Transformers Committee

Chair: Stephen Antosz **Vice Chair:** Sue McNelly **Secretary:** Bruce Forsyth
Treasurer: Greg Anderson **Awards Chair/Past Chair:** Don Platts **Standards Coordinator:** Jim Graham

IEEE/PES Transformers Committee

Spring 2017 Meeting Minutes

New Orleans, Louisiana
April 3, 2017

Unapproved

(These minutes are on the agenda to be approved at the next meeting in Fall 2017)

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APPENDIXES – ADDITIONAL DOCUMENTATION

Monday Opening Session

1.0 AGENDA

Opening Session

Monday, April 3; 8:00 am - 9:15 am

(rosters were circulated and attendance recorded as eligibility for Committee membership)

1. Welcome and Announcements ..... Stephen Antosz
2. Meeting Minute..... Greg Anderson
3. PES Governing Board Activity Update ..... Thomas Mayne
4. Approval of Agenda ..... Stephen Antosz
5. Approval of Minutes from Fall 2016 Meeting ..... Stephen Antosz
6. Chair's Report & Administrative Subcommittee Report ..... Stephen Antosz
7. Vice Chair's Report ..... Sue McNelly
8. Secretary's Report ..... Bruce Forsyth
9. Treasurer's Report ..... Greg Anderson
10. Standards Report ..... Jim Graham
11. Liaison Representative Reports
    - 11.1. CIGRE ..... Raj Ahuja
    - 11.2. IEC TC-14 ..... Phil Hopkinson
    - 11.3. Standards Coordinating Committee, SCC No. 18 (NFPA/NEC) ..... David Brender
    - 11.4. Standards Coordinating Committee, SCC No. 4 (Elect. Ins'n) ..... Paulette Payne Powell
12. Hot Topics for the Upcoming Week ..... Subcommittee Chairs
13. New Business & Wrap-up ..... Stephen Antosz

Closing Session

Thursday, April 6, 2017, 11:00 am - 12:00 pm

1. Chair's Remarks and Announcements ..... Stephen Antosz
2. Meetings Planning Subcommittee ..... Greg Anderson
3. Reports from Technical Subcommittees (decisions made during the week)
    - 3.1 Standards..... Jerry Murphy
    - 3.2 Subsurface Transformers & Network Protectors ..... Dan Mulkey
    - 3.3 Bushings ..... Peter Zhao
    - 3.4 Dielectric Tests ..... Ajith Varghese
    - 3.5 Distribution Transformers ..... Steve Shull
    - 3.6 Dry Type Transformers ..... Chuck Johnson
    - 3.7 HVDC Converter Transformers & Reactors ..... Mike Sharp
    - 3.8 Instrument Transformers ..... Ross McTaggart
    - 3.9 Insulating Fluids ..... David Wallach
    - 3.10 Insulation Life ..... Sheldon Kennedy
    - 3.11 Performance Characteristics ..... Ed teNyenhuis
    - 3.12 Power Transformers ..... Bill Griesacker
4. Additional Report from Standards Subcommittee (issues from the week) ... Jim Graham
5. New Business (continued from Monday) and Wrap-up ..... Stephen Antosz

2.0 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 (Red designates CM added at present meeting)				
Member Type	**Name**	**Company**	**Mon**	**Thu**
CM-LM	Amos, Richard	Retired	X	
CM	Anderson, Gregory	GW Anderson & Associates, Inc.	X	X
CM	Ansari, Tauhid	ABB Inc.	X	
CM	Antosz, Stephen	Stephen Antosz & Associates, Inc	X	X
CM	Arteaga, Javier	ABB Inc.	X	X
CM-LM	Ayers, Donald	Ayers Transformer Consulting	X	X
CM	Ballard, Robert	Federal Pacific	X	X
CM	Beaster, Barry	H-J Enterprises, Inc.	X	X
CM	Beauchemin, Claude	TJH2b Analytical Services	X	
CM	Betancourt, Enrique	Prolec GE	X	X
CM-LM	Binder, Wallace	WBBinder Consultant		X
CM-LM	Blackburn, Thomas	Gene Blackburn Engineering	X	X
CM-LM	Boettger, William	Boettger Transformer Consulting LLC	X	X
CM	Boman, Paul	Hartford Steam Boiler	X	
CM	Brender, David	Copper Development Assn.	X	
CM	Callsen, Thomas	Weldy-Lamont Associates	X	X
CM	Castellanos, Juan	Prolec GE	X	
CM	Chu, Donald	Donald Chu	X	
CM	Claiborne, C. Clair	ABB Inc.	X	
CM	Colopy, Craig	EATON Corporation	X	X
CM	Crotty, John	Ameren		
CM	Damico, Frank	Boldrocchi APC	X	
CM	Davis, Eric	Burns & McDonnell	X	
CM	Del Rio, J. Arturo	Trench Limited	X	X
CM	Dix, Larry	Quality Switch, Inc.	X	X
CM	Dorris, Don	Nashville Electric Service	X	X
CM-LM	Fairris, James	KMS Electrical Products	X	X
CM	Feghali, Pierre	N. American Substation Services		
CM	Forsyth, Bruce	Weidmann Electrical Technology	X	X
CM	Franchek, Michael	Consultant	X	X
CM-LM	Ganser, Robert	Transformer Consulting Services	X	
CM	Garcia, Eduardo	Siemens	X	X
CM	Gardner, James	--	X	X
CM	Gaytan, Carlos	Prolec GE	X	X
CM	Ghafourian, Ali	H-J Enterprises, Inc,		
CM	Ghosh, Saurabh	EGI	X	

Committee Member Attendance (Red designates CM added at present meeting)				
Member Type	**Name**	**Company**	**Mon**	**Thu**
CM-LM	Girgis, Ramsis	ABB Inc.	X	
CM	Golarz, Jeff	PJ Associates	X	X
CM	Graham, James	Mott MacDonald, Inc.	X	X
CM	Griesacker, Bill	Doble Engineering Co.	X	X
CM	Haas, Michael	Instrument Transformers, LLC	X	
CM	Hachichi, Said	Hydro-Quebec	X	X
CM	Hakim, Shamaun	CG Power Systems USA Inc.	X	
CM	Hardin, Michael	H-J Enterprises, Inc.	X	
CM	Harley, John	FirstPower Group LLC		
CM	Hayes, Roger	General Electric	X	X
CM	Heinzig, Peter	Weidmann Electrical Technology	X	X
CM	Hernandez, Ronald	Doble Engineering Co.	X	
CM	Herz, Joshua	Qualitrol	X	
CM	Hochanh, Thang	Surplec Inc.	X	
CM	Hoffman, Gary	Advanced Power Technologies		
CM-LM	Hopkinson, Philip	HVOLT Inc.	X	
CM	Iman, Mohammad	MGM Transformer Company	X	
CM	Johnson, Charles	ABB Inc.	X	
CM	Jordan, Stephen	Tennessee Valley Authority	X	X
CM	Kaineder, Kurt	Siemens AG	X	
CM-LM	Kennedy, Gael	GR Kennedy & Associates LLC	X	X
CM	Kennedy, Sheldon	Niagara Transformer	X	X
CM	Khalin, Vladimir	KV Consulting	X	
CM	King, Gary	Howard Industries	X	X
CM	Kinner, Robert	FirstPower Group LLC	X	
CM	Kiparizoski, Zan	Howard Industries	X	
CM	Klaponski, Brian	Carte International Inc.	X	
CM	Kraemer, Axel	Maschinenfabrik Reinhausen	X	X
CM	Kraetge, Alexander	OMICRON electronics Deutschland GmbH	X	X
CM	Kulasek, Krzysztof	ABB Inc.	X	
CM	Lau, Michael	Weidmann Electrical Technology	X	
CM	Levin, Aleksandr	Weidmann Electrical Technology	X	X
CM	Li, Weijun	Braintree Electric Light Dept.	X	
CM	Lopez-Fernandez, Xose	Universidade de Vigo	X	X
CM-LM	Lowdermilk, Larry	LAL International, LLC	X	
CM-LM	Marek, Richard	DuPont	X	X
CM	Matthews, Lee	Howard Industries	X	X
CM	McClure, Phillip	Weschler Instruments	X	
CM	McNelly, Susan	Xcel Energy	X	X
CM	McShane, Charles Patrick	Cargill, Inc.	X	X
CM	McTaggart, Ross	Trench Limited	X	X
CM	Mehrotra, Vinay	SPX Transformer Solutions, Inc.	X	X
CM	Melle, Thomas	HIGHVOLT	X	
CM-LM	Miller, Kent	T&R Electric Supply Co.	X	X
CM-LM	Moore, Harold	Harold Moore & Associates	X	
CM	Mukerji, Amitav	Consultant	X	
CM	Mulkey, Daniel	Mulkey Engineering Inc		
CM	Murphy, Jerry	Reedy Creek Energy Services	X	X

Committee Member Attendance (Red designates CM added at present meeting)				
Member Type	**Name**	**Company**	**Mon**	**Thu**
CM	Murray, David	Tennessee Valley Authority	X	X
CM	Musgrove, Ryan	Oklahoma Gas & Electric	X	X
CM	Naderian, Ali	Metsco	X	
CM	Narawane, Aniruddha	CG Power Systems USA Inc.	X	
CM	Parkinson, Dwight	EATON Corporation	X	X
CM	Patel, Poorvi	ABB Inc.	X	
CM	Patel, Sanjay	Smit Transformer Sales, Inc.	X	X
CM	Payerle, George	Carte International Inc.	X	X
CM	Penny, Brian	American Transmission Co.	X	X
CM	Perjanik, Nicholas	Weidmann Electrical Technology	X	X
CM	Perkins, Mark	ABB Inc.	X	
CM-LM	Platts, Donald	OMICRON electronics Corp USA	X	X
CM	Ploetner, Christoph	ABB AG	X	
CM	Pointner, Klaus	Trench Austria GmbH	X	
CM	Poulin, Bertrand	ABB Inc.	X	X
CM	Prevost, Thomas	Weidmann Electrical Technology	X	X
CM	Radbrandt, Ulf	ABB AB	X	X
CM	Rasor, Robert	S.D. Myers Inc.	X	
CM	Rave, Martin	ComEd	X	
CM	Recksiedler, Leslie	Manitoba Hydro	X	X
CM	Reed, Scott	MVA Diagnostics, Inc.	X	
CM	Robalino, Diego	Megger	X	X
CM	Roussell, Marnie	Entergy	X	
CM	Sampat, Mahesh	EMS Consulting Inc.	X	
CM	Sarkar, Amitabh	Virginia Transformer Corp.	X	X
CM	Sarkar, Subhas	Virginia Transformer Corp.	X	
CM	Sauer, Daniel	EATON Corporation	X	X
CM	Sauzay, Mathieu	JST Transformateurs	X	X
CM	Schappell, Steven	SPX Transformer Solutions, Inc.	X	
CM	Schroeder, Stephen	ABB Inc.	X	
CM	Schweiger, Ewald	Siemens AG		X
CM	Sewell, Adam	Quality Switch, Inc.	X	
CM	Sewell, Jeremy	Quality Switch, Inc.	X	X
CM-LM	Sharma, Devki	Entergy	X	
CM	Sharp, Michael	Trench Limited	X	
CM	Sharpless, Samuel	Rimkus Consulting Group	X	X
CM	Shekelton, James	H-J Enterprises, Inc.		
CM	Shertukde, Hemchandra	University of Hartford	X	X
CM	Shull, Stephen	The Empire District Electric Co.	X	X
CM	Sizemore, Thomas	ABB Inc.	X	X
CM	Skinger, Kenneth	WEC TEC	X	X
CM	Smith, Edward	H-J Enterprises, Inc.	X	X
CM	Snyder, Steven	ABB Inc.	X	X
CM	Solano, William	Siemens Energy		X
CM	Som, Sanjib	Pennsylvania Transformer	X	X
CM	Spitzer, Thomas	City Transformer Service Co.	X	
CM	Spurlock, Mike	American Electric Power	X	X
CM-LM	Stahara, Ronald	Stahara Consulting	X	X

Committee Member Attendance (Red designates CM added at present meeting)				
Member Type	**Name**	**Company**	**Mon**	**Thu**
CM	Stiegemeier, Craig	ABB Inc.	X	X
CM	Sweetser, Charles	OMICRON electronics Corp USA		X
CM	Swinderman, Craig	Mitsubishi Electric Power Products	X	X
CM	Tarlapally, Susmitha	ABB Inc.		
CM-LM	Tendulkar, Vijay	ONYX, a Division of Smiths Power		
CM	teNyenhuis, Ed	ABB Inc.	X	X
CM	Termini, Giuseppe	PECO Energy Company	X	
CM	Thompson, James	T&R Service Company	X	X
CM	Thompson, Robert	RST Consulting, P.C.	X	
CM	Thompson, Ryan	Burns & McDonnell	X	
CM	Traut, Alan	Power Partners	X	
CM	Trummer, Edgar	Transatlantic Transformer Consulting	X	
CM	Varghese, Ajith	SPX Transformer Solutions, Inc.	X	X
CM	Vedante, Kiran	Meramec Instrument Transformer Co.	X	
CM	Verdolin, Rogerio	Verdolin Solutions Inc.	X	X
CM-LM	Walia, Sukhdev	EATON Corporation	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		
CM	Weisensee, Matthew	PacifiCorp	X	X
CM	Wicks, Roger	DuPont	X	X
CM-LM	Wilks, Alan	Consultant	X	X
CM	Wimmer, William	Dominion	X	
CM	Yang, Baitun	Pennsylvania Transformer	X	X
CM	Zhang, Shibao	PCORE Electric		
CM	Zhao, Peter	Hydro One	X	X
CM	Ziomek, Waldemar	PTI Manitoba Inc.	X	X
		Total Members present:	**145**	**87**
		% of Members Present of 220 members:	**65.9**	**39.5**

Based upon the above attendance totals:

Quorum was achieved at Monday Opening Session.
Quorum not achieved at Thursday Closing Session.

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

General Attendance				
Member Type	**Name**	**Company**	**Mon**	**Thu**
II	Abbott, Scott	PPG Industries		X
II	Abdelkamel, Hamid	Ameren	X	
AP	Ahmed, Omar	Transformer Protector	X	X
II	Ali, Muhammad	American Electric Power	X	X
AP	Allen, Jerry	Metglas, Inc.		
II	Alongia, Rachel	Entergy		
II	An, Kyung Chan	Hyosung	X	X
AP	Antweiler, James	Schneider Electric	X	
AP	Armstrong, James	Siemens Energy		
II	Arnold, Elise	SGB	X	
II	Attard, Jason	Consolidated Edison Co. of NY	X	
II	Audouard, Bernard	M.S. Resistances		
AP	Averitt, Ralph	Reinhausen Mfg.	X	
AP	Ayers, Roy	Nashville Electric Service	X	X
II	Badaracco, Ken	Hitachi HVB, Inc.	X	
II	Balban, Sinan	Oz Direnc Ltd	X	
AP	Baranowski, Derek	Baron USA, Inc.		
II	Barnes, Jeff	Norplex-Micarta	X	
II	Barrientos, Israel	Prolec GE	X	X
AP	Bartek, Allan	C-K Composites	X	
II	Basel, Cheryl	CG Power Systems USA Inc.	X	X
AP	Baumgartner, Christopher	We Energies	X	X
AP	Behrens, Tammy	SPX Transformer Solutions, Inc.		
II	Bekmezian, Sevag	Southern California Edison	X	
AP	Bell, Myron	Delta Star Inc.	X	
AP	Benach, Jeffrey	Weidmann Electrical Technology		
II	Berler, Daniel	ZTZ Services International	X	
AP	Bernesjo, Mats	ABB Inc.	X	
AP-LM	Bertolini, Edward	Richards Manufacturing Co.		
II	Biggie, Kevin	Weidmann Electrical Technology	X	X
AP	Bigham, Lee	Instrument Transformer Equip Corp		
AP	Blackmon, Jr., James	Georgia Power Co.	X	
II	Blackwell, Zack	TCI Sales, Inc.		
II	Blake, Dennis	Pennsylvania Transformer		
II	Blaszczyk, Piotr	The Specialty Switch Co LLC	X	
AP	Boege, Alan	Orto de Mexico	X	
II	Bolar, Sanket	Megger		

General Attendance				
Member Type	**Name**	**Company**	**Mon**	**Thu**
AP	Bolliger, Alain	HV Technologies, Inc.	X	
II	Bolliger, Dominique	HV Technologies, Inc.		
II	Bonito, Raul	Efacec Energia, SA		
II	Bozich, Bradford	Cargill, Inc.	X	
II	Bradford, Ira	Pennsylvania Transformer	X	
II	Bradshaw, Jeremiah	Bureau of Reclamation	X	X
AP	Brafa, John	ABB Inc.	X	X
II	Brannen, Randy	Southern Company Transmission	X	
AP	Brauer, Stephan	Morgan Schaffer	X	
AP	Britton, Jeffrey	Phenix Technologies, Inc.	X	X
AP	Brown, Darren	Howard Industries	X	
II	Brown, Duane	Measurements International Ltd.		
II	Brusetti, Robert	Doble Engineering Co.	X	
AP	Burde, Jagdish	PDI	X	X
AP	Cai, Jim	JSHP Transformer	X	
AP	Cantrell, Rick	M&I Materials, Inc.		
II	Cantu de Leon, Jorge	SPX Transformer Solutions, Inc.	X	
II	Casadaban, Mike	ABB Inc.	X	
II	Casserly, Edward	Ergon, Inc.	X	
AP	Castillo, Alonso	M&I Materials, Inc.		
II	Caverly, David	Trench Limited	X	X
AP	Chakraborty, Arup	Delta Star Inc.	X	X
II	Chambers, Stuart	Powertech Labs Inc.	X	
II	Chapa, Raymundo	WEG Electric Corp.		
AP	Cheim, Luiz	ABB Inc.	X	
AP	Chiang, Solomon	The Gund Company	X	X
AP	Chisholm, John	IFD Corporation	X	
II	Cho, Eun	HICO America	X	
II	Choksi, Bhaumik	ABB Inc.	X	
AP	Christodoulou, Larry	Electric Power Systems		X
AP	Chrysler, Rhett	ERMCO	X	X
II	Chu, Michelle	Bonneville Power Administration	X	
II	Chu, Wen-Ping	Shihlin Electric		
AP	Clonts, Jermaine	Power Partners	X	X
AP	Collin, Jean-Francois	Nomos Systems		
AP	Corsi, Domenico	Doble Engineering Co.	X	
AP	Cox, Paul	GE Grid Solutions		
II	Craig, Douglas	Richards Manufacturing Co.		
AP	Craven, Michael	Phoenix Engineering Services	X	X
II	Cross, James	Kinectrics	X	
II	Cruz Cienfuegos, Jorge	Partner Technologies Inc.	X	
II	Cui, Yuanzhong	TBEA Shenyang		
AP	Cunningham, Kelcie	Delta Star Inc.		
II	Dahlke, Michael	Central Moloney, Inc.		X
AP	Daniels, Timothy	Weidmann Electrical Technology	X	
II	Dauzat, Thomas	General Electric	X	
II	Dav, Pouneh	Hyundai Power Transformers USA	X	X
AP	Dave, Nikita	ABB Inc.		

General Attendance				
Member Type	**Name**	**Company**	**Mon**	**Thu**
II	del Valle, Yamille	NEETRAC	X	X
II	Delisle, Jacques	Nomos Systems		
II	Demes, Rolando	Arteche		
II	Dennis, Scott	ABB Inc.	X	
II	DeRouen, Craig	ERMCO	X	X
AP	Dhawan, Anil	ComEd	X	X
II	Di Biase, Antonio	Tempel	X	
AP	Diaby, Mohamed	ABB Inc.	X	X
II	Dietrich, William	EATON Corporation	X	
AP	Digby, Scott	Duke Energy	X	X
II	Dillon, Nikolaus	ABB Inc.	X	
AP	Dorpmanns, Luc	Royal SMIT Transformers B.V.	X	
II	Dorsten, James	Alabama Power	X	
II	Doyle, Lee	Vaisala	X	
AP	Drees, Terry	Cindus Corp.	X	
II	Drobnick, Jason	Jordan Transformer	X	X
II	Duart, Jean-Claude	DuPont	X	X
AP-LM	Dukarm, James	Delta-X Research Inc.	X	X
II	Dulac, Hakim	Qualitrol	X	
II	Dupuis, Brandon	OMICRON Electronics Corp USA		X
AP-LM	Duval, Michel	Hydro-Quebec IREQ		
II	Elassad, Yann	M.S. Resistances		
II	Elder, Penny	Utility Agency & Import (UAI)		
AP	Elliott, Will	General Electric	X	
II	Epperson, Hazel	Shihlin Electric	X	
II	Etheridge, James	Kinectrics		
II	Euvrard, Eric	RHM International		
II	Evans, Aaron	HICO America		
II	Fang, Ming	TBEA USA	X	
AP	Faulkner, Mark	EATON Corporation	X	
II	Faur, Florin	ABB Inc.	X	X
AP	Fausch, Reto	RF Solutions	X	X
II	Feldmann, David	HICO America		
II	Fennell, Howard	Nashville Electric Service	X	X
II	Fenton, Roger	City of Riverside	X	X
PCM	Ferreira, Marcos	Advisian-Worley Parsons	X	X
II	Fields, Ryan	E. Kentucky Power Cooperative	X	X
II	Fish, Lori	Entergy		
AP	Flores, Hugo	CG Power Systems USA Inc.		
II	Ford, Gary	PowerNex Associates Inc.	X	
II	Ford, Gary	PowerNex Associates Inc.		X
II	Ford, Seaira	Baron USA, Inc.		
AP-LM	Forrest, George	Delta-X Research USA, Inc.	X	
II	Foschia, John	SPX Transformer Solutions, Inc.	X	
II	Friend, Fredric	American Electric Power	X	X
AP	Frimpong, George	ABB Inc.	X	
AP	Frotscher, Rainer	Maschinenfabrik Reinhausen		
AP	Gagnon, Jean-Francois	Siemens Transformers Canada		

General Attendance				
Member Type	**Name**	**Company**	**Mon**	**Thu**
AP	Galbraith, Shawn	Nuclear Service Organization	X	X
II	Galhardo, Leonardo	DuPont	X	X
II	Gamboa, Jose	Siemens Energy	X	X
AP	Gara, Lorne	Orbis Engineering	X	X
AP	Garcia, Benjamin	Southern California Edison	X	
II	Garcia, David	EATON Corporation		
II	Gaun, Alexander	Coil Innovation	X	
II	Gehrmann, Clinton	Instrument Transformer Equip Corp		
AP	Geibel, David	ABB Inc.	X	X
II	Giang, Rebecca	The Sherwin-Williams Company		
AP	Golner, Thomas	SPX Transformer Solutions, Inc.	X	X
AP	Gonzalez de la Vega, Jorge	Orto de Mexico	X	
II	Goydich, Shane	Roechling	X	
AP	Gragert, Jeffrey	Xcel Energy	X	
AP	Gross, Detlev	Power Diagnostix	X	
AP	Guner, Ismail	Hydro-Quebec	X	X
II	Gyore, Attila	M&I Materials Ltd	X	X
II	Hall, John	Tennessee Valley Authority	X	
II	Hall, John	Tennessee Valley Authority		X
AP	Hammer, Mark	Jordan Transformer	X	
II	Han, Suh Joon	Dow Chemical Company	X	
AP	Harder, Steven	Siemens Energy		
AP	Harrison, Ken	N. American Substation Services		
AP	Hartmann, Thomas	Delta Star Inc.	X	X
AP	Herron, John	Raytech USA	X	X
II	Hochreiter, Erich	Siemens AG	X	
II	Holden, Andrew	Ergon, Inc.	X	
II	Holleran, Joseph	Ameren	X	
AP	Holmes, Jill	Bureau of Reclamation	X	
II	Horning, Michael	SD Myers	X	
II	Humphrey, Eric	Electro Composites ULC		
II	Jackson, Jerry	3M		
AP	Jakob, Fredi	Consultant		
AP	Jaroszewski, Marion	Delta Star Inc.	X	
II	Jasek, Margaret	Public Service Co. of New Mexico	X	
AP	Jensen, Brad	Burns & McDonnell		
AP	John, John	Virginia Transformer Corp.	X	X
AP	Johnson, Derek	Reinhausen Mfg.	X	
AP	Johnstone, Ted	Cogent Power Inc.	X	
II	Joshi, Akash	Black & Veatch	X	X
AP	Joshi, Arvin	General Electric		
II	Juchem, Kevin	ABB AG	X	X
AP	Kaiserseder, Gerald	Starkstrom-Geraetebau GmbH	X	
AP	Kampshoff, Ken	Equisales	X	X
II	Kanty, Stephen	Isberg & Associates, Inc	X	
II	Kelley, Robert	N. American Substation Services		
II	Kelly, Joe	TCI Sales, Inc.		
II	Kessler, Stacey	Basin Electric Power Cooperative	X	X

General Attendance				
Member Type	**Name**	**Company**	**Mon**	**Thu**
II	Kim, Dong-Soo	Independent Consultant	X	X
II	Kim, Juhyun	Hyundai Heavy Industries	X	X
II	Kim, Yeounsoo	Siemens Industry	X	
II	Kim, Young	Hyundai Power Transformers USA	X	
II	Kim, Young	Hyundai Power Transformers USA		X
AP	Kirchenmayer, Egon	Siemens AG		
AP	Kirchner, Lawrence	Siemens Industry	X	
II	Kittrell, Brad	Consolidated Edison Co. of NY	X	
II	Kleine, Peter	US Army Corps of Engineers	X	X
II	Klen, Kenneth	PDI/ONYX	X	X
II	Knapp, Catherine	Cogent Power Inc.		
AP	Kornowski, Marek	Polycast International	X	X
II	Korte, Steve	Cargill, Inc.		
II	Koshel, Anton	Delta Star Inc.	X	
II	Kostich, Nicholas	Ameren	X	
AP	Kranich, Neil	Jordan Transformer	X	X
II	Kumaria, Deepak	ABB Inc.		
II	Kuntz, Robert	HICO America		
II	Kuppuswamy, Raja	Dynamic Ratings Inc.	X	
AP	Kurth, Bernhard	Reinhausen Mfg.	X	
AP	Lachman, Mark	Doble Engineering Co.	X	
II	Lamontagne, Donald	Arizona Public Service Co.	X	
II	Lamorey, Maria	PPG Industries		
AP	Larochelle, David	NDB Technologies	X	
II	Larzelere, William	Evergreen High Voltage	X	
II	Lawless, Andrew	Covested International		
II	Leal, Fernando	Prolec GE	X	
AP	Leal, Gustavo	Dominion Virginia Power	X	X
II	Lecomte, Antoine	JST Transformateurs	X	
II	Lee, Shawn	HICO America	X	
II	Lee, So-Young	Hyundai Heavy Industries	X	
II	Leece, Benjamin	American Electric Power	X	
AP	Leishman, Gary	American Electric Power	X	X
II	Levi, Raka	AMforum		X
II	Lin, David	IFD Corporation	X	X
II	Liu, Chienchih	Shihlin Electric		
II	Lively, Parry	Tempel	X	
AP	Livingston, Kerry	Great River Energy	X	X
II	Lobo, Gregorio	Mitsubishi Electric Power Products	X	X
AP	Locarno, Mario	Doble Engineering Co.	X	
AP	Lopes, Ana	Efacec Energia, SA		
II	Lu, John	Shanghai Huaming Power Equipment Co., Ltd.	X	
II	Lu, William	Shanghai Huaming Power Equipment Co., Ltd.	X	
AP	Lugge, Andrew	Mitsubishi Electric Power Products		
II	Macdonald, Nigel	Trench Limited	X	
AP	Macias, Alejandro	CenterPoint Energy	X	X
II	Mai, Tim-Felix	Siemens AG	X	
II	Maia, Mario	Efacec Energia, SA		

General Attendance				
Member Type	**Name**	**Company**	**Mon**	**Thu**
II	Malde, Jinesh	M&I Materials Inc.	X	X
AP	Mango, Joseph	NextEra Energy Resources		
AP	Mani, Kumar	Duke Energy	X	X
II	Mansuy, Bruno	Trench France SAS	X	
AP	Marquardt, Bryan	AK Steel	X	
II	Marshall, Scott	Power Engineers	X	X
II	Martig, Arnaud	Trench Limited	X	X
II	Martin, Gary	Entergy		
AP	Martin, Terence	Doble Engineering Co.	X	
II	Martinez, Bene	Metglas, Inc.		
II	Martinez, Rogelio	Georgia Transformer	X	
AP	Mayer, Robert	San Diego Gas & Electric		
AP	McBride, James	JMX Services, Inc.	X	X
II	McCloskey, Scott	Amran Inc.		
AP	McCullough, Douglas	Maxima / Hyundai	X	
II	McDonald, Adam	CenterPoint Energy	X	
II	McGuire, Joseph	Morgan Schaffer	X	
AP	McIver, James	Siemens Energy		
II	McKinney, Kenneth	UL LLC	X	
II	Medina, Juan Pablo	Olsun Electrics Corporation	X	
PCM-LM	Mehta, Shirish	Mehta Consultants	X	
II	Middleton, Robert	RHM International		
II	Miller, Chase	PPL Electric Utilities	X	
II	Minhaz, Rashed	Transformer Consulting Services Inc.	X	X
AP	Montanha, Juliano	Siemens Ltda	X	X
II	Montoya Castillo, Ricardo	Siemens Energy		
II	Montpool, Rhea	Schneider Electric	X	
AP	Morales-Cruz, Emilio	Qualitrol	X	X
AP	Morgan, Charles	Eversource Energy	X	
II	Morgan, Michael	Duke Energy	X	
II	Morrison, Richard	Utility Agency & Import (UAI)		
II	Moskaluk, Sharie	The Sherwin-Williams Company		
II	Munoz Molina, Martin	Orto de Mexico	X	
II	Munro, Andrew	Siemens AG	X	
AP	Mushill, Paul	Ameren	X	
AP	Nambi, Shankar	Bechtel	X	X
II	Nasrallah, Ghassan	EATON Corporation	X	
II	Natale, Anthony	HICO America	X	
II	Neal, Jason	HICO America		
II	Neild, Kristopher	Megger	X	X
II	Nguyen, Nam Tran	ABB Inc.	X	
AP	Nikoley, Ingo	Electrical Consultants, Inc.		
AP	Nims, Joe	Allen & Hoshall, Inc.	X	
II	Nunes, Jr, Jayme	Nynas AB	X	
AP	Nunez, Arturo	Mistras Group, Inc.		
AP	Oakes, Stephen	Instrument Transformer Equip Corp	X	
AP	Ogajanov, Rudolf	ABB Inc.	X	
II	O'Malley, Anastasia	Consolidated Edison Co. of NY	X	

General Attendance				
Member Type	**Name**	**Company**	**Mon**	**Thu**
II	Ortiz, Jow	NextEra Energy		
II	Osuna, Miguel	CG Power Systems USA Inc.	X	
II	Owen, John	Powertech Labs Inc.		
II	Pagenkopf, Kenneth	Acme Electric	X	X
AP	Panetta, Sergio	I Gard Corporation		
II	Pargaonkar, Vijay	Virginia Transformer Corp.	X	
II	Partyka, George	Partner Technologies Inc.	X	
AP	Patel, Dhiru	Hammond Power Solutions	X	X
II	Patel, Nitesh	Hyundai Power Transformers USA	X	
II	Patel, Nitesh	Hyundai Power Transformers USA		X
AP	Patoine, Barbara	Weidmann Electrical Technology	X	X
II	Pellon, Verena	Florida Power & Light		
AP	Pepe, Harry	Phenix Technologies, Inc.	X	X
II	Pereira, Paulo	Efacec Energia, SA		
II	Perry, Lisa	IEEE	X	
AP	Peterson, Alan	Utility Service Corporation		
II	Peterson, Caroline	Xcel Energy	X	
AP	Petosic, Branimir	Boiler Inspection & Insurance of Canada	X	
II	Portillo, Homero	Advanced Power Technologies	X	
PCM	Powell, Paulette	3P	X	
AP	Prince, Jarrod	ERMCO	X	
II	Pritz, Louis	Florida Power & Light	X	
AP	Pruente, John	SPX Transformer Solutions, Inc.	X	
II	Puntigam, Josef	Siemens AG		
AP	Quandel, Jennifer	HPN Global		
II	Radu, Ion	ABB Inc.	X	X
II	Raines, Summar	ABB Inc.		
II	Ramirez Bettoni, Eduardo	Xcel Energy	X	
AP	Rathi, Rakesh	Virginia Transformer Corp.	X	
II	Rato, Nuno	Efacec Energia, SA		
AP	Razuvayev, Sergiy	Delta Star Inc.	X	
AP	Reagan, Ashley	ELTEK International Labs		
AP	Reiss IV, Clemens	Custom Materials, Inc.	X	
II	Rezai, Hossein	Transformer Consultant, Inc.	X	
AP	Riopel, Sebastien	Electro Composites ULC		
II	Riordan, Kevin	CG Power Systems USA Inc.	X	X
II	Rios, Diang	ZTZ Services International	X	
AP	Rivers, Mark	Doble Engineering Co.	X	
AP	Robey, Dennis	RL Components		
II	Robles, Eduardo	EATON Corporation	X	
AP	Rock, Patrick	American Transmission Co.	X	X
II	Rodriguez, Leopoldo	Georgia Transformer	X	
II	Rohkamm, Henning	Siemens AG	X	
AP	Roizman, Oleg	IntellPower Pty Ltd		
II	Roll, Kevin	San Diego Gas & Electric		
AP	Roman, Zoltan	General Electric		
AP	Rottenbacher, Andre	Ritz Insrument Transformers	X	
AP	Runewicz, John	Weschler Instruments		

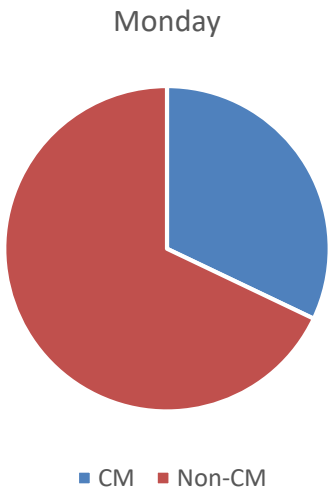
General Attendance				
Member Type	**Name**	**Company**	**Mon**	**Thu**
II	Russwurm, Dirk	DTM Instruments, LLC		
II	Saad, Mickel	ABB Inc.	X	X
AP	Sahin, Hakan	ABB Inc.	X	
II	Salgado, Pedro	Electronic Technology Inc.		
II	Saliba, Joseph	Nashville Electric Service	X	
II	Salva, Jose	JST transformateurs	X	X
II	Sanchez, Eduardo	Pacific Gas & Electric	X	X
II	Sandhu, Surinder	Sanergy Consulting	X	
II	Sbravati, Alan	Cargill		X
AP	Scardazzi, Alaor	Siemens Ltda	X	X
II	Schaffhauser, Cyril	JST Transformateur	X	
AP	Schiessl, Markus	Starkstrom-Geraetebau GmbH	X	
AP	Schleismann, Eric	Southern Company Services	X	X
II	Schram, Bruce	Acme Electric	X	
AP	Schrammel, Alfons	Siemens AG	X	
II	Schwarz, Carl	Phoenix Electric Corporation	X	
II	Selvaraj, Pugazhenthi	Virginia Transformer Corp.	X	
II	Sen, Cihangir	Duke Energy	X	
II	Sestito, John	Hyundai Heavy Industries		
II	Sethi, Kabir	ABB AG	X	
II	Severson, Ty	Cargill, Inc.		
AP	Sewell, Russell	Quality Switch, Inc.	X	
II	Sexton, Aron	Kinectrics		
AP	Shannon, Michael	Rea Magnet Wire	X	
II	Sharifi, Masoud	Siemens Wind	X	
AP	Sheridan, Peter	SGB USA, Inc.	X	
AP	Shirasaka, Yukiyasu	Hitachi Ltd.	X	X
AP	Siebert, Stefan	BROCKHAUS MESSTECHNIK		
II	Siebert-Timmer, Audrey	IFD Corporation	X	X
AP	Simonelli, Richard	SPX Transformer Solutions, Inc.		
II	Simonov, Igor	Toronto Hydro	X	X
II	Simons, Andre	Cogent Power Inc.	X	X
II	Singh, Kushal	ComEd	X	
AP	Slattery, Christopher	FirstEnergy Corp.	X	X
AP	Smith, Shane	Delta Star Inc.	X	
AP	Sohn, Yong Tae	Hyosung	X	X
AP	Sordo, Salvador	WEG Electric Corp.		
II	Spangler, Laura	DuPont		
AP	Sparling, Brian	Dynamic Ratings, Inc.	X	X
II	Spaulding, James	City of Fort Collins	X	
AP	Speegle, Andy	Entergy Services Inc.		
AP	Spiewak, Erin	IEEE	X	
II	Spoone, Travis	EATON Corporation	X	
II	Stacy, Fabian	ABB Inc.	X	X
AP	Stank, Markus	Maschinenfabrik Reinhausen	X	
AP	Stankes, David	3M		
AP	Steineman, Andrew	Delta Star Inc.	X	X
AP	Steineman, Christopher	Meramec Instrument Transformer Co.	X	

