated that the components are manufactured to meet standards other than transformers, and that in particular to PD, they do not meet Transformer PD requirements.
D. Sauer indicated that Load Break Switches are not damaged by fairly high levels of PD's.
B. Forsythe indicated that the goal of the TF has been to have a procedure to test a transformer with, in case a PD test is specified for Class I PT's.
A. Varghese indicated that due to the Induced test at 1.8 times the Voltage, this PD test will require a 2x times test time. And he would rather change the Induced Test spec.
D. Ayers indicated that this was outside of our scope but may need to be investigated by others.
O. Avanom, J. Arteaga, D. Sauer and P. Hopkinson debated over the Class I definition
L. Dix questioned why not use 5001 kVA as a lower limit for Class I Power Transformer Definition.

A. Varghese made the following motion:

When PD testing is specified for Class I Power Transformer, this test should be carried out as defined in C57.12.00-2015

D. Gross seconded the motion.

Discussion:

D. Ayers questioned O. Avanom how was the transformer excited during testing, and if modifications were needed.

O. Avanom indicated that the unit was excited thru LV and measured on HV, with no modifications.

J. Foschia requested the following friendly amendment to A. Varghese earlier Motion.
"PD limits shall be as stated in C57.12.90-2015."

A. Varghese, agreed to this request for amendment.

The motion was then rephrased:

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.

When no further discussion was made, a vote was held.

Motion PASSED 16 votes in favor, 2 opposed, and 7 abstentions.

Discussion started on the topic of which terminals to test.

J. Foschia made a Motion:

"Measure PD on the Primary Terminals only"

S. Hernandez seconded the motion:

Discussion:

B. Forsythe requested a more formal definition of Primary Terminals and argued that they are usually the ones connected to the supply of power and could be lower voltage terminals.

D. Ayers indicated that John perhaps was referring to the HV terminals.
D. Gross indicated that if the LV terminals have a high enough voltage, they should be tested too.

J. Foschia amended his earlier Motion to:

“Measure PD only on the Terminals with the Highest Voltage rating”

D. Gross then proposed measuring all terminals.

D. Sauer did question how do we measure them all.

D. Sauer then questioned the definition of Class I PT again.

P. Hopkinson proposed to do a write-up.

After no further discussion, a vote on the motion was held.

The motion carried with 16 votes in favor, 1 against and 6 abstentions.

At 17:00 P. Hopkinson moved to adjourn the meeting.

O. Avaname seconded.

A request for those against was made, and the motion carried unanimously

The meeting was adjourned at 17:02.

Respectfully submitted
Israel Barrientos
TF Secretary.

Appendix B

IEEE/PES TRANSFORMERS COMMITTEE

Partial Discharge Study Group

- PRELIMINARY MEETING MINUTES -

B.4.7 Virtual Meeting – October 20, 2021

Chair: Bill Griesacker

The Partial Discharge Study Group held its first meeting at 1:00 p.m. US Eastern Daylight Time on October 20, 2021. There were 8 attendees, as listed:

B.5

B.6 Steve Antosz

Bill Griesacker

Thang Hochanh

Alexander Kraetge

Mark Perkins

Markus Schiessl

Hemchandra Shertukde
Ajith Varghese

The following agenda was presented and there were no objections to unanimous approval of it:

Agenda

- Call to order
- Determine quorum (1st meeting, quorum achieved by definition)
- Approval of Agenda, Approval of previous meeting minutes
- Brief review of PD changes in C57.12.00-?2021 and C57.12.90-?2021
- Review Bertrand Poulin's proposal
- Suggestions for other proposals, needed improvements
- Adjournment

The chair stated that the objective of the Study Group is to provide recommendations on revisions to partial discharge (PD) test procedures and acceptance criteria in C57.12.00 and C57.12.90. The recommendations will be submitted to the Task Force for Continuous Revisions to Low Frequency Dielectric Tests.

The group reviewed and discussed Bertrand Poulin's offered proposal:

- **Importance:** verify no detectable PD at max system voltage after the 1 hour induced voltage test
 - Raise the voltage from zero to maximum system voltage. Record PD level.
 - Increase to one hour test and hold for 5 min. Record PD voltage at the beginning and end of this 5 min.
 - Increase to enhanced voltage level. Hold for 7200 cycles. Record PD at beginning and end of enhanced.
 - Lower to one hour test level. Hold for one hour. Record PD every 3 min.
 - Decrease to max system voltage. Record PD.
 - Decrease voltage to zero.
- The criteria shall be as in the latest document with the following addition:
 - There shall be no evidence of pd activity at maximum system voltage at the end of the test. Any evidence of pd activity shall be investigated before the test can be accepted as successful.
- Recommendation:
 - "If possible, I would also encourage the introduction of continuous (or nearly continuous) pd monitoring during the test in graphic format as the technology is available today."

The following comments and discussion of the proposal are noted:

IEC induced voltage test procedure specifies that voltage is raised to 1.2 x Rated Voltage and PD measured. Since IEEE procedure follows maximum system voltage, which is 1.1 x Rated Voltage, it was proposed to amend the proposal with 1.1 x Max System Voltage to be in line

with IEC. It was recognized that the proposed “no evidence of PD” criteria needs to be defined so it was proposed to impose a PD limit of 150 pC at this voltage level.

If PD is detected at 1.1 Max System Voltage then steps should be taken to ensure it is not external.

Since PD levels are expected to be low at the new proposed test levels, should there be a maximum background PD level requirement? IEC requires background PD to be no more than 50% of PD acceptance criteria.

The recommendation to have continuous recording of PD will not be possible for laboratories that do not have equipment with this capability. What specifically would be required to display, monitor and record if this is a requirement?

It is important to have requirements so that all laboratories are measuring PD on the same bases, and any comparisons can be made on an equal basis. IEC 6270 provides information on how to achieve apparent charge, gives performance tests and calibration tests.

The suggestion to record PD at 3 min. intervals rather than the existing 5 min. requirement was generally accepted but the acceptance criteria of no rising trends in the last 20 minutes should probably be changed to the last 21 minutes so the measuring points fall at the beginning and end of this period.

The 5 min hold at the 1-hour level prior to the enhanced voltage test should not be changed. The 5 min hold should also be applied to recording PD at the proposed Max System Voltage level at the beginning of the test.

It was stated that it was preferable to keep Max System Voltage, not 1.1 x Max System Voltage, for the proposed PD check point since there is interest to prove a transformer is PD free at operating voltage.

Another suggested acceptance criteria at the Max System Voltage test level would be to measure PD at this level before and after the test and limit the post test measured PD value at Max System Voltage “not to exceed the pre test Max System Voltage measured value”. There could be some tolerance added to this criterion of maybe 5 or 10%.

The importance of PD measurement before and after the enhanced and 1 hour period of the induced voltage test, is to ensure that any PD that is excited during the test, will extinguish at operating voltage.

Can background PD be measured at say 10%, 50% and 100%? If it is in the test equipment it may follow with the test levels. IEC requires checking background PD at 0.4 X Rated Voltage.

The last step of the proposed procedure should be “Decrease voltage to zero. Record PD.”.

Propose to write information on PD troubleshooting and resolution, common procedures, techniques developed over the years that could be beneficial in a guide.

Should changes be made to C57.113?

A meeting will be scheduled to be held in the next week or two to continue the discussion and to come to a final recommendation.

The meeting adjourned at about 2:00 pm.

IEEE/PES TRANSFORMERS COMMITTEE

Partial Discharge Study Group *- PRELIMINARY MEETING MINUTES -*

B.6.1 Virtual Meeting – November 9, 2021

Chair: Bill Griesacker

The Partial Discharge Study Group held its second meeting at 1:00 p.m. US Eastern Daylight Time on November 9, 2021. There were 5 attendees, as listed:

B.7 Steve Antosz

Bill Griesacker
Thang Hochanh
Alexander Kraetge
Markus Schiessl

The following agenda was presented:

Agenda

- Call to order
- Previous meeting minutes
- Determine quorum
- Approval of Agenda, Approval of previous meeting minutes
- Review Bertrand Poulin's proposal
- Review comments and discussion notes
- Discussion
- Adjournment

The comments and discussion to Bertrand's proposal were reviewed and discussed.

It was preferred to perform the proposed PD measurement before the enhanced level and after the 1 hour test at the “maximum system voltage” since it is close to the nominal operating voltage. The preferred language was at “maximum system voltage” since this term matches C57.12.00 Table 4 terminology and so no changes would be needed to Table 4.

It was commented that since IEC has a higher voltage level, 1.2 nominal system voltage and an acceptance level of 100 pC, then the proposed PD acceptance limit at “maximum system voltage” (which is 1.05 times) after the 1 hour induced voltage test should be 100 pC and not 150 pC as was offered in the PDSG first meeting.

A requirement for PD background level was discussed and it was preferred to leave the 100 pC limit as a form of background limit. This was seen as a practical approach since there could be other ways to introduce a background limit. This simple approach was seen as a way to attain broad acceptance.

It was stated that a simple numeric limit for the new PD measurement would probably be the easiest to accept by all because it is simple and straight forward. Other approaches were offered in the first meeting and these were reviewed and a simple limit was the best chance for acceptance.

A 5 minute wait period at the new “maximum system voltage” PD test level before the enhanced voltage level was proposed but not seen to add significant value in the factory production floor environment.

Adding a requirement to investigate any evidence of PD activity was discussed and it would not likely be accepted very well because of the burden that it would place on manufacturers.

Calibration concerns are addressed in C57.113.

The chair will make revisions to the proposal and send to the Study Group and present it at the next RLFT TF meeting. PD Study Group members are requested to review and provide any further comments if they wish.

The meeting adjourned at about 1:45 p.m.

Meeting Attendance:

First Name	Last Name	Company	Member?
Raj	Ahuja	Raj Ahuja Consulting	Yes
Stephen	Antosz	Stephen Antosz & Associates, Inc	Yes
Edmundo	Arevalo	Bonneville Power Administration	
Elise	Arnold	SGB-Smit	
Javier	Arteaga	Hitachi Energy	
Donald	Ayers	Ayers Transformer Consulting	Yes
Chris	Baumgartner	We Energy	Yes
Wallace	Binder	WBBinder Consultant	

Daniel	Blaydon	Exelon BGE	Yes
William	Boettger	Boettger Transformer Consulting LLC	Yes
Sanket	Bolar	Megger	
Alain	Bolliger	HV Technologies	
Jeff	Britton	Phenix Technologies	Yes
David	Calitz	Siemens Energy	Yes
Arup	Chakraborty	Delta Star, Inc	
Marco	Espindola	Hitachi Energy	
Feras	Fattal	Manitob Hydro	
Hugo	Flores	Hitachi Energy	Yes
Michael	Franchek	Retired	
Shawn	Gossett	Ameren	Yes
Bill	Griesacker	Duquesne Light Co.	Yes
Detlev	Gross	Power Diagnostix	Yes
Sergio	Hernandez Cano	Hammond Power Solutions	Yes
Philip	Hopkinson	HVOLT Inc.	Yes
Paul	Jarman	University of Manchester	
Steve	Jordan	Tennessee Valley Authority	Yes
Alexander	Kraetge	Omicron	
Deepak	Kumaria	Applied Materials	
Fernando	Leal	Prolec GE	Yes
Weijun	Li	BC Hydo	Yes
Mario	Locarno	Doble Engineering	
Jim	McBride	JMX Transformer Solutions, Inc.	
Vinay	Mehrotra	SPX Transformer Solutions	Yes
Zach	Millard	Great River Energy	
Kris	Neild	Megger	
Brady	Nesvold	Xcel Energy	
Joe	Nims	Allen & Hoshall, Inc.	
Harry	Pepe	Phenix Technologies	Yes
Sylvain	Plante	Hydro Quebec	
Adam	Polson	Arizona Public Service Co.	
Bertrand	Poulin	Hitachi Energy	Yes
Ulf	Radbrandt	Hitachi Energy	
Pierre	Riffon	Pierre Riffon Consultant Inc.	
Dan	Sauer	Eaton Corp.	Yes
Markus	Schiessl	SGB-Smit	Yes
Eric	Schleismann	Southern Company Services	

Jeff	Schneider	Power Partners/Spire Power Solutions	Yes
Devki	Sharma	Entergy	
Kushal	Singh	Exelon Comed	
Chris	Slattery	FirstEnergy Corp	Yes
Sanjib	Som	Pennsylvania Transformer	Yes
Mike	Spurlock	Spurlock Engineering Services, LLC	Yes
Kyle	Stechschulte	American Electric Power	Yes
Andy	Steineman	Delta Star, Inc	
Neil	Strongosky	Allen & Hoshall, Inc.	
Janusz	Szczechowski	Maschinenfabrik Reinhausen	Yes
Ajith	Varghese	SPX Transformer Solutions	Yes
Jason	Varnell	Doble Engineering	
Jos	Veens	SGB-Smit	
Krishnamurthy	Vijayan	PTI Transformers	Yes
Loren	Wagenaar	WagenTrans Consulting	
Dieter	Wagner	Hydro One	
Mike	Waldrop	MLGW	
Alan	Washburn	Burns and McDonald	
Eric	Weatherbee	PCORE Electric	
Peter	Werelius	Megger	
Dr. Alexander	Winter	HIGHVOLT Pruftechnik Dresden	Yes
Anand	Zanwar	Siemens Energy	
Michael	Zarnowski	Carte International	
Shibao	Zhang	PCORE Electric	Yes
Kris	Zibert	Allgeier, Martin and Associates	Yes

F21 Update: TF Revision to Low Frequency Test

Quorum: Achieved MOM: Approved Agenda:
Approved

- TF Class I PD Test – Propose to using Class II procedure and Current C57.12.90 Limits
 - Revisions to C57.12.00, 12.00 Table 4, C57.12.90
- Factory PD Limits – Propose operating volt test
 - Pre, Post Induced volt test at 1.1 times, 100 pC limit



B.7.1 Task Force for Impulse Guide – PC57.98

TF Chair: Pierre Riffon

VIRTUAL MEETING | November 16th, 2021 | 10.50 am – 12.05 CET

The TF met on November 16, 2021, from 10:50 am to 12:05 pm (CET). Twenty-one (22) members and sixty-nine (69) guests attended the meeting (see attached attendance list). Eight (8) guests requested membership but only 3 are eligible having attended 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 S21 virtual meeting and five (5) 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 (25) guests have been removed from the TF roster. Four (4) new members have been added since the last meeting.

The meeting agenda has been approved unanimously. Motion has been made by Sylvain Plante and was seconded by Mike Spurlock.

The S21 virtual meeting minutes have been approved unanimously. Motion has been made by Ajith Varghese and was seconded by John John.

The first item of business was related to the review of a proposal made by Daniel Sauer for modification to clause 10.3.2.2 concerning impulse tests on series or multiples winding connections transformers rated 15 kV and below. The actual text is requesting distribution transformers to be type tested only with the series connections while all connections shall be tested during routine impulse tests as stated in clause 10.4.4. Generally, type tests shall be, at least equally or more stringent than routine tests and not the other way around as actually stated in the current edition of IEEE C57.12.90.

D. Sauer proposal is requiring to test all connections during type tests and only the series connection during routine tests on distribution transformers unless otherwise specified.

In addition, the same situation applies to transformers that can be connected in Y or Δ and shall also be considered.

D. Sauer wording supplemented with a similar wording applicable to transformers that can be connected in Y or Δ will be surveyed within the TF membership prior to next meeting. Motion was made by D. Sauer and was seconded by J. McBride.

On the New Business, Steve Antosz mentioned that the new edition of C57.12.90 has been approved on November 9, 2021 and will be published soon. Several modifications have been made to the impulse

testing sections and he does encourage all individuals to have a look on the changes made in the impulse test sections and to see if any other changes or improvements are necessary for the next edition.

Virtual meeting. Fall 2021; Unapproved meeting minutes; Task Force on Revision of Impulse Tests.

Also as a New Business, the Chair propose to have a new text regarding the use of tolerances on the applied voltage during impulse tests. This subject was somewhat controversial. The Chair will prepare a text as a starting point for discussion at the next meeting.

The meeting adjourned at 12:45 am on November 16, 2021.

The next meeting is planned to be held in Denver, Colorado, on March 29, 2022.

Minutes wrote by:
Pierre Riffon P. Eng.
TF Chair

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F21 Update: WG C57.98 Impulse Test Guide

Quorum: **Achieved**

MOM & Agenda: **Approved**

Highlights:

- ❖ It was confirmed with the TF on Impulse Test C57.12.90 (Pierre Riffon) that the limitation of 10% on the k-Factor as per Std 4-2013, is resolved.
- ❖ The wording of 2 new sections 4.1.2.1.1 *Test voltage factor procedure when performing chopped waves* and 4.1.2.1.2 *Test factor and presentation of test results* were discussed within the WG. These clauses will be part of the new revision.
- ❖ Some impulses waves which highlight the importance of the voltage correction VS the high frequency and high β' , of the oscillation of the impulse waves peak, were presented by the Chair, Reto Fausch and Jim McBride.



November 16, 2021 Role	Participation Status	First Name	Last Name	Company	City	State
Guest	Active	Susan	McNelly	Xcel Energy	Minneapolis	MN
Guest	Active	William	Boettger	Boettger Transformer Consulting LLC	Danville	CA
Guest	Active	Bill	Griesacker	Duquesne Light Co.	Coraopolis	PA
Member	Active	Eduardo	Garcia Wild	Siemens Energy	Guanajuato	Other
Guest	Active	Steven	Snyder	Hitachi Energy	Versailles	KY
Guest	Active	Raj	Ahuja	Raj Ahuja Consulting	Fremont	CA
Member	Active	Bertrand	Poulin	Hitachi Energy	Varennes	QC
Guest	Active	Stephen	Jordan	Tennessee Valley Authority	Chattanooga	TN
Member	Active	Stephen	Antosz	Stephen Antosz & Associates, Inc	Pittsburgh	PA
Guest	Active	Loren	Wagenaar	WagenTrans Consulting	Marysville	OH
Guest	Active	Donald	Ayers	Ayers Transformer Consulting	Waxhaw	NC
Guest	Active	Wallace	Binder	WBBinder Consultant	New Castle	PA
Guest	Active	Jeffrey	Britton	Phenix Technologies, Inc.	Accident	MD
Guest	Active	Christopher	Baumgartner	We Energies	Milwaukee	WI
Member	Active	Alain	Bolliger	HV TECHNOLOGIES, Inc.	Manassas	VA
Guest	Active	Sanjay	Patel	Smit Transformer	Summerville	SC
Guest	Active	Gael	Kennedy	GR Kennedy & Associates LLC	York	NE
Member	Active	Reto	Fausch	RF Solutions	Monterey	CA
Chair	Active	Pierre	Riffon	Pierre Riffon Consultant Inc.	Longueuil	QC
Guest	Active	Robert	Ganser	Transformer Consulting Services, Co.	N. Canton	OH
Guest	Active	Waldemar	Ziomek	PTI Transformers	Winnipeg	MB
Guest	Active	Mohammad	Iman	MGM Transformer Company	Commerce	CA
Guest	Active	Hemchandra	Shertukde	University of Hartford	W. Hartford	CT
Guest	Active	Robert	Mayer	San Diego Gas & Electric	San Diego	CA
Guest	Active	Don	Dorris	Nashville Electric Service	Nashville	TN
Guest	Active	David	Wallach	Duke Energy	Charlotte	NC
Guest	Active	Roger	Hayes	General Electric	Ayr	ON
Member	Active	Mike	Spurlock	Spurlock Engineering Services, LLC	Columbus	OH
Member	Active	James	McBride	JMX Services, Inc.	Fayetteville	GA
Member	Active	Hakan	Sahin	Virginia/Georgia Transformer	Cary	NC
Guest	Active	Juan Carlos	Cruz Valdes	Prolec GE	Apodaca	Other
Guest	Active	Xose	Lopez-Fernandez	Universidade de Vigo	Vigo	Other
Vice-Chair	Active	Daniel	Sauer	EATON Corporation	Waukesha	WI
Guest	Active	Pugal	Selvaraj	Virginia Transformer Corp.	Roanoke	VA
Member	Active	Ajith	Varghese	SPX Transformer Solutions, Inc.	Hartland	WI
Guest	Active	Baitun	Yang	R.E. Uptegraff	Scottdale	PA
Guest	Active	Eduardo	Toicachir	Tubos Trans Electric S.A.	Cordoba	Other
Guest	Active	Harry	Pepe	Phenix Technologies, Inc.	Accident	MD
Guest	Active	Jeffrey	Schneider	Power Partners/Spire Power Solutions	Athens	GA
Guest	Active	Ryan	Musgrove	Oklahoma Gas & Electric	Oklahoma City	OK
Guest	Active	Jos	Veens	SMIT Transformatoren B.V.	Nijmegen	Other
Guest	Active	Jagdish	Burde	Virginia Transformer Corp	Pocatello	ID
Guest	Active	Roderick	Sauls	Southern Company Services	Birmingham	AL
Member	Active	Leopoldo	Rodriguez	Transformer Testing Services LLC	Rincon	GA
Member	Active	David	Murray	Tennessee Valley Authority	Chattanooga	TN
Guest	Active	John	Poelma	NRG Energy	Henderson	NV
Member	Active	Fernando	Leal	Prolec GE	Apodaca	Other
Guest	Active	Hugo	Flores	Hitachi Energy	Alamo	TN
Member	Active	John	John	Virginia Transformer Corp.	Roanoke	VA
Member	Active	Steven	Brzoznowski	Bonneville Power Administration	Vancouver	WA
Member	Active	Jarrold	Prince	ERMCO	Dyersburg	TN
Guest	Active	Kerwin	Stretch	Siemens Energy	Erlangen	Other
Guest	Active	Kushal	Singh	ComEd	Oakbrook Terrace	IL
Member	Active	Amitabh	Sarkar	Virginia Transformer Corp.	Roanoke	VA
Guest	Active	Markus	Schiessl	SGB	Regensburg	Other
Guest	Active	Thomas	Hartmann	Pepco Holdings Inc.	Potomac	MD
Member	Active	Christopher	Slattery	FirstEnergy Corp.	Akron	OH
Guest	Active	Jason	Varnell	Doble Engineering Co.	Marlborough	MA
Guest	Active	Jonathan	Reimer	FortisBC	Kelowna	BC
Guest	Active	Anthony	Franchitti	PECO Energy Company	Elverson	PA
Guest	Active	Arup	Chakraborty	Delta Star Inc.	Saint-Jean-sur-Richelieu	QC
Member	Active	Kris	Zibert	Allgeier, Martin and Associates	Joplin	MO
Guest	Active	Tim-Felix	Mai	Siemens Energy	Kirchheim	Other
Member	Active	Dr. Alexander	Winter	HIGHVOLT Pruftechnik Dresden	Dresden	Other
Guest	Active	Joshua	Yun	Virginia Transformer Corp.	Roanoke	NH
Guest	Active	Daniela	Ember Baci	Hydro-Quebec IREQ	Varennes	QC

B.7.2 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 11.16.2021: 8.00 am-9.15 am CT -Virtual Meeting via WebEx

AMS registered attendance:

MEMBERS = 26

GUESTS = 70

1. The meeting was called to order at 8.00 am by Chairman Diego Robalino
2. Quorum established = 22 members out of 41 listed
3. Number of attendees = 102
4. Chairman checked for any patents and copyrights and there were none.
5. The agenda for F21 and Minutes from S21 were approved unanimously.
6. This was an informative meeting to discuss the recommendations of this TF to the DTSC.
7. Chairman shared the documents from TF work and the comments from DTSC.
8. One attendee asked if C57.168 group was consulted relative to interlaminar values for PF/IR. Chairman mentioned that the TF scope was to provide recommendations. It would require a separate action regarding if and where the recommendations should be included.
9. A total of 5 motions were presented and moved by members and seconded (Annex A). There were additional discussions on the wording of motions and some of the wordings were altered based on discussions. The chairman explained that all these motions are recommendations from TF to DTSC and the decision to accept/reject these will be left to DTSC.
10. Chairman thanked all those who contributed and made a special mention of IEEE team members for helping in data analysis.
11. Meeting adjourned at 9.15 am.

ANNEX A

1. The TF revised the text to elevate 5 motions to the DTSC:
 - a. Motion 1:
 - No limits will be added C57.12.00 or C57.12.90 in regard to Limits for insulation PF (Leave standard as is)
 - Include typical values identified by this TF in C57.168 and C57.152

Table 2 Statistical Analysis of Acceptance values for line -frequency power factor (%)

Statistical Parameter	Class I (<69 kV)		Class II (>69 kV)	
	≤1 MVA	>1 MVA and ≤ 10 MVA	>10 MVA and ≤100MVA	>100 MVA
Average	0.495	0.558	0.257	0.332
Median	0.5	0.55	0.25	0.31
90 th percentile	0.69	0.78	0.7	0.63
Typical Range	0.3 - 0.6	0.37 – 0.73	0.15 – 0.35	0.21 – 0.45

- b. Motion 2:

- Recommend the extension of this task force or create a new one to elaborate about the factors affecting insulation line frequency PF results.
- c. Motion 3:
- Modify section 10.10.2 of C57.12.90 and section 9.7.6.4 of C57.15-2018 related to instrumentation accuracy as below:

▪ **IEEE C57.12.90-2015 Section 10.10.2.**

10.10.2 Instrumentation

The insulation line-frequency power factor or dissipation factor may be measured by special bridge circuits or by the voltampere-watt method. The accuracy of the measurement instrumentation at or near rated frequency should be:

For Insulation Power Factor (DF) Below 1%: $\pm 2\%$ of reading $\pm 0.05\%$ absolute

For Insulation Power Factor (DF) Above 1%: $\pm 5\%$ of reading $\pm 0.05\%$ absolute

▪ **IEC 60076-21 / IEEE C57.15-2018 Section 9.7.6.4**

9.7.6.4 Instrumentation

The insulation line-frequency power factor or dissipation factor (DF) may be measured by special bridge circuits or by the voltampere-watt method. The accuracy of the measurement instrumentation at or near rated frequency should be:

For Insulation Power Factor (DF) Below 1%: $\pm 2\%$ of reading $\pm 0.05\%$ absolute

For Insulation Power Factor (DF) Above 1%: $\pm 5\%$ of reading $\pm 0.05\%$ absolute

- d. Motion 4:
- No limits will be added to C57.12.00 or C57.12.90 in regard to Limits for insulation Resistance (Leave standard as is)
- e. Motion 5:
- Recommend extending this task force or creating a new TF / WG as appropriate to develop a best testing practices for IR testing on transformers including factors affecting IR results.

- Meeting was called to order at 8.00 am by Chairman Diego Robalino
 - Quorum established = 22 members out of 41 listed
 - Number of attendees = 85
- Agenda for F21 and Minutes from S21 were approved unanimously.
- This was an informative meeting to discuss the recommendations of this TF to the DTSC.



Role	First Name	Last Name	Company
Chair	Diego	Robalino	Megger
Guest	Susan	McNelly	Xcel Energy
Guest	Joe	Nims	Allen & Hoshall, Inc.
Guest	Eduardo	Garcia Wild	Siemens Energy
Guest	Lee	Matthews	Howard Industries
Guest	Bertrand	Poulin	Hitachi Energy
Guest	Stephen	Antosz	Stephen Antosz & Associates, Inc
Guest	Loren	Wagenaar	WagenTrans Consulting
Guest	Donald	Ayers	Ayers Transformer Consulting
Guest	Sheldon	Kennedy	Niagara Transformer
Guest	Michael	Franchek	Retired
Guest	Reto	Fausch	RF Solutions
Guest	Andrew	Steineman	Delta Star Inc.
Guest	Robert	Ganser	Transformer Consulting Services, Co.
Guest	Waldemar	Ziomek	PTI Transformers
Guest	Clemens	Reiss IV	Custom Materials, Inc.
Guest	Shibao	Zhang	PCORE Electric
Guest	Terence	Martin	MarVen
Guest	George	Frimpong	Hitachi Energy
Guest	Hakan	Sahin	Virginia/Georgia Transformer
Guest	Eduardo	Tolcachir	Tubos Trans Electric S.A.
Guest	Jos	Veens	SMIT Transformatoren B.V.
Guest	Roderick	Sauls	Southern Company Services
Guest	Parminder	Panesar	Virginia Transformer Corp.
Guest	Leopoldo	Rodriguez	Transformer Testing Services LLC
Guest	John	Poelma	NRG Energy
Guest	Donnell	Rackley	RESA Power
Guest	Anil	Sawant	Virginia Transformer Corp.
Guest	Kushal	Singh	ComEd
Guest	Markus	Schiessl	SGB
Guest	Kevin	Biggie	Weidmann Electrical Technology
Guest	Anthony	Franchitti	PECO Energy Company
Guest	Jeffrey	Gragert	Xcel Energy
Guest	Arup	Chakraborty	Delta Star Inc.
Guest	Piotr	Blaszczyk	Specialty Transformer Components LLC
Guest	Anand	Zanwar	Siemens Energy
Guest	Feras	Fattal	Manitoba Hydro
Guest	Martin	Munoz Molina	Orto de Mexico
Guest	Brady	Nesvold	Xcel Energy
Guest	Zachery	Weiss	WEG Transformers USA Inc.

Guest	Deepak	Kumaria	Applied Materials
Guest	Israel	Barrientos	Prolec GE
Guest	Brad	Staley	Salt River Project
Guest	Muhammad Ali Masood	Cheema	Northern Transformer
Guest	Duvier	Bedoya	Hitachi Energy
Guest	Dejan	Vukovic	Hitachi Energy
Guest	Sergio	Hernandez Cano	Hammond Power Solutions
Guest	Moonhee	Lee	Hammond Power Solutions
Guest	Hugh	Waldrop	Memphis Light, Gas & Water
Guest	Shawn	Gossett	Ameren
Guest	Manish	Saraf	Hammond Power Solutions
Guest	Raymond	Frazier	Ameren
Guest	Kayland	Adams	SPX Transformer Solutions, Inc.
Guest	Jared	Bates	Oncor Electric Delivery
Guest	Kyle	Zemanovic	EATON Corporation
Guest	Balakrishnan	Mani	Virginia Transformer Corp.
Guest	Vinay	Patel	Consolidated Edison Co. of NY
Guest	Suresh	Babanna	SPX Transformer Solutions, Inc.
Guest	Taylor	Gray	Portland General Electric (PGE)
Guest	Nicholas	Jensen	Delta Star Inc.
Guest	Rakesh	Patel	Hitachi Energy
Guest	Giovanni	Hernandez	Virginia Transformer Corp.
Guest	Kannan	Veeran	Georgia Transformer
Guest	Hampton	Steele	Tennessee Valley Authority
Guest	Juan Alfredo	Carrizales	Prolec GE
Guest	Thomas	Eagle	SPX Transformer Solutions, Inc.
Guest	Timothy	Menter	Lincoln Electric System
Guest	Livia	Neeson	Entergy
Guest	Adam	Polson	Arizona Public Service Co.
Guest	John	Tranum	Siemens Energy
Guest	Sudip	Chanda	Virginia Transformer Corp.
Member	William	Boettger	Boettger Transformer Consulting LLC
Member	Charles	Sweetser	OMICRON electronics Corp USA
Member	Don	Dorris	Nashville Electric Service
Member	David	Wallach	Duke Energy
Member	Roger	Hayes	General Electric
Member	John	Herron	Raytech USA
Member	Peter	Werelius	Megger
Member	Zan	Kiparizoski	Howard Industries
Member	Sanjib	Som	Pennsylvania Transformer

Member	Daniel	Sauer	EATON Corporation
Member	Ajith	Varghese	SPX Transformer Solutions, Inc.
Member	Baitun	Yang	R.E. Uptegraff
Member	Mario	Locarno	Doble Engineering Co.
Member	Krishnamurthy	Vijayan	PTI Transformers
Member	Rob	Ghosh	General Electric
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	Jorge	Cruz	PTI Transformers
Member	Sanket	Bolar	Megger
Member	Cihangir	Sen	Duke Energy
Member	David	Calitz	Siemens Energy
Secretary	Aniruddha	Narawane	EATON Corporation

B.7.3 Task Force Transient Failure Mitigation (WG PC57.142), WG to Investigate the Interaction between Substation Transients, Jim McBride (Chair), Xose Lopez-Fernandez (Vice Chair) and Tom Melle (Secretary)

Minutes of Meeting held on 4.27.2021: Virtual Meeting via WebEx 2.30-3.35 PM CT

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

Welcome and Chair's Remarks

2) 83 Attendees were present (50 Guests) 33 of 56 Members present

Quorum was achieved. Because of quorum miss count, the Spring Minutes was approved by email.

3) IEEE Patent Policy Slides and Copyrights slides (NO essential patent claims or copyright issues)

4) Approval of Agenda and Minutes from Last Meeting.

Quorum was not achieve. Therefore, the Spring Minutes will be sent by e-mail for approving.

5) Switchgear Liason Task Force Update – Dave Caverly

The Switchgear Task Force met on OCTOBER 21, 2021, but there is nothing new this time.

6) Status of Current Draft 9B and Comments – Jim McBride

Some editorial changes made to Draft 9B before submitting to MEC which corrected errors in the TOC and references. The document from the Transformers website highlights in blue all changes to the C57.142-2010 Guide. And the focus now will be on Mitigation Methods for the upcoming meeting.

7) Request to Proceed to Ballot with Draft 9B – Jim McBride

The Formation of Ballot Group has been initiate and the invitation to join the ballot group for C57.142 logging into the myProject, Close Date is December 10, 2021. The track changes version of Draft 9B can download from the Transformers Committee Website.

8) Mitigation Methods

Jim made a summary about the mitigation methods discussed in previous meetings.

Switchgear Committee has requested that we help to provide dielectric transient withstand information on transformers and reactors. A short discussion was stablshed among Phil Hopkinson, Pierre Riffon, Egon Kirchenmayer and Jim about switching reignitions and prestrikes due to circuit breakers operation with reactors and sometimes with transformers, which not always are covered by standard factory acceptance tests. Pierre Riffon quoted C57.21 IEEE Standard Requirements, Terminology, and Test Code for Shunt Reactors Rated Over 500 kVA, which stablshes limits of chopping waves in percent. A group was formed by Pierre Riffon, Bertrand Poulin and Jim McBride to work on a response to Switchgear Committee which may include references to Clause B.6 of Std C57.21

Mitigation methods discussion was open to brainstorming additional options. Discussion on use of internal arresters was established as a mitigation method, which not always is well accepted by the users. A presentation will be expected to made on it in next meetings. Finally, discussion was focused to additional factory tests. In this respect volunteers were request to work on a recommendation of voltages classes and dielectric tests requirements. Initially offered Phil Hopkinson, K. Vjayan, Amitbh Sakar, Deepak Kumaria. And all interest to join this group could email to Jim McBride.

9) New Business – Deepak Kumaria asked about possibly including the study of transients on instrument transformers in our WG. Due to the lack of remaining time for today’s meeting, this topic was postpone until our next meeting.

10) Next Meeting (Spring 2022 – Denver (Hyatt Regency, Conv. Center), Colorado USA, March 27 – 31, 2022)

11) Motion to Adjournment made by Phil Hopkinson / 2nd by Mike Spurlock
Meeting was adjourned at 3:38 PM without objection.

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 Fall 2021
Virtual Meeting
Tuesday, November 16th, 2021

- 83 total attendees, consisting of 33 members and 50 guests. The WG did achieve a quorum. 33 / 56
- Agenda was approved by those present. The minutes have been approved by email after the meeting.

IEEE PES
Performance Characteristics Subcommittee – Spring 2021

- 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>.
- Transformers WG and Switchgear Committee Task Force have unanimously approved Draft 9B which has now been submitted to MEC for review.
- The ballot group formation has been initiated and those who wish to join the ballot group should join before December 10th, 2021.
- We have received a PAR extension to complete the balloting process. PAR now expires on December 31st, 2023.
- Switchgear Committee has requested that we help to provide dielectric transient withstand information on transformers and reactors. There was some discussion on this topic and a small TF was formed to help draft a response. Any response will be reviewed and approved prior to sending.
- We reviewed the Mitigation Methods which have been presented and discussed in our WG meetings. There was an open discussion to organization of these items for presentation to the Dielectric Tests subcommittee. Several participants offered to assist in future virtual meeting to help draft a completed response to Dielectric Test Subcommittee task.
- New Business – Deepak Kumaria - Requested inclusion of instrument transformers in our mitigation studies. This topic was postponed due to lack of time remaining in today's meeting.
- Next Meeting: Spring 2022 – Denver, CO on March 29th, 2022.
The meeting was Adjourned at 3:40pm Central Time.

IEEE PES
100 YEARS TRANSFORMERS COMMITTEE

Mitigation Methods Summary

- Resistor-Capacitor Snubbers
- Increasing Insulation is Key Areas with Additional Test Requirement for Special Terminated Lightning Impulse to Better Test for Field Conditions.
- Increasing Series Capacitance to Improve Impulse Distribution and Reduce Series Resonance
- Introduce Internal Surge Protection to Limit Overvoltages During Resonant Conditions
- Reignition Mitigation with Controlled Switching
- Using Resistance Load During Switching to Provide Damping During the Event.



Meeting Attendance Role	First Name	Last Name	Company	11/16/2021
Chair	James	McBride	JMX Services, Inc.	X
Vice-Chair	Xose	Lopez-Fernandez	Universidade de Vigo	X
Member	Enrique	Betancourt	Prolec GE	X
Member	William	Boettger	Boettger Transformer Consulting LLC	X
Member	Jeffrey	Britton	Phenix Technologies, Inc.	X
Member	David	Caverly	Trench Limited	X
Member	Huan	Dinh	Hitachi Energy	X
Member	Eduardo	Garcia Wild	Siemens Energy	X
Member	Sergio	Hernandez Cano	Hammond Power Solutions	X
Member	Philip	Hopkinson	HVOLT Inc.	X
Member	John	John	Virginia Transformer Corp.	X
Member	Egon	Kirchenmayer	Siemens Energy	X
Member	Deepak	Kumaria	Applied Materials	X
Member	Moonhee	Lee	Hammond Power Solutions	X
Member	Weijun	Li	Braintree Electric Light Dept.	X
Member	Colby	Lovins	Federal Pacific	X
Member	Ross	McTaggart	Trench Limited	X
Member	Vinay	Mehrotra	SPX Transformer Solutions, Inc.	X
Member	Aniruddha	Narawane	EATON Corporation	X
Member	Harry	Pepe	Phenix Technologies, Inc.	X

Member	Klaus	Pointner	Trench Austria GmbH	X
Member	Bertrand	Poulin	Hitachi Energy	X
Member	Ulf	Radbrandt	Hitachi Energy	X
Member	Pierre	Riffon	Pierre Riffon Consultant Inc.	X
Member	Marnie	Roussell	Entergy	X
Member	Amitabh	Sarkar	Virginia Transformer Corp.	X
Member	Michael	Sharp	Trench Limited	X
Member	Thomas	Sizemore	ABB Inc.	X
Member	Steven	Snyder	Hitachi Energy	X
Member	Mike	Spurlock	Spurlock Engineering Services, LLC	X
Member	Shankar	Subramany	KEMA Labs	X
Member	Rogério	Verdolin	Verdolin Solutions Inc.	X
Member	Sukhdev	Walia	New Energy Power Co.	X

B.8 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 10st of January 2021.**

- ❖ The There was no HVTT Subcommittee update this time, since the Subcommittee has not met since the spring DTSC meeting. The next HVTT meeting is scheduled for January 2022, as part of the IEEE PES Joint Technical Committee Meeting.
If anyone has an questions for HVTT, they can contact me at jbritton@doble.com.

B.9 Old/ Unfinished Business

In last meeting a question was brought to attention by Ronnie Minhaas -should standard adopt a limit for Insulation resistance between core and Frame? Should this value be 1000 megaohm minimum during final factory acceptance test. As time did not allow the discussion of this topic in the last meeting. It was bought up in this meeting as old business. Today there is some information in the following documents.

- **Core to Ground Insulation Resistance:**

C57.12.00 - Included in Table 17 as routine test for Class I and Class II and as other test for distribution transformers. No limits are specified

C57.12.90 - No reference to Core to ground Insulation

C57.152 - Typical values for New and aged transformers are provided.

- **Frame to ground Insulation Resistance :**

Not covered in any standards

- C57.12.00

Table 17—Routine, design, and other tests for liquid-immersed transformers

Tests	Distribution transformers			Class I Power transformers			Class II Power transformers			Comments
				Routine	Design	Other	Routine	Design	Other	
Performance										
Core insulation resistance			*	*			*			The insulation resistance between the core(s) and ground shall be measured after complete assembly of the transformer at a level of at least 500 V dc, for a duration of 1 min.

- C57.152 Field Testing Guide

Table 9—Typical insulation resistance ranges for various conditions of core insulation

Type of equipment	Core insulation resistance (MΩ)	Condition of insulation
New	> 500	Manufacturer to be consulted for values less than 500 MΩ for proper course of action.
Service aged	> 100	Normal
	10 to 100	Indicative of insulation deterioration
	< 10	Needs to be investigated



Discussion was opened. The question came up if there is something in the IEC-standard.

A comment came up if we need a limit and, in that case, where does it belong? Is there a need for pass/fail criteria? Possibly to incorporate this with the insulation resistance TF.

In Spring 2022 maybe a TF or study group will be formed to come with a recommendation to DTSC on the topic of core ground insulation resistance and frame to ground insulation resistance. Please reach out to DTSC chair or secretary if you are interested in joining this TF or Study group.

B.10 New Business

No new Business

B.11 Adjournment

Meeting adjourned 12.20 PM.

Thanks you Ajith for serving 5 years as DTSC chair. From 2022 Poorvi Patel will be the new DTSC Chair.

Minutes respectfully submitted by:

Poorvi Patel

Secretary DTSC.

DSTC Attendee List- November 17th 2021- INCLUDING NEW MEMBERS

Role	First Name	Last Name	Company
Guest	Mubarak	Abbas	Siemens Energy
Guest	Kayland	Adams	SPX Transformer Solutions, Inc.
Member	Stephen	Antosz	Stephen Antosz & Associates, Inc
Member	Elise	Arnold	SGB
Member	Javier	Arteaga	Hitachi Energy
Member	Donald	Ayers	Ayers Transformer Consulting
Guest	Israel	Barrientos	Prolec GE
Member	Christopher	Baumgartner	We Energies
Guest	Barry	Beaster	H-J Family of Companies
Member	Enrique	Betancourt	Prolec GE
Guest	Wallace	Binder	WBBinder Consultant
Member	Daniel	Blaydon	Baltimore Gas & Electric
Member	William	Boettger	Boettger Transformer Consulting LLC
Guest	Alain	Bolliger	HV TECHNOLOGIES, Inc.
Guest	Jeremiah	Bradshaw	Bureau of Reclamation
Member	Jeffrey	Britton	Phenix Technologies, Inc.
Guest	Darren	Brown	Howard Industries
Guest	Steven	Brzoznowski	Bonneville Power Administration
Guest	Erich	Buchgeher	Siemens Energy
Guest	Jagdish	Burde	Virginia Transformer Corp
Member	David	Calitz	Siemens Energy
Guest	Juan Alfredo	Carrizales	Prolec GE
Guest	Edward	Casserly	Ergon, Inc.
Member	Juan	Castellanos	Prolec GE
Member	Arup	Chakraborty	Delta Star Inc.
Guest	Sudip	Chanda	Virginia Transformer Corp.
Guest	Larry	Christodoulou	Electric Power Systems
Guest	Rhett	Chrysler	ERMCO
Member	Craig	Colopy	EATON Corporation
Member	Jorge	Cruz	PTI Transformers
Guest	Michael	Dahlke	Central Moloney, Inc.
Member	Eric	Davis	Burns & McDonnell
Guest	Sami	Debass	Electric Power Research Institute (EPRI)
Guest	Brandon	Dent	Memphis Light, Gas & Water
Member	Huan	Dinh	Hitachi Energy
Member	Don	Dorris	Nashville Electric Service
Member	Samraghi	Dutta Roy	Siemens Energy
Guest	Daniela	Ember Baciu	Hydro-Quebec IREQ
Member	Evgenii	Ermakov	Hitachi Energy

Guest	Marco	Espindola	Hitachi Energy
Member	Feras	Fattal	Manitoba Hydro
Member	Reto	Fausch	RF Solutions
Guest	Norman	Field	Stantec
Member	Hugo	Flores	Hitachi Energy
Member	Bruce	Forsyth	Bruce Forsyth and Associates PLLC
Member	Michael	Franchek	Retired
Member	Anthony	Franchitti	PECO Energy Company
Guest	Raymond	Frazier	Ameren
Member	George	Frimpong	Hitachi Energy
Guest	Jose	Gamboa	H-J Family of Companies
Member	Eduardo	Garcia Wild	Siemens Energy
Member	David	Geibel	--
Member	Rob	Ghosh	General Electric
Member	Jose Antonio	Gonzalez Ceballos	Georgia Transformer
Member	Shawn	Gossett	Ameren
Guest	Jeffrey	Gragert	Xcel Energy
Member	James	Graham	Weidmann Electrical Technology
Member	Bill	Griesacker	Duquesne Light Co.
Member	Detlev	Gross	Power Diagnostix Consult GmbH
Guest	Ismail	Guner	Hydro-Quebec
Guest	Attila	Gyore	M&I Materials Ltd
Member	John	Harley	FirstPower Group LLC
Guest	Thomas	Hartmann	Pepco Holdings Inc.
Member	Roger	Hayes	General Electric
Guest	Ronald	Hernandez	Doble Engineering Co.
Guest	Giovanni	Hernandez	Virginia Transformer Corp.
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
Member	Philip	Hopkinson	HVOLT Inc.
Guest	Daniel	Huenger	PCORE Electric
Guest	Paul	Jarman	University of Manchester
Guest	Nicholas	Jensen	Delta Star Inc.
Member	John	John	Virginia Transformer Corp.
Member	Toby	Johnson	Hunt Electric
Member	Stephen	Jordan	Tennessee Valley Authority
Guest	Laszlo	Kadar	Hatch

Member	Kurt	Kaineder	Siemens Energy
Guest	Nathan	Katz	PacifiCorp
Member	Sheldon	Kennedy	Niagara Transformer
Guest	Gael	Kennedy	GR Kennedy & Associates LLC
Member	Stacey	Kessler	TC Energy
Guest	Dmitriy	Klempner	Southern California Edison
Guest	Anton	Koshel	Delta Star Inc.
Member	Axel	Kraemer	Maschinenfabrik Reinhausen
Member	Alexander	Kraetge	OMICRON electronics Deutschland GmbH
Member	Deepak	Kumaria	Applied Materials
Guest	Donald	Lamontagne	Arizona Public Service Co.
Guest	Andrew	Larison	Hitachi Energy
Member	David	Larochelle	NDB Technologies
Guest	Fernando	Leal	Prolec GE
Member	Moonhee	Lee	Hammond Power Solutions
Member	Aleksandr	Levin	Weidmann Electrical Technology
Member	Weijun	Li	Braintree Electric Light Dept.
Member	Mario	Locarno	Doble Engineering Co.
Guest	Xose	Lopez-Fernandez	Universidade de Vigo
Member	Tim-Felix	Mai	Siemens Energy
Member	Darrell	Mangubat	Siemens Energy SAE
Guest	Balakrishnan	Mani	Virginia Transformer Corp.
Guest	Richard	Marek	Retired
Guest	Lee	Matthews	Howard Industries
Guest	Robert	Mayer	Siemens Energy
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.
Guest	Timothy	Menter	Lincoln Electric System
Guest	Aaron	Meyers	EATON Corporation
Guest	Philip	Miller	Memphis Light, Gas & Water
Guest	Manoj Kumar	Mishra	ASAssoft (Canada) Inc
Guest	Rhea	Montpool	Schneider Electric
Member	Emilio	Morales-Cruz	Qualitrol Company LLC
Member	David	Murray	Tennessee Valley Authority
Guest	Ryan	Musgrove	Oklahoma Gas & Electric
Member	Ali	Naderian	METSCO Energy Solutions Inc.
Guest	Kristopher	Neild	Megger
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	Smit Transformer
Member	Harry	Pepe	Phenix Technologies, Inc.
Guest	Caroline	Peterson	Xcel Energy
Guest	Timothy	Peterson	N. American Substation Services
Member	Sylvain	Plante	Hydro-Quebec
Guest	Cornelius	Plath	OMICRON Energy Solutions GmbH
Guest	John	Poelma	NRG Energy
Guest	Alvaro	Portillo	Ing. Alvaro Portillo
Member	Bertrand	Poulin	Hitachi Energy
Guest	Chris	Powell	Intermountain Electronics
Member	Jarrold	Prince	ERMCO
Guest	Donnell	Rackley	RESA Power
Member	Ulf	Radbrandt	Hitachi Energy
Guest	Shiva	Rampersad	Dow Chemical Company
Guest	Jimmy	Rasco	Rasco Consulting LLC
Guest	John	Reagan	RWE Renewables
Guest	Scott	Reed	MVA
Guest	Jonathan	Reimer	FortisBC
Guest	Afshin	Rezaei-Zare	York University
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	Zoltan	Roman	GE Grid Solutions
Member	Mickel	Saad	Hitachi Energy
Member	Hakan	Sahin	Virginia/Georgia Transformer
Guest	Dinesh	Sankarakurup	Duke Energy
Member	Amitabh	Sarkar	Virginia Transformer Corp.
Member	Daniel	Sauer	EATON Corporation
Guest	Roderick	Sauls	Southern Company Services
Guest	Anil	Sawant	Virginia Transformer Corp.
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

Member	Devki	Sharma	Entergy
Member	Hemchandra	Shertukde	University of Hartford
Guest	Stephen	Shull	BBC Electrical Services, Inc.
Member	Jonathan	Sinclair	PPL Electric Utilities
Guest	Christopher	Slattery	FirstEnergy Corp.
Member	Sanjib	Som	Pennsylvania Transformer
Member	Mike	Spurlock	Spurlock Engineering Services, LLC
Member	Fabian	Stacy	Hitachi Energy
Member	Brad	Staley	Salt River Project
Member	Kyle	Stechschulte	American Electric Power
Guest	Hampton	Steele	Tennessee Valley Authority
Member	Andrew	Steineman	Delta Star Inc.
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	JFE Shoji Power Canada Inc.
Guest	Dervis	Tekin	Meramec Instrument Transformer Co.
Guest	Ed	teNyenhuis	Hitachi Energy
Member	Alwyn	Van Der Walt	Electrical Consultants, Inc.
Guest	Jacques	Vanier	Electro Composites (2008) ULC
Chair	Ajith	Varghese	SPX Transformer Solutions, Inc.
Member	Jason	Varnell	Doble Engineering Co.
Member	Rogério	Verdolin	Verdolin Solutions Inc.
Guest	Dejan	Vukovic	Hitachi Energy
Member	Pragnesh	Vyas	Sunbelt-Solomon Solutions
Guest	Loren	Wagenaar	WagenTrans Consulting
Guest	Dieter	Wagner	Hydro One
Member	Hugh	Waldrop	Memphis Light, Gas & Water
Member	David	Wallach	Duke Energy
Guest	Alan	Washburn	Burns & McDonnell
Member	Bruce	Webb	Knoxville Utilities Board
Guest	Drew	Welton	Intellirent
Member	Peter	Werelius	Megger
Member	Daniel	Weyer	Nebraska Public Power District
Member	Dr. Alexander	Winter	HIGHVOLT Pruftechnik Dresden
Guest	Jeffrey	Wright	Duquesne Light Co.
Member	Baitun	Yang	R.E. Uptegraff
Guest	Malia	Zaman	IEEE
Member	Peter	Zhao	Hydro One
Member	Kris	Zibert	Allgeier, Martin and Associates

Member	Waldemar	Ziomek	PTI Transformers
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Annex C Distribution Subcommittee – Chair: Ed Smith

November 17, 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 50 members in attendance by count of those identified on a slide presented in the meeting. Recorded attendance gave 148 in attendance and 53 members. List of attendees and affiliation attached below.

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

The Spring 2021 meeting minutes were reviewed, a motion was made to approve by Gary Hoffman, seconded by Marcos Ferreira, 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

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

Al presented the following minutes from the working group meeting on November 15, 2021 at 10:50 a.m. with 61 in attendance.

1. Call to order
The meeting was called to order by the Chair (Al Traut) at 10:50AM CST on Monday, November 15, 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. **33** of **54** members were present. A Quorum was declared. Attendance is recorded below.

*4 guests requesting membership. All meet attendance requirements and will be added as members during the next meeting.
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

No old business

8. New Business

a. Discussion: Annex B regarding Cover Dielectric Testing

- i. Al Traut presented photos from Howard Industries during preliminary testing using new fixture/method
- ii. Steve Shull noted that the photos shown did not include bushings on a finish unit. Al pointed out this test would most likely be done as quality control by manufacturers to ensure no issues before units may be finished

b. Discussion: Annex B Table B.1

- i. Steve reminds the group that notes included within the table are "informative" and can easily be changed. Notes outside of the table become part of the document
- ii. Al questions the intent for the 10kV test voltage for the 1.0" clearance area for 2400/4160Y. Josh Verdell who helped create the chart suggests changing the clearance to 2.5". Steve agrees. No vote necessary.

c. Discussion: Annex B Section B.2.4

- i. Al questions the 3 minute duration of the test. Bruce Webb of KUB states his requirement, "Covers shall have a minimum electrical withstand rating of 8 kV, 60 Hz for one (1) minute without failure."

d. Discussion: Adding "120" secondary rating to the standard

- i. Tables that would need to be modified: 2, 7, and 9
- ii. Al and Kendrick will work on a draft to be presented in the next meeting

9. Next meeting--date and location

The Next meeting will be the **2022 Spring: March 27 – 31, 2022; Denver (Hyatt Regency, Conv. Center), Colorado USA**

10. Adjournment

The meeting was adjourned at 11:39 AM CST

Submitted by: Kendrick Hamilton

Date: 15/11/2021

C57.12.20 WG Meeting Attendance
Fall 2021 On-line

Role	First Name	Last Name	Company
Guest	Rehan	Ali	Siemens Energy
Member	Jerry	Allen	Metglas, Inc.
Member	Angela	Amador	EATON Corporation
Member	Glenn	Andersen	Fayetteville PWC
Guest	Gregory	Ante	Southern California Edison
Guest	Edmundo	Arevalo	Bonneville Power Administration
Guest	Kevin	Biggie	Weidmann Electrical Technology
Member	Darren	Brown	Howard Industries
Member	John	Chisholm	IFD Corporation
Member	Rhett	Chrysler	ERMCO
Guest	Craig	Colopy	EATON Corporation
Member	Michael	Dahlke	Central Moloney, Inc.
Member	Benjamin	Garcia	Southern California Edison
Guest	James	Gardner	SPX Transformer Solutions, Inc.
Member	Carlos	Gaytan	Prolec GE
Member	Ali	Ghafourian	H-J Enterprises, Inc.
Guest	Michael	Gonzales	Southern California Edison
Member	Said	Hachichi	Hydro-Quebec
Secretary	Kendrick	Hamilton	Power Partners, Inc.
Member	Kenneth	Hampton	Baltimore Gas & Electric
Member	Ramadan	Issack	American Electric Power
Member	Gael	Kennedy	GR Kennedy & Associates LLC
Guest	Evan	Knapp	EATON Corporation
Guest	Andrew	Larison	Hitachi Energy
Guest	Rosamire	Magee	PSE&G
Guest	Jinesh	Malde	M&I Materials Inc.
Guest	Zachary	Millard	Great River Energy
Guest	Philip	Miller	Memphis Light, Gas & Water
Guest	Manoj Kumar	Mishra	ASAssoft (Canada) Inc
Member	Michael	Morgan	Duke Energy
Guest	Martin	Munoz Molina	Orto de Mexico
Member	Dwight	Parkinson	EATON Corporation
Guest	Chris	Pitts	Howard Industries
Member	Jarrold	Prince	ERMCO
Guest	Lesther Alex	Quispe Cuadrado	EATON Corporation
Guest	Ion	Radu	Hitachi Energy
Member	Juan	Ramirez	CELECO
Member	Martin	Rave	ComEd
Guest	Robert	Reepe	Georgia Power Co.
Guest	Mahesh	Sampat	EMS Consulting Inc.
Guest	Albert	Sanchez	Knoxville Utilities Board
Guest	Alan	Sbravati	Cargill, Inc.
Guest	Jeffrey	Schneider	Power Partners/Spire Power Solutions

Guest	Avijit	Shingari	Pepco Holdings Inc.
Member	Stephen	Shull	BBC Electrical Services, Inc.
Member	Audrey	Siebert-Timmer	IFD Corporation
Guest	Adrian	Silgado	IFD Corporation
Member	Igor	Simonov	Toronto Hydro
Vice-Chair	Edward	Smith	H-J Family of Companies
Guest	Kerwin	Stretch	Siemens Energy
Member	Eric	Theisen	Metglas, Inc.
Member	Michael	Thibault	Pacific Gas & Electric
Guest	Timothy	Tillery	Howard Industries
Chair	Alan	Traut	Howard Industries
Member	Reinaldo	Valentin	Duke Energy
Member	Jeremy	Van Horn	IFD Corporation
Member	John	Vartanian	National Grid
Member	Joshua	Verdell	ERMCO
Guest	Shelby	Walters	Howard Industries
Member	Bruce	Webb	Knoxville Utilities Board
Member	Alan	Wilks	Consultant

██████ 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 November 16, 2021 at 8:00 a.m. in with 79 in attendance.

1. Dan Mulkey called the meeting to order at 8:00 AM CST.
2. Opening remarks and announcements
 - a. None were made
3. Dan Mulkey reviewed IEEE SA Copyright Policy and Essential Patent Claims. No issues were raised.
4. Membership changes were noted:
 - a. Added: Chris Guertin, Andrew Larison, Jeff Schneider, Avjit Shingari
 - b. Changed to Guest: none
5. Quorum was verified. The working group consisted of **59** members, requiring **30** for quorum. **39** members were confirmed through the WebEx poll. Attendance records later confirmed **49** members.
6. Dan Mulkey requested approval of the agenda. Jerry Murphy made a motion, second by Steve Shull. Agenda was unanimously approved.
7. Dan Mulkey requested approval of the minutes. Jerry Murphy made a motion, second by Steve Shull 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 1.4
 - 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 1.4
 - 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 reviewed status of standards and noted that we have three meetings left to finish C57.12.28 and C57.12.29.
 - b. Taskforce Report: Stainless Steel Definitions
 - i. **Taskforce Members: Will Elliot, Tiffany Lucas.**
 - ii. Dan Mulkey informed the group that proposed stainless steel definitions are now included into an annex as per the approved motion from the last meeting.
 - c. Taskforce Report: Special Pad-mount Tests (pry-bar, wire probe)
 - i. **Taskforce Members: Gary King, Shelby Walters, Michael Zarnowski.**
 - ii. Concluded Snap-On torque wrench in Annex B is still available. Iron Man scales No. 1756T4 are no longer available but there are substitutions (i.e. Chatillon DG-200, No 118 Detecto Matic). Plunger springs are still available from MW Components however Figure B-3 needs to be modified to reflect the supplier datasheet.
 - iii. **Gary King made a motion to change Fig B-3 to match supplier datasheet (including changing the free length to 2.5 inches and along with changing units to lbf). Second by Marty Rave. Motion was unanimously approved.**
 - iv. **Dan Mulkey to propose wording next meeting to reference a generic spring scale rather than an Iron Man scale.**
 - d. Taskforce Report: Coating Adhesion Test Methods
 - i. **Taskforce Members: Justin Minikel (chair), Jane Hall, Chris Guertin, Martin Bachand, Scott Abbott, Zoran Goncin.**
 - ii. Taskforce reviewed two primary test methods: tape adhesion and pull-off adhesion. Knife adhesion was mentioned briefly but the group concluded this test method was too subjective.

- iii. Taskforce recommended to the group to keep existing tape adhesion test method as-is and adding a tape adhesion test after humidity exposure.
 - iv. Group discussed humidity exposure test.
 - 1. It was suggested to add a time limit (i.e. tape adhesion test to be performed X hours after humidity exposure)
 - 2. It was discussed that scratching the surface may change paint hardness and improve adhesion which may impact test results.
 - 3. It was mentioned that many other standards do adhesion tests after environmental exposure.
 - 4. It was suggested that humidity adhesion tests should be performed before adding this requirement to the standard.
 - 5. Jane Hall offered to perform a blind test on samples after humidity exposure from different manufacturers. This test would give us general idea on how various coating perform.
 - 6. Test variables were discussed including substrate preparation, substrate material and coating type / cure time. One suggestion was to use ATC test panels to reduce test variabilities.
 - 7. A comment was made that coating performance should be the same regardless of type or application method.
 - v. **Taskforce to continue discussion and present proposed test plan to group at next meeting.**
- e. Taskforce Report: C57.12.38 Request on Tank Touch Temperatures
- i. **Taskforce Members: Jerry Murphy (chair), Steve Shull, Dan Mulkey, Jeremy Van Horn, Justin Minikel, Jane Hall, Chris Geuterin, Scott Abbott.**
 - ii. Taskforce concluded that coating temperature limits far exceed transformer operating temperatures.
 - iii. The group then discussed safety implications of external transformer temperatures (specifically for pad mounted transformers)
 - 1. ASTM C1055 standard state that surface temperatures of 40.5°C are a hazard.
 - 2. Under standard operating conditions external tank temperatures will be way above 40°C (this does not include radiant heat from the sun).
 - 3. Discussed that as this is a human and environmental safety issue it should be captured in the standards somewhere.
 - 4. Tank surface temperature also impacts decal adhesion and corrosion rates.
 - 5. One suggestion was to include this safety warning in the 12.00 standard.
 - 6. A comment was made that the wire pry and probe test is directly related to safety.
 - 7. A comment was made that high temperature insulating fluids have other benefits like fire mitigation during a fault and are not necessarily used to increase transformer loading alone.
 - 8. A comment was made that DER penetration will also impact external tank temperatures.
 - 9. Group discussed possible mitigation methods including increasing the transformer size or the installation of guarding or fencing systems.