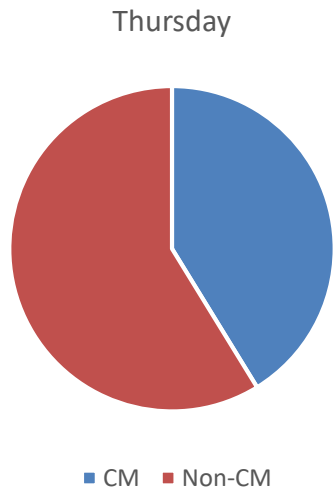
General Attendance				
Member Type	**Name**	**Company**	**Mon**	**Thu**
AP	Stem, Gregory	Cardinal Pumps & Exchangers	X	
II	Stevens, Chuck	Petro-Canada America		
II	Stinson, Robert	General Electric	X	
II	Stockton, David	H-J Family of Companies		
II	Su, Roy	Fortune Electric	X	X
II	Suddarth, Wes	Nashville Electric Service	X	X
AP	Sullivan, Christopher	Westmark Partners		
AP	Sullivan, Kevin	Duke Energy	X	X
II	Sullivan, Liz	ABB Inc.	X	
II	Sun, Yanhong	China Elect. Equip. Industry Assoc.	X	X
II	Sun, Yunhan	China Elect. Equip. Industry Assoc.	X	X
AP	Sundin, David	Ambit Technical Consulting		
II	Szczechowski, Janusz	ABB AG	X	
II	Tabakovic, Dragan	Meramec Instrument Transformer Co.		
II	Taylor, Marc	Cogent Power Inc.	X	X
II	Tedesco, Joseph	ABB Inc.	X	X
II	Thibault, Michael	Pacific Gas & Electric	X	X
II	Thompson, Clifton	N. American Substation Services		
II	Tillery, Timothy	Howard Industries	X	X
II	Tong, Lin	SYET	X	X
AP	Trivitt, Donnie	Oklahoma Gas & Electric	X	
II	Uhlmann, Olivier	Reinhausen Canada Inc.	X	
II	Vailoor, Vasanth	Trantech	X	X
II	Valmus, Jeff	Cargill, Inc.		
II	van der Kolk, Stefan	SMIT Transformatoren B.V.		
AP	Van Horn, Jeremy	IFD Corporation	X	X
AP	VanderWalt, Alwyn	Public Service Co. of New Mexico	X	
II	Varnell, Jason	SPX Transformer Solutions, Inc.	X	
II	Vartanian, John	National Grid	X	
II	Veillette, Michel	Morgan Schaffer	X	X
AP	Verdell, Joshua	ERMCO	X	X
II	Vermette, Yves	Electro Composites ULC		
II	Villagran, Deniss	GE Grid Solutions	X	
II	Virelli, Greg	Virelli & Associates Inc.	X	
AP	vonGemmingen, Richard	Dominion	X	X
II	Vora, Shekhar	Georgia Transformer		
II	Vuittenez, Emmanuel	JST Transformateurs	X	
II	Wahid, Waqar	Mitsubishi Electric Power Products		
AP	Walker, David	MGM Transformer Company	X	X
AP	Walters, Shelby	Howard Industries	X	
II	Wang, Evanne	DuPont	X	X
II	Warren, Robert	DNVGL KEMA Laboratories	X	
AP	Weathington, Larry	N. American Substation Services		
II	Webber, Kenyon	Entergy		
II	Wei, Ryan	Shanghai Huaming Power Equipment Co., Ltd.	X	
II	Weiss, Zachery	CG Power Systems USA Inc.	X	
AP	Welch, Lee	Georgia Power Co.	X	
II	Weldetnsae, Yotam	Bechtel Infrastructure Corp		X

General Attendance				
Member Type	**Name**	**Company**	**Mon**	**Thu**
II	Welton, Drew	Beckwith Electric Co.	X	
AP	Werelius, Peter	Megger	X	
II	Weyer, Daniel	Nebraska Public Power District	X	
II	White, Chris	General Electric		
II	Whitehead, William	Camlin Power		
II	Wiersema, Dave	Mitsubishi Electric Power Products	X	
AP	Williams, Randy	ABB Inc.		
AP	Wimberly, Barrett	GE Grid Solutions	X	X
II	Winstanley, Gerard	NEMA	X	
AP	Winter, Dr. Alexander	HIGHVOLT Pruftechnik Dresden	X	
II	Wright, Jeffrey	Mitsubishi Electric Power Products	X	
II	Wu, Tzupin	Shihlin Electric		
II	Yeh, Tzi Han	Shihlin Electric		
II	Yingling, Thomas	Hubbell ICD, Inc.		
II	Yun, Joshua	CG Power Systems USA Inc.	X	X
II	Zaman, Malia	IEEE	X	
II	Zhang, Ji	TBEA USA	X	
AP	Zibert, Kris	Allgeier, Martin and Associates	X	X
AP	Ziger, Igor	KONCAR - Instrument Transformers	X	X
II	Zito, Anthony	Siemens Energy		

	Mon	**Thu**
Total Non-Committee Member Attendance:	**307**	**124**
Total Committee Member Attendance:	**145**	**87**
Total Attendance:	**452**	**211**

In addition to the above totals, there were **196** of the total attendees that attended **both** the Monday and Thursday Sessions and **467** that attended **either** the Monday or the Thursday Session.





3.0 PES Governing Board Activity Update – Thomas Mayne

Thomas Mayne addressed the attendees and presented an overview of PES Governing Board activities. Mr. Mayne recognized the hard work performed by the attendees at the Society meetings. He noted that the PES

is growing and is now the second largest society within the IEEE with over 37,000 members. He noted the vast diversity of membership from industry, users, and academia and welcomed non-members to join. Mr. Mayne discussed current initiatives, including increasing industry and application participation and encouraging such members to become volunteers. He also noted that 40% of IEEE standards are prepared by PES, and of those 18% are prepared by the Transformers Committee. Mr. Mayne recognized the Transformers Committee for being a major contributor to standards that are used through the world, and that members should be proud of that accomplishment.

Mr. Mayne described his early involvement in the IEEE and how it positively affected his career. He noted that there has been a recent balance shift toward academia and that he believes more industry involvement is required. He stated there is a hard push to help industry and utility companies recognize the value of the IEEE and PES activities. He described the establishment of advisory boards that will help two-way communication in all regions around the world, with focus at the executive levels of companies where positions are frequently held by non-engineers. Conference papers on industry applications are being encouraged to allow increased focus on practical applications to complement the many papers presented on academic research. Attendees were encouraged to visit the PES website to see new improvements to information access.

Mr. Mayne summarized by thanking the attendees for what they do, and encouraged people to share their thoughts and suggestion with him during the coming week, and welcomed everyone to New Orleans.

4.0 APPROVAL OF AGENDA AND PREVIOUS MINUTES – STEPHEN ANTOSZ

The Chair presented the Agenda and asked if there was any opposition to unanimous approval of the Agenda. Hearing none, the Agenda was approved.

The Chair asked if there was any opposition to unanimous approval of the minutes of the Fall 2016 meeting that have been posted on the website. Hearing none, the minutes of the Fall 2016 meeting were approved as written.

5.0 CHAIR'S REMARKS & REPORT – STEPHEN ANTOSZ

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

5.1 CHAIR'S REMARKS

5.1.1 IEEE PES Technical Council

The Technical Council of the IEEE Power Energy Society (PES) is presently composed of the Chairpersons of the PES Technical Committees, plus the Chairpersons of Standing Committees reporting to it. For operating functions it is responsible to the IEEE Technical Advisory Board and for technical activities to the IEEE Technical Activities Board.

The PES Technical Committees report to the Technical Council on matters concerning membership, technical publications, recognition, scope and the coordination of the Power Energy Society generated standards. For standards relating to their technical scope, the Technical Committees work directly with the IEEE Standards Board and the Power Energy Society Standards Coordinating Committee.

For further details on the Statement of Purpose and Scope of Activities for the PES Technical Council Please see; http://www.ieee-pes.org/statement-of-purpose-and-scope-of-activities-for-the-pes-technical-council.

5.1.2 Technical Council Officers & Members

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

TECHNICAL COUNCIL OFFICERS 2016-2017

Miriam Sanders, Chair (SEL University)
Farnoosh Rahmatian, Vice Chair (Quanta Technology)
Secretary, Vijay Vittal (Arizona State University)
Past-Chair, Jeffrey Nelson (TVA)

STANDING COMMITTEES	**CHAIR**
Awards	Jeff Nelson
Technical Sessions, TS	Farnoosh Rahmatian
Organization & Procedures, O&P	Vijay Vittal
Standards Coordination, SC	Ted Burse
COORDINATING COMMITTEES	**CHAIR**
Intelligent Grid & Emerging Technology, IGETCC	Doug Houseman
Marine Systems, MSCC	Dwight Alexander
Wind and Solar Power, WSPCC	Debbie Lew
Power & Energy Education, PEEC	Sukumar Brahma
TECHNICAL COMMITTEES	**CHAIR**
Electric Machinery, EM	Kiruba Haran
Energy Development & Power Generation, EDPG	Ward Jewell
Energy Storage & Stationary Battery, ESSB	Chris Searles
Insulated Conductors, IC	Frank Frentzas
Nuclear Power Engineering, NPE	Thomas Koshy
Analytical Methods for Power Systems, AMPS	Joydeep Mitra
Power System Communications & Cybersecurity, PSCC	Mike Dood
Power System Dynamic Performance, PSDP	Claudio Canizares
Power System Instrumentation & Measurements, PSIM	Jim McBride
Power System Operation Planning & Economics, PSOPE	Hong Chen
Power System Relaying & Control, PSR	Praytap Mysore
Smart Buildings Loads & Customer Systems, SLCS	Shawn Chandler
Substations, SUB	Diane Watkins
Surge Protective Devices, SPD	Ronald Hotchkiss
Switchgear, SWGR	Paul Sullivan
Transformers. TRANS	Stephen Antosz
Transmission and Distribution, T&D	D.D. Sabin

5.1.3 PES Technical Council Activities

a) Tech Council retreat for Technical Committee Chairs, to discuss the future direction of PES. Charlotte, NC for 2 days in November 2016. The purpose was to learn what each Committee's

issues are and to try to help solve them. This is not supposed to be a top-down meeting from PES, but a bottom-up from Tech Committees. So we laid out the important issues to focus on over the next several years. The top four are; increasing value to the industry, tools to enhance effectiveness, sharing best practices, training for leaders and members.

Somehow I volunteered to chair a task force on Sharing Best Practices. We will look at how each Technical Committee handles:

- Meeting Planning and execution
- Systems & Tools (AMS, website, doc storage, etc)
- Standards development
- Methods for sharing info
- Increasing young professional involvement, mentorships
- Knowledge retention and knowledge transfer
- Longer Officer terms or redistribution of responsibilities

Other subjects discussed:

- globalization of IEEE/PES and how it applies to technical committees
- international participation
- IEC/CIGRE relationships, MOU's
- training
- marketing
- PES Resource Center
- meeting planning
- officer term limits
- getting young engineers involved
- increasing utility participation
- editors and paper reviews
- IEEE-SA adoption of documents from CSEE

b) Joint Technical Committee Meeting, JTCM. https://www.pestechnical.org/. Jan 8, 2017. New Orleans. First of two annual gatherings where Technical Council meets to discuss activities of the Standing, Coordinating, and Technical Committees. There were presentations by PES President Damir Novosel, PES Executive Director Pat Ryan, and PES President Elect Saifur Rahman. For meeting minutes, http://www.ieee-pes.org/meetings-and-conferences/7-technical-committees/committees/369-pes-technical-council-meeting-minutes

5.2 TRANSFORMERS COMMITTEE ACTIVITIES

5.2.1 Liaison Representatives. Appointed by Committee Chair.

- CIGRE - Raj Ahuja
- IEC TC-14 - Phil Hopkinson
- Standards Coordinating Committee, SCC No. 18 (NFPA/NEC) – David Brender
- Standards Coordinating Committee, SCC No. 4 (Electrical Insulation) - Paulette Powell – Paulette will resign. Our new liaison will be Evanne Wang of DuPont.

5.2.2 RFID

This issue will be covered by our Meeting Planner, Greg Anderson. We are using RFID tags on the namebadges for this New Orleans meeting in a similar manner as past meetings. Bear with us as we implement this new technology, which is intended to make our meetings better.

5.2.3 Thursday morning Tutorials

We always continue to look for new and exciting topics. Tom Prevost is the leader of this activity for coordination efforts. If interested, see Tom or any of the officers. Any feedback by attendees is welcome.

5.2.4 Association Management System

All WG's should be using AMS to track their membership and meeting attendance. If unable to so, then please assign it to someone who can do it.

5.2.5 Website Password Usage

It is not for public dissemination. It is for use by our meeting attendees (CM, AP, II) and associated work of the Transformers Committee. One can think of it as a benefit of attendance and participation. Use it for yourself and within your immediate workplace, but not beyond that.

5.2.6 Call for Patents (Essential Patent Claims)
http://standards.ieee.org/about/sasb/patcom/index.html

We are required to have a call for patents at every Working Group (WG) meeting. We used to show a slide presentation at every WG meeting, but stopped doing so, and the presentation was posted in the patent section of our website. Several years ago, we replaced the call for patents with a patent question at registration. This is allowed, was approved, but comes with restrictions. At the last meeting in Vancouver we were advised that this was no longer adequate, so we began again to call for patents at every WG meeting. We plan to continue to do so. We will discontinue (at the next meeting) the patent question at registration. The patent issue is specific to each WG and therefore will be addressed in each 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."

That's it. Move on. Don't spend a lot of WG time on this issue. Don't discuss it. Proceed with the WG meeting. Record in the minutes 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.

A Letter of Assurance (LoA) is a document submitted to IEEE-SA by a patent holder which documents the submitter's position with regard to ownership, enforcement, or licensing of an Essential Patent Claim that may be incorporated into a specific IEEE document. As of March 2017, there are three (3) existing Accepted Letters of Assurance that pertain to our committee, as follows:

1. C57.127 Guide for Detection and Location of Acoustic Emissions from Partial Discharges in Oil-Immersed Power Transformers and Reactors. LoA recorded September 6, 2005. Filed by ABB Technology, Ltd.
2. C57.139 Guide for Dissolved Gas Analysis in Transformer Load Tap Changers. LoA recorded January 16, 2013. Filed by Maschinenfabrik Reinhausen GMBH.
3. C57.163 Guide for Establishing Power Transformer Capability while under Geomagnetic Disturbances. LoA recorded May 5, 2014. Filed by Advanced Power Technologies, LLC.

4. C57.147 Guide for Acceptance and Maintenance of Natural Ester Fluids in Transformers, and C57.155 Guide for Interpretation of Gases Generated in Natural Ester and Synthetic Ester-Immersed Transformers. LoA recorded April 5, 2017. Filed by Cooper Power Systems, LLC.
5. C57.147 Guide for Acceptance and Maintenance of Natural Ester Fluids in Transformers, and C57.155 Guide for Interpretation of Gases Generated in Natural Ester and Synthetic Ester-Immersed Transformers. LoA recorded April 5, 2017. Filed by Cooper Power Systems, LLC.

Distribution of an LoA to the related Working Group is permitted.

5.2.7 100 year celebration in Spring 2018 in Pittsburgh

Based on research of AIEE and IEEE, the first recorded meeting of a transformer standards developing group was in 1918, making 2018 the 100 year anniversary of our committee. We will use the Spring 2018 meeting in Pittsburgh to celebrate the occasion. We intend to have a formal banquet on Sunday with special guests and speakers, a reunion of former members, significant honors and awards, a sumptuous reception, etc. More info to come in the future.

5.2.8 Ballot Comment Resolution Actions

Ballot comments must be correctly addressed on the ballot resolution worksheet, or there is the possibility that your ballot will be rejected by RevCom and sent back for re-ballot. Some issues:

- Comments marked accepted, but no or different changes made to the document.
- No disposition detail provided for 'Revised' or 'Rejected' dispositions.
- Disposition Detail refers to another comment. This is not acceptable, each comment must stand alone. It is ok to repeat the same text for many different comments.
- Changes that are accepted exactly as proposed do not need disposition detail, and should be left blank.

5.2.9 Gas Insulated Transformers (GIT)

A question was raised at the end of the Insulating Fluids Subcommittee meeting in Vancouver and again at the General Meeting (Closing Session) regarding whether or not IEEE standards exist for Gas Insulated Transformers (GIT), namely SF6.

After some discussion amongst the Administrative Subcommittee, it was decided that no we don't cover GIT, and see no need to cover it in the near future. The reasons are: there are no known manufacturers in North America making GIT, we have very limited expertise in IEEE, and there is no real demand from the marketplace for this technology.

There is a GIT standard in IEC, titled 60076-15 for Gas-Filled Transformers. In past years, there was interest in Japan, and they developed Japanese standard JEC-2200 to cover GIT. It is one of a few documents that JEC has translated into English.

There might be niche applications of GIT transformers, where users want non-flammability. However, we don't want to develop Standards before an established market need exists. Also, we can't write a standard document unless we have both users and manufacturers who are willing to devote their time and knowledge to the process. This issue is closed.

5.2.10 Entity WG (An Entity is a Corporation, Government Agency, or University)

We (Transformers Committee) have been asked by IEEE-SA to sponsor an Entity based PAR submitted by State Grid Corporation China (SGCC) covering Partial Discharge (PD) Testing of Transformers in the Field. It was presented at the Fall 2016 Vancouver meeting of the Dielectric Test Subcommittee (DTSC). The first step was for DTSC to determine if there is a need for the project and if there are other standards that already cover or could cover the topic. It was decided at the Administrative Subcommittee meeting that we do already have at least four (4) documents that cover PD. There is some potential conflict and overlap. Any

new or additional material (for example, related to UHV application >1,000kV) could be easily added to our existing standards, some of which are currently undergoing revision, and others will be opened soon for regular revision anyway. So we would invite the PAR applicant to come join our committee on our revision work to incorporate any new material.

Respectfully submitted,

Stephen Antosz
Chair, IEEE/PES Transformers Committee
April 6, 2017

6.0 VICE CHAIR'S REPORT – SUSAN MCNELLY

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

6.1 IEEE PES CALENDAR OF UPCOMING EVENTS

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

2017 IEEE/PES General Meeting
July 16-20, 2017, Chicago, Illinois

6.2 CONFERENCE PAPER SUBMITTALS FOR 2017

6.2.1 IEEE/PES General Meeting - July 16-20, 2017, Chicago, Illinois

Papers were peer reviewed and accept/reject decision were made by the March 1, 2017 deadline.

Papers Submitted: 22
IEEE Transaction Papers: 1
Transferred: 1
Rejected: 5
Approved: 15
Best Paper: 1 (17PESGM1247 - On the Development of Power Transformer Failure Models: an Australian Case Study)
Forum: 4
Poster Session: 10

Paper	Title	Recommendation	Forum/ Poster/ Best Paper	Rating
17PESGM0011	Controlled Switching of a 1200 MVA Transformer in Manitoba	TransactionPaper	-	-
17PESGM0098	A Novel Prediction Correction Method for Power Transformer States Based on Association Rule	reject	-	-
17PESGM0105	Understanding the Effect of Non-Uniform Ageing on Dielectric Response of Transformer Insulation	Accept	forum	7.1
17PESGM0207	PDTools: A Toolbox of Partial Discharge (PD) Signal Analysis for Transformer Condition Assessment	Accept	poster	6.8
17PESGM0262	Comparative Study of Single-Phase Shell & Core Type Transformers in GIC Temperature Rise Effect	reject	-	-

Paper	Title	Recommendation	Forum/ Poster/ Best Paper	Rating
17PESGM0273	GIC simulation study for part of UK transmission system by ATP/EMTP	accept	Forum	7.6
17PESGM0283	The Prediction of the Gas Content Dissolved in Transformer Oil Based on Grey Linear Regression Combined Model	reject	-	-
17PESGM0318	Impacts of Substation Transformer Backfeed at High PV Penetrations	Transferred to Relay Committee	-	-
17PESGM0390	A Two-Stage Overload Strategy of Oil-immersed Transformers Considering Operation Risk	accept	poster	5.8
17PESGM0766	Design of New Iron Core for Improving Efficiency of Commercial Single-Phase Transformers Using Finite-Element Analysis	reject	-	-
17PESGM1037	An Estimation of Remaining Life Expectancy of Generator Step-Up Transformer Based on Strength Analysis of Insulating Paper	accept	poster	6.75
17PESGM1121	A New Inrush Current Identification Algorithm Based on Transformer Core Saturation	accept	poster	7
17PESGM1145	Finite Element Analysis to Understand the Mechanical Defects in Power Transformer Winding Clamping Structure	accept	poster	6
17PESGM1165	Machine Learning Applications in Estimating Transformer Loss of Life	Accept	poster	-
17PESGM1182	Thermal Monitoring and Reliability Analysis System for Underground Substation	accept	poster	3
17PESGM1247	On the Development of Power Transformer Failure Models: an Australian Case Study	Accept	best paper	8.25
17PESGM1323	Online Detection of Partial Discharge inside Power Transformer Winding Through IFRA	accept	forum	7.5
17PESGM1699	Study on Auto-transformer Coupling Bridge-type Solid-State FCL and Its Improvement of Topology	accept	forum	7.5
17PESGM1860	Application of Multi-Port Solid State Transformer for Volt-VAR Control in Distribution System	Accept	poster	6.8
17PESGM1903	Application of Ensemble Classification Method for Power Transformers Condition Assessment	reject	-	-
17PESGM2038	A magnetization hysteresis-based power transformer protection scheme	accept	poster	6.25
17PESGM2198	Design and Experimental Verification of DC-DC Autotransformer Prototype	accept	poster	5.8

6.3 IEEE TRANSACTIONS ON POWER DELIVERY FROM 2016

Submitted by Wilsun Xu, Editor on January 24, 2017:

Summary:

Accept after editorial revision 8

Accept Without Changes	16
Administrative Reject	1
Editorial Reject	1
Reject - Do Not Resubmit	28
Total	54

Complete Listing of Transaction Papers:

Manuscript ID	Manuscript Title	Decision
TPWRD-01065-2015	Localization of Radial Displacement in an Actual Isolated Transformer Winding - An Analytical Approach	Accept after editorial revision
TPWRD-00632-2016	Generalized Analytical Expression for Natural Frequencies of a Completely Inhomogeneous Transformer Winding	Accept after editorial revision
TPWRD-00959-2016	Advanced DC Bias Suppression Strategy based on Finite DC Blocking Devices	Accept after editorial revision
TPWRD-00966-2015	Influence of the MV/LV transformer impedance on the propagation of the PLC signal in the power grid	Accept after editorial revision
TPWRD-00981-2015	On the Interaction of Power Transformers and Geomagnetically Induced Currents	Accept after editorial revision
TPWRD-01067-2015	Methodology to Evaluate the Electromechanical Effects of Electromagnetic Forces on Conductive Materials in Transformer Windings using the Von Mises and Fatigue Criteria	Accept after editorial revision
TPWRD-01584-2015	Effect of Different Connection Schemes, Terminating Resistors and Measurement Impedances on the Sensitivity of the FRA Method	Accept after editorial revision
TPWRD-01371-2015	A Joint Vibration and Arcing Measurement System for Online Condition Monitoring of On-Load Tap Changer of Power Transformer	Accept after editorial revision
TPWRD-00743-2015	Nonlinear Magnetic Equivalent Circuit Based Real-time Sen Transformer Electromagnetic Transient Model on FPGA for HIL Emulation	Accept Without Changes
TPWRD-00603-2015	Measuring the Pressboard Water Content of Transformers Using Cellulose Isotherms and the Frequency Components of Water Migration	Accept Without Changes
TPWRD-00914-2015	Duality Derived Transformer Models for Low-Frequency Electromagnetic Transients –Part I: Topological Models	Accept Without Changes
TPWRD-00113-2016	Equivalent Winding Capacitance Network for Transformer Transient Analysis based on Standard Test Data	Accept Without Changes
TPWRD-00443-2016	Hybrid Electromagnetic Unified Power Flow Controller: A Novel Flexible and Effective Approach to Control Power Flow	Accept Without Changes
TPWRD-00727-2016	Gray Box Modeling of Power Transformer	Accept Without Changes

Manuscript ID	Manuscript Title	Decision
	Windings for Transient Studies	
TPWRD-01383-2015	Advanced modeling of magnetic cores for damping of high frequency power system transients	Accept Without Changes
TPWRD-00116-2016	Malfunction Detection of the Cooling System in Air-Forced Power Transformers Using Online Thermal Monitoring	Accept Without Changes
TPWRD-00246-2016	Non-minimum phase effects in transformer low-frequency bandwidth responses	Accept Without Changes
TPWRD-00283-2016	Estimation of Design Parameters of Single-Phase Distribution Transformers from Terminal Measurements	Accept Without Changes
TPWRD-01247-2015	Prediction of Pressure Drop and Flow Distribution in Disc Type Transformer Windings in an OD Cooling Mode	Accept Without Changes
TPWRD-01563-2015	Short Circuit Strength of Power Transformer Windings - Verification of Tests by a Finite Element Analysis Based Model	Accept Without Changes
TPWRD-01654-2015	Duality Derived Transformer Models for Low-Frequency Electromagnetic Transients –Part II: Complementary Modeling Guidelines	Accept Without Changes
TPWRD-00074-2016	Parameter Design and Performance Investigation of A Novel Bridge-Type Saturated Core Fault Current Limiter	Accept Without Changes
TPWRD-00904-2015	The Application of Correlation Technique in Detecting, Internal and External Faults in Three-phase Transformer and Saturation of Current Transformer	Accept Without Changes
TPWRD-00908-2015	Moisture Dependent Thermal Modelling of Power Transformer	Accept Without Changes
TPWRD-00114-2016	A System to Detect Small Amounts of Oil Leakage with Oil Visualization using Fluorescence Recognition	Administrative Reject
TPWRD-00996-2016	Split-core transformer for power supply to modular systems for harsh environment	Editorial Reject
TPWRD-00243-2016	Lighting Impulse Voltage Distribution over Voltage Transformer Windings - Simulation and Measurement	Reject
TPWRD-00617-2016	Influence of the Transformer’s Load on the Lissajous Figures in Winding Deformation Diagnosis	Reject
TPWRD-00696-2016	Novel Technique for the Calculation of Eddy Current Losses and Lorentz Forces in Foil Winding Transformers	Reject
TPWRD-00798-2016	Online Short-circuit Fault Diagnosis of Transformer	Reject

Manuscript ID	Manuscript Title	Decision
	Windings based on Transient Overvoltage Response Performance	
TPWRD-01368-2015	Suppression of Geomagnetic Induced Current Using Controlled Ground Resistance of Transformer	Reject
TPWRD-01467-2015	Electromagnetic Characteristic Analysis of Series Transformer in UPFC System	Reject
TPWRD-00044-2016	Qualitative and Quantitative FMECA on 220 kV Power Transformers	Reject
TPWRD-00064-2016	State of Health Determination for Distribution Transformers	Reject
TPWRD-00081-2016	Investigation of Gas Relay Malfunction Due to External Short Circuit Faults: Tests on 110kV Power Transformer	Reject
TPWRD-00124-2016	Localization and Severity Assessment of an Axial Displacement in an Actual Single Isolated Transformer Winding	Reject
TPWRD-00221-2016	Distribution transformers for rural networks for energetic efficiency and economic purposes: High impedance silicon steel versus amorphous core designs	Reject
TPWRD-00404-2016	A Practical Method for Life Cycle Assessment of Mineral Oil Power Transformers	Reject
TPWRD-00489-2016	Vibration Characteristic Investigation on Transformer under DC Bias Based on Motion Transmission Model	Reject
TPWRD-00610-2016	Development and Analyses of a New High Efficient Distribution Transformer	Reject
TPWRD-00622-2016	Dynamic Thermal Model for Dry-Type Distribution-Class Toroidal Transformers	Reject
TPWRD-00648-2016	Investigation and Analysis of Gas Relay Malfunction Due to External Short Circuit Faults: Tests on 110kV Power Transformer	Reject
TPWRD-00947-2016	Study of No-load Characteristics Measurement of Transformer Using Low-frequency Method	Reject
TPWRD-01061-2016	Improving Transformer Sizing in Planning Studies by Taking into Account its Thermal Inertia	Reject
TPWRD-01063-2016	Contribution of Inrush Current to the Mechanical Fatigue of Transformer Windings	Reject
TPWRD-01089-2016	Dynamic Thermal Model for Dry-Type Distribution-Class Toroidal Transformers	Reject
TPWRD-01274-2016	Classification and Discrimination among Winding Mechanical Defects, Internal and External Electrical Faults and Inrush Current	Reject

Manuscript ID	Manuscript Title	Decision
TPWRD-01308-2014	Testing small transformers with direct current components	Reject
TPWRD-01606-2015	A New Diagnostic Method to Determine the Extent of Axial Displacement in a Transformer Winding	Reject
TPWRD-01711-2015	Enhancements to Frequency Domain Spectroscopy Measurements of Oil-paper Insulation for Energized Transformers	Reject
TPWRD-01739-2015	A Comprehensive Comparison of the Numerical Indices Proposed for the Interpretation of the Frequency Response Analysis	Reject
TPWRD-01860-2015	A Proposal of a Standard Procedure for Mechanical Withstand Safety Margin Analysis of Transformers	Reject
TPWRD-00060-2016	Reduction in the Net Axial Short-Circuit Forces on the Transformer Windings under their Height Mismatch Condition	Reject
TPWRD-01544-2015	The nature of the first resonance in the frequency response of transformer winding	Reject

Respectfully,

Susan McNelly
Vice Chair
April 2, 2017

7.0 SECRETARY'S REPORT – BRUCE FORSYTH

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

7.1 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 the Committee Information Box. 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. WG and SC Chairs are reminded also that signing an application sponsoring a new member signifies their sponsorship that the applicant has met the requirement of membership and active participation for at least one year in the WG or SC they Chair. 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.

7.2 NEW COMMITTEE MEMBER APPROVALS

At the Fall 2016 Administrative Subcommittee meeting in Vancouver, eight new committee member applications were reviewed. Seven of the applications were approved. The new members are listed in the following table. One application by Shankar Nambi was not approved because membership in SA could not be confirmed.

Name	Affiliation	Sponsor #1	Sponsor #2	Sponsor #3	Membership Category
Saurabh Ghosh	Essex Group	Gary Hoffman C57.12.10 2 yrs.	Joe Watson Power Transformers SC 4 yrs.	Mike Lau C57.93 3 yrs.	Producer
Kurt Kaineder	Siemens Oesterreich AG	Mike Franchek P1276 3+ yrs.	Jane Ann Verner C57.163 2 yrs.	Sheldon Kennedy Insulation Life SC 3+ yrs.	Producer
Nick Perjanik	Weidmann Electrical Technology	David Wallach Insulating Fluids SC 4 yrs.	Paul Boman DGA Guide for Ester Fluids 4 yrs	Bob Rasor C57.106 4 yrs.	Producer
Jeff Ray	JLR Consulting	Sheldon Kennedy Insulation Life SC several years	Bruce Forsyth ILS TF Metallic Parts several years	Gary Hoffman WG Guide to XFMRS Connected to Generators duration?	General Interest
Sam Sharpless	Rimkus Consulting Group	Rick Marek WG PC57.110 2 yrs.	Adam Bromley WG PC57.105 2 yrs.	Sheldon Kennedy Insulation Life SC 2 yrs.	User
Weijun Li	Braintree Electric Light Department	Joe Watson Power Transformers SC >2 yrs.	Gary Hoffman WG C57.12.10 ~2 yrs.	Shibao Zang WG C57.19.01 >2 yrs.	User
Matt Weisensee	PacifiCorp	Sanjib Som WG C57.21 2 yrs.	Joe Watson Power Transformers SC 3 yrs.	Craig Colopy WG Tap Changer Guide 60214-2 2 yrs.	User

7.3 NEW MEMBER APPLICATIONS

Seven new applications for Committee Membership have been received for consideration since the Fall 2016 meeting in Vancouver. The following tables lists the names of the applicants and a summary of their supporting eligibility information.

Name	Affiliation	Sponsor #1	Sponsor #2	Sponsor #3	Membership Category
Ryan Musgrove IEEE – Yes PES – Yes SA – Yes	Oklahoma Gas and Electric	Joe Watson Power Trans. SC 3 yr.	Gary Hoffman WG C57.12.10 1.5 yr.	Joe Watson WG C57.148 3 yr.	User
Ali Naderian IEEE – Yes PES – Yes SA – Yes	METSCO	Tauhid Ansari C57.12.00 4 yr.	Jane Ann Verner C57.163 1 yr.	Ajith Varghese Dielectric Test SC 4 yr.	User
Mathieu Sauzay IEEE – No PES – Yes SA – Yes	JST Transformers	Ed teNyenhuis Perf. Char. SC 8 yr.	Hemchandra Shertukde WG C57.159 8 yr.	Richard Marek WG C57.154 4 yr.	Producer

Name	Affiliation	Sponsor #1	Sponsor #2	Sponsor #3	Membership Category
Hamid Sharifnia IEEE – Yes PES – Yes SA – Yes	STANTEC	Joe Watson Power Trans. SC 3 yr.	Alwyn Vanderwalt PC57.93 >2 yr.	Ali Naderian WG C57.161 >2 yr.	User
Mike Spurlock IEEE – Yes PES – Yes SA – Yes	AEP	Pierre Riffon WG Impulse Tests 2 yr.	Bill Griesacker TF RLFT 2+ yr.	Joe Watson Power Trans. SC 5+ yr.	User
Mike Thibault IEEE – Yes PES – Yes SA – Yes	Pacific Gas and Electric	Al Traut WG C57.12.20 Fall '15 &16'/Spring 16'	Ron Stahara WG C57.12.34 Fall '15 &16'/Spring 16'	Dan Mulkey WG C57.12.28/etc. Fall '15 &16'/Spring 16'	User
Eric Weatherbee IEEE – Yes PES – Yes SA – Yes	PCORE	Peter Zhao Bushings SC 8 yr.	Scott Digby WG PC57.19.04 7.5 yr.	Shibao Zhang C57.19.01 7 yr.	Producer

These applications will be reviewed at the Spring 2017 Administrative Subcommittee meeting.