- iv. **Taskforce to continue discussion and develop wording that can be used in the standard to inform users and manufacturers of this safety risk along with options for mitigating this risk. If anybody is interested in contributing, please contact Jerry Murphy.**
 - f. Discussion continued from S21 meeting: Substrate Surface Preparation
 - i. Tom Dauzat brought forward that surface cleaning for stainless steel cannot use carbon grit as it will impregnate the material resulting in pitting corrosion. Manufacturers must only use glass or sand for surface preparation of stainless steels.
 - ii. Tom Dauzat commented that this requirement already exists in some industry standards.
 - iii. Group discussed and agreed that this should be included in the annex of the standard.
 - iv. **Dan Mulkey requested a taskforce to draft up wording summarizing substrate preparation requirements that can be included in the annex.**
 - v. **Taskforce Members: Tom Dauzat (chair), Martin Bachand, Jane Hall and Zoran Goncin.**
10. New business:
- a. No new business was discussed
1. C57.12.28 and C57.12.29 continued revision
- a. Dan Mulkey briefly showed the changes proposed in draft 1.4. All changes are summarized in meeting slides which will be posted on the website. Review of these changes will be the focus for the Spring 2022 meeting.
2. Next meeting: is planned for March 29, 2022, in Denver, Colorado USA
- a. The following attendees requested membership and will be added to membership for the Spring 2021 meeting: **Jane Hall, Robert Reepe.**
3. The meeting was adjourned at 9:14 AM CST.

Submitted by: Audrey Siebert-Timmer

Date: 11/16/2021

List of Members:

Scott Abbott (PPG)
Glenn Andersen (Fayetteville PWC)
Martin Bachand (Cloverdale Paint Inc.)
Darren Brown (Howard Industries)
Thomas Callsen (Weldy-Lamont Associates)
John Chisholm (IFD Corporation)
Rhett Chrysler (ERMCO)
Michael Dahlke (Central Moloney, Inc.)
Thomas Dauzat (General Electric)

William Elliott (Prolec GE)
Benjamin Garcia (Southern California Edison)
James Gardner (SPX Transformer Solutions, Inc.)
Carlos Gaytan (Prolec GE)
Ali Ghafourian (H-J Enterprises, Inc.)
Chris Guertin (Cloverdale Paint 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)
Brian Klaponski (Carte International Inc.)
Andrew Larison (Hitachi Energy)
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 Energy)
Juan Ramirez (CELECO)
James Ratty (Electronic Technology Inc.)

Martin Rave (ComEd)
Pedro Salgado (Electronic Technology Inc.)
Jeffrey Schneider (Power Partners/Spire Power Solutions)
Avijit Shingari (Pepco Holdings Inc.)
Stephen Shull (BBC Electrical Services, Inc.)
Audrey Siebert-Timmer (IFD Corporation)
Igor Simonov (Toronto Hydro)
Edward Smith (H-J Family of Companies)
Travis Spoone (EATON Corporation)
Michael Thibault (Pacific Gas & Electric)
Alan Traut (Howard Industries)
Reinaldo Valentin (Duke Energy)
Jeremy Van Horn (IFD Corporation)
John Vartanian (National Grid)
Joshua Verdell (ERMCO)
Shelby Walters (Howard Industries)
Alan Wilks (Consultant)

List of Guests:

Rehan Ali (Siemens Energy)
Jerry Allen (Metglas, Inc.)
Gregory Ante (Southern California Edison)
Huan Dinh (Hitachi Energy)
Jeffrey Door (H-J Family of Companies)
Zoran Goncin (PTI Transformers)
Michael Gonzales (Southern California Edison)
Jane Hall (Cloverdale Paint Inc.)
Colby Lovins (Federal Pacific)
Tiffany Lucas, P.E. (SPX Transformer Solutions, Inc.)
Rosamise Magee (PSE&G)
Timothy Menter (Lincoln Electric System)

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

Scott Dahlke, for Steve Shull, presented the following minutes from the working group meeting on November 15, 2021 at 2:20 p.m. with 33 in attendance.

Scott brought the motion from the working group to move the current draft of the standard to ballot. This was seconded by Alan Wilks. The Subcommittee voted with 44 for, 12 abstentions, and 0 against. The motion to move the standard to ballot was passed.

1. The Chair called the meeting to order at 2:20 P.M. CST on November 15, 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. The Chair asked for any changes or additions to the displayed Agenda. Hearing none, the Chair declared the Agenda approved as shown.

3. Minutes approval

The Chair commented that the Meeting Minutes of the last meeting were posted on the Transformer Committee website. The Chair asked for any additions or modifications to the Meeting Minutes. Hearing none, the Chair declared the minutes approved as posted.

4. Confirmation of IEEE SA Essential Patent Statement

The patent information request was displayed to the working group and the chair provided an opportunity for participants to identify patent claim(s)/patent application claim(s) and/or if a participant is personally aware of patent claim(s)/patent application claim(s) that may be essential for the use of this standard. There were no responses to this request so no patent claim(s)/patent application claim(s) were identified.

5. IEEE SA Copyright Policy Statement

IEEE-SA's copyright policy is described in Clause 7 of the *IEEE-SA Standards Board Bylaws* and Clause 6.1 of the *IEEE-SA Standards Board Operations Manual*. The Chair stated that any material submitted during standards development, whether verbal, recorded, or in written form, is a Contribution and shall comply with the IEEE-SA Copyright Policy.

6. Old Business

Clause 7.2 - Dielectric tests

The Chair displayed the existing clause. He stated the current wording has been in this standard for many years. Since the PAR extension will be ending in 2022 and this clause would take significant research and discussion to change, the Chair approached the commentor with these concerns. The commentor agreed it would be best to leave Clause 7.2 to a later revision. The Chair asked the WG for any objections on leaving Clause 7.2 unchanged in this current version. There were no objections to this.

7. New Business

The Chair asked the group if this document was ready for ballot? Jerry Murphy made a motion to "Move the current draft revision 2.8 of PC57.12.34 to Ballot". The motion was seconded by Martin Rave. In discussion of the motion, the question was asked if an editorial review had been done on the current draft. The Chair stated that the editorial issues will be brought out on comments from the ballot resolution as well during the Mandatory Editorial Coordination (MEC) review. The Chair stated that a 2/3 majority vote of the present WG members would be required. The motion passed unanimously. The Chair stated due his needing to report in the Bushing Subcommittee, he would ask Scott Dahlke to report for the Working Group and state the motion for ballot to the Distribution Subcommittee.

8. The meeting adjourned at 2:38 P.M. CST.

Submitted by: Scott Dahlke.

Date: 11/16/2021

Attendance:

NAME	Affiliation	M or G
Aaron Meyers	Eaton	Guest

Name	Affiliation	M or G
Igor Simonov	Toronto Hydro	Member

Name	Affiliation	M or G
Michael Zarnowski	Carte	Guest

Alan Sbravati	Cargill	Guest
Alan Traut	Howard Industries	Member
Alan Wilks	Wilks Consulting	Member
Albert Sanchez	Knoxville Utilities Board	Guest
Alejandro Macias	CenterPoint Energy	Member
Ali Ghafourian	H-J Enterprises, Inc.	Member
Andrew Larison	Hitachi Energy	Guest
Audrey Siebert-Timmer	IFD Corp.	Member
Avijit Shingari	PEPCO Holdings	Guest
Ben Garcia	Southern California Edison	Member
Brian Klaponski	Carte	Member
Bruce Webb	Knoxville Utilities Board	Member
Carlos Gaytan	Prolec GE	Member
Dan Mulkey	Mulkey Engineering	Member
Dwight Parkinson	Eaton	Member
Edmundo Arevalo	Boonville Power Administration	Guest
Eric Theisen	Metglas	Member
Gael Kennedy	GR Kennedy & Associates LLC	Member
Gary King	Howard Industries	Member
Glenn Andersen	Fayetteville PWC	Guest
Greg Ante	Southern California Edison	Guest

James Edward Smith	H-J Enterprises, Inc.	Member
Jeff Schneider	Spire Power	Member
Jeremy Van Horn	IFD Corp.	Member
Jerry Allen	Metglas	Member
Jerry Murphy	Reedy Creek Energy Services	Member
John Vartanian	National Grid	Member
Josh Verdell	ERMCO	Guest
Joshua Yun	Virginia Transformer Corp.	Member
Juan Ramirez	Celeco	Member
Kayland Adams	SPX Transformers	Guest
Ken Hampton	BGE	Member
Kendrick Hamilton	Power Partners	Guest
Kent Miller	T&R Electric Supply Co.	Guest
Kevin Rapp	Cargill	Guest
Kyle Zemanovic	Eaton	Guest
Malia Zaman	IEEE SA	Guest
Manoj Mishra	ASAssoft Canada	Guest
Markus Stank	Reinhausen	Guest
Martin Rave	ComEd	Member
Michael Gonzales	Southern California Edison	Guest
Michael S. Dahlke	Central Moloney, Inc.	Member

Mike Thibault	Pacific Gas & Electric	Member
Paul Chisholm	IFD Corp.	Member
Philip Miller	Memphis LGW	Guest
Rajkumar Padmawar	ASAssoft Canada	Guest
Ramadan A Issack	American Electric Power	Guest
Rehan Ali	Siemens-Energy	Guest
Rhea Montpool	Schneider Electric	Member
Rhett Chrysler	ERMCO	Member
Rob Ghosh	General Electric	Guest
Robert Reepe	Southern Co.	Guest
Rosamie Magee	PSE&G	Guest
Said Hachichi	Hydro Quebec	Member
Stephen Shull	BBC Electrical Services, Inc.	Member
Steve Schappell	SPX Transformers	Member
Thomas Callsen	Weldy-Lamont Associates	Member
Tim Tillery	Howard Industries	Guest
Weijun Li	Braintree Elec. Light Dept.	Member
Zachery Weiss	WEG Transformers USA Inc.	Guest

C57.12.36 – Distribution Substation Transformers – Jerry Murphy

This working group did not meet.

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

Marty Rave, for Ali Ghafourian, presented the following minutes from the working group meeting on November 15, 2021 at 12:55 p.m. with 57 in attendance.

1. Call to order, Verification of Quorum, and Chair's remarks

The virtual meeting was called to order by the Chair, Ali Ghafourian, at 12:55 p.m. CDT on Monday November 15th, 2021.

Quorum was established with 29 out of 57 Working Group members present per poll results generated. Actual Member attendance was 36 per Attendees spreadsheet (Attendees.xlsx) provided by ENCORE rep at end of meeting.

The Chair announced the active PAR expires at the end of 2021, and a two-year PAR extension through the end of 2023 was requested and is awaiting approval.

2. Presented required IEEE SA Patent and Copyright Policies Slides, Call for Patents

The essential Patent presentation slides were shown. Then, the Chair called for Patents amongst the Working Group in which there was none that were brought forward to the Chair. Also, the Copyright presentation slides were shown as required.

3. Approval of agenda

The agenda was issued to the Working Group prior to the meeting for review. The agenda was unanimously approved.

4. Approval of minutes of previous meeting

The Spring 2021 meeting minutes (S21-C57.12.38-UnapprovedMinutesR3.pdf) were posted to the Distribution Subcommittee website after the meeting for the Working Group members to review. The Spring 2021 meeting minutes were unanimously approved.

5. Draft review

The latest draft, D2.5 (C57 12 38 D2.5 Sept 2021(Comments).pdf), of proposed revisions to C57.12.38 was reviewed with the Working Group. A review will be performed of the notes for the tables/figures of the proposed Draft to determine whether the notes should be included inside the table (informative) or outside the table (normative). No figures or sketches of the accessories described in Annex A will be included due to potential copyright issues. Section A.2.3 of Annex A – “Bay-O-Net” may need to be removed and changed to “Bayonet” due to copyright (Jerry Murphy) and Section A.9 – Remove reference to Drain Valve NPT size due to different sizes readily available (Ali Ghafourian). Also, Jeff Schneider asked if the WG is considering adding Fault Indicators within Annex A. This was noted to be reviewed for possible inclusion into Annex A in the next draft revision. The latest draft, D2.5, will be revised based on the comments noted during the meeting and then posted to the Distribution Subcommittee website for Working Group to review. A special Working Group meeting will be scheduled prior to the Spring 2022 meeting to vote on a motion (requiring a 2/3 majority for approval) for submitting the latest draft document to the Subcommittee for approval to go to ballot.

6. Old Business

Jeremy Van Horn reported for the Tank Touch Temperature Task Force stating the issue of tank touch temperature is being considered for inclusion by the Enclosure Integrity Working Group, but no final decision has been reached as to which Working Group is most appropriate to address this issue.

7. New Business

No new business items were raised during the meeting.

8. Next meeting – Date and Location

The Chair announced the Working Group will meet at the Spring 2022 meeting in Denver, CO (USA) or by Webex Virtual meeting.
Dates: March 27th – 31st, 2022

9. Adjournment

The Chair adjourned the meeting at approximately 1:45 p.m. CDT.

List of Attendees and Affiliations:

1	Ali Ghafourian (Chair)	H-J Enterprises, Inc.	Member
2	Martin Rave (Vice-Chair)	ComEd	Member
3	Jarrod Prince (Secretary)	ERMCO	Member
4	Jerry Allen	Metglas, Inc.	Member
5	Angela Amador**	EATON Corporation	Member
6	John Chisholm	IFD Corporation	Member
7	Michael Dahlke	Central Moloney, Inc.	Member
8	Benjamin Garcia**	Southern California Edison	Member
9	Carlos Gaytan	Prolec GE	Member
10	Said Hachichi	Hydro-Quebec	Member
11	Kenneth Hampton	Baltimore Gas & Electric	Member
12	Ramadan Issack	American Electric Power	Member
13	Gael Kennedy	GR Kennedy & Associates LLC	Member
14	Andrew Larison**	Hitachi Energy	Member
15	Alejandro Macias**	CenterPoint Energy	Member
16	Kent Miller	T&R Electric Supply Co.	Member
17	Michael Morgan	Duke Energy	Member
18	Daniel Mulkey	Mulkey Engineering Inc.	Member
19	Jerry Murphy	Reedy Creek Energy Services	Member
20	Dwight Parkinson	EATON Corporation	Member
21	Chris Pitts	Howard Industries	Member
22	Juan Ramirez	CELECO	Member
23	Avijit Shingari**	Pepco Holdings Inc.	Member
24	Stephen Shull	BBC Electrical Services, Inc.	Member
25	Igor Simonov	Toronto Hydro	Member
26	Edward Smith	H-J Family of Companies	Member
27	Markus Stank	Maschinenfabrik Reinhausen	Member
28	Eric Theisen	Metglas, Inc.	Member
29	Michael Thibault	Pacific Gas & Electric	Member
30	Reinaldo Valentin	Duke Energy	Member
31	Jeremy Van Horn	IFD Corporation	Member
32	John Vartanian	National Grid	Member
33	Joshua Verdell	ERMCO	Member
34	Shelby Walters	Howard Industries	Member
35	Bruce Webb	Knoxville Utilities Board	Member
36	Alan Wilks	Consultant	Member
37	Rehan Ali	Siemens Energy	Guest
38	Glenn Andersen	Fayetteville PWC	Guest
39	Gregory Ante	Southern California Edison	Guest
40	Jared Bates	Oncor Electric Delivery	Guest
41	Rhett Chrysler	ERMCO	Guest
42	Michael Gonzales	Southern California Edison	Guest
43	David Holland	ExxonMobil	Guest
44	Rosamire Magee	PSE&G	Guest
45	Terence Martin	MarVen	Guest
46	Manoj Kumar Mishra	ASAssoft (Canada) Inc	Guest
47	Martin Munoz Molina	Orto de Mexico	Guest
48	Lesther Alex Quispe Cuadrado*	EATON Corporation	Guest
49	Robert Reepe*	Georgia Power Co.	Guest
50	Mahesh Sampat	EMS Consulting Inc.	Guest

51	Albert Sanchez	Knoxville Utilities Board	Guest
52	Jeffrey Schneider	Power Partners/Spire Power Solutions	Guest
53	Adrian Silgado	IFD Corporation	Guest
54	Katrina Swanson McLeod	Southern Nuclear	Guest
55	Timothy Tillery	Howard Industries	Guest
56	Christopher Whitten	Hitachi Energy	Guest
57	Malia Zaman	IEEE	Guest

** 6 New Members were introduced to the Working Group. 1 of the 6 didn't attend this meeting.

* A total of 2 guests requested Working Group membership which will be reviewed to determine who is eligible for membership before the Spring 2022 meeting.

██████ C57.12.39 – Tank Pressure Coordination – Carlos Gaytan

This working group did not meet

██████ Task Force on Transformer Efficiency and Loss Evaluation – Phil Hopkinson

Phil presented the following minutes from the task force meeting on November 15, 2021 at 9:25 a.m. After the minutes were presented there was some open discussion on the topic of transformer design/loading. Phil Hopkinson mentioned that recent material inflation/scarcity should be considered in the upcoming DOE work. Brian Klaponski brought up the increase in loads due to electric vehicles. Marty Rave brought up that further increases to transformer sizes due to increase efficiency requirements will be prohibitive for current installations.

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. 155 were in attendance for this meeting.

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

a. Phil Hopkinson introduction

Phil Hopkinson noted that the final DOE Energy Conservation Program: Test Procedure for Distribution Transformers has been issued. There is also a Template Form that goes with the final test procedure. Effective January 2022 one will need to submit your compliance data on the appropriate form.

b. DOE Revised Final Testing Requirements for 2021

Embedded below are the Federal Register announcement Test Procedure for Distribution Transformers and the Template Form that goes with the final test procedure.

c. DOE Preliminary NOPR on Mandatory Efficiencies – Jeremy Dommu

Jeremy Dommu of DOE Building Technologies Program reported on Preliminary Analysis for Distribution Transformers. On September 29, 2021 DOE completed rulemaking. The output: What the per unit load should be to rate load of transformers. DOE has reopened the comment period through December 10, 2021. NEMA is working on a response. EEI is working on a response. Mr. Dommu stressed that stakeholder input is an important part of the process.

d. Mahesh Sampat on NREL Forecasted loading

Mahesh Sampat presented on history, future, and impact of 2050 Electrification to utilities and liquid filled distribution transformers and “Net zero” by 2050

- **Usage of Electricity has leveled off since 2005**
- **Per Capita usage of electricity has been going down since 2005**
 - Shift in economy plus efficiency improvements
- **To reach *NetZero* CO2 emission by 2050, significant Electrification of US economy is expected**
 - Transportations
 - Building -Space Heating and Cooling Technology, etc.
- **Per NREL Electrification Report**
 - Demand for Electricity will be 20% higher under Medium scenario & 38% higher under High scenario over reference (BAU)
- **Per Unit Load (PUL) on transformers can go up**
 - *Without local solar*, up to 0.12 -0.38 in medium scenario & up to 0.138 -0.44 in high scenario
 - Local Solar (DPV) Production will lower above PULs
- **Impact on Electric Utility will be *very positive* in any of above scenarios**
 - However, Hydrogen for transportation could be a competing technology

Discussion: EV – long trips at fill in station will yield a new addition to the grid and fast charging will need stiffer system. Roof top PV will reduce grid-supplied electricity. Steve Rosenstock commented the report is a national overview, but it should be noted that certain wildcard states (California, NY) are being very aggressive.

e. Dan Mulkey on Knoxville Loading

Dan Mulkey presented on transformer loading in Knoxville, TN. Measured data from smart meters. Data started with Bruce Webb. 129,955 customers. Full Presentation embedded above. May revisit next time as time was running short.

7. Documents

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

8. Adjourn

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

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

Gary presented the following minutes from the working group meeting on November 16, 2021 at 4:45 p.m. with 60 in attendance.

1. Call to order and Chair's remarks – Called to Order at 3:45PM CST by Gary Hoffman
2. Chairs Remarks (Item #6 in Agenda)
3. Quorum Verification – Took count with 35 members attending – Quorum Met with 60 total in attendance
4. Discussion over those asking for membership requested to identify themselves in the Chat for the Webex – These members will be contacted post meeting to verify attendance of prior meetings.
5. Approval of Agenda - Item #3 for this meeting. No Objections
6. Approval of the meeting of Spring 2021 – Item #4 - Motion by Jerry Murphy 2nd by Hakim Dulac – Unanimous Approval – No Objections
7. Call for Patents and IEEE SA Copyright Policy Statements Made – No Items brought to the Chairs attention
8. Task Force Reports was presented as follows:
 - Clause 4: Dan Mulkey discussed changes – No issues objected to – no motions made
 - Clause 5: Jerry Murphy - Key Monitoring – Direct Fiber Low Voltage Hot Spot Monitoring to be added to Table – Hakim Dulac made Motion – Seconded by Roger Felton – Motion carried unanimously. Jerry to speak to Brad Stayley with Salt River Project on specifics.
 - Clause 6: Method of alert, and Telemetry- Thibault/Shull discussed – No issues objected to – no motions made
 - Clause 7: Installation – Under construction – more work needed - discussion by Gary Hoffman (Chair)
9. New Business a. Agreement and Discussion concerning “Straw Poll” to be present Clause 4,5,6 to STNP and Distribution Transformer Subcommittees for comment in an attempt to uncover and potentially address any comments these members may have with the Working Groups product (Monitoring Guide) to date.
10. Next meeting is in Denver, Co March 27th thru 31st 2022
11. Adjournment

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

Rhett Chrysler presented the following minutes from the working group meeting on November 16, 2021 at 12:55 p.m. with 29 in attendance.

1. Chair called the meeting to order at 12:55pm CDT.
2. Total attendance of 29 is listed below. 14 of 23 members present and quorum was verified (61%). 2 guests requested membership.
3. Chair called for identification of essential patents pertaining to the work of this WG. None brought forward. Copyright policy presented. No issues identified.
4. Motion to approve meeting agenda. Approved unanimously.
5. Motion to approve Spring 2021 (Virtual) meeting minutes by Ken Hampton, 2nd by Dan Mulkey. Approved unanimously.
6. Chair Report
 - a. 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.
 - b. WG goal is to vote to move the document to ballot at the Fall 2022 meeting.
7. Old Business
 - a. Follow up to the TF on editorial review, Rhett will update Figure 7 by the next meeting to show vertical location of the temporary barcode label.
 - b. At the Spring 2021 meeting a request was made for a new manufacturer code 'NS' from Gilbert Kozar of Northeast Transformer Services. At this meeting another request was made by Andre Lainson9?? for Hitachi Energy. Rhett reported that any changes to the manufacturer code list will be balloted along with this standard.
 - c. TF Report on QR Code – Rhett Chrysler, Israel Barrientos and Mike Thibault Israel. Rhett presented the results of the QR code survey. A summary follows:
 - i. 30 responses received, 13 end user, 17 manufacturer
 - ii. QR code technology trickling into manufacturing practices but with limited consistency and/or overlap of uses
 - iii. 32 of 55 selections (58%) preferred information referenced in existing C57.12.35 data requirements
 - iv. 20 of 55 selections (36%) preferred information referenced in C57.12.37 data requirements
 - v. 26 of 30 (87%) of respondents supported inclusion as a standard reference for QR code minimum requirements in the C57.12.35 standard
 - d. A new QR code TF formed (Mike Thibault (chair), Steve Shull, Ken Hampton, Rhett Chrysler, Pragnesh Vyas, Alex Macias) to draft a new informative Annex for QR code on the temporary label.
8. New Business - None

9. Next meeting March 29, 2022 Denver, CO

10. Meeting adjourned at 2:10pm CDT.

Submitted by: Alan Traut, Secretary

Date: 11/16/2021

Attendance:

First Name	Last Name	Company	Role
Glenn	Andersen	Fayetteville PWC	M
Darren	Brown	Howard Industries	M
Rhett	Chrysler	ERMCO	M
Ben	Garcia	Southern California Edison	G
Kenneth	Hampton	Baltimore Gas & Electric	M
Ramadan	Issack	American Electric Power	M
Andrew	Larison	Hitachi ABB Power Grids	G*
Alejandro	Macias	CenterPoint Energy	M
Lee	Matthews	Howard Industries	M
Kent	Miller	Consultant	G
Tyler	Morgan	Duke Energy	G
Dan	Mulkey	Mulkey Engineering	M
Jerry	Murphy	Reedy Creek Energy Services	M
Dwight	Parkinson	EATON Corporation	G
Chris	Pitts	Howard Industries	G
Martin	Rave	ComEd	G
Robert	Reepe	Georgia Power Co.	G*
Albert	Sanchez	Knoxville Utilities Board	G
Avijit	Shingari	Pepco Holdings Inc.	M
Stephen	Shull	BBC Electrical Services, Inc.	M
Adrian	Silgado	IFD Corporation	G
Edward	Smith	H-J Family of Companies	M
Michael	Thibault	Pacific Gas & Electric	M
Alan	Traut	Howard Industries	M
Reinaldo	Valentin	Duke Energy	G
Joshua	Verdell	ERMCO	G
Pragnesh	Vyas	Solomon Corp	G
Shelby	Walters	Howard Industries	G
Alan	Wilks	Consultant	G

G* Requesting Membership

C.3 Old Business

- No old business was discussed

C.4 New Business

Brian Klaponski brought up that the next meeting needed to have published Covid protocols before companies would be comfortable sending reps to the meeting. Bruce Forsyth noted that the message was heard.

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 10:44am.

List of Attendees and Affiliations:

Role	First Name	Last Name	Company
Guest	Rehan	Ali	Siemens Energy
Guest	Nabi	Almeida	Prolec GE
Guest	Glenn	Andersen	Fayetteville PWC
Guest	Gregory	Ante	Southern California Edison
Guest	Edmundo	Arevalo	Bonneville Power Administration
Member	Javier	Arteaga	Hitachi Energy
Member	Donald	Ayers	Ayers Transformer Consulting
Guest	Gilles	Bargone	FISO Technologies Inc.
Member	Israel	Barrientos	Prolec GE
Guest	Jared	Bates	Oncor Electric Delivery
Guest	Duvier	Bedoya	Hitachi Energy
Guest	Tammy	Behrens	SPX Transformer Solutions, Inc.
Guest	Kevin	Biggie	Weidmann Electrical Technology
Guest	Dominique	Bolliger, Ph.D.	HV TECHNOLOGIES, Inc.
Guest	Jeffrey	Britton	Phenix Technologies, Inc.
Member	Darren	Brown	Howard Industries
Guest	Jagdish	Burde	Virginia Transformer Corp
Member	Thomas	Callsen	Weldy-Lamont Associates
Guest	Kurt	Carlson	V&F Transformer
Member	John	Chisholm	IFD Corporation
Member	Rhett	Chrysler	ERMCO
Member	Craig	Colopy	EATON Corporation
Guest	John	Crouse	Roswell Alliance
Guest	Jorge	Cruz	PTI Transformers
Guest	Michael	Dahlke	Central Moloney, Inc.
Member	Thomas	Dauzat	General Electric
Guest	Eric	Davis	Burns & McDonnell
Guest	Larry	Dix	Quality Switch, Inc.
Guest	Hakim	Dulac	Qualitrol Company LLC
Member	Samraghi	Dutta Roy	Siemens Energy
Guest	William	Elliott	Prolec GE
Guest	Reto	Fausch	RF Solutions
Member	Marcos	Ferreira	Beale AFB
Guest	Bruce	Forsyth	Bruce Forsyth and Associates PLLC
Guest	George	Frimpong	Hitachi Energy
Guest	Lorne	Gara	Shermco
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	Andrea	Glynn	Xcel Energy
Guest	Zoran	Goncin	PTI Transformers

Guest	Michael	Gonzales	Southern California Edison
Guest	Jose Antonio	Gonzalez Ceballos	Georgia Transformer
Member	James	Graham	Weidmann Electrical Technology
Member	Said	Hachichi	Hydro-Quebec
Guest	Kendrick	Hamilton	Power Partners, Inc.
Guest	Kenneth	Hampton	Baltimore Gas & Electric
Guest	Giovanni	Hernandez	Virginia Transformer Corp.
Member	Sergio	Hernandez Cano	Hammond Power Solutions
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
Member	Philip	Hopkinson	HVOLT Inc.
Member	John	John	Virginia Transformer Corp.
Member	Gael	Kennedy	GR Kennedy & Associates LLC
Member	Gary	King	Howard Industries
Member	Brian	Klaponski	Carte International Inc.
Guest	Alexander	Kraetge	OMICRON electronics
Guest	Michelle	Kutzleb	TJH2b Analytical Services
Guest	Andrew	Larison	Hitachi Energy
Guest	Moonhee	Lee	Hammond Power Solutions
Guest	Aleksandr	Levin	Weidmann Electrical Technology
Member	Weijun	Li	Braintree Electric Light Dept.
Guest	Xose	Lopez-Fernandez	Universidade de Vigo
Guest	Colby	Lovins	Federal Pacific
Member	Alejandro	Macias	CenterPoint Energy
Member	Tim-Felix	Mai	Siemens Energy
Guest	Jinesh	Malde	M&I Materials Inc.
Member	Lee	Matthews	Howard Industries
Guest	James	McBride	JMX Services, Inc.
Guest	Timothy	Menter	Lincoln Electric System
Guest	Aaron	Meyers	EATON Corporation
Member	Kent	Miller	T&R Electric Supply Co.
Guest	Manoj Kumar	Mishra	ASAssoft (Canada) Inc
Member	Rhea	Montpool	Schneider Electric
Member	Daniel	Mulkey	Mulkey Engineering Inc.
Vice-Chair	Jerry	Murphy	Reedy Creek Energy Services
Guest	Ali	Naderian	METSCO Energy Solutions Inc.
Guest	Frank	Neder	Trench Germany GmbH
Guest	Kristopher	Neild	Megger
Guest	Stephen	Oakes	WEG Transformers USA Inc.
Guest	Rodrigo	Ocon	Industrias IEM
Guest	Rajkumar	Padmawar	ASAssoft (Canada) Inc
Member	Dwight	Parkinson	EATON Corporation

Annex C

Guest	Harry	Pepe	Phenix Technologies, Inc.
Guest	Caroline	Peterson	Xcel Energy
Guest	Matthew	Pinard	Weidmann Electrical Technology
Guest	Chris	Powell	Intermountain Electronics
Member	Jarrold	Prince	ERMCO
Guest	Jimmy	Rasco	Rasco Consulting LLC
Member	Martin	Rave	ComEd
Guest	Samuel	Reed	EATON Corporation
Guest	Scott	Reed	MVA
Guest	Robert	Reepe	Georgia Power Co.
Guest	Afshin	Rezaei-Zare	York University
Guest	Josue	Rodriguez	Prolec GE
Guest	Leopoldo	Rodriguez	Transformer Testing Services LLC
Guest	Hakan	Sahin	Virginia/Georgia Transformer
Guest	Pedro	Salgado	Electronic Technology Inc.
Guest	Mahesh	Sampat	EMS Consulting Inc.
Guest	Albert	Sanchez	Knoxville Utilities Board
Guest	Manish	Saraf	Hammond Power Solutions
Member	Daniel	Sauer	EATON Corporation
Guest	Alan	Sbravati	Cargill, Inc.
Guest	Stefan	Schindler	Maschinenfabrik Reinhausen
Member	Jeffrey	Schneider	Power Partners/Spire Power Solutions
Guest	Dan	Schwartz	Quality Switch, Inc.
Guest	Pugal	Selvaraj	Virginia Transformer Corp.
Guest	Jeremy	Sewell	Quality Switch, Inc.
Guest	Samuel	Sharpless	Rimkus Consulting Group
Member	Hemchandra	Shertukde	University of Hartford
Guest	Avijit	Shingari	Pepco Holdings Inc.
Member	Adrian	Silgado	IFD Corporation
Member	Igor	Simonov	Toronto Hydro
Guest	Jonathan	Sinclair	PPL Electric Utilities
Guest	Christopher	Slattery	FirstEnergy Corp.
Chair	Edward	Smith	H-J Family of Companies
Guest	Mike	Spurlock	Spurlock Engineering Services, LLC
Guest	Markus	Stank	Maschinenfabrik Reinhausen
Guest	Kerwin	Stretch	Siemens Energy
Member	Janusz	Szczechowski	Maschinenfabrik Reinhausen
Guest	Marc	Taylor	JFE Shoji Power Canada Inc.
Guest	Dervis	Tekin	Meramec Instrument Transformer Co.
Guest	Eric	Theisen	Metglas, Inc.
Member	Michael	Thibault	Pacific Gas & Electric
Member	Timothy	Tillery	Howard Industries
Guest	Mark	Tostrud	Dynamic Ratings, Inc.
Member	Alan	Traut	Howard Industries
Member	Jeremy	Van Horn	IFD Corporation

Annex C

Guest	John	Vartanian	National Grid
Secretary	Joshua	Verdell	ERMCO
Member	Rogerio	Verdolin	Verdolin Solutions Inc.
Member	Pragnesh	Vyas	Sunbelt-Solomon Solutions
Member	Sukhdev	Walia	New Energy Power Co.
Guest	Alan	Washburn	Burns & McDonnell
Member	Bruce	Webb	Knoxville Utilities Board
Member	Alan	Wilks	Consultant
Guest	Trenton	Williams	Advanced Power Technologies
Member	Baitun	Yang	R.E. Uptegraff
Member	Joshua	Yun	Virginia Transformer Corp.
Guest	Malia	Zaman	IEEE
Guest	Anand	Zanwar	Siemens Energy
Guest	Michael	Zarnowski	Carte International
Guest	Kyle	Zemanovic	EATON Corporation

Annex D Dry Type Transformers Subcommittee

November 17, 2021

Virtual Meeting

Chair: Casey Ballard

Vice-Chair: David Walker

Secretary: Dave Stankes

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

The Dry-type Transformers Subcommittee (DTS) met virtually on November 17, 2021 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.

Chair welcomed David Walker as the new DTSC Vice-Chair as well as four new members to the DTSC. Chair also described the requirements to become a member as well as best process for requesting membership with considerations for doing this electronically as we meet less frequently in person.

Chair reminded WG and TF Chairs that copyright slides must be shown at the beginning of each meeting. We can openly share inside of the IEEE Transformers Committee, but we cannot share or display any other documents without first getting written approval.

It was encouraged to hold TF/WG meetings between our Spring/Fall sessions to accelerate progress. If a WG or TF Chair would like to hold a meeting, information regarding the meeting should be shared in advance via AMS and posted on the IEEE Transformer Committee website (facilitated by Sue McNelly). Reminded leaders that attendance and meeting minutes must be documented. These could be part of the following Fall/Spring SC submittal for approval.

The Chair reminded leaders the need for maintaining an accurate roster to ensure quorums are reached and business can be conducted. Reviewed guidelines for maintaining membership including regular attendance as well as participation at meetings. Recommended that if a chair is considering changing a member's status to "guest" that he/she reach out the individual to consider any extenuating circumstances.

Chair reviewed the requirements and content expected to be included into WG/TF minutes. Due to the decision to conduct the Fall meeting virtually and the resulting rescheduling to November, the Chair reminded WG/TF leaders there was less time to prepare and submit minutes. As the AMS system is scheduled no longer be available after December 31, 2021 he encouraged leaders to enter attendance into the system prior to that date.

The meeting was convened with 47 people in attendance 25 of the 33 members of the DTS were present, so quorum was reached. Two 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 The attendance roster will be recorded in the AMS.

Motions to entertain the approval of the Agenda and the Spring 2021 DTSC Meeting minutes was proposed by Chair. Both Agenda (Motion to Approve – Tim-Felix Mai, 2nd – Chuck Johnson) and Spring 2021 minutes (Motion to Approve - Joe Tedesco, 2nd – David Walker) were unanimously approved.

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 PC57.16 – Dry Type Reactors

Chair Art Del Rio

The working group for the revision of C57.16 met virtually in WebEx on Monday November 15, 2021, at 9:25 AM.

1. Introductions and Call for Patents

- The meeting was called to order at 9:25 AM by the WG Chair Art Del Rio.
- The meeting was opened with the introduction of participants.
- The WG Chair, Art Del Rio, did a call for potentially essential patents. None was reported.

2. Verification of Quorum

- The attendance was checked with a Poll.
- There was a total of 27 participants: 8 Members and 20 Guests out of which no guest requested membership.
- 8 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 November 9, 2021, by email, was presented to the participants.
- There were no objections or comments, and the agenda was approved unanimously.

3. Approval of the minutes of the April 26, 2021, virtual meeting

- The minutes from the S21 virtual meeting, which were circulated on November 9, 2021, by email, were presented to the participants.
- Dave Caverly has provided a changed text regarding sync with IEC. With that change, the agenda was approved unanimously.

4. Continue to discuss and review

- Dave Caverly gave a presentation regarding the latest update/clean-up status with Annex B, Annex B-1 and Annex F.
- A week ago, the chair Art Del Rio distributed the latest versions of these Annexes.
- At the spring meeting it was concluded, after recommendations from the Switchgear Committee, that with a little bit of “clean-up” the Annexes would then be ready to go to Ballot. Dave Caverly has done the clean-up.

4.a Annex F – Informative, Circuit Breaker Transient Recovery Voltage Implications of Series Reactors

- Dave Caverly presented the latest draft.
- The changes have been mostly editorial and not so much technical.
- The title of Annex F has been changed to better reflect its content

- The format of Table F1, model values for PI model, has been changed to fit better in the text. Some units have been changed to be more convenient, e.g., H changed to mH, and F changed to pF.
- Most of clause F.3, TRV study, has been removed as this information is covered in IEEE C37.011 which is referenced in this Annex.
- Figure F.2 has been updated to show the current limiting reactor on both sides of the breaker. The text has been updated to also cover reactor on both sides of the breaker. This is after comment from Pierre Riffon.
- Alexander Gaun, commented that the capacitance calculation, shown in Clause F.2, is seldom used. Normally the capacitance to ground is simulated, e.g., with finite element simulations. The text will be updated to also state that simulations can be used to define the capacitance to ground.
- With these modifications, Annex F is ready to be balloted as part of the standard.
- Klaus Pointner made a motion to copy this updated Annex F into the draft standard. This motion was seconded by Ulf Radbrandt.

4.b Annex B - Normative, Specific requirements for dry-type air-core shunt capacitor reactors

- Dave Caverly presented the latest draft.
- There have been few changes since the spring meeting.
- The plan at the beginning was to change Annex B as little as possible and to put new information in the newly created informative Annex B-1 instead.
- The text addresses the benefits of putting the TLI, paralleled by an arrester, on the neutral side of the capacitor. As worded, it unintentionally implies that the arrester is applied to reduce the required short circuit rating of the reactor. This was discussed. That would require very high energy of the arrester to withstand the fault current. Alternatively, and more likely, the arrester would be sacrificed in the event of bank flashover. Dave Caverly will develop revised text regarding the fault current aspect and review it with Pierre Riffon and Mike Sharp in advance of copying this updated Annex B into the draft standard.
- Klaus Pointner made a motion to copy this updated Annex B into the draft standard. This motion was seconded by Mike Sharp.

4.c Annex B1 – Informative. Application and Rating Aspects of Shunt Capacitor Reactors (TLI's)

- Dave Caverly presented the latest draft.
- Equation numbers must be corrected before inclusion into the draft standard.
- The text related to Figure 3c will be corrected regarding difference in cost to refer to only 3a instead of 3a and 3b.
- The text regarding the neutral side TLI and parallel arrester will be modified to be more clear (same as mentioned above regarding the similar text in Annex B). Dave Caverly, Mike Sharp and Pierre Riffon will together modify the text. modify the text (same as new text for Annex B).
- The overall factors in Table 1 were originally shown as 1.25 and 1.35 but were modified in the version of the document shown in the meeting to 1.24 and 1.36. Further checking after the meeting found that Annex B shows 1.25 and 1.35 and also that this is consistent with IEEE 1036-2010 and also IEEE C37.012 - 2014. Accordingly, after the meeting, the factors have

been changed back to 1.25 and 1.35. If needed this can be discussed again at the interim virtual meeting in December.

- The text regarding mechanical forces has been rewritten
- Figures and text are added to show components of inrush TLI fault current for different timings of fault occurrence, i.e., time (in electrical degrees) from voltage zero crossing until fault occurrence. Pierre Riffon provided these from simulations.
- Ulf Radbrandt made a motion to do the modifications and to copy Annex B-1 into the draft standard. This motion was seconded by Klaus Pointner.

5. Discussion

- Why do we have an Annex named B-1? Should it get its own letter, e.g., Annex G? There was some discussion but no clear consensus. No vote was taken (we were under time pressure to end the meeting). The reason to name it B-1 is that it is so tightly connected to Annex B. The Chair suggested that we keep the name Annex B-1 but we probably must correct names of clause, equations, figures, and tables to include “B-1”. It is also unsure if this will pass the MEC review. The Chair will investigate further with IEEE as we start the process of merging the revised and new Annexes back into the master document.
- We will try to have the document ready for Ballot before the spring 2022 meeting. Then it might be higher possibility to get a necessary PAR extension. To achieve this, we will need to have at least one virtual working meeting (and possibly two) before the spring meeting. We should have the timeline for the Ballot when we request the PAR extension.
- The rest of the standard will be distributed for review among WG members.
- The next working meeting is scheduled for December 14. Art Del Rio will send an invitation. All members should try to attend the extra working meetings in order to get quorum.

5. New Business

- There was no new business.

6. Adjournment

- The meeting was adjourned at 10:48 AM.

Next meeting:

Spring 2022 – Denver, Colorado USA, March 27 – 31, 2022

F21 Attendance list and membership status.

Role	First Name	Last Name	Company
Guest	Mubarak	Abbas	Siemens Energy
Guest	Edmundo	Arevalo	Bonneville Power Administration
Vice-Chair	David	Caverly	Trench Limited
Chair	J. Arturo	Del Rio	Siemens Energy
Member	Alexander	Gaun	Coil Innovation GMBH
Guest	Thomas	Blackburn	Gene Blackburn Engineering
Guest	Solomon	Chiang	The Gund Company
Member	Sylvain	Plante	Hydro-Quebec
Guest	Sami	Debass	Electric Power Research Institute (EPRI)

Guest	Thomas	Falkenburger	Coil Innovation USA, Inc.
Member	Klaus	Pointner	Trench Austria GmbH
Guest	Rob	Ghosh	General Electric
Secretary	Ulf	Radbrandt	Hitachi Energy
Guest	Andrea	Glynn	Xcel Energy
Guest	Jeffrey	Gragert	Xcel Energy
Guest	Thomas	Hartmann	Pepco Holdings Inc.
Guest	Giovanni	Hernandez	Virginia Transformer Corp.
Guest	Kurt	Kaineder	Siemens Energy
Guest	Ken	Klein	Grand Power Systems
Guest	Aniruddha	Narawane	EATON Corporation
Member	Pierre	Riffon	Pierre Riffon Consultant Inc.
Guest	Livia	Neeson	Entergy
Guest	Paulette	Payne-Powell	Retired
Guest	Caroline	Peterson	Xcel Energy
Guest	Patrick	Rock	American Transmission Co.
Guest	Ullises	Rodriguez	Grand Power Systems
Member	Michael	Sharp	Trench Limited
Guest	Dervis	Tekin	Meramec Instrument Transformer Co.
Guest	Michael	Warntjes	American Transmission Co.
Guest	Helena	Wilhelm	Vegoor Tecnologia Aplicada
Guest	Terry	Wong	Trench Limited

Respectfully submitted,
Chairman: Art Del Rio (a.delrio@ieee.org)
Secretary: Ulf Radbrandt (ulf.radbrandt@ieee.org)

Chair Casey Ballard reminded the WG that the current PAR expires at the end of this year. Art explained that the WG plans to accelerate work, with a planned meeting for December 14th in order to get document ready for SA Ballot. Once the document is in SA ballot a PAR extension will entered. Chair reminded the team that the SC must approve the request for PAR extension but this most likely not be a problem if good progress continues to be made.

D.2.2 Revision of IEEE C57.12.52 Sealed Dry-type Chair Joe Tedesco

The Working Group met virtually over Webex on November 15, 2021. The meeting was called to order at 10:51 AM CST by Chair Joseph Tedesco.

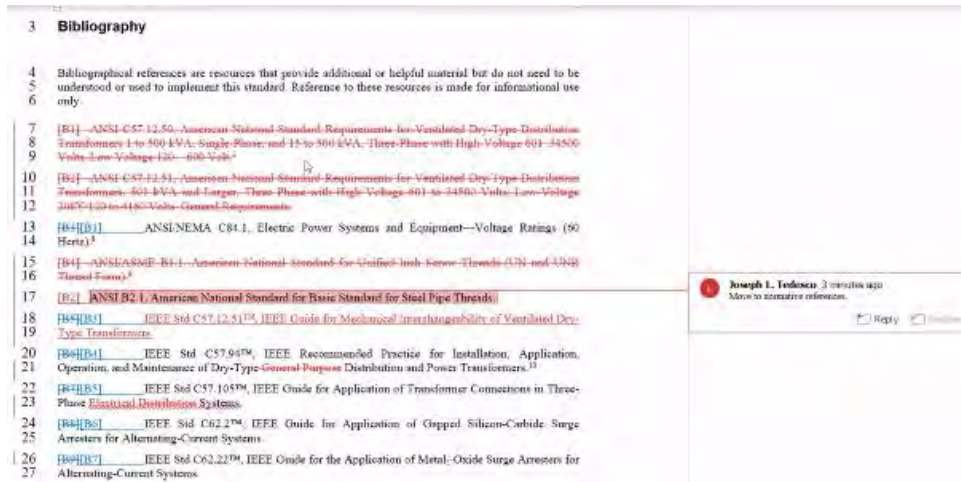
Patent call was given. Slides were sent out before the meeting. Nobody responded to patent call. Copyright policy info was shown.

Membership List was shown, and a poll was taken to determine attendance. Poll Results were: Members- 9 of 13 were present. Quorum achieved. 12 guests present. 3 other guests arrived after the poll was taken.

Chuck Johnson moved to accept the agenda as written. Tim-Felix Mai Seconded. No discussion and unanimous approval. David Walker moved to accept the minutes as written, Chuck Johnson seconded. No discussion and unanimous approval.

Old Business:

Review of Bibliography- Joe retitled standards whose name has changed (ANSI to IEEE for example) since the last revision. Discussion around whether the references add useful information to the reader of the standard, and suggested that if references are not useful, they should be deleted. Casey Ballard mentioned that C57.12.50 was withdrawn and should be removed from the bibliography. Mentioned that references that are not normative should be in the bibliography only, but that editorial review should fix any errors. David Walker moved to accept the changes to the bibliography as marked up on screen (see screenshot below). Chuck Johnson seconded. No discussion and unanimous approval.



New Business

Tim-Felix Mai suggested that the definitions for BIL and GNAN be removed from the definitions in this standard because they are already defined in C57.12.80. Roger Wicks mentioned he had a negative ballot comment because he didn't define terms already in C57.12.80. Chuck Johnson mentioned that C57.12.01 also gives full definition of cooling classes. Question was brought up about what happens if C57.12.80 conflicts C57.12.01. Tim-Felix Mai mentioned that these acronyms in C57.12.80 were owned by the Dry-Type Subcommittee going forward. C57.12.80 will probably be revised in 2022. Could we establish precedence of C57.12.01 over C57.12.80? David Walker moved to remove section 3.2. Tim-Felix Mai seconded. No discussion and unanimously approved.

Why are pad-mounted transformers excluded from the scope of the standard? Only known reason is that it was previously excluded. Chuck Johnson mentioned that pad-mounted sealed transformers had already been built. The only downside to removing the pad mount exception is the need to update the PAR. Can remove the exception without adding discussion to the standard of pad mounts. Casey Ballard moved to remove Section 1.1(d) (pad-mounted transformers) from exception list and revise the PAR. David Walker seconded. Not required to be DOE compliant. Removal would require approval of the Dry-Type Subcommittee. Discussion about the requirements of C57.12.34 such as tank construction, etc. Poll for vote on this motion: 10 for, 0 against, 1 abstain. Motion passed. Tim-Felix Mai moved to remove exclusion 1.1(e) (liquid immersed transformer) from the exclusion list. David Walker seconded. 7 approve, 2 against, 0 abstain. Motion passed.

Casey Ballard suggested using an email vote to go to ballot in the Working Group and the referral to the Subcommittee.

Joe Tedesco adjourned the meeting at 12:02 pm CST.

Chair: Joseph Tedesco

Secretary: David Walker

Following the presentation of the meeting minutes, Joe Tedesco proposed a motion requesting DTSC approval to submit a PAR revision reflecting the agreed upon change in scope approved during the WG meeting. (Not change

to the Title and Purpose.) The motion was seconded by Chuck Johnson. No comment or discussion was heard, and the motion passed unanimously.

The revised scope that will be submitted in the PAR revision is shown below.

<u>CURRENT APPROVED PAR SCOPE</u>	<u>PROPOSED REVISED PAR SCOPE</u>
<p>1. Scope</p> <p>This standard describes electrical and mechanical requirements of single and polyphase sealed dry-type distribution and power with a voltage of 601 V or higher in the highest voltage winding.</p> <p>This standard applies to all sealed dry-type transformers, including those with solid cast and/or resin-encapsulated windings except as follows:</p> <p>a) Transformers described as exceptions in IEEE Std. C57.12.01</p> <p>b) Ventilated transformers</p> <p>c) Nonventilated transformers</p> <p>d) Pad-mounted transformers</p> <p>e) Liquid-immersed transformers</p>	<p>1. Scope</p> <p>This standard describes electrical and mechanical requirements of single and polyphase sealed dry-type distribution and power with a voltage of 601 V or higher in the highest voltage winding.</p> <p>This standard applies to all sealed dry-type transformers, including those with solid cast and/or resin-encapsulated windings except as follows:</p> <p>a) Transformers described as exceptions in IEEE Std. C57.12.01</p> <p>b) Ventilated transformers</p> <p>c) Nonventilated transformers</p>

d) and e) will be deleted

Attendance on November 15th meeting:

Role	First Name	Last Name	Company
Member	Robert	Ballard	DuPont
Guest	Larry	Dix	Quality Switch, Inc.
Guest	Derek	Foster	Magnetics Design, LLC
Guest	Rob	Ghosh	General Electric
Guest	Michael	Gonzales	Southern California Edison
Guest	Giovanni	Hernandez	Virginia Transformer Corp.
Member	Charles	Johnson	Hitachi Energy
Guest	Ken	Klein	Grand Power Systems
Guest	Deepak	Kumaria	Applied Materials
Member	Colby	Lovins	Federal Pacific
Member	Alejandro	Macias	CenterPoint Energy
Member	Tim-Felix	Mai	Siemens Energy
Guest	Richard	Marek	Retired
Guest	Manoj Kumar	Mishra	ASASoft (Canada) Inc
Guest	Aniruddha	Narawane	EATON Corporation
Member	Shawn	Nunn	Hitachi Energy
Guest	Vinay	Patel	Consolidated Edison Co. of NY
Guest	Ullises	Rodriguez	Grand Power Systems
Guest	Manish	Saraf	Hammond Power Solutions
Guest	Justin	Shrewsbury	AMR PEMCO
Member	David	Stankes	3M
Chair	Joseph	Tedesco	Hitachi Energy
Secretary	David	Walker	MGM Transformer Company
Guest	Roger	Wicks	DuPont

D.2.3 Revision of IEEE PC57.134 Hottest Spot Temp in Dry Type Trans. Chair Colby Lovins

Chair: Colby Lovins

Vice-Chair/Secretary: Juan Pablo Medina (absent)

Acting Secretary: Joseph Tedesco

This was the first meeting of the IEEE C57.134 Working Group. The meeting was held virtually on November 15th via Webex and Colby Lovins called the meeting to order at 2:21 PM.

While there were 24 people present in the meeting, only 20 were present at the time of the quorum poll. 15 of the attendees requested membership. With this being the first meeting of the Working Group, there was automatically a quorum, and business could proceed.

There was no objection to unanimous approval of the agenda. The patent slides were shown, and the copyright policy was discussed. There were no essential patent claims.

Old Business:

- Colby Lovins reviewed the PAR that had been approved.

New Business:

- Colby discussed the plan to split up the work amongst task forces to handle different sections and asked for volunteers.
 - Normative references/definitions/bibliography: Dave Stankes, Tim-Felix Mai
 - Temperature measurement: Shawn Nunn
 - Determination of the winding hottest spot temperature: Joe Tedesco
 - Temperature measurement methodology: Chuck Johnson
- Colby began reviewing Draft 1.
 - Section 3
 - Colby would confirm with Malia Zaman that mention of C57.12.80 could be added to boilerplate text in Definitions section.
 - Roger Wicks asked if the average winding rise method was the same in dry as in liquid, and Chuck Johnson described his experiences with sealed dry transformer. Tim-Felix Mai confirmed that the definition in C57.12.80 would be adjusted to include both types. Further discussion would be tabled until after the task force had recommendations.
 - Section 4
 - Chuck Johnson disagreed with the statements about the accuracy of the thermocouples and suggested changing the wording to highlight that some thermocouples were less susceptible to negative effects. Manish Saraf discussed the need to include insulation on temperature sensors or highlight optical sensors. Chuck Johnson agreed and pointed out that there were ways to mitigate problems. Manish and Chuck also discussed how the height must be considered, as well as different constructions.
 - Section 5

Annex D

- There was a short discussion about the factors that affect the temperature measurement. Joe Tedesco pointed out that the surrounding ambient affected the winding temperature rise, with Casey Ballard questioning how the list compared to C57.12.01. His stance was that the list should be more extreme than that for production units.
- Manish Saraf and Chuck Johnson discussed models, with Chuck adding the history and intent of the section on models (the intent was not about simulations, but by ensuring that test models reflect actual production units, so that thermal models were accurate).
- Manish also mentioned how the values of n used in calculations showed inconsistencies in usage (between IEEE and IEC standards and between IEEE standards). It was decided to let the C57.12.91 Working Group eventually deal with this.

Colby stated his desire to go to ballot prior to the expiration of the standard, which is at the end of 2023. There would be virtual meetings in between the larger meetings to help make this possible.

The next meeting will be an interim meeting, with the date TBD. However, the date but will be prior to the Spring Meeting on March 28, 2022. This meeting will be held virtually.

The meeting was adjourned at 3:32 PM CST.

Attendance

Role	First Name	Last Name	Company
Member	Robert	Ballard	DuPont
Guest	Solomon	Chiang	The Gund Company
Member	Rob	Ghosh	General Electric
Member	Charles	Johnson	Hitachi Energy
Member	Ken	Klein	Grand Power Systems
Member	Moonhee	Lee	Hammond Power Solutions
Member	Aleksandr	Levin	Weidmann Electrical Technology
Chair	Colby	Lovins	Federal Pacific
Member	Tim-Felix	Mai	Siemens Energy
Member	Shawn	Nunn	Hitachi Energy
Member	Caroline	Peterson	Xcel Energy
Guest	Chris	Powell	Intermountain Electronics
Member	Afshin	Rezaei-Zare	York University
Guest	Ullises	Rodriguez	Grand Power Systems
Member	Manish	Saraf	Hammond Power Solutions
Guest	Peter	Sheridan	SGB USA, Inc.
Member	David	Stankes	3M
Member	Joseph	Tedesco	Hitachi Energy
Guest	Kiran	Vedante	Ritz Instrument Transformers
Member	Roger	Wicks	DuPont

D.2.4 Revision of IEEE 259 – LV Thermal Aging**Chair Dave Stankes**

Chair: David Stankes

Vice-Chair/Secretary: Joseph Tedesco

This was the second meeting of the IEEE 259 Working Group. The meeting was held virtually via Webex and Dave Stankes called the meeting to order at 3:45 PM.

Dave advertised the open position of Secretary. There were no immediate volunteers, but Dave invited anyone interested to contact him.

There were 23 people present in the meeting. There were 13 members and 10 guests. No one requested membership. The Working Group had 17 members; therefore, a quorum was reached, and business could proceed.

There was no objection to unanimous approval of the agenda and there was no objection to unanimous approval of the minutes from the Spring 2021 Working Group meeting. The patent slides were shown, and the copyright policy was discussed. There were no essential patent claims.

Old Business:

- Dave Stankes briefly discussed the Task Force structure of the working groups and reviewed who had volunteered.
- Colby Lovins (TF Lead) discussed Normative References, stating that they were waiting for more work to be done on the standard.
- Tim-Felix Mai (TF Lead) recommended that a Definitions section be added and reference C57.12.80, using the boilerplate text from other standards.
- Casey Ballard (TF Lead) discussed the Insulation Test Specimens, including the plan to include circulating current aging in addition to oven aging. Sasha Levin inquired why actual LV transformers which are typically smaller in size should not be used. Ed Van Vooren and Solomon Chiang joined the discussion and Ed commented on how the use of different types of test specimens would not affect how the overall test method is conducted and that models needed to remain part of the standard to avoid invalidating decades of LV insulation system test data and approvals.
- Ed Van Vooren (Provided update due to TF Lead Juan Medina not being able to attend) gave a review of the current status for context before discussing the Test Methodology and detailed identification of areas in need of improvement. Casey Ballard asked whether model test objects can adequately evaluate wrapped conductor as the ability to evaluate LV Electrical Insulation systems incorporating this type of insulation. Solomon Chiang remarked that most units that would use these systems are Class B (135°C) or F (155°C) or possibly H (180°C), which is why enameled conductors is sufficient.
- Roger Wicks gave a short update on the Interpretation of Data and the plan to incorporate some of the information in other Electrical Insulation System standards into IEEE 259

New Business:

Annex D

- Dave Stankes stated that his plan was for the individual Task Forces to meet (hopefully) twice between now and the Spring Meeting with the intent of preparing a new working draft incorporating many of the needed changes already identified by the TF's that can be shared with larger WG at the Spring 2022 meeting.

The date of the next meeting for the whole Working Group will be either March 28 or March 29, 2022. That meeting will be in either Denver, Colorado or virtually.

The meeting was adjourned at 4:57 PM CST.

Joseph Tedesco – Secretary (Prepared meeting minutes)

Dave Stankes - Chair

First

Name	Last Name	Affiliation
Robert	Ballard	DuPont
Solomon	Chiang	The Gund Company
Derek	Foster	Magnetics Design, LLC
Rob	Ghosh	General Electric
Charles	Johnson	Hitachi Energy
Ken	Klein	Grand Power Systems
Moonhee	Lee	Hammond Power Solutions
Aleksandr	Levin	Weidmann Electrical Technology
Colby	Lovins	Federal Pacific
Tim-Felix	Mai	Siemens Energy
Aniruddha	Narawane	EATON Corporation
Chris	Powell	Intermountain Electronics
David	Stankes	3M
Joseph	Tedesco	Hitachi Energy
Edward	Van Vooren	ELTEK International Laboratories
Roger	Wicks	DuPont
Malia	Zaman	IEEE
Ullises	Rodriguez	Grand Power systems
Kurt	Carlson	V&F Transformer
Dan	Sauer	EATON Corporation
Caroline	Peterson	Xcel Energy
Feras	Fattal	Manitoba Hydro
Rhea	Montpool	Schneider Electric

D.2.5 Revision for IEEE C57.96 Loading Guide

Vice Chair Mike Iman

- Meeting called to order 11/16/21 at 12:55 by the Chair
- All participants were notified that the meeting was being recorded for the purpose of taking notes but would be deleted after the meeting minutes are completed.

- The chair presented the information on Patent Disclosures and asked the group to report any relevant patent issues – None were communicated.
- The chair presented the information on the IEEE Copyright – No question, comments, or concerns were raised.
- The current membership list was shown and a poll to establish a quorum was taken. A quorum was achieved with 12 of 16 members present.
 - A small number of attendees stated that they had requested membership in the previous meeting but were not shown in the membership roster. The Secretary will investigate this discrepancy and correct any errors.
- The chair shared the WG Meeting Agenda. The agenda was approved unanimously without discussion.
- The chair shared the Meeting Minutes from the Spring 2021. The minutes were approved unanimously without discussion.
- The framework for evaluating the Draft that was created in the Spring 2021 meeting was reused to guide the discussions:

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 <u>Stankes</u> , Aleksandr Levin
2	Loading Equations	5	David Walker, Ryan Hoog, Manish Saraf, Justin <u>Shrewsberry</u>
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	<u>Hemchandra Shertukde</u>

- Draft D1 was shared on screen with the membership.
- It was suggested to remove definitions as this is already covered by C57.12.80. Further it was decided to re-use the wording from C57.12.01 regarding definitions which reads –
 “For the purposes of this document, the following terms and definitions apply. The IEEE Standards Dictionary Online should be consulted for terms not defined in this clause.11 Standard transformer terminology, which is available in IEEE Std C57.12.80,12 shall also apply.
- This proposal was accepted by the participants without discussion.
- In section 4.1 “General Information” the question was raised if C57.12.56-1986 should be kept in Draft due to its age and status. Main discussion points were –
 - C57.12.60 (already mentioned in draft) is the replacement
 - C57.12.56 still contains valid data and is widely used \ referenced in industry
 - C57.12.56 was the basis for several 3rd Party certification bodies

- Mike Iman (MGM) made a motion that the reference to C57.12.56 remain in the Draft as is the current status quo. The motion was seconded by Chuck Johnson (Hitachi) and passed with 10 voting “FOR”, 1 “AGAINST” and 1 “ABSTAIN”
- Section 4.2 “Transformer Life Expectancy” was shown and reviewed with no comments or discussion.
- Section 4.3 “Transformer Rated Output” was shown and reviewed with no comments or discussion.
- Section 4.4 “Aging of Insulation” was shown and had several points of discussion –
 - It was questioned if “Loading” should be added to line 15 along with time and temperature?
 - It was noted the plot of transformer life only uses the two axis of time and temperature
 - At a basic level the temperature is (mostly) a function of the load
 - It was mentioned that other factors – dielectric, mechanical, harmonic, environmental, etc.can influence the the aging of the materials. The group agreed that these are important influencers but are out of scope for a “Loading Guide”
 - It was decided that current text, referencing only time and temperature as factors should be left as is.
- Section 4.5 “Ambient Temperature” was shown and reviewed with no comments or discussion.
- Section 5 “Loading Equations” and a lengthy discussion regarding the variable and definition for the temperature rise took place. This was compared against several other standards (C57.12.91, C57.134). In the end it was agreed that no changes were necessary.
 - It was suggested that the exponent “K” be reviewed and compared against C57.12.91 and aligned if feasible. Specifically the allowance for other constants to be used based on manufacturer data. Group 2 will take this task and report at the next meeting.
 - Further, it was suggested to take a look at IEC 60076-12 for “inspiration” on how the wording and descriptions for the variables could be shortened \ simplified.
- A motion to adjourn was made at 21:16 by Roger Wicks and seconded by Tim-Felix Mai. Motion passed and the Chair adjourned the meeting.
- Next meeting: Spring 2022 – Denver, Colorado USA, March 27 – 31, 2022

FALL 2021 Meeting Attendance

Role	Last Name	First Name	Affiliation
Guest	Ante	Greg	Southern California Edison
Member	Ballard	Robert (Casey)	DuPont
Guest	Blackburn	Gene	Gene Blackburn Engineering
Guest	Chiang	Solomon	The Gund Company
Member	Debass	Sami	Electric Power Research Institute
Guest	Gonzales	Michael	Southern California Edison
Member	Hernandez	Giovanni	Virginia Transformer
Vice-Chair	Iman	Mohammad (Mike)	MGM Transformer
Member	Johnson	Charles (Chuck)	Hitachi Energy
Member	Klein	Ken	Grand Power Systems
Member	Lee	Moonhee	Hammond Power Solutions
Member	Lovins	Colby	Federal Pacific
Member	Mai	Tim-Felix	Siemens Energy
Member	Marek	Richard	Retired
Guest	Martinez	Rogelio	Georgia Transformer
Guest	Montpool	Rhea	Schneider- Electric
Chair	Narawane	Aniruddha	EATON Corporation
Member	Nunn	Shawn	Hitachi Energy
Guest	Patel	Vinay	Consolidated Edison Co. - NY
Guest	Peterson	Caroline	Xcel Energy
Member	Powell	Chris	Intermountain Electronics
Guest	Rodriguez	Ulises	Grand Power Systems
Guest	Roizman	Oleg	IntellPower Pty. Ltd.
Member	Saraf	Manish	Hammond Power Solutions
Member	Shertukde	Hemchandra	University of Hartford
Guest	Shrewsbury	Justin	PEMCO
Guest	Stankes	Dave	3M
Secretary	Stretch	Kerwin	Siemens Energy
Member	Tedesco	Joseph	Hitachi Energy
Guest	Tekin	Dervis Serhat	Hubbell Power Systems
Guest	Verdolin	Rogério	Verdolin Solutions, Inc.
Guest	Walia	Sukhdev	New Energy Power Company
Guest	Walker	David	MGM Transformer
Member	Wicks	Roger	DuPont

Chairman: Aniruddha Narawane

Vice-Chairman: Iman Mohamed

Secretary: Kerwin Stretch

D.2.6 Revision for IEEE C57.124 Partial Discharge

Dr. Shertukde

Chair: Tom Prevost; absent for this meeting

Co-Chair: Rick Marek; acting as Chair for this meeting

Secretary: Hemchandra Shertukde, will take minutes and report before SC meeting November 17, 2021

- 1) Meeting started by Acting Chair at 3:20 pm and agenda for the meeting displayed to all. Co-Chair and Secretary introduced themselves as Officers of this WG.
- 2) The essential patent issues statement was displayed, and attendees were queried if anyone is aware of any such issues? None was affirmed by the participants.
- 3) IEEE Copyright policy statement slide was displayed and shared by the co-chair with all attendees.
- 4) Poll to assess 'Attendance of all participants' at the meeting was conducted at 3:26 pm. Results revealed the following:

Member: 13

Non-Member: 12

No answer: 1

Guests/No answer: 4

Total Attendees: 30

Present membership of this WG: 16

Quorum was met.

- 5) Agenda was approved
- 6) Unapproved Minutes of Virtual Meeting of this WG from Spring 2021 were approved.
- 7) Review of Draft D.1 created so far was conducted
 - a. Review of Scope and Purpose were revisited
 - b. Detlev Gross made a presentation of tutorial material to possibly be included in Annex
 - c. Task Force Chairs of TF 1, TF 3 and TF 4 were asked to wait until Draft 2 is circulated before their review
- 8) Chair queried if the WG wants to include Bushings in the document. The diagrams could be included in the Annex. He intends to create a Draft D.2 before Christmas, and he will keep the figures on bushings in the Annex as a place keeper for now. However, it was decided that in general only the coils are tested, even if the unit has bushings. The one exception is sealed dry type units which are very much like liquid immersed units, but without the liquid.
- 9) Different methods of testing were discussed and queried by J Tedesco and Sergio Cano. Appropriate answers provided by Detlev Gross.
- 10) The Chair asked about the 1991 circuit diagrams and if they were still valid. Detlev Gross said they were outdated and no longer applied. He questioned why more PD test equipment manufacturers were not present and if they could provide generic test circuits that could be included in the document. Further, several members volunteered to provide diagrams for testing.
 - a. Dan Sauer, Alex Kraeje and Sergio Cano volunteered to provide asap.
 - b. Rick Marek provided his email to send him all this information: rick.marek@gmail.com
- 11) New Business queried, no response from attendees
- 12) Meeting adjourned at 4:30 pm

Respectfully submitted

Hemchandra Shertukde, Ph.D., P.E

Secretary, WG C. 57.124

Attendance

Robert	Ballard	DuPont	Member
Alain	Bolliger	HV TECHNOLOGIES, Inc.	Guest
Dominique	Bolliger, Ph.D.	HV TECHNOLOGIES, Inc.	Member
Kurt	Carlson	V&F Transformer	Guest
Juan Alfredo	Carrizales Baaldua	Prolec	Guest
Jaroslav	Chorzepa	ABB Inc.	Guest
Feras	Fattal	Manitoba Hydro	Guest
Rob	Ghosh	General Electric	Guest
Detlev	Gross	Power Diagnostix Consult GmbH	Member
Sergio	Hernandez Cano	Hammond Power Solutions	Guest
Mohammad	Iman	MGM Transformer Company	Member
Charles	Johnson	Hitachi Energy	Member
Ken	Klein	Grand Power Systems	Guest
Alexander	Kraetge	OMICRON electronics Deutschland GmbH	Guest
Tim-Felix	Mai	Siemens Energy	Member
Richard	Marek	Retired	Vice-Chair
Emilio	Morales-Cruz	Qualitrol Company LLC	Member
Shawn	Nunn	Hitachi Energy	Guest
Caroline	Peterson	Eaton	Guest
Chris	Powell	Intermountain Electronics	Guest
Ulises	Rodriguez	GTI Power Acquisition LLC	Guest
Dan	Sauer	Eaton	Guest
Pugal	Selvaraj	Virginia Transformer Corp.	Guest
Hemchandra	Shertukde	University of Hartford	Secretary
Fabian	Stacy	Hitachi Energy	Guest
Janusz	Szczecowski	Maschinenfabrik Reinhausen	Member
Joseph	Tedesco	Hitachi Energy	Member
David	Walker	MGM Transformer Company	Member
Roger	Wicks	DuPont	Member
Alexander	Winter	Highvolt	Guest

D.2.7 TF IEEE C57.12.01 Dry Type General Requirements Chair Casey Ballard

The meeting was called to order at 12:55 PM CST by Chair Casey Ballard.

Chair made opening comments and leaders of the TF were introduced.

This is the second 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 28 participants, 18 TF members and 9 guests. There are 23 members (that requested the membership at the first TF meeting) in the TF currently and meeting quorum was

established. Chair noted that, as the work of TF shall be wrapped up, we are not accepting new members at this point (of course, the WG will be open for membership applications once the PAR is approved). The list of attendees is presented at the end of this report. The attendance will be reported in the AMS.

The Meeting Agenda was reviewed.

Motion: “approve the agenda”, moved by K. Stretch, seconded by C. Lovins, approved unanimously.

The Unapproved Minutes of the Spring 2021 meeting was reviewed

Motion: “approve the Spring 2021 Meeting Minutes”, moved by A. Narawane, seconded by T-F. Mai, approved unanimously.

Chairman requested patent disclosure, no patent claims were made.

IEEE Guidelines on WG procedure and IEEE Copyright policy have been reviewed and understood.

The chair used the attached presentation to guide the meeting:



IEEE C57-12-01 Fall
21.pptx

Old Business

- Title

- Title “Draft Standard for General Requirements for Dry Type Distribution and Power Transformers” has been approved as is during the Spring 2021 TF meeting.

The following is *Dry Type Transformers SC poll results- taken via email with a quorum of the SC (25 responses from a total of 33 members)*.

- Scope

Several aspects were brought to the Dry Type Transformers SC poll.

“Do you support the proposal that the Dry-Type Transformer Subcommittee should increase the scope of IEEE C57.12.01/IEEE C57.12.91 into the Low Voltage transformer market by covering voltages below 601V?” – poll results: No 53%, Yes 44%, Abstain 4%. **Will not be included in the Scope.**

- Drive Transformers

- Proposed definition: “A transformer that is interposed between the incoming power system and a motor drive. The input of a motor drive is typically a set of passive or active rectifiers that subject the drive transformer to significant harmonic load currents. Drive transformers also typically have multiple, phase-shifted, secondary windings to provide reduction of the harmonic load currents as seen by the input power system to minimize power system noise”.

After discussion “also typically have” was substituted with “may have”.

- Poll results on the inclusion of the definition for drive transformers and adding them to the exclusion list in the Scope: Yes 64%, No 32%, Abstain 4%. **Definition will be included in the standard.**

- Inverter Transformers

- Proposed definition: “A transformer that is interposed between the incoming power system and an inverter or group of inverters. The inverter(s) typically provide a load to the transformer that contains harmonic currents as well as high speed, switching currents. Additionally, inverter transformers are often connected to multiple inverters with a single secondary winding per inverter. Inverter transformers may be subject to bi-directional loads on individual or multiple secondary windings”.

Discussion on the definition – **shall be refined in the WG.**

- Poll results on the inclusion of inverter transformers and adding them to the exclusion list in the Scope: Yes 68%, No 28%, Abstain 4%. **Definition will be included in the standard.**

- Note Text

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”.

The Note has been discussed.

Motion: “keep the Note as is”, moved by D. Walker, seconded by C. Johnson, approved unanimously.

- Purpose

- “This standard is intended to serve as a basis for the establishment of performance, interchangeability requirements of equipment described, and for assistance in the proper selection of such equipment”.

The purpose was discussed.

Motion: revise as “This standard is intended to serve as a basis for the establishment of the requirements for the performance and interchangeability, and for assistance in the proper selection of the equipment described”, moved by C. Johnson, seconded by J. Tedesco, approved unanimously.

New Business

- PAR vote

Motion: “approve the Title, Scope and Purpose of the standard and submit to Dry Type Transformer Committee for PAR approval”, moved by A. Narawane, seconded by C. Johnson, approved unanimously.

Action: the Chair shall seek the Dry-Type SC approval, and if successful, submit the PAR for revision in coordination with the Chair of IEEE C57.12.91.

Following the presentation of the above meeting minutes Casey Ballard made a motion requesting the approval from Dry-Type SC for submitting the PAR for revision in coordination with the Chair of IEEE C57.12.91. The motion was seconded by Chuck Johnson. No comment or discussion was heard, and the motion passed unanimously.

- Create list of the potential new topics to be addressed in the standard revision.
 - Solid cast pole mounted transformers.

We discussed to, maybe, consider separate standards. Keep on the list for the WG consideration.

T-F. Mai and J. Tedesco will provide the proposal on the topic.

- Environmental Requirements
 - Thermal Shock
 - Salt Fog
 - Fire Performance

Consider to include IEC definitions. T-F. Mai and J. Tedesco will provide the proposal on the topic.

- Online tap changers.

This topic is, probably, more about the testing (ask C57.91 to discuss and provide the feedback).

- Thermal calculations for short circuit – any updates from IEC?

There are differences in IEC and IEEE scope on this – IEC includes oil-immersed as well. So, this topic shall be considered in connection to the s.c. test procedure (not only thermal aspect).

- 100 kV class equipment

IEC doesn't standardize anything above 72.5 kV. If we go above 72.5 kV, it would hardly be in the distribution transformer group and we will need to introduce a more clear differentiation between power and distribution dry type transformers (e.g. HV test levels and equipment, etc.). In general, the industry doesn't have many examples of such HV designs that standard can draw information from. TF doesn't support inclusion of 100 kV class at this point.

- Impulse levels pending Dielectric Test SC report.

Casey will reach out to Dielectric Test SC to learn their latest decision on the impulse levels.

- Differentiation of Power vs Distribution transformers (like liquid filled).

See above. As a separate point, we shall consider positioning alternative energy dry-type transformers in the standard (shall be separately included or better to keep them in the specific alternative energy standard groups, like solar and wind transformers currently).

- Average Ambient Temperature harmonization with IEC.

T-F. Mai will provide the proposal on the topic. It was noted that this issue is related to all IEEE standards, not only C57.12.01.

- Remove the short circuit current limitation of 25 times (from SA ballot comments).

As mentioned above, review all aspects of s.c. test, including current limitation, consider C57.12.00 and IEC.

- Include 50Hz requirements wherever 60Hz currently appears in the document (from SA ballot comments).

This is already included in C12.91 (annex), anything else needed for this standard?

T-F. Mai, J. Tedesco and R. Montpool will prepare a discussion on this topic for the WG.

- Additional topics to consider: negative impulse test and associated test voltage levels; the class of outdoor ventilated transformers for the EV charging stations.

With no further business, the meeting was adjourned at 2:10 PM CT.

Chair: Casey Ballard

Secretary: Sasha Levin

Meeting Participants List

Charles	Johnson	Hitachi ABB Power Grids
Mohammad	Iman	MGM Transformer Company
Derek	Foster	Magnetics Design, LLC
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
Solomon	Chiang	The Gund Company
David	Walker	MGM Transformer Company
Tim-Felix	Mai	Siemens Energy
Rhea	Montpool	Schneider Electric
Ken	Klein	Grand Power Systems
Joseph	Tedesco	Hitachi ABB Power Grids
Sergio	Hernandez Cano	Hammond Power Solutions
Colby	Lovins	Federal Pacific Transformer
Brian	Sonnenberg	Instrument Transformers, LLC
Justin	Shrewsbury	AMR PEMCO
Moonhee	Lee	Hammond Power Solutions
Manish	Saraf	Hammond Power Solutions
Rick	Marek	Retired
Livia	Neeson	Entergy
Dave	Stankes	3M
Michael	Haas	Instrument Transformers, LLC
Ulises	Rodriquez	Grand Power Systems
Weijun	Li	Braintree Electric Light Department

D.2.8 TF IEEE C57.94 Operation and Maintenance**Chair Dave Stankes**

The Task Force met virtual via WEBEX. The meeting was called to order at 8:00 AM by Vice-Chair David Stankes.

Vice-Chair made opening comments.

Poll for membership:

A.Member	10/17 (59%)
B.Non-member	4/17 (24%)
C.I'm not sure	1/17 (6%)
No Answer	2/17 (12%)

- 15 total participants
- 10 Members / guests requesting membership
- 5 guest

As this was the first meeting of the TF, a quorum was established.

TF Meeting Agenda

1. Welcome & chair's remarks
2. Introduction of attendees
3. Approval of agenda
4. Call for essential Patents & IEEE SA Copyright Policy review
5. Review of IEE C57.94-2015
6. PAR review and development discussion
7. Meeting Adjournment

The agenda was approved unanimously without discussion.

The vice-chair presented the information on Patent Disclosures and asked the group to report any relevant patent issues – None were communicated. Copyright policy was discussed.

New Business:

- **PAR Review**
 - o **Title**
- Latest title was shown and discussed.
Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers

Motion: Keep the title as it is by Casey, second: Colby → approved unanimously

- o **Scope**
- Latest scope was shown and discussed.
Joe suggested to use the same wording for the exceptions as in C57.12.52 'Transformers described as exceptions in IEEE Std. C57.12.01'
Discussion about deleting the words 'single and polyphase' from the scope. To keep the scope in line with the other dry type documents the TF decided to keep the words in the scope.
The TF agrees that the order of the words 'application, installation, operation, and maintenance' should be the same as in the title.
Discussion about adding a note to the scope as in C57.12.01 ('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.')

Scope of proposed standard:

This recommended practice covers general recommendations for the installation, application, operation, and maintenance of all single and polyphase ventilated, non-ventilated, and sealed dry-type distribution and power transformers or autotransformers, including those with solid-cast and/or resin encapsulated windings **except transformers described as exceptions in IEEE Std. C57.12.01.** follows: a) Instrument transformers b) Step and induction voltage regulators c) Arc furnace transformers d) Rectifier transformers e) Specialty and general purpose transformers f) Mine transformers g) Testing transformers h) Welding transformers

von Casey Ballard an alle: 3:22 PM

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.

Motion: Change the scope as displayed (see above) with the note from the chat (see above) by Casey second: Colby → approved unanimously

New scope:

This recommended practice covers general recommendations for the installation, application, operation, and maintenance of all single and polyphase ventilated, non-ventilated, and sealed dry-type distribution and power transformers or autotransformers, including those with solid-cast and/or resin encapsulated windings **except transformers described as exceptions in IEEE Std. C57.12.01.**

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.

Motion: Approve the scope for the PAR by Chuck, second: Joe → approved unanimously

- Purpose

Latest purpose was shown and disused

Standards updated (change ANSI to IEEE Std, ANSI C57.12.50 was deleted)

The TF agrees that the order of the words ‘application, installation, operation, and maintenance’ should be the same as in the title.

The standards mentioned in the prose will be normative, so they be moved from the bibliography to the references

New Purpose:

TF discussed if the last sentence is needed or not. The group agreed to delete it

1. The recommended practice is intended for general use in the installation, application, operation, and maintenance of dry-type transformers manufactured in accordance with IEEE Std C57.12.01, ANSI C57.12.50 [B1], ANSI IEEE Std C57.12.51 [B2] and ANSI IEEE Std C57.12.52 [B3]. Familiarity with other standards applying to dry-type transformers and to their protection is assumed and the provisions of those standards are indicated herein only for clarity.

Motion to use the purpose for the PAR as displayed by Rob second: Chuck → approved unanimously

Motion: Approve the title scope and purpose and submit it to the Dry Type SC by Joe second: Chuck → approved unanimously

With no further business, the meeting was adjourned, without objection, at 9:15 PM.

Following the presentation of the meeting minutes, Dave Stankes made a motion requesting approval from the DTSC to submit a PAR for the revision C57.94 reflecting the agreed Title, Scope, and Purpose scope approved during the TF meeting. The motion was seconded by Colby Lovins. No comment or discussion was heard, and the motion passed unanimously.

The newly formed WG (provided PAR is approved) will meet again at the Spring 2022 meeting in Denver (Hyatt Regency, Conv. Center), Colorado USA, March 27 – 31, 2022.

Vice-Chair: David Stankes

Secretary: Tim-Felix Mai (Prepared Minutes)

Participation list:

First Name	Last Name	Company
Richard	Marek	Retired
Charles	Johnson	Hitachi Energy
Derek	Foster	Magnetics Design, LLC
David	Stankes	3M
Robert	Ballard	DuPont
Shawn	Nunn	Hitachi Energy
Rob	Ghosh	General Electric
Solomon	Chiang	The Gund Company
Tim-Felix	Mai	Siemens Energy
Ken	Klein	Grand Power Systems
Joseph	Tedesco	Hitachi Energy
Colby	Lovins	Federal Pacific
Brian	Sonnenberg	Instrument Transformers, LLC
Justin	Shrewsbury	AMR PEMCO
Chris	Powell	Intermountain Electronics

D.2.9 IEEE TF C57.12.91 Dry type test code

Chair David Walker

The Working Group met virtually 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.

19 members, quorum =10

Poll for quorum:

- 35 total participants
- 18 members
- 3 no answer

A quorum was established.

The Fall 2021 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.

The chair presented the IEEE_SA Copyright Policy. No discussion.

The Spring 2021 minutes were approved unanimously without discussion.

Mike Iman-MGM Transformers provided information that he attended the initial Task Force meeting at the Spring 2021 meeting but was not listed on the AMS member list for the Fall 2021 session. Chair added Mike as a member and will report the inaccuracy in the AMS attendance.

Old Business

- PAR DEVELOPMENT

- C57.12.91 is currently Task Force and does not currently have a PAR.
- TF previously agreed that C57.12.91 scope should align with C57.12.01 scope.
- Casey Ballard, chair of C57.12.01, previously sent out a survey of proposed changes to the scope of C57.12.01.
 - Subcommittee voted to exclude Low Voltage, Inverter, and Drive transformers from the scope of C57.12.01 and C57.12.91.
- Chair presented the previous edition of the PC57.12.91 Par for review

Discussion ensued about including a reference to C57.18.10 in the C57.12.91 standard since rectifier transformers had been removed from the PAR scope. It was determined that C57.18.10 was not currently being referenced by the standard. It was agreed that this reference should not be included in C57.12.91.

PAR SCOPE

Motion #1 was made by Colby Lovins , Second by Ken Klein

Proposal: Keep existing PAR scope wording with the addition of the following to the excluded transformers:

i) Drive Transformers

j) Inverter Transformers

Add the Note from the IEEE C57.12.01 standard—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.

No discussion

Vote for Motion #1 passed unanimously

20 FOR, 0 AGAINST, 0 ABSTAIN

PAR PURPOSE

Chair showed Purpose from previous par and asked for discussion.

Motion #2 was made by Ken Klein , Second by Sergio Hernandez Cano to adopt the previous PAR

Purpose with no changes.,

No discussion

Vote for Motion #2 passed unanimously

19 FOR, 0 AGAINST, 0 ABSTAIN

Motion #3

Casey Ballard – motion to submit PAR to subcommittee for approval

Chuck Johnson – 2nd

Motion passed successfully

20 FOR, 0 AGAINST, 1 ABSTAIN

Chair will submit the proposed PAR to subcommittee.

Following the presentation of the above meeting minutes David Walker made a motion requesting the approval from Dry-Type SC for submitting the PAR for revision of C57.12.91 reflecting the agreed Title, Scope, and Purpose approved during the TF meeting. The motion was seconded by Colby Lovins. Roger Wicks asked for a point of clarification regarding whether the “Note” in the proposed scope should be included in the PAR. Casey Ballard

commented that a previous PAR for C57.12.01 contained a “Note” in the PAR and was approved as written. No comment or discussion was heard, and the motion passed unanimously.

New Business:

- Topics for Consideration in new revision

- **Temperature rise test**
 - Update exponents used in eqns. 25, 26, 27 and 42 (based on Hammond data)
 - Define “free from drafts”
 - AF Testing – Shut off fans or leave on
- **Metering phase angle correction like C57.12.90**
- **Add Scott-T figure to 9.3.4.3**
- **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 reduced and Full like C57.12.90 section 10.4.2.1 Method 1
- **Short Circuit Test**
Match with C57.12.90
- **Distribution and Power same / different**
- **Environmental**
Fire / climatic / environmental
- **AFWF Testing WF? WF/XX?**
- **AF testing should be done with fans on or turn the fans off?**
- **Insulation Resistance is a Routine Test for >300 kVA. Should Pass/Fail Criteria be developed**
- **Temperature Rise test cooling curve timing. It is currently open to interpretation.**

With no further business, the meeting was adjourned, without objection, at 5:00 PM.

The Task Force/Working Group will meet again at the Spring 2022 meeting,

Chair: David Walker
Vice Chair: Tim-Felix Mai
Secretary: Rhea Montpool

Participation list:

Last Name	First Name	Company
Ballard	Robert	DuPont
Britton	Jeffrey	Phenix Technologies, Inc.
Burde	Jagdish	Virginia Transformer Corp
Carlson	Kurt	V&F Transformer
Chiang	Solomon	The Gund Company
Fattal	Feras	Manitoba Hydro
Foster	Derek	Magnetics Design, LLC
Ghosh	Rob	General Electric
Haas	Michael	Instrument Transformers, LLC
Hernandez	Giovanni	Virginia Transformer Corp.
Hernandez Cano	Sergio	Hammond Power Solutions
Iman	Mohammad	MGM Transformer Company
John	John	Virginia Transformer Corp.
Johnson	Charles	Hitachi Energy
Klein	Ken	Grand Power Systems
Kraetge	Alexander	OMICRON electronics Deutschland GmbH

Lee	Moonhee	Hammond Power Solutions
Lovins	Colby	Federal Pacific
Mai	Tim-Felix	Siemens Energy
Montpool	Rhea	Schneider Electric
Narawane	Aniruddha	EATON Corporation
Nunn	Shawn	Hitachi Energy
Pepe	Harry	Phenix Technologies, Inc.
Peterson	Caroline	Xcel Energy
Powell	Chris	Intermountain Electronics
Rodriguez	Ullises	Grand Power Systems
Saraf	Manish	Hammond Power Solutions
Sauer	Daniel	EATON Corporation
Shrewsbury	Justin	AMR PEMCO
Sonnenberg	Brian	Instrument Transformers, LLC
Stankes	David	3M
Stretch	Kerwin	Siemens Energy
Tedesco	Joseph	Hitachi Energy
Walker	David	MGM Transformer Company
Winter	Dr. Alexander	HIGHVOLT Pruftechnik Dresden

D.2.10 Liaison report for Revision of IEEE C57.12.80 WG Terminology Chair Tim-Felix Mai

Tim-Felix Mai provided update that there no new updates related to Dry type transformer in the work to revise C57.12.80.

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D.3 Old Business

D.3.1 Status of Standards

Chair identified IEEE C57.12.59 Guide for Dry-Type Transformer Through-Fault Current Duration as a document the SC needed to address as it is set to expire on 12/31/25. Chair notified the SC that Derek Foster had volunteered and has been appointed Chair for revision of IEEE C57.12.59. He noted that the work to revise this standard may occur outside of the normal Spring and Fall meetings due to lack of meeting slots, but since the document was short and straight forward (only 5 sections) this may be acceptable. Derek plans to organize a virtual meeting prior to the Spring meeting and made a call for volunteers to serve as Vice Chair and Secretary. Chuck Johnson commented that having someone with background on switchgear with be an asset during the revision of the document. Chair reminded the SC that leadership positions could be given to guests (not restricted to members). David Walker volunteered for Vice Chair and Tim-Felix Mai volunteered for Secretary.

Chair commented that most of the documents currently being worked on were on schedule to meet PAR deadlines except for IEEE C57.124.

D.3.2 Survey results

Chair reviewed the results four survey questions that were sent out the DTSC members and guests that were intended to help define the Scopes of IEEE C57.12.01 and IEEE C57.12.91. 25 of 33 members responded to the survey before it was closed therefore there was a quorum. The results were shared with the IEEE C57.12.01 and IEEE C57.12.91 Chairs for use in their TF meetings to assist in developing their PARs

Results of survey:

Do you support the proposal that the Dry-Type Transformer Subcommittee should increase the scope of IEEE C57.12.01/IEEE C57.12.91 into the Low Voltage transformer market by covering voltages below 601V?

[52% NO 44% YES 4% ABSTAIN]

Do you support adding Drive Transformers to the exclusion list in the Scope of IEEE C57.12.01 or IEEE C57.12.91? A Drive transformer can be defined as: A transformer that is interposed between the incoming power system and a motor drive. The input of a motor drive is typically a set of passive or active rectifiers that subject the drive transformer to significant harmonic load currents. Drive transformers also typically have multiple, phase-shifted, secondary windings to provide reduction of the harmonic load currents as seen by the input power system to minimize power system noise.

[32% NO 64% YES 4% ABSTAIN]

Do you support adding Inverter Transformers to the exclusion list in the Scope of IEEE C57.12.01 or IEEE C57.12.91? An Inverter Transformer can be defined as: A transformer that is interposed between the incoming power system and an inverter or group of inverters. The inverter(s) typically provide a load to the transformer that contains harmonic currents as well as high speed, switching currents. Additionally, inverter transformers are often connected to multiple inverters with a single secondary winding per inverter. Inverter transformers may be subject to bi-directional loads on individual or multiple secondary windings.

[28% NO 68% YES 4% ABSTAIN]

Do you support opening ANSI C57.12.55 for Revision? Note: today the copyright to this standard is owned by IEEE, but not required to be revised as it has never been published by IEEE.

[32% NO 44% YES 24% ABSTAIN]

Votes that were cast totaled 19, as 6 of the 25 responses were abstentions. Calculation using only votes that were cast results ins 58% in favor of support and 42% not in favor of support. Although there is support of opening this document the Chair recommended not picking up this work at this time. There was no opposition from the SC members present.

D.4 New Business

No new business

With no further business, the meeting was adjourned at 2:10 PM.

Chairman: Casey Ballard

Vice Chairman: David Walker

Secretary: David Stankes (prepared meeting minutes)

Attendees

First Name	Last Name	Affiliation
Mubarak	Abbas	Siemens Energy
Robert	Ballard	DuPont
Jared	Bates	Oncor Electric Delivery
David	Caverly	Trench Limited
Solomon	Chiang	The Gund Company
Sami	Debass	Electric Power Research Institute (EPRI)
J. Arturo	Del Rio	Siemens Energy
Thomas	Falkenburger	Coil Innovation USA, Inc.
Reto	Fausch	RF Solutions
Derek	Foster	Magnetics Design, LLC
Alexander	Gaun	Coil Innovation GMBH
Rob	Ghosh	General Electric
Detlev	Gross	Power Diagnostix Consult GmbH
Michael	Haas	Instrument Transformers, LLC
Giovanni	Hernandez Hernandez	Virginia Transformer Corp.
Sergio	Cano	Hammond Power Solutions
Mohammad	Iman	MGM Transformer Company
Ramadan	Issack	American Electric Power
John	John	Virginia Transformer Corp.
Charles	Johnson	Hitachi Energy
Ken	Klein	Grand Power Systems
Moonhee	Lee	Hammond Power Solutions
Aleksandr	Levin	Weidmann Electrical Technology
Colby	Lovins	Federal Pacific
Alejandro	Macias	CenterPoint Energy
Tim-Felix	Mai	Siemens Energy
Richard	Marek	Retired
Aaron	Meyers	EATON Corporation
Rhea	Montpool	Schneider Electric
Paulette	Payne-Powell	Retired
Caroline	Peterson	Xcel Energy
Klaus	Pointner	Trench Austria GmbH
Chris	Powell	Intermountain Electronics
Ullises	Rodriguez	Grand Power Systems
Manish	Saraf	Hammond Power Solutions
Hemchandra	Shertukde	University of Hartford
Avijit	Shingari	Pepco Holdings Inc.
Justin	Shrewsbury	AMR PEMCO
Brian	Sonnenberg	Instrument Transformers, LLC
David	Stankes	3M

Kerwin	Stretch	Siemens Energy
Joseph	Tedesco	Hitachi Energy
Dervis	Tekin	Meramec Instrument Transformer Co.
Eric	Theisen	Metglas, Inc.
David	Walker	MGM Transformer Company
Roger	Wicks	DuPont
Malia	Zaman	IEEE

Annex E Transformers and Reactors for HVDC Applications Subcommittee

Nov 15, 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 by calling the participants in person and the attendance was checked by a poll.

There was a total of 24 persons in the meeting, 8 members and 16 guests present. 2 new requests for membership were received. Qualification for membership in the SC will be verified by the SC Chair.

Actual Membership:

Subgroup Name	Members	Role	Participation Status	Type	First Name	Last Name	Company	IEEE Member
*SC HVDC Conve	Active	Member	Active	Committee Member	David	Caverly	Trench Limited	Yes
*SC HVDC Conve	Active	Member	Active	Committee Member	Solomon	Chiang	The Gund Company	Yes
*SC HVDC Conve	Active	Member	Active	Committee Member	Eric	Davis	Burns & McDonnell	Yes
*SC HVDC Conve	Active	Member	Active	Active Participant	Alexander	Gaun	Coil Innovation GMBH	Yes
*SC HVDC Conve	Active	Member	Active	Committee Member	Peter	Heinzig	Weidmann Electrical Technology	Yes
*SC HVDC Conve	Active	Member	Active	Committee Member	John	John	Virginia Transformer Corp.	Yes
*SC HVDC Conve	Active	Member	Active	Committee Member	Christoph	Ploetner	t.b.a.	Yes
*SC HVDC Conve	Active	Secretary	Active	Committee Member	Klaus	Pointner	Trench Austria GmbH	Yes
*SC HVDC Conve	Active	Chair	Active	Committee Member	Ulf	Radbrandt	Hitachi Energy	Yes
*SC HVDC Conve	Active	Vice-Chair	Active	Committee Member	Leslie	Recksiedler	Manitoba Hydro	Yes
*SC HVDC Conve	Active	Member	Active	Committee Member	Pierre	Riffon	Pierre Riffon Consultant Inc.	Yes
*SC HVDC Conve	Active	Member	Active	Committee Member	Michael	Sharp	Trench Limited	Yes
*SC HVDC Conve	Active	Member	Active	Committee Member	Rogério	Verdolin	Verdolin Solutions Inc.	Yes
*SC HVDC Conve	Active	Member	Active	Committee Member	Waldemar	Ziomek	PTI Transformers	Yes

Screenshot of attendance verification poll



The total membership of the SC is 14. We needed at least a total of 8 members to be present to have a quorum. This was achieved.

The agenda for this meeting, that was distributed via email Nov. 8, was presented. Due to lack of time for preparation, the presentation of the condition monitoring needs to be postponed to the spring meeting. The agenda was unanimously approved considering this change.

The list of all attendees of the meeting is shown here:

First Name	Last Name	Company	Role
Ulf	Radbrandt	Hitachi Energy	Chair
Klaus	Pointner	Trench Austria GmbH	Secretary
David	Caverly	Trench Limited	Member

Eric	Davis	Burns & McDonnell	Member
Alexander	Gaun	Coil Innovation GMBH	Member
Pierre	Riffon	Pierre Riffon Consultant Inc.	Member
Michael	Sharp	Trench Limited	Member
Waldemar	Ziomek	PTI Transformers	Member
William	Boettger	Boettger Transformer Consulting LLC	Guest
Jagdish	Burde	Virginia Transformer Corp	Guest
Daniela	Ember Baci	Hydro-Quebec IREQ	Guest
Evgenii	Ermakov	Hitachi Energy	Guest
Thomas	Falkenburger	Coil Innovation USA, Inc.	Guest
Feras	Fattal	Manitoba Hydro	Guest
Curtiss	Frazier	Ameren	Guest
Ali	Ghafourian	H-J Enterprises, Inc.	Guest
Deepak	Kumaria	Applied Materials	Guest
Xose	Lopez-Fernandez	Universidade de Vigo	Guest
Sylvain	Plante	Hydro-Quebec	Guest
Alvaro	Portillo	Ing. Alvaro Portillo	Guest
Afshin	Rezaei-Zare	York University	Guest
Hemchandra	Shertukde	University of Hartford	Guest
Jos	Veens	SMIT Transformatoren B.V.	Guest
Peter	Werelius	Megger	Guest

E.2 Approval of the minutes of the April 26, 2021 virtual meeting

The minutes from the virtual Spring 21 meeting, that was distributed via email Nov. 08, 2021 were presented and then unanimously approved. Klaus Pointner mentioned the great content of the HVDC tutorial part 1. This content can be used for training purposes and backup information.

E.3 Brief report on the meeting of the Administrative SC by Ulf Radbrandt

New officers of the IEEE Transformerscommittee from 2022:

- Ed teNyenhuis will be new chair
- David Wallach will be new vice chair.
- Bill Griesacker will be new secretary

AMS system will be replaced by a new system – Activity leaders - please make a back-up of your WG details prior December 31, 2021 including membership, attendance, roasters etc.

PAR lifetime of 4 years shall be attended in future. WG should plan to complete work within 3 years to keep 1 year for balloting and comment resolution. It will be more difficult to get extensions of PAR's and a second extension will very seldom be accepted. If the job is not done then the WG must start all over with a new PAR. A consequence might be that it will be more common with extra meetings (between the ordinary committee meetings).

Activity chair, vice chair and secretary shall not be from the same company and preferably be representing both users and manufacturers.

E.4 Condition Monitoring

Presentation by Evgenii Ermakov from Hitachi Energy Sweden is postponed to the spring meeting.

E.5 Brief information about the upcoming tutorial

Thursday Nov. 18, 2021 will be the second part of the HVDC tutorial dealing with equipment aspects covering the following scope:

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.6 Working Group Reports

Currently no active working group. The IEEE1277 has been published 2020 (10 years stability until Dec 31, 2030). The dual logo standard IEC/IEEE 60076-57-129 was published 2017 and is good until Dec 31, 2027

E.7 Future Work of this Subcommittee

As there is currently no active WG, the question about possible tasks has been raised by the SC Chair. Possible areas are condition assessment for converter transformers, which have some specific implications. Some basic insights have been given by Evgenii (assessment of datasets of sister units in service, fingerprint information etc.). Site measurements of the units are sometimes an issue (e.g. physical wall between DC and AC bushings).

Peter Werelius may also add input to the upcoming presentation on condition monitoring and will get in touch with Evgenii.

Pierre Riffon confirmed that there is currently no gap or need to update or extend the subcommittee standards. Both are in a good shape.

Waldemar proposes to add some work on maintenance and condition assessment particularly for converter transformers and bushings as future work.

Alexander Gaun reported that there are two ongoing study committees at CIGRE, the B4-89 (Condition Health Monitoring and predictive maintenance of HVDC Converter Stations – final report expected Sept 2022) and B4-90 (Operation and maintenance of HVDC and FACTS Facilities – final report expected Oct 2023).

The SC chair pointed out the strategic importance of the availability of HVDC schemes, thus preventive maintenance and close monitoring and assessment of the main equipment is decisive. However, future work shall be in line with the scope of the SC HVDC.

The SC chair was asking for some input material from the users and manufactures which can add value, if available. Also technical presentation at coming SC meetings are welcome.

If someone would like to hold a presentation regarding maintenance/preventive maintenance of main HVDC equipment is warmly welcome to do so. Please contact the SC chair.

E.8 Old Business

There was no old business

E.9 New Business

There is no new business

E.10 Adjournment

The meeting was adjourned at 4:25 pm.

Annex F Instrument Transformers Subcommittee

Chair: Thomas Sizemore

Vice Chair: David Wallace

Secretary: Nigel MacDonald

F.1 Introductions

In lieu of introduction all attendees were encouraged to enter their name and affiliation in the chat function. This was done primarily to save time as this meeting was expected to last most of the allotted time.

The table below shows all recorded attendees, affiliations at the time of the meeting and roles in the ITSC.

Israel	Barrientos	Prolec GE	Guest
Lee	Bigham	Instrument Transformer Equip Corp	Member
Randy	Brannen	Southern Company Services	Member
Jeffrey	Britton	Phenix Technologies, Inc.	Guest
Steven	Brzoznowski	Bonneville Power Administration	Member
Jagdish	Burde	Virginia Transformer Corp	Guest
Jaroslav	Chorzepa	ABB Inc.	Member
Michael	Craven	Phoenix Engineering Services	Guest
Juan Carlos	Cruz Valdes	Prolec GE	Guest
Sami	Debass	Electric Power Research Institute (EPRI)	Guest
Rolando	Demes	Arteche	Member
Brandon	Dent	Memphis Light, Gas & Water	Guest
Huan	Dinh	Hitachi Energy	Member
Daniela	Ember Baci	Hydro-Quebec IREQ	Guest
Eric	Euvrard	RHM International	Member
Feras	Fattal	Manitoba Hydro	Member
Reto	Fausch	RF Solutions	Guest
Dora	Gazivoda	KONCAR - Instrument Transformers	Guest
Rob	Ghosh	General Electric	Member
Andrea	Glynn	Xcel Energy	Guest
Michael	Gonzales	Southern California Edison	Guest
Michael	Haas	Instrument Transformers, LLC	Guest
Ryan	Hogg	Bureau of Reclamation	Guest
Ramadan	Issack	American Electric Power	Guest
Ivan	Konta	KONCAR - Instrument Transformers	Member
Marek	Kornowski	Polycast International	Member
Deepak	Kumaria	Applied Materials	Member

Xose	Lopez-Fernandez	Universidade de Vigo	Guest
Colby	Lovins	Federal Pacific	Guest
Nigel	Macdonald	Trench Limited	Secretary
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
Randolph	Mullikin	ABB Inc.	Member
Frank	Neder	Trench Germany GmbH	Member
Livia	Neeson	Entergy	Guest
Thomas	Nelson	NIST	Guest
Stephen	Oakes	WEG Transformers USA Inc.	Member
Rudolf	Ogajanov	ABB Inc.	Member
Sanjay	Patel	Smit Transformer	Guest
Dipakkumar	Patel	Instrument Transformer Equip Corp	Member
Caroline	Peterson	Xcel Energy	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
Stephen	Shull	BBC Electrical Services, Inc.	Guest
Thomas	Sizemore	ABB Inc.	Chair
Edward	Smith	H-J Family of Companies	Guest
Steven	Snyder	Hitachi Energy	Member
William	Solano	Instrument Transformer Equip Corp	Member
Brian	Sonnenberg	Instrument Transformers, LLC	Member
Mauricio	Soto	Hitachi Energy	Guest
Katrina	Swanson McLeod	Southern Nuclear	Guest
Janusz	Szczechowski	Maschinenfabrik Reinhausen	Guest
Dervis	Tekin	Meramec Instrument Transformer Co.	Member
Eric	Theisen	Metglas, Inc.	Guest
Reza	Torabi Goodarzi	SMIT Transformatoren B.V.	Guest
Risto	Trifunoski	Trench Limited	Member
Kiran	Vedante	Ritz Instrument Transformers	Member

Deniss	Villagran	GE Grid Solutions	Member
Dieter	Wagner	Hydro One	Guest
Hugh	Waldrop	Memphis Light, Gas & Water	Guest
David	Wallace	Mississippi State University	Vice-Chair
Peter	Werelius	Megger	Guest
Mana	Yazdani	Trench Limited	Member
Malia	Zaman	IEEE	Guest
Kris	Zibert	Allgeier, Martin and Associates	Guest
Igor	Ziger	KONCAR - Instrument Transformers	Member

F.2 Quorum

37 of 42 members were present and quorum was attained. 37 guests were also in attendance. The total number of attendees was 74 and 6 requested membership. These requests for membership will be reviewed.

F.3 Agenda

An agenda was displayed by the chair. It was approved unanimously after a motion by Marek Kornowski and seconded by Deepak Kumaria.

F.4 Approval of minutes – Spring 2021 meeting

Minutes were approved unanimously after a motion by Deepak Kumaria and seconded by Rob Ghosh.

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: 52 people attended the meeting with 25 members present. Quorum was met. 2 people requested membership to the working group.

The table below shows all recorded attendees, affiliations at the time of the meeting and roles in this working group.

Stephen	Anthony	--	Guest
Allan	Bartek	Spruce Run Engineering LLC	Guest
Lee	Bigham	Instrument Transformer Equip Corp	Member
Randy	Brannen	Southern Company Services	Member
Steven	Brzoznowski	Bonneville Power Administration	Member
Jaroslav	Chorzepa	ABB Inc.	Guest
Michael	Craven	Phoenix Engineering Services	Guest
Rolando	Demes	Arteche	Member
Brandon	Dent	Memphis Light, Gas & Water	Guest
Huan	Dinh	Hitachi Energy	Member
Feras	Fattal	Manitoba Hydro	Guest
Dora	Gazivoda	KONCAR - Instrument Transformers	Guest
Kurt	Kaineder	Siemens Energy	Guest
Ivan	Konta	KONCAR - Instrument Transformers	Guest
Deepak	Kumaria	Applied Materials	Member
Nigel	Macdonald	Trench Limited	Member
James	McBride	JMX Services, Inc.	Member
Scott	McCloskey	Amran Inc.	Guest
Ross	McTaggart	Trench Limited	Vice-Chair
Frank	Neder	Trench Germany GmbH	Member
Stephen	Oakes	WEG Transformers USA Inc.	Member
Rudolf	Ogajanov	ABB Inc.	Member
Dipakkumar	Patel	Instrument Transformer Equip Corp	Guest
Caroline	Peterson	Xcel Energy	Member
Sylvain	Plante	Hydro-Quebec	Guest
Michael	Richardson	Ameren	Guest
Pierre	Riffon	Pierre Riffon Consultant Inc.	Member
Patrick	Rock	American Transmission Co.	Member
Zoltan	Roman	GE Grid Solutions	Member
Andre	Rottenbacher	Ritz Instrument Transformers	Guest
Eric	Schleismann	Southern Company Services	Guest
Devki	Sharma	Entergy	Member
Thomas	Sizemore	ABB Inc.	Member
Kenneth	Skinger	Scituate Consulting, Inc.	Vice-Chair
Steven	Snyder	Hitachi Energy	Member
William	Solano	Instrument Transformer Equip Corp	Member
Mike	Spurlock	Spurlock Engineering Services, LLC	Guest

Kyle	Stechschulte	American Electric Power	Guest
Dervis	Tekin	Meramec Instrument Transformer Co.	Member
Risto	Trifunski	Trench Limited	Guest
Kiran	Vedante	Ritz Instrument Transformers	Member
Deniss	Villagran	GE Grid Solutions	Member
Dieter	Wagner	Hydro One	Guest
David	Wallace	Mississippi State University	Chair
Barrett	Wimberly	GE Grid Solutions	Member
Mana	Yazdani	Trench Limited	Member
Malia	Zaman	IEEE	Guest
Kris	Zibert	Allgeier, Martin and Associates	Guest
Igor	Ziger	KONCAR - Instrument Transformers	Member

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. Kenneth Skinger made a motion to approve the minuets and Deepak Kumaria seconded the motion. The agenda was approved with no objections made.

Minutes: Minutes of the Spring 2021 Virtual meeting were presented. Pierre Riffon made a motion to accept the minuets and Deepak Kumaria seconded the motion. The minuets were approved by the members of the working group with no objections.

David Wallace pointed out that a request for a par extension had been submitted.

Ross McTaggart led a discussion on the status of the latest revision of the draft and presented the timeline for submittal to IEC and IEEE.

Pierre Riffon brought up a question concerning what happens if IEC or IEEE disagree on the draft. A thorough discussion was held and it was decided to address it with Malia and IEEE.

David Wallace agreed to post the latest version of the draft to the website and send it to the WG.

Igor Ziger made a motion to adjourn the meeting, Deepak Kumaria seconded the motion. No objections were made.

The meeting was adjourned at 8:55 am.

Next Meeting: The WG will meet to continue work at the Spring 2022 meeting in Denver, Co.

F.7.2.3 Working Group for PLC Capacitors and CCVT's C57.13.9 – Zoltan Roman

Minutes from the November 16, 2021 Webex meeting at an 11:50 (USA Eastern time) session of the Fall Transformers Committee meeting.

The Working Group Chair, Zoltan Roman, started the meeting with Mike Craven as Secretary and introductions were made. Deepak Kumaria made the motion to approve the Agenda which Zoltan presented, and Dave Wallace seconded it. There were no comments or objections. A membership poll was done and there were 19 members present and only 13 needed. There was a quorum therefore the Agenda was approved.

Overall, there were 41 WG attendees with 20 members present when attendance was checked.

The table below shows all recorded attendees, affiliations at the time of the meeting and roles in this working group.

Stephen	Ashcraft	Hitachi Energy	Member
Olle	Benzler	Megger	Guest
Sanket	Bolar	Megger	Guest
Randy	Brannen	Southern Company Services	Member
Jaroslav	Chorzepa	ABB Inc.	Guest
Michael	Craven	Phoenix Engineering Services	Secretary
Rolando	Demes	Arteche	Member
David	Ellis	PSEG	Guest
Feras	Fattal	Manitoba Hydro	Guest
Lorne	Gara	Shermco	Guest
Dora	Gazivoda	KONCAR - Instrument Transformers	Guest
Andrea	Glynn	Xcel Energy	Guest
Ivan	Konta	KONCAR - Instrument Transformers	Member
Deepak	Kumaria	Applied Materials	Member
Nigel	Macdonald	Trench Limited	Member
Scott	McCloskey	Amran Inc.	Guest
Matthew	McFadden	Oncor Electric Delivery	Guest
Ross	McTaggart	Trench Limited	Member
Livia	Neeson	Entergy	Guest
Kristopher	Neild	Megger	Guest
Rudolf	Ogajanov	ABB Inc.	Guest
Dipakkumar	Patel	Instrument Transformer Equip Corp	Guest
Caroline	Peterson	Xcel Energy	Member
Diego	Robalino	Megger	Member
Patrick	Rock	American Transmission Co.	Member
Zoltan	Roman	GE Grid Solutions	Chair
Andre	Rottenbacher	Ritz Instrument Transformers	Member
Devki	Sharma	Entergy	Guest
Stephen	Shull	BBC Electrical Services, Inc.	Guest
Thomas	Sizemore	ABB Inc.	Member

Muhammad Abdullah	Sohail	Trench Limited	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
David	Wallace	Mississippi State University	Member
Peter	Werelius	Megger	Guest
Barrett	Wimberly	GE Grid Solutions	Member
Mana	Yazdani	Trench Limited	Member
Shibao	Zhang	PCORE Electric	Guest
Igor	Ziger	KONCAR - Instrument Transformers	Member

The patent notice was made and there were no patent claims. Attendees were notified of the copyright Policy.

The motion to approve all of the last four meeting's minutes was made by Diego Robalino and seconded by Deepak Kumaria. There were no objections, and they all are approved.

Zoltan reviewed the history of the WG and went on to also review the status of the standard explaining the PAR extension and need for the PSCC vote in January 2022.

The main new business started with Zoltan's review and minor changes to 6.5 RIV Table 9, Table 15 and Figure 3 in 7.12. which was a copy from the original C93.4 standard. The question of usage and copyright came up and will be rechecked. Minor changes continued with 8.3.10 and checks of Figures C2, 3 and 4. 9.5.1 was revised and 9.5.2 was similar. All of these resulted in no further comments and implicit acceptance. The definition of "return loss" and Figure A1 were also copied from C93.4.

C4.1 "Ratio measurement..." led to the polarity discussion left from the last meeting. Volunteers hadn't been able to do tests and make recommendations. This led to new polarity language in C4.1 and resolved with no further comments. Also, in C4.1 was "Define the uncertainty" and Zoltan presented Diego's email with investigation of different manufacturer's equipment accuracy and a long discussion of what numbers to cite. Eventually the clarification was added "...0.5% or lower uncertainty for the ratio measurement."

At this point, Zoltan said the Draft 15 appears final and asks if it should be released for balloting. Pat Rock made the motion to release it for balloting and Diego Robalino seconded it. No one had anything for discussion and a poll was requested. The motion passed.

There was some discussion of the steps for the standard's procedure and Zoltan will look to form a ballot resolution group. The next meeting will be in Denver during the TC meeting March 27 – 31, 2022.

The motion to adjourn the meeting passed at 13:17.

F.7.5 TF for Instrument Transformers Accuracy – Igor Ziger

Attendees: A total of 56 people attended the meeting of which 26 were members and a quorum was obtained. The status of those requesting membership will be determined between meetings.

The table below shows all recorded attendees, affiliations at the time of the meeting and roles in this task force.

Stephen	Ashcraft	Hitachi Energy	Guest
Israel	Barrientos	Prolec GE	Guest
Allan	Bartek	Spruce Run Engineering LLC	Guest
Olle	Benzler	Megger	Guest
Lee	Bigham	Instrument Transformer Equip Corp	Member
Jaroslav	Chorzepa	ABB Inc.	Guest
Michael	Craven	Phoenix Engineering Services	Guest
Rolando	Demes	Arteche	Guest
Huan	Dinh	Hitachi Energy	Member
David	Ellis	PSEG	Member
Wayne	Ellis	Memphis Light, Gas & Water	Guest
Feras	Fattal	Manitoba Hydro	Member
Dora	Gazivoda	KONCAR - Instrument Transformers	Guest
Rob	Ghosh	General Electric	Guest
Andrea	Glynn	Xcel Energy	Guest
Michael	Haas	Instrument Transformers, LLC	Guest
Ryan	Hogg	Bureau of Reclamation	Guest
Kurt	Kaineder	Siemens Energy	Member
Ivan	Konta	KONCAR - Instrument Transformers	Member
Marek	Kornowski	Polycast International	Member
Deepak	Kumaria	Applied Materials	Vice-Chair
Colby	Lovins	Federal Pacific	Member
Nigel	Macdonald	Trench Limited	Member
James	McBride	JMX Services, Inc.	Guest
Scott	McCloskey	Amran Inc.	Member
Ross	McTaggart	Trench Limited	Member
Randolph	Mullikin	ABB Inc.	Guest
Frank	Neder	Trench Germany GmbH	Member
Livia	Neeson	Entergy	Guest
Thomas	Nelson	NIST	Guest
Stephen	Oakes	WEG Transformers USA Inc.	Guest
Rudolf	Ogajanov	ABB Inc.	Member
Dipakkumar	Patel	Instrument Transformer Equip Corp	Member
Caroline	Peterson	Xcel Energy	Member
Sylvain	Plante	Hydro-Quebec	Member

Pierre	Riffon	Pierre Riffon Consultant Inc.	Member
Diego	Robalino	Megger	Guest
Patrick	Rock	American Transmission Co.	Guest
Zoltan	Roman	GE Grid Solutions	Member
Andre	Rottenbacher	Ritz Instrument Transformers	Guest
Thomas	Sizemore	ABB Inc.	Member
Muhammad Abdullah	Sohail	Trench Limited	Guest
William	Solano	Instrument Transformer Equip Corp	Member
Brian	Sonnenberg	Instrument Transformers, LLC	Member
Dervis	Tekin	Meramec Instrument Transformer Co.	Member
Risto	Trifunoski	Trench Limited	Member
Cole	Van Dreel	American Transmission Co.	Guest
Kiran	Vedante	Ritz Instrument Transformers	Member
Deniss	Villagran	GE Grid Solutions	Member
Dieter	Wagner	Hydro One	Guest
David	Wallace	Mississippi State University	Member
Peter	Werelius	Megger	Guest
William	Whitehead	H2scan Corporation	Guest
Mana	Yazdani	Trench Limited	Member
Peter	Zhao	Hydro One	Guest
Igor	Ziger	KONCAR - Instrument Transformers	Chair

Essential Patent Claims: Text was displayed, and the Chair inquired as to if anyone knew of essential patent claims. None were brought up.

Copyright: Text was displayed at the meeting

Minutes of pervious meeting: Unanimously approved with motion brought forward by David Wallace and seconded by Sylvan Plante.

Agenda: Unanimously approved with motion brought forward by Pierre Riffon and seconded by David Wallace

Review of the action items for this task force:

Report on activities within the Sub Taskforce – Investigation of burdens at amperage other than 5 amps

The minutes and material from the Sub Taskforce – Investigation of burdens at amperage other than 5 amps was reported on and shown (after being circulated to the TF body the previous day)

The minutes from both virtual meetings held on 14th and 28th of July 2021 were approved. The motion was brought forward by Thomas Sizemore and seconded by Deepak Kumaria.

All materials from the sub-TF will be posted on the committee website

Presentation of the initial variant of Annex A regarding calculation of VT RCF and phase error from measured values at different PF and burdens

Thomas Sizemore presented and read through the initial proposal of the new “Annex A”, which was drafted by Hossein Nabi-Bidhendi. Thomas also provided some examples of when customers required information that is enabled by this calculation procedure (adding additional burden due to ferro-resonance, having burden power factors different from those required by the standard...)

Participants were encouraged to try out the method

The initial variant of the Annex A along with the presentation from the spring meeting will be sent out to the TF body

Presentation of the application of the method on different high-voltage units

Igor Ziger gave a presentation on the application method to different HV units using test data retroactively

There was a discussion on application of the method when the supply voltage is not completely sinusoidal. This was brought forward by D. Ellis and was concluded that the method (and regular accuracy measurements) are applicable only when the supply voltage is sinusoidal or as close to that as possible

A question was raised by R. Ogajanov on whether the method can be used to guarantee revenue metering accuracy performance. After a brief discussion it was concluded that, based on experiences with different units, it can be used to guarantee revenue metering accuracy performance, provided that the considered burdens are lower than the burden measurements were performed on.

It was discussed that this method is not applicable to CTs

Participants were again encouraged to try out the method. Z. Roman volunteered to try out the method.

New business: “Extended Range” CTs

I. Ziger briefly presented the background on extended range CTs and experiences from different customers and markets.

There was a brief discussion on the topic, shortened due to a lack of time, and it was concluded that this will be made a new business item. The motion was brought forward by Rob Ghosh and seconded by William Solano.

Motion to adjourn: A motion was put forth by Deepak Kumaria and seconded by Thomas Sizemore.

Next Meeting: This WG will meet to continue work at the Denver, Colorado USA, Spring 2022 meeting.

F.8 Old Business

No old business was displayed or discussed.

F.9 New Business

The creation of a new working group for the revision of C57.13 was discussed. It was approved unanimously after a brief discussion. A motion to approve was given by Steve Snyder and seconded by Igor Ziger. Whether to use a traditional or continuous revision type PAR was discussed for several minutes. Comments were provided by Zoltan Roman, Steve Snyder and Igor Ziger. Some questions were raised about the continuous revision process and Steve Shull provided answers to those questions. Ultimately it was decided to pursue a traditional PAR for this working group. This was followed a unanimous approval. David Wallace and Igor Ziger were introduced as officers for the working group.

Zoltan Roman presented the results of the C57.13.9 meeting. This working group had recommended that the ITSC consider if this standard could now recommend beginning the balloting stage. After a brief discussion a motion was approved unanimously after a motion by Zoltan Roman in the ITSC for the standard to be moved into the balloting phase.

Thomas Sizemore presented that the ITSC has been approached about a guide being developed in China. They are developing a document tentatively titled "Guide for live line calibrator of current transformer in distribution network". The proposed scope was also presented. A request was made that members of the ITSC consider acting as a liaison between this working group and the ITSC. It was noted that the liaison, Steve Shull and Thomas Sizemore will meet to recommend changes to the title and scope.

Jim McBride brought up the possibility of having a presentation regarding instrument transformer and how they are affected by breaker interactions. Zoltan Roman, Pierre Riffon, Deepak Kumaria and Thomas Sizemore provided additional comments. A presentation was proposed on the topic. This topic will be discussed further before the Spring meeting to determine scope, materials to be presented, etc.

F.10 ITSC Adjournment

The meeting concluded after a motion to adjourn was put forward by Diego Robalino and seconded by Deepak Kumaria which was approved unanimously.

The next meeting is to be held in Denver, Colorado, USA, in the Spring of 2022.

Annex G Insulating Fluids Subcommittee

**November 17, 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, S21 Minutes Correction and Approval, and Chair's Comments

G.1.1 Chair's Opening Remarks:

- a. Presentation of the Vice-Chair, Jerry Murphy, and the Secretary Alan Sbravati.
- b. Reminded that the SC minutes are due December 30, 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 (Dec 7th, 2021).

G.1.2 Roll Call of SC members: (Quorum requirement: 22 minimum)

- a. 32 Members signed in, from a total of 47 members. Quorum was achieved.
- b. Total of 105 attendees. 51 Guests and 22 new attendees, and 10 requested membership, whose eligibility will be verified.
- c. Registered Attendance:

Gregory Ante	Guest	Norman Field	Guest
Elise Arnold	Guest	George Frimpong	Guest
Claude Beauchemin	Member	Rainer Frotscher	Guest
Jeff Benach	Guest	James Gardner	Guest
Kevin Biggie	Guest	Rob Ghosh	Guest
William Boettger	Member	James Graham	Member
Dominique Bolliger,	Guest	Attila Gyore	Member
Paul Boman	Member	Robert Harper	Guest
Jeremiah Bradshaw	Guest	Roger Hayes	Member
Erich Buchgeher	Guest	Ronald Hernandez	Guest
David Calitz	Member	Andrew Holden	Member
Edward Casserly	Member	David Holland	Guest
Juan Castellanos	Member	Daniel Huenger	Guest
Sudip Chanda	Guest	John John	Member
Luiz Cheim	Member	Toby Johnson	Member
Larry Christodoulou	Member	Kurt Kainer	Member
Michael Dahlke	Guest	Zan Kiparizoski	Member
Sami Debass	Guest	John Lackey	Guest
Stephanie Denzer	Member	Donald Lamontagne	Member
Larry Dix	Guest	Andrew Larison	Guest
Don Dorris	Member	Tiffany Lucas, P.E.	Guest
Zachary Draper	Guest	Alejandro Macias	Guest
James Dukarm	Member	Jinesh Malde	Member
Samraghi Dutta Roy	Guest	Darrell Mangubat	Guest
Marco Espindola	Guest	Balakrishnan Mani	Guest
Marcos Ferreira	Guest	Robert Mayer	Guest

Timothy Menter	Guest	Mickel Saad	Member
Aaron Meyers	Guest	Alan Sbravati	Secretary
Rashed Minhaz	Guest	Cihangir Sen	Guest
Hali Moleski	Guest	Peter Sheridan	Guest
Paul Morakinyo	Guest	Avijit Shingari	Guest
Anatoliy Mudryk	Guest	Stephen Shull	Guest
Jerry Murphy	Vice-Chair	Igor Simonov	Guest
Jayne Nunes, Jr	Guest	Jonathan Sinclair	Guest
Stephen Oakes	Guest	Fabian Stacy	Member
Anastasia O'Malley	Guest	Hampton Steele	Guest
Parminder Panesar	Member	Paul Su	Guest
Nicholas Perjanik	Member	David Sundin	Guest
John Poelma	Guest	James Thompson	Guest
Adam Polson	Guest	Ryan Thompson	Member
Alvaro Portillo	Guest	Timothy Tillery	Guest
John Prunte	Guest	Mark Tostrud	Guest
Donnell Rackley	Guest	Risto Trifunoski	Guest
Jimmy Rasco	Guest	Alwyn Van Der Walt	Guest
Timothy Raymond	Member	Dejan Vukovic	Guest
John Reagan	Guest	Dieter Wagner	Guest
Scott Reed	Chair	Daniel Weyer	Guest
Sebastian Rehkopf	Guest	William Whitehead	Guest
Jonathan Reimer	Guest	Christopher Whitten	Guest
Clemens Reiss IV	Guest	Helena Wilhelm	Guest
Afshin Rezaei-Zare	Member	Malia Zaman	Guest
Josue Rodriguez	Guest	Anand Zanwar	Guest
Zoltan Roman	Guest		

G.1.3 Agenda Approval:

- a. A motion was made by Claude Beauchemin and seconded by David Sundin to approve the agenda. The agenda was approved unanimously without objection.