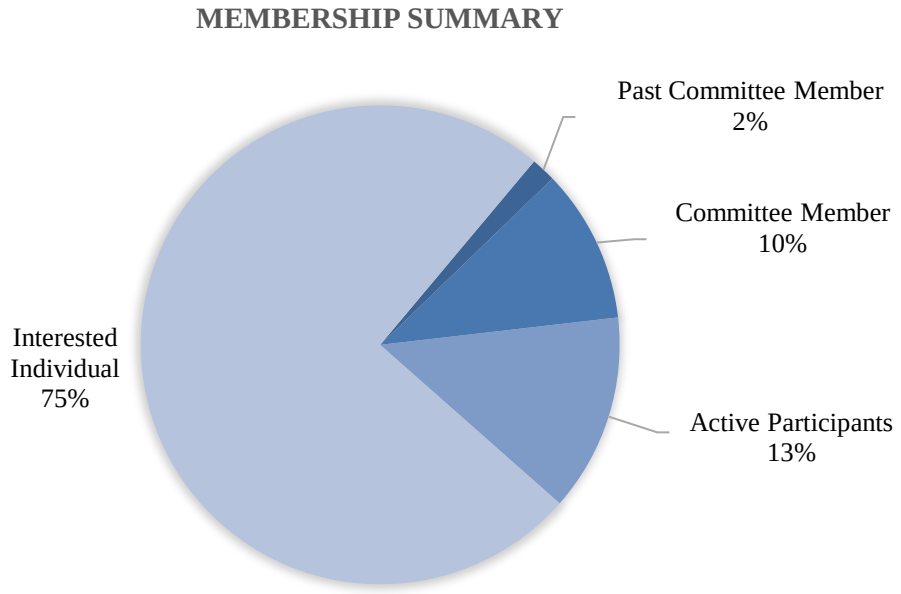
7.4 ASSOCIATION MANAGEMENT SYSTEM (AMS) DATABASE

The Transformers Committee AMS database of people currently has three general categories of participation in our activities. These are: **Interested Individual**, **Active Participant**, and **Committee Member**. In addition, the Committee Secretary maintains a list of **Past Committee Members**. Anyone can join the AMS 123 system as the system is designed for self-registration. A new participant will automatically be assigned the role of Interested Individual when they first sign up. 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. 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).

Membership Status	Mar-14	Oct-14	Apr-15	Nov-15	Mar-16	Oct-16	Mar-17*
Interested Individual	1381	1386	1362	1462	1471	1507	1554
Interested Individual - IEEE Life Member	12	10	9	11	11	11	11
Total Interested Individuals	**1393**	**1396**	**1371**	**1473**	**1482**	**1520**	**1565**
Active Participant	192	201	205	240	242	258	275
Active Participant - IEEE Life Member	5	6	6	7	5	5	5
Total Active Participants	**197**	**207**	**211**	**247**	**247**	**263**	**280**
Committee Member	166	170	173	161	172	175	180
Committee Member – Emeritus	09	10	10	10	9	9	9
Committee Member - IEEE Life Member	21	20	22	23	25	27	29
Total Committee Members	**196**	**200**	**205**	**194**	**206**	**211**	**218**
Past Committee Member	15	18	19	28	32	31	30
Past Committee Member - IEEE Life Member	6	6	7	6	5	5	5
Total Past Committee Members	**21**	**24**	**26**	**34**	**37**	**36**	**35**
TOTAL IN AMS DATABASE	**1810**	**1827**	**1813**	**1948**	**1972**	**2028**	**2098**

*Mar-17 data is as of March 23, 2017



It is the responsibility of each individual to keep his/her profile updated (except for the category).

7.5 COMMITTEE, SUBCOMMITTEES, AND WORKING GROUP ROSTERS

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

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

7.6 IEEE/PES AND IEEE/SA MEMBERSHIP REQUIREMENTS

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

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

7.7 COMMITTEE MEMBERSHIP MAINTENANCE

No changes to the membership list have taken place since the fall 2016 meeting. The membership list will be reviewed after the upcoming meeting and notices will be sent to members who appear to be inactive (based on attendance) to inquire about their intentions of attending/participating in the Committee.

7.8 ESSENTIAL PATENT CLAIMS

The Transformers Committee asks each participant at the time of meeting registration if they are aware of an essential patent claim, and if so to provide details. An Essential Patent Claim is any Patent Claim the use of which was necessary to create a compliant implementation of the IEEE Standard when there was no commercially and technically feasible non-infringing alternative. In other words, if an IEEE Standard REQUIRES the use of a product or process that is already patented, then this could be an essential patent claim. If they did, they would be instructed to have the patent holder's legal team file a Letter of Assurance (LOA) with the IEEE-SA Standards Board Patent Committee. There is a link to this information on the transformerscommittee.org website under Patent Disclosure Requirements.

For the Spring 2017 meeting in New Orleans, most people answered "NO" to the Patent question presented during the online registration process. As of March 24, 2017 there were 7 people who answered "YES" that they were aware of an essential patent claim. Of these, 4 provided no details and therefore will not be considered any further. The remaining 3 comments are as follows:

1. Patent 11/238,799: Multi-compartmental transformer and methods of maintenance therefor affecting C57.12.34 (3-phase pad-mount). Inventors: Thomas Callsen & Martin Rave - Exelon Already working with Steve Shull on securing the LOA.

2. C57.139 - Letter of Assurance signed - Jan 2013

3. Bruce, it was agreed at the Fall 16 AdCom meeting there would be a call for Patents at the start of each WG Meeting as required by Clause 6.3.2, Call for patents of the IEEE-SA Standards Board Operations Manual. Please ensure that all WG Chairs know their obligation to read the patent slide at the start of their WG meeting has not been superseded by having this statement on the registration page. The call shall occur in front of the WG and if someone voices knowledge of a potential essential patent in a draft standard for which no Letter of Assurance has been submitted the WG Chair or their designee shall document this in the WG minutes as stated in the Op Man. This is not a punitive action by the IEEE-SASB but a means to identify potential essential patents being put into our Standards without an Letter of Assurance being submitted. You do understand that this has happened within this committee and we should do everything we can to prevent this bad behavior.

7.9 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."

7.10 MEETING MINUTES

The minutes of the Fall 2016 meeting in Vancouver were posted to the committee website in March of 2017.

Subcommittee Chairs are asked to submit their respective subcommittee meeting minutes for the New Orleans meeting to the Committee Secretary no later **May 21**, **2017**, which is 45 days after the completion of the meeting. It is strongly recommended that meeting minutes be prepared soon 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, Bruce Forsyth [bruce.forsyth@ieee.org], who will forward them on for posting on the Committee website.

The submittal file should be saved as a Word document formatted similar to this document. Attendance, indication of quorum, names of members making any motion, seconding any motion, and the result of any votes (affirmative and negative count) for each SC, WG, and TF meeting shall be included in all minutes.

Respectfully submitted,

Bruce Forsyth
Secretary
IEEE/PES Transformers Committee
April 2, 2017

8.0 TREASURER'S REPORT – GREGORY ANDERSON

Greg reported that the finances of the Committee are in good condition.

MEMORANDUM

April 2, 2017

To: Stephen Antosz, Chair
IEEE/PES Transformers Committee

RE: IEEE/PES Transformers Committee
Treasurer's Report
Sprint 2017 Meeting
(for reporting period 09/01/2016 to 01/31/2017)

Dear Steve,

The finances of the Committee are in good condition. As of 31st of January 2017 (end of this reporting period), the balance was $83,245.91.

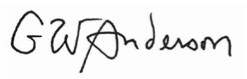
FYI: January 31st is essentially a "snap-shot" in time after all income & expenses are resolved from the previous Fall 2016 Meeting in Vancouver, and before we start spending significant funds for the Spring 2017 Meeting in New Orleans.

No significant assets (PC projectors, etc.) were purchased during this reporting period.

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

Let me know if you have any questions or concerns.

Sincerely,



Gregory W. Anderson, Treasurer
IEEE/PES Transformers Committee

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

IEEE/PES TRANSFORMERS COMMITTEE

Treasurer's Report - Spring 2017

(for reporting period 09/01/2016 to 01/31/2017)

AAAAA	**Balance before Spring 2015 Meeting , as of 02/28/2015**	**$93,166.09**
AAAA	**Balance before Fall 2015 Meeting , as of 08/01/2015**	**$53,501.80**
AAA	**Balance before Spring 2016 Meeting , as of 01/31/2016**	**$59,683.51**
AA	**Balance before Fall 2016 Meeting , as of 08/31/2016**	**$60,111.54**
	Misc Income, not related to a specific meeting	
	-- interest, approx 6 months	$124.16
	-- misc income; shirt sales, CD-ROM sales, book sales, etc.	$61,941.00
B	Total Misc Income, not meeting related	$62,065.16
	Misc Expenses, not related to a specific meeting	
	-- 123Signup subscription fee, for approx 6 months	$879.00
	-- awards	$0.00
	-- equipment purchases, major assets (projectors & cases, etc.)	$0.00
	-- technology (RFID tech, meeting app, WiFi equip, printers & ink, cables, etc)	$2,553.19
	-- conferences, remote meetings, etc.	$1,000.01
	-- other misc expenses (shirts, CD-ROMs, books, office suppies, namebadges, etc.)	$62,062.98
C	Total Misc Expenses, not meeting related	$66,495.18
	Spring 2016 Meeting	
	-- late income, meeting registrations (rolling reserve paybacks)	$0.00
	-- misc late income (incentives, late sponsor contributions, etc.)	$2,472.56
	-- late meeting expenses	$0.00
D	Total Late Income/(expenses), Spring 2016 Meeting	$2,472.56
	-- reported prelim. gain/(loss), as of 08/31/2016, from previous Treasurer's Report	$20,277.95
	Actual Gain/(Loss), Spring 2016 Meeting	$22,750.51
	Fall 2016 Meeting	
	-- income, meeting registration	$307,837.57
	-- income (coffee break sponsors)	$7,500.00
	-- meeting expenses	$203,567.64
	-- expenses, not related to this meeting (sale of CD-ROMs)	$61,941.00
E	Income minus expenses (between 09/01/2016 and 01/31/2017)	$49,828.93
	-- meeting income (expenses), before 09/01/2016	($28,486.07)
	Preliminary Gain/(Loss), Fall 2016 Meeting	$21,342.86
	Expenses, Future Meetings (deposits paid, etc)	
FF	-- future meeting expenses, paid 02/01/2016 to 08/31/2016	$24,737.10
FFF	-- future meeting expenses, paid 09/01/2016 to 01/31/2017	$0.00
G	**Net Income (loss), between Fall 2016 and Spring 2017 meetings (B - C + D + E)**	**$47,871.47**
A	**Balance before Spring 2017 Meeting , as of 01/31/2017 [(AA - FF) + G]**	**$83,245.91**

9.0 RECOGNITION AND AWARDS REPORT – DON PLATTS

9.1 SPECIAL TRIBUTES

During the months since our previous meeting in October 2016 in Vancouver, the Transformers Committee and the industry lost another of our long time contributors. At our Awards luncheon on Tuesday, the meeting attendees gathered to pay special tribute to another of our friends and collogues who have recently passed away.

Charles "Chuck" Simmons (1964 – 2016)
Chuck Simmons, 52, died Monday, December 5, 2016. He was born in Caldwell County. Chuck was an electrical engineer at Duke Energy Progress. He was a graduate of NC State where he received his Bachelor of Science degree. He later completed his MBA at Virginia Tech. One of Chuck's greatest joys in life was watching his son Mitch skate and play hockey. Chuck is survived by his loving wife of 23 years Donna Simmons; son Mitch; and his mother Charlotte Simmons. A private family gathering was held in memory of Chuck.

9.2 COMMITTEE MEMBERSHIP CERTIFICATES

The Transformers Committee welcomes six new full committee members, and a Past Member, who has been re-instated. Each of the following new members was presented with a membership certificate:

New Member	Affiliation
Ryan Musgrove	*Oklahoma Gas and Electric*
Ali Naderian	*METSCO*
Mathieu Sauzay	*JST Transformers*
Hamid Sharifnia	*STANTEC*
Mike Spurlock	*AEP*
Eric Weatherbee	*PCORE*

9.3 GENERAL SERVICE AWARDS

Certificates of Appreciation were presented to the following list of recipients for their contributions to the Transformers committee:

Name of Award Recipients	Affiliation	Contributions
Marnie Roussell	*Entergy*	*Meeting Host – Spring 2017*
Entergy	*Entergy*	*Host Company– Spring 2017*
Joe Watson	*JD Watson and Associates Inc.*	*Chair of Power Transformers Subcommittee (2013–2016)*

Sanjib Som	*PA Transformer*	*Technical Editor for Transformers Committee (2012 -2016)*

9.4 OUTSTANDING CONTRIBUTOR AWARDS & CERTIFICATE OF APPRECIATION

In any successful organization, there are always a handful of hard working individuals, laboring behind the scene that put in the sweat equity year after year to provide great contributions to the success of the group. Often these contributors are not necessarily those who held the official titles. Similarly, in the Transformers Committee, we also have a long list of these outstanding contributors. At our recent meetings, the Awards subcommittee has started the process of recognizing the individuals who provided long tenured contributions to our organization. As we look across the many contributors we have in the organization, we realize that there are many deserving candidates. We hope to continue to recognize these awardees at each of our future meeting.

The criteria for the evaluation of the nominees are primarily based on the long tenure of significant contributions in either technical subject matter expertise and/or broader organizational impacts in our ability to reinvent our thinking and continue our industry leadership and relevancy.

At the Awards Luncheon on Tuesday, the Transformers Committee presented special certificates of appreciation to two of our members for their many years of service to the Transformers Committee and to the industry.

Our first recipient has been a steadfast technical contributors over the past several decades and has brought us his expertise in the design and field applications and testing for transformers, bushings, and other components. The committee has benefited greatly from this experience, wisdom, and practical expertise. A brief description of his career highlights and contributions is included below.

Craig Stiegemeier is the Director of Technology for ABB's Transformer Service business unit (TRES) in North America. He is responsible for developing effective processes supporting condition evaluation and assessment tools, life extension solutions and training programs for utility and industrial users of power transformers. Craig started his career as a power transf. development engineer in 1979 and has performed a number of different roles, including shell-form transf. design engineer; program mgr. for the U.S. Navy's fleet improvement program; transf. components engineering, marketing & aftermarket service mgrs..; project mgr. for power transf. winding improvements; commercial operations manager for the St. Louis power transf. facility; and transf. service related roles, including engineering solutions manager and marketing manager. He has been a member of the transformers committee since 1998 and has served several roles as task force chair, working groups and Subcommittee Vice Chairs, Meetings Planning support team and others.

Our second recipient has been an active leader of Working Group activities with the Transformers Committee for many years, and has been a committee member since 2007. During his career, he has also been heavily involved with research in other technical fields, such as motors and electric vehicles. He has been a perpetual technical contributor over decades on participation, and has brought to us a level of expertise in the area of dielectric and thermal evaluation of materials performance and testing. As a result, the committee has benefited greatly from his experience, wisdom, and practical expertise. **Roger Wicks** currently serves as the Chair of the following working groups

C57.12.58 Transient Analysis

C57.100 Thermal Evaluation Tests

Application of High Temp Insulation IEEE 1276

Thermal Evaluation for Dry-Type C57.12.60

In addition to IEEE activities, he is also the Chairman of IEC TC112.

Roger Wicks, global technical marketing manager, DuPont Advanced Fiber Systems, was inducted into the Electrical Insulation Conference (EIC) Hall of Fame. Each year, the EIC inducts one person into the Hall of Fame who "has made significant contributions to furthering the growth and progress of the Electrical Insulation Conference and the Electrical Manufacturing and Coil Winding Association." Roger has been a member of the EIC for about 30 years and chaired their annual convention in 2003. He has been instrumental in supporting the DuPont Nomex® electrical insulation business, including recent launches of new products such as Nomex® Strata Composite.

9.5 IEEE SA STANDARDS BOARD AWARDS

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

IEEE SA Award Recipients:

We have had a number of working groups that have completed their projects, their standards documents have been published, but IEEE SA has been slow to recognize them by awarding the SA plaques and Certificates of Appreciation. At our fall meeting in Vancouver, the 9 Working Groups were again recognized as a group, at our Tuesday luncheon, with the understanding that they may still request that the official plaque award ceremony be at a future Transformers Committee meeting.

Several of these Working Groups will finally be recognized in New Orleans with the presentation of their SA Award plaques. In addition, there are a few other projects that were completed in 2015, and we also have the opportunity to recognize these Working Groups for their accomplishments.

IEEE C57.156-2016 - IEEE Guide for Tank Rupture Mitigation of Liquid-Immersed Power Transformers and Reactors

Peter Zhao *- Working Group Chair*

Robert Thompson*- Vice Chair*

Other Significant Contributors

Sam Brodeur	Bill Darovny
Marc Foata	Josh Herz
Terrence Lee	Jim Zhang

C57.12.24 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

Giuseppe Termini *- Working Group Chair*

George Payerle*- Vice Chair*

Other Significant Contributors

Corey Morgan	Christopher Sullivan
Dan Mulkey	Ralph Wegner
Paul Chisholm	Brian Klaponski
Robert Kinner	

IEEE 1538 -2015 Amendment 1- IEEE Guide for Determination of Maximum Winding Temperature Rise in Liquid Filled Transformer

Rick Marek *- Working Group Chair*

Hasse Nordman *- Vice Chair*

Other Significant Contributors

C57.159 Guide on Transformers for Application in Distributed Photovoltaic (DPV) Power Generation

Hem Shertukde*- Working Group Chair*

Mathieu Sauzay*- Vice Chair*

Aleksandr Levin*- Secretary*

Other Significant Contributors

Enrique Betancourt	Carlos Gaytan
Phil Hopkinson	Sheldon Kennedy
Anirudha Narwane	Martin Navarro
Subhash Sarkar	Sanjib Som
Vijay Tendulkar	Kiran Vedante

The two Working Groups that chose to have their awards shipped directly to their contributors are:

Number	Title	WG Chair
C57.157 2015	Guide for Conducting Functional Life Tests on Switch Contacts Used in Insulating Liquid Transformers	Phil Hopkinson
C57.12.01	General Requirements for Dry- Type Distribution and Power Transformers Including Those with Solid Cast and/or Resin Encapsulated Windings	Tim Holdway

Despite getting many of our working groups recognized, we still have a backlog of projects that must be resolved. The Awards Chair will be working to correct this promptly. The list of Working Groups that remain in the category where their award production is still in progress is as follows:

Number	Title	WG Chair	Awards Lunch
C57.125 2015	Guide for Failure Investigation, Documentation, Analysis, and Reporting for Power Transformers and Shunt Reactors	Wally Binder	F2015
C57.106-2015	Guide for Acceptance and Maintenance of Insulating Mineral Oil in Electrical Equipment	Bob Rasor	

Since our last meeting, we had 3 New Transformer Standards documents that were approved by RevCom, and subsequently the SA Board.

Number	Title
60076-57-1202	International Standard Requirements for Liquid-Immersed Phase-Shifting Transformers
C57.120	IEEE Guide for Loss Evaluation of Distribution and Power Transformers and Reactors
C57.138-2016	IEEE Recommended Practice for Routine Impulse Tests for Distribution Transformers

Due to the process of waiting for document publication, identifying the recipients, and producing the awards, we will not have awards ready for these projects at this meeting, but we still want to provide recognition and notice of these accomplishments.

9.6 OTHER IEEE PES AWARDS (AVAILABLE UPON APPLICATION TO PES)

The IEEE PES recognizes important technical, educational and service contributions through the conferral of numerous awards. The listing below highlights the various other awards that are available through the IEEE PES organization.

- IEEE PES Award for Excellence in Power Distribution Engineering
  Nominations due by October 1

- IEEE PES IAS A.P. Seethapathy Rural Electrification Excellence Award
  Nominations due by February 1st

- IEEE PES Charles Concordia Power System Engineering Award
  Nominations due by February 29th

- IEEE PES Cyril Veinott Electromechanical Energy Conversion Award
  Nominations due by February 1st

- IEEE PES Douglas M. Staszesky Distribution Automation Award
  Nominations due by January 31st

- IEEE PES Lifetime Achievement Award
  Nominations due by February 1st

- IEEE PES Leadership in Power Award
  Nominations due by February 1st

- IEEE PES Meritorious Service Award
  Nominations due January 31st

- IEEE PES Nari Hingorani Custom Power Award
  Nominations due by January 31st

- IEEE PES Nari Hingorani FACTS Award
  Nominations due by January 31st

- IEEE PES Outstanding Chapter Award

- IEEE PES Outstanding Power Engineering Educator Award
  Nominations due by January 30th

- IEEE PES Outstanding Young Engineer Award
  Nominations due by February 1st

- IEEE PES Prabha S. Kundur Power System Dynamics and Control Award
  Nominations due by January 31st -

- IEEE Power & Energy Society Ramakumar Family Renewable Energy Excellence Award
  Nominations due by January 31st

- IEEE PES Robert P. Noberini Distinguished Contributions to Engineering Professionalism Award
  Nominations due by February 1st

- IEEE PES G. Ray Ekenstam Memorial Scholarship
  Nominations due by June 30th

- IEEE PES Scholarship Plus Initiative
  Applications due by June 30th

- IEEE PES Roy Billinton Power System Reliability Award
  Nominations due by February 1st

- IEEE PES Uno Lamm High Voltage Direct Current Award
  Nominations due by November 30th

- IEEE PES Wanda Reder Pioneer in Power Award
  Nominations due by January 15th

- IEEE PES CSEE Yu-Hsiu Ku Electrical Engineering Award
  Nominations due by January 31st

- IEEE PES Working Group Recognition Awards
  The PES Working Group Recognition Awards recognize "the most outstanding and timely publications" by a PES Working Group (or Committee or Subcommittee) from among the nominations. The PES Recognition Award is divided into two categories: 1) for technical reports; 2) standards and guides. Each Technical Council Committee may nominate one report from each category, published by IEEE, during the previous three year period." This award consists of a plaque which will be presented to the Working Group Chair at the PES Summer Meeting Awards Luncheon. A framed certificate will be presented to each Working Group member at a designated meeting of the parent Technical Committee.

Respectfully submitted,

Donald W Platts
Chair, Recognitions and Awards Subcommittee

10.0 ADMINISTRATIVE SUBCOMMITTEE MEETING REPORT

10.1 INTRODUCTION OF MEMBERS AND GUESTS

The Chair called the meeting to order and asked attendees to introduce themselves and their affiliation. Consultants were asked to identify the company they were representing if they were not representing their own consulting interest. Introductions were made by members and guests.

Members and Guests Present:

Chair ..... Stephen Antosz
Vice Chair ..... Susan McNelly
Secretary ..... Bruce Forsyth
Treasurer/ Meetings Planning SC ..... Gregory Anderson
Standards Coordinator ..... Jim Graham
Awards/Past Chair ..... Donald Platts
Bushings ..... Peter Zhao
Dielectric Tests ..... Ajith Varghese
Distribution Transformers ..... Stephen Shull
Dry Type Transformers ..... Chuck Johnson
HVDC Converter Transformers & Reactors ..... Michael Sharp
Instrument Transformers ..... Ross McTaggart
Insulating Fluids ..... David Wallach
Insulation Life ..... Sheldon Kennedy
Performance Characteristics ..... Ed teNyenhuis
Power Transformers ..... Bill Griesacker
Standards ..... Jerry Murphy
Underground Transformers & Network Protectors ..... (Dan Mulkey was absent)
Guests: Peter Balma (by phone, partially), Erin Spiewak (IEEE), Malia Zaman (IEEE), Tom Prevost

10.2 APPROVAL OF PREVIOUS MEETING MINUTES

The Chair asked for comments of the minutes from the Fall 2016 Administrative Subcommittee meeting in Atlanta. There were no comments and no objections to unanimous approval, therefore the minutes were approved.

10.3 ADDITIONS TO AND/OR APPROVAL OF THE AGENDA

The Chair reviewed the draft agenda and noted the addition of a new item under New Business (IEEE/IEC issue regarding dual references) since the initial preliminary agenda was sent to members. In addition, the Chairs asked that the issues involving Peter Balma be covered first since Peter was calling in and had other commitments. There were no additional changes requested and no objections to unanimous approval of the revised agenda, therefore the following agenda was approved.

Approved Agenda:

1. Introduction of Members and Guests (:02) ..... All
2. Approval of Fall 2016 Minutes from Vancouver (:02) ..... Stephen Antosz
3. Additions to and/or Approval of the Agenda (:02) ..... Stephen Antosz
4. Chair's Report (:05) ..... Stephen Antosz
5. Vice Chair's Report (:05) ..... Sue McNelly
6. Secretary's Report & New Committee Membership Approval (:10) ..... Bruce Forsyth
7. Treasurer's Report (:05) ..... Greg Anderson
8. Recognition & Awards Report (:05) ..... Don Platts
9. Standards Report (:20) ..... Jim Graham
10. IEEE Staff Update (:10) ..... Malia Zaman/Erin Spiewak
11. Meeting Planning (:10) ..... Greg Anderson
    11.1. New Orleans Meeting Update

11.2. Future Meetings

Time Check (3:30 pm) & Break (20 min max)

12. Old Business
    - 12.1. Emeritus Member Task Force Update (:05) ..... Bruce Forsyth
    - 12.2. 100 Year Anniversary Meeting Survey Results (:05)..... Peter Balma
    - 12.3. Patent Disclosure Update (:05)..... Stephen Antosz
13. New Business
    - 13.1. Entity WGs and SGCC PAR (:05)..... Stephen Antosz
    - 13.2. Transfer C57.144 Metric Conversion to SCC14 Qty/Units/Symbols (:05)..... Peter Balma
    - 13.3. Ballot Comment Resolution Actions (:05) ..... Peter Balma
    - 13.4. Gas Insulated Transformers, GIT (:05) ..... Stephen Antosz
    - 13.5. Caution About Personal Written Comments in Minutes (:05) ... Bruce Forsyth

Time Check – 4:15 PM

14. Subcommittee Reports – Roundtable (not intended to indicate order of reporting)
    - Bushings (:03)..... Peter Zhao
    - Dielectric Test (:03)..... Ajith Varghese
    - Distribution Transformers (:03)..... Steve Shull
    - Dry Type Transformers (:03)..... Chuck Johnson
    - HVDC (:03) ..... Mike Sharp
    - Instrument Transformers (:03)..... Ross McTaggart
    - Insulating Fluids (:03)..... David Wallach
    - Insulation Life (:03) ..... Sheldon Kennedy
    - Performance Characteristics (:03)..... Ed teNyenhuis
    - Power Transformers (:03)..... Bill Griesacker
    - Standards (:03)..... Jerry Murphy
    - Underground Transformers & Network Protector (:03) ..... Dan Mulkey
15. Adjourn

10.4 CHAIR'S REPORT – STEPHEN ANTOSZ

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

Highlights:

- Topics from the last Technical Council retreat meeting were reviewed.
  - The Chair will lead a TF on best practices at technical meetings.
- SC Chairs are reminded to ensure their respective activity leaders use the AMS to record attendance.
- A verbal call for patents is required at the beginning of all WG meetings.

10.5 VICE CHAIR'S REPORT – SUE MCNELLY

Refer to Section 6.0 of the Main Minutes for a complete "Vice Chair's Report."

Highlights:

- Only upcoming event is IEEE/PES General Meeting on July 16-20 in Chicago.
  - 22 papers were submitted; one was a PES Transaction paper; one was transferred to Relay Committee; 5 were rejected; 15 were approved.
- Information on IEEE Transaction papers is included in the full report.

10.6 SECRETARY'S REPORT – BRUCE FORSYTH

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

Highlights:

- There were seven applications for Committee Membership since the last meeting.
  A motion was made by Bruce Forsyth (seconded by Steve Shull) to approve all 7 applications subject to a) Mike Thibault confirming at least 2 yr. participation in a SC, and b) confirmation of Eric Weatherbee's PES and SA membership. The motion was approved unanimously.
- There were 7 positive responses to the essential patent claim question on the registration form. Of those, only 3 provided any further detail and those details are noted in the full report.
- SC Chairs are asked to submit their minutes not later than May 21, 2017.

10.7 TREASURER'S REPORT – GREGORY ANDERSON

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

Highlights:

- Greg reviewed the finances briefly and noted the current balance is higher than in the past in anticipation of higher than normal costs for the spring 2018 100-year anniversary meeting.
- The Committee finds are in good shape.

10.8 RECOGNITION & AWARDS REPORT – DON PLATTS

Refer to Section 9.0 of the Main Minutes for a complete "Recognition & Award's Report."

Highlights:

- 2 awards for outstanding contributions will be handed out this week.

10.9 STANDARD'S REPORT – JIM GRAHAM

Refer to Section 11.0 of the Main Minutes for a complete "Standards Report."

Highlights:

- 3 new standards have been approved.
- 3 corrigenda have been approved.
- 4 PARs for new projects have been approved.
- 6 extensions have been approved.
- May 5 and October 16 are 2017's key submission deadlines.
- Reminder to SC Chairs to review website data and advise Webmaster of any required changes.
- Reminder to SC Chairs to notify Jim and Greg Anderson of new WG Chairs so access in AMS can be provided.
- Peter Zhao asked about the procedure for dual logo standards. Jim advised there is no change from past direction and that there is no obligation to pursue dual logo.

10.10 IEEE STAFF UPDATE – MALIA ZAMAN

Refer to Annex 4 for the full PowerPoint presentation.

Regarding the comment resolution process, RevCom prefers the disposition section to be left blank if a comment is accepted. If a comment is changed, details should be provided. If a comment is rejected, a technical rationale for the rejection should be provided.

The results of the patent question must be included in the meeting minutes.

Two entity ballots have recently been presented to the Transformers committee for consideration. One that was referred to the Insulation Life Subcommittee wasn't considered further because it appeared to be a

material specification to build a specific product. The second, which is an issue for the Dielectric Test Subcommittee will be discussed further in Old Business.

The WG Chair awards process is being reformatted.

The Transformers Committee P&P manual expires in 2019 and an updated template has been recirculated.

Comments were made regarding PARs that will be expiring soon.

10.11 MEETING PLANNING REPORT – GREGORY ANDERSON

No written report provided.

Highlights:

- Preliminary registration shows the following:
  - Main meeting: about 598 registrants, with about 88 companions.
  - Early Bird event: about 50
  - Monday Luncheon: about 215 expected
  - Tuesday Luncheon: about 240 expected
  - Wednesday Evening Social: about 250 expected
- Marnie Russell welcomed everyone to New Orleans on behalf of Entergy and described the companion tours.
- The Fall 2017 meeting will be held in Louisville, KY, on Oct. 29 – Nov. 2, 2017. This will be a host-less meeting.
- The Spring 2018 meeting will be held in Pittsburgh, PA on March 25-29, 2018, hosted by Dennis Blake (Pennsylvania Transformer).
- The Fall 2108 meeting location will be announced soon.

10.12 OLD BUSINESS

10.12.1 Emeritus Member Task Force Update – Bruce Forsyth

A current list of Emeritus Members was presented. Bruce noted that a TF was formed to review EM issues (Platts, Antosz, Kennedy, Shull) but not much action has taken place. At the next meeting a report will be presented on the following topics:

- Updated list
- EM qualifications
- Benefit of EM status
- Duration of status

10.12.2 100-Year Anniversary Meeting Survey results – Peter Balma

Refer to Annex 1 for the PowerPoint presentation prepared by Peter for this discussion.

Peter recapped the past decision have a special celebration in the spring of 2018 to recognize the apparent 100-year anniversary of the Transformers Committee. Peter's full presentation is attached in Annex 1. A survey was sent to get input for planning activities. A summary the results is as follows:

- The survey was sent to 214 members of which 85 (40%) responded.
- Recommend a combined Sunday reception celebration dinner.
- Suggest business casual and encourage optional jacket, or jacket and tie.
- Suggest the reception be on Sunday and different or no additional event be on Wednesday. Alternatively, if the special reception is on Wednesday, then would still have a normal Sunday reception.
- Suggest we allow sponsors; but must carefully determine how they would be recognized.

- 75 of the respondents said they would attend a special event. One said no, 10 said maybe.
- A question regarding companion attendance resulted in inconclusive results, suggesting the question was not clear.
- 25 respondents expressed interest in helping plan the event.
- 73 respondents said their company would be willing be a sponsor.
- A list of speaker suggestions was reviewed.
- A list of suggested awards was reviewed.

Stephen Antosz commented on the number of companies interested in being sponsors compared to the number of respondents who support having company sponsors.

A discussion regarding respondents preferences for when the special event should take place occurred. Peter Balma explained the suggestion of a Sunday reception was the result of weighting the responses. Greg Anderson reviewed the current reservations for the hotel and noted the large banquet room is currently reserved for Sunday, based in part on past attendance numbers for Sunday and Wednesday evening events. Some further discussion took place regarding the impact of meeting attendance on Monday morning if the special event is held on Sunday evening.

Bruce Forsyth made a motion that the special event be held on Sunday night and no activity be planned for Wednesday night. The motion was seconded by Don Platts. The motion passed by a vote of 15 in favor, 2 opposed, and no abstentions.

10.12.3 Patent Disclosure – Stephen Antosz

The patent issue was discussed previously and no further discussion took place.

10.13 NEW BUSINESS

10.13.1 Entity WG's and SGCC PAR – Stephen Antosz

We have had two entity WG PARs recently submitted from SGCC. One was refer to the Insulation Life Subcommittee. The second refers to field PD testing of transformers and has been presented to the Transformers Committee for approval. Stephen noted that the Officers have been reluctant to do so because they are not sure where it fits and whether there is overlap. Stephen gave an overview of the difference between the individual based process (one person, one vote) and the entity based process (one company, one vote). The Transformers Committee has traditionally used the individual based process. Regarding the proposed standard, Ajith Varghese noted there are at least 4 active documents that currently address PD measurements.

Stephen Antosz suggested there are two choices – to have the Dielectric Test Subcommittee consider the PAR at the upcoming meeting to determine the need for the project, or had AdCom stop the proposal from proceeding now because we see a lack of need or conflict. Another option – to allow the proposal to proceed as an addendum or amendment to current documents was presented. It was noted that the proposal covers UHV transformers, but there are very few locations using UHV transformers at this time.

A discussion took place regarding the entity process. Topics discussed included the Transformers Committee's role in the approving an entity WG PAR, and the impact of the Transformers Committee not supporting an entity WG PAR.

Steve Shull made a motion that the request to sponsor the entity PAR related to PD testing in the field is rejected because we believe we already have documents in place that cover these issues, that we are open to expanding the scope of the existing documents to include UHV, and that we encourage SGCC to join the existing groups. Bruce Forsyth seconded the motion. There was no objection to unanimous approval.

10.13.2 Transfer C57.144 Metric Conversion to SCC14 Qty/Units/Symbols – Peter Balma

Refer to Annex 2 for the PowerPoint presentation prepared by Peter for this discussion.

Peter outlined some issues that recently occurred during a Standards Board review of SCC14. Peter recalled C57.144 is related to metric conversion, but that is not really the Transformers Committee's primary focus. SCC14 covers metric units and metric practice. Peter asked the question, "Would it make sense to transfer C57.144 to SCC14?"

Steve Shull shared some of his experiences during the development of C57.144 and expressed concern about transferring it to SCC14 without some careful review.

Bruce Forsyth suggested that unless the existing document is causing a problem that we leave it alone and let it expire naturally (in 2020). It was noted that we are at a point that if we are going to keep C57.144 alive we need to open a PAR now. Jim Graham suggested the issue be raised at the Standards Subcommittee meeting.

Don Platts made a motion that we retain the document and refer it to the Standards Subcommittee to start the process of review. The motion was seconded by Steve Shull. There was no objection to unanimous approval.

10.13.3 Ballot Comment Resolution Actions – Peter Balma

Refer to Annex 3 for the PowerPoint presentation prepared by Peter for this discussion.

Peter discussed procedural issues related to ballot comment resolution actions. He noted that comments must be properly addressed on the ballot resolution template. Peter's detailed comments can be read in Annex 3. It was noted that every Ballot Resolution Group is required to present their recommendations to their respective Working Group unless the Working Group has expressly authorized the Ballot Resolution Group to forward their decisions without returning to the Working Group.