G.1.4 Approval of minutes from the S21 meeting (virtual):

- a. A motion was made by Ed Casserly and seconded by Claude Beauchemin 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 10 guides under the Sub-Committee Insulating Fluids.
- b. C57.166 PAR's expires in December 2022, and the first balloting is expected to happen in Feb/22. This will supersede C57.106, C57.111, C57.121, C57.147, so no activity is required at this point for these standards.
- c. C57.155 will. C57.637, C57.130, C57.139 will expire in 2025.
- d. The chair of C57.130 resigned. This will be discussed under new business topic.
- e. C57.104 will expire in 2029.
- f. C57.146, C57.155, C57.637 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 (interim Scott Reed)

The report of the WG Meeting was presented at the IFSC meeting by Scott Reed:

- a. The WG meeting had 30 of 40 members were present so a quorum was achieved.
- b. Call for patents was presented without any claim.
- c. Five Task Forces chairs each gave a status report of their respective sections.
- d. TF1, with Jinesh Malde, already completed their draft and shared with TF6.
- e. TF2 is with Scott Reed. Only pending topic was the in-service limits for synthetic ester liquids, and the presented values were accepted by the group. Draft is going to be shared with TF6 soon.
- f. TF3 is with Alan Sbravati. Work is completed, and already shared with TF6.
- g. TF5 is with Rainer Frotscher. The document was modified according to last meeting decisions. Some pending topics around the breakdown voltage limits, which need to be harmonized with the limits of the transformer. Testing per ASTM D877 will be removed. A table with values for energization after maintenance interventions is required. A suggestion for moving this to C57.637 was rejected.
- h. TF6 is now working on the merging of the individual drafts. A conference call will be scheduled in early January for ensuring compatibility and consistency across the guide. All members and guests will be informed of this meeting.
- i. The expectation is to have the guided balloted prior to the S22 meeting.

See **Appendix I** for the F21 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 extended to Dec 2024)

WG Chair: Jon Karas

- a. Attendance total 39, members 8, guest 22 and 2 requested. Quorum was not achieved.
- b. No patent claim was presented.
- c. Scott Reed recommended an electronic poll of members for approval of Spring 2021 and Fall 2021 Meeting Minutes.
- d. Chair gave timeline of Guide progress with the Guide expiration at the end of 2021, a PAR extension was given to 2024
- e. Claude Beauchemin presented some statistics. They are preparing values for different levels, including 90th and 95th percentiles.

See **Appendix II** for the F21 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 110 attendees. Out of the 59 members, 31 attended the meeting, confirming quorum.
- b. One patent claim was presented by Don Lamontagne and it will be verified.

- c. Don Lamontagne presented very interesting case studies on the use of on-line monitoring in Arizona Public Services. Both short- and long-term trends were identified, and several failures were prevented. Several questions were presented and answered by the presenter.
- d. A publication of 2 papers which may be of interest of the SC was mentioned. The creation of a working group in Cigre for on-line DGA monitoring was mentioned and discussed.
- e. The IFSC chair reinforced the need of having the presentations posted in the transformer committee website. Claude will follow-up.
- f. Meeting was adjourned.

See *Appendix III* for the F21 Minutes (unapproved) of C57.104 TF Meeting as submitted.

G.2.1.4 C57.637 – Guide for the Reclamation of Mineral Insulating Oil and Criteria for Its Use

WG Chair: Stephanie Denzer

- a. This is a new working group. PAR was approved.
- b. All attendees will be made members, excluding who expressed the intention of not becoming a member in the chat.
- c. Call for patents was presented, without claims. Copyright slides were presented.
- d. The standard was divided in four portions and task forces were created for analyzing each of them.
- e. The working group is requesting more volunteers for the task forces.

See *Appendix IV* for the F21 Minutes (unapproved) of C57.637 WG Meeting as submitted.

G.2.1.5 C57.155 – Guide for Interpretation of Gases Generated in Natural and Synthetic Ester Liquid Type Transformers

WG Chair: Alan Sbravati

- a. This is a new working group. PAR was approved.
- b. The attendees who requested membership during the TF meeting were made members. Attendees of this meeting who request membership in the chat will become members.
- c. No patent claims were presented. Copyright slides were presented.
- d. Next topic was the discussion of the Title, Scope and Purpose. Motions were presented and the three items were modified accordingly. During the PAR approval there were some edits in the proposed texts, which will be presented to the working group during S22 meeting.
- e. The main discussion was around the procedure for collecting data on historical values of dissolved gas content. The main proposal is to create a computational routine to be applied by each of the laboratories on their database, generating the statistical data to be used by this WG. A task force was created, and it will be led by Jon Karas.
- f. A second task force was created for starting to review the content of the standard, for avoiding duplications / conflicts with the current version of IEEE C57.104.
- g. Meeting was adjourned.

See *Appendix V* for the F21 Minutes (unapproved) of C57.155 WG Meeting as submitted.

G.2.1.6 Task Force C57.139 – Guide for the Interpretation of Gases generated in Liquid Type Load Tap Changers

TF Chair: Rainer Frotscher

- a. The task force had 43, with 11 attendees requesting membership.
- b. Call for patents showed none at this time.
- c. Copyright Policy was discussed.
- d. Title, scope and Purpose were discussed and changed during the meeting.
- e. Chair then showed possible improvements of the Guide, such as adding limit values for major LTC classes, which would need to set up a database with LTC DGA data, or to receive parametrics from DGA data sets.

- f. Chair asked for volunteers for the new Working Group: Active members, Vice Chair and Secretary are needed. Paul Boman volunteered to act as Secretary, Chair accepted and thanked

See *Appendix VI* for the F21 Minutes (unapproved) of C57.139 TF Meeting as submitted.

G.3 Old Business

- a. No old business

G.4 New Business

- a. The subcommittee needs a new volunteer for becoming the chair of the task force for the revision of C57.130, since John Foschia resigned from that position.
- b. Alan Sbravati presented a request for the Task Force he was coordinating within the WG PC57.154, which belongs to the Insulation Life Subcommittee to become a new Task Force in the Insulating Fluids Subcommittee. There were some discussions around what the correct procedure for such situation is. This will be verified by the chair and discussed with the chair of ILSC. A conclusion will be presented in the S22 meeting.

G.5 Next IFSC Meeting:

March 30, 2022 – Denver, CO

G.6 Adjournment

A motion for the meeting to be adjourned was presented by Claude Beauchemin and seconded by Ed Casserly.

The subcommittee adjourned at 3:32 p.m.

Respectively Submitted, Alan Sbravati, Secretary IFSC

Unapproved Minutes from the F21 IFSC WG and TF meetings

Appendix I

**Working Group for Acceptance and Maintenance of Insulting Liquids
PC57.166**

**Tuesday, November 16th, 2021
12:55 – 2:10 PM (central time)
Virtual Meeting**

Minutes of Working Group Meeting

Chairman Interim Scott Reed (temporarily replacing Tom Prevost)
Vice Chair Scott Reed
Secretary Alan Sbravati

The meeting was called to order at 12:55 pm by the Chair.

There were 30 of 40 members present. There were 72 guests. A membership quorum was achieved.

Attendance list:

Juan Acosta	Guest	Andrew Holden	Guest
Jennie Aldenlid	Guest	David Holland	Guest
Rehan Ali	Guest	Daniel Huenger	Guest
Barry Beaster	Guest	John John	Guest
Claude Beauchemin	Member	Toby Johnson	Member
Olle Benzler	Guest	Kurt Kaineder	Member
Enrique Betancourt	Guest	Jon Karas	Member
Kevin Biggie	Guest	Nathan Katz	Guest
William Boettger	Guest	Gael Kennedy	Guest
Dominique Bolliger,	Member	Zan Kiparizoski	Member
Jeremiah Bradshaw	Member	Dmitriy Klempner	Guest
Edward Casserly	Member	Michelle Kutzleb	Guest
Luiz Cheim	Member	Donald Lamontagne	Guest
Larry Christodoulou	Guest	Olivier Lejay	Guest
Brandon Dent	Guest	Aleksandr Levin	Guest
Stephanie Denzer	Member	Tiffany Lucas, P.E.	Guest
Eric Doak	Guest	Jinesh Malde	Member
Don Dorris	Member	Darrell Mangubat	Guest
James Dukarm	Guest	Terence Martin	Guest
George Frimpong	Guest	Robert Mayer	Guest
Rainer Frotscher	Member	James Mciver	Guest
Eduardo Garcia Wild	Member	Susan McNelly	Member
James Gardner	Member	Aaron Meyers	Guest
Ali Ghafourian	Guest	Hali Moleski	Guest
Rob Ghosh	Guest	Ali Naderian	Guest
Orlando Giraldo	Guest	Ashmita Niroula	Guest
James Graham	Member	Jayme Nunes, Jr	Guest
Ismail Guner	Guest	Anastasia O'Malley	Guest
Attila Gyore	Guest	Parminder Panesar	Guest
David Hanson	Guest	Rakesh Patel	Guest
Robert Harper	Guest	Pranav Pattabi	Guest
Roger Hayes	Member	Nicholas Perjanik	Member
Ronald Hernandez	Guest	Alvaro Portillo	Guest

Donnell Rackley	Guest	Brian Sparling	Guest
Kevin Rapp	Member	Fabian Stacy	Guest
Jimmy Rasco	Guest	Gregory Steeves	Member
Robert Rasor	Member	Paul Su	Guest
Timothy Raymond	Member	David Sundin	Guest
Scott Reed	Vice-Chair	Troy Tanaka	Guest
Sebastian Rehkopf	Guest	James Thompson	Guest
Diego Robalino	Member	Ryan Thompson	Guest
Patrick Rock	Member	Timothy Tillery	Guest
Josue Rodriguez	Guest	Cole Van Dreel	Guest
Andre Rottenbacher	Guest	Dejan Vukovic	Guest
Mickel Saad	Member	David Wallach	Guest
Alan Sbravati	Secretary	Daniel Weyer	Guest
Pugal Selvaraj	Member	William Whitehead	Guest
Peter Sheridan	Guest	Christopher Whitten	Guest
Igor Simonov	Guest	Helena Wilhelm	Guest
Jonathan Sinclair	Member	Malia Zaman	Guest
Mauricio Soto	Guest	Peter Zhao	Guest

Introductions

Approval of Agenda

Approval of Spring 2021 Minutes

Call for Patents ... Please read slides before meeting

Review of Copyright Policy.... Please read slides before meeting

Review of Scope and Purpose

Review of Document Structure and Task Forces

Task Force Reports

TF1 Types of Insulating Liquids—Jinesh Malde

TF2 In Service—Scott Reed

TF3 Mixture of Insulating Liquids—Alan Sbravati

TF5 Insulating Liquids for LTCs—Rainer Frotscher

TF6 Editorial—Toby Johnson

New Business

Adjourn

The agenda of the meeting was presented by the chair. A motion for approval was presented by Don Dorris, and seconded by Eduardo Garcia. Without objections, the agenda was unanimously approved. A motion for approving the minutes of meeting from S21 was presented by Ed Casserly, seconded by David Sundin. No comments were presented, minutes from Spring 2021 were approved unanimously.

Chairman posted the Patent Claim. No claims were made.

Chairman presented the copyright policy slides.

The first discussed topic was the next steps for completing the work till the PAR expiration, which is due by Dec/22. Ideally, the proposed text should be balloted before the S22 meeting. Considering that Task Forces 1 to 5 completed most of their work, some additional effort on Task Force 6 for combining / harmonizing all the chapters may allow having a draft before next meeting.

Presentations of the task force activities

TF 1 – Jinesh Malde

- The draft was completed and shared with Toby Johnson. No pending topics.

TF 5 – Rainer Frotscher

- The draft was adjusted according to the decisions from S21 meeting, adopting the same voltage classes of TF1.
- The values of breakdown voltage were discussed, and it was agreed to remove the testing per ASTM D877 for both unused fluid and in-service conditions

- For in-service conditions, the requirement of visual inspection will be maintained, excluding a limit for fluid color.
- Values of breakdown voltage need to be harmonized with those applied for the transformer.
- Specifically for natural ester liquids, it was suggested to include in the text as assessment of the variation of viscosity, as the main indication of fluid oxidation.
- There is an additional table for the tap changers, with the required properties after maintenance prior to re-energization. These values are lower than the unused limits, and higher than the continuous service limits. The possibility of moving this table to the IEEE Std. 637 was discussed and rejected.

TF 3 – Alan Sbravati

- The draft was completed in May/21.
- Latest version will be shared with TF 6 (Toby).

TF 2 – Scott Reed

- Only open question was regarding the in-service limits for synthetic ester liquids.
- The suggestion was to adopt the same limits currently applied for natural ester liquids, adding a table note for the values of acidity in the case of free breathing transformers.

TF 6 – Toby Johnson

- Activities of this task force are starting now.
- Additional meetings will be scheduled in January / February for completing the first draft and harmonizing the values.
- All working group members and guests will be informed.

New Business: No new business.

The meeting was adjourned at 2:08 pm.

Alan Sbravati, Secretary

Scott Reed, Vice Chair / Interim Chair

Appendix II

Working Group C57.146 IEEE Guide for DGA in Silicone

**Monday, November 15th, 2021
10:50 PM to 11:51 AM (central time)
Virtual Meeting**

Minutes of Working Group Meeting

Chair Jon Karas / Vice Chair Toby Johnson
Secretary Paul Boman

Attendance total 39, members 8, guest 22 and 2 requested membership

F21 Meeting Attendance at end of meeting

Role	First Name	Last Name
Member	Claude	Beauchemin
Secretary	Paul	Boman
Member	Eric	Davis
Member	Dmitriy	Klempner
Guest	John	Lackey
Member	Scott	Reed
Guest	Jeff	Benach
Guest	Juan	Castellanos
Guest	Antonio	Ceballos
Guest	Luiz	Cheim
Guest	Larry	Christodoulou
Member	Zack	Draper
Guest	James	Dukarm
Guest	Bruce	Forsyth
Guest	George	Frimpong
Guest	Rainer	Frotscher
Guest	Lorne	Gara
Member	Jim	Graham
Guest	Robert	Harper
Guest	Ronald	Hernandez
Guest	David	Holland
Guest	Axel	Kraemer
Guest	deepak	Kumaria*
Guest	Michelle	Kutzleb
Guest	Hali	Moleski
Guest	Anatoliy	Mudryk
Guest	Martin	Muñoz
Guest	Arturo	Nunez
Guest	Harry	Pepe
Guest	Nick	Perjanik

Guest	Josue	Rodriguez*
Member	John	Pruente
Guest	Wes	Schrom
Guest	Jonathan	Sinclair
Guest	Mauricio	Soto
Guest	David	Sundin
Guest	Risto.	T
Guest	Bill	Whitehead
Guest	Helena	Wilhelm

*Requested Membership

Call for patents – none at this time

Copyright discussed

Membership roll call where quorum was not met for this meeting

Scott Reed recommended an electronic poll of members for approval of Spring 2021 and Fall 2021 Meeting Minutes.

Chair gave timeline of Guide progress with the Guide expiration at the end of 2021, a PAR extension was given to 2024.

Claude Beauchemin presented the analysis for 4 sets of DGA data
Data for combustible gas 90th percentile

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
Transformer data set ages clustered between 1980 and 2010

Members asked for the 95th percentile and oxygen since silicon gassing dependent on oxygen concentration.

Claude Beauchemin explained the rules used for the C57.104 Guide development like rounding number for the various ranges of data.

Meeting adjourned

Appendix III

TF Next Revision to C57.104: Guide for Interpretation of Gases Generated in Mineral Oil-Immersed

**Monday, November 15th, 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 110 attendees at the start of the meeting. There are 59 members, with 23 attendees that requested membership last meeting (Spring 2021). Quorum was made with 31 of the 59 members according to the poll. Of those 23 that had requested membership, 13 were in attendance in this meeting (*italicized below*). These 72 members are listed below. There were 6 attendees that requested membership this meeting. If all membership requests were accepted, the new membership count would be 78 members.

Members (59 original and 13 new based on F21 meeting attendance):

- | | |
|------------------------------|-------------------------------|
| 1. Anand Zanwar | 30. Juan Acosta |
| 2. Anastasia O'Malley | 31. Kris Zibert |
| 3. Bill Whitehead | 32. Mani Kumar |
| 4. Bob Rasor | 33. Larry Christodoulou |
| 5. Brad Staley | 34. Lee Doyle |
| 6. Brady Nesvold | 35. Luiz Cheim |
| 7. Cihangir Sen John | 36. Marco Espindola |
| 8. Claude Beauchemin (Chair) | 37. Markus Schiessl |
| 9. David Calitz | 38. Michael Botti |
| 10. David Murray | 39. Mickel Saad |
| 11. David Wallach | 40. Monty Goulkhah |
| 12. Diego Robalino | 41. Nick Perjanik |
| 13. Dmitriy Klempner | 42. Nitesh Patel |
| 14. Don Dorris | 43. Norman Field (Vice Chair) |
| 15. Donald Lamontagne | 44. Oleg Roizman |
| 16. Dwight Parkinson | 45. Paul Boman |
| 17. Emilio Morales-Cruz | 46. Roger Hayes |
| 18. Eric Doak | 47. Samragni Dutta Roy |
| 19. Erich Buchgeher | 48. Scott Reed |
| 20. Florin Faur | 49. Shiva Rampersad |
| 21. Hali Moleski (Secretary) | 50. Stacey Kessler |
| 22. James Dukarm | 51. Stephanie Denzer |
| 23. Jayme Nunes | 52. Stuart Chambers |
| 24. Jerry Murphy | 53. Sukhdev Walia |
| 25. Jim Graham | 54. Susan McNelly |
| 26. John K John | 55. Timothy Raymond |
| 27. John Prunte | 56. Ashmita Niroula |
| 28. John Sinclair | 57. William Boettger |
| 29. Jon Karas | 58. Zack Draper |

59. Zan Kiparizoski

60. *Afshin Rezaei-Zare*

61. *Amitahh Sarkar*

62. *Anatoliy Mudryk*

63. *Anthony Franchitti*

64. *Balakrishnan Mani*

65. *Brian Sparling*

66. *George Frimpong*

67. *Ion Radu*

68. *James Gardner*

69. *Juan Castellanos*

70. *Mike Waldrop*

71. *Robert Harper*

72. *Stephan Brauer*

Attendees Requesting Membership

1. Edmundo Arevalo

1. Elise Arnold

2. Ismail Guner

3. Arturo Nunez

4. Josue Rodriguez

5. Risto Trifunoski

The agenda was reviewed along with patent call and copyright policy. None were opposed to the Spring 2021 meeting minutes emailed prior to the conference. Motion to approve was by Jon Karas and seconded by Jon Sinclair.

Next, a presentation was given by Donald Lamontagne on online monitoring analytical techniques specific to transformer dissolved gas analysis. Don shared that this was also presented in C57.143 annex. And that a patent claim was submitted. After the presentation, discussion followed.

Phil Hopkins – Has Don been able to associate certain gasses based on causal events (example was given as to solar transformers and certain increased gassing traced back to phenomena in the core)? Don replied he did not look at transformers hooked up to solar inverters. He would expect the type of gasses unique to these units, and there would need to be specific changes made to algorithm used in TOAN.

Luiz Cheim asked if Don could explain what was patented. Claude stated we could not discuss the detail of the patent. Don said that when the letter of agreement is posted, it will show what is patented.

Luiz asked how the algorithm handles the fact that CO and CO₂ may not necessarily be from paper aging. Don shared that all their transformers are sealed.

Claude thanked Don for his presentation.

Claude reviewed the activities of the CIGRE WG D1/A2.77 “Liquid Tests for Electrical Equipment”. Proposal for a CIGRE/IEC centralised data repository of transformer related test and operating information. The slides were not all read, but Claude said they would be in the meeting minutes. See below in Italics.

It had been observed by various members of the WG that obtaining the data required to develop improved diagnostic techniques, such as for example DGA interpretation or insulating liquids quality assessment, is often one of the main difficulties of the WG task.

CIGRE WG are per their nature temporary (2 – 3 years) and group typically a few dozen of world experts tasked to address specific questions about topics of interest to the general community of energy production.

In most cases, addressing those specific questions require large amount of data to be available for review and discussion to produce improvements in methods of analysis or in procedures of operation. Obtaining this data has proven to be quite difficult, requiring a large amount of time and efforts, taking a valuable part of the time and resources available to the WG. Unfortunately, when the WG conclude its task and is disbanded, the accumulated data is lost, as there is no "universal" permanent repository available where the WG could transfer the data it accumulated for the benefit of the next WG that will address a similar topic in the future.

A good example is data for Dissolved Gases Analysis (DGA). There have been several WG working on the topic of DGA interpretation in the past few decades and several Technical Brochures have been issued on this topic (In the last 15 years: TB 296, TB 409, TB 443, TB 771 and TB 783). Each time the WG convenor had to request various WG members to supply "had hoc" data in order to generate the interpretation method updates or new limits tables. After each of those WG had completed their work, the accumulated data was not retained.

We therefore propose the constitution of a central repository to collect and conserve data accumulated by the various WG. This repository could either be hosted by the CIGRE, the IEC or be a joint operation.

We recognise that such endeavor will have to address several possible roadblocks to be successful, but we consider the required effort to be worthwhile. Some of the items that will need to be addressed for success are as follow:

Protection of data supplier's anonymity with its associated NDA and other legal considerations (including "opting out" option from specific future WG).

Data security.

Universal transformer "Basic data set" containing the information of use for various tasks (e.g. Type, size, rating, insulating liquid, oil preservation system, loading....)

Uniformized data format (It will be different for each different type of data but need to be uniform withing a category, regardless of the data supplier).

Long term data storage and maintenance.

Control of data access to prevent missuses.

Clear usage protocols and user's obligations, including users NDA.

Some of the work already performed by various WG, specifically or partially, on data handling and integration (for example, TB 298, TB 630, TB 706 and TB 761) probably contain information useful in addressing some of the items mentioned above.

Claude mentioned some publications of interest that are relevant to our TF.

"The Data Behind the Numbers: IEEE C57.104TM-2019 DGA Interpretation Guide" By C. Beauchemin, L. Cheim and N. Field. Transformer Technology Magazine, January 2022.

"Near-Term Failure of Transformers Using Reliability Statistics on Dissolved Gas Analysis". by Z.H. Draper and J. J. Dukarm. In 2021 CIGRE Canada Conference, number 408, Toronto ON, October 2021.

Then a list of IEEE Working Group and Task Forces were given that were relevant to our task force.

Monday 10H50: WG Guide for DGA in Silicone PC57.146, J Karas

Monday 14H20: WG Transformer Monitoring C57.143, M. Spurlock

Tuesday 10H50: TF Guide DGA for Factory Temp Rise Tests - C57.130, J. Foschia

Tuesday 14H20: WG Guide DGA in Ester-Immersed Transformers PC57.155, A. Sbravati

Tuesday 15H45: TF Revision of Guide for DGA in LTCs C57.139, R. Frotscher

Claude asked if there was any new business.

Mickel Saad asked if data was gathered on industrial transformers. Claude said that the data used in C57.104 does have a decent number of small transformers. It was also noted that some types such as windfarm transformers behave differently, and cautionary statements are given accordingly. Though that is one area of improvement that is not done yet. Another improvement to 104 would be to cover online DGA data.

Luiz Cheim noted that CIGRE had a proposal in consideration for a Working Group on online monitoring as well. It is not approved yet but may know in 6 months or so if approved.

No new business was brought forward. Meeting was adjourned unanimously a few minutes past five o'clock central time.

Appendix IV

Working Group C57.637 Guide for the Reclamation of Mineral Insulating Oil and Criteria for Its Use

**Tuesday, November 16th, 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 (c.s.t) by Chair Stephanie Denzer. Scott Reed (Vice-Chair) and Andy Holden (Secretary) were also present.

Attendees:

This was the first meeting of the Working Group so attendance today will trigger automatic membership. There were 54 attendees.

- | | |
|------------------------|-------------------------|
| 1. Alan Sbravati | 28. Jinesh Malde |
| 2. Aleksandr Levin | 29. John Poelma |
| 3. Anand Zanwar | 30. John Prunte |
| 4. Andy Holden | 31. Jon Karas |
| 5. Ashmita Niroula | 32. Jonathan Sinclair |
| 6. Bob Rasor | 33. Josue Rodriguez |
| 7. Christopher Whitten | 34. Juan Acosta |
| 8. Colin Clark | 35. Kevin Biggie |
| 9. Darrell Mangubat | 36. Larry Christodoulou |
| 10. David Holland | 37. Lorne Gara |
| 11. David Sundin | 38. Marc Foata |
| 12. Dejan Vuković | 39. Mickel Saad |
| 13. Don Dorris | 40. Nick Perjanik |
| 14. Donnie Rackley | 41. Paul Boman |
| 15. Ed teNyenhuis | 42. Rajkumar Padmawar |
| 16. Edward Casserly | 43. Robert Harper |
| 17. Eric Doak | 44. Roger Hayes |
| 18. George Frimpong | 45. Ryan Thompson |
| 19. Greg Steeves | 46. Scott Reed |
| 20. Hali Moleski | 47. Sebastian Rehkopf |
| 21. Helena Wilhelm | 48. Shibao Zhang |
| 22. Igor Simonov | 49. Stacey Kessler |
| 23. Ismail Guner | 50. Stephanie Denzer |
| 24. Jayme Nunes | 51. Thomas Hartmann |
| 25. Jeremiah Bradshaw | 52. Tim Peterson |
| 26. Jim Graham | 53. Timothy Raymond |
| 27. Jimmy M Rasco | 54. Wes Schrom |

Due to the time constraints, attendees did not introduce themselves.

Agenda

- 1) Introduction
- 2) Reviewed Call for Patents
- 3) Reviewed Copyright Notification.
- 4) Reviewed Title, Scope and Purpose
- 5) Reviewed the Guide C57.637-2015
- 6) Call for Task Force volunteers

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 focused her time on reviewing the current guide and the creations of Task Forces to divide the work of including esters (natural & synthetic), silicone, and less flammable hydrocarbons (LFHs) to the guide. The following Task Forces were established:

- Task Force 1 – Overview, Normative References, & Definitions
- Task Force 2 – Classification of Service Aged Oils (Liquids) & Criteria for Reuse
- Task Force 3 – Types of Reconditioning & Reclamation Processes
- Task Force 4 – Oil (liquid) Tests & Their Significance
- Editor at Large

Volunteers were found to lead each Task Force and will be confirmed during the coming weeks.

The meeting was called to order at 11:20 am (c.s.t) by Chair Stephanie Denzer.

Appendix V

Working Group C57.155 – Guide for Interpretation of Gases Generated in Natural Ester and Synthetic Ester-Immersed Transformers

**Tuesday, November 16th, 2021
14:20 – 15:35 PM (central time)
Virtual Meeting**

Minutes of Working Group Meeting

The meeting was called to order at 14:20 am by the Chair.

There were 19 of 25 members present during the meeting, at time of the poll there were 16 members, however this was the first WG meeting after a TF meeting in Spring 2021. There were 62 guests, 13 membership requests which were granted after the meeting.

A “provisional” membership quorum was achieved, but as a first WG meeting, there is no meaning of it.

Attendance list:

1	Juan Acosta	Guest	42	Terence J. Martin	Guest
2	Elise Arnold	Member	43	Rogelio Martinez	Guest
3	Javier Arteaga	Guest	44	Robert Mayer	Guest
4	Barry Beaster	Guest	45	Matthew Mcfadden	Guest
5	Claude Beauchemin	Member	46	Tim Menter	Guest
6	Jeff Benach	Guest	47	Aaron Meyers	Guest
7	Paul Boman	Member	48	Ronnie Minhaz	Guest
8	Jeremiah Bradshaw	Member	49	Hali Moleski	Guest
9	David Calitz	Guest	50	Paul Morakinyo	Guest
10	Edward Casserly	Member	51	Anatoliy Mudryk	Guest
11	Juan Castellanos	Guest	52	Jerry Murphy	Guest
12	Luiz Cheim	Member	53	Kris Neild	Guest
13	Larry Christodoulou	Guest	54	Ashmita Niroula	Guest
14	Bhaba Das	Guest	55	Stephen Oakes	Guest
15	Eric Doak	Guest	56	Nick Perjanik	Member
16	Don Dorris	Guest	57	Donnie Rackley	Guest
17	Zack Draper	Guest	58	Kevin Rapp	Member
18	James Dukarm	Guest	59	Scott Reed	Guest
19	Tommy Eagle	Guest	60	Sebastian Rehkopf	Guest
20	Marco Espindola	Guest	61	Jonathan Reimer	Guest
21	Ed Feloni	Guest	62	Josue Rodriguez	Member
22	George Frimpong	Member	63	Alan Sbravati	Chair
23	Rainer Frotscher	Member	64	Peter Sheridan	Guest
24	Lorne Gara	Guest	65	Jonathan Sinclair	Guest
25	James Gardner	Guest	66	Muhammad A. Sohail	Guest
26	Rob Ghosh	Guest	67	Brian Sparling	Guest
27	Orlando Giraldo	Guest	68	Markus Stank	Guest
28	Jim Graham	Member	69	Hampton Allen Steele	Guest
29	Attila Gyore	Secretary	70	Paul Su	Guest
30	David Hanson	Member	71	Ryan Thompson	Guest
31	Robert Harper	Member	72	Tim Tillery	Guest
32	Roger Hayes	Guest	73	Risto Trifunoski	Guest
33	David Holland	Guest	74	Krishnamurthy Vijayan	Guest
34	Toby Johnson	Guest	75	Dejan Vuković	Guest
35	Jon Karas	Member	76	Pragnesh Vyas	Guest
36	Gary King	Guest	77	Bill Whitehead	Member
37	Michelle Kutzleb	Guest	78	Christopher Whitten	Guest
38	Aleksandr Levin	Guest	79	Helena Wilhelm	Guest
39	Tiffany Lucas	Guest	80	Mana Yazdani	Guest
40	Nigel Macdonald	Guest	81	Anand Zanwar	Guest
41	Jinesh Malde	Member			

Previously circulated agenda (which structure was slightly differed from the showed one as points 7/8 were combined)

1. Introductions
2. Approval of Agenda
3. Review of Spring 2021 Task Force Minutes
4. Call for Patents ... Please read slides before meeting
5. Review of Copyright Policy.... Please read slides before meeting
6. Review of Scope and Purpose
7. Review of Document Structure
8. Possible definition of Task Forces
9. New Business
10. Adjourn

The agenda of the meeting was presented by the chair.

4. Chair posted the Patent Claim. No claims were made.

5. Chair presented the copyright policy slides.

6. Review of Scope and Purpose

The group has approved Scope and Purpose which were submitted in the PAR. Claude Beauchemin (CB) pointed that we did not need to change the scope and purpose beforehand, it is a good practice if we do small changes along the work and then before balloting a change in the PAR is requested.

The texts approved in the PAR request are:

Title:

Guide for the Interpretation of Gases Generated in Natural and Synthetic Ester Liquid Type Transformers

Scope:

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

Purpose:

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.

7/8 Review of Document Structure / Possible Improvements

Luiz Cheim (LC) questioned whether we want to collect data and it is the scope

Alan Sbravati (AS) replied we need data collection, and this is covered by the scope

Long discussion on the structure of the new C57.155 document which could follow the structure of C57.104 (IEEE Guide for the Interpretation of Gases Generated in Mineral Oil-Immersed Transformers), the main points were:

- If we want to create Table 1,2,3 similar to C57.104, we need a lot of data
- Kevin Rapp (KR) we should differentiate on free breathing and non-free breathing transformers. Discussion was on the interoperation of Table 1,2,3 and 4 in C57.104 with the ratio of O₂/N₂ < or > 0.2. CD described that if the transformer is sealed the values for <0.2 should be used and for free breathing units the value for >0.2 should be used
- AS asked the contributors for the previous C57.155 how they gathered and processed the data

- James Dukarm (JD) confirmed that he'd done the statistical analysis and he also had the program code for that. JD can provide the original database
 - AS has access to John Luksich's files but couldn't find any relevant data on this
- AS asked current laboratories whether they can provide data for the new/expanded database
 - Jon Karas (JS) from SD Myers said they'd done a similar summary statistic for silicone liquids where all sensitive information were removed
 - LC suggested to work out a standardized statistical procedure what all lab could use, however it is maybe beyond our capabilities
 - CB agreed that a "simple spreadsheet with macros" might not be enough as data filtering is a huge part of the task
- Jinesh Malde (JM) suggestions were
 - Reach out to labs and end users to know how much data they have to decide whether we have enough data to create Table 1, 2 and 3 for C57.155
 - Get data on transformers' types, like wind, renewable, traction, etc
- AS mentioned, there could be max 25 years old data on natural ester filled units. Attila Gyore (AG) comment, on synthetic ester filled unit there could be 30-35 years data, however collecting these data is really hard
- LC commented that IEC 60599 has ranges of values for the gases which could be a guide for the new C57.155 as in agreement with Michel Duval this is a practical approach of DGA
- Helena Wilhelm (HW) asked whether we only need the type of the natural esters. AS asked the participants to use brand names too as there are at least 4 soyabean natural esters on the market from different suppliers
- JD confirmed again that he had the original program code which has two parts
 - Cleanup the data
 - Statistical software to calculate the percentile values
- CB can provide the code what was used in C57.104, however the user needs a training to use it

Based on the aforementioned discussion AS suggested to form two task forces:

Task Force 1 Developing a program code/system to analyze data and later build up a database

Leader: Jon Karas

Volunteered participants during the meeting:

- Claude Beauchemin
- Luiz Chem
- Jinesh Malde
- James Dukarm

Task Force 2 Reviewing the content of the current C57.155

Leader: Alan Sbravati

Volunteered participants during the meeting:

- Attila Gyore
- Josue Rodriguez

We need more volunteers.

9. New Business: No new business.

The meeting was adjourned at 15:35, on time.

Attila Gyore, Secretary

Alan Sbravati, Chair

Appendix V

Task Force C57.139 – Guide for Interpretation of Gases Generated in Liquid Type Load Tap Changers

**Tuesday, November 16th, 2021
3:45 PM to 4:58 PM (central time)
Virtual Meeting**

Minutes of Task Force Meeting

Chair Rainer Frotscher

Vice Chair <not nominated yet>

Secretary Paul Boman

Virtual Meeting took place on November 16, 2021, from 3:45 PM to 4:58 PM

Attendance record: 43, with 11 attendees requesting membership.

First Name	Name	eMail	Requesting Membership
Juan	Acosta	juan.acosta@ergon.com	
Claude	Beauchemin	beauchemin@tjh2b.com	
William	Boettger	weboettger@aol.com	
Paul Su	Boman	paul_boman@hsb.com	Secretary
Antonio	Ceballos	aceballos@gatransformer.com	
Larry	Christodoulou	l.christodoulou@epsii.com	
Don	Dorris	ddorris@nespower.com	x
James	Dukarm	j.dukarm@ieee.org	
Samraghi	Dutta Roy	samraghi.dutta_roy@siemens-energy.com	
Joe	Foldi	foldijoseph1@aol.com	
Rainer	Frotscher	r.frotscher@reinhausen.com	Chair
Jim	Graham	jimgraham@ieee.org	
Attila	Gyore	attilagore@mimaterials.com	x
David	Hanson	hanson@tjh2b.com	
Thomas	Hartmann	dr.thomas.hartmann@ieee.org	
Ronald	Hernandez	rhernandez@doble.com	
David	Holland	david.s.holland@exxonmobil.com	
Jon	Karas	jon.karas@sdmyers.com	
Zan	Kiparizoski	zkiparizoski@ieee.org	x
Michelle	Kutzleb	kutzleb@tjh2b.com	
Olivier	Lejay	o_lejay@hotmail.com	x
Matthew	McFadden	matthew.mcfadden@oncor.com	x
Susan	McNelly	susan.j.mcnelly@xcelenergy.com	
Kris	Neild	kris.neild@megger.com	
Brady	Nesvold	brady.a.nesvold@xcelenergy.com	
Nick	Perjanik	nick.perjanik@weidmann-group.com	x
Tim	Peterson	t.peterson@nassusa.com	
John	Pruente	john.pruente@spx.com	x
Scott	Reed	sreed@mvdiagnostics.com	
Patrick	Rock	patrock@ieee.org	
Josue	Rodriguez	josue.rodriguez@prolecge.com	x

Rod	Sauls	resauls@southernco.com	
Jonathan	Sinclair	jjsinclair@pplweb.com	
Kushal	Sing	kushal.singh@comed.com	
Brian	Sparling	sparlibr@gmail.com	
Paul	Su	pocheng.su@fmglobal.com	
Ed	teNyenhuis	ed.g.tenynhuis@hitachi-powergrids.com	x
Mark	Tostrud	mark.tostrud@dynamicratings.com	
Cole	Van Dreel	cvandreel@atcllc.com	x
Daniel	Weyer	dfweyer@nppd.com	
Bill	Whitehead	bwhitehead@h2scan.com	
Christopher	Whitten	christopher.l.whitten@hitachienergy.com	x
Kris	Zibert	kris.zibert@amce.com	

Agenda

1. Welcome and Task
2. Call for Patent Claims / IEEE SA Copyright Policy
3. Revision activities:
 - Title
 - Scope
 - Purpose
 - Identify possible improvements
4. Setting up PAR
5. Formation of Working Group

Minutes

- Chair welcomed the group, presented agenda and gave a short introduction on the task.
Since the last revision in 2015, knowledge on tap-changer DGA did significantly improve, and new methods have been developed which are worth to be evaluated if they are suitable to be incorporated in the guide.
- Call for patents showed none at this time.
- Copyright Policy was discussed.
- Chair started Discussion on:
 - a) Title
 Changed to: “*IEEE Guide for the Interpretation of Gases generated in Liquid-Immersed Load Tap Changers*”, with the objective to align with other DGA Guides, such as C57.104
 Motion to accept the new title as written: 1st motion Claude Beauchemin, 2nd motion Scott Reed.
 Poll to accept new title as written: For 23, Against 0, Abstained 6, No answer 11 ⇒ Motion passed.
 Amendment made Nov 17, at SCIF Meeting: S.Reed proposed to change “*Liquid-Immersed*” to “*Liquid-Type*”, as this will be the future wording for all Gas Guides.
 Motion to change the new title to “*IEEE Guide for the Interpretation of Gases generated in Liquid-Type Load Tap Changers*”: 1st motion Rainer Frotscher, 2nd motion Claude Beauchemin.
 Approved by unanimous consent ⇒ Motion passed.
 - b) Scope
 Changed to: “*This guide describes methods of evaluating dissolved gases in insulating liquids used with load tap changers (LTCs). General types of LTC mechanisms, breathing configurations, and electrical design will be included for evaluation criteria in determining when mechanical damage, deterioration or failure might have occurred.*”
 Motion to accept the new Scope as written 1st motion Ed teNyenhuis, 2nd motion Don Dorris.
 Poll to accept new scope as written: For 18, Against 0, Abstained 5, No answer 17 ⇒ Motion passed.
 - c) Purpose
 Changed to: “*The purpose of this guide is to provide non-invasive methods for evaluating the condition of an LTC.*”

Motion to accept new purpose as written: 1st motion Don Dorris, 2nd motion Christopher Whitten
Approved by unanimous consent ⇒ Motion passed.

- Chair then showed possible improvements of the Guide, such as adding limit values for major LTC classes, which would need to set up a database with LTC DGA data, or to receive parametrics from DGA data sets.
Further possible topics to be worked on are:
 - how to apply online-DGA
 - discuss suitability of AI methods which could also handle exceptional LTC types (J.Dukarm)
 - revise gas ratios, define typical ranges for ratios and give a graphical representation of these.
- Finally, Chair asked for volunteers for the new Working Group: Active members, Vice Chair and Secretary are needed.
Paul Boman volunteered to act as Secretary, Chair accepted and thanked.
- Having agreed on Title, Scope and Purpose, the Chair proposed the revision of the Guide C57.139 to the Insulating Fluid Subcommittee, to start the process for PAR approval.

Meeting adjourned.

Insulation Life Subcommittee

November 17, 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 November 17, 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 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 to be included within the subcommittee minutes. 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 reviewed guidelines for IEEE working group meetings reminding compliance with all applicable laws, including antitrust and competition laws.

The Chair displayed the copyright policy and advised the subcommittee that permission would be required from the authors or organizations for use of information.

The Chair discussed the membership requirements and recognized the following new members: Eric Doak, Samraghi Dutta Roy, Anthony Franchitti, Rainer Frotscher, Carlos Gaytan, Ismail Gunner, Andy Holden, Parminder Panesar, John Reagan, Jeff Schneider, Jonathan Sinclair, Kenneth Skinger, Mike Waldrop, Evanne Wang and Waldemar Ziomek.

The Chair stated that the following members had been changed to guest status due to lack of regular attendance: Juan Acosta, Derek Baranowski, Arup Chakraborty, Dieter Dohnal, Joseph Foldi, Rob Ghosh, Michael Lau, Ryan MacMullin, Phillip McClure, Kent Miller, Verena Pellon, Pugazhenthir (Pugal) Selvaraj and Kevin Sullivan. Subsequent to the meeting, Kent Miller was reinstated to member status as his attendance to the prior two virtual subcommittee meetings was confirmed.

The Chair recognized C. Clair Claiborne in memoriam for his active participation and contributions.

H.2 Project Status Reports. The Chair reported the status of each project as follows:

H.2.1 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.2.2 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.2.3 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.2.4 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.2.5 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.2.6 C57.165 IEEE Guide for Temperature Measurements for Liquid Immersed Transformers and Reactors

PAR expires December 31, 2021. The working group Chair is Mark Tostrud.

H.2.7 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.2.8 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. Kevin Biggie chairs a Task Force to consider Amendments to Annex B.

H.2.9 Task Force C57.12.90 Clause 11, Temperature Rise Tests – Dinesh Sankarakurup

The Task Force Chair is Dinesh Sankarakurup.

H.3 Secretary's Report

The attendance poll reported that 78 out of 119 members were present in the meeting along with 123 guests. A quorum had been achieved. For the Fall 2021 virtual meeting, only the poll roster was used. Participants requesting membership for the subcommittee were advised to request membership in the chat and to email the Chair, Vice-Chair or Secretary. Eleven guests requested membership. A 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. Since the Task Force for C57.12.00 Clause 5.11.1.4 had completed their work, item i. on the agenda had been stricken. Don Dorris made a motion to approve the agenda as shown and it was seconded by David Wallach. After hearing no objection from the attendees, the meeting agenda was approved. The Spring 2021 subcommittee meeting minutes had been provided to participants in advance of the meeting for review. Bruce Forsyth made a motion to approve the minutes. Marcos Ferreira seconded the motion. The Spring 2021 meeting minutes were approved after hearing no objection from the attendees.

H.4 Working Group (WG) and Task Force (TF) Reports:**H.4.1 Working group on C57.91 IEEE Guide for Loading Mineral-Oil-Immersed Transformers – David Wallach****Working Group PC57.91 Loading Guide Meeting Minutes**

November 16, 2021, 3:45 PM – 5:00 PM (CST)

Virtual Webex Meeting

- 1.** The Chair made the opening remarks and proposed a meeting agenda.
- 2. Call for Patents:** The chair asked if anyone was aware of any patents and there were none claimed.
- 3. Copyright Policy:** The IEEE copyright policy was reviewed.
- 4.** Quorum was established with 32 members present out of membership of 53, with 82 guests.
- 5.** Meeting agenda was approved by unanimous approval.
- 6.** Minutes of Spring 2021 meeting were approved by unanimous approval.
- 7.** Chair outlined the standard revision timeframe, indicating that a PAR extension is being requested until October 2023
- 8.** The Annex A Task Force met on 5 occasions since the Spring 2021 meeting.
- 9.** Oleg Roizman, the Chair of this task force presented the highlights of the work done by it:
 - A.** In annex A, corrections were made to the bubble inception temperature and indicated the need to coordinate with WG C57.162 Interpretation of Moisture Related Parameters.

- B. Definitions were proposed for terms: “transformer insulation life”, “hotspot”, “relative aging rate”, “standard remaining useful life (RUL)”, “percent loss of life” and “overload”.
 - C. Background of existing thermal model and loading formulas was provided, pointing out the existing mathematical errors on these and the previous reports on the inaccuracies of tested values versus calculated values.
 - D. Annex G will be converted from discrete form algebraic equations into continuous form differential algebraic equations. Mathematical proof of new formulas was shown.
 - E. It was proposed to have a host computer code as an open source in IEEE SA, open community powered platform.
 - F. New method predicts higher overload hot spot temperatures for loads of short duration, and similar results with steady state loading conditions.
- 10.** Zack Draper presented the open-source initiative within IEEE SA Open to create program for the thermal model. This platform is intended to bridge the gap between standards developers and other open technical communities to enable nimble and creative technical solutions.
- The objective is that anyone with an active IEEE account can join or create a project, open to other technical communities to enable nimble and creative technical solutions.
- It is proposed to submit a revised PAR amending scope and purpose to include development and provision of open-source code, agree to licensing considerations determined by the Open Source Committee and appoint responsible members in WG C57.91 and Standards Committee.
- 11.** Chair indicated that it is necessary to consult with IEEE SA personnel on how to use the open-source option before revising the PAR.
- 12.** The next Task Force meeting will be a Webex meeting on December 8, 2021. All presentations made today will be posted on the Transformers Committee web site.
- 13.** The meeting was adjourned at 5:00 PM CST.

Attendees requesting membership (attending 2 of the last 3 meetings):

Luiz Cheim	Approved
Huan Dinh	Approved
Zack Draper	Approved
Curtiss Frazier	Approved
Mario Locarno	Approved
Anatoliy Mudryk	Approved
Patrick Picher	Approved
Alvaro Portillo	Needs to attend one more meeting
Jason Varnell	Approved

Chair: David Wallach**Vice-Chair:** Javier Arteaga**Secretary:** Kumar Mani

Attendance

Role	First Name	Last Name	Affiliation
Guest	Kayland	Adams	SPX Transformer Solutions, Inc.
Guest	Elise	Arnold	SGB
Vice-Chair	Javier	Arteaga	Hitachi Energy
Guest	Donald	Ayers	Ayers Transformer Consulting
Guest	Suresh	Babanna	SPX Transformer Solutions, Inc.
Guest	Jared	Bates	Oncor Electric Delivery
Guest	Olle	Benzler	Megger
Guest	Mats	Bernesjo	Hitachi Energy
Guest	Kevin	Biggie	Weidmann Electrical Technology
Member	Wallace	Binder	WBBinder Consultant
Member	Daniel	Blaydon	Baltimore Gas & Electric
Guest	William	Boettger	Boettger Transformer Consulting LLC
Guest	Jeremiah	Bradshaw	Bureau of Reclamation
Member	David	Calitz	Siemens Energy
Guest	Thomas	Callsen	Weldy-Lamont Associates
Guest	Juan Alfredo	Carrizales	Prolec GE
Member	Juan	Castellanos	Prolec GE

Annex H

Role	First Name	Last Name	Affiliation
Guest	Luiz	Cheim	Hitachi Energy
Member	Craig	Colopy	EATON Corporation
Guest	John	Crouse	Roswell Alliance
Guest	John	Crouse	Roswell Alliance
Guest	Juan Carlos	Cruz Valdes	Prolec GE
Guest	Eric	Davis	Burns & McDonnell
Guest	Valery	Davydov	Mr. Valery Davydov
Guest	Huan	Dinh	Hitachi Energy
Guest	Zachary	Draper	Delta-X Research Inc.
Guest	Thomas	Eagle	SPX Transformer Solutions, Inc.
Guest	William	Elliott	Prolec GE
Guest	Marco	Espindola	Hitachi Energy
Guest	Norman	Field	Stantec
Member	Bruce	Forsyth	Bruce Forsyth and Associates PLLC
Guest	Anthony	Franchitti	PECO Energy Company
Guest	Raymond	Frazier	Ameren
Member	George	Frimpong	Hitachi Energy
Member	Eduardo	Garcia Wild	Siemens Energy
Guest	Rob	Ghosh	General Electric
Guest	Bill	Griesacker	Duquesne Light Co.
Guest	Thomas	Hartmann	Pepco Holdings Inc.
Member	Roger	Hayes	General Electric
Member	Saramma	Hoffman	PPL Electric Utilities
Guest	Ryan	Hogg	Bureau of Reclamation
Guest	Philip	Hopkinson	HVOLT Inc.
Member	John	John	Virginia Transformer Corp.
Guest	Toby	Johnson	Hunt Electric
Guest	Stephen	Jordan	Tennessee Valley Authority
Guest	Laszlo	Kadar	Hatch
Guest	Kurt	Kaineder	Siemens Energy
Guest	Gael	Kennedy	GR Kennedy & Associates LLC
Member	Sheldon	Kennedy	Niagara Transformer
Member	Stacey	Kessler	TC Energy
Guest	Gary	King	Howard Industries
Member	Egon	Kirchenmayer	Siemens Energy
Guest	Dmitriy	Klempner	Southern California Edison
Guest	Anton	Koshel	Delta Star Inc.
Guest	Krzysztof	Kulasek	Hitachi Energy
Member	John	Lackey	PowerNex Associates Inc.
Guest	Donald	Lamontagne	Arizona Public Service Co.

Role	First Name	Last Name	Affiliation
Member	Aleksandr	Levin	Weidmann Electrical Technology
Member	Weijun	Li	Braintree Electric Light Dept.
Guest	Mario	Locarno	Doble Engineering Co.
Guest	Tiffany	Lucas, P.E.	SPX Transformer Solutions, Inc.
Guest	Balakrishnan	Mani	Virginia Transformer Corp.
Guest	Richard	Marek	Retired
Member	Terence	Martin	MarVen
Member	Lee	Matthews	Howard Industries
Guest	Vinay	Mehrotra	SPX Transformer Solutions, Inc.
Guest	Timothy	Menter	Lincoln Electric System
Guest	Aaron	Meyers	EATON Corporation
Guest	Kent	Miller	T&R Electric Supply Co.
Guest	Rashed	Minhaz	Transformer Consulting Services Inc.
Guest	Paul	Morakinyo	PSEG
Member	Emilio	Morales-Cruz	Qualitrol Company LLC
Guest	Anatoliy	Mudryk	Camlin Power
Guest	Ryan	Musgrove	Oklahoma Gas & Electric
Guest	Rodrigo	Ocon	Industrias IEM
Guest	Anastasia	O'Malley	Consolidated Edison Co. of NY
Guest	Vinay	Patel	Consolidated Edison Co. of NY
Guest	Pranav	Pattabi	METSCO Energy Solutions Inc.
Guest	Patrick	Picher	Hydro-Quebec IREQ
Guest	Patrick	Picher	Hydro-Quebec IREQ
Guest	Chris	Pitts	Howard Industries
Guest	John	Poelma	NRG Energy
Guest	Adam	Polson	Arizona Public Service Co.
Guest	Alvaro	Portillo	Ing. Alvaro Portillo
Guest	Ion	Radu	Hitachi Energy
Guest	Jeffrey	Ray	JLR Consulting, Inc.
Member	Timothy	Raymond	Electric Power Research Institute (EPRI)
Guest	John	Reagan	RWE Renewables
Guest	Jonathan	Reimer	FortisBC
Guest	Afshin	Rezaei-Zare	York University
Guest	Tim	Rocque	SPX Transformer Solutions, Inc.
Member	Oleg	Roizman	IntellPower Pty Ltd
Member	Mickel	Saad	Hitachi Energy
Guest	Hakan	Sahin	Virginia/Georgia Transformer
Guest	Dinesh	Sankarakurup	Duke Energy
Member	Amitabh	Sarkar	Virginia Transformer Corp.
Guest	Anil	Sawant	Virginia Transformer Corp.

Role	First Name	Last Name	Affiliation
Guest	Markus	Schiessl	SGB
Guest	Eric	Schleismann	Southern Company Services
Member	Samuel	Sharpless	Rimkus Consulting Group
Guest	Sanjib	Som	Pennsylvania Transformer
Member	Brad	Staley	Salt River Project
Guest	Kyle	Stechschulte	American Electric Power
Guest	Marc	Taylor	JFE Shoji Power Canada Inc.
Guest	Reza	Torabi Goodarzi	SMIT Transformatoren B.V.
Guest	Alan	Traut	Howard Industries
Guest	Jason	Varnell	Doble Engineering Co.
Guest	Jos	Veens	SMIT Transformatoren B.V.
Guest	Kannan	Veeran	Georgia Transformer
Member	Rogério	Verdolin	Verdolin Solutions Inc.
Guest	Yves	Vermette	Electro Composites ULC
Member	Sukhdev	Walia	New Energy Power Co.
Chair	David	Wallach	Duke Energy
Guest	Shelby	Walters	Howard Industries
Guest	Michael	Warntjes	American Transmission Co.
Guest	Alan	Washburn	Burns & McDonnell
Member	Bruce	Webb	Knoxville Utilities Board
Member	Roger	Wicks	DuPont
Member	Jeffrey	Wright	Duquesne Light Co.
Guest	Malia	Zaman	IEEE
Guest	Shibao	Zhang	PCORE Electric
Member	Peter	Zhao	Hydro One

H.4.2 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

Fall 2021 “Virtual” Meeting – 16 November 2021, 10:50 a.m. – 12:05 p.m. CST, Webex
 Chair: Roger Wicks, Secretary: Kevin Biggie

The Chair called the meeting to order at 10:50 p.m. and welcomed attendees. The meeting agenda was reviewed. A quorum poll was then taken indicating 27 members were present (of 56), thus a quorum was not initially achieved (28 needed). Essential Patent Claims information and copyright information were reviewed, and no comments were noted.

Shortly later, it was noticed that attendance had risen, thus another quorum poll was organized. This time, the poll indicated 32 members present (of 56), thus a quorum was achieved. With a quorum, the Fall 2021 meeting agenda and the Spring 2021 meeting minutes were approved unanimously (motion: Rob Ghosh, second: Mickel Saad).

As full attendance details were provided after the meeting by the Encore virtual meeting service, attendance was subsequently confirmed to be a total of 111 attendees, with 40 members and 71 guests present. As no guests requested membership, the total number of members remains 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 a Chair's introduction on the status, recent activities and next steps with the document. The Chair then reviewed a summary of the updates made and included in Draft 2 distributed on 3 Sept. 2021 to the WG. Only comment was Kevin Biggie clarifying that Annex D covers a proposed method for aging of enameled wires specifically in liquids.

The Chair continued with a review of additional information proposed to be added to Draft 2 regarding a thermally upgraded paper qualification test. This information was proposed as a new Annex H, and was included in an updated Draft (2.1) distributed with the Fall 2021 meeting agenda on 8 Nov. 2021. The qualification test proposal is due to the recent work being done to update the definition of TU paper in both IEEE C57.12.80 and in IEC, which includes a qualification test.

As supporting information to the proposed Annex H, the proposed updated definition of TU paper discussed both by IEEE C57.12.80 and within IEC was shared by the Chair for reference. Jim Graham commented that the version shown by Roger had a couple small differences from that discussed by IEEE C57.12.80. Bruce Forsyth added that although the 12.80 WG may have approved an update, that the document itself has yet to be updated allowing potential further updates to the TU paper definition. Alan Sbravati commented that perhaps Degree of Polymerization (DP) should be considered rather than 50% tensile strength retention for the qualification test, with a concern for potential low initial tensile values. Several return comments were made: the 50% tensile at 65k hours is only a qualification test and not a life test, it is a carryover from the current definition in C57.12.80 and has been used as a qualification criteria for decades, the major change in the new definition is the addition of retained nitrogen content, low tensile is prevented by new additional minimum tensile requirements in current Draft 2 Table 1, there is no short duration qualification test level established for DP (200 DP can't be used as it is a long term life aging value, not short qualification test level), and DP is not an application characteristic, while tensile strength is. Phil Hopkinson and Oleg Roizman also spoke in favor of DP as a parameter for testing. Roger concluded that in case the TU paper definition proposed for C57.12.80 changes, that the proposed TU paper qualification test (proposed Annex H) for C57.100 may have to change during the ballot process.

The Chair then reviewed the results of surveys conducted on the proposed initial moisture contents of solids and liquids in the aging test procedure in the latest Draft 2. In summary, the surveys indicated that both labs and OEMs/end users agree with the proposed levels. Valery Davydov commented additionally to include the statement that the starting liquid relative humidity levels indicated are measured at room temperature, as RH is affected by temperature. The Chair agreed to add this to the draft before balloting. Alan Sbravati then presented a summary of a proposed additional annex on an alternative data analysis method considering translation of test results to unit life. Comments from Sasha Levin that perhaps this could be considered for IEEE 1276 Annex B, and also it may be better for internal lab comparison of different tested parameters, rather than comparison of tests from different labs, which may not be recommended. Roger commented that it was suggested for Alan to update the proposed data analysis

annex with a generic example, rather than data specific to natural ester aging, and to clarify the way the analysis is conducted further. Alan offered to resubmit an updated annex with a generic example.

As time ran out for the meeting, the Chair concluded that the proposed Draft 2, the proposed addition of a TU paper qualification test annex, and the proposed addition of an alternative data analysis method will be brought up for a vote before the Spring 2022 meeting in order to progress towards a WG vote on a final draft to go to IEEE-SA ballot.

The virtual meeting was adjourned at 12:05 p.m. Next planned meeting is in the Spring of 2022.

Respectfully submitted,

Roger Wicks
Chair

Kevin Biggie
Secretary

Attendance WG C57.100 Fall 2021 Virtual Meeting:

Members (40)

Robert	Ballard	DuPont
Gilles	Bargone	FISO Technologies Inc.
Kevin	Biggie	Weidmann Electrical Technology
Erich	Buchgeher	Siemens Energy
Juan	Castellanos	Prolec GE
Samragani	Dutta Roy	Siemens Energy
Bruce	Forsyth	Bruce Forsyth and Associates LLC
George	Frimpong	Hitachi ABB Power Grids
Rob	Ghosh	GE
Attila	Gyore	M&I Materials Ltd
Saramma	Hoffman	PPL Electric Utilities
Kurt	Kaineder	Siemens Energy
Jon	Karas	SDMyers, LLC.
Sheldon	Kennedy	Niagara Transformer
Stacey	Kessler	Basin Electric Power Cooperative
Moonhee	Lee	Hammond Power Solutions
Aleksandr	Levin	Weidmann Electrical Technology
Jinesh	Malde	M&I Materials Inc.
Darrell	Mangubat	Siemens Power Operations Inc.
Richard	Marek	Retired
Terence	Martin	MarVen
Rogelio	Martinez	Georgia Transformer
Emilio	Morales-Cruz	Qualitrol Company LLC
Ashmita	Niroula	Ergon, Inc.
Kevin	Rapp	Cargill, Inc.
Jimmy	Rasco	Rasco Consulting LLC
Timothy	Raymond	Electric Power Research Institute (EPRI)
Afshin	Rezaei-Zare	York University

Mickel	Saad	Hitachi ABB Power Grids
Amitabh	Sarkar	Virginia Transformer Corp.
Alan	Sbravati	Cargill, Inc.
Steven	Schappell	SPX Transformer Solutions, Inc.
Samuel	Sharpless	Rimkus Consulting Group
David	Stankes	3M
Paul	Su	FM Global
Radoslaw	Szewczyk	Specialty Products Poland Sp. z o.o.
Mark	Tostrud	Dynamic Ratings, Inc.
Pragnesh	Vyas	Sunbelt-Solomon Solutions
Daniel	Weyer	Nebraska Public Power District
Roger	Wicks	DuPont

Guests (71)

Juan	Acosta	Ergon, Inc.
Rehan	Ali	Siemens Energy
Greg	Ante	Southern California Edison
Edmundo	Arevalo	BPA
Javier	Arteaga	Hitachi ABB Power Grids
Suresh	Babanna	SPX Transformer Solutions, Inc.
Jared	Bates	Oncor Electric Delivery
Mats	Bernesjo	Hitachi ABB Power Grids
William	Boettger	Boettger Transformer Consulting LLC
Jeremiah	Bradshaw	Bureau of Reclamation
Sudip	Chanda	Virginia Transformer
Valery	Davydov	Mr. Valery Davydov
Scott	Digby	Duke Energy
Huan	Dinh	Hitachi Energy
Zachary	Draper	Delta-X Research Inc.
Marco	Espindola	Hitachi ABB Power Grids
Thomas	Falkenburger	Coil Innovation USA, Inc.
Michael	Franchek	Retired
Rainer	Frotscher	Maschinenfabrik Reinhausen
Eduardo	García Wild	Siemens Energy
Orlando	Giraldo	H-J Family of Companies
Michael	Gonzales	Southern California Edison
James	Graham	Weidmann Electrical Technology
Thomas	Hartmann	Pepco Holdings Inc.
Giovanni	Hernandez	Virginia Transformer Corp.
Ronald	Hernandez	Doble Engineering Co.
Philip	Hopkinson	HVOLT Inc.
Paul	Jarman	University of Manchester
Nicholas	Jensen	Delta Star Inc.
László	Kádár	Hatch
Nathan	Katz	PacifiCorp

Gael	Kennedy	GR Kennedy & Associates LLC
Zan	Kiparizoski	Howard Industries
Dmitriy	Klempner	Southern California Edison
Donald	Lamontagne	Arizona Public Service Co.
Balakrishnan	Mani	Virginia Transformer Corp.
Vinay	Mehrotra	SPX Transformer Solutions, Inc.
Timothy	Menter	Lincoln Electric System
Rashed	Minhaz	Transformer Consulting Services Inc.
Anatoliy	Mudryk	Camlin Power
Martin	Munoz Molina	Orto de Mexico
Rodrigo	Ocon	Industrias IEM
Anastasia	O'Malley	Consolidated Edison Co. of NY
Dwight	Parkinson	Eaton Corp
Pranav	Pattabi	METSCO Energy Solutions
Chris	Pitts	Howard Industries
Klaus	Pointner	Trench Austria GmbH
Adam	Polson	Arizona Public Service Co.
Alvaro	Portillo	Ing. Alvaro Portillo
John	Reagan	Oncor Electric Delivery
Tim	Rocque	SPX Transformer Solutions, Inc.
Josue	Rodriguez	Prolec GE
Oleg	Roizman	IntellPower Pty Ltd
Albert	Sanchez	Knoxville Utilities Board
Anil	Sawant	Virginia Transformer Corp.
Markus	Schiessl	SGB
Sanjib	Som	Pennsylvania Transformer
Brad	Staley	Salt River Project
David	Sundin	Engineered Fluids, LLC
Marc	Taylor	JFE Shoji Canada
Reza	Torabi Goodarzi	Royal SMIT Transformer
Alan	Traut	Howard Industries
Rogelio	Verdolin	Verdolin Solutions Inc.
Shelby	Walters	Howard Industries
Michael	Warntjes	American Transmission Co.
Alan	Washburn	Burns & McDonnell
Bruce	Webb	Knoxville Utilities Board
Helena	Wilhelm	Vegoor Tecnologia Aplicada
Trenton	Williams	Advanced Power Technologies
Malia	Zaman	IEEE
Anand	Zanwar	Siemens Energy

H.4.3 C57.154 IEEE Standard for Liquid Immersed Transformers Designed to Operate at Temperatures Above Conventional Limits Using High-Temperature Insulation Systems – Richard Marek

This working group did not meet during the Fall 2021 Virtual Meeting. The Chair, Richard Marek provided a status update.

- No meeting was held since the document is in ballot
- 5 meetings were conducted in total
- PAR expiration date: 31 December 2022
- Invitation of ballot started on September 16, 2021 and closed on October 16, 2021
- The Ballot opened on October 19 and closes on November 18, 2021
- Current ballot status as of the morning of November 17:
 - Balloting ongoing on Draft 7 of the document
 - Ballot group members: 128
 - Approval rate: 98%
 - Disapprovals: 1
 - Total comments: 25
 - Return rate: 74% (75% required)

Subsequent to the virtual meeting, the Ballot closed on November 18:

- Ballot Group Members: 128
- Return Ballots: 111 (86%) - Minimum return rate must be 75%
- Abstentions: 4 (3%)
- Approval rate: 97% - Minimum approval rate must be at least 75%
- 104 approved and 3 disapproved with MBS comments
- 64 comments have been received
- Forming a balloting resolution group, which will be led by Kevin Biggie

Chair: Richard Marek Vice-Chair: Anastasia O'Malley Secretary: Ewald Schweiger

H.4.4 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

This working group did not meet during the Fall 2021 Virtual Meeting. The Secretary, Stephanie Denzer provided a status update.

- The PAR expires on December 31, 2022
- The document is in the final editing stages in preparation to go out for the balloting process

Chair: Tom Prevost Vice-Chair: Valery Davydov Secretary: Stephanie Denzer

**H.4.5 Working group on C57.165 IEEE Guide for Temperature Measurements for
Liquid Immersed Transformers and Reactors – Mark Tostrud**

Unapproved Meeting Minutes

**PC57.165 WG Guide for Temperature Measurements for Liquid
Immersed Transformers and Reactors**

Minutes from Fall 2021 Virtual Meeting

Officers

Chair – Mark Tostrud

Vice Chair/Secretary – Zan Kiparizoski

1. Meeting Date and Time: 11/16/2021 at 9:25-10:40am CST

Meeting started at 9:25am

2. Call for essential patents

The patent slides were shared 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 shared on screen and a request for any known copyright issues was made. One member has previously submitted copyright document for his work.

3. Chairs remarks

Proposed revision of the document does not have a purpose statement as a part of the document. Working group members had voted to add a purpose statement several meetings ago to help clarify the reason for the document when we were discussing what content should be added. Adding or changing the purpose statement will require PAR revision. Since the document is in its final stages, add It is not required to have purpose statement in the document. Since the document is in its final stages, adding now doesn't make sense. Members agreed with this position during the meeting.

4. Attendance

There were 49 attendees in the meeting

9 members

26 guest

3 guests requested membership

14 attendees did not identify as a member/guest

Quorum check

Quorum was not achieved

The first poll showed 9 of 27 members were present

The second poll was performed about 10 minutes into the meeting, 10 of 27 members were present for the second poll.

The third poll was performed about 1 hour into the meeting, 9 of 27 members were present for the third poll.

6. Approval of the agenda and minutes

Due to lack of quorum, meeting agenda and the minutes from the previous meeting were not approved. Minutes of the Spring meeting will be sent via e-mail to all participants for their approval

7. Old Business

Chair presented changes in the latest revision of the guide:

Normative references have been updated

Portions of section 4.7 moved in section 4.2

Section 4.1. – Ambient Temperature Measurement

Fiber optic temperature sensor have been added to the list of instruments to measure ambient temperature

Section 4.2. – Liquid Temperature Measurement

Added information related to OLTC liquid temperature measurements

Changes in 4.2.3.1, additional information about mixing sensor types, and main tank/OLTC temperature differential measurements.

Section 4.2.3.3., clarifications related to the oil temperature measurement in the oil ducts have been added.

Section 4.5 – Tank wall Temperature Measurements:

Changes in 4.5.2 Location of Sensors

Annex A - Types of Temperature Sensors

Review of several minor changes

Annex B - Types of Winding Temperature Thermometers

Review of several minor changes

Section 3. Definitions

Juan Catellanos proposed revision to section 3. Definitions, to add definitions for various acronyms. Oleg Rozman accepted the task.

8. New Business

The chair proposed to:

Proceed without purpose statement in the guide.

Send e-mail to the group and request acceptance of all the changes in the present draft of the guide and in a same time request permission to proceed to do a straw ballot.

Schedule virtual meeting to discuss the straw ballot.

9. The meeting adjourned at 10:40

10. Minutes

The minutes were recorded by Zan Kiparizoski – Secretary and reviewed by Mark Tostrud – Chair

WG PC57.165 – Participation List, Virtual Fall 2021 Meeting			
Member	Gilles	Bargone	FISO Technologies Inc.
Member	Juan	Castellanos	Prolec GE
Member	Hakim	Dulac	Qualitrol Company LLC
Member	Zan	Kiparizoski	Howard Industries
Member	Martin	Munoz Molina	Orto de Mexico
Member	Ryan	Musgrove	Oklahoma Gas & Electric
Member	Samuel	Sharpless	Rimkus Consulting Group
Member	Mark	Tostrud	Dynamic Ratings, Inc.
Member	Trenton	Williams	Advanced Power Technologies
Guest	Kayland	Adams	SPX Transformer Solutions, Inc.
Guest	Rehan	Ali	Siemens Energy
Guest	Edmundo	Arevalo	Bonneville Power Administration
Guest	Jeff	Benach	Megger
Guest	William	Boettger	Boettger Transformer Consulting LLC
Guest	Randy	Brannen	Southern Company Services
Guest	Zachary	Draper	Delta-X Research Inc.
Guest	Edmund	Feloni	CEG Forensics LLC
Guest	Roger	Fenton	Fenton Solutions
Guest	James	Gardner	SPX Transformer Solutions, Inc.
Guest	Orlando	Giraldo	H-J Family of Companies
Guest	Thomas	Hartmann	Pepco Holdings Inc.
Guest	Gary	Hoffman	Advanced Power Technologies
Guest	Bates	Jared	
Guest	Laszlo	Kadar	Hatch
Guest	Gael	Kennedy	GR Kennedy & Associates LLC
Guest	Dmitriy	Klempner	Southern California Edison
Guest	Donald	Lamontagne	Arizona Public Service Co.
Guest	Balakrishnan	Mani	Virginia Transformer Corp.
Guest	Lee	Matthews	Howard Industries
Guest	Zachary	Millard	Great River Energy

Guest	Manoj Kumar	Mishra	ASAssoft (Canada) Inc
Guest	Rodrigo	Ocon	Industrias IEM
Guest	Anastasia	O'Malley	Consolidated Edison Co. of NY
Guest	Matthew	Pinard	Weidmann Electrical Technology
Guest	Alvaro	Portillo	Ing. Alvaro Portillo
Guest	Homero	Portillo	Advanced Power Technologies
Guest	Jeffrey	Ray	JLR Consulting, Inc.
Guest	Jonathan	Reimer	FortisBC
Guest	Oleg	Roizman	IntellPower Pty Ltd
Guest	Albert	Sanchez	Knoxville Utilities Board
Guest	Stefan	Schindler	Maschinenfabrik Reinhausen
Guest	Adrian	Silgado	IFD Corporation
Guest	Mauricio	Soto	Hitachi Energy
Guest	Brad	Staley	Salt River Project
Guest	Katrina	Swanson McLeod	Southern Nuclear
Guest	Jos	Veens	SMIT Transformatoren B.V.
Guest	Rogério	Verdolin	Verdolin Solutions Inc.
Guest	Hugh	Waldrop	Memphis Light, Gas & Water
Guest	Anand	Zanwar	Siemens Energy

H.4.6 Working group on C57.169 Maximum Winding Temperature Rise in Liquid-Filled Transformers (PC57.169 replacing IEEE 1538) – Scott Digby

This working group did not meet during the Fall 2021 Virtual Meeting due to the status of the document. The Chair, Scott Digby provided a status update.

- The document is ready to go to sponsor ballot
- The Chair had solicited a vote of the working group via email to recommend the document move to sponsor ballot
- 23 of the 36 working group members responded, achieving a quorum, and voted unanimously in favor of moving to sponsor ballot
- The working group for this document approved recommending to the subcommittee that the current draft of the document be sent for sponsor ballot
- The PAR expires December 31, 2023

Chair: Scott Digby Secretary: Cihangir John Sen

H.4.7 1276 Guide for the Application of High Temperature Insulation Materials in Liquid-Immersed Power Transformers

This document is valid until December 31, 2030. The former working group Chair is Roger Wicks. Kevin Biggie chairs a related Task Force that was formed to consider an amendment of IEEE 1276 Annex B and develop a corresponding PAR if merited.

The task force met virtually on September 16 and reviewed proposed changes that could be addressed if an amendment was opened up for IEEE 1276 Annex B. The task force also met on November 15 from 12:55 – 2:10 CST. The task force completed its work and voted to recommend opening a PAR to Annex B of 1276.

On behalf of the task force, Kevin Biggie made a motion to authorize a PAR to amend IEEE 1276 Annexes B and D, with the following amendment title: “Updates to Annex B and corresponding references in Annex D,” and the following project scope: “The amendment is adding updated and new insulation system aging examples and other additional related information to Annex B, and corresponding references in Annex D.”

The motion was seconded by Bruce Forsyth. There was no discussion or opposition to the motion. The motion passed.

H.4.8 Task Force C57.12.90 Clause 11, Temperature Rise Tests – Dinesh Sankarakurup

TF C57.12.90 Continuous Revision to Test Code – Clause 11 Temperature Rise Tests

Virtual Meeting – November 16, 2021 at 12:55pm CST

Chair: Dinesh Sankarakurup
Vice Chair: Ajith Varghese
Secretary: John Reagan

Attendance

45 Total Attendees
19 Members

Discussion

1. No quorum was reached so no Approvals of Agenda and Previous Meeting Minutes were possible.
2. No essential patent claims or copyright violations were noted.
3. Old Business - Jason Varnell’s comment on the use of “Ultimate Temperature” in Clause 11.3.2 and a need to clarify what Ultimate means.
 - a. Dinesh suggested the use of “Stabilize” instead of the use of “Ultimate” and “Final”.
 - b. A survey will be used to get input from TF.
4. Second Quorum vote was taken but was still not met.
5. Jason had also asked to clarify that the final temperature is not to be Averaged.
 - a. Discussion about adding “The stabilized liquid temperature rise determined at the end of the total loss run shall not be averaged over time”.
 - b. Joe brought up we typically say what we should do and not what we shouldn’t do.
 - c. Decision was to use a survey to determine if this addition is actually needed.
6. Jason’s 2nd comment: Subclauses 11.4.1 and 11.4.2 do not provide indication for which exponent to use for K or L insulating fluids associated with the cooling class designation per C57.12.00-2015 Subclause 5.1 (KNAN or KNAF).
 - a. There was discussion on how manufacturers have been handling different liquids, but nobody present had data for m and n exponents to know what a realistic value would be.

- b. A survey will be sent out to ask for experience with this from the Insulation Subcommittee. If there is enough information, the suggestion is to add information for the K and L type liquids. If there is no need to add specific information, the suggestion is to update C57.12.90 to be more general when referring to the cooling type.
7. New Business - Bertrand Poulin had new business regarding C57.119-2018, but he was not present. TF wanted him present to clarify what he was proposing. This will be added to the agenda for the next meeting.
8. New Business - Steve Antosz brought up issue with Clause 11.4.3, Testing above 1000m. He brought up that the standard does not address if the testing is occurring at over 1000m.
 - a. Steve will write up his proposal and send to Dinesh.
9. Steve Antosz brought up issue with Subclause 11.1.2.1 and 11.1.2.2, “transformer shall be tested with the combination of connections and taps that give the highest average winding temperature rise.”. This works for two-winding transformers, but for an autotransformer with a loaded tertiary, there may be cases of allowable loading that produce higher total losses.
 - a. Steve is raising the issue and is looking for input from others.
 - b. Hakan volunteered to provide information.
 - c. TF agreed this was an issue and asked for volunteers with experience with this issue to get together to discuss/collect data.
 - i. Steve Antosz
 - ii. Hakan Sahin
 - iii. Anthony Franchetti
 - iv. Ajith Varghese
 - v. Dinesh Sankarakurup
 - vi. Polo Rodriguez
10. Ajith had more new business, but time was up.
11. Meeting was adjourned on time.

Attendance Roster:

COUNT	LAST	FIRST	MEMBERSHIP	AFFILIATION
1	Antosz	Steve	Request	Stephen Antosz & Associates, Inc
2	Baciu	Daniela Ember	Guest	Hydro-Quebec IREQ
3	Bargone	Gilles	Member	FISO Technologies Inc.
4	Bedoya	Duvier	Guest	Hitachi Energy
5	Boettger	William	Member	Boettger Transformer Consulting LLC
6	Brzoznowski	Steve	Guest	Bonneville Power Administration
7	Buchgeher	Erich	Guest	Siemens Energy
8	Castellanos	Juan	Member	Prolec GE
9	Chorzepa	Jaroslav	Guest	ABB Inc.
10	Digby	Scott H	Guest	Duke Energy
11	Eagle	Tommy	Member	SPX Transformer Solutions, Inc.
12	Forsyth	Bruce	Member	Bruce Forsyth and Associates PLLC
13	Franchitti	Anthony	Member	PECO Energy Company
14	Frazier	Curtiss	Guest	Ameren
15	Hachichi	Said	Member	Hydro-Quebec
16	Hartmann	Thomas	Guest	Pepco Holdings Inc.

17	Hoffman	Saramma	Guest	PPL Electric Utilities
18	John	John K	Member	Virginia Transformer Corp.
19	Katz	Nathan	Guest	PacifiCorp
20	Kennedy	Sheldon	Member	Niagara Transformer
21	Kennedy	Gael	Guest	GR Kennedy & Associates LLC
22	Kessler	Stacey	Guest	TC Energy
23	King	Gary	Member	Howard Industries
24	Kumaria	Deepak	Guest	Applied Materials
25	Mudryk	Anatoliy	Guest	Camlin Power
26	Musgrove	Ryan	Member	Oklahoma Gas & Electric
27	Neild	Kris	Guest	Megger
28	O'Malley	Anastasia	Guest	Consolidated Edison Co. of NY
29	Powell	Paulette Payne	Guest	Retired
30	Prince	Jarrold	Member	ERMCO
31	Reagan	John	Secretary	RWE Renewables
32	Reimer	Jonathan	Guest	FortisBC
33	Rocque	Tim	Guest	SPX Transformer Solutions, Inc.
34	Dutta Roy	Samraghi	Request	Siemens Energy
35	Sahin	Hakan	Member	Virginia/Georgia Transformer
36	Sankarakurup	Dinesh	Chair	Duke Energy
37	Sauls	Rod	Guest	Southern Company Services
38	Schwartz	Dan	Guest	Quality Switch, Inc.
39	Sen	Cihangir John	Member	Duke Energy
40	Sharpless	Sam	Member	Rimkus Consulting Group
41	Steele	Hampton Allen	Guest	Tennessee Valley Authority
42	Swanson	Katrina	Guest	Southern Nuclear
43	Taylor	Marc	Member	JFE Shoji Power Canada Inc.
44	Varghese	Ajith	Vice-Chair	SPX Transformer Solutions, Inc.
45	Warntjes	Mike	Guest	American Transmission Co.

H.5 Old Business

As discussed under section H.4.7 The task force report for 1276 Guide for the Application of High Temperature Insulation Materials in Liquid Immersed Power Transformers, the Task Force for IEEE 1276 Annex B made a motion to authorize a PAR to amend IEEE 1276 Annexes B and D with the following amendment title: “Updates to Annex B and corresponding references in Annex D,” and the following project scope: “The amendment is adding updated and new insulation system aging examples and other additional related information to Annex B, and corresponding references in Annex D.” The motion was seconded and passed.

H.6 New Business

There were no new business items brought forward for discussion.

H.7 Adjournment

The meeting was adjourned at 9:09 AM CST.

Post-Meeting Notes

Following the fall meeting, the Subcommittee Chairman appointed Kevin Biggie of Weidmann Group as Working Group Chairman of the newly re-formed IEEE 1276 Working Group. Mr. Biggie subsequently appointed George Frimpong of Hitachi Energy as WG Vice-Chair and Evanne Wang of DuPont as WG Secretary.

Attendance Roster

Name	Membership	Affiliation
Kayland Adams	Guest	SPX Transformers
Raj Ahuja	Guest	
Nabi Almeida	Guest	Prolec GE USA
Stephen Antosz	Member	Stephen Antosz & Associates, Inc
Edmundo Arevalo	Guest	BPA
Elise Arnold	Guest	SGB
Javier Arteaga	Member	Hitachi Powergrids
Donald Ayers	Member	Ayers Transformer Consulting
Juan Alfredo Carrizales Baaldua	Guest	Prolec GE
Suresh Babanna	Member	SPX Transformers
(Robert) Casey Ballard	Member	DuPont
Gilles Bargone	Member	FISO
Bates, Jared	Guest	Oncor Electric Delivery
Barry Beaster	Member	H-J
Claude Beauchemin	Member	TjH2b
Tammy Behrens	Guest	SPX
Kevin Biggie	Member	Weidmann Electrical Technology
Gene Blackburn	Guest	
Piotr Blaszczyk	Guest	Transformer Components
William Boettger	Member	Boettger Transformer Consulting LLC
Sanket Bolar	Guest	Megger
Alain (Dominique) Bolliger	Requesting	HV Technologies
Jeremiah Bradshaw	Guest	Bureau of Reclamation
Darren Brown	Guest	Howard Industries
David Calitz	Member	Siemens Energy
Sergio Hernandez Cano	Guest	Hammond Power Solutions
Kurt Carlson	Guest	
Edward Casserly	Member	Ergon Inc
Juan Castellanos	Member	Prolec GE
Antonio Ceballos	Requesting	Georgia Transformer

Arup Chakraborty	Requesting	Delta Star Inc.
Sudip Chanda	Requesting	Virginia Transformer
Muhammad Ali Masood Cheema	Requesting	Northern Transformer Corp.
Luiz Cheim	Member	Hitachi Energy
Solomon Chiang	Member	Gund Co.
Larry Christodoulou	Guest	Electric Power Services
Rhett Chrysler	Guest	ERMCO
Craig Colopy	Guest	Eaton Corp
Domenico corsi	Guest	Doble Engineering Co.
John Crouse	Guest	Roswell Alliance
Jorge Cruz	Member	PTI Transformers
Eric Davis	Guest	Burns & McDonald
Valery Davydov	Guest	Mr. Valery Davydov
Denzer, Stephanie	Requesting	Alliant Energy
Digby, Scott H	Member	Duke Energy
Larry Dix	Guest	Quality Switch
Don Dorris	Member	Nashville Electric Service
Hakim Dulac	Requesting	Qualitrol Corp
Samraghi Dutta Roy	Member	Siemens Energy
Tommy Eagle	Guest	SPX Transformer Solutions
Wayne Ellis	Guest	Memphis Gas, Light & Water
Evgenii Ermakov	Guest	Hitachi Energy
Marco Espindola	Guest	Hitachi Energy
Ed Feloni	Guest	CEG Forensics
Marcos Ferreira	Member	Bridge View Resources
Norman Field	Guest	Stantec
Joseph Foldi	Guest	
Bruce Forsyth	Member	Bruce Forsyth and Associates
Michael A. Franchek	Member	Retired
Anthony Franchitti	Member	PECO Energy Co.
Curtiss Raymond Frazier	Guest	Ameren
George Frimpong	Member	Hitachi Powergrids
Rainer Frotscher	Member	Reinhausen
Eduardo Garcia	Member	Siemens Energy
Carlos Gaytan	Member	Prolec GE
Orlando Giraldo	Guest	H-J Family of Co.
Shawn Gossett	Guest	Ameren
Jeff Gragert	Guest	Xcel Energy
Jim Graham	Guest	Weidmann Electrical Technology
Taylor Gray	Guest	PGE
Bill Griesacker	Member	Duquesne Light Co.
ISMAIL GUNER	Member	HydroQ
Attila Gyore	Member	M&I Materials Inc.

Ken Hampton	Guest	BGE
Thomas Hartmann	Member	Pepco Holdings Inc.
Roger Hayes	Member	GE
Giovanni Hernandez	Guest	VA Transformer
Thang Hochanh	Guest	Surplec
Gary Hoffman	Member	Advanced Power Technologies
Saramma Hoffman	Member	PPL Electric Utilities
Andy Holden	Member	Ergon
David Holland	Guest	Exxon Mobile
Philip Hopkinson	Requesting	HVOLT Inc.
Paul Jarman	Guest	Manchester Univ.
Nicholas Jensen	Guest	Delta Star
John K John	Member	Virginia Transformer
Toby Johnson	Guest	Hunt Electric
Steve Jordan	Member	TVA
László Kádár	Guest	Hatch
Kurt Kaineder	Member	Siemens Energy
Gael R Kennedy	Member	GR Kennedy & Associates
Sheldon Kennedy	Member	Niagara Transformer
Stacey Kessler	Member	TC Energy
Gary King	Member	Howard Industries
Zan Kiparizoski	Member	Howard Industries
Dmitriy Klempner	Guest	Southern California Edison
Axel Kraemer	Guest	Reinhausen
Michelle Kutzleb	Guest	TJH2b Analytical Services
John Lackey	Guest	PowerNex Associates Inc.
Don Lamontagne	Guest	Arizona Public Service
Andrew Larison	Guest	Hitachi Energy USA
Fernando Leal	Guest	
Moonhee Lee	Member	Hammond Power Solutions
Aleksandr Levin	Member	Weidmann Electrical Technology
Weijun Li	Member	Braintree Electric Light Dept.
Mario Locarno	Member	Doble Engineering Co.
Tiffany Lucas	Guest	Prolec GE- Waukesha
Alejandro Macias	Guest	Centerpoint Energy
Jinesh Malde	Member	M&I Materials Inc.
Balakrishnan Mani	Guest	Virginia Transformer
Richard Marek	Member	Retired
J.Dennis Marlow	Guest	DenMar TDS Transformers
Robert Mayer	Guest	Siemens Energy
Susan McNelly	Member	Xcel Energy
Vinay Mehrotra	Member	SPX Transformers
Tim Menter	Guest	Lincoln Electric System

Annex H

Aaron Meyers	Guest	Eaton Corp
Zach Millard	Guest	
Kent Miller (USER)	Member	T&R Electric Supply Co.
Ronnie Minhaz	Guest	Transformer Consulting Services Inc.
Manoj Mishra	Guest	ASAssoft Canada
Hali Moleski	Guest	SD Myers
Rhea Montpool	Guest	Schneider Electric
Emilio Morales-Cruz	Guest	Qualitrol Corp
David Murray	Member	TVA
Ryan Musgrove	Guest	Oklahoma Gas & Electric
Ali Naderian	Guest	
Kris Neild	Guest	Megger
Ashmita Niroula	Guest	Ergon
Jayme Nunes	Guest	NYNAS AB
Rodrigo Ocon	Guest	Industrias IEM
Anastasia O'Malley	Member	Consolidated Edison Co NY
Rajkumar Padmawar	Guest	ASAssoft Canada
Parminder Panesar	Member	VA Transformer
Dwight Parkinson	Member	Eaton Corp
Vinay Patel	Guest	Consolidated Edison Co NY
Rakesh Patel	Guest	Hitachi Energy
Harry Pepe	Guest	Doble Engineering Co.
Matt Pinard	Guest	Weidmann Electrical Technology
JOHN POELMA	Guest	NRG Energy
Klaus Pointner	Member	Trench Austria GmbH
Adam Polson	Guest	Arizona Public Service
Alvaro Portillo	Guest	Ing Alvaro Portillo
Homer Portillo	Guest	Advanced Power Technologies
Chris Powell	Guest	Intermountain Electronics
Jarrood Prince	Guest	ERMCO
John Prunte	Guest	SPX Transformer Solutions
Donnie Rackley	Guest	RESA Power
Jimmy M Rasco	Member	Rascoe Consulting LLC
Jeff Ray	Member	JLR Consulting Inc.
Raymond, Timothy	Member	EPRI
John Reagan	Member	RWE Renewables
Scott Reed	Member	MVA
Jonathan Reimer	Guest	Fortis BC
Tony Reiss	Guest	Custom Materials
Rob	Guest	
Tim Rocque	Guest	SPX Transformers
Josue Rodriguez	Requesting	Prolec GE
Oleg Roizman	Member	IntellPower

Mickel Saad	Member	Hitachi Energy
Hakan Sahin	Guest	Virginia & Georgia Transformer
Mahesh Sampat	Guest	
Albert Sanchez	Guest	Knoxville Utilities Board
Sankarakurup, Dinesh	Member	Duke Energy
Amitabh Sarkar	Member	Virginia Transformer
Rod Sauls	Guest	Southern Co.
Alan Sbravati	Member	Cargill
Markus Schiessl	Requesting	SGB
Stefan Schindler	Guest	Reinhausen
Jeff Schneider	Member	Power Partners
Dan Schwartz	Guest	Quality Switch
Ewald Schweiger	Member	Siemens Energy
Pugal Selvaraj	Guest	Virginia Transformer
Cihangir John Sen	Guest	Duke Energy
Devki Sharma	Guest	Entergy
Sam Sharpless	Member	Rimkus Consulting Group
Dr. Shertukde	Member	Hartford University
Avijit Shingari	Guest	Pepco Holdings Inc.
Jonathan Sinclair	Member	PPL Electric Utilities
Kenn Skinger	Member	Scituate Consulting
Chris Slattery	Guest	First Energy
Sanjib Som	Member	Pennsylvania Transformer
Mike Spurlock	Guest	Spurlock Engineering Services
Fabian "Durand" Stacy	Guest	Hitachi Energy
Brad Staley	Member	Salt River Project
Dave Stankes	Guest	3M
Kyle D Stechschulte	Guest	AEP
Hampton Allen Steele	Guest	TVA
Andy Steineman	Guest	Delta Star
Paul Su	Guest	FM Global
David Sundin	Requesting	Engineered Fluids Inc.
Babanna Suresh	Member	SPX Transformers
Charles Sweetser	Guest	Omicron Energy
Radek Szewczyk	Guest	DuPont
Troy Tanaka	Member	Burns & McDonald
Marc Taylor	Guest	JFE Shoji Power Canada Inc.
Ed teNyenhuis	Guest	Hitachi Energy
Reza Torabi	Guest	SGB-SMIT
Mark Tostrud	Member	Dynamic Ratings
Wilson Trantum	Guest	Siemens Energy
Alan Traut	Member	Howard Industries
Cole Van Dreel	Guest	American Transmission Co.

Alwyn Van der Walt	Member	ECI
Ajith Varghese	Member	SPX Waukesha
Jason Varnell	Member	Doble Engineering Co.
Rogerio Verdolin	Member	Verdolin Solutions Inc.
K.Vijayan	Guest	PTI Transformers
Dejan Vuković	Guest	Hitachi Energy
Pragnesh Vyas	Member	Sunbelt Solomon
Loren Wagenaar	Guest	
Sukhdev Walia	Member	New Energy Power LLC
Wallach, David	Member	Duke Energy
Mike Warntjes	Guest	American Transmission Co.
Alan Washburn	Guest	Burns & McDonald
Joe Watson	Guest	JD Watson & Assoc.
Bruce Webb	Guest	Knoxville Utilities Board
Zachery Weiss	Guest	WEG
Drew Welton	Member	Intelirent
Bill Whitehead	Member	H2scan Inc.
Roger Wicks	Member	DuPont
Trenton Williams	Guest	Advanced Power Technologies
Baitun Yang	Member	
Joshua Yun	Guest	Virginia Transformer
Malia Zaman	Guest	IEEE SA
Anand Zanwar	Guest	Siemens Energy
Peter Zhao	Member	Hydro One
Waldemar Ziomek	Member	PTI Transformers

Guests Requesting Membership

Dominique Bolliger
Antonio Ceballos
Arup Chakraborty
Sudip Chanda
Muhammad Ali Masood Cheema
Stephanie Denzer
Hakim Dulac
Phillip Hopkinson
Josue Rodriguez
Markus Schliessl
David Sundin

Respectfully submitted,

Anastasia O'Malley
Secretary, Insulation Life Subcommittee

Meeting Planning Subcommittee Minutes

Fall 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 to the Transformers Committee Secretary

Annex J Performance Characteristics Subcommittee (PCS)

November 17th, 2021, In the Cloud

UNAPPROVED MINUTES

Chair: Rogerio Verdolin

Vice Chair: Sanjib Som

Secretary: Kris Zibert

J.1 Introduction / Attendance

There were 81 of the 114 PCS members in attendance so quorum was achieved (71% in attendance). In addition, 90 guests were present at the meeting. The total attendance at the meeting was 171. Guests should contact the Vice Chair to request 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 Denver, Colorado, March 27-31, 2022.

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.

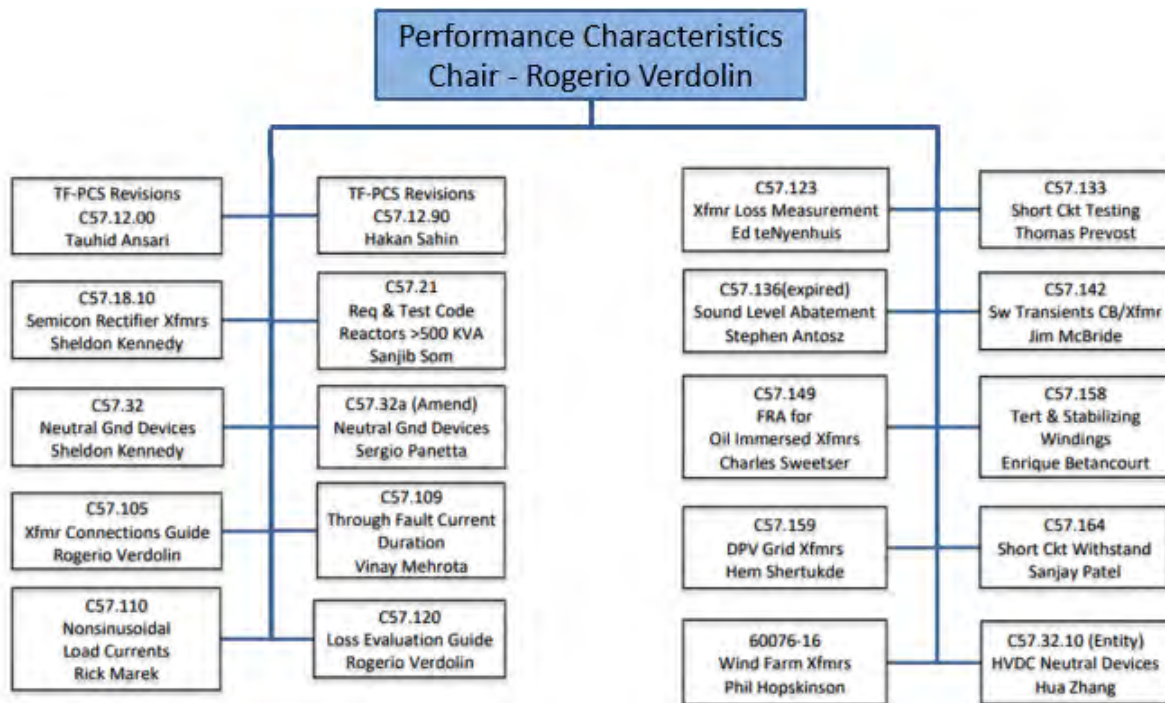
The Chair asked anyone with new business to submit in writing prior to the meeting.

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 – 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**
 - C57.142 Transient Guide (in Ballot Group Creation)
 - C57.164 Short Circuit Withstand Guide (at Rev Com)
- **2022 PAR's**
 - 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 – Xfmr 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 1 Member missed the past 2 meetings and have been moved to “Guest” status:

- Roger Fenton

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:

- | | |
|-------------------------|----------------------|
| ▪ Raj Ahuja | ▪ Rashed Minhaz |
| ▪ Jose Gamboa | ▪ Afshin Rezaei-Zare |
| ▪ Sergio Hernandez Cano | ▪ Kyle Stechschulte |

Welcome the New Members: We look forward to your contributions to the Subcommittee

Attendance / Membership – Quorum determination

- Current breakdown of the Subcommittee:
 - 114 Members
 - 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 Spring 2021 – April 28th, 2021 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 Test Code** **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**

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: November 15, 2021 10:25 AM

Vice-Chair: Poorvi Patel (EPRI)

Secretary: James Cross (Kinectrics)

80 total attendees, consisting of 17 members and 63 guests. The WG achieved a quorum. 17/32

Highlights:

- Consolidated failure mode considerations
- New Analysis Section for Radial Deformation
- Included 2 - Radial Deformation Cases
- Discussed frequency range identification
- Presented newly reformatted connection tables:

Table 1—Two winding transformers – 15 tests

Test type	Test #	3 ϕ	1 ϕ
HV Open Circuit (OC) All Other Terminals Floating	1	Phase A	Phase A
	2	Phase B	
	3	Phase C	
LV Open Circuit (OC) All Other Terminals Floating	4	Phase A	Phase A
	5	Phase B	
	6	Phase C	
Short Circuit (SC) Short [X1-X2-X3] ^a	7	Phase A	Phase A Short [X1-X2] ^a
	8	Phase B	
	9	Phase C	
Capacitive Inter-Winding All Other Terminals Floating	10	Phase A	H1-X1
	11	Phase B	
	12	Phase C	
Inductive Inter-Winding High (H) to Low (L) Ground (H- and X-) ^b	13	Phase A	Phase A Ground [H2, X2]
	14	Phase B	
	15	Phase C	

Table 1— SFRA test connection for even phase deviation between windings

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
YNyn	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-X1	X2-X3	X1-X3	X1-X2

Table 2— SFRA test connections for odd phase deviation between windings

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
Dyn	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

- Connection tables are completed
- Test order lists will be added for 2W, 3W, and Auto

2) TF on Audible Sound Revision to Test Code/C57.136 Guide for Audible Sound R. Girgis/S. Antosz

- The TF met on Monday.
 - 25 members attended, out of a total of 61 total attendance.
 - The TF has 44 members now.
- First technical item on the Agenda :
 - Overview of the items discussed in detail at previous TF meetings with the resolution to address them in more detail in the new Noise Guide PC57.136
 - Impact of temperature on core noise

- Impact of temperature on load noise
 - Impact of tap position on core noise
 - Impact of tap position on load noise
- Second technical item on the Agenda:
 - Overview of resolutions of comments received on ballots of the C57.12.00 and C57.12.90
 - Table C.1 of Annex C on No Load Sound levels was expanded to include sound levels of both Power & Distribution transformers
 - Add text in the Noise Guide explaining the relative levels of no load and load noise.
 - Requesting No-Load sound level measurements to be required to be made (and guaranteed) at the highest sound producing tap position combinations
 - This will require a change in C57.12.00 and therefore is planned to be discussed in a future TF meeting.
 - Requesting whether to add ambient sound pressure measurements arithmetically or logarithmically, to determine the average level.
 - Difference is <1 dB. Plan to be discussed and decided upon in a future TF meeting.
 - Requesting measuring load noise after the Heat-Run test
 - Already discussed in detail, impact is small, and is being discussed in Noise Guide.

3) WG on Noise Guide C57.136

S. Antosz

- WG held first meeting
- Chair presented background and status of the guide and an overview of the content of the guide.
- A solicitation of those in attendance was initiated to request membership. A total of 22 requests were received.
- Input to specific parts of the Guide was requested.
- The plan is to include these into the next draft of the Guide and send it back to the WG for comments and additional input.
- The updated draft of the Guide will be posted on the committee website in the C57.136 section under Performance Characteristics Subcommittee.

4) TF on PCS Continuous Revisions to C57.12.00

T. Ansari

- TF group met Nov 15, 14:20 hr with 40 out of 79 Members present.
- The Chair presented Copyright and Patents Disclosure documents from IEEE.
- Minutes from Spring 2021 Meeting were approved.
- Agenda Item discussed: Addition of transformer core information on Type C Nameplate.
 - Accepted to indicate Type of Core: “Shell” or “Core”.
 - Discussion not finished to define Specific type of construction: “D or Conventional”, for Shell type transformers, number of columns and how many of those wound, for “Core” type transformers.
- Meeting adjourned at 15:35 hr.

5) TF on PCS Continuous Revisions to Test Code C57.12.90

H. Sahin

- Meeting started at 9:25 am CST. Quorum was not achieved during the first poll. Meeting continued to share the information
- 30 minutes into the meeting, a second poll was conducted, and quorum was achieved with 37/69 members’ presence out of 79 total attendees
- Agenda and previous meeting minutes were officially approved

- Updated the TF that the revision to the “Ratio Test Methods” under section 7.3 was passed on to the PCS
- TF second revision survey results and comments for proposed changes to the “Ratio tests voltage and frequency” section 7.1.2 was reviewed. Members voted to pass the new version of the section to the PCS
- Meeting started at 9:25 am CST. Quorum was not achieved during the first poll. Meeting continued to share the information
- 30 minutes into the meeting, a second poll was conducted, and quorum was achieved with 37/69 members’ presence out of 79 total attendees
- Agenda and previous meeting minutes were officially approved
- Updated the TF that the revision to the “Ratio Test Methods” under section 7.3 was passed on to the PCS
- TF second revision survey results and comments for proposed changes to the “Ratio tests voltage and frequency” section 7.1.2 was reviewed. Members voted to pass the new version of the section to the PCS
- Discussion took place regarding surveying the recommendations of this TF to the PCS SC for approval.

6) WG on HV & EHV Breaker & Transformer Sw. Transients C57.142 J. McBride

- 58 total attendees, consisting of 25 members and 33 guests. The WG did not achieve a quorum. 25 / 56
- Agenda and Minutes were Approved via e-mail.
- 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>.
- Transformers WG and Switchgear Committee Task Force have unanimously approved Draft 9B which has now been submitted to MEC for review.
- The ballot group formation has been initiated and those who wish to join the ballot group should join before December 10th, 2021.
- We have received a PAR extension to complete the balloting process. PAR now expires on December 31st, 2023.
- Switchgear Committee has requested that we help to provide dielectric transient withstand information on transformers and reactors. There was some discussion on this topic and a small TF was formed to help draft a response. Any response will be reviewed and approved prior to sending.
- We reviewed the Mitigation Methods which have been presented and discussed in our WG meetings. There was an open discussion to organization of these items for presentation to the Dielectric Tests subcommittee. Several participants offered to assist in future virtual meeting to help draft a completed response to Dielectric Test Subcommittee task.
- New Business – Deepak Kumaria - Requested inclusion of instrument transformers in our mitigation studies. This topic was postponed due to lack of time remaining in today’s meeting.
- Next Meeting: Spring 2022 – Denver, CO on March 29th, 2022.
- The meeting was Adjourned at 3:40pm Central Time.

J.6 Unfinished (Old) Business

- **There was no old business.**

J.7 New Business

- **There was no new business.**

J.8 Adjournment

- The meeting adjourned at 3:21PM.

J.9 Minutes of Meetings of Working Group (WG) and Task Force (TF) Reports (all unapproved)

J.9.1 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: November 15, 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 70 total attendees, consisting of 18 members and 52 guests. A quorum was achieved.

AGENDA

1. Introduction and Member confirmation / Attendance poll
2. Meeting Guidelines and Patent information.
3. Review Agenda
4. Approval of Minutes from October 19, 2020 and April 26, 2021 Meetings (Virtual) Discussions
 - a. Update/Presentation – Analysis and Interpretation (New Radial Format)
 - i. Peter Werelius (Megger) - Lead
 - b. Connection Table Discussion – Presentation of new tables
 - i. Diego Robalino (Megger)
5. Old Business
6. New Business
7. 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 waited 5 minutes before triggering the attendance poll to allow people to sign into the meeting.

The membership list shows 32 WG members.

18 members were present at this meeting, so quorum was achieved.

The agendas and minutes were approved, both Fall 2020 and Spring 2021.

CS noted that there is a 1 year left on the PAR and so we need to get the draft prepared this year for balloting.

Discussions:

Revision tasks are wrapping up with the main focus on consolidated failure modes, connection tables, and analysis.

Latest work included:

1. Consolidated failure mode considerations

The consolidation is as follows:

- Radial “Hoop Buckling” Deformation of Winding

- Axial Winding Elongation “Telescoping”
- Overall- Bulk & Localized Movement
- Core Defects
- Winding Turn-to-Turn Short Circuit
- Winding Looseness due to Transportation
- Residual Magnetization
- 2. New Analysis Section for Radial Deformation
 - Introduced newly formatted Radial Winding deformation section. Several new edits were discussed. Two new figures added along with two new case studies.
 - Discussions focused around identifying frequency ranges associated with Radial Winding deformation. The WG will keep the original ranges.
- 3. Presented newly reformatted connection tables:
 - Connection tables are completed and presented by Diego Robalino
 - Test order lists will be added for 2W, 3W, and Auto
- Section leadership assignments for final wrap-up
 - Grounding – Wes Schrom
 - Connection – Diego Robalino
 - Analysis – Mario Locarno

List of meeting participants with membership status at the end of the meeting:

Ali Naderian	
Jonathan Reimer	
Rogério Verdolin	Member
Amitabh Sarkar	
Taylor Gray	
Sergio Hernandez Cano	
Sudip Chanda	
Fernando Leal	Member
Jeremiah Bradshaw	
Mark Perkins	
Drew Welton	
Suresh Babanna	
Eduardo Garcia	
Eric Davis	
Stacey Kessler	
Luiz Cheim	Member
Sanket Bolar	
Philip Miller	
George Frimpong	
Diego Robalino	Member
Alwyn VanderWalt	
vinay mehrotra	
Jeff Ray JLR Consulting	
Loren Wagenaar	
Rodrigo Ocon	
Jason Varnell	Member
Emilio Morales-Cruz	
Charles Sweetser	Member
Jonathan Sinclair	Member
Waldemar Ziomek	
Shibao Zhang	Member
Pranav Ketharam Pattabi	

Leopoldo Rodriguez	
Mario Locarno	Member
Rob Ghosh	
Zack Draper	
James Gardner	
James Cross	Member
Wes Schrom	Member
Dwight Parkinson	
Daniel Weyer	Member
Paul Boman	
Hakan Sahin	
arturo nunez	
Donnie Rackley	
Kenn Skinger	
David Murray	
Jim McBride	Member
Roger Hayes	
Rakesh Patel	Member
Balakrishnan Mani	
Marco Espindola	
Wayne Ellis	
Scott Reed	Member
Bill Whitehead	
Shawn Gossett	
Patrick Picher	Member
Arup Chakraborty	
Matthew Mcfadden	
Larry Christodoulou	
Gael R Kennedy	
Brady Nesvold	
Bertrand Poulin	
Ed teNyenhuis	
Chris Slattery	
Mickel Saad	Member
K.Vijayan	
Steve Jordan	
Peter Werelius	Member
Evgenii Ermakov	Member
Alexander Kraetge	
Paul Jarman	
Jos Veens	
Matthew Pinard	
Lorne Gara	

Respectfully submitted,

James Cross
Secretary
C57.149 WG

J.9.2 TF PCS Continuous Revisions to Test Code C57.12.90

Meeting was called to order at 9:25 AM CST, November 16, 2021.

1. Administrative

- a. IEEE Patent Policy and Call for Patents
 - i. No comments from group
- b. IEEE SA Copyright Policy
 - i. No comments from group
- c. Introduction of the new officers
 - i. Chair: Hakan Sahin
 - ii. Vice-Chair: -
 - iii. Secretary: Pugal. Selvaraj
- d. Update on membership and Quorum
 - i. First poll conducted at 9:30AM did not achieve quorum, second poll conducted at 11 AM, achieved quorum with 37/69 members' presence
- e. Approval of Agenda
 - i. No opposition to unanimous approval. APPROVED
- f. Approval of minutes from Fall 2020 and Sprint 2021 TF Meeting
 - i. Minutes of both Fall 2020 meeting and Spring 2021 meetings were approved.

2. Old Business – “Ratio Test Methods” clause 7.3

- a. Chair provided update on the status of changes to “Ratio Test Methods” under section 7.3. This revision was already approved by poll during the Spring-21 meeting. However, Chair needed to confirm the poll submitters' member status. Chair shared with the group that he had confirmed the poll member count, and the revision was passed on to PCS for survey. Revision as below:

7.3 Ratio test method

7.3.1 Electronic ratio and phase measurement meters

An electronic meter that determines the transformer turns ratio, polarity and phase angle may be used for the measurement of these parameters

7.3.2 Voltmeter method (This is currently 7.3.1)

(Clause number changes and descriptions stay the same)

7.3.3 Comparison method (This is currently 7.3.2)

(Clause number changes and descriptions stay the same)

Current 7.3.3 Ratio meter clause (R/R1) to be removed

3. Old Business - “Ratio tests voltage and frequency” under section 7.1.2

Chair shared the proposed changes with the group, which was surveyed within the TF. The proposed revision was:

Ratio test Voltage and Frequency

CURRENT:

7.1.2 Voltage and frequency

- The ratio test shall be made at rated or lower voltage and rated or higher frequency.

NEW PROPOSAL:

7.1.2 Voltage and frequency

- The ratio test shall be made at rated or lower voltage and be such that the ratio of test voltage to test frequency is less than or equal to the ratio of rated voltage to rated frequency.

Survey results within the Task Force was:

Approved:	22
Disapproved:	6
Abstain:	2
Total Response:	30

Chair commented to pass the revision to PCS to be surveyed since it has passed with majority approvals. However, Bruce Forsyth corrected the Chair that since the total responses were less than the half of the total members, it would not count as “pass” within the TF, hence recommended to survey during the meeting since we had the quorum. Peter Klaine made motion to accept the proposed revisions to the ratio voltages and test frequency under section 7.1,2 and pass on the survey results to PCS. Steve Antoz seconded the motion. Daniel Blaydon made objection for unanimous approval and the motion was set on floor for voting. Motion was accepted with 29 members for, 3 against and 3 abstain.

4. Old Business – “Number of short circuit tests” under section 12.3.4

Chair presented the proposed changes to the “Number of short circuit tests” under section 12.3.4 along with the survey results which was done within the Task Force. The proposed revision and the survey results are as follows:

Current Version:

12.3.4 Number of tests

Each phase of the transformer shall be subjected to a total of six tests satisfying the symmetrical current requirement specified in 12.3.1 or 12.3.2, as applicable. Two of these tests on each phase shall also satisfy the asymmetrical current requirements specified in 12.3.3.

Proposed Version

12.3.4 Number of tests

- When a three-phase transformer is tested in a three-phase test circuit or in a single-phase test circuit as given in Annex C, each phase of the transformer shall be subjected to three tests satisfying the asymmetrical current requirements specified in 12.3.3. The tests shall be performed on one of the outer phases with the tap-changer in the maximum position, on the other outer phase with the tap-changer in the minimum position and on the middle phase with the tap-changer in the principal position
- When a single-phase transformer is tested in a single-phase test circuit the transformer shall be subjected to three tests satisfying the asymmetrical current requirements specified in 12.3.3. The three tests shall be performed one each, with the tap-changer in the maximum, minimum and principal position.

Approved:	20
Disapproved:	3
Abstain:	8
Total Response:	31

Since we had the quorum, Chair asked if anyone had any objections to passing the presented revision. John John made motion to accept the proposed revisions to the number of short circuits under section 12.3.4 and forward survey results to PCS. Peter Klaine seconded the motion. Chair opened the floor for discussions comments and objections. Motion passed.

5. Old Business - New proposed test sections 8.7 & 9.6 for OLTC tests

Chair Presented the new proposed test sections for OLTC tests under section 8.7 and 9.6, along with the Task Force survey results, which are as follows:

8.7 On Load Tap Changer Voltage Test

8.7.1 General

In order to verify the performance of a transformer that has an on load tap changer (OLTC), the OLTC shall be operated through one end-to-end-to-end sequence (from one tap extreme to the other tap extreme and back again) with the transformer energized at rated voltage.

8.7.2 Control voltage

Control voltage for the OLTC motor during the test shall be as near to rated voltage as possible, with a minimum of 85%.

8.7.3 Preparation for the test

The OLTC shall be fitted with all included equipment. It shall be connected as it will be in service, including protective devices.

8.7.4 Procedure

Either the high or low voltage winding of the transformer under test shall be energized at rated voltage and frequency, unless otherwise specified. The OLTC shall be operated using the motor drive but not manual rotation. The OLTC shall be operated through all tap positions twice, starting at one tap extreme and progressing to the other tap extreme, and then ~~return back~~ again to the original tap position.

The test may be performed at intervals, if necessary, such as to adjust the test circuit for the applied voltage to be adjusted to the rated voltage of the tap position, but it is a requirement that the transformer be energized at no less than rated voltage corresponding to each tap to be changed.

8.7.6 Failure Detection and Acceptance Criteria

The transformer will have passed this OLTC Voltage test if:

- The tap changer operates normally with no abnormal sound
- The transformer stays energized without a trip in the supply test circuit
- For mineral oil filled vacuum OLTCs, the increase of the sum of H₂, CH₄, C₂H₆, C₂H₄ and C₂H₂ should not exceed 12 ppm for in-tank type OLTCs and 6 ppm for compartment type LTCs.
- For non-vacuum type OLTCs, or OLTCs filled with a liquid other than mineral oil, the determination of acceptance criteria is through sound only and there is not a limit for increase in gases.

9.6 On Load Tap Changer Current Test

9.6.1 General

In order to verify the performance of a transformer that has an on load tap changer (OLTC), the OLTC shall be operated through one end-to-end-to-end sequence (from one tap extreme to the other tap extreme and back again) with the transformer current flowing through the windings, corresponding to the top nameplate MVA rating.

9.6.2 Control voltage

Control voltage for the OLTC motor during the test shall be as near to rated voltage as possible, with a minimum of 85%.

9.6.3 Preparation for the test

The OLTC shall be fitted with all included equipment. It shall be connected as it will be in service, including protective devices.

9.6.4 Procedure

The test shall be performed by applying a short circuit either the high-voltage winding or the low-voltage winding and applying sufficient voltage across the other winding to cause a specific current to flow in the windings. The OLTC shall be operated using the motor drive but not manual rotation. The OLTC shall be operated through all tap positions twice, starting at one tap extreme and progressing to the other tap extreme, and then ~~return back~~ again to the original tap position.

The test may be performed at intervals, if necessary, such as to adjust the test circuit for the applied voltage to be adjusted to the required current of the tap position, but it is a requirement that the transformer be energized at no less than 80% of the top MVA nameplate current value for each tap change.

8.7.5 Observations and Analysis

8.7.5.1 Audible Sound

The transformer shall be observed during this test and the operator shall identify that the sound during the tap changing operations was either normal or abnormal. With some types of tap changers, there will be abnormally loud sounds if components are not assembled properly. Note that during operation of the change-over selector (reversing switch or coarse-tap selector) the sound can be slightly different.

8.7.5.2 Supply Test Circuit

The test control system shall be monitored for any trip of the test circuit that automatically stops the circuit from keeping the transformer energized.

8.7.5.3 Dissolved Gas-in-Oil Analysis

Oil samples shall be taken from the ~~LTC~~ ^{OLTC} compartment of vacuum type tap-changers before and after the test and analyzed for dissolved gasses. Results of the analysis may show some increase of dissolved gases due to current commutation, resistor heating and / or stray-gassing of the oil.

9.6.5 Observations and Analysis

9.6.5.1 Audible Sound

The transformer shall be observed during this test and the operator shall identify that the sound during the tap changing operations was either normal or abnormal. With some types of tap changers, there will be abnormally loud sounds if components are not assembled properly. Note that during operation of the change-over selector (reversing switch or coarse-tap selector) the sound can be slightly different.

9.6.5.2 Supply Test Circuit

The test control system shall be monitored for any trip of the test circuit that automatically stops the circuit from keeping the transformer energized.

9.6.5.3 Dissolved Gas-in-Oil Analysis

Oil samples shall be taken from the LTC compartment of vacuum type tap-changers before and after the test and analyzed for dissolved gasses. Results of the analysis may show some increase of dissolved gases due to current commutation, resistor heating and / or stray-gassing of the oil.

9.6.6 Failure Detection and Acceptance Criteria

The transformer will have passed this OLTC Current test if:

- The tap changer operates normally with no abnormal sound
- The transformer stays energized without a trip in the supply test circuit
- For mineral oil filled vacuum OLTCs, the increase of the sum of H₂, CH₄, C₂H₆, C₂H₄ and C₂H₂ should not exceed 12 ppm for in-tank type OLTCs and 6 ppm for compartment type LTCs.
- For non-vacuum type OLTCs, or OLTCs filled with a liquid other than mineral oil, the determination of acceptance criteria is through sound only and there is not a limit for increase in gases.

Approved:	25
Disapproved:	3
Abstain:	4
Total Response:	32

Chair asked the group if anyone had any objections to approving to pass the new section to PCS for survey. Steve Antoz made motion to accept the proposed revisions to the LTC tests under section 8.7 and 9.6 as presented and forward the survey results to PCS. Hugo Flores seconded the motion. However, there was an objection to the approval, as:

Dr Alexander commented that some factories may not have needed power source to conduct the test per proposed revisions and sought permission to make a presentation on the impact of the changes. Due to lack of time, and the long history of the work performed on these new clauses, which was presented, Chair declined the request of Dr. Alexander for making presentation. Rainer Frotscher commented that the discussions regarding power source requirements were discussed in the past meetings and clarified. Dr. Alexander made objection for unanimous approval. The Motion was sent for poll voting. Motion passed with 34 approval, 2 opposed and 5 abstain. The group approved the new sections to be sent to PCS for survey.

Chair commented that since there is no definitive conclusion to either using “LTC” or “OLTC”, he will change the acronym to the most commonly known “LTC” and send the new clauses to PCS to be surveyed.

6. New Business - Request by Jason Varnell to revise the subclauses 9.3.a and 9.3.b, “Tests for measuring load losses and impedance voltage” to bring better clarity, and Chair’s proposal for this revision

Chair presented the new business requested by Jason Vernal’s to revise the subclauses 9.3.a and 9.3.b for better clarity. Chair presented the question and his answers to each, as follows:

Q: Does the requirement for no more than a 5°C temperature difference stated in 9.3.a.1 apply for both of the measurements taken immediately before and after the load loss test as stated in 9.3.a.2 or is just applicable to the before test measurement?

A: 9.3.a.1 is for before. However, we will discuss 9.3.a.3 refers to in the next slide

9.3 Tests for measuring load losses and impedance voltage

Regardless of the test method selected, the following preparatory requirements shall be satisfied for accurate test results:

- a) To determine the temperature of the windings with sufficient accuracy, the following conditions shall be met, except as stated in the NOTE in ~~3.1.2~~ ~~3.1~~
 - 1) The temperature of the insulating liquid has stabilized, and the difference between top and bottom liquid temperatures does not exceed 5 °C.
 - 2) The temperature of the windings shall be taken immediately before and after the load losses and impedance voltage test in a manner similar to that described in 5.1. The average shall be taken as the true temperature.
 - 3) The difference in winding temperature before and after the test shall not exceed 5 °C.

Q: I've observed that some interpret 9.3.a.1 as a prerequisite to start the test but that subclause 9.3.a.3 is the criteria for the after test measurement and that the 5°C temperature difference between the top and bottom liquid does not apply to the after test measurement.

A: 9.3.a.3 interpretation is such that, the top and bottom oil temperatures difference after completion of the Load Loss test to before temp difference shall not exceed 5°C difference. The purpose is to perform the load loss tests in timely manner not to heat the windings up more than they would. We also need to pay attention to "9.3.a.2", as in sequence and look at section 5.1

5.1 Determination of cold temperature

The cold temperature of the winding shall be determined as accurately as possible when measuring the cold resistance. The precautions in 5.1.1, 5.1.2, and 5.1.3 shall be observed.

5.1.1 General

Cold-resistance measurements shall be made on a transformer only when the liquid or winding temperature is stable. The temperature is considered stable if the top liquid temperature does not vary more than 2 °C in a 1-h period.

5.1.2 Transformer windings immersed in insulating liquid

The temperature of the windings shall be assumed to be the same as the average temperature of the insulating liquid, provided:

- a) The windings have been under insulating liquid with no excitation and with no current in the windings for a minimum of 3 h for a transformer without pumps and for 1 h for transformer with pumps running before the cold resistance is measured.
- b) The temperature of the insulating liquid has stabilized, and the difference between top and bottom temperature does not exceed 5 °C.

Q: Why is subclause 5.1 referenced in subclause 9.3.a.2 and which specific sub-section of 5.1?

A: Answered in the previous slide

I assume the reference is to subclause 5.1.2 but 5.1.2.e (it should be noted that this subclause is incorrectly labeled as "e" instead of "a" **Corrected in the new revision**) states that the transformer should have no excitation for 3 hours prior to the measurement. Is that the intent of referencing to subclause 5.1? I don't think so. It should be noted that if the reference was for subclause 5.1.1 then that directly contradicts the criteria given in 9.3.a.1. **Discussed in the previous slide**

In subclause 9.3.a, there is a reference to a "NOTE in 2)" but there is only a note after "3)". **Corrected in the new revision**

Q: Which "leads" from subclause 9.3.b are to be considered? Is it the lead cables/bus that are internally connected to the bushings or the winding lead exits? **Internal bushing line leads** In my opinion it is unclear. I assume that it refers to the cross-sectional area of the conductors connected internally to the bushing. Some have interpreted it as the external bushing spades. I have observed that the "leads" design information is not frequently given to the test department and it is difficult to obtain the design values unless there was a design review or request to engineering.

- b) The conductors used to short-circuit the low-voltage high-current winding of a transformer shall have a cross-sectional area equal to or greater than the corresponding transformer leads.

Raja Ahuja commented that the clarification is sufficient, and revision is not necessary. Steve Antoz recommended to Jason to make a proposal of the revision for review and Jason Vernal agreed to provide the proposed changes to Chair.

Final Remark by the Chair:

I will send all these revisions and new clauses to PCS and work closely with PCS Chair Rogerio and help during the PCS survey of these clauses. We will target to get these done in January 2022.

7. Next meeting: TBD at Spring 2022 Transformer Committee Meeting scheduled for March 27-31, 2022 in Denver, Colorado, USA

8. Close of meeting
 - a. Meeting adjourned at 10:40 AM CST
9. Attendee's list is provided in Annexure - A

Submitted by: Hakan Sahin Date: 12/27/21

Annexure – A Meeting Attendance:

Aaron Meyers	EATON Corporation
Ajith Varghese	SPX Transformer Solutions, Inc.
Alain Bolliger	HV TECHNOLOGIES, Inc.
Alexander Kraetge	OMICRON electronics Deutschland GmbH
Amitabh Sarkar	Virginia Transformer Corp.
Andy Steineman	Delta Star Inc.
Anthony Franchitti	PECO Energy Company
Antonio Ceballos	Georgia Transformer
Arup Chakraborty	Delta Star Inc.
Axel Kraemer	Maschinenfabrik Reinhausen
Barry Beaster	The H-J Family of Companies
Bertrand Poulin	Hitachi ABB Power Grids
Bill Griesacker	Boettger Transformer Consulting LLC
Brady Nesvold	Xcel Energy
Brandon Dent	Memphis Light, Gas & Water
Bruce Forsyth	Bruce Forsyth and Associates LLC
Charles Sweetser	OMICRON electronics Corp USA
Chris Baumgartner	We Energies
Chris Powell	Intermountain Electronics
Chris Slattery	FirstEnergy Corp.
Craig Colopy	EATON Corporation
Curtiss Frazier	Ameren
Daniel Blaydon	Baltimore Gas & Electric
Daniel Weyer	Nebraska Public Power District
DANIELA EMBER BACIU	Hydro-Quebec IREQ
Darren Brown	Howard Industries
David Murray	Tennessee Valley Authority
David Walker	MGM Transformer Company
Digby Scott H	Duke Energy
Don Dorris	Nashville Electric Service
Donald Ayers	Ayers Transformer Consulting
Alexander Winter	HIGHVOLT Pruftechnik Dresden
Duvier Bedoya	Hitachi ABB Power Grids
Dwight Parkinson	EATON Corporation

Eduardo Garcia	Siemens AG
Elise Arnold	SGB
enrique betancourt	Prolec GE
Eric Schleismann	Southern Company Services
Eric Weatherbee	PCORE Electric
Evgenii Ermakov	Hitachi Energy
Feras Fattal	Manitoba Hydro
Fernando Leal	Prolec GE
Gael Kennady	GR Kennedy & Associates LLC
Gary King	Howard Industries
Hakan Sahin	Virginia and Georgia Transformers
Harry Pepe	Phenix Technologies, Inc.
Hemchandra Shertukde	University of Hartford
Hugo Flores	Hitachi ABB Power Grids
J.Dennis Marlow	DenMar TDS Transformers
Jarrold Prince	ERMCO
Jason Varnell	Doble Engineering Co.
Javier Arteaga	Hitachi Energy
Jeff Britton	Phenix Technologies, Inc.
Jeff Door	H-J Family of Companies
Jeff Gragert	JLR Consulting, Inc.
Jeffrey Wright	Duquesne Light Co.
Joe Watson	JD Watson and Associates Inc.
John Crouse	Roswell Alliance
John Herron	Raytech USA
John K John	Virginia Transformer Corp.
John Lackey	PowerNex Associates Inc.
Jorge Cruz	PTI Transformers
Juan Carlos Cruz Valdes	Prolec GE
Krishnamurthy Vijayan	PTI Transformers
Kannan Veeran	Georgia Transformer
Kerwin Stretch	Siemens Energy
Kris Neild	Megger
Kris Zibert	Allgeier, Martin and Associates
KUSHAL SINGH	ComEd
Mahesh Sampat	EMS Consulting Inc.
Marc Taylor	Taylor
Markus Schiessl	SGB
Mats Bernesjo	Hitachi Energy
Mike Iman	MGM Transformer Company
Mike Warntjes	American Transmission Co.