10.13.4 Gas Insulated Transformers, GIT – Stephen Antosz

Stephen noted that a question has been raised whether a) we cover GITs in our standards, and b) should we? In summary, Stephen stated that GITs are outside our scope and there is no apparent demand for such standards by transformer manufacturers using the IEEE standards. He noted that he will address this further in his Chair's report. It was noted that there are GIT standards available in the IEC, in Japan, and perhaps other locations.

10.13.5 Caution About Personal Written Comments in Minutes – Bruce Forsyth

Bruce Forsyth cautioned Chairs not to allow people to submit unvetted comments to be included in the meeting minutes, even if the reason is because the person did not have a chance to make a statement before the meeting time expired. Bruce noted that not only is it possible the comments may be inappropriate or out of order, but more importantly doing so denies the general audience an opportunity to comment or respond. Stephen Antosz added that we should not give people that platform. Steve Shull suggested it would be more appropriate to provide the individual an opportunity to speak at the next meeting.

10.14 SUBCOMMITTEE REPORTS

Subcommittee	Report/Hot Topic
Bushings (S. Shull)	No pressing issues submitted for inclusion in the minutes.
Dielectric Test (A. Varghese)	No pressing issues submitted for inclusion in the minutes.
Distribution Transformers (S. Shull)	No pressing issues submitted for inclusion in the minutes.
Dry Type Transformers	No pressing issues submitted for inclusion in the

Subcommittee	Report/Hot Topic
(C. Johnson)	minutes.
HVDC (M. Sharp)	The recirculation ballot results are back for the dual logo standard IEC / IEEE 60076-57-129 Converter Transformers for HVDC Applications. They will be presented and discussed at our subcommittee meeting tomorrow. As well a PAR has been approved for revision of IEEE 1277 Standard General Requirements and Test Code for Dry-Type and Oil Immersed Smoothing Reactors for DC Power Transmission. Our SC meeting tomorrow will also be the kick off meeting for the new working group for revision of this standard.
Instrument Transformers (R. McTaggart)	No pressing issues submitted for inclusion in the minutes.
Insulating Fluids (D. Wallach)	No pressing issues submitted for inclusion in the minutes.
Insulation Life (S. Kennedy)	Discussed issues related to an off-schedule meeting for issues related to C57.154.
Performance Characteristics (E. teNyenhuis)	No pressing issues submitted for inclusion in the minutes.
Power Transformers (J. Watson)	No pressing issues submitted for inclusion in the minutes.
Standards SC (J. Murphy)	No pressing issues submitted for inclusion in the minutes.
Underground Transformers & Network Protectors (D. Mulkey)	No pressing issues submitted for inclusion in the minutes.

Jim Graham asked about the status of a standard agenda template. Steve Shull mentioned that he had such a template. Jim suggested this be presented at the Standards Subcommittee to develop a template for all activity groups to follow. Further discussion included meeting minutes. Stephen Antosz asked that this be covered by a Task Force with Jim Graham, Steve Shull and Bruce Forsyth.

10.15 ADJOURNMENT

The meeting was adjourned at 5:35 PM.

Submitted by,

Bruce Forsyth
Secretary, Transformers Committee

September 10, 2017

Attachments (4): Annex 1 – Peter Balma's Presentation on 100-yr Anniversary Survey Results
Annex 2 – Peter Balma's Presentation on C57.144 and SCC14
Annex 3 – Peter Balma's Presentation on Ballot Comment Resolution

Annex 4 – IEEE Staff Update Presentation

NOTE: *The Attachments can be found in the full Administrative Subcommittee report on the Transformers Committee website.*

11.0 STANDARDS REPORT – JIM GRAHAM

The Standard Report was presented at the Monday General Session.

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

12.0 LIAISON REPORTS

12.1 CIGRE – RAJ AHUJA

Raj Ahuja was not in attendance but notified the Chair there are no significant updates to report.

12.2 IEC TC-14 – PHIL HOPKINSON

Phil Hopkinson presented an overview of TC14 activities. His presentation is available in **Appendix 3**.

12.3 STANDARDS COORDINATING COMMITTEE NO. 18 (NFPA/NEC) – DAVID BRENDER

The Chair reported that SCC18 did not meet since the Vancouver meeting, at which there were no updates to report. David Brender reported that the National Electric Code 2020 proposals are due in October 2017.

12.4 STANDARDS COORDINATING COMMITTEE NO. 4 (ELECTRICAL INSULATION) – PAULETTE PAYNE

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.

12.4.1 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.

12.4.2 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 99-2008** Recommended Practice for the Preparation of Test Procedures for the Thermal Evaluation of Insulation Systems for Electrical Equipment

12.4.3 Current Activities:

- **IEEE 99** –PAR expires Dec 2020. Initial draft is being reviewed by the Working Group. We appreciate the Transformers Committee providing a room for the WG meeting. Anyone interested in joining the P99 WG can contact the chairperson, Evanne Wang: Evanne.Wang@dupont.com

12.4.4 Future Plans:

- **IEEE 1 –** Solicit volunteers for review and revision of standard which expires 12/31/21.

For those interested in joining SCC04 or WG for revision of IEEE 1, please contact the Chairperson at papayne@ieee.org

Respectfully submitted,

Paulette Payne Powell

The Chair noted that Paulette is stepping down from her role as SCC4 Liaison after many years and asked the audience to recognized her for the excellent reporting she has offered during her time in that role.

13.0 HOT TOPICS FOR THE UPCOMING WEEK

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

14.0 OPENING SESSION ADJOURNMENT

The meeting adjourned at 9:15 AM.

Thursday Closing Session

15.0 Chair's Remarks and Announcements

The Chair called the meeting to order at 8:00 AM.

16.0 Meetings Planning SC Minutes & Report – Gregory Anderson

Greg asked Marnie Roussell to come forward with her team from Entergy. Marnie thanked the audience for attending and expressed her hopes that everyone had a good time. She recognized her team and expressed her gratitude for their efforts to organize the activities.

Greg welcomed everyone and presented a summary of events of the past week. There were 601 people attendees (604 registered less no-shows) at this meeting, setting a record for attendance.

Future meetings (also see Transformers Committee website):

Meeting	Date	Location
2017 Fall	Oct 29 – Nov 2	Louisville, KY
2018 Spring	March 25 - 29	Pittsburgh, PA
2018 Fall	October 14-18	Jacksonville, FL

Greg noted the Spring 2018 meeting (hosted by Dennis Blake) will be a celebration of the 100-year anniversary of the Transformers Committee. He presented a list of a few locations that are on the radar for future meetings.

Greg presented an overview of the Committee's finances and noted we are in good shape financially. He commented that the WIFI and RFID worked very well during the week.

Greg thanked several people for their help in coordinating the meeting, including Ed Smith for coordinating break sponsors, Tom Prevost for coordinating the Technical Presentations, Sue McNelly for the website, David Wallach for the Guidebook app, Tammy Behrens for food and beverages, and Seaira Ford for the registration desk.

Greg mentioned that sending meeting notifications is becoming a bit more difficult as companies tighten up their inbound email filtering. He asked that all attendees ensure their information in the AMS system is accurate.

An attendee mentioned he had heard a rumor that future meetings would be kept in the USA and asked if that was true. Greg stated it was true for the near future.

Another attendee asked about making contributions toward the additional expenses expected for the Spring 2018 meeting. Greg asked the attendee to contact him after the meeting.

17.0 Reports from Technical Subcommittees (decisions made during the week)

Reports from each Technical SC were presented. Their minutes are included in full in the attached Annexes.

17.1 Dielectric Test SC (Ajith Varghese)

See full minutes in the Annex.

17.2 DISTRIBUTION TRANSFORMERS SC (STEVE SHULL)

See full minutes in the Annex.

17.3 DRY TYPE TRANSFORMERS SC (CHARLES JOHNSON, PRESENTED BY CASEY BALLARD)

See full minutes in the Annex.

5 working groups and 1 task force with a submitted par met this week.

- 12.01 general requirements and 12.91 test code are in continuous revision and on track. The largest topic relates to potentially increasing the standard BIL levels for some voltage classes.
- 12.51 ventilated dry type has a par revision pending and we are planning to get the proper WG and SC approvals and ballot before the Fall meeting so we can handle comment resolution then.
- 12.60 thermal aging is informally linked with an IEC TC112 document 61857-41 which we are working to prevent them from having major conflicts.
- 12.58 transient analysis has successfully completed the balloting process after a recirculation and will be submitted for IEEE approval and publishing
- 57.16 air core reactors is on track and a question arose if iron core reactors need to be addressed by IEEE.
- C57.124 PD guide has a par submitted with a review underway of other IEEE and IEC standards to determine next steps

17.4 HVDC CONVERTER TRANSFORMERS SC (MIKE SHARP)

See full minutes in the Annex.

17.5 INSTRUMENT TRANSFORMERS SC (ROSS MCTAGGART)

See full minutes in the Annex.

17.6 INSULATING FLUIDS SC (DAVID WALLACH)

See full minutes in the Annex.

- **WG C57.104 Guide for DGA**

  Claude Beauchemin, chair, and a team of contributors have been burning the midnight oil attempting to get a stable guide ready for approval to go to ballot at this meeting. A straw ballot was completed and the majority of the comments incorporated but too close to this week for member consideration. There was not support within the WG that the guide was quite ready for ballot. The WG has also been speaking with Malia Zaman about the PAR expiration December 31, 2017 and the Guide expiration December 31, 2018. The best path at this time is as follows:

  1. The WG will continue work on the guide incorporating changes from the first straw ballot and also accommodate some requests about table simplification.
  2. Final numbers will be placed into the tables.
  3. A second straw ballot will be circulated and comments incorporated.
  4. The guide will be sent via email motion for WG approval to go to sponsor ballot.
  5. A summary of the guide development will be sent to SC for Insulating Fluids with motion to approve to go to ballot.
  6. A PAR extension request will be submitted to request extension to December 31, 2018.
  7. Upon approval of the WG and SC, the ballot process will begin. Upon close of the ballot until October 2018 will be spent on ballot resolution and recirculations.
  8. October 2018 - submit to REVCOM

This is the best path from here but will place the Guide into an all or nothing mode to complete in 2018 or else the PAR and the current Guide will expire.

I ask for WG and SC support to ensure when the email ballots come that you consider the urgency.

- **WG C57.147 Guide for Acceptance and Maintenance of Natural Ester Fluids**

  The guide has been balloted and is currently in ballot resolution.

- **TF Consolidation of Insulating Liquids Guides**

  This TF has been awaiting stability in all the feeder documents. We have arrived at the point to submit the PAR. A title and scope were developed by the WG with some modifications by the Subcommittee in wording, has been approved.

- **Subcommittee Comments**

  The SC reviewed a rejected C57.12.00 ballot resolution comment regarding alternate fluids. Approved language will be sent to Steve Snyder for use that alternate fluids may be considered in C57.12.00 when an ASTM standard exists for the liquid. I understand ASTM is now working on this standard for synthetic esters. As experience is gained, information can be added to the consolidated fluid guide.

17.7 INSULATION LIFE SC (SHELDON KENNEDY)

See full minutes in the Annex.

17.8 PERFORMANCE CHARACTERISTICS SC (ED TENYENHUIS)

See full minutes in the Annex.

- At present there are 13 active WG/TF's in PCS
- C57.120 – Loss Evaluation Guide has been published – thank you Rogerio Verdolin
- 2018 PAR's – no issues
  - P60076-16 IEEE/IEC Wind Turbine Transformers — DONE
  - C57.158 Tertiary/Stabilization Windings — Approved to go for Ballot
  - C57.110 Non-sinusoidal Load Currents — Ready for Ballot
  - C57.21 Shunt Reactors — Still under Draft
- 2019 PAR's - no issues
  - C57.105 3-ph Transf. Connections
  - C57.109 Through-Fault-Current Duration — approved for balloting
- 2020 PAR's – just starting but no issues
  - C57.164 Short Circuit Withstand Guide
  - C57.18.10 Semiconductor Rectifier Transformers
- 2021 PAR's – just starting but no issues
  - C57.142 - Transient Guide
  - C57.32A – Neutral Grounding Devices amendment
- The TF for Audible Sound Revision to Test Code C57.12.90 reviewed
  - 1) no load noise levels for NEMA TR1 Tables 1 & 2 into Annex C of C57.12.00

- 2) replacing the formulas presently included in Annex – C, for calculating reference load noise Sound Power levels, with tables of corresponding Sound Pressure levels
- 3) proposed wording for a note to be added to Table 17 in C57.12.00 referencing noise levels incorporated in Annex – C.
- Chairman presented testdata including the effect of position of the Tap Changer on the load noise level and change of core and load noise with temperature

- TF for PCS Revisions to Test Code C57.12.90
  - Discussed again the wording for LTC testing in the factory
- TF for PCS Revisions to C57.12.00
  - Motion for inclusion of Sound Level values on transformer's nameplate. After much discussion the motion did not pass.
- A TF will investigate changes to C57.123 Loss Guide which expires in 2020

New business item – The SC agreed to set up a TF to evaluate the need for a new guide on field testing of LTC's. This will report back at the next PCS meeting.

17.9 POWER TRANSFORMERS SC (JOE WATSON)

See full minutes in the Annex.

17.10 STANDARDS SC (JERRY MURPHY)

See full minutes in the Annex.

17.11 UNDERGROUND TRANSFORMERS & NETWORK PROTECTORS SC (DAN MULKEY)

See full minutes in the Annex.

17.12 BUSHINGS SC (PETER ZHAO, PRESENTED BY STEVE SHULL)

See full minutes in the Annex.

18.0 REPORTS FROM STANDARDS SUBCOMMITTEE AND STANDARDS (ISSUES FROM THE WEEK)

Jim Graham reported to the Chair that there was nothing to report.

19.0 NEW BUSINESS

No other new business was raised.

Joe Watson made a comment related to terminology related to load tap changer abbreviations (OLTC and LTC). He suggested we need an executive decision regarding the most appropriate abbreviation for our purpose. An audience member recommended LTC to avoid confusion OLTC may create between with "on load" and "off load." The Chair asked anyone who has an opinion they would like to share on this subject to send him an email.

Sue McNelly reminded SC and WG Chairs to review the information on their website and to send her any required updates.

20.0 CLOSING SESSION ADJOURNMENT

The meeting was adjourned at 12:00 PM.

ANNEX A Bushings Subcommittee

April 05, 2017
New Orleans, Louisiana, USA

Chair: Peter Zhao
Secretary: Eric Weatherbee

A.1 Opening of the Meeting

A.1.1 Introductions

The Chair opened the meeting with group introduction.

A.1.2 Attendance

Membership count was taken with the following results: 33 of 52 members were present with 106 guests and 2 corresponding members for a total of **117 attendees**. There were 8 new membership requests. There was a quorum.

A.1.3 New Members

Ten new members were introduced to the SC and added to the roster. The new members were Mr. William Boettger, Mr. James Campbell and Mr. Eric Euvrard, Mr. Victor Garcia, Mr. Eric Humphrey, Mr. Kurt Kaineder, Ms. Susan McNelly, Mr. Robert Middleton, Mr. Durand Stacy, and Mr. Kiran Vedante.

A.1.4 Chairman's Remarks

The Chair asked for a motion to approve the F16 Vancouver BC minutes that are posted on the IEEE website as well as displayed for several minutes for review. A motion was made by Dr. Zhang and seconded by Mr. Dave Geibel with no objections.

The Chair informed the SC that the CSA Group (formerly EEMAC) is looking for technical volunteers to review their bushing standard for possible revisions.

The Chair presented the Standards Status Report for bushings, see Appendix A. The Chair noted that Mr. Keith Ellis, the WG Chair for C57.19.00, has retired. The end of cycle for this document is 12/08/2020 as such he and the SC Secretary will review the document, define the Scope of a PAR, if deemed necessary, by the next meeting and then will form WGs or TFs as necessary and asked if there were any objections, none were received.

A.2 Working Group and Taskforce reports

A.2.1 C57.19.00-2004 – Keith Ellis, Chair (Retired)

As discussed above, the SC Chair and Secretary will review and prepare an update for the SC by the next meeting.

A.2.2 WG PC57.19.01-2000 – Dr. Shibao Zhang, Chair; David Wallach, Secretary

See complete WG minutes in Appendix B of this report.

A.2.3 C57.19.100-2012 – Tommy Spitzer, Chair (not present); Jeff Benach, Secretary

Mr. Tommy Spitzer was not in attendance; but had prepared a small update on the first meeting of this WG which was read by the SC Secretary. See complete WG minutes in Appendix C of this report.

A.2.4 WG PC57.19.04 – Scott Digby, Chair; JD Brafa, Vice Chair; Rich vonGemmingen, Secretary

Mr. Digby informed the SC that the WG voted and would like to proceed to ballot with the document. The SC Chair made a motion for the document to proceed to ballot which was seconded by JD Brafa.

The SC Chair asked if there were any objection which none were received and therefore the motion was deemed to have passed. See complete WG minutes in Appendix D of this report.

A.2.5 IEC/IEEE 65700.19.03 – Les Recksiedler (IEEE) and John Graham (IEC), Co-Chairs

The first dual logo standard was approved June of 2014, as such no meeting was held.

A.2.6 WG PC57.19.02 Distribution Transformer Bushings – Steven Shull, Chair; Ed Smith, Vice Chair

See complete minutes in Appendix E of this report.

A.2.7 TF Composite Bushings – John Graham, Chair; Secretary, Robert Middleton

The SC Chair displayed the TF report that had been submitted the previous year by the Chair of the TF who was not present. Mr. Sebastien Riopel asked to comment on the report as a member of the TF. Mr. Riopel informed the SC that the report that was submitted by the TF Chair had not been agreed too or even reviewed by the TF members prior to its submission to the SC Chair. Mr. Riopel stated that a new agreed upon definition for Composite Bushings was never determined and that industry survey had a very minute response rate, as such it could not be considered as accurate sampling of the industry. Mr. Riopel also wished to make it clear that the statement in the report in regards to changing the PF requirements were arbitrary, and as a manufacturer he has never received any such request from his customers which was also the case for at least one other manufacturer on the TF.

The SC Chair asked if there were any further comments or question in regards to the report, which there were none. See TF Report in Appendix F of this report.

A.3 External Liaison Reports

A.3.1 IEC Bushing Standards Activity – John Graham, IEEE Liaison (not present)

Mr. Les Recksiedler volunteered to assist the SC as a backup for Mr. Graham. Mr. Recksiedler read/presented the submitted report to the SC. See complete report in Appendix G of this report.

A.3.2 IEEE 693 – Eric Weatherbee, IEEE Liaison

Mr. Eric Weatherbee informed the SC that 693 is still undergoing the ballot process. Currently the comment resolution TF is reviewing the 400 comments that were received and that a PAR extension was granted until the end of 2018.

A.3.3 WG PC57.160 Guide for PD Meas. in Bushings and Inst. Trans. – Thang Hochanh, Chair

See complete WG minutes in Appendix H of this report.

A.4 Unfinished Business

A.4.1 500kV Bushings – Voltage Class by Jim Zhang

The Chair asked if the previous answer supplied by Mr. Fred Elliot had fully satisfied the question submitted by Mr. Zhang. Mr. Don Lamontagne said that he may be able to provide more feedback in regards to his colleague's question. Mr. Lamontagne stated they operate at 525kV but their LTC has a 10% tolerance so it is possible they could exceed the allowable maximum of 550kV. Mr. Craig Stiegmeier stated that although the LTC has a stated tolerance of 10% it is highly unlikely that their system will actually ever exceed the 550kV maximum. Mr. Don Platts stated that the voltage ratings are not controlled by this SC but are governed under ANSI C84.1 and suggested that the submitter may wish to review that document. Mr. Lamontagne stated he would discuss the comments and recommendations with Mr. Zhang to see if he is satisfied with the information provided in regards to his inquiry.

A.5 New Business

A.5.1 IEC inquiry in regards to making C57.19.100 into a dual-logo document

The Chair informed the SC that IEC had asked if there was interest in making C57.19.100, IEEE Guide for Application of Power Apparatus Bushings, into a dual-logo document. Mr. Les Recksiedler stated that in his opinion it would be very hard to do, as the IEC bushing standard covers more applications than the IEEE bushing standards. Dr. Shibao Zhang suggested that an IEC group review the current revision of the guide and provide areas that they would want to add, expand and or revise for review by the WG. The SC Chair said that he and the SC Secretary will reach out to the IEC group as a Communications Taskforce to see if they can provide some information prior to the Fall WG meeting.

A.5.12 Bushing Overload – Sanjib Som

Mr. Sanjib Som stated that he was unhappy to see the bushing overload discussion not continued under unfinished business as he was not satisfied with the conclusion at the end of the previous meeting and would like to open the issue back up for further discussion. Mr. Som stated that he was shocked to learn in the last meeting that the new RIP styles have no overload capabilities. However, he did state that would be fine if no bushings had any overload capabilities and it was specifically stated as such to eliminate the confusion within the industry. Mr. Amitabh Sarkar commented that he is also in agreement with Mr. Som.

Mr. Dave Geibel said that there is some misunderstanding on bushing requirements, the new material bushings cannot tolerate overloading because no bushing designs are required to be designed with any overload capabilities. The current rating stated on bushing name plates are in fact the current they are designed to operate at per the parameters specified in the standard. Even though OIP bushings designs are more tolerant to overloading, no bushings are designed with intrinsic overload capability.

Mr. Matt Weisensee also commented on his issues with the overload confusion and also would like to see something done to make it easier to understand what one should expect from their bushings. The Chair asked Mr. Weisensee if he could lead a Taskforce to establish some suggestions prior to the F17 SC meetings. There were three additional volunteers that joined the TF, Mr. Sanjib Som, Mr. David Geibel and Dr. Shibao Zhang.

A.6 Adjournment 10:50 am

VI. Transformers Standards Status *(as of Sep 24, 2016)*

Standard Number	Title	Year	SASB Expiration	ACTIVE PAR?
Bushings Subcommittee		**SC Chair: Peter Zhao email: peter.zhao@HydroOne.com phone: (417) 345-5926**		
65700-19-03	IEC/IEEE International Standard -- Bushings for DC application	2014	12/31/2024	No
C57.19.00	IEEE Standard General Requirements and Test Procedure for Power Apparatus Bushings	2004	12/8/2020	No
C57.19.01	IEEE Standard Performance Characteristics and Dimensions for Outdoor Apparatus Bushings	2000	12/31/2018	Yes - PAR expires in 2017, In Sponsor Ballot
C57.19.100	IEEE Guide for Application of Power Apparatus Bushings	2012	12/31/2022	No

V. Transformer Committee Active PAR Status *(as of Mar 24, 2017)*

PAR Number	Project Type	Title	Approval Date	PAR Expiration
Bushings				
PC57.19.01	Revision	Standard Performance Characteristics and Dimensions for Outdoor Apparatus Bushings	8-Dec-2010	12/31/2017
PC57.19.02	New	Standard for the Design and Performance Requirements of Bushings Applied to Liquid Immersed Distribution Transformers	5-Feb-2016	12/31/2020
PC57.19.04	New	Standard Performance Characteristics and Dimensions for High Current Power Transformer Bushings with Rated Continuous Current in Excess of 5000 A in Bus Enclosures	16-Jun-11	12/31/2017

WG PC57.19.01 - IEEE Standard Performance Characteristics and Dimensions for Power Transformer and Reactor Bushings

MINUTES OF WORKING GROUP MEETING – S17 New Orleans, LA

The working group met on Tuesday, April 4, 2017 at 1:45 PM. Rosters were passed out and introductions made. Of those, 25 members and 48 guests with a total of 73 participants in attendance. 17 members were needed for a quorum. The Working Group membership is currently 33 members therefore a quorum was achieved. Since PC57.19.01 is in ballot, new members will not be entertained at this time.

1. Introductions and Distribution of Attendance Rosters
    a. Attendance rosters were circulated.
    b. The committee officers were introduced (chair and secretary).
2. Establishment of Quorum
    a. A count was performed and a quorum was established as 20 of 33 members were present at the beginning of the meeting (later rising to 25 members based upon RFID report).
    b. Agenda Approval: No objections to unanimous approval.
3. Introductions of attendees and their affiliations were made.
4. No new members at this time since we are in ballot.
5. Patent Call: The call for essential patents was made and there were no responses from the attendees and is hereby recorded in the meeting minutes.
6. Minutes Approval with F16 minutes on screen.
    a. F16 Vancouver Minutes approval – Sebastien Riopel motion and Dave Geibel seconded. Minutes approved with 16 positive votes and four abstains.
7. Timeline review
    a. PAR expires in 2017
8. Since the last meeting:
    a. We went to ballot and ballot closed April 2, 2017. Mandatory Editorial Review was also completed.
    b. Ballot result summary was shown on the screen. The IEEE process statistics were reviewed. We had 68 comments from the ballot. Results are good and met the requirements to move forward to resolve ballot comments and recirculate. Peter Zhao spoke up about the results and suggested we move forward to Ballot Resolution. The document will be updated, reviewed with WG, and recirculation.
    c. Ballot Resolution Committee: Dave Geibel, Sebastien Riopel, and Eric Weatherbee will assist Shibao Zhang with resolution.
    d. The goal will be to complete ballot resolution by June 30 then recirculate. It must be submitted to Revcom by October 16, 2017.
    e. 68 comments have been circulated to the WG members via email.
    f. Shibao reviewed a sampling of the comments on the screen. The IEEE-SA ballot comment spreadsheet for the ballot is the documented record of these comments and will not be repeated here in the minutes. Decisions were not made during the meeting to resolve particular comments as these will be handled by the Ballot Resolution Committee and circulated back to the Working Group.
9. Old Business
    a. None
10. New Business
    a. None
11. Adjournment
    a. Meeting was adjourned at 2:50 pm.

DRAFT

Note to Meeting Planning: C57.19.01 DOES NOT plan meet at the F17 Louisville, KY meeting as the document is nearing completion and is in ballot resolution as of April 2017.

Minutes by: David Wallach, WG Secretary.
e-mail: david.wallach@ieee.org
Astor Crowne Plaza Hotel, New Orleans, LA

C57.19.100 Meeting Minutes

We had our initial meeting for the next revision on Tuesday April 4. The meeting was called to order at 3:15 with 38 people present and 17 requesting membership. After introductions I asked for patent disclosures and none were presented. I asked for a volunteer to act as secretary and Jeff Benach agreed to accept this job.

I had been asked about a conflict between C57.19.00 and C57.19.100 in regard to current ratings with oil temperatures above 55° C rise. The current wording in C57.19.100 indicates a derating is necessary. Three manufacturers were present and all indicated that their currently manufactured bushings are rated for 65° C rise oil.

We discussed other items that need to be addressed in the next revision and agreed to have a written list ready for the next meeting as well as a proposed scope for the PAR. Items mentioned were:

1. Materials and temperature ratings of gaskets
2. Current ratings for terminals
3. Test connections and their weight
4. Special considerations for bushings used in iso-phase bus.

This list and the proposed scope will be sent to all attendees for feedback before the next meeting.

A PAR will be requested after the fall meeting with the revision needing to be completed by Dec. 2022. The meeting was adjourned at 4:00 pm

Tommy Spitzer
May 7, 2017

Minutes: WG PC57.19.04 – LV Bushings rated > 5000A and applied in Bus Enclosures

Date: April 4, 2017

Chair: Scott Digby

Vice Chair: JD Brafa

Secretary: Richard von Gemmingen

Introduction and Attendance:

Number of Active Working Group Members: 28 + 3 Corresponding = 31

Number of Members in Attendance: 19

Number of Guests in Attendance: 62

Total Attendance: 81

- Meeting was called to order at 9:30 AM by Chair
- Two rosters were circulated for attendance, and attendees were reminded to use the RFID scan system also.
- Current Membership List was displayed and members were asked to raise hands to establish if meeting had a quorum
- Hand count indicated we had 14 members present out of 28 total (Total does not include 3 corresponding members) so 50% quorum was established. (5 additional members arrived after quorum attendance was taken)
- Scott announced that James Campbell was unable to continue as Secretary and introduced Richard von Gemmingen as new Secretary.

Agenda Review

- Chair noted only change to agenda was change of Secretary
- Floor was opened for comments or discussion on Agenda. There was no discussion or comments and Chair asked if there was a motion to accept.
- Anthony Natale made a motion to accept Agenda
- Sebastian Riopel seconded the motion.
- Chair asked if there was any opposition. None was indicated, so motion carried unanimously

Essential Patent Claims

- Chair made a call for Patents. No Patent Claims were presented

Review of previous meeting minutes Rev. 1 from Fall Vancouver meeting

- Chair opened floor for discussion or comments. There was no discussion or comments, so Chair asked if there was a motion to accept.
- Dave Geibel moved to accept minutes.
- Eduardo Garcia seconded motion.
- Chair asked if there was any opposition. None was indicated, so motion carried unanimously

Review of Par Status

- Par is scheduled to expire 12/31/2017
- Since document revision is very near end, no extension request has been requested.
- Major progress has been made on document since Vancouver meeting as follows:
    - External Dimensions have now been established which was major mile stone
    - Wordsmithing of Section 3.3 has been completed by David Geibel and Eric Weatherbee
    - Drawings have been updated with metric as primary units
    - Feb. 5, Draft 1.05 was circulated to 224 emails and only 1 comment was returned (Comment was editorial in nature, stated that a note indicating that primary units are in mm was missing)
    - Draft was transferred into IEEE format
    - Editorial review conducted by Anthony Natale and David Stockton.
- For Clarity and per Editorial Review, wording of scope was adjusted to change from "...bushings **within** bus enclosures that have ..." to "...bushings **located within** bus enclosures that have ..." to make it consistent with title of document.
    - Chair asked IEEE if Title and Scope and Par have to exactly match. IEEE response was that minor word tweaks are acceptable as long as scope is not expanded.
    - Current Draft is D5.3 dated March 2017 (PC57.19.04 (D5-3-2017))
    - Chair called for discussion, No objections to the text adjustment.

Old Business

- Review with C37.23 (IEEE Standard for Metal Enclosed Bus)
    - This document currently has no working group
    - C37.23 Liaison, Devki Sharma, last attended C37.23 meeting one year ago. Then the standard had finished ballot and was approved. The C37.23 working group at the time was OK with direction C57.19.04 was going.
    - Chair stated he may reach out and talk with former chair of C37.23.

Discusion on ballot preparedness for balloting

- David Geibel made motion to ballot latest Draft
- Kumar Mani seconded motion
- Vote was called and 19 Members in attendance, (including officers), voted. There were 0 opposed, 0 abstaining, so vote carried unanimously to send document to ballot.

Next Steps

- Chair will make motion at Bushing Sub Committee meeting on Wednesday 4-5-2017 for document to go to ballot.
- There will be a mandatory IEEE Editorial Review, Our working group assigned IEEE liaison will be Malia Zaman
- Ballot pool will be created upon approval by the Bushing SC to proceed.
- Comment resolution group created to help respond to balloting comments (Accept or Reject)
    - A request for volunteers to assist working group officers in comment resolution.
    - 5 members volunteered
        - Sebastien Riopel
        - David Geibel
        - David Stockton
        - Kumar Mani
        - Eric Weatherbee

New Business

- David Geibel asked with submittal due date this year being 10/16/2017, How far along do we need to be in the process before 10/16?
- Peter Zhao responded that if we cannot resolve comments by 10/16, we should consider asking for a PAR extension by June or July.
- Once all comments are resolved the document will have to go back out for vote
- Peter Zhao indicated we can use a redline review process. On re-ballot. Comments outside scope of PAR can be rejected and documented for next review cycle.
- 75% response is required from ballot pool, and 75% have to approve for document to pass
- No more new business was discussed

Meeting Adjourned at 10:00 AM

Prepared by Richard von Gemmingen (Secretary) 4/4/2017

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 Fred Friend

Current Draft Being Worked On: D1 **Dated:** March 2017

Meeting Date: April 4, 2017 **Time:** 11:00 am – 12:15 pm

Attendance:		
	Members	**27**
	Guests	**22**
	Total*	**49**

*** For details of attendance, please refer to AMS system of the Transformers Committee**

Meeting Minutes / Significant Issues / Comments:

The meeting was called to order by the Chair at 11:00am, the roster was circulated, followed with an introduction of members and guests. A check for quorum was made and achieved. The Chair made a call for any Essential Patent Claims and none were brought forward. A motion was made by Ron Stahara and seconded by Dan Sauer for approval of the agenda. The motion was unanimously approved. A motion was made by Martin Rave and seconded by Marek Kornowski for approval of the Fall 2016 meeting minutes. The motion was unanimously approved. A motion was made Dan Sauer and seconded by Jerry Murphy for the approval of the Spring 2016 meeting minutes. The motion was unanimously approved.

Under Old Business, discussions centered on these items in the sample document provide by the Chair.

- Table 1 – Electrical Insulation Characteristics
- Table 2 – Cantilever Design Test Requirements
- Figure 1 – Standard Stud Sizes
- Figure 2 – Standard Mounting Holes
- Figure 3 – Termination Configurations

The working group felt that the document provided by the Chair was a good start but it needed more work. It was suggested that the bushing range shown in the Table 1 be widened. The Chair commented that this was the goal but he would like to direct the group to focus more on the 600 volt and below or rather 1.2kV and below, since this voltage range covers the majority of service voltages supplied in North America. There was a discussion on the 45kV BIL bushings. It was pointed out that sometimes these were specified to gain additional creep when the transformer was in a contaminated area. However, it was also pointed out that these were used on 2.4kV distribution applications as well. It was suggested that this be considered in Table 1 and a method to address this concern be developed.

There was a discussion on how the nominal current rating was determined in Table 2. Peter Zhao, Bushing Subcommittee Chair emphasized the need to coordinate our work within the existing bushing standards and not duplicate any work that is already in C57.19.00 and C57.19.01. The Chair agreed. Peter further commented that if the range of the values or test methods are not applicable or exceed the limits in these documents, it would be permissible to

Distribution Transformer Subcommittee
Working Group Report

place these test methods and tables in this standard but care must be taken not to repeat or misdirect a test already in the previously mentioned standards.

After a lot of discussion, the following Task Forces were formed and were asked to provide their recommendations at the next meeting:

Table 2 – Cantilever Design Test Requirements.
Dan Sauer (Chair), Josh Verdell, Mike Thibault, and Marek Kornowski
This task force will review the design of Table 1 in light of questions raised by the group concerning the differences in the columns labeled "unsupported" and "with supports". The "with support" column allows the bushing to be loaded to a higher level which caused concern for the group as the shear force at the tank can be a critical point. It was asked that a cantilever test procedure be developed as a part of this task force's work. This would include the review of C57.19.00 or C57.19.01 to determine if an applicable test for this table was already developed.

Figure 1 – Standard Stud Current Values
Dave Geibel (Chair), Carlos Gaytan, Ali Ghafourian, Dan Saur, and Weijun Li.
This task force will work on determining the correct minimum current values for these specific stud sizes. This will include background on how these values were determined.

Figure 1 – Standard Stud Sizes and Figure 3 – Termination Configurations
Al Traut (Chair), Ed Smith, Josh Verdell, and Marek Kornowski
The working group had concerns about Figure 1 in that it was showing a bushing which was confusing the real intent which was to display the "minimum usable thread length" both inside and outside of the tank. In this conversation the configuration of the terminals on the outside of the tank was discussed. It was pointed out that a fairly through document, NEMA CC-1 "Electric Power Connectors for Substations" was available that described these connections. There was also a concern about the product on which these would be used since these could be used on pole and padmounts transformers. It was also pointed out that the drawings needs to be oriented correctly and have consistent drafting views. So in conclusion, it was fairly clear from the discussion that this standard would only cover bushings that had these terminals were included as an integral part of the bushing. The charge of this group would be to provide guidance on the future of these figures and associated tables.

Figure 2 – Standard Mounting Holes
Martin Rave (Chair), Josh Verdell, Darren Brown, and Israel Barrientos
This task force's charge would be to complete the tank hole table. They would review the accuracy of the information and format of the table as needed.