Marnie Roussel	Entergy
Muhammad Ali	Northern Transformer
Nicholas Jensen	Delta Star Inc.
Norman Field	Stantec
Peter Kleine	US Army Corps of Engineers
Phil Hopkinson	HVOLT Inc.
Polo Rodríguez	
Pugal Selvaraj	Virginia Transformer Corp.
Rainer Frotscher	Maschinenfabrik Reinhausen
Raj Ahuja	Raj Ahuja Consulting
Ramsis Girgis	Hitachi Energy
Reto Fausch	RF Solutions
Reza Torabi	SMIT Transformatoren B.V.
Rhea Montpool	Schneider Electric
Rhett Chrysler	ERMCO
Rod Sauls	Southern Company Services
Rogério Verdolin	Verdolin Solutions Inc.
Samragni Dutta Roy	Siemens Energy
Sanjay Y. Patel	Smit Transformer
Sanjib Som	Pennsylvania Transformer
Sankarakurup, Dinesh	Duke Energy
Saramma Hoffman	PPL Electric Utilities
Sen, Cihangir John	Duke Energy
Shankar Subramany	KEMA Labs
Shawn Gossett	Ameren
Sheldon Kennedy	Niagara Transformer
Steve Antosz	Stephen Antosz & Associates, Inc
Steve Brzoznowski	Bonneville Power Administration
Sukhdev Walia	New Energy Power Co.
Suresh Babanna	SPX Transformer Solutions, Inc.
Susan McNelly	Xcel Energy
Terence J. Martin	Cleveland
Tiffany Lucas	SPX Transformer Solutions, Inc.
Toby Johnson	Hunt Electric
Troy Tanaka	Burns & McDonnell
Ulf Radbrandt	Hitachi ABB Power Grids
vinay mehrotra	SPX Transformer Solutions, Inc.
Wallace Binder	WBBinder Consultant
Weijun Li	Braintree Electric Light Dept.
William Boettger	Boettger Transformer Consulting LLC

Quorum Confirmation by the second poll:

1.What is your status for this meeting?

A.Member 36/117 (31%)

B.Non Member 44/117 (38%)

C.I don't know 2/117 (2%)

No Answer 35/117 (30%)

36 + from K.Vijayan to everyone: Krishnamurthy Vijayan- I voted first

time but could not vote the 2nd time. I am member and so include me for attendance

Total 37 members were present

J.9.3 TF PCS Audible Sound Revision to Clause 13 of C57.12.90

Unapproved Minutes of Fall 2021 TF PCS Audible Sound Revision to Clause 13 of C57.12.90

The task force met at 12:55 PM, on Monday, November 15, 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 Spring 2021 meeting, the membership was adjusted to 44 members. There was 25 of 44 members with a total of 61 persons in attendance. A quorum was established with 56.8 % of the membership. A call was made for any objections for a unanimous approval of the Spring 2021 TF minutes; no objections were raised so minutes are approved as written. A revised agenda was presented without objections for approval. Two requests for membership have been reviewed.

The first technical agenda item was a summary of items previously considered for inclusion in Clause 13 of C57.12.90. The following bullets describe these four subjects with the previously agreed upon action by the TF.

- Impact of temperature on Core Noise
- Impact of temperature on Load Noise
- Impact of Tap position on core noise
- Impact of Tap position on load noise

Previous decision: These items are to be addressed in more detail in the noise guide rather than in the C57.12.90 Standard. This is already addressed in Clauses 3.2.1.6, 3.2.2.6, 3.2.1.4, and 3.2.2.5 of the present draft of the new noise guide, C57.136.

The next agenda item was a review of resolutions previously agreed upon at earlier TF meetings on comments received from balloting of C57.12.00 and C57.12.90. These are:

1. Comment: Table C1 in C57.12.00 starts at 700 kVA and refers to “Power Transformers”, Table C2 refers to “Distribution Transformers”, covers up to 3 MVA, and C57.12.36 for distribution substation transformers has a scope of up to 10 MVA.

Resolution (already incorporated in the new revision of C57.12.00):

- No Load Sound levels for ratings below 700 kVA were added to Table C1.
- Original Tables C1 and C2 have been replaced by a revised Table C1.
- “Distribution transformers” were added to title of Annex C. The title now reads: “Audible sound pressure levels for No-Load and Load noise of liquid immersed power and distribution transformers”. Title of Table C1 was supposed to include Distribution transformers but it was missed. The chairman of C57.12.00 will try to correct this before publication but if not, then through a Corrigenda.

2. Comment: Table C.3 in C57.12.00 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.

Resolution: Add such an explanation into the Noise Guide with a few clarifying sentences. It is being planned.

3. 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.

Related text present in Clause 13.3.3.1 of C57.12.00 : Core noise is to be measured at rated tap position and only upon request by customer that the transformer is tested at highest noise producing tap position.

Issue: This will require changes in C57.12.00 and C57.12.90. The TF needs to decide whether the existing text is, or is not, sufficient.

Resolution: This is planned to be discussed in a future meeting of the TF. Also, the impact of Tap Position on Core noise is discussed in the noise guide

4. Comment: Related to whether to add ambient sound pressure measurements arithmetically, or logarithmically, to determine the average level

Issue: The difference is typically a fraction of 1 dB. Also, this will require changes in C57.12.90

Resolution: This is planned to be discussed in a future meeting of the TF

5. Comment: Related to whether to measure load noise after the Heat-Run test

Resolution: This item was discussed in great detail at previous TF meetings. Also, impact of temperature on Load noise is small and Text on this impact has already been incorporated in the Noise Guide (C57.136). The next agenda item dealt with the new “*Guide for Audible Sound of Liquid-Immersed Power Transformers*”, IEEE PC57.136. The officers for this Guide WG are Stephen Antosz as Chair, Ramsis Girgis as Vice-Chair, and Mats Bernesjo as Secretary. Separate minutes of the WG meeting will be submitted to the PCS separately.

A discussion was raised about the continuous operation conditions of certain transformers operating in a step-up condition, e.g. GSUs, where the core flux density is typically higher than the rated flux density which, in turn, causes the core noise level to be higher than at rated. A request was made to review if factory testing might be able to address this condition. Joe Foldi asked how to incorporate in-service modes of operation to factory testing. Should the worst case tap position be used? The Chairman responded that the core flux density, under such loading conditions, can be calculated and the transformer can be tested for core noise in the factory at that flux density. Also, Joe requested that some text be added in the Guide about whether the guaranteed sound level should be based on the worst case tap position. Presently C57.12.90 has the guarantee based on the nominal tap position, unless otherwise specified by the User. The Chairman responded that text on this subject will be added to the Guide as part of “Impact of Load and Power Factor on Core noise”. However, requiring core noise to be tested at the worst case tap position will need to be discussed at another Audible Sound TF meeting.

A solicitation of those in attendance was initiated to request membership in the Noise Guide. A total of twenty-two requests were received. Names and affiliations of these new WG members are included in the minutes of the Guide WG meeting.

With no new business raised, the meeting was adjourned.

Respectfully submitted,

Barry Beaster, TF Secretary

Spring 2021 Task Force Meeting Attendance and Affiliation is as follows:

First Name	Last Name	Company
Kayland	Adams	SPX Transformer Solutions, Inc.
Raj	Ahuja	Raj Ahuja Consulting
Stephen	Antosz	Stephen Antosz & Associates, Inc
Edmundo	Arevalo	Bonneville Power Administration

Elise	Arnold	SGB
Donald	Ayers	Ayers Transformer Consulting
Suresh	Babanna	SPX Transformer Solutions, Inc.
Barry	Beaster	H-J Family of Companies
Mats	Bernesjo	Hitachi Energy
Enrique	Betancourt	Prolec GE
Thomas	Blackburn	Gene Blackburn Engineering
William	Boettger	Boettger Transformer Consulting LLC
Darren	Brown	Howard Industries
Steven	Brzoznowski	Bonneville Power Administration
Arup	Chakraborty	Delta Star Inc.
John	Crouse	Roswell Alliance
Everton	De Oliveira	Siemens Energy
Scott	Digby	Duke Energy
Thomas	Eagle	SPX Transformer Solutions, Inc.
Thomas	Falkenburger	Coil Innovation USA, Inc.
Hugo	Flores	Hitachi Energy
Joseph	Foldi	Foldi & Associates, Inc.
Eduardo	Garcia Wild	Siemens Energy
Mohammad	Gholami	Trench Limited
Ramsis	Girgis	Hitachi Energy
Ismail	Guner	Hydro-Quebec
Thomas	Hartmann	Pepco Holdings Inc.
Nicholas	Jensen	Delta Star Inc.
John	John	Virginia Transformer Corp.
Stephen	Jordan	Tennessee Valley Authority
Kurt	Kaineder	Siemens Energy
Xose	Lopez-Fernandez	Universidade de Vigo
Vinay	Mehrotra	SPX Transformer Solutions, Inc.
Aaron	Meyers	EATON Corporation
Rashed	Minhaz	Transformer Consulting Services Inc.
Paul	Morakinyo	PSEG
Joe	Nims	Allen & Hoshall, Inc.
Sanjay	Patel	Smit Transformer
Sylvain	Plante	Hydro-Quebec
Klaus	Pointner	Trench Austria GmbH
Pierre	Riffon	Pierre Riffon Consultant Inc.
Tim	Rocque	SPX Transformer Solutions, Inc.
Dinesh	Sankarakurup	Duke Energy
Amitabh	Sarkar	Virginia Transformer Corp.
Daniel	Sauer	EATON Corporation

Markus	Schiessl	SGB
Cihangir	Sen	Duke Energy
Michael	Sharp	Trench Limited
Christopher	Slattery	FirstEnergy Corp.
Sanjib	Som	Pennsylvania Transformer
Marc	Taylor	JFE Shoji Power Canada Inc.
Ryan	Thompson	Burns & McDonnell
Reza	Torabi Goodarzi	SMIT Transformatoren B.V.
Ajith	Varghese	SPX Transformer Solutions, Inc.
Jason	Varnell	Doble Engineering Co.
Kiran	Vedante	Ritz Instrument Transformers
Jos	Veens	SMIT Transformatoren B.V.
David	Wallach	Duke Energy
Terry	Wong	Trench Limited
Jeffrey	Wright	Duquesne Light Co.

J.9.4 WG PC57.136 Noise Guide

Unapproved Minutes of Fall 2021 TF PCS IEEE PC57.136, “Guide for Audible Sound of Liquid-Immersed Power Transformers”

The task force met at 12:55 PM, on Monday, November 15, 2021 as part of the TF PCS Audible Sound Revision to Clause 13 of C57.12.90 meeting. Chairman Steve Antosz presided over the meeting with Ramsis Girgis being the Vice-Chair, and Mats Bernesjo as Secretary.

The total membership of the WG is 47, including 22 requested membership at this meeting. The total attendance was 51.

First, the Chairman gave the following background for the new Guide:

- C57.136 was the “Sound Abatement Guide” and the document expired several years ago
- 2019/2020 was decided to resurrect/update it
- The PAR was approved in early 2021
- An early draft was circulated to TF participants in April 2021
- Some feedback was received and incorporated
- The draft was updated Summer/Fall 2021

The new guide has made significant progress and noise experts are asked to review the latest draft and provide more material where needed. The following list of technical chapters and sections of the Guide are summarized below:

Chapter 3 Basics and Standards of Transformer Noise

3.2 Sources and characteristics of transformer noise

3.2.1 Core noise

3.2.1.1 Impact of Core design & material

3.2.1.2 Frequency spectrum

3.2.1.3 Impact of Core and Tank resonances

3.2.1.4 Impact of Tap Changer position

3.2.1.5 Impact of load and load power factor

3.2.1.6 Impact of core temperature

3.2.2 Load noise

- 3.2.2.1 Sources of load noise
- 3.2.2.2 Design factors impacting load noise level
- 3.2.2.3 Impact of load
- 3.2.2.4 Frequency components
- 3.2.2.5 Impact of tap changer position
- 3.2.2.6 Impact of temperature
- 3.2.3 Cooling system noise
- 3.2.4 Contribution of components of transformer noise to the total noise level of transformers
- 3.3 Transformer industry standards related to noise
 - 3.3.1 IEEE Standards
 - 3.3.2 IEC Standards
 - 3.3.3 Sound level information used in the IEEE & IEC Standards

Chapter 4 Factors affecting sound levels in field operation

- 4.1 Operating voltage and tap-changer settings
- 4.2 Noise of auxiliary transformers and reactors
- 4.3 Load noise
- 4.4 Load power factor
- 4.5 Voltage and load current harmonics
 - 4.5.1 Load current harmonics
 - 4.5.2 Harmonics in the excitation voltage
- 4.6 DC and GIC current
- 4.7 Contribution from vibrations of structures attached to the transformer
- 4.8 Contribution of sound build-up from surrounding sound / fire walls
- 4.9 Impact of transformer mounting
- 4.10 Other sources of noise on site
- 4.11 Operating temperature

Chapter 5 Transformer noise reduction in the design stage and factory

- 5.1 Methods to reduce core noise
 - 5.1.1 Lower core flux density
 - 5.1.2 Usage of high permeability grain-oriented core steel
 - 5.1.3 Avoiding core resonance
 - 5.1.4 Filling tank stiffeners with sand
 - 5.1.5 Other means
- 5.2 Methods to reduce / eliminate cooling equipment noise
- 5.3 Methods to reduce load noise
- 5.4 Methods to reduce both core and load noise
 - 5.4.1 Low noise tank design
 - 5.4.2 Vibration isolation between active part and tank
 - 5.4.3 Tank mounted external sound panels
 - 5.4.4 Sound enclosures
- 5.5 Older methods of transformer noise reduction

Chapter 6 Methods to reduce noise on site

- 6.1 Sound enclosures
- 6.2 Sound barriers and walls
- 6.3 Other field installed techniques

Chapter 7 Determination of required sound levels of power transformers on-site

- 7.1 Simplified relationship between sound level of a transformer and sound level at specific receiver locations on the far field

7.2 Determination of appropriate noise level of a transformer on site

It was reported that input into Clauses 6.1 and 6.2 was solicited from Sanjay Patel and is expected to be received in the next week or two. Also, material of Clause 7.2 was requested from Chris Howell of Burns & McDonnell and was recently received. These will be added in the next draft of the Guide.

In relation to clause 7.2 regarding methods of determination of appropriate noise level of a transformer on site, one manufacturer noted that some specifications from the north-east region of the country specify the same low total noise level for transformers of a wide range of MVA ratings. This represents added expense to the customer to try to achieve such low noise levels for larger transformers. Several utility representatives commented on how they determine sound requirements for their transformer Specifications. The Vice Chair commented that he previously gave a presentation at a tutorial (Fall 2020 meeting) specifically on issues with some sound requirements in Specification. He promised to add this presentation to the website of the IEEE Standards.

A solicitation of those in attendance was initiated to request membership in the Noise Guide. A total of twenty-two requests were received. The following names are included in this following table.

Scott Digby	Hugo Flores	Ajith Varghese	Vinay Mehrotra	David Wallach
Chris Slattery	Klaus Pointer	Marc Taylor	Sanjib Som	William Boettger
John K. John	Eduardo Garcia	Enrique Betancourt	Elise Arnold	Markus Schiessl
Steve Brzoznowski	Kurt Kainer	Everton De Oliveira	K. Vijayan	Thomas Hartmann
Kiran Vendante	Kayland Adams			

Finally, a request was made to members of the newly formed Guide WG to review the next draft of the Noise Guide and provide feedback, add text, as well as add their experience to Chapter 6 on methods on noise mitigation on site. The current Draft will be posted on the committee website in the C57.136 section under Performance Characteristics Sub Committee and it will be posted again after updates are made.

With no new business raised, the meeting was adjourned.

Respectfully submitted,

Mats Bernesjo, WG Secretary

J.9.5 TF PCS Continuous Revisions to C57.12.00

PCS Task Force on General Requirements C57.12.00

*Performance Characteristics Subcommittee
IEEE / PES Transformers Committee*

*November 15, 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, November 15, 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 members and guests present was aware of issues related to this TF's activities. There were 46 Members and 66 Guests present. The quorum to conduct regular business was achieved, as 77 members are registered in the Task Force.

The following 8 guests requested membership:

Alexander Kraetge	OMICRON
Dan Sauer	Eaton
Deepak Kumaria	Applied Materials
Mats Bernesjo	Hitachi Energy
Ryan Hogg	Bureau of Reclamation
Samragini Dutta Roy	Siemens Energy
Suresh Babanna	SPX Transformer Solutions
Vinay Mehrotra	SPX Transformer Solutions

The Agenda proposed by the TF Chair was unanimously approved by the Group (Motion Raj Ahuja, Second Phil Hopkinson), and also were approved the minutes from the Spring 2021 meeting, with none opposed (Motion Sylvain Plante, Second Eduardo Garcia).

Next, the Chair briefly provided background and relevance of each item brought for Group's discussion in the agenda. The Chair started Group's regular business.

1. OLD BUSINESS

A. Inclusion of Core information on Nameplate

This request had originally been brought up by Bipin Patel, expecting to simplify GIC evaluation of power transformers (type C Nameplate). In course of discussion with subject matter experts, it turned out that much more information would be required for a proper evaluation. However, a second group of participants saw value on having core type information on nameplate and the topic came back within Group's business agenda.

With support of a TF of WG Members, the Chair developed new proposed text to include on Table 6 of C5.12.00 standard. WG Member Ramsis Girgis provided detailed description of core type options currently applied in industry. The Chair opened the floor for discussion.

Group's general opinion was in favor of including either "Shell" or "Core" on "Core Design" (new, line 25) of Table 6, but there was lengthy discussion as for "Core Type" options. Main arguments brought up by meeting participants follow:

- There are different types of Shell design cores which designations should be stated as possible inputs for Table 6. Option to include sketches as part C57.105 was mentioned but was not considered within TF's scope.
- Recommendation was given to let manufacturers freely state "core type", according to own definitions.
- Recommendation was given to address at least 80% of industry application, leaving special cases to manufacturer's own definitions.

The Chair tried to lead the Group to agree on a new version of proposed Line 26 to Table 6, showing different options, but it was not possible to reach a consensus within the time of the meeting. The subject will remain within TF's agenda.

Meeting was adjourned at 15:35 hr. (Motion Phil Hopkinson, Second Eduardo García).

Respectfully submitted,

Tauhid Ansari
WG Chair

Enrique Betancourt
Co-Chair and Acting Secretary

Name of attendees

Joe Foldi	Donald Ayers	Jim Graham
Ajith Varghese	Dr. Alexander Winter	John Crouse
Alexander Kraetge	Duvier Bedoya	John Herron
Ali Naderian	Ed teNyenhuis	John K John
Allan Bartek P.E.	Eduardo Garcia	John Lackey
Amitabh Sarkar	Elise Arnold	K.Vijayan
Anderson, Greg	Encore 12	Kenneth Skinger
Andrew Larison	enrique betancourt	Kevin Biggie
Anthony Franchitti	Eric Schleismann	Kris Neild
Arup Chakraborty	Evan H.B. Knapp-Eaton	Kris Zibert
Bertrand Poulin	Everton De Oliveira	Larry Dix
Bruce Forsyth	Feras Fattal	Leopoldo Rodriguez
Bruce Webb KUB	Gary King	Marc Taylor
Chris Baumgartner	hachichi said	Mark Perkins
Chris Slattery FirstEnergy	Hakan Sahin	Markus Schiessl
Craig Colopy	Harry Pepe	Marnie Roussell
Dan Sauer - Eaton	HUAN DINH	Mats Bernesjo
Daniel Blaydon	J.Dennis Marlow	Michael Botti
DANIELA EMBER BACIU	Jarrood Prince - ERMCO	Michael Zarnowski - Carte
Darren Brown	Jason Varnell	Muhammad Ali Masood Cheema
deepak	Javier Arteaga	Nicholas Jensen - Delta Star
Don Dorris	Jeff Schneider	Olle Benzler

pedro	Shawn Gossett	Zachery Weiss
Philip Hopkinson	Sheldon Kennedy	Zan Kiparizoski
Polo Rodríguez	Stephen Oakes	
Raj Ahuja	Steve Antosz	
Ramsis Girgis	Steve Brzoznowski	
Reza Torabi	Steve Jordan	
Richard von Gemmingen	Steve Schroeder	
Rod Sauls	Steve Snyder	
Rodrigo Ocon	Sukhdev Walia	
Rogério Verdolin	Suresh Babanna	

Ronnie Minhaz (Rashid)	Sylvain Plante Hydro-Quebec
Ross McTaggart	Tauhid Ansari
Rudolf Ogajanov	Terence J. Martin
Ryan Hogg	Thomas Tom Dauzat
	Tiffany Lucas - Prolec GE -
Ryan Musgrove - OG&E	Waukesha
Samraghi Dutta Roy	Toby Johnson
Sanjay Patel	Tommy Eagle
Sankarakurup, Dinesh	Kent Miller
Sanket Bolar	vinay mehrotra
Saramma Hoffman	Waldemar Ziomek
Sen, Cihangir John	Will Elliott - Prolec-GE
Sergio Hernandez Cano	William Boettger

J.9.6 WG HV & EHV Breaker & Transformer Sw. Transients C57.142

MEETING NOTES

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

2:30 PM – 3:35 PM Central Time Zone - USA

Chairman – Jim McBride

Vice Chair – Xose Lopez-Fernandez

Secretary – Tom Melle

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

Welcome and Chair's Remarks

2) Two Attendance Poll were taken.

First at 2:25 PM 52 Attendees were present (31 Guests) 21 of 56 Members present

Second 3:00 PM 58 Attendees were present (33 Guests) 25 of 56 Members present

Quorum was not achieve. Therefore, the Spring Minutes will be sent by e-mail for approving.

3) IEEE Patent Policy Slides and Copyrights slides (NO essential patent claims or copyright issues)

4) Approval of Agenda and Minutes from Last Meeting.

Quorum was not achieve. Therefore, the Spring Minutes will be sent by e-mail for approving.

5) Switchgear Liason Task Force Update – Dave Caverly

The Switchgear Task Force met on OCTOBER 21, 2021, but there is nothing new this time.

6) Status of Current Draft 9B and Comments – Jim McBride

Some editorial changes made to Draft 9B before submitting to MEC which corrected errors in the TOC and references. The document from the Transformers website highlights in blue all changes to the C57.142-2010 Guide. And the focus now will be on Mitigation Methods for the upcoming meeting.

7) Request to Proceed to Ballot with Draft 9B – Jim McBride

The Formation of Ballot Group has been initiate and the invitation to join the ballot group for C57.142 logging into the myProject, Close Date is December 10, 2021. The track changes version of Draft 9B can download from the Transformers Committee Website.

8) Mitigation Methods

Jim made a summary about the mitigation methods discussed in previous meetings.

Switchgear Committee has requested that we help to provide dielectric transient withstand information on transformers and reactors. A short discussion was established among Phil Hopkinson, Pierre Riffon, Egon Kirchenmayer and Jim about switching reignitions and prestrikes due to circuit breakers operation with reactors and sometimes with transformers, which not always are covered by standard factory acceptance tests. Pierre Riffon quoted C57.21 IEEE Standard Requirements, Terminology, and Test Code for Shunt Reactors Rated Over 500 kVA, which establishes limits of chopping waves in percent. A group was formed by Pierre Riffon, Bertrand Poulin and Jim McBride to work on a response to Switchgear Committee which may include references to Clause B.6 of Std C57.21

Mitigation methods discussion was open to brainstorming additional options. Discussion on use of internal arresters was established as a mitigation method, which not always is well accepted by the users. A presentation will be expected to be made on it in next meetings. Finally, discussion was focused to additional factory tests. In this respect volunteers were requested to work on a recommendation of voltages classes and dielectric tests requirements. Initially offered Phil Hopkinson, K. Vjayan, Amitbh Sakar, Deepak kumaria. And all interest to join this group could email to Jim McBride.

9) New Business – Deepak Kumaria asked about possibly including the study of transients on instrument transformers in our WG. Due to the lack of remaining time for today's meeting, this topic was postponed until our next meeting.

10) Next Meeting (Spring 2022 – Denver (Hyatt Regency, Conv. Center), Colorado USA, March 27 – 31, 2022)

11) Motion to Adjournment made by Phil Hopkinson / 2nd by Mike Spurlock
Meeting was adjourned at 3:38 PM without objection.

J.10 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.11 Performance Characteristics Subcommittee Attendance List

Role	First Name	Last Name	Company
Guest	Nabi	Almeida	Prolec GE
Member	Tauhid Haque	Ansari	Hitachi Energy
Member	Stephen	Antosz	Stephen Antosz & Associates, Inc
Guest	Edmundo	Arevalo	Bonneville Power Administration
Member	Javier	Arteaga	Hitachi Energy
Member	Donald	Ayers	Ayers Transformer Consulting
Guest	Suresh	Babanna	SPX Transformer Solutions, Inc.
Member	Robert	Ballard	DuPont
Member	Gilles	Bargone	FISO Technologies Inc.
Member	Christopher	Baumgartner	We Energies
Member	Barry	Beaster	H-J Family of Companies
Guest	Mats	Bernesjo	Hitachi Energy

Member	Enrique	Betancourt	Prolec GE
Member	Wallace	Binder	WBBinder Consultant
Member	Wallace	Binder	WBBinder Consultant
Guest	Thomas	Blackburn	Gene Blackburn Engineering
Member	Daniel	Blaydon	Baltimore Gas & Electric
Member	William	Boettger	Boettger Transformer Consulting LLC
Guest	Elizabeth	Bray	Southern Company Services
Member	Jeffrey	Britton	Phenix Technologies, Inc.
Guest	Darren	Brown	Howard Industries
Guest	Steven	Brzoznowski	Bonneville Power Administration
Guest	Jagdish	Burde	Virginia Transformer Corp
Guest	Juan Alfredo	Carrizales	Prolec GE
Guest	David	Caverly	Trench Limited
Guest	Rhett	Chrysler	ERMCO
Member	Craig	Colopy	EATON Corporation
Guest	Jorge	Cruz	PTI Transformers
Guest	Juan Carlos	Cruz Valdes	Prolec GE
Guest	Juan Carlos	Cruz Valdes	Prolec GE
Member	J. Arturo	Del Rio	Siemens Energy
Guest	Brandon	Dent	Memphis Light, Gas & Water
Guest	Huan	Dinh	Hitachi Energy
Guest	Samraghi	Dutta Roy	Siemens Energy
Guest	Thomas	Eagle	SPX Transformer Solutions, Inc.
Guest	William	Elliott	Prolec GE
Guest	Daniela	Ember Baci	Hydro-Quebec IREQ
Guest	Evgenii	Ermakov	Hitachi Energy
Guest	Marco	Espindola	Hitachi Energy
Guest	Feras	Fattal	Manitoba Hydro
Member	Reto	Fausch	RF Solutions
Member	Hugo	Flores	Hitachi Energy
Member	Joseph	Foldi	Foldi & Associates, Inc.
Member	Bruce	Forsyth	Bruce Forsyth and Associates PLLC
Guest	Anthony	Franchitti	PECO Energy Company
Guest	Raymond	Frazier	Ameren
Member	Jose	Gamboa	H-J Family of Companies
Member	Eduardo	Garcia Wild	Siemens Energy
Guest	Rob	Ghosh	General Electric
Member	Ramsis	Girgis	Hitachi Energy
Member	Shawn	Gossett	Ameren
Member	Bill	Griesacker	Duquesne Light Co.
Guest	Ismail	Guner	Hydro-Quebec

Member	Said	Hachichi	Hydro-Quebec
Member	Thomas	Hartmann	Pepco Holdings Inc.
Guest	Giovanni	Hernandez	Virginia Transformer Corp.
Member	Sergio	Hernandez Cano	Hammond Power Solutions
Member	John	Herron	Raytech USA
Guest	Saramma	Hoffman	PPL Electric Utilities
Guest	Ryan	Hogg	Bureau of Reclamation
Member	Philip	Hopkinson	HVOLT Inc.
Guest	Ramadan	Issack	American Electric Power
Guest	Nicholas	Jensen	Delta Star Inc.
Member	John	John	Virginia Transformer Corp.
Member	Stephen	Jordan	Tennessee Valley Authority
Guest	Laszlo	Kadar	Hatch
Member	Sheldon	Kennedy	Niagara Transformer
Guest	Gael	Kennedy	GR Kennedy & Associates LLC
Member	Stacey	Kessler	TC Energy
Guest	Gary	King	Howard Industries
Guest	Dmitriy	Klempner	Southern California Edison
Guest	Alexander	Kraetge	OMICRON electronics Deutschland GmbH
Guest	Krzysztof	Kulasek	Hitachi Energy
Member	Deepak	Kumaria	Applied Materials
Guest	Moonhee	Lee	Hammond Power Solutions
Member	Aleksandr	Levin	Weidmann Electrical Technology
Member	Weijun	Li	Braintree Electric Light Dept.
Guest	Mario	Locarno	Doble Engineering Co.
Member	Xose	Lopez-Fernandez	Universidade de Vigo
Guest	Colby	Lovins	Federal Pacific
Member	Tim-Felix	Mai	Siemens Energy
Member	Richard	Marek	Retired
Corresponding Member	Dennis	Marlow	DenMar TDS Transformers
Guest	Lee	Matthews	Howard Industries
Member	James	McBride	JMX Services, Inc.
Member	James	McBride	JMX Services, Inc.
Guest	Matthew	McFadden	Oncor Electric Delivery
Guest	Susan	McNelly	Xcel Energy
Member	Vinay	Mehrotra	SPX Transformer Solutions, Inc.
Member	Rashed	Minhaz	Transformer Consulting Services Inc.
Guest	Manoj Kumar	Mishra	ASAsoft (Canada) Inc

Member	Rhea	Montpool	Schneider Electric
Member	Emilio	Morales-Cruz	Qualitrol Company LLC
Member	David	Murray	Tennessee Valley Authority
Member	Ryan	Musgrove	Oklahoma Gas & Electric
Guest	Ali	Naderian	METSCO Energy Solutions Inc.
Member	Kristopher	Neild	Megger
Guest	Rodrigo	Ocon	Industrias IEM
Guest	Rudolf	Ogajanov	ABB Inc.
Member	Sanjay	Patel	Smit Transformer
Member	Sanjay	Patel	Smit Transformer
Corresponding Member	Paulette	Payne-Powell	Retired
Guest	Harry	Pepe	Phenix Technologies, Inc.
Guest	Caroline	Peterson	Xcel Energy
Guest	Matthew	Pinard	Weidmann Electrical Technology
Member	Sylvain	Plante	Hydro-Quebec
Guest	Cornelius	Plath	OMICRON Energy Solutions GmbH
Member	Klaus	Pointner	Trench Austria GmbH
Guest	Chris	Powell	Intermountain Electronics
Member	Jarrod	Prince	ERMCO
Member	Ulf	Radbrandt	Hitachi Energy
Member	Ion	Radu	Hitachi Energy
Member	Afshin	Rezaei-Zare	York University
Member	Pierre	Riffon	Pierre Riffon Consultant Inc.
Guest	Diego	Robalino	Megger
Member	Tim	Rocque	SPX Transformer Solutions, Inc.
Member	Marnie	Roussell	Entergy
Guest	Hakan	Sahin	Virginia/Georgia Transformer
Guest	Albert	Sanchez	Knoxville Utilities Board
Guest	Dinesh	Sankarakurup	Duke Energy
Guest	Amitabh	Sarkar	Virginia Transformer Corp.
Member	Daniel	Sauer	EATON Corporation
Guest	Roderick	Sauls	Southern Company Services
Member	Steven	Schappell	SPX Transformer Solutions, Inc.
Guest	Markus	Schiessl	SGB
Guest	Stephen	Schroeder	Hitachi Energy
Guest	Dan	Schwartz	Quality Switch, Inc.
Guest	Ewald	Schweiger	Siemens Energy
Guest	Pugal	Selvaraj	Virginia Transformer Corp.
Guest	Cihangir	Sen	Duke Energy
Guest	Devki	Sharma	Entergy
Guest	Michael	Sharp	Trench Limited

Member	Samuel	Sharpless	Rimkus Consulting Group
Member	Hemchandra	Shertukde	University of Hartford
Guest	Thomas	Sizemore	ABB Inc.
Member	Kenneth	Skinger	Scituate Consulting, Inc.
Member	Christopher	Slattery	FirstEnergy Corp.
Vice-Chair	Sanjib	Som	Pennsylvania Transformer
Member	Mike	Spurlock	Spurlock Engineering Services, LLC
Guest	Brad	Staley	Salt River Project
Member	Kyle	Stechschulte	American Electric Power
Guest	Andrew	Steineman	Delta Star Inc.
Guest	Neil	Strongosky	Memphis Light, Gas & Water
Member	Charles	Sweetser	OMICRON electronics Corp USA
Guest	Janusz	Szczechowski	Maschinenfabrik Reinhausen
Guest	Marc	Taylor	JFE Shoji Power Canada Inc.
Guest	Dervis	Tekin	Meramec Instrument Transformer Co.
Member	Ed	teNyenhuis	Hitachi Energy
Guest	Alan	Traut	Howard Industries
Member	Ajith	Varghese	SPX Transformer Solutions, Inc.
Guest	Joshua	Verdell	ERMCO
Chair	Rogério	Verdolin	Verdolin Solutions Inc.
Member	Krishnamurthy	Vijayan	PTI Transformers
Guest	Pragnesh	Vyas	Sunbelt-Solomon Solutions
Corresponding Member	Loren	Wagenaar	WagenTrans Consulting
Guest	Hugh	Waldrop	Memphis Light, Gas & Water
Member	Sukhdev	Walia	New Energy Power Co.
Guest	David	Wallach	Duke Energy
Member	Joe	Watson	JD Watson and Associates Inc.
Member	Bruce	Webb	Knoxville Utilities Board
Guest	Drew	Welton	Intellirent
Corresponding Member	Peter	Werelius	Megger
Guest	Daniel	Weyer	Nebraska Public Power District
Guest	William	Whitehead	H2scan Corporation
Guest	Helena	Wilhelm	Vegoor Tecnologia Aplicada
Member	Dr. Alexander	Winter	HIGHVOLT Pruftechnik Dresden
Member	Jeffrey	Wright	Duquesne Light Co.
Guest	Joshua	Yun	Virginia Transformer Corp.
Guest	Malia	Zaman	IEEE
Member	Peter	Zhao	Hydro One
Secretary	Kris	Zibert	Allgeier, Martin and Associates
Role	First Name	Last Name	Company

Guest	Nabi	Almeida	Prolec GE
Member	Tauhid Haque	Ansari	Hitachi Energy
Member	Stephen	Antosz	Stephen Antosz & Associates, Inc
Guest	Edmundo	Arevalo	Bonneville Power Administration
Member	Javier	Arteaga	Hitachi Energy
Member	Donald	Ayers	Ayers Transformer Consulting
Guest	Suresh	Babanna	SPX Transformer Solutions, Inc.
Member	Robert	Ballard	DuPont
Member	Gilles	Bargone	FISO Technologies Inc.
Member	Christopher	Baumgartner	We Energies
Member	Barry	Beaster	H-J Family of Companies
Guest	Mats	Bernesjo	Hitachi Energy
Member	Enrique	Betancourt	Prolec GE

Annex K Power Transformers Subcommittee

November 17, 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, November 17, 2021 at 12:55 PM CT. The WebEx attendance record indicated that 91 out of 136 members of the subcommittee were in attendance; a quorum at the meeting was achieved. A total of 231 individuals attended the meeting; 5 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 Spring 2021 meeting minutes. The minutes were approved without objection.

K.3 Chair's Remarks

The Chair noted that his term as Chair of the PTSC expired and that Ryan Musgrove (Oklahoma Gas & Electric) would be assuming the Chair position at the Spring 2022 meeting.

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 roster.

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

This is dealing with the topic of low temperature cold starts for transformers with natural ester. A meeting was held in July in China. The WG has developed a procedure for startup. They are also planning to perform testing which includes inserting fiber optics into the transformer to evaluate temperatures at different loading conditions. These tests will also include DGA samples to verify the results and to detect damage. It has not been determined when a follow-up meeting or the testing will be scheduled.

The complete meeting minutes can be found in Attachment K.4.1.

K.4.2 Revision of C57.125 Guide for Failure Investigation, Documentation, Analysis and Reporting for Power Transformers and Shunt Reactors – H. Sahin

This working group met on Monday. This was the first meeting as a working group. 56 individuals requested and were granted membership. They reviewed the PAR which included a revision to the purpose statement. Several sections of the current document were presented with areas noted as needing updates. A question was raised whether the document applies to field failures only or also to factory test failures. They will consider

looking into this further and no decision was made at the meeting. They are seeking data from manufacturers and end users to help update guidance in the document.

The complete meeting minutes can be found in Attachment K.4.2.

K.4.3 Revision of C57.131 Tap Changers – C. Colopy

The working group met on Monday. A quorum was achieved. A draft and redline version of the document has been posted to the transformers committee website. They are trying to harmonize as much as they can with IEC 60214-1 standard. Since that document was published in 2014, they expect that next revision will be worked on in a couple of years. The working group has added in IEC references including additional info on vacuum tap changers, SF6 tap changers, and voltage regulators. They expect to have a few virtual off schedule meetings before the spring meeting.

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. Major revisions have been made to several sections of the document related to monitoring of load tap changers, DGA, moisture, bushings, and GMD. A new section has been submitted for online transient frequency response monitoring. The PAR expires at the end of 2021, but they did receive a PAR extension until December 2023. They are working towards completing the document by end of 2022. The cutoff date for revisions will be Jan 3, 2022. A motion was made to start a straw ballot after the guide is ready in January which passed.

The complete meeting minutes can be found in Attachment K.4.4.

K.4.5 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. The PAR for this working group expires December 31, 2021. NesCom will meet on December 7, to consider a 2 year PAR extension request. They plan to send the draft document to the WG for review and comment with a goal to have the document approved to go to ballot at the Spring 2022 Committee Meeting. They will likely have some off-cycle virtual meetings to accomplish this.

K.4.6 Task Force on V/Hz Curve – J. Watson

This was the first meeting as a working group. 31 individuals requested and were granted membership. A PAR was granted which does not expire until 2025. They are planning on going through straw ballots before going to ballot in the Fall 2023. They discussed the need to develop a philosophy on the temperature limits for oil and insulating materials and how they will affect the V/Hz curves for each transformer. The general consensus was that the V/Hz curves should document the operating conditions that would cause no damage or accelerated loss-of-life to insulation or other parts of the transformer. The Committee has other Subcommittees and WG's that have done extensive work in these areas. A TF was created to develop the philosophy and to reach out to other groups for guidance.

The complete update can be found in Attachment K.4.6.

K.4.7 Development of PC57.170 Condition Assessment Guide – K. Mani

A pre-draft version of this document has been circulated within the working group. They are actively seeking experts to join the WG.

The complete meeting minutes can be found in Attachment K.4.7.

K.4.8 Revision of C57.116 GSU Transformers – W. Li

This working group met on Monday and achieved a quorum. 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. The WG voted to accept all proposed changes except for changes on

Clause 6, which will be addressed and resubmitted to the WG for review and approval. They plan to finalize their work by Spring 2022 so that the draft may be submitted by the end of 2022.

The complete meeting minutes can be found in Attachment K.4.8.

K.4.9 PAR Study Group for C57.135, Phase Shifting Transformers - E. Schweiger

A PAR study group was formed in last PTSC meeting. They held a meeting virtually last Wednesday with 16 members present. The Power System Relaying and Control Committee asked for harmonization with their standards. There was also a dual logo discussion. An email was sent to all members after the meeting to vote to report back to PTSC with a recommendation to form a WG to revise the document.

Ewald Schweiger then made a motion to recommend to PTSC to form a Working Group to revise C57.135 Phase shifting transformers.

A concern was brought up whether the PAR information would be identical to the existing document. A motion was made by Gary Hoffman to table the current motion until the end of the meeting which was seconded by Dan Sauer.

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 motion to create a working group to revise C57.135 Phase Shifting Transformers was revisited. Ewald Schweiger reviewed the PAR for C57.135. It was noted that title is slightly different, dropping "IEEE" in the title and changing some of the punctuation. A member of Power System Relaying and Control Committee present in the meeting mentioned that one suggested change was to remove protection from the purpose statement since this expertise is in PSRC. It was pointed out that PARs are not required to have a purpose statement. It was suggested that just the title and scope be provided in the new PAR to resolve this issue. Ewald Schweiger made a motion to form a WG based on the existing title and scope in the PAR document. This motion was withdrawn without objection. Ewald Schweiger presented a motion to request the PTSC to approve establishing a PAR based on info presented in PAR document reviewed during the meeting, as recommended by the PAR study group. No second required. During discussion, it was discussed to invite IEC if it will become a dual logo revision. This will need to be considered when developing the PAR. Steven Shull made a motion to move to the question. This was seconded by Dan Sauer. There were no objections to this motion. The motion was approved by unanimous consent.
2. The Chair stated that the following documents will be referenced in an email sent to the PTSC following the meeting, requesting approval for PAR study groups to be formed.
 - a. C57.153 Paralleling Guide – expires 12/31/25
 - b. C57.156 Tank Rupture – expires 12/31/26
 - c. C57.157 Contact Functional Life – expires 12/31/25

K.7 Adjournment

The meeting adjourned at 2:12pm CT.

K.8 Attachments

Attachment K.1 – Attendance

Attachment K.2 – S21 PTSC Agenda

Attachment K 4.1 - PC57.93a Minutes

Attachment K 4.2 – C57.125 Minutes

Attachment K 4.3 – C57.131 Minutes

Attachment K 4.4 – C57.143 Minutes

Attachment K 4.6 – V/HZ Minutes

Attachment K 4.7 – C57.170 Minutes

Attachment K 4.8 – C57.116 Minutes

Attachment K 4.9 – C57.135 Minutes

Role	First Name	Last Name	Company
Member	Gregory	Anderson	GW Anderson & Associates, Inc.
Member	Susan	McNelly	Xcel Energy
Guest	Dennis	Marlow	DenMar TDS Transformers
Member	Bruce	Forsyth	Bruce Forsyth and Associates PLLC
Guest	James	Gardner	SPX Transformer Solutions, Inc.
Guest	Jeff	Benach	Megger
Guest	Thomas	Blackburn	Gene Blackburn Engineering
Member	William	Boettger	Boettger Transformer Consulting LLC
Chair	Bill	Griesacker	Duquesne Light Co.
Member	Joseph	Foldi	Foldi & Associates, Inc.
Member	Joe	Watson	JD Watson and Associates Inc.
Guest	Stephen	Schroeder	Hitachi Energy
Member	Juan	Castellanos	Prolec GE
Guest	Barry	Beaster	H-J Family of Companies
Guest	Larry	Dix	Quality Switch, Inc.
Member	Javier	Arteaga	Hitachi Energy
Member	Eduardo	Garcia Wild	Siemens Energy
Member	Raj	Ahuja	Raj Ahuja Consulting
Guest	Lee	Matthews	Howard Industries
Member	Dinesh	Sankarakurup	Duke Energy
Guest	Ed	teNyenhuis	Hitachi Energy
Guest	Stephen	Jordan	Tennessee Valley Authority
Member	Emilio	Morales-Cruz	Qualitrol Company LLC
Member	Stephen	Antosz	Stephen Antosz & Associates, Inc
Guest	Loren	Wagenaar	WagenTrans Consulting
Member	Donald	Ayers	Ayers Transformer Consulting
Guest	Dieter	Wagner	Hydro One
Member	Ramsis	Girgis	Hitachi Energy
Guest	Ali	Ghafourian	H-J Enterprises, Inc.
Member	Wallace	Binder	WBBinder Consultant
Member	Philip	Hopkinson	HVOLT Inc.
Guest	Paul	Jarman	University of Manchester
Member	Sheldon	Kennedy	Niagara Transformer
Guest	John	Crouse	Roswell Alliance
Member	Axel	Kraemer	Maschinenfabrik Reinhausen
Member	Christopher	Baumgartner	We Energies
Member	Enrique	Betancourt	Prolec GE
Guest	Devki	Sharma	Entergy
Member	Peter	Zhao	Hydro One
Guest	Sanjay	Patel	Smit Transformer
Guest	Gael	Kennedy	GR Kennedy & Associates LLC
Member	Ewald	Schweiger	Siemens Energy
Member	Reto	Fausch	RF Solutions
Member	Craig	Colopy	EATON Corporation

Member	Steven	Schappell	SPX Transformer Solutions, Inc.
Guest	Waldemar	Ziomek	PTI Transformers
Member	Vinay	Mehrotra	SPX Transformer Solutions, Inc.
Member	Eric	Davis	Burns & McDonnell
Member	Paul	Boman	Hartford Steam Boiler
Member	Rogério	Verdolin	Verdolin Solutions Inc.
Member	Gary	Hoffman	Advanced Power Technologies
Member	Scott	Reed	MVA
Guest	James	Mciver	Siemens Energy
Member	Don	Dorris	Nashville Electric Service
Member	Scott	Digby	Duke Energy
Guest	Clemens	Reiss IV	Custom Materials, Inc.
Member	Luiz	Cheim	Hitachi Energy
Guest	Jeremy	Sewell	Quality Switch, Inc.
Member	David	Wallach	Duke Energy
Member	Stephen	Shull	BBC Electrical Services, Inc.
Member	James	Graham	Weidmann Electrical Technology
Member	Roger	Hayes	General Electric
Member	Marcos	Ferreira	Beale AFB
Member	Mike	Spurlock	Spurlock Engineering Services, LLC
Guest	James	McBride	JMX Services, Inc.
Guest	Brian	Sparling	Dynamic Ratings, Inc.
Member	Laszlo	Kadar	Hatch
Guest	George	Frimpong	Hitachi Energy
Member	Donald	Lamontagne	Arizona Public Service Co.
Member	Markus	Stank	Maschinenfabrik Reinhausen
Guest	Alexander	Kraetge	OMICRON electronics Deutschland GmbH
Guest	Peter	Werelius	Megger
Guest	Rodrigo	Ocon	Industrias IEM
Guest	Marco	Espindola	Hitachi Energy
Guest	John	Pruente	SPX Transformer Solutions, Inc.
Guest	Olivier	Lejay	Huaming USA Corp.
Guest	Hakan	Sahin	Virginia/Georgia Transformer
Member	Mark	Tostrud	Dynamic Ratings, Inc.
Member	Zan	Kiparizoski	Howard Industries
Guest	Jose	Gamboa	H-J Family of Companies
Guest	Juan Carlos	Cruz Valdes	Prolec GE
Guest	Ryan	Thompson	Burns & McDonnell
Member	Sanjib	Som	Pennsylvania Transformer
Secretary	Daniel	Blaydon	Baltimore Gas & Electric
Guest	Xose	Lopez-Fernandez	Universidade de Vigo
Member	Daniel	Sauer	EATON Corporation
Guest	Pugal	Selvaraj	Virginia Transformer Corp.
Member	Ajith	Varghese	SPX Transformer Solutions, Inc.
Guest	Kenneth	Skinger	Scituate Consulting, Inc.

Guest	Huan	Dinh	Hitachi Energy
Guest	Harry	Pepe	Phenix Technologies, Inc.
Guest	Mario	Locarno	Doble Engineering Co.
Guest	Jeffrey	Schneider	Power Partners/Spire Power Solutions
Guest	Ali	Naderian	METSCO Energy Solutions Inc.
Member	Ryan	Musgrove	Oklahoma Gas & Electric
Guest	Diego	Robalino	Megger
Guest	Jos	Veens	SMIT Transformatoren B.V.
Guest	Jagdish	Burde	Virginia Transformer Corp
Guest	Roderick	Sauls	Southern Company Services
Member	Parminder	Panesar	Virginia Transformer Corp.
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	Larry	Christodoulou	Electric Power Systems
Guest	John	Poelma	NRG Energy
Guest	Donnell	Rackley	RESA Power
Member	Hugo	Flores	Hitachi Energy
Member	Weijun	Li	Braintree Electric Light Dept.
Member	Adam	Sewell	Quality Switch, Inc.
Member	John	John	Virginia Transformer Corp.
Member	William	Solano	Instrument Transformer Equip Corp
Guest	Ronald	Hernandez	Doble Engineering Co.
Member	Steven	Brzoznowski	Bonneville Power Administration
Guest	Mats	Bernesjo	Hitachi Energy
Guest	Marc	Taylor	JFE Shoji Power Canada Inc.
Member	Elizabeth	Bray	Southern Company Services
Guest	Patrick	Rock	American Transmission Co.
Guest	Paul	Morakinyo	PSEG
Guest	Christopher	Whitten	Hitachi Energy
Guest	Amitabh	Sarkar	Virginia Transformer Corp.
Guest	Alvaro	Portillo	Ing. Alvaro Portillo
Member	Kurt	Kaineder	Siemens Energy
Guest	Robert	Mayer	Siemens Energy
Member	Markus	Schiessl	SGB
Vice-Chair	Alwyn	Van Der Walt	Electrical Consultants, Inc.
Guest	Kevin	Biggie	Weidmann Electrical Technology
Guest	Thomas	Hartmann	Pepco Holdings Inc.
Guest	Christopher	Slattery	FirstEnergy Corp.
Member	Fabian	Stacy	Hitachi Energy
Guest	Toby	Johnson	Hunt Electric
Member	Kristopher	Neild	Megger
Member	Jason	Varnell	Doble Engineering Co.
Guest	Jonathan	Reimer	FortisBC
Member	Ismail	Guner	Hydro-Quebec

Member	Jeffrey	Wright	Duquesne Light Co.
Member	Anthony	Franchitti	PECO Energy Company
Guest	Rashed	Minhaz	Transformer Consulting Services Inc.
Guest	Peter	Sheridan	SGB USA, Inc.
Member	David	Geibel	--
Guest	Michael	Thompson	SEL Engineering Services, Inc.
Member	Hakim	Dulac	Qualitrol Company LLC
Guest	Anand	Zanwar	Siemens Energy
Guest	Michael	Dahlke	Central Moloney, Inc.
Member	Kris	Zibert	Allgeier, Martin and Associates
Member	Attila	Gyore	M&I Materials Ltd
Member	Jorge	Cruz	PTI Transformers
Guest	Zoran	Goncin	PTI Transformers
Member	Niklas	Gustavsson	Hitachi Energy
Guest	Jinesh	Malde	M&I Materials Inc.
Member	Dr. Alexander	Winter	HIGHVOLT Pruftechnik Dresden
Guest	Joshua	Yun	Virginia Transformer Corp.
Guest	Anton	Koshel	Delta Star Inc.
Guest	Trenton	Williams	Advanced Power Technologies
Guest	Philip	Miller	Memphis Light, Gas & Water
Guest	Timothy	Tillery	Howard Industries
Guest	Jeremiah	Bradshaw	Bureau of Reclamation
Member	William	Whitehead	H2scan Corporation
Member	Anastasia	O'Malley	Consolidated Edison Co. of NY
Member	Alan	Sbravati	Cargill, Inc.
Member	Feras	Fattal	Manitoba Hydro
Member	Peter	Kleine	US Army Corps of Engineers
Member	Mickel	Saad	Hitachi Energy
Guest	Malia	Zaman	IEEE
Member	Roger	Fenton	Fenton Solutions
Guest	Cihangir	Sen	Duke Energy
Member	Stacey	Kessler	TC Energy
Member	Daniel	Weyer	Nebraska Public Power District
Member	Janusz	Szczechowski	Maschinenfabrik Reinhausen
Member	Deepak	Kumaria	Applied Materials
Guest	Elise	Arnold	SGB
Member	Ion	Radu	Hitachi Energy
Guest	Drew	Welton	Intellirent
Member	Brad	Staley	Salt River Project
Member	Muhammad Ali Masood	Cheema	Northern Transformer
Member	Dan	Schwartz	Quality Switch, Inc.
Member	Gilles	Bargone	FISO Technologies Inc.
Guest	John	Reagan	RWE Renewables
Guest	Jose Antonio	Gonzalez Ceballos	Georgia Transformer
Member	Bruce	Webb	Knoxville Utilities Board

Guest	Dejan	Vukovic	Hitachi Energy
Member	David	Calitz	Siemens Energy
Member	Darrell	Mangubat	Siemens Energy SAE
Member	Hugh	Waldrop	Memphis Light, Gas & Water
Member	Samraghi	Dutta Roy	Siemens Energy
Member	Dmitriy	Klempner	Southern California Edison
Member	Kyle	Stechschulte	American Electric Power
Guest	Shawn	Gossett	Ameren
Guest	Afshin	Rezaei-Zare	York University
Guest	Jonathan	Sinclair	PPL Electric Utilities
Member	Saramma	Hoffman	PPL Electric Utilities
Member	Matthew	McFadden	Oncor Electric Delivery
Guest	Jeffrey	Door	H-J Family of Companies
Guest	Zachary	Draper	Delta-X Research Inc.
Guest	Tim	Rocque	SPX Transformer Solutions, Inc.
Guest	Stefan	Schindler	Maschinenfabrik Reinhausen
Guest	Raymond	Frazier	Ameren
Guest	Alan	Washburn	Burns & McDonnell
Member	Kayland	Adams	SPX Transformer Solutions, Inc.
Member	Pragnesh	Vyas	Sunbelt-Solomon Solutions
Guest	Anatoliy	Mudryk	Camlin Power
Guest	Edmundo	Arevalo	Bonneville Power Administration
Member	Evgenii	Ermakov	Hitachi Energy
Guest	Brandon	Dent	Memphis Light, Gas & Water
Guest	Andrew	Larison	Hitachi Energy
Guest	Albert	Sanchez	Knoxville Utilities Board
Guest	Balakrishnan	Mani	Virginia Transformer Corp.
Guest	Nabi	Almeida	Prolec GE
Member	Suresh	Babanna	SPX Transformer Solutions, Inc.
Guest	David	Holland	ExxonMobil
Guest	Taylor	Gray	Portland General Electric (PGE)
Guest	Nicholas	Jensen	Delta Star Inc.
Guest	Ryan	Hogg	Bureau of Reclamation
Guest	Michael	Richardson	Ameren
Guest	Kannan	Veeran	Georgia Transformer
Guest	Hampton	Steele	Tennessee Valley Authority
Guest	Juan Alfredo	Carrizales	Prolec GE
Guest	Thomas	Eagle	SPX Transformer Solutions, Inc.
Guest	Josue	Rodriguez	Prolec GE
Guest	Jennie	Aldenlid	Hitachi Energy
Guest	Daniel	Huenger	PCORE Electric
Guest	Sebastian	Rehkopf	Maschinenfabrik Reinhausen
Guest	Nathan	Katz	PacifiCorp
Guest	Sudip	Chanda	Virginia Transformer Corp.
Guest	Matthew	Pinard	Weidmann Electrical Technology

AGENDA

Power Transformers Subcommittee

IEEE PES Transformers Committee

Wednesday, November 17, 2021, 12:55-2:10 PM CST, 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. PAR Study Group for C57.17, Arc Furnace Transformers D. Corsi
 - b. PAR Study Group for C57.93, Installation and Maintenance Guide ... S. Reed
 - c. WG Revision of C57.116, GSU Transformers W. Li
 - d. WG Revision of C57.125, Failure Investigating and Reporting H. Sahin
 - e. WG Revision of C57-131, Tap Changers C. Colopy
 - f. PAR Study Group for C57.135, Phase Shifting Transformers..... E. Schweiger
 - g. WG Revision of C57.143, Monitoring Guide M. Spurlock
 - h. WG Revision of C57.150, Transportation Guide G. Anderson
 - i. WG C57.170, Condition Assessment Guide K. Mani
 - j. PAR Study Group for Transformer Volts per Hertz J. Watson
 - k. PAR Study Group for IEEE 638 Class 1E Xfmrs for Nuclear Stations ... C. Swinderman
 - l. Liaison to PC57.93a – Installation and Maintenance Guide S. Reed
6. Old business
7. New business
8. Adjournment

Working Group for Installation & Maintenance of Power Transformers C57.93a
 9:00 am – 10:40 am
 Chongqing, China
 Thursday, July 22, 2021

Chairman Wei Yao
 Vice Chairman Feipeng Wang
 Secretary Hanbo Zheng

The meeting was called to order at 9:00 am by Chair Wei Yao.

There were 39 members present. A membership quorum was achieved.

Attendees:

1	Wei Yao (chair)	21	Yunpeng Liu
2	Xiaohui Yang	22	Jie Liu
3	Tao Yang	23	Huaqiang Li
4	Ji Wang	24	Guochao Qian
5	Tian Wang	25	Qingdan Huang
6	Xuehuan Li	26	Yihua Qian
7	Wei Wang	27	Qing Wang
8	Hua Yu	28	Zhiqiang Huang
9	Kai Liu	29	Xiaoming Yue
10	Mengzhao Zhu	30	Bo Gao
11	Wei Sun	31	Xianqing Guo
12	Shaigen Han	32	Xingyu Chen
13	Shengwei Cai	33	Xuan Xuan
14	Qian Hong	34	Li Li
15	Feipeng Wang (vice chair)	35	Ruifeng Wang
16	Zhengyong Huang	36	Songjiang Li
17	Jian Hao	37	Ting Hu
18	Hanbo Zheng (secretary)	38	Xianwei Wu
19	Jinhua Han	39	Malia Zaman
20	Tao Zhao		

Agenda

1. Call to order and introduction
2. Approval of the Agenda
3. Call for patents
4. Review the minutes of the kick-off meeting
5. Appointment of WG Officers
6. Appointment of WG vice-chair and secretary
7. Technical Discussion
8. Task Assignment
9. Summary
10. Adjournment

The 2020 Agenda was unanimously approved.

Malia Zaman posted the Patent Claim. No notifications or comments were received.

Chair's Remarks:

Chairman Yao reviewed the minutes of the kick-off meeting. Next, he presented the Meeting Agenda of WG PC57.93a and the candidates for WG vice-chair and secretary. Next, he made a presentation on PC57.93a about properties of natural ester fluid at cold temperatures, including: kinematic viscosity, moisture content, density, and breakdown characteristics change with temperature under low temperature conditions.

Songjiang Li made a speech:

The breakdown characteristics of insulating liquid depends on its water content. It is recommended to measure the low temperature breakdown characteristics of the maximum water content required by the current standard.

Ruifeng Wang made a speech:

According to the maximum moisture content (300 ppm) of natural esters in the current standard, it is recommended to measure the breakdown characteristics of natural esters at this moisture content.

The motion passed unanimously.

Xianqing Guo and Ruifeng Wang introduced the low-temperature cold start test protocol of vegetable transformer oil. Including:

1. No-load and step-by-step loading cold start test for transformers
2. Cold start tests with immediate full load for transformers
3. Routine test of transformers

Yunpeng Liu suggested that in the follow-up test, some optical fiber temperature measurement points can be arranged inside the transformer to judge the change of the internal temperatures.

The motion passed unanimously.

No new business was discussed.

The meeting was adjourned at 10:40 am. The next meeting would be held on October 2021.

Hanbo Zheng, Secretary

Power Transformer Subcommittee

Working Group Report

Document #: C57.125
Document Title: Guide for Failure Investigation, Documentation, Analysis and Reporting for Power Transformers and Shunt Reactors

Chair: Hakan Sahin **Vice-Chair** Thomas Melle
Secretary Adam Sewell **Percent Complete** 0% (first WG meeting)

Current Draft Being Worked On: n/a-first WG meeting **Dated:** n/a

PAR Expiration Date: December 31, 2025

Meeting Date: 15 November 2021 **Time:** 3:45pm CST

Location: Virtual Online Meeting

K.9	Attendance:	K.10	Members	0-first WG meeting
K.11		K.12	Guests	31
K.13		K.14	Guests Requesting Membership	56 (all given membership)
K.15		K.16	Total*	87

* Attendance list for this meeting is shown at end of meeting minutes

Meeting Minutes / Significant Issues / Comments:

Meeting was called to order at 3:45pm CST, November 15, 2021.