There was no new business presented. The meeting was adjourned at 12:03 pm.

The next meeting will be in October 31, 2017 in Louisville, KY

Submitted by: Fred Friend

Date: 04/05/2017

JOHN SCOTT GRAHAM
HIGH VOLTAGE BUSHING CONSULTANT

Composite Bushings Task Force Report to Bushing Sub-committee

The Task Force as set by Bushing Sub-Committee at Fall 2014 meeting in Washington, with a purpose to determine;

1) What is the understanding of the term "composite bushing" within the industry?
2) Does the C57.19 family adequately cover emerging bushing technologies?

Three meetings have been held and an industry survey carried out courtesy of Doble. The results of the survey have been discussed in Memphis and Atlanta. Although in Atlanta a quorum was not recognised to make a formal decision it was the opinion of the meeting that the work of the Task Force had gone as far as necessary.

Question 1:
From the results of the survey a definition is proposed as follows;

- Composite bushing: a bushing with a non-ceramic external insulating weathershell regardless of the major insulation material.

It was also discussed to add an extra definition to distinguish from a historical term although this was not well supported;

- Combined insulation bushing: a bushing in which the major insulation consists of a several coaxial layers of different insulating material.

  Note; bushings of this type were referred to as composite bushings in previous editions of this standard

Question 2:
The following areas were identified for consideration by the relevant Working Group.

- Thermal basis of rating; Existing C57.19.00 clause 5.4.1 only covers 105 thermal index material RIP and RIG generally higher. Figures should be included for more materials. **ACTION: WG 19.00**
- Partial discharge limits: C57.19.01 Table 5 gives limits for a range of materials these values should reflect emerging technologies. **ACTION: WG 19.00**
- Power factor limits: C57.19.01 Table 6 gives limits for OIP (0.5%) and RIP (0.85%), these limits could be tightened to reflect market expectation and manufacturing possibilities. Figures should be included for more materials. **ACTION: WG 19.01**
- Integrity of weathershell: Properties such as resistance to tracking of materials, tightness at high voltage end and flange were the rubber is directly moulded to the insulation are not covered by any current IEEE standard. **ACTION WG 19.00**
- It was also suggested that a comparison table be developed to show the performance characteristics and highlight the differences of the various bushing technologies. **ACTION: WG 19.01**

The TF propose to Sub-committee officers that The TF actions are complete and the above results should be directed to the relevant WG. The present WG 19.01 is at the stage of a draft revision. The topics raise by the TF are important to the future application of the standards and should be included in this revision process.

John Graham
Chairman TF Composite Bushings
20th April 2016

Home: +44 191 417 4796
Mobile: +44 77 111 40814
Email: johngraham137@gmail.com

7 Park Chare
Washington
Tyne & Wear
NE38 7LH, UK

IEC BUSHINGS STANDARDISATION

Nothing much to report, Working Groups have completed their work and nothing new is expected in the short term (12/24 months). I will retire from the Chair at end of 2017 and an enquiry will be opened shortly for a replacement. I will be less active within IEEE but will continue as Liaison at least until a new IEC Chair is in place.

IEC Meetings
The IEC bushing committee SC36A last met during the IEC General Session in Frankfurt Germany 9th October 2016.
Subcommittee Chair – John Graham, High Voltage Bushing Consultant UK.
Secretary – Gian Franco Giorgi, CEDESPA, IT.

IEC60137 "Insulated Bushings for Alternating Voltages above 1000V"
The FDIS (Final Draft International Standard) is delayed and is now with IEC Central Office for editing and translation before voting. It is expected that the new revision will be published within 2017.

IEC61463 "Seismic qualification of bushings"
The revision was published in 2016. There are similarities with IEEE693 but IEC offers qualification by calculation or modelling instead of direct testing.

New Work Proposal:
At the last meeting, it was proposed to consider an Applications Guide for bushings. Due to the wider scope of IEC60137, covering all bushing types, this may not be limited to transformer bushings as with IEEE C57.19.100. However, it may be possible to work on a dual logo document in future and IEEE Bushing Subcommittee are asked to consider this.

Other Documents –
IEC/IEEE6570.19.03 "Bushings for DC Application" No work at this.
IEC61464 Dissolved gas analysis of oil impregnated paper bushings – No work done. An approach has started to TC10 Insulating Fluids, to harmonise this document with IEC60599 Dissolved Gas Analysis of Electrical Equipment.
IEC62271-pt211 Bushings for direct connection transformer/GIS – re-numbered from IEC61693. No work at this time.
EN50180 Three parts – Bushings above 1kV to 52kV for liquid filled transformers.
EN50181 – Plug-in type bushings above 1kV to 52kV for equipment other than liquid filled transformers. Work within CENELEC to extend to 72.5Kv
EN50243 – Outdoor bushings for 24kV to 36kV and for 5kA to 8kA for liquid filled tranformers.
EN50336 – Bushings for transformers and reactor cable boxes not exceeding 36kV.
EN50387 – Busbar bushings up to 1kV for liquid filled transformers.

John Graham
Johngraham137@outlook.com
+44 77 111 40814
28 March 2017

WG PD in Bushings & PTs/CTs – PC57.160

Meeting Minutes April 3, 2017 at 4:45 pm – New Orleans, LA

Attendees: 71

Members attending: 19/42 - Quorum requirements were not met.

Rosters: Circulated for members and guests.

Agenda: An agenda was presented for the meeting.

Essential Patent Claims: Text was displayed and the Chair inquired as to if anyone knew of essential patent claims. None were brought up during the meeting.

Minutes: Minutes could not be approved due to the quorum requirements not being met.

Items discussed based upon comments received:

A total of 23 comments were received for discussion many were editorial or minor in nature. Details of the discussion points are below.

Comments discussed and which will be incorporated into the next draft:

- An abstract was not included in the previous draft. Suggested text was provided.
- Keywords were not included in the previous draft. Suggested text was provided.
- A suggestion was made to change the order of the references.
- Change 'pico-Coulombs' to 'picocoulombs' in several locations.
- Section 3.1 correct referenced clause number.
- Section 4.2.1 make the last indented statement a separate paragraph.
- Section 4.2.2 add the word 'capacitance' for clarity.
- Sections 4.2.2 and 7.1 Discussed wording regarding allowing the measured PD noise to be as high as the limit if no higher values are measured.
- Section 4.2.4.1 Discussed changing to 500 kHz from 1 MHz.
- Sections 4.2.4.2 and Appendix A removed company logo from provided figures.
- Section 4.2.4.3 Added qIEC, Rmax, Rmin and Pulse Train definitions from IEC.
- Section 4.2.4.4 Removed typographical error from the section heading.
- Section 4.2.4.4 Discussed adding stronger language for recommend recording and evaluation of several pieces of data. Chose to leave the current language both because it would be excessively hard to do in higher production environments and also to prevent potentially controversial language from a legal standpoint.
- Section 6.2 Discussed the wording relating to the use of shielding as part of test preparation.
- Annex C updated references which called out 'B' instead of 'C' figures and text.

Motion to submit the document for ballot: At the next meeting, a motion for ballot will be submit to the WG members.

PAR extension: Due to the termination (2017-12-31) of the original PAR, a PAR extension is necessary.

Motion to adjourn: A motion was presented by Bertrand Poulin and was seconded by Vladimir Khalin.

Fall meeting 2017: This WG plans to continue working at the IEEE Fall meeting in Louisville (KY).

Next version of draft: A new and "final" draft is being prepared to incorporate all of the recent comments. This will be sent out between meetings.

Date: 2017-04-03
Chairman: Thang Hochanh
Secretary: Thomas Sizemore

Annex B Dielectric Tests Subcommittee

April 5th, 2017
New Orleans, Louisiana.

Dielectric Tests Subcommittee		
Chair: Ajith M. Varghese	**Vice-Chair: Thang Hochanh**	**Secretary: Poorvi Patel**
Room : Grand Ballroom ABC	Date : April 5th, 2017	Time: 11:00 am to 12:15 pm
Members : 122	Present at time of checking : 84	Present per attendance roster & recorded to AM System: 85
Guests present : 147	Membership requested : 22	Membership accepted: 20

B.1 Chair's Remarks

The Chair briefly highlighted the requirement that while introducing one need to state their employer/ company and sponsor if difference from company. Chair also reminded that IEEE and transformer committee are non-commercial organizations and standards shall focus only in developing performance and functional requirement and not design and construction details.

The Chair reminded the WG on attendance requirement for new membership and for 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. Chair welcomed .the new members during the meeting.

The Chair reminded to start every meeting, conference calls if there are any patents that are known to be applicable for within the area of WG scope. If yes, patent claim type should 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 30 days to the SC chair and secretary. The SC Secretary then has to submit the SC minutes within 45 days of the SC meeting.

The Chair shared details of upcoming PES sponsored meeting as well as details of next transformer committee. IEEE PES General Meeting will be held in July 16-20,2017 in Chicago and next IEEE PES T&D Expo in April 16-19 of 2018 in Denver, CO, USA The next transformer committee will be from October 29th – 2nd of November, 2017 in Louisville, Kentucky .

The Current Status of PARs was presented by The Chair. C57.161 Guide for DFR Measurements is currently under ballot process the par expires December 2017 and an extension is recommended. Par for C57.12 Guide for the Detection of Acoustic Emissions from Partial Discharges in Oil Immersed Power Transformers expires in 2018 and may require a par extension. All other pars are in good order.

Last meeting in Vancouver, Canada, 18 requested membership and 9 request were accepted. 6 participants status went from member to guest due to lack of attendance.

Sue McNelly informed that from the next meeting in Louisville, the meeting schedule will include a percentage indicating at what stage the WG and TF work is at. WG and TF leaders please review and update this completion percentage in the AM system before the next meeting.

B.2 Quorum, Approval of Minutes and Agenda

The membership list was shown and a show of hands of committee members present showed that a quorum of members were in attendance at the start of the meeting. 84 out of 122 members were present, so there was a quorum.

All attendance is recorded in AM System. Per verification of roster 85 members and 147 guests attended the SC in New Orleans, Louisiana.

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

The minutes of the Spring 2016 meeting at Atlanta meeting was approved unanimously.

B.3 Taskforce and Working Group Reports

B.3.1 TF on External Dielectric Clearances
Eric Davis, Chair; Troy Tanaka, Secretary

The Working Group on External Dielectric Clearances met on Monday April 3, 2017 at 9:30 AM in the Astor Crowne Plaza Hotel. There were 47 people in attendance; 10 of 18 members, and 37 guests. A majority of the members were not present at the same time and, therefore, a quorum was not achieved. The full attendance record is available in the AM System.

Since a quorum was not present, no official business could be conducted. The meeting agenda and previous meeting minutes could not be approved. Approval of the previous meeting minutes will be conducted by e-mail.

The chairman asked if there were any known essential patent claims. None were stated.

The chairman reviewed the results of the Dielectric Test Subcommittee Survey. One hundred eight-teen (118) surveys were sent using the AM System. Eight (8) emails were undeliverable leaving a survey size of 110. A 20% response rate was achieved with twenty-four (24) responses received; 2 abstentions, 19 approvals, 2 approvals with comments and 1 disapproval.

The majority of the comments received were editorial in nature. These comments were discussed and responses proposed. Approval of the responses will be conducted by email.

The disapproval stated that “The phase-to-phase distances proposed for the 345 and 500kV voltage systems are significantly too large…”.

The proposed phase-to-ground and phase-to-phase distances were compared with the distances proposed with the disapproval and the IEC distances. The phase-to-ground distances are larger than the IEC

distance but both have a similar trend. The phase-to-phase distances are much larger than the IEC distances.

The following points were made during the discussion:

- Larger clearances will result in larger unit sizes and increased costs.
- The proposed distances are based on a scientific approach using generally accepted formulas and assumptions.
- Problems have not been reported with flashovers using the IEC distances.
- The larger proposed distances may not be justified given the lack of reported problems with the smaller distances.

Given the similar shape of the curves for the proposed and IEC phase-to-ground distances, the chair proposed reducing the probability of withstand to approximate the IEC curve. The phase-to-phase distance will be recalculated using the same value and the results distributed to the Task Force for discussion. Approval of this approach will be conducted by email.

Respectfully submitted,
Eric Davis
Chair

B.3.2 WG on Dielectric Frequency Response Analysis (DFR)

Ali Naderian, WG Chair; Peter Werelius, Vice Chair, Poorvi Patel, Secretary

The working group for Dielectric Frequency Response Analysis did not meet in New Orleans. The guide is under ballot. The ballot repose return rate was 78% with and approval rate of 91%. 167 comments were received and now needs to be addressed
The WG chair will call for approval to start a ballot resolution team and invite anybody that wants to be part of the resolution team. Once all comments has been addressed the document will again be circulated within the members of the WG.
The par is expiring end of December 2017, thus an extension will be needed for this WG.

B.3.4 TF on Revision of Impulse Tests
Pierre Riffon, Chair; Daniel Sauer, Vice-Chair
New Orleans, LA, April 4th – 4.45pm-6.00 pm

- Pierre Riffon (Chair) not able to attend the 4/4/17 meeting
  - Daniel Sauer (Vice Chair) served as Chair for the 4/4/17 meeting.
  - John Foschia served as secretary
- Based on the membership of 43 prior to the 4/4/17 meeting, 22 members were required for a quorum.
  - No members were dropped from the roster prior to this meeting
  - 6 members were added to the membership prior to this meeting
  - 19 members present at start of the meeting; **quorum could not be established.**
  - 21 members were present at the start of new business during a recount; **quorum could not be established.**
  - Final review of the paper roster indicated 76 people in attendance including 23 members which is a quorum and 6 guests requesting membership.
- The spring 2017 agenda and minutes of the fall 2016 meeting could not be approved due to lack of quorum.
- No essential patent claims were brought to attention.

Old Business:

- The third survey pertaining to section 10.3.1.3 of C57.12.90 was discussed.
  - Comments received were brought to attention.
    - "Is chopping-time clear enough?"
    - Are the measurement systems accurate enough to meet the requirements?
    - The chop time limit is specified in C57.12.90-2015.
    - Mr. Bertrand presented the illustration in IEEE Std 4 that defines 'virtual steepness,' and recommends that this language is used in C57.12.90 instead of 'chop-time.'
      - Ajith Varghese highlighted differences in the definitions.
      - David Geibel noted that (dv/dt) measurement is accurately depicted by the word 'steepness.'
    - No further commentary regarding Pierre's observations of the comments was offered (refer to Pierre's 2/25/17 email).
- **A recount of the present members was conducted. At this point, 21 members were present; insufficient to establish a quorum.**
  - No official business could be conducted.

New Business:

- Ajith Varghese asked for discussion regarding:

- Clear definitions of neutral grounding resistor/reactor (non-)utilization during impulse testing.
  - The current standards have no reference to these scenarios.
  - For transformers with a fully insulated neutral bushing which could be ungrounded in service – what should be the test condition for this bushing?
  - Mark Perkins offered an explanation as to why these devices are not used during impulse testing.
    - Ajith agreed but stated that this should be covered in the standard.
- When temporary tertiary terminals are established during factory tests, what are the necessary circuits to be established during impulse testing?
  - TV configured similar to operation conditions or are all terminals grounded?

- Meeting was informally adjourned due to lack of quorum.

B.3.5 TF on Revision of Low Frequency Tests

Bill Griesacker, Chairman; Daniel Blaydon, Vice Chairman; Myron Bell, Secretary

New Orleans, LA – April 4, 2017, 1:45 p.m

There were 115 attendees, 35 members and 80 guests present at the meeting; 8 guests requested membership that will be granted. More than 50 % of the working group members were in attendance at the meeting, therefore a quorum was present.

I. The meeting was called to order at 1:45 PM followed by introductions.

Attending members were counted and quorum was verified.
There were no objections to unanimous approval of the agenda.
There were no objections to unanimous approval of the meeting minutes from the 2016 fall meeting in Vancouver.

Old business
Tap changer position during induced test (survey results).
Bertrand Poulan presented the results and comments of the survey conducted after the last meeting. The survey results were as follows: 230 distributed, 106 returned, 7 abstentions, 99 responses, 80 approve as is, 16 approve with comments, and 3 disapprove. Bertrand discussed the disapprovals with the individuals and agreed to make revisions to satisfy the comments. There will be another survey before the next meeting, reflecting the revisions.
Applying pressure inside a transformer tank during induced test (survey results)
Bertrand Poulan agreed to forward the comments from the last survey to Steve
Antosz. Steve will evaluate the comments and introduce revised wording for re-survey.
Alternative Applied test method for HV Delta windings.
No further progress. Based on comments from Don Platts, some believe this information should be placed in a Guide. Ajith Varghese indicated no motion had been passed to establish a PAR for a guide, but this would be addressed at Thursday's SC meeting. If a motion is made and approved, the application of PAR would follow.
Gassing issue for certain types of transformers with wound cores: proposal for new design test
No progress. There is no indication that the comments from 2 yrs ago have been addressed by Phil Hopkinson, and Phil was not present in our meeting to provide a status.

TF PD Factory Limits report by Vinay Mehrotra

The initial meeting was attended by 171 people; a bigger room was requested for the next meeting. The following two points were covered in the TF for Revision to Low Frequency Dielectric Tests.
There was open discussion concerning the scope of the new TF for PD Factory Limits, and agreement that a change to the initial scope had to originate from the TF for Revision to Low Frequency Dielectric Tests.
A motion was made by Edgar Trummer to "Amend the scope by adding to TF PD Factory Limits, to provide recommendations for background noise and test acceptance criteria." The second for the motion came from Dan Sauer. The motion passed with 30 members in favor, 0 opposed, and 0 abstentions.
There was confusion in the TF PD Factory Limits concerning membership, as the roster for a different TF was circulated. A motion was made by Mark Perkins that "The next meeting should be counted as the initial meeting and all participants should be allowed membership if requested". The second for the motion came from Dan Sauer. The motion passed with 31 members in favor, 0 opposed, and 0

abstentions. The Fall 2017 meeting in Louisville will be considered the initial meeting and all who request membership will be granted.
New business

No new business was discussed.

This Task Force plans to meet next in October of 2017 at the Fall Transformer Committee meeting to be held in Louisville, KY.
Dan Sauer motioned for the meeting to be adjorned. The second for the motion was made by Hemchandra Shertukde. The motion was unanimously passed and the meeting adjourned at 2:54 p.m.

B.3.6 WG - IEEE Guide for the Detection of and Location of Acoustic Emissions from Partial Discharges in Oil-Immersed Power Transformers and Reactors (C57.127)

Chair: Detlev Gross Chairs Vice Chair: Jack Harley Secretary: David Larochelle

New Orleans, LA, April 4th 2017
Room: St. Charles AB (1)

Meeting Attendance

The working group met at 11:00 AM. 84 persons were in the room and 15 members out of 23 were present. Quorum requirement was met. Complete attendance record is available in the AM System. From the 7 membership requests received, 6 have attended the last two meetings and will be included as members for next meeting in Louisville.

Discussions

The meeting started with the unanimous approval of the agenda (Thang Hochanh). The minutes from Vancouver's meeting were also unanimously approved (motion by Thang Hochanh, second by Robert Brusetti).

No new patent was brought to our attention during the call for patent.

It was mentioned that our PAR will expire in December 2019. For meeting this deadline without asking for extension, the work will focus on having a stable document after F17 meeting. Changes will be made to the document and circulated for comments before Louisville.

Robert Brusetti questioned the need to mention a number of sensors in subclause 4.2. The reason why 3 sensors are mentioned is because this section covers the spherical triangulation approach which needs 3 sensors. It is an explanation of the technique and not meant as a recommendation.

Robert Brusetti also mentioned his disagreement with the sentence in clause 11 that states that a correlation can be made between acoustic characteristics and PD levels. It was agreed to correct the sentence. He also suggested cropping certain images to emphasize on the signals only, which will be done.

Detlev Gross volunteered to add details to the clause covering the acoustic localisation during impulse test.

Raja Kuppuswami suggested adding examples for user to better distinguish the direct propagation path and the combined oil-steel path. This could include mathematical approaches that could fall under patent material with ownership outside our WG. Alexander Kraetge volunteered to work on adding this information with concepts from public domain.

Hemchandra Shertukde suggested not removing Annex C covering wavelet transform for being an applicable approach to solving times of arrival of waveforms. He will provide examples where such

process was proven useful. Waldemar Ziomek and Detlev Gross suggested adding the time-frequency analysis as a wider topic since wavelet processing is not the only option.

The group will meet again in Louisville for the fall 2017 meeting.

Adjournment

The meeting was adjourned at 11:50 AM.

David Larochelle

B 3.7 Working Group for PD in bushings, PTs and CTs – PC57.160
WG Secretary: Thomas Sizemore; WG Chair: Thang Hochanh
Meeting Minutes April 3rd, 2017 at 4:45 – New Orleans. LA

Attendees: 71
Members attending: 19/42 - Quorum requirements were not met.
Rosters: Circulated for members and guests.
Agenda: An agenda was presented for the meeting.
Essential Patent Claims: Text was displayed and the Chair inquired as to if anyone knew of essential patent claims. None were brought up during the meeting.
Minutes: Minutes could not be approved due to the quorum requirements not being met.
Items discussed based upon comments received:
A total of 23 comments were received for discussion many were editorial or minor in nature. Details of the discussion points are below.
Comments discussed and which will be incorporated into the next draft:

- An abstract was not included in the previous draft. Suggested text was provided.
- Keywords were not included in the previous draft. Suggested text was provided.
- A suggestion was made to change the order of the references.
- Change 'pico-Coulombs' to 'picocoulombs' in several locations.
- Section 3.1 correct referenced clause number.
- Section 4.2.1 make the last indented statement a separate paragraph.
- Section 4.2.2 add the word 'capacitance' for clarity.
- Sections 4.2.2 and 7.1 Discussed wording regarding allowing the measured PD noise to be as high as the limit if no higher values are measured.
- Section 4.2.4.1 Discussed changing to 500 kHz from 1 MHz.
- Sections 4.2.4.2 and Appendix A removed company logo from provided figures.
- Section 4.2.4.3 Added qIEC, Rmax, Rmin and Pulse Train definitions from IEC.
- Section 4.2.4.4 Removed typographical error from the section heading.
- Section 4.2.4.4 Discussed adding stronger language for recommend recording and evaluation of several pieces of data. Chose to leave the current language both because it would be excessively hard to do in higher production environments and also to prevent potentially controversial language from a legal standpoint.
- Section 6.2 Discussed the wording relating to the use of shielding as part of test preparation.
- Annex C updated references which called out 'B' instead of 'C' figures and text.

Motion to submit the document for ballot: At the next meeting, a motion for ballot will be submit to the WG members.

PAR extension: Due to the termination (2017-12-31) of the original PAR, a PAR extension is necessary.
Motion to adjourn: A motion was presented by Bertrand Poulin and was seconded by Vladimir Khalin.
Fall meeting 2017: This WG plans to continue working at the IEEE Fall meeting in Louisville (KY).
Next version of draft: A new and "final" draft is being prepared to incorporate all of the recent comments. This will be sent out between meetings.

Date: 2017-04-03
Chairman: Thang Hochanh
Secretary: Thomas Sizemore

B 3.8 Task Force Winding Insulation Power Factor & Winding Insulation Resistance Limits WG Secretary: Diego Robalino; WG Chair: Susmitha Tarlapally
Tuesday 4/4/17– New Orleans Canada.

Meeting initiated at 08:00 AM at the Grand Ballroom AB, Astor Crown Plaza Hotel, New Orleans, LA, USA.
Susmitha Tarlapally (Chair) and Diego Robalino (Secretary) at the meeting
Meeting started with introduction of attendees
At the beginning of the meeting, 22 members were in the room out of 36 total members listed. Quorum was established to continue with the agenda.

- Data received from Cluod-in-hand
    - Activity Name: TF Winding Insulation PF/Resistance Limits
      Activity ID: 2186
      Number of Members in Activity = 36
      Number of Members Present = 22
      Quorum Present = 61.1%
      Number of attendees = 127

    - 10 new guests requested membership and 8 guests were granted membership.
- Susmitha presented the Agenda for the S17 meeting. None opposed to unanimous approval of agenda. Agenda for S17 meeting was approved unanimously
- Susmitha requested a motion for Approval of F16 meeting minutes submitted previously to members and guests.
    - Motion by Aniruddha Narawane
    - Second: James Antweiler
    - None opposed to F16 meeting minutes approval
    - F16 meeting minutes were approved unanimously
- The scope of the TF was read again to all attendees
- Susmitha made a review of the documentation gathered so far supporting the activity of this TF
- Diego presented a summary of the information gathered during the F16 meeting on an anonymous survey
    - Charts included acceptance limits for:
        - PF (line frequency) based on rated KVA and kV
        - IR based on rated kVA and kV
    - Results showed a tendency of values for PF line frequency at different MVA and kV ratings
    - Results showed a wide dispersion of limit values for IR
- Open discussion on survey data presented
    - Mark Perkins suggested to reduce variability of IR limits by separating delta and wye configurations with reference to a resistance value per nominal kV.
    - The influence of bushings on the PF measurement was brought up to the attention of the TF. It was suggested to approach the bushing group and get a feedback of the influence of the bushings due to materials.

  - Ali Naderian suggestd to review in the literature the formulas correlating kV and KVA to PF
  - It was suggested to stablish the factory limits and provide guidance to percentage increase in the field
  - Reccomended best practices for testing different types of transfomrers
  - Ramsis Girgis suggested to include the type of core as variability might be observed between core and shell type, as well as wound type. A section is suggested to include core and cutting.
  - Suggested to differentiate in the survey the type of insulating liquid: mineral oil or ester oil.
  - Baitun Yang suggested factory testing to be benchmark for future analysis and limits should be recommnended only.
  - Aniruddha Narawane requested to include the influence of grounded shield
  - Mario Locarno reminded the attendees that the scope of the TF is factory acceptance and/or field commissioning limits. The scope does not include field data.
- There were no new topics for discussion
- Susmitha requested a motion to move into a WG to continue with the activity
  - Ajith Varghese clarified the TF cannot be a working group unless it is related to the main standard. We have to continue as a task force and come up with recommended limits. Some suggestion shall come out from the work on this TF before any decision is taken to move forward.
  - Mark Perkins suggested to start with Class II Power transformers with oil-paper insulation as those seem to have more consistency of data based on the survey
  - The survey needs more detail and become more specific
  - It was suggested to ask NETA if data base could be used
  - It was suggested to divide the data between manufacturers and end users
- A decision was made to form a smaller group and frame a table to be circulated among members and guests for a formal survey
- Members and guests volunteered to complete this task (total of 12). Meeting will be arranged by Susmitha Tarlapally over skype.

Peter Werelius	Mario Locarno
Saurabh Ghosh	Subhash Tuli
Tauhid Ansari	Matthew Weisensee
James Antweiler	Fernando Leal
Cihangir Sen	David Wallach
Don Dorris	Aniruddha Narawane
Poorvi Patel	Susmitha Tarlapally
Scott Marshall	Diego Robalino

- No more topics for discussion
- Motion to adjourn:
  - Aniruddha Narawane
  - Second: Diego Robalino
- Meeting adjourn 9:01 AM

B.4 Liaison Reports

B.4.1 IEEE High-Voltage Testing Techniques Subcommittee, Liaison Report to Dielectric Tests, Subcommittee of IEEE Transformers Committee, Submitted by Jeff Britton (HVTT Chair) on behalf of Arthur Molden, April 5th, 2017, New Orleans, LA

The High-Voltage Testing Techniques (HVTT) Subcommittee of the IEEE Power System Instrumentation and Measurements Committee met in New Orleans, Louisiana on January 11th, 2017, in conjunction with the 2017 IEEE PES Joint Technical Committee Meeting. There were a total of:

20 Onsite Attendees – Comprised of 7 Members and 13 Guests
31 Web Meeting Attendees – Comprised of 4 Members and 27 Guests

Official HVTT Subcommittee Membership presently stands at 13 persons, so we had a strong quorum present. Of the total of 40 Guests, 30 requested membership. Ray Hill of NEETRAC was accepted as a new member of the Subcommittee.

Following introductions, a presentation was given by representatives of State Grid Corporation, China, regarding a PAR submitted to IEEE SA to develop a Guide titled "Guide for Accurate Measurement and Classification of Fast-Front and Very Fast-Front Overvoltages in Electric Power Systems". IEEE SA was looking for possible PES Committees to sponsor the development of this guide, and the Transmission and Distribution and Power System Instrumentation and Measurements Committees were offered the opportunity to participate. At the meeting, PSIM/HVTT agreed to provide input to the PAR, and possibly participate in the document development.

Working Group Updates: HVTT presently has 2 active working groups which also met at the JTCM:

WG P1122 "IEEE Standard for the Digital Recorders for Measurements in High-Voltage Impulse Tests"
Chaired by Jeff Britton (Phenix Technologies), with Secretary Tom Melle (Highvolt).

This group met and reviewed the overall uncertainty requirements on digital recorders as stated in IEEE 1122-1998, and compared these to the requirements stated in the present Committee Draft of IEC Standard 61083-1. There are minor differences between the IEC and IEEE documents, and where possible we will work to harmonize the standards. The other technical topics being addressed in the revision will be:

- To review and update the initial qualification and periodic testing requirements for digital recorders used to measure high-voltage impulses,

- To ensure that a mathematically correct, standard methodology is given for estimation of the overall uncertainty based on the results of the various tests and measurements prescribed in the standard.

WG P510 "Guide for Electrical Safety in High-Voltage Testing"
Chaired by Jeff Hildreth (Bonneville Power Administration) with Secretary Johannes Rickmann (Phenix Technologies)

This WG met for the first time, having received PAR approval in December 2016.

A proposed table of contents was presented by the chair, and comments received on the proposed table of contents were discussed. An older CENELEC document (EN 50191) was also circulated for discussion.

Assignments for the next meeting include a further review of existing safety documents published or "in use" that members can locate and provide to the WG. By the next meeting, individual writing tasks should begin to be assigned.

Following the WG reports, there was discussion on a proposal to develop a general IEEE Guide for Partial Discharge Measurement. A motion was passed to form a task force to develop a scope statement for such a guide. Once reviewed and accepted by the Subcommittee, this scope statement will become the basis for a PAR. The TF is presently being chaired by Nigel McQuin (McQuin Power Consulting), and also includes Detlev Gross (Power Diagnostix) and Jeff Britton (Phenix Technologies) who may give input from the perspective of the Transformers Committee. Membership on this TF is open, and anyone who would like to join may contact Detlev Gross or Jeff Britton.

The HVTT Subcommittee is planning to meet in the Fall of 2017, tentatively during the week of October 2nd, in Clearwater Beach Florida.

Anyone interested in participating in the work of HVTT should contact Arthur Molden, Jim McBride or Jeff Britton.

B.5 Discussions

None.

B.6 Old Business

As a part of Old business the chair talked about the request for an entity PAR for guide for field measurements and Pattern recognition of Partial Discharges in oil-immersed Power Transformers. During Vancouver meeting, a representative from SGCC had a made a presentation to support this.

Chair reported that PAR request was reviewed during administrative subcommittee on Sunday 4/2/2017 and was not approved due to significant overlap with current standards. It was pointed out that there was at least four standards or guides (C57.127, C57.113, C57.152 and C57.124) that have some overlaps. UHF is not included in the current standard but scope of the current documents doesn't exclude the requested topics. PAR Applicant is advised to participate in Transformer Committee WGs towards addressing areas that are not covered in existing documents

B.7 New Business

- **Accuracy requirement for power factor test defined under C57.12.90 – 10.10.2**
    - There is a request to identify the equipment accuracy during power factor testing.
    - Bertrand pointed out that we should not talk about accuracy but rather **uncertainty** is not greater then xx%
    - The Equipment manufacturer all agreed to that the equipment uncertainty of +/- 1% can be met.
    - Suggestion was made to send out a survey to PF- equipment manufacturer
    - Ali suggested to possibly create a new TF
    - Diego suggested to include this topic in the TF for Winding Insulation Power Factor & Winding Insulation Resistance Limits
    - Dan Sauer made a motion to include in the scope of TF on Winding Insulation Power Factor & Winding Insulation Resistance Limits to review and recommend accuracy of PF Test as defined under C57.12.90-10.10.2 – Bertrand made a second.
    - 52 approved this suggestion, 2 Abstained, No negatives

- **Concern with bushing PD affecting transformer induce test**.
    - A concern was raised in Bushing SC meeting regarding need for bushings to be vented to have transformer pass partial discharge limits during induce test.

- Transformer and bushing manufactures shared their experience and knowledge of this phenomena that seems to appears only at factory testing and has not been seen in the field.
- Steve Antosz recommended this topic can be added to agenda for the TF on The Revision of Low Frequency TF for additional investigation and recommendation, which Chair agreed.

B.8 Adjournment

Meeting adjourned 12.05 PM. Motion to adjourn made by Dan Sauer and Diego Robalino

Minutes respectfully submitted by:
Poorvi Patel
Secretary DTSC.

Annex C Distribution Subcommittee – Chair: Stephen Shull

April 5, 2017
New Orleans, LA, USA

Chair: Stephen Shull
Vice-Chair: Jerry Murphy

C.1 General Opening

Steve opened the meeting welcoming everyone to the meeting. Jerry circulated the rosters. To establish a quorum, a list of members were displayed and a count of was made. We did have a quorum with 43 of the 63 members in attendance by count of those identified on a slide presented in the meeting. Recorded attendance gave 151 in attendance, 46 members and 22 requesting membership with 15 being eligible.

The agenda was reviewed and motion made by Gael Kennedy, seconded by Dan Sauer and approved by unanimous acclamation of the members in attendance.

The Fall 2016 meeting minutes were reviewed and motion made by Ron Stahara, seconded by Dan Sauer and approved by unanimous acclamation of the members in attendance.

C.2 Working Group and Task Force Reports

C.2.1 C57.15/IEC 60076-21 – Step-Voltage Regulators – Craig Colopy

Craig presented the following minutes from the working group meeting on April 3, 2017 at 4:45 p.m. with 35 people in attendance.

1. Craig Colopy opened the meeting and introductions were made by the attendees.
2. Distribution of attendance sheets. Essential Patent call made by Craig Colopy - None received from attendees. Check for Quorum was made, 22 from card reader vs. 25 visual count, Members in attendance. Quorum was achieved (38 members). 15 members attended the Saturday working session - 1 April 2017.
3. Approval of agenda - Dan Sauer made Motion, Steve Shull seconded, no opposition to approval.
4. Approval of minutes from Spring meeting in Vancouver BC, Canada - Motion for approval by Fred Friend and second by Steve Shull , no opposition to approval.
5. Discussions/ decisions with regard to a majority of the comments from Draft 2.0 ballot resulted in the completion of Draft 2.2. Discussions/ decisions with regard to the balance of the comments as well as the comments from IEC generated Draft 2.3.

Summary of work completed from Saturday's all day session was presented. The following was submitted for review:

a. New subclause, Over-Excitation, was created from text taken from previous clause.
b. Added detail in the document on the difference between the thermal and mechanical force short-circuit test requirements with regard to the 25X requirement.
c. Separated out the routine and type testing of the complete voltage regulator from the key components. Clause identified as components added to Draft 2.3 covering tank integrity, control and on-load tap-changer.

d. Added additional requirement from IEC for nameplate data (weight of fluid when specified).
e. Note added for Lifting Lug Section regarding the possible need of a spreader bar when lift the complete unit.
f. Clarified the need to perform dielectric testing before visual inspection after a short circuit test.

8. Unanimous decision from committee members was received to have Draft 2.3 go for recirculation and formation of IEC CDV after final review by the working group.
9. Move for Adjournment - Fred Friend made Motion, Steve Shull seconded, no opposition to approval. Close of meeting.

Recorded and submitted by: Craig A Colopy/Gael R Kennedy

C.2.2 C57.12.20 – Overhead Distribution Transformers – Al Traut

Al presented the following minutes from the working group meeting on April 3, 2017 at 11:00 a.m. with 69 in attendance.

The patent policy was reviewed and upon asking for essential patents none were brought forward.

Based on the WG members listed on the roster and projected at the meeting a quorum was declared after a count was made.

The Chair asked if any member objected to the proposed agenda as displayed to the Working Group. No objections were brought forward so the agenda was approved as submitted.

The Chair asked if any member objected to the F16 (Vancouver BC, CANADA) minutes as submitted to the Working Group. No objections were brought forward; therefore, the F16 Minutes were unanimously approved.

The basic work at this meeting was to continue to review and address all comments received from the initial ballot as detailed below.

- Clause 7.5
  - Comment that Lifting Lugs should be moved to this section based on the 5-times safety factor
  - Recommendation by Chair to remain as is for now and considered for the next revision.
- Clause 7.5.4.3
  - Grounding connection only applies to the 120/240 connection for clarification
- Section 9.6
  - Replaced oil with liquid for clarification
- Table 3
  - No content changes only minor changes for clarification
  - Use of delta symbol to differentiate from “Y”
- Tables:
  - Based in comment Al adjust the format for consistency table to table on voltages
- Figure 1 & 2
  - Changed maximum voltage for 95BIL applications from 12,000 to 13,800v.
  - Comment on 30” creep bushings was rejected as this is outside the scope of this standard.
- Figure 6

  - Eliminate note “e”
- Figure 7
  - Eliminate note “e”
- Figure 9
  - The word “two” was added in the description for clarification
- Figure 10
  - Item 4 the hand hole provision was missing. Added it to be consistent with the other Figures
- Figure 12
  - Item 4 was missing again
- Figure A1
  - Note 4 - Added the previous requirements for the “C” support lug.
  - Note 6 – Added tolerance information

With all comments reviewed and resolved, a motion made by Steve Shull and seconded by Ron Stahara to approve all resolved comments and move forward with the recirculation ballot of D5. Motion passed unanimously.

There were a few others items that were captured to place on the list for future consideration.

- Review low voltage grounding as may be shown in Figure 10
- Look at the “T” (Scott Connected Transformer) connection for the three phase transformer connection
- Review the proximity of the lifting lugs to the low voltage bushings as referred to in Section 7.2.4

The next meeting will be held October 2017 in Louisville, KY.

The meeting was adjourned at 11:43am, Ed Smith recording.

C.2.3 C57.12.28, .29, .30, .31 & C57.12.32 – Enclosure Integrity – Dan Mulkey

Jerry Murphy presented the following minutes from the working group meeting on April 4, 2017 at 8:00 a.m. with 58 in attendance.

A call for was made for essential patent statement and responses. None were raised.

Introductions were performed and membership changes were noted. Quorum was verified. The working group consisted of 42 members, requiring 21 for quorum. 22 members were confirmed at the time of counting. Jerry Murphy made the call for any opposition to unanimous approval of the minutes. No opposition was raised so the minutes were unanimously approved.

The Status of Standards covered by this working group was made by the Chair:

a. C57.12.28 Standard for Pad-Mounted Equipment – Enclosure Integrity, Published July15, 2014, Revision Due: 12/31/2024
b. C57.12.29 Standard for Pad-Mounted Equipment – Enclosure Integrity for Coastal Environments, Published August 8, 2014, Revision Due date 12/31/2024
c. C57.12.31 Standard for Pole Mounted Equipment – Enclosure Integrity, Published September 20, 2010, Revision Due: 6/17/2020, Corrigenda approved May16, 2014
d. C57.12.32 Standard for Submersible Equipment – Enclosure Integrity, Reaffirmed 3/7/2008, Revision Due: 12/31/2018, PAR expiration: 12/31/2019

Under Old Business, a report on accelerated UV testing was presented by Scott Abbott, PPG with an introduction by Rebecca Giang, Sherwin-Williams. Rebecca provided an overview of

the coatings test that had been run using the FS-40, QUV-A and QUV-B bulbs since the last WG meeting in Vancouver. She mentioned that one driver for the test is that the FS-40 bulb is an old technology which will not work in the new test chambers. Scott Abbott presented detailed results from the coatings test. The following conclusions were given in his presentation:

- Variability observed between panels exposed to different bulbs
- Results indicate that longer test duration and/or higher % gloss retention requirements beyond the current 500 hour duration and 50% gloss retention requirement using FS-40 bulbs would be recommended if using UVA-340 bulbs
- Additional test results are needed before proposing a test method specification requirement using UVA-340 bulbs

After the presentation, a discussion took place. Mike Thibault asked how 1200 hours of testing compared to 1200 hours of "real life" usage. Scott Abbott mentioned that this is very difficult to determine. Rebecca Giang added that typically this type of test gives comparative results between different coating systems. Carlos Gaytan asked if the 70% retention criteria for the QUV-A test method came from the test results or from another source. Scott Abbott responded that it had come from the test results, and that when they were looking at the data it became apparent that 70% was a reasonable value. Dwight Parkinson asked how it was possible to have a gloss retention result above 100%, as some of the test results indicated. Scott Abbott mentioned that it could be a result in variability in the measurements, or in the smoothness or flatness of the samples. He also mentioned that it may be possible they're being polished during the test cycle. Rebecca Giang added that there is a large range in the metal profiles. A question was asked if there was any correlation between how much gloss the panels started with versus how much gloss was retained. Rebecca Giang commented that it doesn't seem to have had an effect, except in the case of the negative controls. When the coating is not performing well, it doesn't matter if the initial gloss is high or low, the final result will not be good. Scott Abbott added that typically there would be better gloss retention in a high gloss coating than a low gloss coating with all other things being equal. The question was asked if the standard should switch to the QUV test, and if the black panels would need a different standard. Scott Abbott mentioned that if a switch to the QUV test method was done, the test duration would need to increase as well as the baseline level. He also mentioned that we needed more test results to comment on the black data. Rebecca Giang agreed that the test should be run out to 1500 or 2000 hours as is currently planned. Jerry Murphy commented that black coatings are typically used in underground applications, and therefore light exposure might be limited. It was mentioned that these transformers may still be exposed to significant levels of UV while they are in a yard or during field use such through gridding in underground vaults. Mike Thibault asked how the high QUV exposure affects the durability of the coating. Rebecca Giang commented that it tends to make it more brittle with a higher chance of peeling off the substrate. Scott Abbott agreed that long term exposure to the extreme conditions may result in flaking off. QUV looks at UV, temperature and humidity, but does not include rainfall and environmental effects. There are other tests to simulate these items, but they are longer tests with more expensive equipment. Rebecca Giang commented that one motivation to change to the QUV-A or B bulbs is that the FS-40 bulb doesn't have irradiant control as it is old technology. As a result, it is unknown what type of intensity is hitting the panel. A new method would result in more consistent data. Jerry Murphy added that the investigation into alternate test methods initially came up from a comment indicating the FS-40 bulb may not be available. Since then it's been discovered that the FS-40 bulb is available, but the question has been asked if that the use of this bulb still makes sense to determine the effect of light on the coating finish since the bulb is obviously moving toward obsolesce. Rebecca Giang and Scott Abbott agreed that the QUV-A340 bulb would better fit for the coatings test.

In new business, the group continued to review the document. The draft standard was reviewed beginning with Paragraph 4.5.6 Ultraviolet accelerated weathering test (QUV). Rebecca Giang commented that the recommendation in the ballot comment "Working to see if we have an equivalent – potentially QUVA-303 with lower irradiance level" is not correct. The bulb being investigated is the QUV-A340. Someone asked how condensation mentioned in the paragraph would be addressed. Scott Abbott mentioned that adding condensation is part of the QUV cycle. Mike Thibault suggested that it might better if the test was run until the coating systems failure, recording where this occurs. A **motion** was made by Steve Shull and seconded by Carlos Gaytan to table the discussion on paragraph 4.5.6 until the next meeting. The motion passed with unanimous approval.

Next, paragraph 4.5.7 Simulated corrosive atmospheric breakdown (SCAB) was reviewed by the working group. The original paragraph and a proposed new paragraph by Dan Mulkey were reviewed. A **motion** was made by Rebecca Giang and seconded by Steve Shull to delete the original paragraph in the section. A friendly amendment was made by James Gardner and accepted by Rebecca and Steve to accept the paragraph as revised by Dan Mulkey and delete the second paragraph. Another friendly amendment was made Darren Brown and accepted by Rebecca and Steve to remove the words "both the exterior and interior cabinet / frontplate surfaces of the pad-mounted" from the first sentence of the paragraph. A third friendly amendment was made by Steve Shull and accepted by Rebecca to add dates to the references of ASTM D1654 in the paragraph. There was discussion about whether or not the # of cycles should be reduced to 15 or left at 20 as in the original paragraph, but no further friendly amendments were made. The motion passed unanimously.

With this the meeting was adjourned due to time. The next meeting will be held in Louisville, KY, USA.

The meeting adjourned at 9:15am, Jeremy Van Horn recording.

C.2.4 C57.12.34 – Three Phase Pad-Mount Transformers – Ron Stahara

Ron Stahara presented the following minutes from the working group meeting on April 3, 2017 at 3:15 p.m. with 84 in attendance.

Ron Stahara called the meeting to order and introductions were made. The rosters were circulated. The names of those in attendance are recorded in the AM system. To establish a quorum, a members list was displayed on the screen and those who saw their names were asked to hold up their hand. From this count of hands, it was determined that a quorum was established. A motion was made by Alex Macias and seconded by Brian Klaponski to accept the agenda as shown. The motion passed unanimously. The Patent Slide statement calling for Essential Patent Claims was read and no new patents were brought up but it was noted that the "third door" patent which was held by ComEd and was brought up last time has yet to be resolved. (As a side note, Martin Rave had an LOA form delivered to him at the last meeting and even though it was delivered to ComEd's legal department, no comment had been received from ComEd's legal department. So even though a number of attempts had been made by Martin, the status of this has yet to be determined). A motion was made by Jerry Murphy to accept the minutes of the Fall 2016 meeting as amended since were a few spelling/grammar errors brought forth by Fred Friend. This was seconded by Ed Smith. The motion passed unanimously.

Task force reports were given on the following items.

- **Existing Standards - Dan Mulkey, Task Force Chair**

Since Dan was unable to attend, the Vice Chair of the Working Group reported for Dan. This task force found that there were a number of standard updates and corrections that should be made from the standard references found in the current draft. These standards were ASME B30.9™, *Slings: Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks, and Slings*, IEEE Std 386™, *Separable Insulated Connector Systems for Power Distribution Systems above 600 V*, IEEE Std C57.12.00™, *General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers*, IEEE Std C57.12.28™, *Pad-Mounted Equipment—Enclosure Integrity*, IEEE Std C57.12.70™, *Terminal Markings and Connections for Distribution and Power Transformers*, IEEE Std C57.12.90™, *Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers* and a pending standard IEEE PC12.39, *Standard for Distribution Transformer Tank Pressure Coordination*. All of these suggested corrections were provided to the Chair with the exception of the review of ASME B30.9 and IEEE C57.12.90. After some discussion, Carlos Gaytan and Israel Barrientos volunteered to review ASME B30.9 and IEEE C57.12.90 for any changes that would need to be included in the new document. As well, with the resignation of Justine Pezzin from the Working Group, Israel was appointed to this task force.

- **Figure Review - Gary King, Task Force Chair**

  As Gary and his team combed through these, they found a number of inconsistences, as well as editorial, and technical errors. Gary illustrated a number of these for the group so the Working Group would have an understanding of what the task force had encountered. One of the items was the use of a different dimension for an interface that was using a bail as compared to not using a bail. It was commented that the standard needs a default position on this item so that it will be clear what will be specified unless specially called out in a user's specification. The task force's work to date was turned over to the chair.

- **Informative Annex – Items to Consider Steve Shull**

  The following list was presented and a hard copy provide to the Working Group.

  - Fusing
    - Weak Link
    - Current limiting
      - Underoil
      - Drywell
    - Combo – Weak Link and partial range current limiting
  - Under-oil MOV arrester
  - Under-oil Primary Switch
  - Under-oil Secondary Breaker
  - Oil Sampler and Combination Drain Valve
  - Oil level Gauge
  - Temperature Gauge
  - Third Door Compartment- access to various accessories
  - Optional barriers for the compartments

  Steve stated the hard copy could used as a talking and thinking document. He suggested that as the group reviewed this list that they use the document as a scratch pad to note thinks that may need to be added or removed or placed into the standard. He asked that these be provide back to him so that they could consider when the Annex was created. The discussion led to the discovery that IEEE C57.12.24 had a number of these items incorporated into this standard's body as opposed to an informative annex. One other

item that was mentioned was the addition of an explanation of the use of the interface bail that is referred to in some of the drawings and clearances tables.

The chair stated that rather than present a detail listing of each of these items, he would suggest that these be incorporated into a new draft which would denote them as changes. He would hope that this draft could be presented at the next meeting which would occur in the fall of 2017.

With this, the meeting was adjourned, Stephen Shull recording.

C.2.5 C57.12.36 – Distribution Substation Transformers – Jerry Murphy

Jerry reported the working group met Tuesday, April 4, 2017 at 1:45pm with 45 people in attendance.

Jerry Murphy called the meeting to order at 1:45 PM. Introductions were made. The names of the members were projected on the screen. By a show of hands the quorum was not reached since there were 10 out of the 21 members present. Later another member joined the meeting and the quorum was reached.

After Jerry asked the question, there were no patent claims brought up to the attention of the working group.

Once quorum was established, Wally Binder moved to approve the agenda for the meeting and the minutes of the last meeting in Vancouver. Steve Shull seconded and the motion was approved with unanimous consent.

Jerry reviewed the one comment received from the latest ballot recirculation. It was related with the reference to PC57.12.39. Since this same issue had been discussed and approved at the previous meeting in Vancouver, Lee Mathews made a motion to reject the comment from the recirculation. It was seconded by Steve Schroeder. The motion was approved by unanimous consent.

Jerry informed that he would send the document to RevCom, expecting to get approval for publication of the document.

Jerry announced that considering that this approval from RevCom would be accomplished, the WG would not meet in the Fall in Louisville.

The meeting adjourned at 2:10 pm, Carlos Gaytan recording.

C.2.6 C57.12.38 – Single-Phase Pad-Mounted Transformers – Ali Ghafourian

Ali Ghafourian presented the following minutes from the working group meeting on April 3, 2017 at 1:45 p.m. with 55 in attendance.

The meeting was called to order at 1:45 p.m. by Ali Ghafourian.

A quorum was established with 19 of 27 working group members present.

The agenda for the meeting was presented and unanimously approved.

The minutes of the Fall 2016 meeting in Vancouver have been posted on the website since shortly after that meeting for the working group members to review. There were no suggested changes to the meeting minutes, and the meeting minutes were unanimously approved.

A call for essential patents was made as required using the statement provided in the general session. No essential patents were brought forward.

The Chair informed the working group members a complimentary PDF of the recently approved Corrigendum 1 had been e-mailed to them.

There was a discussion of proposed changes to be included in the next revision of the standard:

- The Chair proposed adding a table (Table 5) with minimum percent impedances identical to the table in C57.12.20.
- A question was raised as to why the Phase-to-Ground clearances in Table 2 were smaller than the Phase-to-nonhygroscopic insulating barrier clearances. It was noted that this was actually only true for the first three lines of the table. After comparing this table to the similar table in C57.12.34, it was determined that the first three lines should not have contained values. They should have been grayed out as in C57.12.34 to indicate that values are not applicable for these system voltages. This will be corrected.
- Giuseppe Termini presented a list of transformer accessories the Task Force developed for working group consideration to be included in the next revision of the standard. The transformer accessories discussed included an oil sightglass, fuses, liquid thermometer, HV tap changer, one inch drain plug, one inch fill plug, loadbreak switch, and arresters. Giuseppe Termini suggested following the same format used in C57.12.24 regarding transformer accessories in the next revision of C57.12.38. Steve Shull recommended the transformer accessories function and purpose be listed in an informative annex. Steve Shull highlighted, as an example, the difficulty in providing too much specificity regarding fuses because fuse TCC curves, transformer impedance, and system available fault current need to be taken into consideration.
- As a member of the transformer accessories Task Force, Giuseppe Termini stated he will issue a survey to working group members to solicit feeback on what transformer accessories should potentially be included in the next revision of the standard.
- Jerry Murphy offered a motion with a second from Martin Rave to change the last sentence of the Scope to “This standard does not cover all electrical and mechanical requirements of accessory devices that may be supplied with the transformer.”. This motion passed with unanimous consent.
- Steve Shull offered a motion with a second from Jerry Murphy for the Chair to apply for a PAR with the same Purpose as in the current revision of the standard and the revised Scope (per the bullet above) as discussed in the working group meeting. This motion passed with unanimous consent.

The Chair adjourned the meeting at approximately 2:45 pm. A meeting will be required for the Fall meeting.

Submitted by Martin Rave

C.2.7 C57.12.39 – Tank Pressure Coordination – Carlos Gaytan

Carlos reported the working group met Tuesday afternoon at 4:45 p.m. with 37 in attendance.

The meeting was called to order at 4:45 PM. Quorum was reached by having 17 of 26 members present. After Carlos asked the question, there were no patent claims brought up to the attention of the working group. The approval of the agenda was moved by Said Hachichi,

seconded by Steve Shull, and the motion was approved unanimously. The approval of the minutes from the Fall 2016 meeting was moved by Ron Stahara, seconded by Cory Morgan, and the motion was approved unanimously. On chair remarks, Carlos informed that a PAR extension was approved, with new Expiration date of Dec. 31, 2017. There were 13 comments that would be discussed at the meeting.

On the review of the comments from the ballot, after a long discussion on the comment to add a PRV to section 4.2.2.5 of Pressure Vacuum Bleeder Valve, the group realized that this comment was addressed on Sect. 4.2.2.4 Pressure Relief Device, Brian Klaponski moved to eliminate 4.2.2.5; Anil Dhawan seconded, and the motion was approved with unanimous consent.

The following comments reviewed were related with Sect. 4.2.2.4 of the PRD. A motion was made by Brian Klaponski, seconded by Steve Shull, to modify the 2nd paragraph to say: "If a PRD is required or specified, the tank shall also have a PRV to relieve the tank pressure manually, or a pressure-vacuum bleeder valve."

On the comment that PRDs were not currently required for 3 phase padmounted transformers, the group agreed to accept the comment, to be consistent with the present C57.12.34 standard.

On the comment about Sect. 4.3.2 Sudden pressure relay, to add "but not limited to" to the operating pressures, the group agreed to reject the comment, because it would cause confusion.

The group again discussed Sect. 4.2.2.4 of the PRD requirements. A motion to change the text in the first paragraph to move the words "when specified for padmounted transformers", after the kVA and BIL requirements for Substation Transformers", was made by Steve Shull, seconded by Ron Stahara, and it was unanimously approved.

A comment about changing the fault current rating from 8 to 10 kA on Sect. 5.4.1 of the fault current capability test was rejected because it would take a significant effort to analyze

The other comments were reviewed and the disposition agreed by the group. Near the end of the meeting a motion to accept the comments incorporated in draft 5 and send it for recirculation ballot, was made by Steve Shull, seconded by Ron Stahara, and it was unanimously approved.

The meeting was adjourned at 5:55 PM, Jeremy Van Horn reporting.

C.2.8 Task Force on Transformer Efficiency and Loss Evaluation – Phil Hopkinson

Phil reported that the task force met Monday morning at 9:30 a.m. This was followed by repeating part of his presentation from the TF meeting. Ron Stahara asked "What is DOE's posture on this?" Phil responded that DOE had a delegate at this meeting and were set to review efficiency levels in 2022. Steve Shull noted that this Subcommittee is looking at this data so we will not be caught by surprise and not to submit anything to the DOE.

Phil Hopkinson welcomed the members to the meeting and noted that the high attendance (107) indicted the level of interest in the topic.

This was the second meeting of the task group. The minutes of the last meeting were uploaded to the IEEE Transformer Committee Website. Also uploaded to the website were data from PG&E provided by Dan Mulkey. The data provides transformer loads recorded an hourly basis over one year for more than 1 million transformers. It was collected from smart meters from

residential, commercial & industrial applications and broken down by transformer type and rating.

There were no additional items for the agenda.

Background

The DOE Energy Efficiency rules will be due for renewal or revision by January 1, 2022. The current loading is estimated at 50% of nameplate rating load for medium voltage transformers and 39% for low voltage transformers. There is a need for real data to replace these estimates. The quality and availability of data have benefited from the expanding use of smart meters. Utilities should be capable of providing data on transformer loading broken down into load types, geographic locations and other useful categories.

PG&E Data

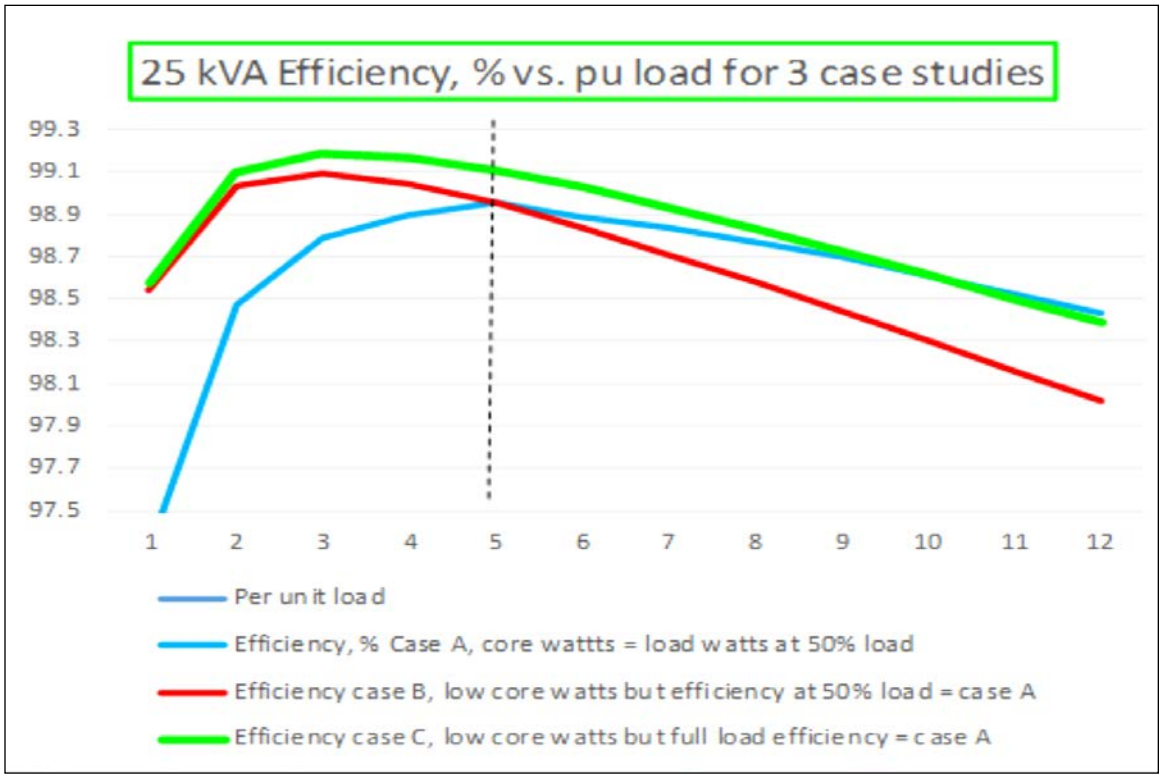
Mr Hopkinson reviewed some of the key features of the PG&E data from a presentation he made to ASEAN.

1. Residential 10% to 78% of nameplate, 50% average
2. Commercial 40% to 80% of nameplate, 60% average
3. Industrial varies 40% to 90% of nameplate, 70% average

Transformers are drawn from stock as needed. There are a limited number of transformer sizes used to reduce the number of transformers needed to be held in inventory.

A transformer may go to any location – residential, commercial or industrial – with loads that could be 10% to 90% of nameplate.

Mr. Hopkinson used the graph below to illustrate efficiency for 3 case studies.



He proposed a new Total Loss Constraint:

1. Basis is total allowable loss at current measurement point for energy efficiency; i.e. at 50% or 35 % load, called "W"
   W= (pu Load) * kVA*1000*(1-PU Efficiency)/Efficiency
2. W/2 is starting assumed load loss.
3. W/2 * (1 /(pu load))^2 / Temperature correction factor = full load loss component = L
4. **Total Loss limit = L + W/2**
5. Suppose real core loss, C, < W/2
6. That is excellent and encouraged.
7. Two constraints must be satisfied.
   a) C < W/2.
   b) L' +C < L+W/2

Discussion

There was much discussion and interesting points were made. Some of the comments are given below:

- Is this intended as a proposal to DoE for the next rule making cycle? The consensus was not to push for any changes to the current requirements. If DoE does decide to revise the requirement this could be an option for a direction to consider.
- Fixing two points on the curve may be limiting the design alternatives.
- This proposal would result in a more expensive transformer that would be larger than presently required. This would increase transport and installation costs.
- Materials other traditional steel core will have different load efficiency curves.
- Number of buckets of transformer sizes – agreed minimum desirable.
- Is PG&E representative of country at large? Is data needed from other geographical regions and smaller utilities?
- The DoE rules of 2010 were better as driving efficiency goals than the 2016 rules.
- Having a smaller number of transformer sizes could result in transformers 2 or 3 sizes larger than necessary in new installations where the customer typically overestimates usage.
- Should there be different efficiency requirements for high voltage and high current applications?
- Reducing energy consumption across system includes energy used in manufacturing, transportation and installation.
- Total lifetime costs (TLC) should be the aim but very difficult to calculate all energy costs.
- New technologies such as electric vehicle charging, solar power and energy storage could have unforeseen impact on transformer loading.

Data Collection

According to Steve Rosenstock of Edison Electric Institute (EEI) residential loads represent 37% of the National Electricity consumption with Commercial at 31% and the balance industrial.

EEI is prepared to compile utility data (on anonymous basis if necessary) to match PG&E and combine if possible.

The chair asked members representing utilities if they were willing to share similar data with the task force. Two members said they were willing to share their data and disclosure of their organization would not be a problem.

Next Meeting

The next meeting will be in Louisville in October 2017.

The meeting was adjourned, Gerard Winstanley recording.

C.3 Old Business

- None

C.4 New Business

- Series Resonance – Phil Hopkinson

  Phil raised a concern regarding series resonance causing failures in distribution transformers related to solar farm inverters.

C.5 Chairman's Closing Remarks and Announcements

Steve had no closing comments to the SC except to see them in Louisville in fall of 2017.

C.6 Adjournment

Steve adjourned the meeting as provided in the meeting agenda at 10:15am.

Annex D Dry Type Transformers Subcommittee

April 5, 2017

New Orleans, LA USA

Chair: **Charles Johnson**

Vice-Chair: **Casey Ballard**

Secretary: **David Stankes (absent)**

D.1 Introductions and Approval of Agenda and Minutes

The Subcommittee met on April 5, 2017 at 1:30 PM in the Tolouse AB Room of the New Orleans Astor Crowne Plaza Hotel.

There were 17 of 26 members present (therefore we had a quorum of 50+%), and 16 guests present, 2 guests requested membership. The attendance roster will be kept in the AMS.

The agenda was approved unanimously.

The minutes of the Vancouver, BC Canada meeting were approved unanimously.

D.2 Chairs Remarks

None.

D.3 Working Group/Task Force Reports

The next order of business was the presentation of the reports of the various working groups and task forces. See the following sections for the individual reports:

D.3.1 IEEE PC57.12.01 - Dry Type General Requirements Chair Casey Ballard

The working group met in the Iberville Room of the Astor Crown Plaza Hotel.

The meeting was called to order at 1:45 PM by Chairman Casey Ballard.

Chairman made opening comments.

Introductions were made by all participants. WG Roster has been distributed and signed.

The meeting was convened with 35 participants, 15 of them are members, 3 participants requested membership. Quorum was reached (22 current members). The attendance was reported in the AMS.

The Agenda was approved unanimously being no negative votes.

The Minutes of Fall 2016 Vancouver meeting was approved unanimously.

The chair made a call for known patent issues. No patent related issues were claimed.

Old business

- Chair informed on the revisions that have been incorporate into Draft 2 and circulated to the membership.

  - Term “power” has been changed to the term “kilovoltamperes” in the text of the standard.
  - Fuzzy Figures 3-4 – new higher resolution pictures inserted.

- Other topics that had proposals created were (volunteers reports):
  - Cooling ratings by C57.12.00, IEC nomenclature, CSA – current C57.12.01 nomenclature doesn’t fit any other systems anymore. Dhiru Patel provided proposal on 3 letter system for the cooling classes. Discussion:
    - C. Ballard mentioned the need to cover dry-type transformers with water cooled heat exchangers using forced air and forced water – AFWF in IEC.
    - V. Tendulcar was satisfied with the current 4 letter designation system used by IEC.
    - C. Johnson commented that “G” represents contained air enclosures and “A” is all other air type cooling systems (C57.52). He also noted that the difference between dry-type and liquid-immersed transformers may warrant different cooling designation conventions.

- R. Marek reminded that C57.12.80 (terminology) has been opened for a revision and he recommended taking part in the work of this WG – this is in a conflicting slot to C57.12.91.
- T-F. Mai volunteered to review IEC standards and make a proposal prior to the F17 meeting.
- WG felt that the proposed 3 letter designation system doesn't cover the variety of the cases and doesn't bring a harmonization with other standards. It was also proposed to keep reference to IEC (if different) in Table 2 of the standard. The Chair thanked D. Patel for his proposal.

- Maximum system voltage in Table 5.
  - V. Tendulkar proposed to use C57.12.00 maximum system voltages.
  - P. Hopkinson agreed and added that we need to add nominal and maximum voltages to the level between 600 V and 1200 V. It was a comment that C57.13 defines 660 V as a maximum system voltage for 600 V system.
  - C. Johnson commented that the specified voltages at regulating taps may go beyond a maximum system voltage.
  - Chairman conducted Straw Poll, which confirmed that the WG supports harmonization with C57.12.00; tap voltages shall be a separate issue – perhaps addressed by text in the main document or a note.
  - The table will be updated and circulated for formal approval and will have further discussion planned for the Fall 17 meeting.
- Short Circuit thermal limits.
  - R. Marek and D. Patel informed on the results of their research related to the topic: mechanical strength of the conductor is not a limiting factor in the determination of the winding sc thermal limits (Cu conductor remains 50% of it mechanical strength after exposure to 450 deg. C even for 30 min; similar result is for Al conductor at 350 deg. C for 30 min). Thermal endurance of the insulation shall define these limits. Also cracking of the cast resin insulation might be a limitation.
  - R. Marek presented the tests of different materials at 450 deg. C for 5 sec and 15 seconds, that demonstrated the different degree of the deterioration of the materials. Rick wanted to repeat test for shorter times (2 sec) and to look at development of the insulation system short term thermal endurance acceptance test.
  - The request to harmonize with IEC maximum allowed temperatures has been dropped as the conducted study showed that IEC limits might be wrongly defined.
  - Discussion on the proposed revision of Table 15 – C. Johnson proposed to remove column 2 for winding initial average temperature as it isn't used in the determination of the limits anymore. V. Tendulkar commented that IEC uses average winding rise temperatures and IEEE uses hot spot temperature limits. S. Chiang noted that UL 845 has sc requirements for insulation (instant test), he will share the appropriate excerpt with the WG.
- Short Circuit thermal calculation.
  - D. Walker has shown the comparison of the IEEE and IEC thermal calculation methods for 6 transformers and demonstrated that the results are quite close (max 3.4% difference).
  - After discussion, WG feels that both methods shall be included in the body of the standard as it's unknown what method is more accurate and also for the historical continuity.
- Higher standard BIL ratings in Table 5.
  - Results of the previous WG surveys were split 50/50.
  - Discussion revolved around 15 kV voltage class with 60, 75 or 95 kV BIL test level.
  - C. Johnson thought that 60 kV level is not relevant anymore for this voltage class and shall be increased. This will make a transformer more robust.
  - C. Ballard argued that 60 kV works fine in many cases and there is no evidence that increasing BIL level will solve problems with switching transients.
  - P. Hopkinson informed on the Schneider Electric database for 15 kV units (open ventilated design): 75 % of transformers are specified for 95 kV BIL testing (based on the logic that those units are connected to the switchgears that is tested to 95 kV BIL). The

proposal was to make 95 kV BIL a standard test level for 15 kV BIL voltage class, but keep 60 kV BIL as an optional lower level.

- V. Tendulkar commented that, normally, protective devices have a higher test level and this shall not be a reason for increasing transformer test levels, which results in more expensive units. We shall not close the option for the customers to receive 60 kV BIL transformers, if they consider this level acceptable.
- P. Hopkinson – the switchgear test levels have been changed for a reason (even though, it's still an indoor equipment and nothing has changed as for the lightning withstand requirements for this equipment), so we need to think about transformers as well.
- C. Ballard – even now standard allows for the optional higher voltage test levels. We also need to think about other voltage classes.
- D. Patel thinks that 60 kV BIL is outlier and provides the reduced test levels compared to Hi-Pot test levels for other voltage classes. He would agree making 75 kV BIL as a standard level.
- It was also a comment that, contrary to liquid-immersed transformers, in dry-type there is no differentiation between power and distribution classes and this might be something to look at going forward.
- P. Hopkinson – in the future, the specifics of power electronic expansion shall be addressed.
- The Chair will circulate a ballot to the WG members on this topic and make a response mandatory. The three questions polled will be related to:
  - Should both 60 and 95kV BIL be marked with an 'S' to dictate a standard BIL level for 15kV class equipment? This would allow both to be used as standard instead of 60 being standard and 95 being optional.
  - Should a 75kV BIL level be created and added to table 5 and marked as the only standard for 15kV? This would remove 60kV BIL as standard and leave 95 as optional.
  - Should 95 be marked as the standard, removing 60 and adding 110kV BIL as an optional level?
- Other BIL/system voltage levels will be addressed on or before the Fall 17 meeting

New Business

- Environmental testing requirements such as per IEC-60076-11 – has not been discussed due to time constrain, Chairman will send some proposal to the membership.
- On Load Tap Changers (OLTC) are not currently covered by 12.01 and T.F. Mai has proposed that it be considered. This will also be submitted to the membership.

Next meeting: Fall 2017, Louisville, Kentucky, October 29 – November 2, 2017

With no further business, the meeting was adjourned at 3 PM.

Chairman: Casey Ballard

Secretary: Sasha Levin

D.3.2 IEEE PC57.12.60 - Dry Type Thermal Aging Chair Roger Wicks

The meeting was called to order at 1:45 PM by Chairman Roger Wicks. Introductions were made and attendance sheet was circulated.

The meeting was convened with 38 people in attendance / 11 members present (22 members so Quorum was reached.). One of the guests present requested membership and Chair will review to see if person met eligibility requirements. (11 members on paper roster did not reflect electronic badge sign in which said 10.)

The Chairman reviewed the proposed Agenda. He apologized for the delay in getting the agenda out to the WG. The delay was due to waiting for outcome of IEC TC 112 WG 6 special meeting for IEC 61857 Part 41 in Krefeld Germany, a document dealing with similar/same topic as C57.12.60.

The agenda was reviewed and approved unanimously.

The minutes from fall 2016 WG meeting were approved unanimously

The chairman asked if there were any essential patent issues relevant to this standard. None were noted.

Discussion of IEC 61857-41 Meeting March 28 & 29 in Krefeld, Germany

Chairman provided some background surrounding the IEC 61857 Part 41 and taskforce (with experts from both TC 112 and 14) that was formed to review comments received from Committee Draft. The meeting in Krefeld was a special meeting of TC 112 WG 6.

Chairman noted area where work in IEC 61857-41 (which is still a work in progress) could impact C57.12.60 including:

1. Improved aging table
2. Concept of screening test
3. Simplified model test to possibly replace current Method B and/or to be used for material substitution.