1. Administrative

- a. IEEE Patent Policy and Call for Patents
 - i. No comments from group
- b. IEEE SA Copyright Policy
 - i. No comments from group
- c. Introduction of the new officers
 - i. Chair: Hakan Sahin
 - ii. Vice-Chair: Tom Melle
 - iii. Secretary: Adam Sewell
- d. Update on membership since this is first meeting as a working group
 - i. All attendees requesting membership were given membership and quorum was achieved since all members were present.
- e. Approval of Agenda
 - i. No opposition to unanimous approval. APPROVED
- f. Approval of minutes from Sprint 2021 TF- Study Group Meeting

- i. Not needed since this is the first Working Group meeting and previous meeting was Task Force

2. Business

- a. Review the motion which was approved during the spring meeting to advance the PAR to a Working Group, its path forward and the timeline
- b. Discussions on the past motion to revise the purpose statement
 - i. Wallace Binder, Bill Griesacker and Bruce Forsyth commented that the beginning of the purpose statement is already revised and no need to try to revise the purpose again, unless the WG decides to do so later. After the meeting Chair confirmed these comments and corrects his statement that the purpose has already been revised per the previous motion, and the WG will focus on the review and update of the current document as it is stated in the PAR Ballot:

5.5 Need for the Project: Review and update the document as it expires on 12/31/2025.

Change to Need for the Project: Revise, Review and consolidate update two the existing document guides as that it cover expires the on subject of transformer reliability.C57 12/31/2025 . 117 C57.125

- c. Chair's recommendations with group discussions on the sections and clauses that can be reviewed and updated within C57.125
 - i. Expectation from the WG is to review and update the document as it expires on 12/31/2025
 - ii. Chair covered 2 sections related to the flow chart in the existing document that can be updated, and used these as examples to ask members to review the document and point out sections that may need review and update
 - iii. There was a discussion on whether the document applies to field failures only or could be reviewed to adapt to factory acceptance tests. Agreed to keep this document as guide for field failure investigation by the Power Transformers Subcommittee later after the meeting.
 - iv. Chair commented that the data collection from manufacturers and end users would be a critical task due to their confidentiality, however more data and case studies would be very helpful to add better guidance within the document
 - v. Expectation from this WG is to review and update the existing document, hence looking for inputs and volunteers to review the document and send feedback as new business requests

3. New Business

- a. As this was the first WG meeting, Chair asked everyone who wants to be a member and continue the work to view the existing document and email ahead of the next meeting with new sections which may need update
4. Next meeting: TBD at Spring 2022 Transformer Committee Meeting scheduled for March 27-31, 2022 in Denver, Colorado, USA.
5. Close of meeting
- a. Meeting adjourned at 4:45pm CST

Submitted by: Hakan Sahin

Date: 11/19/201

Meeting Attendance:

First Name	Last Name	Affiliation	Role
Raj	Ahuja	Raj Ahuja Consulting	Guest
Tauhid Haque	Ansari	Hitachi Energy	Member
Suresh	Babanna	SPX Transformer Solutions, Inc.	Member
Gilles	Bargone	FISO Technologies Inc.	Guest

First Name	Last Name	Affiliation	Role
Tiffany	Lucas, P.E.	SPX Transformer Solutions, Inc.	Guest
Matthew	McFadden	Oncor Electric Delivery	Member
Aaron	Meyers	EATON Corporation	Guest
Ryan	Musgrove	Oklahoma Gas & Electric	Member

First Name	Last Name	Affiliation	Role
Jared	Bates	Oncor Electric Delivery	Guest
Duvier	Bedoya	Hitachi Energy	Member
Enrique	Betancourt	Prolec GE	Member
Wallace	Binder	WBBinder Consultant	Member
William	Boettger	Boettger Transformer Consulting LLC	Member
Sanket	Bolar	Megger	Member
Michael	Botti	Hyosung HICO	Member
Juan Alfredo	Carrizales	Prolec GE	Guest
Larry	Christodoulou	Electric Power Systems	Guest
Colin	Clark	AltaLink	Member
Craig	Colopy	EATON Corporation	Guest
John	Crouse	Roswell Alliance	Member
Everton	De Oliveira	Siemens Energy	Member
Larry	Dix	Quality Switch, Inc.	Member
Thomas	Eagle	SPX Transformer Solutions, Inc.	Guest
Wayne	Ellis	Memphis Light, Gas & Water	Guest
Marco	Espindola	Hitachi Energy	Member
Edmund	Feloni	CEG Forensics LLC	Member
Bruce	Forsyth	Bruce Forsyth and Associates PLLC	Member
Eduardo	Garcia Wild	Siemens Energy	Member
Rob	Ghosh	General Electric	Member
Bill	Griesacker	Duquesne Light Co.	Member

First Name	Last Name	Affiliation	Role
Ali	Naderian	METSCO Energy Solutions Inc.	Guest
Livia	Neeson	Entergy	Guest
Anastasia	O'Malley	Consolidated Edison Co. of NY	Member
Rajkumar	Padmawar	ASAsoft (Canada) Inc	Guest
Parminder	Panesar	Virginia Transformer Corp.	Member
Sanjay	Patel	Smit Transformer	Member
Matthew	Pinard	Weidmann Electrical Technology	Guest
Lesther Alex	Quispe Cuadrado	EATON Corporation	Member
Kevin	Rapp	Cargill, Inc.	Member
John	Reagan	RWE Renewables	Guest
Diego	Robalino	Megger	Member
Leopoldo	Rodriguez	Transformer Testing Services LLC	Guest
Mickel	Saad	Hitachi Energy	Guest
Hakan	Sahin	Virginia/Georgia Transformer	Chair
Albert	Sanchez	Knoxville Utilities Board	Member
Amitabh	Sarkar	Virginia Transformer Corp.	Member
Roderick	Sauls	Southern Company Services	Member
Anil	Sawant	Virginia Transformer Corp.	Guest
Pugal	Selvaraj	Virginia Transformer Corp.	Member
Adam	Sewell	Quality Switch, Inc.	Secretary
Samuel	Sharpless	Rimkus Consulting Group	Member
Neil	Strongosky	Memphis Light, Gas & Water	Guest

First Name	Last Name	Affiliation	Role
Roger	Grubb	EATON Corporation	Guest
Ismail	Guner	Hydro-Quebec	Guest
Thomas	Hartmann	Pepco Holdings Inc.	Member
Ronald	Hernandez	Doble Engineering Co.	Member
Sergio	Hernandez Cano	Hammond Power Solutions	Member
John	Herron	Raytech USA	Guest
Ryan	Hogg	Bureau of Reclamation	Guest
John	John	Virginia Transformer Corp.	Member
Laszlo	Kadar	Hatch	Member
Gael	Kennedy	GR Kennedy & Associates LLC	Guest
Sheldon	Kennedy	Niagara Transformer	Guest
Stacey	Kessler	TC Energy	Member
Zan	Kiparizoski	Howard Industries	Guest
Axel	Kraemer	Maschinenfabrik Reinhausen	Member
Alexander	Kraetge	OMICRON electronics Deutschland GmbH	Member
Deepak	Kumaria	Applied Materials	Member
Fernando	Leal	Prolec GE	Member
Weijun	Li	Braintree Electric Light Dept.	Member

First Name	Last Name	Affiliation	Role
Janusz	Szczechowski	Maschinenfabrik Reinhausen	Member
Troy	Tanaka	Burns & McDonnell	Member
Marc	Taylor	JFE Shoji Power Canada Inc.	Member
Ed	teNyenhuis	Hitachi Energy	Member
Reza	Torabi Goodarzi	SMIT Transformatoren B.V.	Member
Risto	Trifunoski	Trench Limited	Guest
Jason	Varnell	Doble Engineering Co.	Member
Jos	Veens	SMIT Transformatoren B.V.	Guest
Kannan	Veeran	Georgia Transformer	Guest
Rogério	Verdolin	Verdolin Solutions Inc.	Member
Richard	vonGemmingen	Dominion Energy	Member
Dieter	Wagner	Hydro One	Member
Sukhdev	Walia	New Energy Power Co.	Member
Alan	Washburn	Burns & McDonnell	Member
Bruce	Webb	Knoxville Utilities Board	Guest
Helena	Wilhelm	Vegoor Tecnologia Aplicada	Member
Malia	Zaman	IEEE	Guest

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** 25%

Current Draft Being Worked On: 1.0 **Dated:** November 2021

PAR Expiration Date: December 31, 2024

Meeting Date: 15 November 2021 **Time:** 9:25am-10:40am CST

Location: Virtual Online Meeting

K.17	Attendance:	K.18	Members	<u>22 out of 27</u>
K.19		K.20	Guests	<u>42</u>
K.21		K.22	Guests Requesting Membership	<u>20 (all given membership)</u>
K.23		K.24	Total*	<u>84</u>

* Attendance list for this meeting is shown at end of meeting minutes

Meeting Minutes / Significant Issues / Comments:

6. Meeting was called to order at 9:25am CST, November 15, 2021.
7. Opening of meeting and officer introductions.
 - a. Chair-Craig Colopy-EATON Corporation, Vice Chair-Axel Kraemer-Maschinenfabrik Reinhausen, Secretary-Adam Sewell-Quality Switch, Inc.
8. Call for patent disclosure
 - a. No comments made from attendees
9. Chair remarks
 - 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 since it expires at end of 2022.
 - b. Draft 1.0 and Redline version were posted on Transformer Committee-Power Subcommittee website Nov 8, 2021.
 - c. Plan to have virtual meeting(s) before next Transformer Committee meeting.
10. Quorum Check - Poll - Request for Members
 - a. 27 members before meeting in working group - quorum is at least 14 members...22 members were in attendance (18 answered quorum poll which was enough)

- b. 20 Guests requesting membership were done in chat and given membership

11. Approval of Agenda

- a. Motion – D. Geibel, 2nd-A.Kraemer. No opposition to unanimous approval. APPROVED

12. Approval of minutes from Sprint 2021 Virtual Meeting

- a. Motion – L.Dix, 2nd-D.Geibel. No opposition to unanimous approval. APPROVED

13. Discussion on Draft 1.0

- a. Current C57.131-2012 expires in 2022
- b. Harmonize existing C57.131-2012 with IEC standard 60214-1 Ed. 2.0. May 2014
- c. Addition of IEC references, vacuum tap-changers, SF₆ tap-changers, and voltage regulators
- d. Concern of IEC referenced standards in the draft.
 - i. Chair to check if referenced IEC standards would be available to WG members for review.
 - ii. A. Kraemer proposed to use a similar paragraph as §4 of 60214-2 in C57.131 saying that the document can be used with IEC or IEEE references but that they shall not be mixed

14. Next meeting: TBD at Spring 2022 Transformer Committee Meeting scheduled for March 27-31, 2022 in Denver, Colorado, USA.

- a. May have virtual meeting before Spring 2022 Transformer Committee Meeting organized by chair.

15. Close of meeting

- a. Meeting adjourned at 10:15am CST. Motion – L. Dix, 2nd – A. Kraemer. No opposition to unanimous approval. ADJOURNED.

Submitted by: Craig A. Colopy

Date: _____

Meeting Attendance:

Last Name	First Name	Company	Role
Adams	Kayland	SPX Transformer Solutions, Inc.	Guest
Aldenlid	Jennie	Hitachi Energy	Member
Ali	Rehan	Siemens Energy	Guest
Arevalo	Edmundo	Bonneville Power Administration	Guest
Bartek	Allan	Spruce Run Engineering LLC	Member
Behrens	Tammy	SPX Transformer Solutions, Inc.	Guest
Blaszczyk	Piotr	Specialty Transformer Components LLC	Member
Boettger	William	Boettger Transformer Consulting LLC	Guest
Buchgeher	Erich	Siemens Energy	Guest
Burde	Jagdish	Virginia Transformer Corp	Member

Last Name	First Name	Company	Role
Munoz Molina	Martin	Orto de Mexico	Member
Neild	Kristopher	Megger	Member
Patel	Sanjay	Smit Transformer	Guest
Pitts	Chris	Howard Industries	Guest
Polson	Adam	Arizona Public Service Co.	Guest
Pruente	John	SPX Transformer Solutions, Inc.	Member
Raymond	Timothy	Electric Power Research Institute (EPRI)	Member
Rehkopf	Sebastian	Maschinenfabrik Reinhausen	Guest
Richardson	Michael	Ameren	Guest
Rocque	Tim	SPX Transformer Solutions, Inc.	Guest

Last Name	First Name	Company	Role
Calitz	David	Siemens Energy	Member
Carrizales	Juan Alfredo	Prolec GE	Guest
Castellanos	Juan	Prolec GE	Guest
Colopy	Craig	EATON Corporation	Chair
Cruz Valdes	Juan Carlos	Prolec GE	Member
Dauzat	Thomas	General Electric	Member
Dent	Brandon	Memphis Light, Gas & Water	Guest
Dix	Larry	Quality Switch, Inc.	Member
Ellis	Wayne	Memphis Light, Gas & Water	Guest
Ember Baciú	Daniela	Hydro-Quebec IREQ	Guest
Fausch	Reto	RF Solutions	Guest
Ferreira	Marcos	Beale AFB	Member
Flores	Hugo	Hitachi Energy	Member
Foldi	Joseph	Foldi & Associates, Inc.	Guest
Franchitti	Anthony	PECO Energy Company	Member
Frotscher	Rainer	Maschinenfabrik Reinhausen	Guest
Ganser	Robert	Transformer Consulting Services, Co.	Guest
Garcia Wild	Eduardo	Siemens Energy	Guest
Geibel	David	--	Member
Griesacker	Bill	Duquesne Light Co.	Member
Gustavsson	Niklas	Hitachi Energy	Member
Gyore	Attila	M&I Materials Ltd	Member
Hartmann	Thomas	Pepco Holdings Inc.	Guest

Last Name	First Name	Company	Role
Sauls	Roderick	Southern Company Services	Guest
Schindler	Stefan	Maschinenfabrik Reinhausen	Member
Schleismann	Eric	Southern Company Services	Member
Schwartz	Dan	Quality Switch, Inc.	Member
Sen	Cihangir	Duke Energy	Guest
Sewell	Adam	Quality Switch, Inc.	Secretary
Sewell	Jeremy	Quality Switch, Inc.	Member
Sheridan	Peter	SGB USA, Inc.	Guest
Som	Sanjib	Pennsylvania Transformer	Member
Sparling	Brian	Dynamic Ratings, Inc.	Member
Stacy	Fabian	Hitachi Energy	Member
Stank	Markus	Maschinenfabrik Reinhausen	Member
Stechschulte	Kyle	American Electric Power	Member
Steele	Hampton	Tennessee Valley Authority	Guest
Szczechowski	Janusz	Maschinenfabrik Reinhausen	Guest
Tanaka	Troy	Burns & McDonnell	Guest
Tillery	Timothy	Howard Industries	Member
Torabi Goodarzi	Reza	SMIT Transformatoren B.V.	Guest
Van Dreel	Cole	American Transmission Co.	Guest
Varnell	Jason	Doble Engineering Co.	Guest
Vedante	Kiran	Ritz Instrument Transformers	Member
Vijayan	Krishnamurthy	PTI Transformers	Guest
Wagner	Dieter	Hydro One	Guest

Last Name	First Name	Company	Role
Hernandez	Ronald	Doble Engineering Co.	Guest
Jensen	Nicholas	Delta Star Inc.	Guest
John	John	Virginia Transformer Corp.	Guest
Kadar	Laszlo	Hatch	Guest
Kennedy	Gael	GR Kennedy & Associates LLC	Guest
Kleine	Peter	US Army Corps of Engineers	Member
Kraemer	Axel	Maschinenfabrik Reinhausen	Vice-Chair
Lejay	Olivier	Huaming USA Corp.	Member
Millard	Zachary	Great River Energy	Guest

Last Name	First Name	Company	Role
Waldrop	Hugh	Memphis Light, Gas & Water	Member
Washburn	Alan	Burns & McDonnell	Member
Whitehead	William	H2scan Corporation	Member
Whitten	Christopher	Hitachi Energy	Member
Yang	Baitun	R.E. Uptegraff	Guest
Yule	Kipp	Bechtel	Guest
Yun	Joshua	Virginia Transformer Corp.	Member
Zanwar	Anand	Siemens Energy	Member
Zhao	Peter	Hydro One	Member

C57.143 – IEEE Guide for Transformer Monitoring**Monday, November 22, 2021****Virtual Meeting****Minutes of WG Meeting**

The meeting was called to order at 2:20 PM by Chair Mike Spurlock. Secretary Elizabeth Bray (writer of Minutes) was also present. Vice-Chair Poorvi Patel was not present.

There were 70 of 117 members present. There were 60 guests, and 0 guests requesting membership. A membership quorum was achieved. The attendance for this meeting was as follows:

- Number of Members in Activity = 117
- Number of Members Present = 70
- Percentage of Members Present = 60%
- Number of attendees = 130
- Attendees requesting Membership = 0

List of Meeting Attendees is provided below.

Last Name	First Name	Association	
Bargone	Gilles	FISO Technologies Inc.	Member
Bates	Jared	Oncor Electric Delivery	Guest
Benach	Jeff	Megger	Guest
Boettger	William	Boettger Transformer Consulting LLC	Member
Boman	Paul	Hartford Steam Boiler	Member
Bradshaw	Jeremiah	Bureau of Reclamation	Member
Brauer	Stephan	Morgan Schaffer	Member
Bray	Elizabeth	Southern Company Services	Secretary
Buchgeher	Erich	Siemens Energy	Guest
Burde	Jagdish	Virginia Transformer Corp	Guest
Calitz	David	Siemens Energy	Member
Castellanos	Juan	Prolec GE	Guest
Cheim	Luiz	Hitachi Energy	Member
Christodoulou	Larry	Electric Power Systems	Member
Clark	Colin	AltaLink	Guest
Craven	Michael	Phoenix Engineering Services	Guest
Crouse	John	Roswell Alliance	Member
Das	Bhaba	Hitachi Energy	Guest
Dauzat	Thomas	General Electric	Guest
Dent	Brandon	Memphis Light, Gas & Water	Guest
Denzer	Stephanie	Alliant Energy	Member
Doak	Eric	D4EnergySolutions LLC	Guest
Draper	Zachary	Delta-X Research Inc.	Guest
Dukarm	James	Delta-X Research Inc.	Member
Dulac	Hakim	Qualitrol Company LLC	Member
Dutta Roy	Samraghi	Siemens Energy	Guest
Ellis	Wayne	Memphis Light, Gas & Water	Guest
Ermakov	Evgenii	Hitachi Energy	Guest
Espindola	Marco	Hitachi Energy	Member
Fattal	Feras	Manitoba Hydro	Guest

Fazlic	Zlatan	Camlin Power	Member
Fenton	Roger	Fenton Solutions	Member
Field	Norman	Stantec	Guest
Frimpong	George	Hitachi Energy	Member
Gara	Lorne	Shermco	Member
Gardner	James	SPX Transformer Solutions, Inc.	Member
Griesacker	Bill	Duquesne Light Co.	Member
Gross	Detlev	Power Diagnostix Consult GmbH	Member
Guner	Ismail	Hydro-Quebec	Member
Gustavsson	Niklas	Hitachi Energy	Member
Harley	John	FirstPower Group LLC	Member
Hartmann	Thomas	Pepco Holdings Inc.	Member
Hayes	Roger	General Electric	Member
Heiden	Kyle	EATON Corporation	Member
Hernandez	Ronald	Doble Engineering Co.	Guest
Hoffman	Gary	Advanced Power Technologies	Member
Hoffman	Saramma	PPL Electric Utilities	Member
Holland	David	ExxonMobil	Guest
Jarman	Paul	University of Manchester	Member
Kadar	Laszlo	Hatch	Guest
Karas	Jon	SDMyers, LLC.	Member
Katz	Nathan	PacifiCorp	Guest
Kessler	Stacey	TC Energy	Member
Klempner	Dmitriy	Southern California Edison	Member
Kraemer	Axel	Maschinenfabrik Reinhausen	Member
Kulasek	Krzysztof	Hitachi Energy	Member
Kumaria	Deepak	Applied Materials	Guest
Lamontagne	Donald	Arizona Public Service Co.	Member
Larochelle	David	NDB Technologies	Member
Lejay	Olivier	Huaming USA Corp.	Guest
Lopez-Fernandez	Xose	Universidade de Vigo	Member
Mangubat	Darrell	Siemens Energy SAE	Member
Mani	Balakrishnan	Virginia Transformer Corp.	Member
Martin	Terence	MarVen	Member
Martinez	Rogelio	Georgia Transformer	Guest
Mayer	Robert	Siemens Energy	Member
McBride	James	JMX Services, Inc.	Member
McFadden	Matthew	Oncor Electric Delivery	Guest
Miller	Philip	Memphis Light, Gas & Water	Guest
Minhaz	Rashed	Transformer Consulting Services Inc.	Guest
Moleski	Hali	SDMyers, LLC.	Guest
Morales-Cruz	Emilio	Qualitrol Company LLC	Member
Mudryk	Anatoliy	Camlin Power	Member
Munoz Molina	Martin	Orto de Mexico	Member
Naderian	Ali	METSCO Energy Solutions Inc.	Guest
Neeson	Livia	Entergy	Guest
Nunez	Arturo	Mistras Group, Inc.	Member
O'Malley	Anastasia	Consolidated Edison Co. of NY	Member
Panesar	Parminder	Virginia Transformer Corp.	Guest
Patel	Vinay	Consolidated Edison Co. of NY	Guest
Pattabi	Pranav	METSCO Energy Solutions Inc.	Guest

Peterson	Timothy	N. American Substation Services	Guest
Pinard	Matthew	Weidmann Electrical Technology	Guest
Poelma	John	NRG Energy	Guest
Polson	Adam	Arizona Public Service Co.	Guest
Portillo	Alvaro	Ing. Alvaro Portillo	Guest
Portillo	Homero	Advanced Power Technologies	Guest
Pruente	John	SPX Transformer Solutions, Inc.	Member
Rackley	Donnie	RESA Power	Guest
Ray	Jeffrey	JLR Consulting, Inc.	Guest
Reed	Scott	MVA	Member
Rehkopf	Sebastian	Maschinenfabrik Reinhausen	Guest
Reimer	Jonathan	FortisBC	Guest
Richardson	Michael	Ameren	Guest
Robalino	Diego	Megger	Guest
Rocque	Tim	SPX Transformer Solutions, Inc.	Guest
Rodriguez	Josue	Prolec GE	Guest
Roizman	Oleg	IntellPower Pty Ltd	Member
Saad	Mickel	Hitachi Energy	Member
Schindler	Stefan	Maschinenfabrik Reinhausen	Guest
Selvaraj	Pugal	Virginia Transformer Corp.	Guest
Simonov	Igor	Toronto Hydro	Guest
Sinclair	John	PPL Electric Utilities	Member
Soeller	Markus	Power Diagnostix	Guest
Soto	Mauricio	Hitachi Energy	Member
Spoone	Travis	EATON Corporation	Member
Spurlock	Mike	Spurlock Engineering Services, LLC	Chair
Stechschulte	Kyle	American Electric Power	Member
Stretch	Kerwin	Siemens Energy	Guest
Su	Paul	FM Global	Member
Swanson McLeod	Katrina	Southern Nuclear	Guest
Sweetser	Charles	OMICRON electronics Corp USA	Member
Szczechowski	Janusz	Maschinenfabrik Reinhausen	Member
Thompson	James	T&R Service Company	Guest
Thompson	Ryan	Burns & McDonnell	Member
Tostrud	Mark	Dynamic Ratings, Inc.	Member
Trifunowski	Risto	Trench Limited	Guest
Van Der Walt	Alwyn	Electrical Consultants, Inc.	Guest
Veens	Jos	SMIT Transformatoren B.V.	Guest
Wagner	Dieter	Hydro One	Guest
Waldrop	Hugh	Memphis Light, Gas & Water	Member
Walia	Sukhdev	New Energy Power Co.	Member
Warntjes	Michael	American Transmission Co.	Guest
Watson	Joe	JD Watson and Associates Inc.	Member
Welton	Drew	Intellirent	Member
Werelius	Peter	Megger	Guest
Whitehead	William	H2scan Corporation	Member
Williams	Trent	Advanced Power Technologies	Member
Wright	Jeffrey	Duquesne Light Co.	Member
Yazdani	Mana	Trench Limited	Member

The WG plans to meet at the Spring 2022 Meeting.

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. Approval of Spring 2021 Virtual Meeting Meetings
9. Approval of June 28, 2021 Virtual Meeting Minutes
10. 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) – Emilio 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 7 Cost Benefits) – Elizabeth Bray
 - g. Appendix
11. Status of PAR Extension Request
12. New Business

Chair Mike Spurlock asked if a call for patents disclosure was made and no patent claims were reported. Letters of assurance were received the week before the meeting from two claimants.

Chair Mike Spurlock reviewed the IEEE Copyright policy.

One new member was welcomed into the Working Group, bringing the total members to 117.

Chair Mike Spurlock mentioned the good progress with major revisions to the guide such as section 5.5 – Load Tap Changers, Section 5.8 – Dissolved Gas monitoring, Section 5.9 – Moisture monitoring, Section 5.10 – Bushing monitoring, and Section 5.12 – Geomagnetic Induced Current monitoring. Also, the cut-off for revisions is January 3, 2022. Additional content underway is in the voltage and current section and Jim McBride reported the initial draft of Section 5.13 – On-line Frequency Response monitoring as also been submitted. The goal will be for a ballot Spring 2022.

The Fall 2021 Agenda, Spring 2021 Minutes, and June 28, 2021 minutes were unanimously approved.

Five of the six task force chairs reported status to date.

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.

Task Force 2 - Chair: Poorvi Patel – presented by Mike Spurlock

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)

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)

Task Force 5 - Chair: Zlatan Fazlic Chapter 6 (Communications)

Brian & Zlatan are working on this alone and ask for anyone 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 stated that the IEEE SA Standards Board approved the PAR extension on May 21,2021. The new PAR expiration date is December 31, 2023.

Progress of the draft C57.143 Guide is on the IEEE Transformer Committee website. Several attendees stated issues with accessing the documents. This has been noted and will be investigated.

The call for any new business brought a motion to initiate a straw ballot after the Guide is ready in January was made by Gary Hoffman and seconded by Drew Welton. The motion passed with unanimous approval.

There was no other new business.

A motion to adjourn was made by Emilio Morales and seconded by Detlev Gross. The motion passed with unanimous approval. The meeting adjourned at 3:15pm.

Meeting Minutes**PC57.107 WG****Recommended Practice for Developing Design Specific Operational Limits for Transformers Connected to Generators or Power Systems Subject to Significant Short-term Changes in Voltage and/or Frequency****Tuesday, November 16, 2021, 12:55-2:10 PM (Central Standard Time)****Joe Watson – Chair, Ramsis Girgis - Vice Chair, Secretary – Drew Welton**

The WG met for the first time on Tuesday, November 16th at 12:55 PM CST. We had 63 attendees. 31 of the attendees requested, and were granted, membership.

A quorum of 100% was in effect since this was our first meeting, but no motions were made or voted on.

No Patent of Copyright issues were raised.

We discussed the project schedule:

- Fall 2021 - Appoint TF's for content and prepare a Draft 1 for Spring 2022
- Spring 2022 – Reports from TF's and prepare a Draft 2 for Fall 2022
- Fall 2022 – Review Draft 2, revise if needed and hold Straw Ballot #1 before Fall 2023 meeting
- Spring 2023 – Revise per Straw Ballot comments, discuss and issue Straw Ballot #2 and resolve any comments
- Fall 2023 – WG approval and send to Power Transformers SC with recommendation to ballot

The WG reviewed Draft 0 which is the Standard Template with the title, scope and purpose added, plus section headers and some text from the work of the V/Hz TF that led to this WG.

The title was discussed with thoughts of revising it for clarity and brevity, but no consensus was reached. We agreed that members could forward recommendations to the Chair and we could discuss them and possibly vote on any recommended changes at the next meeting. This would require a PAR revision.

Draft 0 has a Section 4.2 titled Causes of short term overexcitation of power transformers, and a Section 4.4 titled Relay practices. A TF was formed to prepare text for these two sections. The TF members are:

- Drew Weldon
- Kipp Yule
- Bruce Webb
- Ryan Hogg

Draft 0 also has a Section 4.4 titled Existing short term overexcitation curves. We decided to move this section to an Annex and add a brief paragraph on the subject to Section 4.1. Ramsis Girgis agreed to write this text.

Draft 0 also has a Section 6 titled Recommended short time temperature limits for metallic parts and insulating materials. While all insulating materials have thermal ratings, these are typically for continuous conditions and not for short-time durations in the 10's of seconds, where higher temperatures may not deteriorate the materials. We discussed the need to develop a philosophy on the temperature limits for oil and insulating materials and how they will affect the V/Hz curves for each transformer. The general consensus was that the V/Hz curves should document the operating conditions that would cause no damage or accelerated loss-of-life to insulation or other parts of the transformer. The Committee has other Subcommittees and WG's that have done extensive work in these areas and we need to be consistent with these other groups. A TF was created to develop the philosophy and to reach out to other groups for guidance. The TF members are:

- Joe Watson
- Jagdish Burde
- Sanjay Patel

Additional sections of the document will be developed after these sections have been drafted, including the Definitions, Acronyms, References and Section 4.2 currently titled Impact of short term overexcitation on power transformers.

The Chair agreed to send out Draft 0 to all of the attendees once the attendance is entered into AMS. We will also post Draft 0 on the Transformer Committee website under the Power Transformers page.

We will meet again in Spring 2022, and if we meet in-person we should have a room that will hold approximately 75 people.

The meeting adjourned on-time at 2:10PM.

The attendees are listed below.

Status	Name	Affiliation
Member	Amitabh Sarkar	VA Transformer
Guest	Anton Koshel	Delta-Star
Member	Antonio Ceballos	Georgia Transformer
Guest	Axel Kraemer	Reinhausen
Member	Balakrishnan Mani	VA Transformer
Member	Bruce Webb KUB	Knoxville Utiities Board
Member	David Murray	Tennessee Valley Authority
Guest	David Walker	MGM Transformers
Guest	Deepak Kumaria	Applied Materials
Secretary	Drew Welton	Intellirent
Member	Ed teNyenhuis	Hitachi Powergrids
Member	Eduardo Garcia	Siemens Energy
Guest	Eduardo Tolcachir	TTE
Member	Egon Kirchenmayer	Siemens Energy
Guest	Emilio Morales-Cruz	Qualitrol
Guest	Fabian "Durand" Stacy	Hitachi Energy
Member	Huan Dinh	Hitachi Energy
Guest	Ion Radu	Hitachi Energy
Member	Jagdish Burde	VA Transformer
Guest	Jeff Gragert	XCEL Energy
Guest	Jeff Ray	JLR Consulting
Guest	Jeffrey Wright	Duquesne Light
Chair	Joe Watson	JD Watson and Associates
Member	John K John	VA Transformer
Guest	JOHN POELMA	NRG
Guest	Jos Veens	SGB-Smit
Guest	Juan Alfredo Carrizales Baaldua	Prolec/GE
Member	Juan Carlos Cruz Valdes	Prolec/GE
Guest	Kannan Veeran, GA Transformer	Georgia Transformer
Member	Kayland Adams SPX Transformers	SPX
Member	Kipp Yule	Bechtel
Member	Kiran Vedante	Ritz Instrument Transformers
Guest	Larry Dix	Quality Switch
Member	László Kádár	Hatch
Guest	Livia Neeson	Entergy
Guest	Lorne Gara	Shermco
Guest	Mana Yazdani	Trench
Guest	Martin Muñoz	Orto
Member	Mats Bernesjo	Hitachi Powergrids
Guest	Mcfadden, Matthew	Oncor
Guest	Muhammad Ali Masood Cheema	Northern Transformer
Member	Nicholas Jensen - Delta Star	Delta-Star
Guest	Olle Benzler	Megger
Guest	Orlando Giraldo	H-J
Member	Peter Kleine	US Army Corps of Engineers
Co-Chair	Ramsis Girgis	Hitachi Energy
Member	Reza Torabi	SGB-Smit

Member	Richard von Gemmingen	Dominion Energy
Guest	Rob Ghosh	Power System Asset Mgmt Solutions
Guest	Rodrigo Ocon	Condumex
Guest	Roger Hayes	GE
Member	Ronnie Minhaz	TC Services
Member	Ryan Hogg	Bureau of Reclamation
Member	Sanjay Y. Patel	Royal Smit Transformers
Guest	Stefan Schindler	Reinhausen
Member	Sudip Chanda	VA Transformer
Member	Suleman Khan	OPG
Guest	Suresh Babanna	SPX
Guest	Taylor Gray	PG&E
Member	Thomas Hartmann	Pepco Holdings
Member	Waldemar Ziomek	PTI Transformers
Guest	William Boettger	Boettget Transformer Consulting
Guest	XOSE M LOPEZ-FERNANDEZ	Universidade de Vigo

Working Group for Condition Assessment Guide
PC57.170
Tuesday, November 16, 2021
08:00 – 9:15 AM
Virtual Meeting

Acting Chairman: James Cross (interim, replacing Kumar Mani)
Vice Chair: James Cross
Acting Secretary: Alan Sbravati (interim, replacing Akash Joshi)

The meeting was called to order at 8:00 am CST by Chair.

There were 38 of 84 voting members present. There were 53 guests. A membership quorum was not achieved.

Attendance list:

Jams Cross - Acting Chair
Alan Sbravati - Acting Secretary

AGENDA

- A. Welcome & Introduction
- B. Attendance and Establishment of Quorum- the meeting attendance will be recorded by the Online Conference Call Coordinator.
- C. Call for Patent Disclosure
- D. IEEE Copyright Policy
- E. Approval of Spring 2021 Minutes
- F. Working Group Activities
 - 1. Task Force 1 Presentation by Luiz Cheim
 - 2. Task Force 2 Presentation by Saramma Hoffman
 - 3. Task Force 3 Presentation by Jonathan Sinclair
 - 4. Task Force 4 Presentation by Alan Sbravati
- G. Discussion on individual Task Force presentations will be held at the end of all presentations.
- H. Other Items
- I. Adjournment

The agenda of the meeting was presented by the chair.

Chairman posted the Patent Claim. No claims were made.

Chairman presented the copyright policy slides.

Call of members was performed twice as there seemed to be confusion about the alphabetical member listing on the PPT and quorum was not achieved. (Note: For future meetings the member list should be in alphabetical order by LAST name, spread over as many slides as necessary.)

Several attendees requested membership in the WG (recorded in the meeting chat).

Presentations of the task force activities

TF 1 – Luiz Cheim

- The task force has been working mostly on chapter one, starting chapter 2 now.
- Great participation and attendance to the conference calls, but two sub-task force leaders are missing.
- Members of other task forces may volunteer to be a sub-task force leader. Some names were presented in the chat and will be contacted by the TF leader.
- The current draft was briefly presented.

TF 2 – Saramma Hoffmann

- The task force has been working mostly on chapters 3, 4 and 5.
- Great participation and attendance to the conference calls.
- Requesting additional contributors, for the chapters are quite long.

- Highlighted the several interface points between chapter 5, covering the failure modes for core and coils and chapter 9, for insulating liquid.

TF 3 – John Sinclair

- The task force has been working mostly on chapters 6, 7 and 8.
- Great participation and attendance to the conference calls.
- Did relevant progress, but missing experts in specific topics, such as cable boxes.

TF 4 – Alan Sbravati

- The task force has been working mostly on chapters 9 and Annexes A and B.
- The Annex A will not be included, as the reference for limits is the IEEE C57.166
- Annex B was transferred to TF 1.
- Great participation and attendance to the conference calls, allowing the chapter on insulating liquids to be concluded.
- Main topics in this chapter are the failure modes of the insulating liquid, not the situations where the liquid works as a message transmitter.
- Comments from the WG were requested.
- The chapter will be a reference to IEEE Std. 637, for the sake of avoiding repetition.
- TF was discontinued

TF 5 – Stephanie Denzer

- All current drafts were combined in a single document.
- This is not yet a “first draft”. It is being called a pre-draft.

Additional discussions:

- Transformer criticality is an important topic. Toby offered to help with his experience
- The analysis cannot include dollar figures, economic assessment. Suggestion to use letters instead of monetary values in the examples.
- The Cigre document proposed the use of 6 statuses, being 1-5 for different levels of degradation and 6 the trigger for de-energizing as soon as possible. Colors and letters are associated with each level.
- Different suggestions were presented:
 - o Using numbers for differentiation
 - o Reducing the categories from 5+1 to only 3
- There are different strategies for combining the individual assessment results into a single health index. This is the content of the Annex B of the Cigre brochure, which is now incorporated in the TF 1.

- Being this a guide, it should not indicate a method to be used. Presenting pros / cons of the different methodologies is a very important aspect.

New Business: No new business.

The transformer committee chair congratulated the group for being able to put together this document in such a short period of time.

The meeting was adjourned at 9:12 am CST.

Alan Sbravati, Interim Secretary
James Cross, Vice Chair / Interim Chair

ATTENDANCE ROSTER

First Name	Last Name		Affiliation	Request Membership
Javier	Arteaga		Hitachi Energy	
Suresh	Babanna		SPX transformers	X
Barry	Beaster		The H-J Family of Companies	
Enrique	Betancourt		Prolec GE	X
William	Boettger		Boettger Transformer Consulting LLC	
Paul	Boman		Hartford Steam Boiler	
Jeremiah	Bradshaw			
Jagdish	Burde		Virginia Transformer Corp.	X
Luiz	Cheim		Hitachi Energy	
James	Cross		Kinectrics Inc.	
Eric	Davis		Burns & McDonnell	
Stephanie	Denzer		Alliant Energy	
Eric	Doak		D4EnergySolutions	
Hakim	Dulac		Qualitrol	
Wayne	Ellis		Memphis Light, Gas and Water	

Evgenii	Ermakov		Hitachi Energy	
Marco	Espindola		Hitachi Energy	X
Roger	Fenton		Fenton Solutions	
Norman	Field		Stantec	
Bruce	Forsyth		Bruce Forsyth and Associates PLLC	
Eduardo	Garcia		Siemens Energy	
James	Graham		Weidmann Electrical Technology	
Bill	Griesacker		Duquesne Light	
Ismail	Guner		Hydro Quebec	X
Niklas	Gustavsson		Hitachi Energy, Sweden	X
Attila	Gyore		M&I Materials	
Thomas	Hartmann		Pepco Holdings Inc	
Saramma	Hoffman		PPL	
Paul	Jarman		University of Manchester	
Toby	Johnson		Hunt Electric	
Jon	Karas		SDMyers	
Gael	Kennedy		GR Kennedy & Associates LLC	
Peter	Kleine		U.S. Army Corps of Engineers	
Axel	Kraemer		Reinhausen Germany	
Alexander	Kraetge		OMICRON, Germany	
John	Lackey		PowerNex Associates Inc.	
Don	Lamontagne		Arizona Public Service	
Weijun	Li		Braintree Electric Light Department	X
Jinesh	Malde		M&I Materials	
Robert	Mayer		Siemens-Energy	
Emilio	Morales Cruz		Qualitrol	
David	Murray		TVA	
Tim	Peterson		Nomos Systems / North American Substation Services	
Patrick	Picher		Hydro-Québec	
Matt	Pinard		Weidmann Electrical Technology Inc.	
Paulette Payne	Powell			
Tim	Raymond		EPRI	
Scott	Reed		MVA	

Oleg	Roizman			X
Samraghi Dutta	Roy		Siemens Energy	
Mickel	Saad		Hitachi Energy	
Amitabh	Sarkar		Virginia Transformer Corp.	
Alan	Sbravati		Cargill	
Ewald	Schweiger		Siemens Energy	
Devki	Sharma		Entergy	
Hemchandra	Shertukde		University of Hartford	
Jonathan	Sinclair		PPL Electric Utilities	X
Mauricio	Soto		Hitachi Energy	X
Brad	Staley		Salt River Project	
Janusz	Szczechowski		Maschinenfabrik Reinhausen GmbH, Germany	
Troy	Tanaka		Burns & McDonnell	
Marc	Taylor		JFE Shoji Canada	
Ed	teNyenhuis		Hitachi Energy	
Jason	Varnell		Doble Engineering	X
Rogério	Verdolin		Verdolin Solutions Inc.	
Richard	von Gemmingen		Dominion Energy	
Sukhdev	Walia		New Energy Power LLC	
Alan	Washburn		Burns & McDonnell	
Joe	Watson		JD Watson and Associates	
Drew	Welton		Intellirent	
William "Bill"	Whitehead		H2scan	
Trenton	Williams		Advanced Power Technologies	
Jeffrey	Wright		Duquesne Light	

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 11/15/2021 at 10:50 a.m. via Webex. A total of 66 attendees participated in the meeting. 19 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 which was granted after checking attendance records.

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 discussed the PAR timeline. The PAR was approved on 11/7/2019 and is valid until the end of 2023.

The meeting agenda was approved by unanimous consent. The meeting minutes from the previous meeting held on April 26, 2021 were also approved by unanimous consent.

Task Force reports:

Task Force #1 (sections 3, 4, 5, 9, 10, 11) – Shankar Nambi, Chair:

Since presenting the initial proposed changes at the Spring 2021 meeting, the TF has suggested 2 additional changes: adding C57.19.04 to Section 2 as a reference and updating the new paragraph in Section 11. A motion to accept the proposed changes was made by Toby Johnson and seconded by John K. John. The motion was approved by unanimous consent.

Task Force #2 (section 6) – Toby Johnson, Chair:

The TF chair reviewed the proposed changes to the document, most of the changes were made for clarification purposes. It was noted that a few clarifications are still needed. One focus is to review a

recommendation by Jason Varnell regarding the wording for voltage ratings in Subclause 6.3.1. The reference to “risk” will be addressed, to be in line with IEEE preference.

Task Force #3 (sections 7, 8) – Kayland Adams, Chair:

The changes to the document were reviewed. A motion to accept the proposed changes was made by Kayland Adams and seconded by Toby Johnson. The motion was approved by unanimous consent.

Task Force #4 (new Annex A – Considerations for Specifying GSUs):

The new annex was reviewed by the working group. A motion to accept the new annex was made by Suresh Babanna and seconded by Joe Watson. The motion was approved by unanimous consent.

Task Force #5 (new Annex B – V/Hz) – Joe Watson, Chair:

The new annex was reviewed by the working group. Figure 1 in the new annex will become new Figure B.1. A motion to accept the new annex was made by Suresh Babanna and seconded by Joe Watson. The motion was approved by unanimous consent.

Updates to Figures 1, 7, 17, 18:

The updated figures were reviewed by the working group. A motion to accept the updated figures was made by Suresh Babanna and seconded by Toby Johnson. The motion was approved by unanimous consent.

New Business:

A comment by Han-Min Park at Korea Electric concerning a discrepancy between Figure 13(b) and its wording was reviewed and resolved during the task force report by TF2

Recommendations by Jason Varnell regarding wording in subclauses 6.3.1 and 6.3.5: Recommended change to 6.3.5 has been incorporated in the new draft; TF2 and Jason Varnell will work together to update 6.3.1.

[B16] Operating Characteristics of Salient-Pole Machines has been added to Annex C.

The meeting was adjourned at 12:05 p.m. The group will meet next in Denver, Colorado in March 2022.

Attendance:

<u>Role</u>	<u>First Name</u>	<u>Last Name</u>	<u>Company</u>
Member	Kayland	Adams	SPX Transformer Solutions, Inc.
Member	Suresh	Babanna	SPX Transformer Solutions, Inc.
Guest	Gilles	Bargone	FISO Technologies Inc.

Guest	Mats	Bernesjo	Hitachi Energy
Guest	Enrique	Betancourt	Prolec GE
Guest	William	Boettger	Boettger Transformer Consulting LLC
Guest	Jeremiah	Bradshaw	Bureau of Reclamation
Guest	Jagdish	Burde	Virginia Transformer Corp
Guest	Arup	Chakraborty	Delta Star Inc.
Guest	Sudip	Chanda	Virginia Transformer Corp.
Guest	Muhammad Ali Masood	Cheema	Northern Transformer
Guest	Everton	De Oliveira	Siemens Energy
Guest	Thomas	Eagle	SPX Transformer Solutions, Inc.
Guest	Evgenii	Ermakov	Hitachi Energy
Guest	Edmund	Feloni	CEG Forensics LLC
Guest	Robert	Ganser	Transformer Consulting Services, Co.
Guest	Eduardo	Garcia Wild	Siemens Energy
Member	Rob	Ghosh	General Electric
Guest	Ramsis	Girgis	Hitachi Energy
Secretary	Bill	Griesacker	Duquesne Light Co.
Guest	Roger	Hayes	General Electric
Member	Ryan	Hogg	Bureau of Reclamation
Guest	Nicholas	Jensen	Delta Star Inc.
Member	John	John	Virginia Transformer Corp.
Member	Toby	Johnson	Hunt Electric
Guest	Laszlo	Kadar	Hatch
Member	Suleman	Khan	Ontario Power Generation
Guest	Krzysztof	Kulasek	Hitachi Energy
Member	John	Lackey	PowerNex Associates Inc.
Guest	Donald	Lamontagne	Arizona Public Service Co.
Chair	Weijun	Li	Braintree Electric Light Dept.
Guest	Xose	Lopez-Fernandez	Universidade de Vigo
Guest	Balakrishnan	Mani	Virginia Transformer Corp.
Guest	Robert	Mayer	Siemens Energy
Guest	James	Mciver	Siemens Energy
Member	Vinay	Mehrotra	SPX Transformer Solutions, Inc.
Guest	Rashed	Minhaz	Transformer Consulting Services Inc.

Member	Emilio	Morales-Cruz	Qualitrol Company LLC
Member	Shankar	Nambi	Bechtel
Guest	Livia	Neeson	Entergy
Guest	Sanjay	Patel	Smit Transformer
Guest	John	Poelma	NRG Energy
Guest	Adam	Polson	Arizona Public Service Co.
Guest	Michael	Richardson	Ameren
Guest	Tim	Rocque	SPX Transformer Solutions, Inc.
Member	Dinesh	Sankarakurup	Duke Energy
Guest	Amitabh	Sarkar	Virginia Transformer Corp.
Guest	Anil	Sawant	Virginia Transformer Corp.
Member	Steven	Schappell	SPX Transformer Solutions, Inc.
Guest	Ewald	Schweiger	Siemens Energy
Guest	Kenneth	Skinger	Scituate Consulting, Inc.
Guest	Ed	teNyenhuis	Hitachi Energy
Guest	Michael	Thibault	Pacific Gas & Electric
Guest	Ryan	Thompson	Burns & McDonnell
Guest	Eduardo	Tolcachir	Tubos Trans Electric S.A.
Guest	Reza	Torabi Goodarzi	SMIT Transformatoren B.V.
Guest	Mark	Tostrud	Dynamic Ratings, Inc.
Vice-Chair	Jason	Varnell	Doble Engineering Co.
Guest	Jos	Veens	SMIT Transformatoren B.V.
Guest	Krishnamurthy	Vijayan	PTI Transformers
Guest	Sukhdev	Walia	New Energy Power Co.
Member	Joe	Watson	JD Watson and Associates Inc.
Member	Drew	Welton	Intellirent
Guest	William	Whitehead	H2scan Corporation
Member	Kipp	Yule	Bechtel
Guest	Waldemar	Ziomek	PTI Transformers

**PAR Study Group for PC57.135 -
IEEE Guide for the Application, Specification, and Testing of Phase-Shifting Transformers**

After the exchange via emails we held our virtual meeting on Wednesday Nov 10, 2021 starting at 2:00PM (EST). This was the first virtual meeting as a PAR Study group.

9 of 16 Members were present. A quorum was met with 9 members present.

Ahuja	Raj	Raj Ahuja Consulting
Avanoma	Onome	MJ Consulting
Aymen Lpizra	Aymen Lpizra	Eversource
Burde	Jagdish	Virginia Transformer Corporation
Feghali	Pierre	NASS
Jarman	Paul	University of Manchester
Juchem	Kevin	Hitachi ABB
Kraemer	Axel	Maschinenfabrik Reinhausen GmbH
Patel	Sanjay	TD-Smit Transformers
Portillo	Álvaro	
Schrammel	Alfons	Siemens Energy
Stechschulte	Kyle D	AEP
Thompson	Michael	SEL Engineering Services, Inc.
Veens	Jos A.M.	Royal SMIT Transformers B.V.
Welton	Drew	Intellirent
	Ewald	Siemens Energy

9 members of Total 16 Members participated in the virtual meeting

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.

Before the virtual meeting took place the group has been asked to provide their feedback about

- After the review of the document should C57.135 be revised?
- Based on your answer above - Please state any further comment why we should or should not revise C57.135

All responses indicated that C57.135 should be revised.

Major topics are (examples):

IEC/IEEE 60076-57-1202:

i.e. It needs review in the context of IEC/IEEE 60076-57-1202 to remove duplication and update

Correct errors, revision, improvements:

i.e. Figure 11, Table 1, Clause 4.7.2 a, Clause 5.1 a

Requests from PSRC WG K1, C37.245:

i.e. harmonization, request for clarification, protective relay application should be removed

Further there is the request from the group, that the work should be offered to IEC TC14 as a joint project

Members mentioned that previously there was the agreement made with IEC that and a revision of C57.135 has to be done with the involvement of IEC TC14.

Based on the discussions took place during the virtual meeting the next steps have been discussed and therefore a voting email was sent out after the meeting – The response was requested asap but not later than Sunday, November 14th.

There was no additional new business and the meeting was adjourned at 2:24PM (EST).

The attached presentation was used during the meeting and amended (after the meeting) in order to include the information received just before the meeting took place and updated accordingly (to be seen as MoM).

After the virtual meeting:

13 emails have been received, and all these 13 members answered the question:

**Should we as the PAR Study Group report back to the Power Transformers Subcommittee (PTSC) with a recommendation to form a working group to revise the document?
with YES**

3 Members did not response within the given timeline.

We achieved a quorum of 81%

Therefore we report back to the Power Transformers Subcommittee (PTSC) that the PAR Study Group recommends to form a working group to revise the document PC57.135 - IEEE Guide for the Application, Specification, and Testing of Phase-Shifting Transformers

Ewald Schweiger
Chair of PAR Study Group

November 15th, 2021

Standards Subcommittee

November 17, 2021 Virtual meeting

Standards Subcommittee		
Chair: Daniel Sauer	Vice-Chair: Marcos Ferreira	Secretary: Ajith Varghese
Standards Coordinator: Steve Shull		
Room: Virtual	Date: Nov 17th, 2021	Time: 3:45 PM to 04:32 pm
Members: 81	Present at time of quorum check: 44	Attended per WebEx Record: 49
Guests present: 79	Membership requested: 9	Membership accepted: 7

L.1 Meeting Attendance

The Standards Subcommittee met on Wednesday; Nov 17, 2021 and started at 3:45 PM (CST). **44 of 81** 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 **128** attendees (49 members and **79** guests (**9** guests requested membership and **7** met attendance requirement and will be granted membership).

L.2 Chair's Remarks

The Chair welcomed members and guests to the virtual meeting. 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.

Chair presented revised agenda that included new business on digital Standard. The Agenda was moved by Rogerio Verdolin and seconded by Vinay Mehrotra. The motion was carried with unanimous consent. The Minutes for spring 2021 was moved by Jerry Murphy and seconded by Steve Shull. 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 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. The Chair welcomed members and guests to the virtual meeting.

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.

Two motions were passed during the SC meeting

- Motion to initiate PAR for next revision of C57.12.00 with same title and scope as 2021 revision was moved by Steve Antosz and seconded by Steve Shull.
- Motion to initiate PAR for next revision of C57.12.90 with same title and scope as 2021 was moved by Steve Snyder and seconded by Ajith Varghese.

Both motions passed unanimously.

Steve Snyder informed SC that he will be stepping down from Chair for WG C57.12.00. Chair thanked Steve for years of service and informed SC to contact him if anyone of interested in taking over this position.

Under New business, Chair communicated that transformer committee is working to setup a digital compilation of standards relevant to transformers and would like to get feedback if there are any specific standards or guides that should be included.

Meeting adjourned at 3:42 pm.

Minutes respectfully submitted by

Ajith M. Varghese

Secretary Standards SC.

Standards SC F21 Attendance List

Role	First Name	Last Name	Company
Chair	Jerry	Murphy	Reedy Creek Energy Services
Vice-Chair	Marcos	Ferreira	Beale AFB
Secretary	Ajith	Varghese	SPX Transformer Solutions, Inc.
Member	Susan	McNelly	Xcel Energy
Member	Bruce	Forsyth	Bruce Forsyth and Associates PLLC
Member	Bill	Griesacker	Duquesne Light Co.
Member	Eduardo	Garcia Wild	Siemens Energy
Member	Steven	Snyder	Hitachi Energy
Member	Lee	Matthews	Howard Industries
Member	Ed	teNyenhuis	Hitachi Energy
Member	Gary	King	Howard Industries
Member	Stephen	Antosz	Stephen Antosz & Associates, Inc
Member	Ramsis	Girgis	Hitachi Energy
Member	Peter	Zhao	Hydro One
Member	Vinay	Mehrotra	SPX Transformer Solutions, Inc.
Member	Rogerio	Verdolin	Verdolin Solutions Inc.
Member	Gary	Hoffman	Advanced Power Technologies
Member	Hemchandra	Shertukde	University of Hartford
Member	Scott	Reed	MVA
Member	Scott	Digby	Duke Energy
Member	Stephen	Shull	BBC Electrical Services, Inc.
Member	James	Graham	Weidmann Electrical Technology
Member	Daniel	Blaydon	Baltimore Gas & Electric
Member	Daniel	Sauer	EATON Corporation
Member	Parminder	Panesar	Virginia Transformer Corp.
Member	Rob	Ghosh	General Electric
Member	Sukhdev	Walia	New Energy Power Co.
Member	Weijun	Li	Braintree Electric Light Dept.
Member	John	John	Virginia Transformer Corp.
Member	Jarrod	Prince	ERMCO
Member	Paul	Morakinyo	PSEG
Member	Amitabh	Sarkar	Virginia Transformer Corp.
Member	Kurt	Kaineder	Siemens Energy
Member	Kristopher	Neild	Megger
Member	Jason	Varnell	Doble Engineering Co.
Member	Jonathan	Reimer	FortisBC
Member	Thomas	Dauzat	General Electric
Member	Kris	Zibert	Allgeier, Martin and Associates
Member	Tim-Felix	Mai	Siemens Energy
Member	Mickel	Saad	Hitachi Energy
Member	Drew	Welton	Intellirent
Member	Joseph	Tedesco	Hitachi Energy
Member	Gilles	Bargone	FISO Technologies Inc.
Member	Bruce	Webb	Knoxville Utilities Board
Member	Sergio	Hernandez Cano	Hammond Power Solutions
Member	Samragini	Dutta Roy	Siemens Energy
Member	Jonathan	Sinclair	PPL Electric Utilities
Member	Evgenii	Ermakov	Hitachi Energy
Member	Andrew	Larison	Hitachi Energy

Role	First Name	Last Name	Company
Guest	William	Boettger	Boettger Transformer Consulting LLC
Guest	Dinesh	Sankarakurup	Duke Energy
Guest	Wallace	Binder	WBBinder Consultant
Guest	Reto	Fausch	RF Solutions
Guest	Don	Dorris	Nashville Electric Service
Guest	David	Wallach	Duke Energy
Guest	Mike	Spurlock	Spurlock Engineering Services, LLC
Guest	George	Frimpong	Hitachi Energy
Guest	Donald	Lamontagne	Arizona Public Service Co.
Guest	Peter	Werelius	Megger
Guest	Marco	Espindola	Hitachi Energy
Guest	Hakan	Sahin	Virginia/Georgia Transformer
Guest	Mark	Tostrud	Dynamic Ratings, Inc.
Guest	Juan Carlos	Cruz Valdes	Prolec GE
Guest	Sanjib	Som	Pennsylvania Transformer
Guest	Pugal	Selvaraj	Virginia Transformer Corp.
Guest	Huan	Dinh	Hitachi Energy
Guest	Aaron	Meyers	EATON Corporation
Guest	Krishnamurthy	Vijayan	PTI Transformers
Guest	Ali	Naderian	METSCO Energy Solutions Inc.
Guest	Ryan	Musgrove	Oklahoma Gas & Electric
Guest	Diego	Robalino	Megger
Guest	Alejandro	Macias	CenterPoint Energy
Guest	Jagdish	Burde	Virginia Transformer Corp
Guest	John	Poelma	NRG Energy
Guest	Joshua	Verdell	ERMCO
Guest	Steven	Brzoznowski	Bonneville Power Administration
Guest	Mats	Bernesjo	Hitachi Energy
Guest	Marc	Taylor	JFE Shoji Power Canada Inc.
Guest	Christopher	Whitten	Hitachi Energy
Guest	Markus	Schiessl	SGB
Guest	Alwyn	Van Der Walt	Electrical Consultants, Inc.
Guest	Toby	Johnson	Hunt Electric
Guest	Jonathan	Reimer	FortisBC
Guest	Jeffrey	Wright	Duquesne Light Co.
Guest	William	Elliott	Prolec GE
Guest	Rashed	Minhaz	Transformer Consulting Services Inc.
Guest	Samuel	Sharpless	Rimkus Consulting Group
Guest	Jeremiah	Bradshaw	Bureau of Reclamation
Guest	William	Whitehead	H2scan Corporation
Guest	Anastasia	O'Malley	Consolidated Edison Co. of NY
Guest	Daniela	Ember Baci	Hydro-Quebec IREQ
Guest	Feras	Fattal	Manitoba Hydro
Guest	Malia	Zaman	IEEE
Guest	Cihangir	Sen	Duke Energy
Guest	Stacey	Kessler	TC Energy
Guest	Janusz	Szczechowski	Maschinenfabrik Reinhausen
Guest	Deepak	Kumaria	Applied Materials
Guest	Elise	Arnold	SGB
Guest	Muhammad Ali Masood	Cheema	Northern Transformer
Guest	John	Reagan	RWE Renewables
Guest	David	Calitz	Siemens Energy
Guest	Moonhee	Lee	Hammond Power Solutions
Guest	Hugh	Waldrop	Memphis Light, Gas & Water
Guest	Sylvain	Plante	Hydro-Quebec
Guest	Dmitriy	Klempner	Southern California Edison
Guest	Shawn	Gossett	Ameren
Guest	Afshin	Rezaei-Zare	York University
Guest	Saramma	Hoffman	PPL Electric Utilities
Guest	Matthew	McFadden	Oncor Electric Delivery
Guest	Raymond	Frazier	Ameren
Guest	Alan	Washburn	Burns & McDonnell
Guest	Pragnesh	Vyas	Sunbelt-Solomon Solutions
Guest	Chris	Powell	Intermountain Electronics
Guest	Edmundo	Arevalo	Bonneville Power Administration
Guest	Jared	Bates	Oncor Electric Delivery
Guest	Brandon	Dent	Memphis Light, Gas & Water
Guest	Angela	Leigl	EATON Corporation
Guest	Tiffany	Lucas, P.E.	SPX Transformer Solutions, Inc.
Guest	Albert	Sanchez	Knoxville Utilities Board
Guest	Balakrishnan	Mani	Virginia Transformer Corp.
Guest	Nabi	Almeida	Prolec GE
Guest	Hampton	Steele	Tennessee Valley Authority
Guest	Thomas	Eagle	SPX Transformer Solutions, Inc.
Guest	Rehan	Ali	Siemens Energy
Guest	Nathan	Katz	PacifiCorp
Guest	Sudip	Chanda	Virginia Transformer Corp.
Guest	Matthew	Pinard	Weidmann Electrical Technology

L.3 Working Group and Task Force Reports

L.3.1 Standards Working Group on the Continuous Revision of C57.12.00

Standards Working Group on the Continuous Revision of C57.12.00

Standards Subcommittee
IEEE/PES Transformers Committee
WG Chair: Steven L. Snyder
November 17, 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.

Standards 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
Recirculation #1 Open	8-10-2021
Recirculation #1 Close	8-25-2021
Recirculation #2 Open	8-27-2021
Recirculation #2 Close	9-08-2021

Number in Ballot Pool	231
Number of Affirmative Votes (final)	187
Number of Negative Votes (final)	0
Number of Abstentions (final)	4

Return Rate (final)	82%
Affirmative Rate (final)	100%

The project was approved by IEEE SA Standards Board on 11-9-2021, and the revised standard will be good for 10 years. My understanding is that it will bear the 2021 publication date.

Thanks to everyone that voted, provided constructive comments, and helped with the resolution process.

Respectfully submitted,
Steven L. Snyder, WG Chair C57.12.00
November 17, 2021

L.3.2 WG Standard Terminal Markings and Connections for Transformers C57.12.70

WG on C57.12.70 did not meet during Fall 21 TF Meeting.

L.3.3 WG Standard Transformer Terminology for Transformers C57.12.80

L.3.3.1 2021 Sep 13th Meeting

Document #:	<u>C57.12.80</u>		
Document Title:	<div>Standard Terminology for Distribution and Power Transformers</div>		
Chair:	<u>James Graham</u>	Vice-Chair	<u>Open</u>
Secretary	<u>Shankar Nambi (acting)</u>		
Current Draft Being Worked On:	<u>1.0</u>	Dated:	<u>NA</u>
Meeting Date:	<u>2021-09-13</u>	Time:	<u>9:00 AM</u>
Attendance:	Members	11	
	Guests:	12	
	Total	23	

Meeting Minutes / Significant Issues / Comments:

The Chair opened the meeting at 9:00 a.m. (Central) on Monday 13 September, 2021.

- 1) Quorum Check
Quorum was achieved with 11 of 14 members present. 12 non-voting participants also attended. No new members have been added, and one member was dropped 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 April 2021 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. Task force consensus was reached on revised definitions, and recommended revised definitions were presented to the working group. A motion was made by Dan Sauer to accept the task force recommendations, seconded by Kyle Heiden. After a lengthy discussion, the question was called, and the motion failed. Points of contention included the definition did not align with 7-leg shell form construction and 5-leg construction which appears to be shell construction but is widely referred to as a core construction.

Further work is needed. Jeff Wright made a motion authorize the task force to continue their work and consider adding illustrations of various core types, seconded by Kris Zibert. The motion passed with no objections.

Jeff Wright volunteered to consult with Ramsis Girgis, a recognized subject matter expert related to core construction & performance, for additional input.

b) GSU transformer definition

This was not discussed and is a closed item.

Transformer Class Designations

A request was received to consider creating definitions of Class 1 transformers to clarify the difference between distribution transformers and Class I (small power) transformers. There was no support within working group to create transformer class definitions. This is a closed item.

c) Insulating Fluids definitions

This item was tabled due to a lack of time for discussion.

7) New Business

a) Shankar Nambi will provide definitions from C57.100 and 1276 that Rick Marek has proposed to migrate to C57.12.80. It was discussed that definitions can reside in both C57.12.80 and IEEE 1276, although it is preferred to have them in only one place.

b) Power Transformers definitions review – no update was provided

c) A proposed definition for stray gassing will be developed

d) Rick Marek offered to help with definition of thermally upgraded paper along with Tom Prevost. They will coordinate with Shankar Nambi.

e) Standards Review – Volunteers

Volunteers still needed to review standards from the Bushings, Dielectric Test, Distribution, Instrument Transformers, and Performance Characteristics Subcommittees.

8) The meeting was adjourned at 10:35 a.m. (Central)

Next meeting –November 2021 via Webex

Submitted by: Jim Graham, Chair

Meeting Attendance List

Role	Last Name	First Name	Affiliation	2021-09-13
Chair	Graham	James	Weidmann Electrical Technology	X
Secretary	vonGemmingen	Richard	Dominion Energy	
Member	Betancourt	Enrique	Prolec GE	
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	
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

Role	Last Name	First Name	Company	2021-09-13
Guest	Cruz Valdes	Juan Carlos	Prolec GE	X
Guest	Gonzalez	Luis	Conduct Industries Limited	X
Guest	Hogg	Ryan	Bureau of Reclamation	X
Guest	Karas	Jon	SDMyers, LLC.	X
Guest	Macias	Alejandro	CenterPoint Energy	X
Guest	Marek	Richard	Retired	X
Guest	Montpool	Rhea	Schneider Electric	X
Guest	Portillo	Homero	Advanced Power Technologies	X
Guest	Shingari	Avijit	Pepco Holdings Inc.	X
Guest	Washburn	Alan	Burns & McDonnell	X
Guest	Webb	Matthew	SPX Transformer Solutions, Inc.	X
Guest	Zaman	Malia	IEEE	X

L.3.3.1 2021 Nov 15th Meeting

Document #: C57.12.80

Document Title: Standard Terminology for Distribution and Power Transformers

Chair: James Graham Vice-Chair: Open

Secretary: Richard vonGemmingen

Current Draft Being Worked On: 1.0 Dated: NA

Meeting Date: 2021-11-15 Time: 9:25 AM – 11:40 AM

Attendance:	Members	14
	Guests:	31
	Total	45

Meeting Minutes / Significant Issues / Comments:

The Chair opened the meeting at 9:25 a.m. (Central) on Monday 15 November, 2021.