Chairman described that a screening test (electrical and thermal) may be useful to potentially reduce test times due to testing closer to the failure point of unaged system. A rough draft of the proposed screening process available and will be circulated to the WG per request from Dhiru Patel.

Chairman described that current Transformer Test in C57.12.60 is for the most part OK, but that model test is in need of improvement. The models that will be listed in Part 41 may be useful in C57.12.60.

The Chairman described that Part 41 may be used as a replacement for current Sealed Tube test that is used to approve new materials.

Areas of work to be completed include:

- Additional models to be added to represent various winding configurations
- Apply transient voltage analysis / impulse test as option to induced voltage test.

Chairman also suggested that PD inception level may also be used as part of the screening process. Chairman noted that we must decide what are the correct tests that should be included.

Chairman presented winding setup from Part 41 and described how the model used voltage stress levels (VSL's) for testing. A potential problem with testing insulation thinner than what would be used in an actual transformer was noted by the Chairman. An example was given of film, and how dielectric strength changes with thickness. It was noted by Chairman that it was recommended in Krefeld that actual thickness of insulation designed to be used in finished transformer (+/- some tolerance) be used in model test.

Reviewed data presented by Eltek at Krefeld meeting showing test results of coils tested per 12.60 and Part 41 (impulse vs. induced voltage). The data showed that test results from induced voltage test were more conservative compared to impulse, although there was no details regarding voltage tested at, etc. A question was raised by Casey Ballard regarding what version of C57.12.60 was used (simulated impulse or true impulse).

Chairman reviewed a VSL example, which recommended using maximum stress level identified in finished transformer + 0.5 additional stress. Chairman noted that this stress level may be less than air, and recommended considering use of higher stress levels.

The need to determine how to perform screening test under impulse was identified. Chair requested a volunteer to help write this procedure. Ken McKinney volunteered.

A discussion on whether or not part 41 would be used as a material test as opposed to having to conduct a design test. Casey Ballard suggested that it be determined what materials would be eligible to be modified in this method. (Would not be used to replace on material with another material with totally different chemistry. Tim Mai volunteered to submit various model constructions. Solomon Chaing thought that UL accepts material tests for substitutions of Busbar insulations with good results.

Follow-up Items from our meeting in Vancouver

- **PD test proposal**

  Chairman showed proposal regarding PD test proposal. (Initial Test, Trending test, and use of collected data to be used to help predict failure.) It was agreed that this was a starting point, but we may have to modify/detail the use of PD testing as a trending test.

- **How to change Voltage (down) from a previously tested design**

  Casey described proposal including which would give UL a logical path (rules) that could be used to reduce voltage

  - OK to scale down, but not OK to scale up
  - Volts/mil cannot be increased
  - Voltage stress (impulse)
  - Air shall be considered in the design
  - Full scale transformer must be built and tested
  - Major insulation cannot be changed
  - Examples will be added

Review of action items:

Chairman to circulate:

- Presentation
- Screening proposal
- Current draft of 12.60
- Data from Eltek presenting 12.60 vs. IEC 61857-41 test data

With no further items to discuss, Chair asked for motion to adjourn.

Tim Mai motioned to adjourn and Vijay Tendulkar seconded.

Meeting was concluded at 3:00PM.

It was confirmed that the WG would meet again at the Fall 2017 Transformer Committee Meeting in Louisville.

Chair: Roger Wicks

Co-Chair: Dave Stankes

D.3.3 IEEE PC57.12.58 - Dry Type Transient Analysis **Chair Roger Wicks**

This WG did not meet in person in Vancouver. However, IEEE C57.12.58 has successfully been balloted within the IEEE-SA balloting process after completing a recirculation. At this point the working group chair will work with IEEE Staff to submit this document for IEEE approval and publication.

D.3.4 IEEE PC57.12.91 - Standard Test Code **Chair Derek Foster (absent)**

Vice Chair David Walker presented minutes from meeting

The Working Group met in the Saint Charles AB meeting room. The meeting was called to order at 4:45 PM.

There were 28 people present. 10 members and 18 guests were present. A quorum was present.

The patent call was given. No one replied with any patent issues.

The agenda was approved unanimously.

The minutes of the April 2016 meeting in Atlanta were unanimously approved as written in this meeting because there was not a quorum present at the October 2016 Vancouver meeting. The minutes of the October, 2016 meeting in Vancouver were unanimously approved as written.

Old Business

- Old business from Vancouver meeting was carried over because it could not be voted on due to the lack of a quorum.
- Tim Felix-Mai had proposed to adopt the language from C57.96 for altitude corrections to the temperature from a temperature test. No need for further considerations was identified by those in attendance. Tim Felix-Mai proposed to move to a vote on the proposal. Chuck Johnson seconded the motion. The motion passed.
- A proposal had been made to include temperature tests with harmonic load in Section 11. This is not currently included. The discussion during the Vancouver meeting was that the test does not belong in C57.12.91. Casey Ballard moved to take a vote to quash the proposal. Vijay Tendulkar seconded the motion. The motion passed with 7 votes for and 0 votes opposed.

New Business:

- Jagdish Burde proposed that the Equation 23 in Section 11.7.1 for correction of temperature rise measurements for variations in ambient temperature should be removed because an analogous equation does not exist in either C57.12.90 or IEC 60076-3. This is the equation for correcting the winding temperature rise when the ambient air temperature is anything other than the air temperature at rated kVA (usually 30°C). Chuck Johnson objected, explaining that according to the "old school" engineers that he had consulted with, this correction was designed to give all transformers a "level playing field" when considered winding rise, regardless of what the temperature was when the test was conducted. Dave Walker added that to remove this equation would create a discontinuity in customers' data. Joe Tedesco countered that such an argument could be made any time a change was made to the test in the standard, therefore, such a discontinuity, by itself, is not a valid argument. Casey Ballard asked if the problem was that Equation 23 was technically wrong in some way or was it just different than other standards. Chuck Johnson added that there are plenty of times that something is in one of our standards and not in another standard and that does not make our standard wrong. Dhiru Patel stated that if there was potentially something wrong with the equation, it was worth considering removing it. Vijay Tendulkar pointed out that the 30°C in the standard refers to the ambient air, which is the cooling medium; in liquid-filled units, the cooling fluid is oil, which does not experience much temperature change during operation. That is likely the reason why this equation is not present in C57.12.90. He also agreed with Chuck Johnson's comment. Jagdish Burde stated that the problem is that if either cold air or hot air affects the temperature rise, then there are thermodynamic concerns that come into effect, so correcting the temperature using a coefficient related to the wire is wrong. Ultimately, Dave Walker asked if there would be a motion to study if the equation needed to be changed. Jagdish Burde motioned for this study. Dihru Patel seconded the motion. The motion passed with 6 votes for and 0 votes opposed. Jagdish Burde agreed to study whether the equation is correct and appropriate and report at the next meeting.
- Casey Ballard asked if the Old Business section of the Vancouver minutes was the right place to list future business. Dave Walker responded that those were tasks for future consideration for which no one had volunteered. Volunteers were solicited to review Sections 11, 12, and 13 and compare them to other applicable standards. Jagdish Burde accepted the responsibility of reviewing the rest of Section 11, since he was already reviewing Equation 23. Dave Walker stated that he would e-mail two other individuals about Sections 12 and 13 since no one volunteered.
- The business from Tim Felix-Mai was raised again regarding adding language regarding LTC's, and climactic and environmental ratings from IEC, to C57.12.01. Casey Ballard stated that this had not been done in C57.12.01 because that Working Group did not make it far enough in their motions to discuss adding them, so no movement could be made on adding them to C57.12.91.

- Dave Walker reminded everyone to review all of C57.12.91 and look for sections, subs-sections, sentences, equations, etc. that are obsolete, missing, confusing, out-of-place, in disagreement with other standards, etc. If any such items are found, e-mail a description of them to Dave Walker and he will compile a list of the items that need to be reviewed and will distribute that list to the Working Group.

Tim-Felix Mai agreed to act as Secretary for this Working Group. Thanks to Tim-Felix. This is much appreciated.

With no further business, the meeting was adjourned, without objection, at 5:13 PM.

The Working Group will meet again at the Fall 2017 meeting in Louisville, KY.

Chairman: Derek Foster (absent)

Vice Chairman: David Walker (acting as Chairman)

Secretary: Joseph Tedesco (acting as note-taker)

D.3.5 IEEE PC57.16 – Dry Type Reactors **Chair Art Del Rio**

The working group for the revision of C57.16 met in the Iberville room of the Astor Crowne Plaza Hotel on Monday April 03, 2017, at 4:45 PM.

1. Introductions and Call for Patents

- The meeting was called to order at 4:45 PM 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. Circulation of Rosters

- The attendance rosters were circulated.

3. Verification of Quorum

- There were a total of 23 participants: 9 Members and 14 Guests out of which 2 Guest requested membership. One was granted.
- 9 of the current 10 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 March 27, 2017, was presented to the participants.
- There were no objections or comments and the agenda was approved unanimously.

4. Approval of the minutes of the October 25, 2016, meeting in Vancouver,

Canada.

- The minutes from the F16 meeting in Vancouver, which were circulated on March 27, 2017 by email, were presented to the participants.
- There was one comment. In Old Business 1.e, the text “AC side of multilevel converters” should be changed to “AC side of 2, 3 or multilevel converters”.
- The WG Chair Art Del Rio will do that change and circulate the updated minutes within the WG again.

5. Continue to discuss and review of the scope, purpose.

- One comment on the scope. What is the meaning with “With some restrictions, this standard is applicable to … ” in the Scope?

- Mike Sharp checked with Richard Dudley (the former chair of C57.16) and it may be related to a legal issue, with no other details available at this time.
- If we will keep that wording then the restrictions should be listed.

- IEC 60076-6 covers most types of reactors.
- In the present standard there are both Normative (A, B, C and D) and Informative (E, F and G) Annexes. Annex A, B and C are referred in the Scope. This must be investigated so that is will be correct.
  - It can make sense to put text that is only related to requirements on special types of reactors in separate normative Annexes. The main text can then be general and refer to the different annexes.
  - The normative Annexes could be incorporated in the main text but then it could be more difficult to read the standard.
  - Is it ok to have a general main text and the normative Annexes with precedence over the main text?
  - Art Del Rio will check this with IEEE-SA editorial staff.
- Art Del Rio will distribute the word document.

6. New Business

- Art Del Rio asked for volunteers to review different parts of the document.
  - David Caverly volunteered to review the annex on dry-type air-core shunt capacitor reactors.
  - Klaus Pointner volunteered to review the annex on filter reactors.
  - Mike Sharp volunteered to review the annex on discharge current limiting reactors for series capacitor banks applications.
  - The three reviews above should be finished before May 15. Answers to be sent to Art Del Rio.
  - There is also a need to review the Scope and the sections on TRV issues.
- This standard does not need to cover arc suppression coils, which are covered by IEEE C57.32, Neutral Grounding Devices.
- All WG members are encouraged to look through the whole document and give comments.
- We should explain 2, 3 and multi-level converters in the definitions.
- Klaus Pointner made a motion that we should include AC side converter reactors, for Voltage Source Converters, in an additional Annex. Mike Sharp seconded the motion. A voting took place with the result 7 positive, 1 negative and 1 abstain.
- Should we include iron core reactors? IEC does not exclude this kind of reactor but says that filter reactors mostly are of air-core type. The conclusion was that we should not include it because the market is very small and we are lacking expertise. This question should be raised at the SC meeting.

7. Adjournment

- Motion to adjourn the meeting by Robert Ballard, seconded by Vijay Tendulkar, the meeting was adjourned at 5:45 PM.

Next meeting: Fall 2017, Louisville, Kentucky, October 29 - November 2, 2017.

Respectfully submitted,

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

Secretary: Ulf Radbrandt (ulf.radbrandt@ieee.org)

D.3.6 IEEE PC57.124 – Dry Type Partial Discharge Guide Chair Tom Prevost (absent)

Rick Marek presented minutes from meeting

Chair welcomed the attendees. There were in total 48 members and guests in attendance. 10 of 13 members were in attendance so we had a quorum. PAR for the WG has been submitted and expected to be obtained in June of 2017. Since this was the last meeting of the TF before the PAR for the TF work becoming official all members attending and wishing to be members of the WG will become members.

Agenda circulated by the Chair was accepted unanimously. Patent statement was posted. There was no individual with any knowledge of such an association that affected the working of the WG and its implications to the work.

The minutes of the previous meeting were unanimously approved with no comments.

The Scope, which was approved at the Vancouver meeting, was presented by the chair to remind the group of our working boundaries.

C.57.113 was proposed by the Chair to be used as a guideline for our work. In addition other documents like C.57.12.01, C.57.113, C.57.124 will be circulated by the Chair to all participants for review and guidance to all members in preparation for the next meeting in Louisville, KY in Fall.

In addition, IEC 60270 will be also used as guidance and will be added to the list of documents above for circulation by the Chair in the near future. Chair will request copy of IEC 60270 from SA for use in this group.

It was pointed out that C.57.12.01- 2015 has the PD limits for Dry Type Transformers while our focus in C. 57.124 will be for the test methodology.

The chair mentioned that Detvev Gross will give a presentation on PD pattern recognition at the next WG meeting. PD pattern recognition is included as an annex in both C57.124, current version and C57.113.

Finally, Alex Kraetge will check for considerations related to 600076-03 and its implications to our work and report at the next meeting.

Barring no New Business the meeting was adjourned at 9:15 am.

Respectfully Submitted,

Hemchandra Shertukde

Secretary

C.57.124

D.3.7 IEEE PC57.12.51 - Dry Type Product Standard "> 500kVA Ventilated" Chair Sanjib Som

Document #:	**PC57.12.51**
Document Title:	IEEE Standard for Ventilated Dry-Type Power Transformers

Chair:	**Sanjib Som**	**Vice-Chair**	**vacant**
Secretary	**Mark Gromlovits**		

Current Draft Being Worked On:	**to be started May 2017**	**Dated:**	

Meeting Date:	**3 April 2017**	**Time:**	**11:00am – 12:15pm**

Attendance:	**Members**	**9 out of 13**
	Guests	**16**
	Total*	**25**

*** For details of attendance, please refer to AMS system of the Transformers Committee**

Meeting Minutes / Significant Issues / Comments:

1. Call to order and any Chair's remarks
2. Quorum was achieved with 8 of 13 members being present.
3. Call for essential patents was made and none were brought forward.
4. Minutes of the previous meeting were approved unanimously.
5. Agenda for this meeting was approved unanimously.
6. The PAR revision was submitted and is on the 4 May 2017 RevCom.
7. The chair presented the draft standard.
    - The chair indicated there were no technical issues to address.
8. Next meeting—Louisville, KY on 30 October 2017.

Submitted by: Sanjib Som

Date: 04/03/2017

D.4 Old Business

D.4.1 Status of Dry Type Transformers Standards

Chair reviewed status of standards activity including:

- IEEE PC57.12.51 - The Chair expressed concern regarding timing for the completion of PC57.12.51, as PAR expires in 2018. This document is in need of a PAR revision and ballot be sent out for comments prior to Fall 2017 meeting in order to meet the 2018 deadline.

D.5 New Business

D.5.1 Dry-Type Iron Core Reactors

A question arose during the WG meeting for C57.16 as to whether or not the document should cover iron core reactors as well. The SC was polled informally and (2) members would be interested in contributing. The SC chair will take this under advisement and determine if a formal vote will be requested to start a new TF.

D.5.2 IEEE C57.12.80 Terminology

Rick Marek noted that 12.80 was opened for revision. It was then commented that the 12.80 and C57.12.91 timeslot were in conflict. Rick then agreed he would combine the dry-type subcommittee's member's comments and raise them at the 12.80 meeting. The Chair thanked Rick for taking on this task and encouraged the members and guests to read over 12.80 and submit their comments as quickly as possible.

D.6 Adjournment

With no further business, the meeting was adjourned at 2:43 PM.

Chairman: Charles Johnson

Vice Chairman: Casey Ballard

Annex E HVDC Converter Transformers and Smoothing Reactors Subcommittee

April 3, 2017, 3.15 pm
New Orleans, Louisiana, USA

Chair: **Michael Sharp**
Vice Chair: **Les Recksiedler**
Secretary: **Ulf Radbrandt**

E.1 Introduction / Attendance

Introductions were made and the attendance list circulated.

There were 13 members and 12 guests present. One guest requested membership,

The total membership of the SC is 17. We needed at least a total of 9 members to be present in order to have a quorum. This was achieved.

The agenda for this meeting was approved.

E.2 Approval of the minutes of the October 24, 2016 meeting in Vancouver

The minutes from the Vancouver meeting were approved.

E.3 Brief report on the meeting of the Administrative SC

Each WG meeting must go through a patent call.

For ballot resolutions the following applies for different Disposition Status categories:

- Accepted. Comments must be adopted exactly as proposed. The Disposition Detail should be left blank. If the comment is agreed but with a very little change then the status should be Revised.
- Revised. The Disposition Status shall explain how the Proposed Change has been adopted (revised).
- Rejected. The Disposition Status must explain why.
- If there are several equal comments with the same answer, then Disposition Details cannot refer to other Disposition Details. The answer must then be copied.

Each member of the Transformers Committee is responsible to keep his/hers data (e.g. e-mail address) updated in the AM system.

Reminder that IEEE C57.129 will expire in 2018 and IEEE 1277 will expire in 2020.

E.4 Working Group Reports

E.4.1 WG IEC/IEEE 60076-57-129 – Transformers for HVDC applications

Chair: Ulf Radbrandt (IEEE) and Mats Berglund (IEC), Co-Chairs

Ulf Radbrandt made a presentation regarding the status of the work with the dual logo document. The highlights of that presentation and following discussions are as follows:

- The document was out for a recirculation ballot between March 02 and March 17 this year.

- The actual ballot status is:
  The ballot has met the 75% returned ballot requirement, 89% returned.
  66 eligible people in the ballot group.
  52 affirmative votes
  3 total negative votes with comments
  1 negative vote with new comments
  0 negative votes without comments
  4 abstention votes: (Lack of expertise: 1, Lack of time: 2, Other: 1)
  The 75% affirmation requirement is being met, 94% affirmative

- Negative vote 1, from first ballot.
  Comment “please consider specifying in the Scope of the Std if it applies to transformers used with Line Current Commutated (LCC) technology or Voltage Source Converters (SVC) technology, or both."
  The comment was rejected. The reason for the rejection is that the WG consider it to be too late to change the scope. Anyway, this standard covers all HVDC transformers including VSC where applicable.

- Negative vote 2, from first ballot.
  Comment “Add IEC 60099-9, IEC 60099-4 and IEC 60099-5 to the Bibliography"
  This comment was accepted.

- Negative vote 3, from the recirculation ballot.
  Comment “The structure of clause 2 is not in line with the requirement to have no leading text. The sub-clause 2.1 should be integrated into the whole body or sub-clauses should be added."
  It is not decided yet how we will respond to this comment. There were no comments regarding this at the first ballot and this has not been changed since the first ballot. Anyway, modifications in this direction have been done by the IEC editorial review.

- The Decisions by Standardization Management Board (SMB) of IEC has now agreed that it is ok to have alternative references (IEC or IEEE) and that the purchaser decides which to be used for the whole document. This means that the process with this document and three other dual logo standards can proceed.

- The IEC editorial review did not only cover spelling and grammar. It included some functional changes also and the most critical are listed below:

  – The dates were added to the references of IEC 60076-1 and IEC 60076-3. That means that when those standards are revised than this standard will refer to the old standards.

  – The phrase “If only one alternative is given in a certain part of the document, i.e. only IEC reference(s) or only IEEE reference(s), then that/these reference(s) is/are valid independent of the choice of normative references.” has been removed from clause 2.1 “Use of normative references”. We have single references at some locations in the document and we would miss that requirement if the document is used for the other standard. As example, partial discharge measurement refers only to IEC 60270 and was supposed to be valid also for IEEE usage.

  – A statement that “All the requirements in IEC 60076 are valid” is changed to IEC 60076-1. That is probably correct.

  - A number of notes have been transferred to mandatory text. Some of them lead to functional changes of the standard. E.g. insulation coordination (which is an HVDC system study) has now become a requirement in the document.

- IEC is planning to publish the document as it is after the editorial update.

- Erin Spiewak checked the status of the FDIS and it has been launched March 31 and will be finalized May 12. Normally, an IEC document is not changed during this process but it is strange that IEEE is not asked if changes are ok when we are working with a dual logo document.

- We must get explanation from IEC about the reasons for the changes.

- We must now explain why we won't accept some of the changes. We should insist that the document be modified as soon as possible and relaunched.

- Coming work with this document:

  - IEC convener (Mats Berglund) checks within IEC about the reason for the functional changes.

  - Agree with IEC (within the joint WG) how to handle the functional changes.

  - Distribute the results within the SC and the joint WG.

  - Possible new recirculation ballot within IEEE (because of the functional changes).

  - FDIS within IEC

E.4.2 WG IEEE P1277 - Dry-Type and Oil-Immersed Smoothing Reactors and Dry-Type Converter Reactors

Chair: Klaus Pointner (klaus.pointner@ieee.org)
Vice-Chair: -
Secretary: Ulf Radbrandt (temporary)

E.4.2.1 Introductions and Call for Patents

This was the first meeting for this WG. It was conducted as part of the HVDC SC meeting.

The WG chair, Klaus Pointner, asked the members if they are aware of any essential patent claims that could affect the work by the WG but nobody expressed any knowledge of such claims.

Notification IEEE SA: Roberto Zannol (roberto.zannol@it.abb.com) affiliated to ABB, Inc. has registered an interest in PE/TR/HVConv-WG1277 HV Converter TR & Reactors - Req. & Test Code for HVDC Smoothing Reactors Working Group.

E.4.2.2 Review of the PAR, scope, purpose.

The PAR was approved by February 17, 2017

The PAR will expire December 31, 2021. That means that we have 10 meetings from now from PAR point of view but we should try to finish earlier since the standard expires in 2020.

Survey Results on PAR input

Statistics:

- Proposed text sent to 25 individuals
- 10 returns
- 7 approvals without comments
- 3 approvals with comments
- 0 disapprove
- 0 abstains

Changes in Title

The new title is “Standard General Requirements and Test Code for Dry-Type and Oil-Immersed Smoothing Reactors and for Dry-Type Converter Reactors for DC Power Transmission” where the words “and for Dry-Type Converter Reactors” are added.

Changes in Scope

The scope of this standard is “This standard only applies to smoothing reactors for dc transmission and converter reactors for dc transmission located at the converter arms”.

A discussion of the term “converter arms” followed. The decision was to explain this in the definitions.

Purpose

The purpose of this standard is to provide those in the HVDC industry, manufacturers and "end users", a document that defines and specifies the electrical, mechanical and physical requirements of dry-type and oil-immersed smoothing reactors for HVDC (high voltage direct current) applications. Furthermore the document defines and specifies electrical, mechanical and physical requirements of dry-type converter reactors used for voltage sourced HVDC converters (VSC HVDC) which are located at the converter arms and loaded with DC and AC current. Test code is also defined and specified

E.4.2.3 Review and Definition of Work Items

Input: Word File of actual version, drawings and figures (tif format)

Copy will be made available at Transformers Committee Subcommittee Website

Proposed First Work Items:

- Review of service conditions – incorporation of the converter reactors
- Review of oil (liquid) immersed Smoothing Reactor part and proposal for changes/updates (e.g. insulation liquids). Peter Heinzig volunteered to do a draft update of this part.
- Basic description of converter reactors (new). Klaus Pointner will ask for support at Trench for this.
- Review of proposed tests and test sequence (both dry-type and liquid-immersed)
- Proposal of routine-/type/special tests for converter reactors (new)

- Sound level measurement. Should align with the latest work in IEEE and/or IEC. Christoph Ploetner volunteered to do a draft update of this part.

- Review of appendices. Are they still valid or is update required? The UHVDC and VSC parts might now be incorporated into the main part of the standard.

E.4.2.4 New Business

The document is now ~100 pages. We should have the aim to make it shorter.

All WG members are encouraged to go through the document and send comments to Klaus Pointner.

Klaus Pointner will distribute the Word document for the standard. It should be named Draft 1 and be put in Track Changes mode.

We will continue with this meeting as a part of the SC meeting. The work with the converter transformer standard will hopefully soon be completed.

E.4.2.5. Adjournment

The WG meeting was adjourned and the SC chair, Mike Sharp, took over with the SC meeting.

E.5 Old Business

-

E.6 New Business

-

E.7 Adjournment

The meeting was adjourned at 4.14 pm.

Annex F Instrument Transformers Subcommittee

Chair: Ross McTaggart

F.1 Introductions

The attendees introduced themselves and reported affiliations.

F.2 Quorum

20 of 34 members were present - quorum attained

Also 26 guests attended

F.3 Approval of minutes – Vancouver, BC meeting

Motion by David Wallace & seconded by Vladimir Khalin

F.4 Review of Agenda

F.5 Status of C57.13 Standards

Ross presented the status of the various standards handled by the ITSC

A PAR has been written for the revision of C57.13.2, Thomas Sizemore is to chair this working group.

Ross McTaggart indicated that the work on C57.13.7 covering milli-ampere CTs was in the balloting process and that a ballot resolution group is to be formed.

The SSVT standard C57.13.8 development effort led by David Wallace is continuing.

A working group is being led by Zoltan Roman to revise the PLC Caps and CCVT standard C57.13.9.

F.6 Working Group Reports

F.6.1 Working Group on Current Transformers with mA range (WG C57.13.7) - Chair: Henry Alton, Vice-Chair: Adnan Rashid

This WG did not meet in New Orleans. The Standard is in the balloting process

F.6.2 WG on Station Service Voltage Transformers - D Wallace

The meeting of the C57.13.8 Working Group met at 8:00 AM as convened by Chair David Wallace. Roster sheets were circulated for attendees to sign in.

A total of 46 people were in attendance with 18 members and 28 guests. 18 out of 30 members were present, therefore quorum was met. One guest requested membership.

The agenda was presented and accepted with no discussion.

The Patent Claims Statement was presented to the workgroup with no claims being identified.

The minutes from the Vancouver meeting were presented. Rudy Ogajanov made a motion to accept the minutes with Vladimir Khalin seconding the motion. The motion was approved with no discussion.

In new business, Ross McTaggart gave a short presentation on the proposed incorporation of C57.13.8 into the CSA Standard. According to Ross, the CSA committee will wait until C57.13.8 is approved and then look at incorporating it.

In old business, the remaining comments from the request for comments on C57.13.8 D3 were discussed. This wrapped up the discussion on comments from draft 3 of C57.13.8. The accepted comments will now be inserted into Draft 4 of C57.13.8 for comment and review at the next meeting in Louisville, Ky.

It was also decided to hold a discussion at the beginning of the next meeting on accuracy measurements on metering windings in SSVT's.

A motion to adjourn the meeting was offered by Patrick Rock and seconded by Barrett Wimberly. The motion carried unanimously without discussion.

F.6.3 WG PD in Bushings & PTs/CTs PC57.160 - Thang Hochanh

Attendees: 71
Members attending: 19/42 - Quorum requirements were not met.
Rosters: Circulated for members and guests.
Agenda: An agenda was presented for the meeting.
Essential Patent Claims: Text was displayed and the Chair inquired as to if anyone knew of essential patent claims. None were brought up during the meeting.
Minutes: Minutes could not be approved due to the quorum requirements not being met.
Items discussed based upon comments received:
A total of 23 comments were received for discussion many were editorial or minor in nature. Details of the discussion points are below.
Comments discussed and which will be incorporated into the next draft:

- An abstract was not included in the previous draft. Suggested text was provided.
- Keywords were not included in the previous draft. Suggested text was provided.
- A suggestion was made to change the order of the references.
- Change 'pico-Coulombs' to 'picocoulombs' in several locations.
- Section 3.1 correct referenced clause number.
- Section 4.2.1 make the last indented statement a separate paragraph.
- Section 4.2.2 add the word 'capacitance' for clarity.
- Sections 4.2.2 and 7.1 Discussed wording regarding allowing the measured PD noise to be as high as the limit if no higher values are measured.

- Section 4.2.4.1 Discussed changing to 500 kHz from 1 MHz.
- Sections 4.2.4.2 and Appendix A removed company logo from provided figures.
- Section 4.2.4.3 Added qIEC, Rmax, Rmin and Pulse Train definitions from IEC.
- Section 4.2.4.4 Removed typographical error from the section heading.
- Section 4.2.4.4 Discussed adding stronger language for recommend recording and evaluation of several pieces of data. Chose to leave the current language both because it would be excessively hard to do in higher production environments and also to prevent potentially controversial language from a legal standpoint.
- Section 6.2 Discussed the wording relating to the use of shielding as part of test preparation.
- Annex C updated references which called out 'B' instead of 'C' figures and text.

Motion to submit the document for ballot: At the next meeting, a motion for ballot will be submit to the WG members.

PAR extension: Due to the termination (2017-12-31) of the original PAR, a PAR extension is necessary.
Motion to adjourn: A motion was presented by Bertrand Poulin and was seconded by Vladimir Khalin.
Fall meeting 2017: This WG plans to continue working at the IEEE Fall meeting in Louisville (KY).
Next version of draft: A new and "final" draft is being prepared to incorporate all of the recent comments. This will be sent out between meetings.

F.6.4 Working Group on Revision of C57.13.5 "Standard of Performance and Test Requirements for Instrument Transformers of a Nominal System Voltage of 115 kV and Above.

The WG met on April 4, 2017, from 9:30 am to 10:30 am. Seventeen (17) members and Thirty-five (35) guests attended the meeting. Four (4) guests requested membership. The meeting was chaired by David Wallace, vice-chair of the WG.
This was the third WG meeting.
Required quorum was met, presence of at least 12 members was required.
The agenda was reviewed and approved by all members present.
Minutes of Atlanta meeting were approved unanimously. The motion was made by Steven Oakes and seconded by Thomas Sizemore.
Call for patents has been made and no essential patent claims have been reported.
As the first item of business, the results from the survey on a new relaying accuracy designation when an anti-remanence gap is added within magnetic circuits were presented. It was agreed that wording will be proposed by the WG chair in Draft 1.4 of revision C57.13.5 prior to the Louisville meeting.
The results of the survey will also be brought up in the Subcommitte meeting for the clause placement into the latest revision of C57.13
Alternative gases to SF6 during internal arc test were added to clause 12.2.2 3rd paragraph. Now 3 gasses are specified: air, CO2 and N2

Changes proposed in D1.3 have been reviewed one by one up from clauses A.2 through the end of the draft. Several changes were mainly editorial in nature such as reference clause numbers and date of referenced standards.

• Zoltan Roman will make a proposal for the next meeting in Louisville, Ky on the the temperature rise test procedure for CTs having dielectric losses greater than 20% of the RI2 losses

Draft 1.4 of C57.13.5 will be released to the WG before the next meeting in Louisville Ky.

The meeting adjourned at 10:45 am on October 25, 2016. The adjournment motion was made by Mr. T. Sizemore and was seconded by Mr. R. Ogajanov. The motion was approved unanimously.

The next meeting is planned to be held in Louisville, Ky, on October 31, 2017.

F.6.5 C57.13.9 Task Force for PLC Capacitors and CCVT's – Zoltan Roman

Zoltan Roman started the meeting as Chair with Mike Craven as Secretary.

Introductions were made.

This is the first meeting as a new Working Group formed from the Task Force. There were 41 attendees and 17 signed in requesting Membership. All are accepted and we inherently had a quorum. (Motion made by Steve Snyder and seconded by Barrett Wimberly.)

The call for patents was made and there were no patent claims by attendees.

The Agenda was presented and the October 24, 2016 Vancouver meeting minutes was accepted.

As Old Business the PAR approval was announced with very slight changes from the submittal.

As New Business Zoltan Roman reviewed the schedule/timetable he had proposed and started with the review of his first composition of the new standard from ANSI C93.1.

- C57.13 will be a basis for similar content and this standard will attempt to harmonize with CSA and IEC standards.

- -review started with the standard IEEE contents with revisions made to the "Definitions" section by the group

- Service conditions section was also commented on and revised

- Several items will need future verification (PLC frequency range, voltage ratings reference to C84.1 Table 4, ratios in Table 3.

- There was concern that there be a basis for the ratings used and the low voltage terminal BIL was decided to be kept as in C93.1 as 10 kV.

- Section 5.5.2 will need to be rechecked with the source.

Date and place of the next meeting will be the Transformers Committee Meeting in Louisville Ky. Adjournment was at 12:16.

F.6 Special Presentation

Vladimir Khalin gave a presentation to the subcommittee regarding in service recertification of CTs. Both metering and relaying applications were covered. Additionally his presentation covered online testing. Two case study examples were shown indicating the value this type of testing to end users.

F.7 New Business:

Our subcommittee was approached by Dale Finney, Chairman, Working Group J12 of the Rotating Machinery subcommittee of the IEEE PES, Power System Relaying and Control Committee. This WG is writing a report on new developments for stator ground fault protection for high-impedance grounded, synchronous generators. One method uses negative and zero sequence voltages to selectively differentiate between a stator ground fault and other ground faults. This method allows faster tripping by improving the selectivity of the protection. The method requires calculating the negative and zero sequence voltages associated with a ground fault on the secondary wiring of the generator voltage transformer (VT) circuit. Calculation of these values requires the leakage reactance be known. Slides were presented by Thomas Sizemore covering the information they would like to receive. The membership associated with these types of PTs was requested to provide information.

Conversation also took place regarding initiating a Task Force to review accuracy requirements. No Chair for this work was identified. Additionally a discussion took place regarding if a task force should be initiated to create an applications guide for instrument transformers. This topic will likely be discussed further in the future.

F.8 ITSC Adjournment

The meeting concluded by motion to adjourn by David Wallace and seconding of this motion by Arnaud Martig.

The next meeting will be at the Fall 2017 Transformers Committee meeting in Louisville, KY

Annex G Insulating Fluids Subcommittee

April 5, 2017
New Orleans, LA

Chair: David Wallach
Vice-Chair: Jerry Murphy
Secretary: C. Patrick McShane

G.1 Introductions, Roll Call of Members for Quorum, Meeting Agenda Approval, F13 Minutes Approval, and Chair's Comments

G.1.1 Chair's Opening Remarks:

a. Shared the scope statement of the SCIF.

b. Reminded WG and TF Chairs that their meeting minutes are due for submittal to the SCIF Secretary within 15 days of their meetings.

G.1.2 Roll Call of SC members: (Quorum requirement: 25 minimum)

a. 34 Members signed in. Quorum was achieved.

b. 72 Guests attended, of which 10 requested or re-requested membership: Jason Attard, Don Dorris, Attila Gyore, Kumar Mani, Donald Platts, Alan Sbravati, Igor Simonov, Fabian Stacy, Kevin Sullivan, Michael Thibault.

c. By their attendance, the following will be listed as WG Members: Attila Gyore, Jinesh Malde, Kumar Mani.

d. 3 attendees signed the roster, but not registered via electronic sign-in, and 6 registered electronically but without signing roster sheets.

G.1.3 Agenda Approval:

a. The motion was Approved unanimously, without objection

G.1.4 Approval of minutes from the F16 meeting in Vancouver, BC, Canada:

a. The motion to approve was made by Susan McNelly and seconded by Jim Thompson.

The motion was approval unanimously.

G.1.5 WG & TF Reports Presented at the SC Meeting

G.1.5.1 C57.104 – IEEE Guide for the Interpretation of Gases Generated in Oil – Immersed Transformer (PAR Expiration: 12/31/17)

WG Chair - Claude Beauchemin

The report of the WG Meeting was presented at the SCIF meeting by Claude Beauchemin.

a. Attendance at the meeting was 120, a relatively large crowd for the WG. Par expired is about to expire, and the WG will request an extension. Last meeting 3.0 for comments, 20 contributions, released Draft 3.1 for straw ballot on March 10th. 202 comments received, but few negatives,

b. 500,000 reports were used. Still have to merge another same amount. There is some issue of spread of data, which have look closely at. Need to decide which form of the tables to use, how many criteria to use. Some explanation wording needs to be completed. Draft will be updated for an email straw ballot to WG sometime this summer.

c. Attendee question: Can you explain PAR Extension? Response: The WG voted to take a step back. Had to recirculate the straw ballot. The PAR will expire end of this year. A PAR extension is not likely unless the document is out for ballot or at least approved to go to ballot before the end of the year.

d. The call for potential Essential Patents resulted in one attendee indicating he may have an essential patent claim.

e. Need to get moving all or nothing to meet next year deadline. Expect to receive a request vote on final draft.