9) Quorum Check

Quorum was achieved with 14 of 14 members present. 31 non-voting participants also attended. No new members have been added.

10) Approval of the Agenda

A motion proposed by Dan Sauer, seconded by Lee Matthews, to approve the agenda as presented passed unanimously.

11) Approval of the Fall 2020 minutes

A motion proposed by Lee Matthews, seconded by Jerry Murphy, to approve the 13 September 2021 meeting minutes passed unanimously.

12) Call for Essential Patents

A call for essential patents was made. No essential patent issues were reported.

13) Copyright policy

The IEEE copyright policy was briefly reviewed.

14) Unfinished Business

a) Core Form and Shell form definitions

Task force chair Dan Saur reported the task force met several times but could not reach a consensus on revised definitions of core-form and shell-form construction. Distribution transformer core construction variations proved to be difficult to quantify as core or shell type. The task force made the following recommendations:

- i. Keep the existing definitions of core form transformer and shell form transformer as is.
- ii. Send a suggestion to PCS Continuous Revisions to C57.12.00 to include type of core construction and number of limbs (legs) to Type C transformer nameplates.

- iii. Send a suggestion to WG PC57.105 to include core construction sketches in that document

A motion made by Dan Saur, seconded by Jerry Murphy, to accept the taskforce recommendations passed unanimously.

Thermally Upgraded Paper definition

A proposed definition of thermally upgraded paper was reviewed. After a thorough discussion a motion was made by Shankar Nambi to accept the following definition of thermally upgraded paper, seconded by Ryan Musgrove. The motion passed unanimously.

thermally upgraded paper:

Cellulose based paper that has been chemically modified to reduce the rate at which the paper decomposes. Ageing effects are reduced either by partial elimination of water forming agents (as in cyanoethylation) or by inhibiting the formation of water through the use of stabilizing agents (as in amine addition with dicyandiamide).

A paper is considered to be thermally upgraded if:

1. When tested in accordance with IEEE C57.100, Annex H, "Standard Test Procedure for Qualification of Thermally Upgraded Kraft Paper," it retains a minimum of 50% of initial tensile strength for a time/temperature combination given by the equation:
$$\text{Time (h)} = e^{(15,000 / (T+273) - 28.082)}$$
Where: T = test temperature in °C,
2. The unused paper has a minimum nitrogen content of 1.3 %,
3. The paper retains a minimum of 50% of initial nitrogen content after performing the IEEE C57.100, Annex H test.

Note 1 - A typical test time/temperature combination is 476 hours at 165 °C

Note 2 - The criterion to retain 50% tensile strength should be considered only as a qualification criterion to determine if a kraft paper can be considered thermally upgraded. The actual expected life of the paper in equipment is longer than given by the formula. Decades of operating equipment manufactured using the Industry Proven System (IPS) including thermally upgraded kraft paper, cellulose pressboard, Polyvinyl Formal (PVF) coated magnet wire, and mineral oil, has shown that a minimum life expectancy of at least 180 000 hours may be assumed, if the hottest-spot temperature of 110 °C, at rated load as defined in IEEE Std C57.12.00 or IEC 60076-1, is maintained.

Note 3 - Because the thermal upgrading chemicals used today contain nitrogen, which is not present in kraft pulp, the degree of chemical modification is determined by testing for the amount of nitrogen present in the treated paper in accordance with ASTM D-982.

b) Insulation Life Definitions

Several definitions of conventional and high temperature insulation from IEEE Std 1276 and C57.154 were proposed for consideration. These definitions were determined to be too vague when taken out of context of the source standards. A motion made by Jerry Murphy, seconded by Jeff Wright, was made to leave these definitions out of PC57.12.80. The motion passed unanimously.

c) Insulating Fluids definitions

Proposed definitions from Insulating Fluids standards previously shared with the working group were discussed. Due to limited time remaining in the PAR, it was noted we may not have time to properly review these definitions. A motion was made by Dan Sauer, seconded by Jerry Murphy,

to table consideration of these definitions until the next revision cycle. The motion passed unanimously.

d) Stray Gassing Definition

A proposed definition of stray gassing with some background was presented. It was noted the term “Stray Gassing” traditionally applied to unexplained generation of hydrogen and hydrocarbon fault gassing but was becoming extended to CO and CO₂ and other gasses. This item was tabled until the next meeting due to insufficient time to complete the review.

15) New Business

The PAR for PC57.12.80 expires in December 2021. A PAR extension was submitted and will be considered at the December NesCom meeting.

16) The meeting was adjourned at 11:45 a.m. (Central)

Next meeting –January 2022 via Webex, pending approval of a PAR extension

Submitted by: Jim Graham, Chair

Date: 11/15/2021

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
Fall 2021, Nov 17, 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. Dielectric Test –Insulation Power Factor and Resistance, 10.10 and 10.11, TF Chair: Diego Robalino
6. Insulation Life – Cont Rev to Temperature Test Clause 11, TF Chair: Dinesh Sankarakurup

SUMMARY

PC57.12.90 was approved as a revised standard by the IEEE SA Standards Board on November 9, 2021. The new version will be C57.12.90-2021. The title is unchanged. It is expected to be published in a month or two; probably will be early in 2022.

The revisions can be found in the Introduction and are as follows:

7. Implemented corrigendum C57.12.90-2015/Cor 1-2017, to correct an editorial mistake of the constant k in the definitions for Equation (2) in 8.3, and in 10.8.2 the terminal voltage was changed from 115 kV to 69 kV to reflect the new definition (in 2015) of Class II transformers.
8. Subclause 5.4.1. Added requirement for line-to-gnd resistance measurement on wye windings.
9. Subclause 9.3.1. Added text for an alternate method for measuring load loss and impedance, and a new Figure 19. All figures after this in the document are renumbered accordingly.
10. Subclause 10.2.4. Added text regarding tap connection during switching impulse test.
11. Subclause 10.3.1 & 10.3.1.1. Added text regarding impulse waveshape & front-time of full wave.
12. Subclause 10.3.1.3. Added text regarding steepness of voltage collapse for chopped-wave test.

13. Subclause 10.3.2.1. Added text regarding connection of tertiary terminals during impulse test.
 14. Subclause 10.7.7. Inserted a new procedure for a special induced test to detect improper core grounding of wound cores, for distribution transformers and Class I power transformers. This is to coincide with a new requirement in IEEE Std C57.12.00-2021, Subclause 6.7.2.1 & Table 17.
 15. Subclause 10.8.1. Added text regarding tap connection during induced voltage test. Also, added Annex D with more information on this subject. The plan is to transfer the Annex and possibly parts of the subclause text into a future guide on low frequency testing, currently in development.
 16. Subclause 10.8.2. Added requirement that overpressure is not allowed during induced test.
 17. Subclause 10.8.5. Decreased partial discharge failure detection limits: 500 to 250; 150 to 50 pC.
 18. Subclause 11.1.2.2 e). Added text to allow subsequent gradient runs of 30 min, instead of 60.
 19. Subclause 11.4.3. Change (editorial) from 3280 to 3300 feet as 1000 m equivalent. This is to coordinate with altitude corrections used here and in other IEEE documents such as IEEE Std C57.12.00 and IEEE Std C57.91.
- #2 & 3 came from Performance Characteristics Subcommittee; Mark Perkins/Hakan Sahin Task Force on Resistance, LL & Impedance.
 - 4,5,6,7 came from Ajith Varghese's Dielectric Test Subcommittee; Pierre Riffon Task Force on Impulse.
 - 8,9,10,11 came from Ajith Varghese's Dielectric Test Subcommittee; Bertrand Poulin/Bill Griesacker Task Force on Induced test.
 - #12 came from Insulation Life Subcommittee; Ajith Varghese Task Force on Temperature Test.
 - 1 & 13 came from Stephen Antosz WG in the Standards Subcommittee.

Once the new document is published, we will have to immediately request a new PAR.

The work already continues, for a next revision in 5 years or so ...

FUTURE REVISIONS AND PENDING WORK

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.

Changes already approved for the next revision:

1. Hakan Sahin’s PCS TF for Revision of C57.12.90.

- a. Changes to subclause 7.3, Ratio test methods to “modernize” it. Final survey approved in the Spring 2021 virtual meeting.*

Insert a new subclause 7.3.1 as follows:

7.3.1 Electronic ratio and phase measurement meters

An electronic meter that determines the transformer turns ratio, polarity and phase angle may be used for the measurement of these parameters.

The existing 7.3.1 Voltmeter method should be renumbered to be 7.3.2, and there are no changes to the text.

The existing 7.3.2 Comparison method should be renumbered to be 7.3.3, and there are no changes to the text or the figures 10 & 11.

The existing 7.3.3 Ratio meter clause and figure 12 is to be deleted.

- b. Ratio test voltage and frequency under subclause 7.1.2. Request to change frequency bandwidth.*

7.0 Ratio test

Current Version:

7.1.2 Voltage and frequency

The ratio test shall be made at rated or lower voltage and rated or higher frequency.

Proposed Version

7.1.2 Voltage and frequency

The ratio test shall be made at rated or lower voltage and be such that the ratio of test voltage to test frequency is less than or equal to the ratio of rated voltage to rated frequency.

- c. Load Tap Changer performance test with rated voltage. New subclause 8.7.*

8.7 Load Tap Changer Voltage Test

8.7.1 General

In order to verify the performance of a transformer that has a load tap changer (LTC), the LTC shall be operated through one end-to-end-to-end sequence (from one tap extreme to the other tap extreme and back again) with the transformer energized at rated voltage.

8.7.2 Control voltage

Control voltage for the LTC motor during the test shall be as near to rated voltage as possible, with a minimum of 85%.

8.7.3 Preparation for the test

The LTC shall be fitted with all included equipment. It shall be connected as it will be in service, including protective devices.

8.7.4 Procedure

Either the high or low voltage winding of the transformer under test shall be energized at rated voltage and frequency, unless otherwise specified. The LTC shall be operated using the motor drive but not manual rotation. The LTC shall be operated through all tap positions twice, starting at one tap extreme and progressing to the other tap extreme, and then return back again to the original tap position. The test may be performed at intervals, if necessary, such as to adjust the test circuit for the applied voltage to be adjusted to the rated voltage of the tap position, but it is a requirement that the transformer be energized at no less than rated voltage corresponding to each tap to be changed.

8.7.5 Observations and Analysis

8.7.5.1 Audible Sound

The transformer shall be observed during this test and the operator shall identify that the sound during the tap changing operations was either normal or abnormal. With some types of tap changers, there will be abnormally loud sounds if components are not assembled properly. Note that during operation of the change-over selector (reversing switch or coarse-tap selector) the sound can be slightly different.

8.7.5.2 Supply Test Circuit

The test control system shall be monitored for any trip of the test circuit that automatically stops the circuit from keeping the transformer energized.

8.7.5.3 Dissolved Gas-in-Oil Analysis

Oil samples shall be taken from the LTC compartment of vacuum type tap-changers before and after the test and analyzed for dissolved gasses. Results of the analysis may show some increase of dissolved gases due to current commutation, resistor heating and / or stray-gassing of the oil.

8.7.6 Failure Detection and Acceptance Criteria

The transformer will have passed this LTC Voltage test if:

- *The tap changer operates normally with no abnormal sound*
- *The transformer stays energized without a trip in the supply test circuit*
- *For mineral oil filled vacuum LTCs, the increase of the sum of H₂, CH₄, C₂H₆, C₂H₄ and C₂H₂ should not exceed 12 ppm for in-tank type LTCs and 6 ppm for compartment type LTCs.*
- *For non-vacuum type LTCs, or LTCs filled with a liquid other than mineral oil, the determination of acceptance criteria is through sound only and there is not a limit for increase in gases.*

- d. *Load Tap Changer performance test with rated current. New subclause 9.6.*

9.6 Load Tap Changer Current Test

9.6.1 General

In order to verify the performance of a transformer that has a load tap changer (LTC), the LTC shall be operated through one end-to-end-to-end sequence (from one tap extreme to the other tap extreme and back again) with the transformer current flowing through the windings, corresponding to the top nameplate MVA rating.

9.6.2 Control voltage

Control voltage for the LTC motor during the test shall be as near to rated voltage as possible, with a minimum of 85%.

9.6.3 Preparation for the test

The LTC shall be fitted with all included equipment. It shall be connected as it will be in service, including protective devices.

9.6.4 Procedure

The test shall be performed by applying a short circuit either the high-voltage winding or the low-voltage winding and applying sufficient voltage across the other winding to cause a specific current to flow in the windings. The LTC shall be operated using the motor drive but not manual rotation. The LTC shall be operated through all tap positions twice, starting at one tap extreme and progressing to the other tap extreme, and then return back again to the original tap position. The test may be performed at intervals, if

necessary, such as to adjust the test circuit for the applied voltage to be adjusted to the required current of the tap position, but it is a requirement that the transformer be energized at no less than 80% of the top MVA nameplate current value for each tap change.

9.6.5 Observations and Analysis

9.6.5.1 Audible Sound

The transformer shall be observed during this test and the operator shall identify that the sound during the tap changing operations was either normal or abnormal. With some types of tap changers, there will be abnormally loud sounds if components are not assembled properly. Note that during operation of the change-over selector (reversing switch or coarse-tap selector) the sound can be slightly different.

9.6.5.2 Supply Test Circuit

The test control system shall be monitored for any trip of the test circuit that automatically stops the circuit from keeping the transformer energized.

9.6.5.3 Dissolved Gas-in-Oil Analysis

Oil samples shall be taken from the LTC compartment of vacuum type tap-changers before and after the test and analyzed for dissolved gasses. Results of the analysis may show some increase of dissolved gases due to current commutation, resistor heating and / or stray-gassing of the oil.

9.6.6 Failure Detection and Acceptance Criteria

The transformer will have passed this LTC Voltage test if:

- The tap changer operates normally with no abnormal sound
- The transformer stays energized without a trip in the supply test circuit
- For mineral oil filled vacuum LTCs, the increase of the sum of H₂, CH₄, C₂H₆, C₂H₄ and C₂H₂ should not exceed 12 ppm for in-tank type LTCs and 6 ppm for compartment type LTCs.
- For non-vacuum type LTCs, or LTCs filled with a liquid other than mineral oil, the determination of acceptance criteria is through sound only and there is not a limit for increase in gases.

e. Number of short-circuit tests under subclause 12.3.4.

Current Version:

12.3.4 Number of tests

Each phase of the transformer shall be subjected to a total of six tests satisfying the symmetrical current requirement specified in 12.3.1 or 12.3.2, as applicable. Two of these tests on each phase shall also satisfy the asymmetrical current requirements specified in 12.3.3.

Proposed Version

12.3.4 Number of tests

- When a three-phase transformer is tested in a three-phase test circuit or in a single-phase test circuit as given in Annex C, each phase of the transformer shall be subjected to three tests satisfying the asymmetrical current requirements specified in 12.3.3. The tests shall be performed on one of the outer phases with the tap-changer in the maximum position, on the other outer phase with the tap-changer in the minimum position and on the middle phase with the tap-changer in the principal position
- When a single-phase transformer is tested in a single-phase test circuit the transformer shall be subjected to three tests satisfying the asymmetrical current requirements specified in 12.3.3. The three tests shall be performed one each, with the tap-changer in the maximum, minimum and principal position.

All of these above items have been approved in Hakan's Task Force on Tues Nov 16, 2021. They have been passed up to the Performance Characteristics Subcommittee and await the subcommittee's survey and approval.

2. *Changes to Insulation Power Factor test, from Diego Robalino's Dielectric Test SC TF for Winding Insulation Power Factor. Final survey approved in the Fall 2021 virtual meeting. Specifically with regards to Subclause 10.10.2 revising the accuracy requirements of instrumentation.*

The existing text is:

10.10.2 Instrumentation

The insulation power factor may be measured by special bridge circuits or by the voltampere-watt method. The accuracy of measurement should be within $\pm 0.25\%$ insulation power factor, and the measurement should be made at or near a frequency of 60 Hz.

The revised text will be:

10.10.2 Instrumentation

The insulation power factor may be measured by special bridge circuits or by the voltampere-watt method. The measurement should be ~~within $\pm 0.25\%$ insulation power factor, and the measurement should be made at or~~ near a frequency of 60 Hz.

The accuracy of measurement should be as follows:

- *for $PF < 1\%$, $\pm 2\%$ of reading $\pm 0.05\%$ absolute*
- *for $PF > 1\%$, $\pm 5\%$ of reading $\pm 0.05\%$ absolute*

I AM NOT SURE OF THE EXACT TEXT NOR THE EXACT CHANGES. NEED TO GET IT FROM DIEGO ROBALINO. STEVE Nov 2021

3. *Other ?*

PENDING WORK

Since this is a continuous revision document, there is ongoing work in the various Task Forces.

1. *Possible revisions from Hakan Sahin's PCS TF for Revision of C57.12.90.*
2. *Possible changes to Clause 13 sound test from Ramsis' TF.*
3. *Possible changes to Subclause 10.2 or 10.3 from Pierre Riffon's TF regarding switching and lightning 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.*
 - *Revision to PD test procedure for Class II*
 - *Class I transformer PD test revision to the test procedure*
 - *Clarification of measuring voltage during low frequency tests*
 - *Venting bushings during PD test,*
5. *Possible changes to subclauses 10.10 and 10.11 from Diego Robalino's TF regarding insulation power factor and insulation resistance.*
6. *Changes to Clause 11 Temperature Test from Dinesh Sankarakurup's TF*
 - *11.4.3 Add text that reverse correction for altitude is also allowed; i.e., when factory is located above 1000 m and transformer rating is based on $< 1000\text{m}$.*

- 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.
- Request for clarification for temp test of 3-winding transformers

Respectfully submitted,
Stephen Antosz, WG Chair
Nov 17, 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*

November 15, 2021, 12:55PM – 2:10PM, CT

Virtual meeting

UNAPPROVED MINUTES

Welcome

The chair, Marcos Ferreira, opened the meeting at 12:55PM.

1. Attendance and Attendance for Quorum

At the time of the meeting there are 47 Members, including Chair, Vice Chair and Secretary. The poll registered 91 participants, where 28 Members, 44 non-members, and 4 guests with unknown status. No answer from 15.

27 members present of 47 mean requirements for quorum was fulfilled. Further analysis of attendance information shows that 34 members were present, and that not all responded to the poll. The list of attendees is shown below:

Name	Affiliation	Status
Ferreira, Marcos	Beale AFB	Chair
Werelius, Peter	Megger	Vice chair
Milojevic, Goran	DV Power	Secretary
Binder, Wallace	WBBinder Consultant	Member
Colopy, Craig	EATON Corporation	Member
Dorris, Don	Nashville Electric Service	Member
Dutta Roy, Samraghi	Siemens Energy	Member
Foata, Mark	Maschinenfabrik Reinhausen	Member
Gara, Lorne	Shermco Industries	Member
Guner, Ismail	Hydro-Quebec	Member
Gustavsson, Niklas	Hitachi Energy	Member
Harley, John	FirstPower Group LLC	Member
Hayes, Roger	General Electric	Member
Heiden, Kyle	EATON Corporation	Member
Hemchandra, Shertukde	University of Hartford	Member
Herron, John	Raytech USA	Member
Kraemer, Axel	Maschinenfabrik Reinhausen	Member
Lejay, Olivier	Huaming USA Corp.	Member
Locarno, Mario	Doble Engineering	Member

Mayer, Robert	Siemens Energy	Member
McNelly, Susan	Xcel Energy	Member
Murray, David	Tennessee Valley Authority	Member
Musgrove, Ryan	OG&E	Member
Plath, Cornelius	OMICRON Energy Solutions GmbH	Member
Pugal, Selvaraj	Virginia Transformer Corp.	Member
Reed, Scott	MVA	Member
Robalino, Diego	Megger USA	Member
Saad, Mickel	Hitachi Energy	Member
Sweetser, Charles	OMICRON electronics Corp USA	Member
Tanaka, Troy	Burns & McDonnell	Member
teNyenhuis, Ed	Hitachi Energy	Member
Verdolin, Rogerio	Verdolin Solutions Inc.	Member
Walia, Sukhdev	New Energy Power LLC	Member
Welton, Drew	Intellirent	Member
Aldenlid, Jennie	Hitachi Energy	Guest
Benzler, Olle	Megger	Guest
Boettger, William	Boettger Transformer Consulting LLC	Guest
Bolar, Sanket	Megger	Guest
Boman, Paul	Hartford Steam Boiler	Guest
Bradshaw, Jeremiah	US Bureau of Reclamation	Guest
Burde, Jagdish	Virginia Transformer Corp.	Guest
Christodoulou, Larry	Electric Power Systems	Guest
Clark, Cloin	AltaLink	Guest
Davis, Eric	Burns & McDonnell	Guest
Elliot, Will	Prolec - GE	Guest
Ellis, Wayne	Memphis Light, Gas and Water	Guest
Ermakov, Evgenii	Hitachi Energy	Guest
Forsyth, Bruce	Bruce Forsyth and Associates PLLC	Guest
Frotscher, Rainer	Maschinenfabrik Reinhausen	Guest
Garcia, Eduardo	Siemens Energy	Guest
Gardner, James	SPX Transformer Solutions	Guest
Graham, James	Weidmann Electrical Technology	Guest
Harper, Robert	Soltex	Guest
Hernandez, Ronald	Doble Engineering	Guest
Hoffman, Gary	Advanced Power Technologies	Guest
Hoffman, Saramma	PPL Electric Utilities	Guest
Hogg, Ryan	US Bureau of Reclamation	Guest
Johnson, Toby	Hunt Electric	Guest
Kadar, Laszlo	Hatch	Guest
Kennedy, Gael R.	GR Kennedy & Associates LLC	Guest
Lamontaigne, Don	Arizona Public Service	Guest
Mangubat, Darrel	Siemens Energy	Guest
McBride, Jim	JMX High Voltage	Guest
Millard, Zack	Great River Energy	Guest
Miller, Phillip	Memphis Light, Gas and Water	Guest

Moleski, Hali	SDMyers, LLC	Guest
Mudryk, Anatoliy	Camlin	Guest
Nield, Kris	Megger	Guest
Niroula, Ashmita	Ergon	Guest
Panesar, Parminder	Virginia Transformer Corp.	Guest
Patel, Rakesh	Hitachi Energy	Guest
Pattabi, Pranav Ketharam	Metsco Energy Solutions	Guest
Peterson, Tim	Nomos Systems	Guest
Pinard, Matthew	Weidmann Electrical Technology Inc.	Guest
Poelma, John	NRG	Guest
Polson, Adam	Arizona Public Service	Guest
Portillo, Alvaro		Guest
Pruente, John	SPX Transformer Solutions	Guest
Rackley, Donnie	RESA Power	Guest
Reagan, John	University of Arizona, Tucson	Guest
Reimer, Jonathan	Fortis BC	Guest
Rock, Patrick	American Transmission Company	Guest
Roizman, Oleg	IntellPower	Guest
Schrom, Wes	Carolina Dielectric Co	Guest
Sharma, Devki	Entergy	Guest
Sinclair, Jonathan	PPL Electric Utilities	Guest
Strongosky, Neil	Memphis Light, Gas and Water	Guest
Tolcachir, Eduardo	Tubos Trans Electric	Guest
Van der Walt, Alwyn	Electrical Consultants, Inc.	Guest
Vermette, Yves	Hubbell	Guest
Wagner, Dieter	Hydro One	Guest
Washburn, Alan	Burns & McDonnell	Guest
Weatherbee, Eric	Hubbell	Guest
Whitehead, Bill	H2scan Corporation	Guest
Zaman, Malia	IEEE SA	Guest
Zemanovic, Kyle	EATON Corporation	Guest
Zhang, Shibao	PCORE Electric	Guest
Zhao, Peter	Hydro One	Guest
Ziebert, Kris	Allgeier Martin	Guest

2. Approval of Agenda

After a motion by Drew Welton, and seconded by Wallace Binder, the group unanimously approved the agenda.

3. Approval of Minutes of Meeting from Spring 2021

After a motion by Shertukde Hemchandra, and seconded by Dave Murray, the group unanimously approved Meeting from Spring 2021.

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 the third virtual meeting and we are going to try to provide the latest on working progress of each task force.”

“We hope this meeting we can have some discussed among the attendees (members and guests) so we can keep progressing to complete the task of the new revision for the document.”

7. Task Forces Working Progress Report

TF-1: Section 7.2 – Main Tank Volunteers

Charles Sweetser (team leader)

The work of the Task Force 1 on the revisions of the Section 7.2 has been completed prior to the Spring 2021 meeting, and the comments have been submitted to the members of WG to vote on whether they will be included. A total of 30 comments out of 130 were selected. Due to insufficient number of votes (only 15 out of 47 members voted to accept), the vote was inconclusive.

The poll will be re-submitted by the WG officers to the members for another vote, together with the comments. Members who already voted in the previous poll do not need to do so again.

TF2: Section 7.3 – Bushings Volunteers

Mario Locarno (team leader)

Mario briefly described the work on the section. The previously proposed material on DFR test was included in this section instead of a separate annex. The section is close to completion, and after remaining minor edits, Mario will submit his work to the WG officers, who will send it to the rest of the WG members for review and vote.

TF3: Section 7.4 – Tap Changers Volunteers

Marcos Ferreira (team leader)

Marcos briefly described the work on the section. Previously proposed additions about the LTC reactors and series transformer devices will not be included in the current revision due to lack of volunteers and limited time remaining. This section is also close to completion, and after remaining minor edits, Marcos will send it to the rest of the WG members for review and vote.

TF4: New Annexes: Dynamic Resistance and Vibroacoustic Measurements

Goran Milojevic

Goran briefly described the work on the two Annexes. Some minor work and revision remain, and the proposed text of the annexes will be sent to the WG members for review and vote by the end of December.

8. Old Business Related to the Work that Has Been Done So Far

Due to need to finalize the work of the WG and the limited time remaining, the chair Marcos Ferreira proposed that new annexes that were proposed at the previous meeting will not be added within the current revision, and that the efforts should be made to finalize the work already started during next year.

Wallace Binder repeated his earlier proposal of addition of column with recommended tests after transportation of power transformers to Table 1 in Section 5.1. A discussion was held on this point, in which Marcos Ferreira, Mario Locarno, Don Dorris and Susan McNelly took part. It was proposed that dew point test should be added to the list. The conclusion of the discussion was that Wallace Binder will take responsibility to run a Task Force (TF-5) among help from Marcos Ferreira and Mario Locarno to review the proposal made by Wallace and determine if the changes can be made within the limited time remaining and finalize by the Spring 2022 Meetings

Goran Milojevic mentioned proposed additions to Section 8 by Sanket Bolar, who responded to a call for volunteers made at the previous meeting and asked for Sanket's permission to send the comments to the rest of the WG for comments. Sanket granted the permission.

9. Meeting Adjournment

A motion to adjourn the meeting was raised by Wallace Binder and seconded by Diego Robalino. The meeting adjourned at 2:05PM

Respectfully submitted,

Marcos Ferreira – Chair Peter Werelius – Vice Chair

Goran Milojevic – 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

2:20 PM to 3:35 PM Central, November 16, 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 third meeting of this Working Group, all of which have been in virtual format. Meeting attendance numbers as derived from the electronic meeting records are as follows:

Total Attendance	80
Members in Attendance	40 (out of 65 members, quorum achieved)
Guests in Attendance	40
Guests Requesting Membership	1

Guests Requesting Membership (attendance at 2 out of 3 meetings required to qualify for membership):

	Membership Granted? (effective after this meeting)
Bill Griesacker	Yes

Participants were advised that membership requests could be made via email requests from attendees to the WG Chair.

The requisite patent and IEEE-SA copyright policy slides were reviewed, with no items noted. The agenda was reviewed by the Chair, with no changes requested by attendees. The agenda was approved by unanimous consent. The minutes from the Spring-2021 meeting had been circulated prior to the meeting. There were no changes to the Spring-2021 meeting minutes requested.

The minutes were approved by 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 reviewed the project milestones, noting that the objective was to have the document ready for balloting by the end of 2023, with the PAR expiring December-2024. The current document expires December-2025.

Activity since last meeting and status was reviewed. Since last meeting in the Spring, the proposed revisions and restructuring discussed during the Spring WG meeting had been incorporated into a Draft (D1) of the document, which had been circulated to the WG for review and comment. Comments received thus far have been compiled into a spreadsheet for tracking and communication purposes, including proposed disposition/resolution of each. It was reported that the WG officers had worked prior to this WG meeting to propose disposition of most of the comments. This tracking spreadsheet was shared with the WG prior to the meeting and members were asked to review and advise if there was any disagreement with the proposed dispositions. Some comments were identified as needing discussion at the WG meeting, so the remaining time was spent discussing those comments.

There had been a comment asking if the document should include guidance for shunt and series reactors. As these devices are not covered in the current scope of the document doing so would require a PAR revision. After some discussion, which noted that the effect of GIC on such devices is so different from power transformers, the effect is an order of magnitude less, and that if necessary at all the information might be better suited in other documents, such as C57.21, the consensus was to not pursue this within this WG.

Five comments that had been received concerned Section 10, which covers GIC monitoring. It was noted that C57.143 (the Monitoring Guide) is currently in a revision cycle. There were several members of that activity present who advised that that document was nearing completion and that it only had a brief, high-level section on GIC monitoring, which essentially just directed readers to C57.163. So, it was agreed that the content is best kept in this GMD Guide, C57.163. Gary Hoffman volunteered to review comments concerning this section and recommend changes, with Joe Watson agreeing to work with him on this. The Chair requested that individuals contact the Chair or Gary Hoffman if they are interested in working on this Clause. There were a couple of comments concerning the need to include definitions of I_H and I_N to ensure proper interpretation. It had been initially thought that the terms were already defined in other industry documents. WG member Afshin Rezaei-Zare and WG Vice-Chair Ramsis Girgis agreed the review and further discuss disposition outside the meeting to make a recommendation to the WG.

Another review comment is requesting text be added concerning Figure 8 to clarify that the magnitude of the magnetizing current in Amps, which is the y-axis of the Figure, is independent of the transformer MVA was discussed. During discussion it was noted that the Figure was just an example to illustrate the basic concept and that every transformer will have its own curve. WG Member Afshin Rezaei-Zare agreed to submit some proposed text to provide the desired clarification for consideration by the WG.

The last review comment discussed was about whether there should be text added to cite and refer to a specific modeling technique that is the subject of a published paper on a method of calculating temperature rises due to GIC. Several participants, which included manufacturers that perform such analysis, noted that there are other models and techniques being used, that in general each manufacturer tended to have their own models, and that they can be very different from each other. It was indicated that manufacturers don't typically publish the methods they use. The conclusion of the discussion was that the document should not refer to or endorse a specific modelling technique, but that the published paper that was indicated, as well as other published papers in the area, will be added to the document's bibliography.

As next steps, the changes indicated in the tracking spreadsheet are in the process of being incorporated into a new Draft, which, after receiving the additional inputs discussed during the WG meeting, would be prepared and posted for review and comment by the WG.

There were no Old Business items to address and there were no New Business items raised.

The next planned meeting of the WG will be during the Spring-2021 Transformers Committee meetings, scheduled to be held in Denver, CO.

The meeting adjourned at 3:29 pm central time, a few minutes ahead of its scheduled ending time of 3:35 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	Suresh	Babanna	SPX Transformer Solutions, Inc.
Member	Mats	Bernesjo	Hitachi Energy
Member	William	Boettger	Boettger Transformer Consulting LLC
Member	Muhammad Ali Masood	Cheema	Northern Transformer
Member	Hakim	Dulac	Qualitrol Company LLC
Member	Norman	Field	Stantec
Member	Bruce	Forsyth	Bruce Forsyth and Associates PLLC
Member	Anthony	Franchitti	PECO Energy Company
Member	Gary	Hoffman	Advanced Power Technologies
Member	Saramma	Hoffman	PPL Electric Utilities
Member	Kurt	Kainerder	Siemens Energy
Member	Stacey	Kessler	TC Energy
Member	Zan	Kiparizoski	Howard Industries
Member	Dmitriy	Klempner	Southern California Edison
Member	Balakrishnan	Mani	Virginia Transformer Corp.
Member	Martin	Munoz Molina	Orto de Mexico
Member	Ali	Naderian	METSCO Energy Solutions Inc.
Member	Anastasia	O'Malley	Consolidated Edison Co. of NY
Member	Patrick	Picher	Hydro-Quebec IREQ
Member	Ion	Radu	Hitachi Energy
Member	Afshin	Rezaei-Zare	York University
Member	Hakan	Sahin	Virginia/Georgia Transformer
Member	Steven	Schappell	SPX Transformer Solutions, Inc.
Member	Markus	Schiessl	SGB
Member	Eric	Schleismann	Southern Company Services
Member	Hemchandra	Shertukde	University of Hartford
Member	Marc	Taylor	JFE Shoji Power Canada Inc.
Member	Mark	Tostrud	Dynamic Ratings, Inc.
Member	Jason	Varnell	Doble Engineering Co.
Member	Kiran	Vedante	Ritz Instrument Transformers
Member	Rogério	Verdolin	Verdolin Solutions Inc.
Member	David	Wallach	Duke Energy
Member	Joe	Watson	JD Watson and Associates Inc.
Member	Daniel	Weyer	Nebraska Public Power District

Member	William	Whitehead	H2scan Corporation
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	Thomas	Blackburn	Gene Blackburn Engineering
Guest	Steven	Brzoznowski	Bonneville Power Administration
Guest	Colin	Clark	AltaLink
Guest	John	Crouse	Roswell Alliance
Guest	Roger	Fenton	Fenton Solutions
Guest	Eduardo	Garcia Wild	Siemens Energy
Guest	Shawn	Gossett	Ameren
Guest	Bill	Griesacker	Duquesne Light Co.
Guest	Thomas	Hartmann	Pepco Holdings Inc.
Guest	Paul	Jarman	University of Manchester
Guest	Nicholas	Jensen	Delta Star Inc.
Guest	Toby	Johnson	Hunt Electric
Guest	Nathan	Katz	PacifiCorp
Guest	Gael	Kennedy	GR Kennedy & Associates LLC
Guest	Anton	Koshel	Delta Star Inc.
Guest	Axel	Kraemer	Maschinenfabrik Reinhausen
Guest	John	Lackey	PowerNex Associates Inc.
Guest	Donald	Lamontagne	Arizona Public Service Co.
Guest	Lee	Matthews	Howard Industries
Guest	Susan	McNelly	Xcel Energy
Guest	Rashed	Minhaz	Transformer Consulting Services Inc.
Guest	Brady	Nesvold	Xcel Energy
Guest	Sanjay	Patel	Smit Transformer
Guest	Pranav	Pattabi	METSCO Energy Solutions Inc.
Guest	Matthew	Pinard	Weidmann Electrical Technology
Guest	John	Poelma	NRG Energy
Guest	Tim	Rocque	SPX Transformer Solutions, Inc.
Guest	Sanjib	Som	Pennsylvania Transformer
Guest	Brad	Staley	Salt River Project
Guest	Kerwin	Stretch	Siemens Energy
Guest	Troy	Tanaka	Burns & McDonnell
Guest	Reza	Torabi Goodarzi	SMIT Transformatoren B.V.
Guest	Loren	Wagenaar	WagenTrans Consulting
Guest	Michael	Warntjes	American Transmission Co.
Guest	Alan	Washburn	Burns & McDonnell
Guest	Bruce	Webb	Knoxville Utilities Board
Guest	Jeffrey	Wright	Duquesne Light Co.

L.3.7 IEEE / IEC Continuous Cross Reference

TF did not meet during Fall 2021 Transformer Committee.

L.4 Old Business

There was no old business to discuss.

L.5 New Business

Under New business, Chair communicated that transformer committee is working to setup a digital format of relevant standard and would like to get feedback if there are any specific standards or guides that should be included.

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	Schiesl	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	teNyenhuus	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	Jarrold	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	Intellirent
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	Samraghi	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	Knappek	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	Panasar	Virginia Transformer Corp.	Guest	David	Holland	ExxonMobil
Guest	Joshua	Verdell	ERMCO	Guest	Christopher	Lianides	Southern California Edison
Guest	Steven	Brzozowski	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
Task Force Report**

Chairman: George Payerle

Vice-Chair: Tony Reiss

Meeting Date: 11/17/2021 **Location:** Virtual **Time:** 10:50 AM to 12:05 PM CST

Members present

Thomas	Dauzat	General Electric
Larry	Dix	Quality Switch, Inc.
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
Brian	Klaponski	Carte International Inc.
Alejandro	Macias	CenterPoint Energy
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
John	Vartanian	National Grid
Joshua	Verdell	Ermco

Guests Present

Nabi	Almeida	Prolec GE
Gregory	Ante	SCE
Gilles	Bargone	FISO
Kevin	Biggie	Weidmann
Jaroslav	Chorzepa	ABB Inc.
William	Elliott	Prolec GE
Rob	Ghosh	General Electric
Kendrick	Hamilton	Power Partners
Matthew	McFadden	Oncor Electric
Robert	Page	EATON Corporation
Albert	Sanchez	Knoxville Utilities Board

Subsurface Transformers and Network Protectors Subcommittee Task Force Report

Avijit	Shingari	Pepco Holdings Inc.
Edward	Smith	H-J Family of Companies
Eric	Theisen	Metglas, Inc.
David	Walker	MGM Transformer
William	Whitehead	H2scan Corporation
Malia	Zaman	IEEE

Meeting Administration: Meeting opened at 10:53 CST

- Sign In
- Chairman's Comments
We will lose the AM system at the end of 2021. Be sure to back up the attendance data you have there. The Power and Energy Society (PES) is working on a replacement for AMS. We should know more in November.
- Quorum Determination, member list – Quorum met 21 of 36 members with 15 guests
- Present agenda and approval – no opposition to approval
- Approval of the Spring 2021 minutes – no opposition to approval
- Does anyone request SC membership? Send a chat or let Tony or me know. – no membership requests

Working Groups Report:

- **C57.12.23 Single-Phase Submersible Transformers** working group –
- **NOT MEETING AT THIS TIME**
Alan Traut, Chairman,
 - Revision due date: 12/31/2028
 - PAR Approval Date:
 - PAR Expiration Date:

Stage: On break

Chairman spoke with Al Traut who couldn't attend STNP SC meeting. The WG is still inactive but will start meeting again in S23.

- **C57.12.24 Three-Phase Submersible Transformers** working group –
Ben Garcia, Chairman; Tom Dauzat, Vice Chair; George Payerle, Secretary
 - Approved: **12/7/2016**
 - Revision Due Date: 12/31/2026
 - PAR Approval Date:
 - PAR Expiration Date: **12/31/23**

Members Present

First Name	Last Name	Company
Piotr	Blaszczyk	Specialty Transformer Components

**Subsurface Transformers and Network Protectors Subcommittee
Task Force Report**

David	Blew	Retired (PSE&G)
John	Chisholm	IFD Corporation
Thomas	Dauzat	General Electric
Larry	Dix	Quality Switch, Inc.
William	Elliott	Prolec GE
Benjamin	Garcia	Southern California Edison
Carlos	Gaytan	Prolec GE
Said	Hachichi	Hydro-Quebec
Kenneth	Hampton	Baltimore Gas & Electric
John	Harley	FirstPower Group LLC
Ramadan	Issack	American Electric Power
Brian	Klaponski	Carte International Inc.
Brad	Kittrell	Consolidated Edison Co. of NY
Andrew	Larison	Hitachi Energy
Alejandro	Macias	CenterPoint Energy
Kent	Miller	T&R Electric Supply Co.
Charles	Morgan	Eversource Energy
Daniel	Mulkey	Mulkey Engineering Inc.
George	Payerle	Carte International Inc.
Juan	Ramirez	CELECO
James	Ratty	Electronic Technology Inc.
Pedro	Salgado	Electronic Technology Inc.
Avijit	Shingari	Pepco Holdings Inc.
Audrey	Siebert-Timmer	IFD Corporation
Michael	Thibault	Pacific Gas & Electric
Alan	Traut	Howard Industries
Reinaldo	Valentin	Duke Energy
John	Vartanian	National Grid

Guests Present

First Name	Last Name	Company
Scott	Abbott	PPG
Jerry	Allen	Metglas, Inc.
Nabi	Almeida	Prolec GE
Angela	Amador	EATON Corporation
Gregory	Ante	Southern California Edison
Zoran	Goncin	PTI Transformers
Michael	Gonzales	Southern California Edison
Kendrick	Hamilton	Power Partners, Inc.
Olivier	Lejay	Huaming USA Corp.

Subsurface Transformers and Network Protectors Subcommittee Task Force Report

Xose	Lopez-Fernandez	Consultant
Tiffany	Lucas	SPX
Rosamire	Magee	PSEG
Bob	Page	EATON Corporation
Vinay	Patel	Consolidated Edison Co. of NY
Chris	Pitts	Howard Industries
Clemens	Reiss IV	Custom Materials, Inc.
Dan	Schwartz	Quality Switch, Inc.
Ewald	Schweiger	Siemens Energy
Jeremy	Sewell	Quality Switch, Inc.
Adam	Sewell	Quality Switch, Inc.
Stephen	Shull	BBC Electrical Services, Inc.
Mauricio	Soto	Hitachi Energy
Joseph	Tedesco	Hitachi Energy
Eric	Theisen	Metglas, Inc.
Timothy	Tillery	Howard Industries
Joshua	Verdell	ERMCO
Shelby	Walters	Howard Industries
Bruce	Webb	Knoxville Utilities Board
Bill	Whitehead	H2 Scan
Alan	Wilks	Consultant
Malia	Zaman	IEEE
Michael	Zarnowski	Carte International

The F21 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 29 members and 32 guests in attendance. Total membership is 51 so there was a quorum. 1 guest requested membership. Avijit Shingari and Andrew Larison were recognized as new members since the Spring 2021 meeting. Membership requirement for 12.24 is that you have attended 2 meetings in a row or 3 of the last 5.

George Payerle moved to approve the agenda and Dan Mulkey seconded. The motion passed unanimously. Said Hachichi moved to accept the minutes of the spring 2021 virtual meeting and Ken Hampton 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 2 working meetings to finalize the draft and get it to review and resolve comments.

Old Business – there was no old business.

Work continued on revision of the spec.

Subsurface Transformers and Network Protectors Subcommittee Task Force Report

Section 7.1 The chair said that introduction of 5000 kVA into Figure 1 would require that the title and scope of the document change, and for that reason will be dealt with after this revision and addressed during the next PAR. The group did consider the chair's editorial revision of table 1 which was to display the rectangular transformers on the left and round transformers on the right table in order of kV-BIL/kVA from top to bottom. Dan Mulkey moved to accept this change, Will Elliott seconded and the motion passed.

There was discussion about whether to indicate a preferred location for fusing on Fig 2. Based on feedback from the WG, the chair will update the figure by extending the shaded section labeled "preferred area for primary switch handles" to the right and include that fusing is included to the notation. The chair will make this update before the next WG meeting to bring it to a vote.

In Figure 2, Will Elliott made a motion to move the existing Note 2 (dimensions are in mm...) into the table associated with Figure 2 because the note deals with the table and is informative in nature. The existing Note 1 ("H1B, H2B,...") and the new Note 2 ("H0 connection...") was moved from below the table in Figure 2 to below the figure since these notes relate to the figure and not the table. Alex Macias seconded. A poll was taken to make the changes to Figure 2 and approved.

It was further decided to change the wording on the top view of the transformer from X0 H0 to X0 or H0/X0. The chair will make the change and then it will be voted on at the next meeting.

The Figure 2 title was change to "Preferred location and arrangement of transformer cover Wording" and was approved without objection.

Section 7.2: Removed the word 'instruction' before the work "nameplate." Was approved without objection.

Section 7.2.1: Added the words 'by the user' after the words as specified" in the first sentence. Also added 'or integral bushings' after 'The bushing wells' in the second sentence. Dan Mulkey made a motion and George Payerle seconded. The motion passed without objection.

Section 7.2.1: The third sentence shall be changed to "One parking stand shall be provided for each primary bushing." The new wording was approved without objection.

The last 2 sentences of 7.2.1 were suggested to be deleted by the task force as redundant, Mike Thibault made the motion and Dan Mulkey seconded to leave these sentences in as aids to the users, because although it may be redundant, it provides readers the "why" HV connectors are located on the cover (hot-line tool usage) and where to find more information on separable connectors. The motion to leave the proposed deleted passage in the standard was passed without objection.

Discussion at S22 should begin with page 10, table 4.

**Subsurface Transformers and Network Protectors Subcommittee
Task Force Report**

Respectfully Submitted by: Ben Garcia, Chairman C57.12.24 Working Group

- **C57.12.40 Secondary Network Transformer** working Group –
Dave Blew, Chairman, Dan Schwartz, Secretary
 - Published 2017
 - Revision due date: **12/31/2027**
 - PAR Approval Date: 8/31/2012
 - PAR Expiration Date: **12/31/2023**

Members Present

Dave Blew (Chair)
Dan Schwartz (Secretary)
Piotr Blaszczyk
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

Consultant (Retired PSE&G)
Quality Switch
Specialty Transformer Components
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

Jerry Allen
Nabi Almeida
John Crouse
Rob Ghosh
Ken Hampton
Jack Harley

Company

Metglas, Inc
Prolec GE USA
Roswell Alliance
General Electric
Baltimore Gas & Electric
First Power Group LLC

Subsurface Transformers and Network Protectors Subcommittee Task Force Report

John Herron	Raytech USA
Tiffany Lucas	Prolec GE - Waukesha
Rosamie Magee	PSE&G
Aaron Meyers	Eaton Corporation
Vinay Patel	Consolidated Edison Co. of NY
Tony Reiss	Custom Materials, Inc
Jonathan Sinclair	PPL Electric Utilities
Bill Whitehead	H2scan
Mike Zarnowski	Carte International Inc.
*Requested Membership	

- 1) The group met on Tuesday, November 16, 2021 at 10:50 AM CST with 20 members and 15 guests. Zero (0) guests requested membership. Quorum was achieved with 20/29 (69%) of members present.
- 2) A call for patents was made; none were mentioned.
- 3) Copyright requirements were reviewed by the Chair.
- 4) An agenda was presented for approval. Motion to approve was made by Jeremy Sewell and seconded by Brian Klaponski. The agenda was approved unanimously.
- 5) The minutes of the April 27, 2021, meeting on WebEx were reviewed. A motion to approve was made by Adam Sewell and seconded by Mark Faulkner. The minutes were approved unanimously.
- 6) The Chair reviewed that the PAR was approved and became active May 21, 2019 and expires December 31, 2023.
- 7) Old Business - The Chair reviewed the previous meetings list of topics to be addressed in the next revision of C57.12.40 and the following items were discussed:
 - a. **Primary Switch Testing** - Cory Morgan (Eversource) previously expressed interest in reviewing and updating wording in the primary switch testing section (Section 6.2) of the standard to provide clarity to the test requirements. Cory will most likely no longer be attending transformer committee meetings. Larry Dix (Quality Switch) agreed to discuss proposed changes with Cory and provide input prior to the next meeting.
 - b. **Update of Tables 8 & 9** – Tables 8 & 9 were reviewed. The group approved a proposal to remove the other liquids section of both tables and combine into a single table with both millimeter and inch dimensions. Dan Schwartz (Quality Switch) and Dave Blew (Consultant) have agreed to develop the new table and present at the next meeting for approval.
 - c. Dave Blew is waiting for feedback from PSE&G about the current usage of fluids in transformers to determine if utilities are still using fluids other than mineral oil and ester fluids.
 - d. **Tank and Throat Sizing** – The removal of Table 7 and updating of wording in Section 5.6 were discussed. Dan Schwartz (QS) Dave Blew (Consultant), Mike Zarnowski (Carte International) and Igor Siminov (Toronto Hydro) have agreed to develop and update Section 5.6, Table 7, and potentially Figures 3 & 4 for discussion and approval at the next meeting.

**Subsurface Transformers and Network Protectors Subcommittee
Task Force Report**

- e. **Bushing Standardization** – Mike Zarnowski (Carte) provided some discussion on his review of potentially providing standardization of bushings in the standard. Will Elliott (Prolec GE), Mike Zarnowski (Carte), John Vartanian (National Grid), Alex Macias (CenterPoint Energy), Dave Blew (Consultant), and Dan Schwartz (QS) agreed to review the standard and provide proposed updates on bushing standardization for review and approval in the Spring 2022 meeting.
 - f. **Cathodic Protection and Corrosion** – The work of the corrosion TF was discussed. The group decided to wait for the corrosion task force’s future direction to be determined. The working group’s path forward will be determined by that outcome.
 - g. **C57.12.24 vs C57.12.40** – Mike Zarnowski (Carte), Brad Kittrell (Consolidated Edison), Dave Blew (Consultant) and Dan Schwartz (QS) agreed to develop updates based on previous comparisons and present at future meetings for discussion and approval.
- 8) 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.
- 9) The group discussed the spring meeting and what the current view of various groups (utilities, manufacturers, etc.) regarding attendance at the spring meetings based on the current and projected pandemic climate. Many utilities expressed doubt that they will be able to attend in the spring and interest in a potential hybrid meeting setup.
- 10) Motion to adjourn the meeting was made by George Payerle and seconded by Alejandro Macias. The meeting was adjourned at 11:48 PM CST with the next meeting set for Denver, CO on March 29, 2022.

Respectfully submitted,
D. Schwartz, Secretary

- **C57.12.44 Secondary Network Protectors** working group –
Mark Faulkner, Chairman, Alex Macias, Secretary
 - Revision due date: **12/31/2024**
 - PAR Approval Date: **3/26/2015**
 - PAR Expiration Date: **12/31/21**

Document #:	C57.12.44		
Document Title:	STANDARD REQUIREMENTS FOR SECONDARY NETWORK PROTECTORS		
Chair:	Mark Faulkner	Vice-Chair	Alex Macias
Secretary	n/a		
<small>M</small>			
Current Draft Being Worked On:	DRAFT 11	Dated:	November 15, 2021
Meeting Date:	November 15, 2021	Time:	3:45PM – 5PM CT

**Subsurface Transformers and Network Protectors Subcommittee
Task Force Report**

Meeting Attendance

Activity Name: C57.12.44 WG Secondary Network Protectors

Activity ID:

Number of Members in Activity = 21

Number of Members Present = 17

Quorum Present = 81%

Number of attendees = 27

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 Payerle	Carte	member
James Ratty	ETI-NJ	member
Jeremy Sewell	Quality Switch	member
Travis Spoone	Eaton	member
Alex Macias	CenterPoint Energy	member
Doug Craig	Richard Mfg.	member
John Vartanian	National Grid	member
Mark Faulkner	Eaton	member
Igor Simonov	Tornoto Hydro	member
Brad Kittrell	ConEd	member
Will Elliott	Prolec/GE	member
Avijit Shingari	Pepco Holding Inc.	member
Malia Zaman	IEEE	guest
Kevin Biggie	Weidmann	guest
David Blew	Consultant	guest
Vinay Patel	ConEd	guest
Tony Reiss	Custom Materials	guest
Bill Whitehead	H2scan	guest
Reinaldo Valentin	Duke	guest
Ramadan Issack	AEP	guest
Hachichi Said	Hydro	guest
Michael Zarnowski	Carte	guest

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

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- a. 3:48 PM
2. Quorum Verification
 - a. Quorum was confirmed via Encore polling process
3. Membership
 - a. Avijit Shingari – Added
 - b. David Blew – Requested to be added
4. Confirmation of the essential patent statement and responses
 - a. No conflicts; presented to group
5. Copyright requirements were reviewed by the Chair
 - a. No conflicts; presented to group
6. Approval of minutes of the previous meeting
 - a. Minutes presented to group
 - b. Motion to approve Alex Macias, 2nd Doug Craig
 - c. Minutes approved unanimously
7. Approval of agenda for this meeting.
 - a. Agenda presented to group
 - b. Agenda approved unanimously
8. Meeting Discussion
 - a. Attendees Informed
 - i. Ballot has been passed
 - ii. PAR to expire 12/31/2021. Par extension was approved and now expires 12/31/2022.
 - b. MEC received along with Comments from the Ballot
 - i. Task Group (TG) continuing with addressing changes recommended by MEC
 - ii. TG: Mark Faulkner, Doug Craig, Dan Mulkey and Cory Morgan
 - iii. TG to presented comments received and a discussion with the attendees.
 1. 69 comments received and sorted into 7 sections.
 2. Section 1, 22 comments were discussed
 - a. WG agreed with recommendations noted by the TG for 17 line items
 - b. Section 10.5.17 Contact position indicator
 - i. WG agree to not to add an additional paragraph and change “shall” to “should”.
 - c. Section 5.2.1 Interrupting rating test
 - i. WG agree to “no change”
 - ii. WG agreed to take up Generation on the next revision
 - d. Section 5.2.2.2 Performance
 - i. WG agree to “no change”
 - ii. WG agreed to take up comment for clarification on the next revision
 - e. Section 5.2.5.1 Test conditions
 - i. WG agree to “no change”
 - f. Section 5.2.6.2 Operating duty
 - i. WG agree to “no change”
 - ii. WG agreed to take up comment for clarification on the next revision
 3. Section 2, 5 of 15 comments were discussed
 - a. WG agreed with recommendations noted by the TG for initial 4 line items

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- b. Section 6.5.2 Submersible seal integrity test conditions and performance
 - i. WG agreed to change “lbf/in2” to “psig”
 - ii. TG will also make the change in other sections (section 11.1)
 - 4. Time expired
 - a. WG approved (poll taken) to TG to continue with review and addressing comments; Technical issues may be addressed with WG when necessary.
- 9. Meeting adjourned at 5:00 pm
- 10. Spring meeting--date and location
 - a. Denver, Colorado, USA
 - b. Date: March 27-31, 2022

Submitted by: Mark Faulkner

Date: 11/16/2021

- ☐ **C57.167 Guide for Monitoring Distribution Transformers** working group – Gary Hoffman, Chairman, Mike Thibault, Secretary ○ Revision due date: N/A – **new standard**
- PAR Approval Date: **6/14/2018**
 - PAR Expiration Date: **12/31/2022**

Chair Gary Hoffman summarized the activity of his working group meeting for the SC. Full details can be found on the transformers committee web page under the Distribution Subcommittee section.

Task force: Corrosion Effects on Subsurface Transformers; Chair, Will Elliott; Vice-chair, Justin Minikel; Secretary, Audrey Siebert-Timmer.

Document #:	<u>n/a</u>		
Document Title:	<div>Corrosion Effects on Subsurface Transformers</div>		
Chair:	<u>Will Elliott</u>	Vice-Chair	<u>Justin Minikel</u>
Secretary	<u>Audrey Siebert-Timmer</u>	Per Cent Complete	<u>0</u>
Current Draft Being Worked On:	<u>Draft 5</u>	Dated:	<u>Nov 2021</u>
Meeting Date:	<u>Nov 16, 2021</u>	Time:	<u>2:20 PM CST</u>
Attendance:	Members	33	

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Guests	34
Total*	67

* For details of attendance, please refer to AMS system of the Transformers Committee

Attending Members:

Nabi Almeida, Prolec GE	Tyler Morgan, Duke Energy
Martin Bachand, Cloverdale Paint Inc.	Daniel Mulkey, Mulkey Engineering Inc.
Paul Chisholm, IFD Corporation	George Payerle, Carte International Inc.
Juan Carlos Cruz Valdez, Prolec GE	James Ratty, Electronic Technology Inc.
Thomas Dauzat, Prolec GE	Pedro Salgado, Electronic Technology Inc.
William Elliott, Prolec GE	Dan Schwartz, Quality Switch, Inc.
Benjamin Garcia, Southern California Edison	Adam Sewell, Quality Switch, Inc.
Zoran Goncin, Partner Technologies Inc.	Avijit Shingari, Pepco Holdings Inc.
Chris Guertin, Cloverdale Paint Inc.	Audrey Siebert-Timmer, IFD Corporation
Said Hachichi, Hydro-Quebec	Igor Simonov, Toronto Hydro
Jane Hall, Cloverdale Paint Inc.	Paul Su, FM Global
Ramadan Issack, American Electric Power	Alan Traut, Howard Industries
Brad Kittrell, Consolidated Edison Co. of NY	John Vartanian, National Grid
Brian Klaponski, Carte International Inc.	Mike Waldrop, Memphis Light, Gas & Water
Tiffany Lucas, SPX Transformer Solutions, Inc.	Shelby Walters, Howard Industries
Alejandro Macias, Centerpoint Energy	Michael Zarnowski, Carte International Inc.
Justin Minikel, EATON Corporation	

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Attending Guests:

Greg Ante, Southern California Edison
Thomas Callsen, Weldy-Lamont Associates
Antonio Ceballos, Georgia Transformer
Solomon Chiang, The Gund Company
Rhett Chrysler, ERMCO
Michael Dahlke, Central Moloney, Inc.
Eric Davis, Burns & McDonnell
Jose Gamboa, H-J Family of Companies
Carlos Gaytan, Prolec GE
Michael Gonzales, Southern California Edison
Ken Hampton, Baltimore Gas & Electric
Andrew Larison, Hitachi ABB Power Grids
Olivier Lejay, Huaming USA Corp.
Ryan Musgrove, Oklahoma Gas & Electric
Livia Neeson, Entergy
Joe Nims, Allen & Hoshall, Inc.
Vinay Patel, Consolidated Edison Co. of NY
Tim Peterson, N. American Substation Services
Chris Pitts, Howard Industries
Adam Polson, Arizona Public Service Co.
Jarrod Prince, ERMCO
Tony Reiss, Custom Materials, Inc.
Leopoldo Rodriguez, Transformer Testing Services LLC
Samraghi Dutta Roy, Siemens Energy
Mahesh Sampat, EMS Consulting Inc.
Anil Sawant, Virginia Transformer
Jeff Schneider, Spire Power Solutions
Jeremy Sewell, Quality Switch, Inc.
Stephen Shull, BBC Electrical Services, Inc.
Adrian Silgardo, IFD Corporation
Neil Strongosky, Memphis Light, Gas & Water
Reinaldo Valentin, Duke Energy
Jeremy Van Horn, IFD Corporation
Drew Welton, Intellirent

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Meeting Minutes:

1. Will Elliott called the meeting to order at 2:24 PM CST.
2. Opening remarks and announcements.
 - i. None made.
3. Will Elliott reviewed IEEE Essential Patent Claims and SA Copyright Policy. No issues were raised.
4. Membership changes were noted (since 3rd summer meeting on September 9th 2021):
 - i. Added: Tiffany Lucas, Shelby Walters, Michael Zarnowski
 - ii. Removed: none
5. Quorum was verified. The working group consisted of **40** members, requiring **21** for quorum. **25** members were confirmed through the WebEx poll. **33** members were confirmed afterwards through the roster.
6. Will Elliott requested approval of the agenda. Hearing no requests for changes, the agenda was approved as written.
7. Will Elliot requested approval of the previous minutes for the S21 and the three interim meetings. Tom Dauzat made a motion, second by George Payerle for approval of the minutes. All meeting minutes were unanimously approved.
 - i. Interim meetings were held on June 8th, August 11th, and September 9th 2021
8. Old Business:
 - i. Review of Electronic Ballot Results
 - a. Will Elliot reviewed results of electronic ballot that we performed. Only 16 members provided feedback. The majority wanted the taskforce to pursue a PAR.
 - ii. Review of 1991 GE / Con Ed Corrosion Resistant Submersible Network Transformer Study
 - a. The report was released by GE and is available on Collabratec TF file repository.
 - b. Will Elliot reviewed high level findings
 1. Copper-bearing steel and 409 failed all tests
 2. 302 and 304L passed 4/7 tests and 316L passed 6/7 tests
 3. 255 (duplex) and AL-6XN (duplex) were the only materials that passed all 7 tests
 - c. A question was asked if salts were from road salts or sea water in the New York City field study. Group discussed that it is likely a combination of both.
 - iii. Will Elliot reviewed of comments and changes to draft 5
 - a. Correction in Section 5.1.2 passivate (good) vs sensitize (bad).
 - b. Received suggestion that recommendations should be performance-based rather than recommendations on specific alloys.
 1. C57.12.00 references transformer life to be a minimum of 20.5 years.
 2. Dan Mulkey made the comment that asset life is assumed to be 30 years (from the accounting side) though in reality transformers live anywhere from 1 to 80 years.

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3. Brad Kittrell commented that their expected age due to heavy corrosion in 33.72 years.
 - c. Bob Kinner provided a draft procedure for determining chloride concentration in a water sample which was added to the Collabratec TF file repository.
 - d. Dan Mulkey commented that there are two enclosures: the metal tank enclosure and the concrete box enclosure that the transformer is set in.
 1. Group discussed terminology for the concrete box enclosure could be vault or structure.
 2. A comment was made that structure is not used in 12.80 however it is used in overhead standards.
9. New Business:
- i. Discussion for PAR Submission
 - a. Group drafted a title and scope for PAR submittal as follows:
 1. Title: Guide for Mitigating Corrosion on Subsurface Transformers and Network Protectors
 2. Scope: Provide guidance and technical references for users of transformers and network protectors in subsurface structures. This includes testing, measurements, and classifications to define corrosive environments, as well as strategies to mitigate corrosion in subsurface environments, guidance on equipment enclosure specifications, and cathodic protection.
 - b. **Tom Dauzat made a motion to request PAR using the drafted title and scope. Second by Ben Garcia. A poll was taken, and 25 members approved. Motion passed.**
10. The meeting was adjourned at 3:34 PM CST.
11. After the task-force meeting, in the STNP subcommittee meeting the PAR was reviewed. After some discussion it was decided to ask the members to grant conditional approval for the proposed scope to give the task-force leadership additional time to consider the wording. A poll was taken, and the motion was passed. The PAR request will be submitted to PES so it can be reviewed by NesCom at the Dec 16, 2021 meeting.
- i. Subsequent to the subcommittee meeting, it was decided that no changes would be made to the wording of the PAR request.

Submitted by: Audrey Siebert-Timmer

Date: 11/16/2021

Old Business:

•
none

New Business:

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none

Next meeting:

- March 30, 2022 in Denver, CO (Hopefully)

Adjourned at 11:43 CST

Respectfully submitted,

George Payerle, Chair, Submersible Transformers and Network Protectors Subcommittee.