See ***Appendix I*** for the Minutes (unapproved) of C57.104 WG Meeting as Submitted.

G.1.5.2 IEEE C57.147 Guide for Acceptance and Maintenance of Natural Ester Fluids in Transformers

WG Chair: Patrick McShane, Vice-Chair: Clair Claiborne, Secretary: Jim Graham

The WG Report at the Sub-Committee Meeting: Presented by Patrick McShane:

a. No WG Meeting was held at S17. The work of the WG is completed.
b. Since the last meeting, a revised Draft based on the BRC changes to the initial voting draft and discussion at the F16 meeting was sent to WG Members for a straw vote. The BRC meet on Monday to discuss and vote on comments received from that straw vote. Almost all comments were addressed before time ran out. The few remaining comment resolution will be done via correspondence and conference, allowing the recirculating draft be sent to IEEE SA within the next couple of months.
c. PC57.147 did receive an extension last year, now valid until 12/31/18.

G.1.5.3 TF on Consolidation of Insulating Liquid (Fluid) Guides

Chair: Tom Prevost

The TF Report given at the Sub-Committee Meeting by Tom Prevost:

a. There was a quorum

b. Patrick McShane gave an update on the revision of PD57.147. He expects the recirculation ballot will be issued early summer.

c. Tom noted that two insulating liquid Guides, C57.111 (silicone) and C57.121 (Less-Flammable Hydrocarbon) both have expiration of December 31, 2019. The plan is to get both guides incorporated into the Consolidated Guide before they expire. Even if they are withdrawn as active Guides, the publication of them will still be available. This would be a better application of resources to focus on the consolidated guide.

d. He reported that the bulk of the TF meeting focused on the wording for the Title, Scope, and Purpose. He showed the draft proposed by the TF to the SCIF members for motions and discussion. The following drafts were approved by the SCIF:

   a. **Title:** Guide for Acceptance and Maintenance of Insulating Liquids in Transformers and Related Equipment

   b. Scope: This guide provides acceptance and maintenance criteria for insulating liquids used in transformers, tap changers, regulators, and reactors.

   c. Purpose:

   To assist the user of the equipment in evaluating insulating liquids:

   - As received from insulating liquid supplier prior to processing and/or filling into equipment,
   - As received in new equipment filled prior to energization,
   - In service-aged equipment.

   This guide also discusses the following topics related to insulating liquids:

   - Test methods and their significance,
   - Methods of handling and storage,
   - Mixtures of insulating liquids,
   - Re-processing, re-claiming and replacement

   This guide does not cover dissolved gas analysis of insulating liquids, which is covered by other IEEE Guides.

e. A motion was made to approve to submit a PAR request based on the wording above.

f. The probable Guide number to be assigned upon approval of the PAR will be C57.166.

See ***Appendix II*** for the S16 Minutes (unapproved) of TF Consolidation of Insulating Liquid Guides as submitted.

Old Business

a. Gas Insulated Transformers: A question was raised by a user at the F16 Vancouver meeting that SF6 insulating gas has not been considered for a Guide under the SCIF. At that meeting, it was noted that there has not been a significant demand for this insulation system for transformer application to date in North America. The topic was included in the Subcommittee meeting of April 2. The decision has been made not to pursue.

b. C57.12.00 Revision - Unresolved Ballot Comment regarding the types of listed insulating liquids. Patrick McShane made a presentation on the issue, including a background summary and proposed recommendations. The recommendations accepted unanimously as follows:

- Support C57.12.00 WG decision to continue limiting inclusion of insulating liquids to those that have a published ASTM Acceptance Standard.
- Respond to C57.12.00 of this SCIF position, and make a recommendation for their next revision to include all insulating liquids that have ASTM documentation at that time.
- Once operating experience is obtained for all types of insulating liquids that have a published ASTM Acceptance Std., such liquid types Guides should be developed by the SCIF for inclusion in the C57 series of Insulating Liquid Guides or preferably, incorporated in the future Consolidated Guide for which a PAR will be requested 2nd Quarter 2017.

The SCIF Chair will forward the recommendations to Steve Synder of WG C57.12.00.

A copy of the presentation at the SCIF meeting is attached. (See Annex III)

G.2 New Business

None was presented.

G.3 Next SCIF Meeting:

November 1, 2017 – Louisville, KY

G.4 Adjournment

The motion passed unanimously.

Respectively Submitted, Patrick McShane, Secretary SCIF

Unapproved Minutes from the S17 SCIF WG and TF Meetings

Appendix I – WG C57.104 Minutes

IEEE Guide for the Interpretation of Gases Generated in Oil – Immersed Transformers

C57.104 – IEEE Guide for the Interpretation of Gases Generated in Oil – Immersed Transformers

Tuesday, April 4, 2017

New Orleans, Louisiana, USA

Minutes of WG Meeting

The meeting was called to order at 4:45pm by Chair Claude Beauchemin. Vice-Chair Don Platts and Secretary Susan McNelly (writer of Minutes) was also present. Vice-Chair Norm Field was not present.

There were 60 of 85 members present (based on the summation of both the paper and RFID rosters). There were 60 guests, and 10 guests requesting membership. A membership quorum was achieved. The WG plans to meet at the Fall 2017 Transformers Committee Meeting in Louisville, Kentucky.

The following guests requesting membership were:

Jason Attard	Verena Pellon
Donald Ayers	Ion Radu
Don Dorris	Mickel Saad
Ryan Fields	Drew Welton
Stacey Kessler	William Whitehead

Since the document is in late stage of completion, new requests for membership will not be entertained without significant contribution to the remaining work.

Agenda:

1. Attendance Roster Circulation
2. Member Roll Call & Quorum Check
3. Approval of the Fall 2016, Vancouver minutes
4. Document Status – Straw Ballot 3.1
    a. Review of major comments
    b. Discuss Tables and Table content
    c. Next step
5. New Business
6. Adjournment

Introductions of the Vice Chair and Secretary were made. Attendees were asked to introduce themselves and indicate their affiliations when making comments or asking questions.

A call for essential patent claims was made. Donald Lamontagne from APS indicated that he may have an essential patent claim. He provided the following information following the meeting:

> Patent 7,747,417, Column 10, line 43 through Column 11, line 53, and Figures 9 and 10 describe the Piecewise Linear Approximation process for DGA.
>
> The draft guide section 6.1.1, 6.1.5, and Annex B; particularly Page 37, Figure B.1 "Multi-points rate example" is a Piecewise Linear Approximation.

List of Meeting Attendees is provided below. Those identified in bold are WG Members in attendance.

Jason Attard
Donald Ayers
Claude Beauchemin
Jeffrey Benach
Kevin Biggie
William Boettger
Paul Boman
Stephan Brauer
Robert Brusetti
Edward Casserly
Juan Castellanos
Stuart Chambers
Jonathan Cheatham
Luiz Cheim
Larry Christodoulou
Paul Cox
James Cross
Frank Damico
Timothy Daniels
Mohamed Diaby
William Dietrich
Scott Digby
Don Dorris
James Dukarm
Thomas Golner
James Graham
Attila Gyore
Roger Hayes
Thang Hochanh
Michael Horning
Fredi Jakob
John John
Ted Johnstone
Ken Kampshoff
Gael Kennedy
Stacey Kessler
Dong-Soo Kim
Young Kim
Zan Kiparizoski
Brad Kittrell
Raja Kuppuswamy
Donald Lamontagne
Michael Lau
Benjamin Leece
Raka Levi
Jinesh Malde
Kumar Mani
Terence Martin
Nicholas Perjanik
Branimir Petosic
Donald Platts
Homero Portillo
Thomas Prevost
John Pruente
Ion Radu
Robert Rasor
Leslie Recksiedler
Scott Reed
Hossein Rezai
Diego Robalino
Oleg Roizman
Mickel Saad
Joseph Saliba
Alaor Scardazzi
Pugazhenthi Selvaraj
Masoud Sharifi
Richard Simonelli
Brian Sparling
Erin Spiewak
Thomas Spitzer
Gregory Stem
Craig Stiegemeier

Hakim Dulac	Douglas McCullough	Kevin Sullivan
Brandon Dupuis	Joseph McGuire	Charles Sweetser
Michel Duval	James McIver	Susmitha Tarlapally
Roger Fenton	Susan McNelly	Marc Taylor
Marcos Ferreira	Emilio Morales-Cruz	James Thompson
Ryan Fields	Jerry Murphy	Robert Thompson
George Forrest	Paul Mushill	Ryan Thompson
Bruce Forsyth	Ali Naderian	Alwyn VanderWalt
George Frimpong	Kristopher Neild	Michel Veillette
Rainer Frotscher	Joe Nims	David Wallach
Shawn Galbraith	Jayme Nunes, Jr	Evanne Wang
Lorne Gara	Anastasia O'Malley	Matthew Weisensee
Eduardo Garcia	Jow Ortiz	Drew Welton
James Gardner	Vijay Pargaonkar	Peter Werelius
Sylvain Gelinas	Poorvi Patel	William Whitehead
Jeffrey Golarz	Verena Pellon	Malia Zaman

A motion to approve the Spring 2017 New Orleans Agenda was made by Jerry Murphy and seconded by Brian Sparling. There were no objections or additions to the agenda.

A motion to approve the Fall 2016 Vancouver Meeting Minutes was made by Dave Wallach and seconded by Jerry Murphy. There were no objections or additions to the agenda.

Straw Ballot 3.1 – Status/Results

Claude discussed the ballot process and next steps for the document. IEEE indicates that the document must be stable when it is submitted to the ballot process. Stable is defined as 2/3 of the quorum present at the WG agreeing that the document is ready to move forward.

Claude indicated that the Guide will expire at the end of next year. The PAR for the WG will expire at the end of 2017. A PAR extension would need to be requested before the October 16 deadline date.

Due to the above deadlines, there is a very tight timeline to finish up work on the document to get it out for ballot. A PAR extension is not likely unless the document is out for ballot or approved to go to ballot before the end of the year.

Preliminary Review

- Draft 3.0 distributed before Vancouver meeting.
- Comments send by email with email exchanges up to February 2017
- Draft updated and edited to D3.1
  - Update Figure 1
  - Fill Table 1 to 4 with data from DB2
  - New Case history
  - Delete annex on sampling
  - General editing
- All necessary scrip for data reduction written and tested
- Run on 500 000 DGA to give a first set of values

- Similar project run in parallel on a second DB of same size

Straw Ballot 3.1

- Draft 3.1 distributed to all WG members (83) March 10, 2017
- 23 responses (including chair)
- 203 comments (one too late for the review)
  - Approve: 12
  - Approve with reserve: 2
  - Disapprove: 2
  - "In-Between" 2
  - Abstention 5 (Did not mention anything about it)

  (But comments look favorable!)
- All comments reviewed from March 25 to April 1, by S. McNelly and C. Beauchemin, with M. Duval inputs on selected comments
- Of 202 comments:
  - 174 (86.1%) accepted (several with modifications) and implemented
  - 19 Refused (9.4%)
  - 10 without action
  - 5 are editorial requiring more time to implement
  - 2 associated with the negative
  - 3 Various
- Redlined version (Draft 3.2) distributed to WG members April 1, 2017
- Most notable changes:
  - Simplified Table 3
  - New layout for Table 1 and 2
  - MVA divided now at 10 MVA

Simplification of table 3 from D3.1:

Maximum µL/L (ppm) variation between consecutive samples for DGA below Table 1				
Period:	**< 1 month**	**1 Month - 1.5 Year**	**1.5 - 2.5 Years**	**>= 2.5 Years**
H_2	**10**	**20**		**25**
CH_4	**10**	**15**		
C_2H_6	**5**	**10**		
C_2H_4	**5**	**10**		**15**
C_2H_2	**0**			**1**
CO	**90**	**200**		**400**
CO_2	**800**	**1500**	**2000**	**3000**

Simplification of table 3 to D3.2:

Maximum µL/L (ppm) variation between consecutive samples for DGA below Table 1	
H_2	20
CH_4	15
C_2H_6	10
C_2H_4	
C_2H_2	Any increase
CO	300
CO_2	2000

Simplification of Table 1 and 2 from D3.1:

Table 1 90 Peccentile in function of O_2/N_2		
	O_2/N_2 <= 0.2	O_2/N_2 > 0.2
H_2	100	45
CH_4	90	20
C_2H_6	90	15
C_2H_4	70	50
C_2H_2	1	2
CO	800	500
CO_2	8000	5000

Table 1 a) to d) 90 Peccentile in fuction of O_2/N_2, Age and MVA				
Gas / Years	All Age	1-10	10-30	> 30
Table 1a) O_2/N_2 <= 0.2 and <= 50 MVA				
H_2	90	90		125
CH_4	80	35	75	100
C_2H_6	100	20	75	150
C_2H_4	60	15	50	80
C_2H_2	1	0	2	1
CO	800	800		
CO_2	7000	4000	7000	
Table 1b) O_2/N_2 <= 0.2 and > 50MVA				
H_2	70	35	50	90
CH_4	110	35	100	150
C_2H_6	100	20	100	150
C_2H_4	70	25	70	100
C_2H_2	2	2		1
CO	750	750		
CO_2	6000	4000	6000	
Table 1c) O_2/N_2 > 0.2 and <= 50MVA				
H_2	40	30	35	50
CH_4	10	10		15
C_2H_6	10	5	10	
C_2H_4	50	15	50	
C_2H_2	2	2		
CO	500	500		
CO_2	4000	2000	4000	5500
Table 1d) O_2/N_2 > 0.2 and > 50MVA				
H_2	40	40		
CH_4	35	60	25	
C_2H_6	20	20		
C_2H_4	100	100		
C_2H_2	3	2	3	4
CO	700	700		
CO_2	6000	4000	7000	

Simplification of Table 1 and 2 from D3.2:

Table 1 90 Peccentile in function of O_2/N_2 (all values in uL/L (ppm))						
Table 1a) O_2/N_2 <= 0.2						
Gas	**Rating and Age Unknow**	**MVA**	**Transformer Age (Years)**			
			Unknow	**1-10**	**10-30**	**> 30**
H_2	**100**	***< 10***	**150**	225	125	150
		> 10	**70**	30	50	100
CH_4	**90**	***< 10***	**125**	100	90	150
		> 10	**90**	20		100
C_2H_6	**90**	***< 10***	**150**	50	70	300
		> 10	**100**	15	90	125
C_2H_4	**70**	***< 10***	**70**	30	60	100
		> 10	**50**	15	50	80
C_2H_2	**1**	***< 10***	**1**	0	2	1
		> 10		1		
CO	**800**	***< 10***	**900**	800	1100	900
		> 10	**700**	600	800	600
CO_2	**8000**	***< 10***	**9000**	5000	10000	9000
		> 10	**6000**	3000	6000	6000
Table 1b) O_2/N_2 > 0.2						
Gas	**Rating and Age Unknow**	**MVA**	**Transformer Age (Years)**			
			Unknow	**1-10**	**10-30**	**> 30**
H_2	**45**	***< 10***	**40**	50	30	40
		> 10		40		50
CH_4	**20**	***< 10***	**10**	10		
		> 10	**20**	40	20	
C_2H_6	**15**	***< 10***	**9**	6		10
		> 10	**15**	15		
C_2H_4	**50**	***< 10***	**40**	20	30	40
		> 10	**80**	80	90	70
C_2H_2	**2**	***< 10***	**2**	2		
		> 10	**3**	2	3	4
CO	**500**	***< 10***	**450**	450	500	400
		> 10	**600**	600	700	600
CO_2	**5000**	***< 10***	**4500**	3000	3500	4500
		> 10	**5500**	4000	6000	6000

- Most problematic issues
  - Complexity of procedure
  - Low number of samples supporting table 1 and 2 finest divisions
  - TIME !!!

Some data and complexity issue

- One negative based on complexity of the procedure
  - Several comments on the same
  - Majority make no comments on this topic

Below are some ideas presented by Claude for simplification of the tables

Split with O2/N2, age and MVA D3.2

Table 1 90 Peccentile in function of O_2/N_2 (all values in uL/L (ppm))						
Table 1a) O_2/N_2 <= 0.2						
Gas	**Rating and Age Unknow**	**MVA**	**Transformer Age (Years)**			
			Unknow	**1-10**	**10-30**	**> 30**
H_2	**100**	***< 10***	**150**	225	125	150
		> 10	**70**	30	50	100
CH_4	**90**	***< 10***	**125**	100	90	150
		> 10	**90**	20		100
C_2H_6	**90**	***< 10***	**150**	50	70	300
		> 10	**100**	15	90	125
C_2H_4	**70**	***< 10***	**70**	30	60	100
		> 10	**50**	15	50	80
C_2H_2	**1**	***< 10***	**1**	0	2	1
		> 10		1		
CO	**800**	***< 10***	**900**	800	1100	900
		> 10	**700**	600	800	600
CO_2	**8000**	***< 10***	**9000**	5000	10000	9000
		> 10	**6000**	3000	6000	6000
Table 1b) O_2/N_2 > 0.2						
Gas	**Rating and Age Unknow**	**MVA**	**Transformer Age (Years)**			
			Unknow	**1-10**	**10-30**	**> 30**
H_2	**45**	***< 10***	**40**	50	30	40
		> 10		40		50
CH_4	**20**	***< 10***	**10**	10		
		> 10	**20**	40	20	
C_2H_6	**15**	***< 10***	**9**	6		10
		> 10	**15**	15		
C_2H_4	**50**	***< 10***	**40**	20	30	40
		> 10	**80**	80	90	70
C_2H_2	**2**	***< 10***	**2**	2		
		> 10	**3**	2	3	4
CO	**500**	***< 10***	**450**	450	500	400
		> 10	**600**	600	700	600
CO_2	**5000**	***< 10***	**4500**	3000	3500	4500
		> 10	**5500**	4000	6000	6000

Split with O2/N2, age and MVA D3.2 (partial)

Table 1 90 Peccentile in function of O_2/N_2 (all values in uL/L (ppm))						
Table 1a) O_2/N_2 <= 0.2						
Gas	Rating and Age Unknow	MVA	Transformer Age (Years)			
			Unknow	1-10	10-30	> 30
H_2	100	< 10	150	225	125	150
		> 10	70	30	50	100
CH_4	90	< 10	125	100	90	150
		> 10	90	20		100
C_2H_6	90	< 10	150	50	70	300
		> 10	100	15	90	125
C_2H_4	70	< 10	70	30	60	100
		> 10	50	15	50	80
C_2H_2	1	< 10	1	0	2	1
		> 10		1		
CO	800	< 10	900	800	1100	900
		> 10	700	600	800	600
CO_2	8000	< 10	9000	5000	10000	9000
		> 10	6000	3000	6000	6000

Split with O2/N2, age and MVA: Remove 1 column (Partial)

Table 1 90 Peccentile in function of O_2/N_2 (all values in uL/L (ppm))					
Table 1a) O_2/N_2 <= 0.2					
Gas	MVA	Transformer Age (Years)			
		Unknow	1-10	10-30	> 30
H_2	Unknow	100	70		100
	< 10	150	225	125	150
	> 10	70	30	50	100
CH_4	Unknow	90	30	80	100
	< 10	125	100	90	150
	> 10	90	20		100
C_2H_6	Unknow	90	20	80	150
	< 10	150	50	70	300
	> 10	100	15	90	125
C_2H_4	Unknow	70	15	50	80
	< 10	70	30	60	100
	> 10	50	15	50	80
C_2H_2	Unknow	1	0	1	
	< 10			2	1
	> 10		1		
CO	Unknow	800	700	900	700
	< 10	900	800	1100	900
	> 10	700	600	800	600
CO_2	Unknow	8000	4000	7000	8000
	< 10	9000	5000	10000	9000
	> 10	6000	3000	6000	6000

Split on O2/N2 and Age: Remove 1 criteria

Table 1 90 Peccentile in function of O_2/N_2 (all values in uL/L (ppm))				
Table 1a) O_2/N_2 <= 0.2				
Gas	Transformer Age (Years)			
	Unknow	1-10	10-30	> 30
H_2	100	70		100
CH_4	90	30	80	100
C_2H_6	90	20	80	150
C_2H_4	70	20	50	80
C_2H_2	1	0	1	
CO	800	700	900	700
CO_2	8000	4000	8000	
Table 1b) O_2/N_2 > 0.2 (all values in uL/L (ppm))				
Gas	Transformer Age (Years)			
	Unknow	1-10	10-30	> 30
H_2	45	50	40	50
CH_4	20	30	20	15
C_2H_6	15	10	15	
C_2H_4	50	50	80	60
C_2H_2	2	2		
CO	500	600		
CO_2	5000	3500	6000	

Split on O2/N2 only: Remove 2 Criteria

Table 1 90 Peccentile in function of O_2/N_2		
	O_2/N_2 <= 0.2	O_2/N_2 > 0.2
H_2	100	45
CH_4	90	20
C_2H_6	90	15
C_2H_4	70	50
C_2H_2	1	2
CO	800	500
CO_2	8000	5000

Reduce the Number of Gas

Table 1 90 Peccentile in function of O_2/N_2 (all values in uL/L (ppm))					
Table 1a) O_2/N_2 <= 0.2					
Gas	MVA	Transformer Age (Years)			
		Unknow	1-10	10-30	> 30
H_2	***Unknow***	**100**	70		100
	< 10	**150**	225	125	150
	> 10	**70**	30	50	100
CH_4	***Unknow***	**90**	30	80	100
	< 10	**125**	100	90	150
	> 10	**90**	20		100
C_2H_6	***Unknow***	**90**	20	80	150
	< 10	**150**	50	70	300
	> 10	**100**	15	90	125
C_2H_4	***Unknow***	**70**	15	50	80
	< 10	**70**	30	60	100
	> 10	**50**	15	50	80
C_2H_2	Unknow	1	0	1	
	< 10			2	1
	> 10		1		

Effect of selecting 10 VS 50 MVA break point

- 50 MVA does not correspond to a “natural” division in transformer
- 10 MVA correspond to different class
- However, the amount of DGA data available is limited
- Some large differences between the two large DB we have in hand

Use 10 MVA as break point

Table 1 90 Peccentile in function of O_2/N_2 (all values in uL/L (ppm))						
Table 1a) O_2/N_2 <= 0.2						
Gas	All	MVA	Transformer Age (Years)			
			All Age	1-10	10-30	> 30
H_2	100	< 50	90			125
		> 50	70	35	50	90
CH_4	90	< 50	80	35	75	100
		> 50	110		100	150
C_2H_6	90	< 50	100	20	75	150
		> 50			100	
C_2H_4	70	< 50	60	15	50	80
		> 50	70	25	70	100
C_2H_2	1	< 50	1	0	2	1
		> 50	2	2	0	
CO	800	< 50	800			
		> 50	750			
CO_2	8000	< 50	7000	4000	7000	
		> 50	6000		6000	
Table 1b) O_2/N_2 > 0.2						
Gas	All	MVA	Transformer Age (Years)			
			All Age	1-10	10-30	> 30
H_2	45	< 50	40	30	35	50
		> 50	40			
CH_4	20	< 50	10			15
		> 50	35	60	25	
C_2H_6	15	< 50	10	5	10	
		> 50	20			
C_2H_4	50	< 50	50	15	50	
		> 50	100			
C_2H_2	2	< 50	2			
		> 50	3	2	3	4
CO	500	< 50	500			
		> 50	700			
CO_2	5000	< 50	4000	2000	4000	5500
		> 50	6000	4000	7000	7000

Table 1 90 Peccentile in function of O_2/N_2 (all values in uL/L (ppm))						
Table 1a) O_2/N_2 <= 0.2						
Gas	**All**	**MVA**	**Transformer Age (Years)**			
			All Age	**1-10**	**10-30**	**> 30**
H_2	**100**	***< 10***	**150**	225	125	150
		> 10	**70**	30	50	100
CH_4	**90**	***< 10***	**125**	100	90	150
		> 10	**90**	20		100
C_2H_6	**90**	***< 10***	**150**	50	70	300
		> 10	**100**	15	90	125
C_2H_4	**70**	***< 10***	**70**	30	60	100
		> 10	**50**	15	50	80
C_2H_2	**1**	***< 10***	**1**	0	2	1
		> 10	**1**	1		
CO	**800**	***< 10***	**900**	800	1100	900
		> 10	**700**	600	800	600
CO_2	**8000**	***< 10***	**9000**	5000	10000	9000
		> 10	**6000**	3000	6000	6000

Table 1b) O_2/N_2 > 0.2 (all values in uL/L (ppm))						
Gas	**All**	**MVA**	**Transformer Age (Years)**			
			All Age	**1-10**	**10-30**	**> 30**
H_2	**45**	***< 10***	**40**	50	30	40
		> 10	**40**	40		50
CH_4	**20**	***< 10***	**10**	10		
		> 10	**20**	40	20	
C_2H_6	**15**	***< 10***	**9**	6		10
		> 10	**15**	15		
C_2H_4	**50**	***< 10***	**40**	20	30	40
		> 10	**80**	80	90	70
C_2H_2	**2**	***< 10***	**2**	2		
		> 10	**3**	2	3	4
CO	**500**	***< 10***	**450**	450	500	400
		> 10	**600**	600	700	600
CO_2	**5000**	***< 10***	**4500**	3000	3500	4500
		> 10	**5500**	4000	6000	6000

Use 10 MVA as break point: Data validity

Number of points DB1 (Total: 518195)									
	All MVA	1-10 Years	10-30 years	> 30 Years		% of DB			
Low O2 < 10 MVA		625	2459	4099			0.1	0.5	0.8
Low O2 > 10 MVA		6221	19694	9989			1.2	3.8	1.9
High O2 < 10 MVA		437	947	4452			0.1	0.2	0.9
High O2 > 10 MVA		4387	4931	3870			0.8	1.0	0.7
Number of point DB2 (Total: 539742)									
	All MVA	1-10 Years	10-30 years	> 30 Years		% of DB			
Low O2 < 10 MVA	33444	3646	6681	7842		6.2	0.7	1.2	1.5
Low O2 > 10 MVA	65900	7475	16337	22024		12.2	1.4	3.0	4.1
High O2 < 10 MVA	22676	1840	5696	10519		4.2	0.3	1.1	1.9
High O2 > 10 MVA	44153	11820	13579	12575		8.2	2.2	2.5	2.3

Difference between 2 Data Bases

Table 1 90 Peccentile in function of O_2/N_2 (all values in uL/L (ppm)) DB1/DB2						
Table 1a) O_2/N_2 <= 0.2						
Gas	All	MVA	Transformer Age (Years)			
			All Age	1-10	10-30	> 30
H_2	101 / 97	< 10	NA	230 / 232	200 / 116	190 / 144
		> 10	NA	69 / 29	163 / 53	250 / 95
CH_4	103 / 92	< 10	NA	56 / 95	106 / 87	94 / 162
		> 10	NA	48 / 23	115 / 89	155 / 108
C_2H_6	125 / 93	< 10	NA	27 / 45.5	81 / 68	140 / 279
		> 10	NA	38 / 13	149 / 89	189 / 120
C_2H_4	57 / 66	< 10	NA	17 / 29	53 / 61	79 / 95
		> 10	NA	15 / 13	40 / 52	68 / 82
C_2H_2	0.5 / 1	< 10	NA	0 / 0	0.5 / 2	01-Jan
		> 10	NA	0 / 1	0.4 / 2	1.8 / 1
CO	817 / 839	< 10	NA	794 / 760	878 / 1079	822 / 881
		> 10	NA	571 / 640	631 / 798	792 / 625
CO_2	8652 /8369	< 10	NA	4956 / 4844	9687 / 9771	9158 / 9170
		> 10	NA	2877 / 3121	4867 / 5766	7066 / 6214

Table 1b) O_2/N_2 > 0.2 (all values in uL/L (ppm))						
Gas	All	MVA	Transformer Age (Years)			
			All Age	1-10	10-30	> 30
H_2	66 / 45	< 10	NA	107 / 54	105 / 29	123 / 44
		> 10	NA	52 / 40	120 / 40	172 / 49
CH_4	32 / 19	< 10	NA	15 / 12	16 / 11	15 / 10
		> 10	NA	18 / 41	27 / 22	23 / 20
C_2H_6	21 / 13	< 10	NA	8 / 6	13 / 6	16 / 10
		> 10	NA	9 / 15	22 / 15	21 / 16
C_2H_4	71 / 51	< 10	NA	13 / 20	30 / 32	49 / 44
		> 10	NA	12 / 76	57 / 94	41 / 73
C_2H_2	5 / 2	< 10	NA	0 / 2	1 / 2	1 / 2
		> 10	NA	0 / 2	2 / 3	4 / 4
CO	566 / 492	< 10	NA	527 / 454	505 / 515	546 / 411
		> 10	NA	447 / 610	562 / 676	543 / 621
CO_2	5362 /4733	< 10	NA	3532 / 3082	5347 / 3622	5764 / 4666
		> 10	NA	2022 / 3800	4106 / 6420	5283 / 6430

Differences between the two databases

Low O2	% Delta from average of the two DB				
Gas	All Data	MVA	1-10	10-30	> 30
H_2	-4	< 10	-1	53	28
		> 10	82	102	90
CH_4	-11	< 10	-70	20	-53
		> 10	70	25	36
C_2H_6	-29	< 10	-51	17	-66
		> 10	98	50	45
C_2H_4	15	< 10	-52	-14	-18
		> 10	14	-26	-21
C_2H_2	67	< 10	0	-120	0
		> 10	-200	-133	57
CO	3	< 10	4	-21	-7
		> 10	-11	-23	24
CO_2	-3	< 10	2	-1	0
		> 10	-8	-17	12

High O2	% Delta from average of the two DB				
Gas	All data	MVA	1-10	10-30	> 30
H_2	-38	< 10	66	115	95
		> 10	26	100	111
CH_4	-51	< 10	22	37	40
		> 10	-78	20	14
C_2H_6	-47	< 10	29	74	46
		> 10	-50	38	27
C_2H_4	-33	< 10	-42	-6	11
		> 10	-145	-49	-56
C_2H_2	-86	< 10	0	-67	-67
		> 10	-200	-40	0
CO	0	< 10	15	-2	28
		> 10	-31	-18	-13
CO_2	0	< 10	13	38	19
		> 10	-61	-44	-20

Number of points DB1 (Total: 518195)								
	Age NA	1-10 Years	10-30 years	> 30 Years		% of DB		
Low O2 < 10 MVA		625	2459	4099		0.1	0.5	0.8
Low O2 > 10 MVA		6221	19694	9989		1.2	3.8	1.9
High O2 < 10 MVA		437	947	4452		0.1	0.2	0.9
High O2 > 10 MVA		4387	4931	3870		0.8	1.0	0.7
Number of point DB2 (Total: 539742)								
	Age NA	1-10 Years	10-30 years	> 30 Years		% of DB		
Low O2 < 10 MVA	33444	3646	6681	7842	6.2	0.7	1.2	1.5
Low O2 > 10 MVA	65900	7475	16337	22024	12.2	1.4	3.0	4.1
High O2 < 10 MVA	22676	1840	5696	10519	4.2	0.3	1.1	1.9
High O2 > 10 MVA	44153	11820	13579	12575	8.2	2.2	2.5	2.3
Number of point DB3 (Total: 268764)								
	Age NA	1-10 Years	10-30 years	> 30 Years		% of DB		
Low O2 < 10 MVA	133487	22587	37986	11521	49.7	8.4	14.1	4.3
Low O2 > 10 MVA	53848	9870	16165	7055	10.0	1.8	3.0	1.3
High O2 < 10 MVA	63314	11027	12379	6277	11.7	2.0	2.3	1.2
High O2 > 10 MVA	16085	4362	5789	1936	3.0	0.8	1.1	0.4

With 3 databases: Similarities and Differences

Table 1 90 Peccentile in function of O_2/N_2 (all values in uL/L (ppm)) DB1/DB2/DB3						
Table 1a) O_2/N_2 <= 0.2						
Gas	All	MVA	Transformer Age (Years)			
			All Age	1-10	10-30	> 30
H_2	101/97/79	< 10	NA	230/232/889	200/116/64	190/144/53
		> 10	NA	69/29/34	163/53/38	250/95/38
CH_4	103/92/99	< 10	NA	56/95/280	106/87/85	94/162/91
		> 10	NA	48/23/33	115/89/79	155/108/124
C_2H_6	125/93/89	< 10	NA	27/45.5/90	81/68/70	140/279/102
		> 10	NA	38/13/14	149/89/69	189/120/125
C_2H_4	57/66/60	< 10	NA	17/29/28	53/61/48	79/95/91
		> 10	NA	15/13/10	40/52/35	68/82/84
C_2H_2	0.5 /1/0	< 10	NA	0/0/3	0.5/2/0	1 / 1 / 0
		> 10	NA	0 / 1 / 0	0.4 / 2 / 0	1.8 / 1 / 0
CO	817/839/1023	< 10	NA	794/760/963	878 / 1079/1232	822/881/1039
		> 10	NA	571/640/766	631/798/923	792/625/629
CO_2	8652/8369/10847	< 10	NA	4956/4844/5090	9687/9771/11311	9158/9170/14042
		> 10	NA	2877/3121/4200	4867/5766/6212	7066/6214/8240

Separated DB Network Transformers

	min	max
kVA RANGE	31.5	2500
kV RANGE	2.4	33
Total samples	32302	
Total transformers	19265	

	H2	CH4	C2H6	C2H4	C2H2	CO	CO2
90th %	2460	522	160	36	0	567	5670
95th %	8471	1610	403	64	0	690	8870

Claude discussed the simplification of Table 3 (Maximum uL/L variation between samples), which was reduced from 4 columns down to 1.

The effect of selecting 10 vs 50MVA break point. The data are not similar enough to remove the break point. Also there is a question of data validity using 10MVA as a break point due to a smaller data pool. With a smaller data pool, there are more differences that appear between the two separate data pools.

Claude asked for comments on Table 1 and 2. Don Platts indicated that a lot of work has been done by the TF. He indicated that only 23 of 84 members responded to the survey. He also indicated that confidence in the numbers is an issue. Don indicated that Dave Hanson ran an analysis of a separate set of data and depending on which version of the table was used, 30% of the data base fell into Condition 3. Depending on which data base was used, the results varied greatly. Don suggested that the WG members need to take a close look at the document and provide feedback.

Claude acknowledged that the document is not perfect. He indicated it is a work in progress. He asked whether the flaws are enough that it prevent us moving forward and risking the document being withdrawn.

Luis Cheim indicated that the statistics won't change. Either we throw the database away or we trust the numbers. He indicated the data is the data and it is indicating that the existing numbers (actual 2008 version) don't make sense. He indicated that the results are in line with analysis that IEC has done and that he believes we are moving in the right direction. Regarding the vote, it is important that the group reanalyze the document and then vote. Maybe in the process the conditions needs to be revised.

Tom Prevost indicated that the point is the numbers will be used to guide people on what to do with their equipment. Erin Speiwak indicated that it is likely that the NESCOM could be convinced to grant a PAR extension. Tom indicated that it is important that the information presented be sent to the members for adequate review.

Kumar Mani – indicated that it would be helpful to have a separate column for wind transformers.

Claude commented that even if the data for that group is good and solid, is it worth having it in the main body for a very small percentage of the population.

Jim Thompson indicated he had a negative ballot, but would be happy to relook at it if a revised document is sent out. Claude indicated that the data in the published Guide dates back to 1972 and was based on a data pool from the UK. It was based on a very limited sample of data.

Matt Weisensee– He indicated that the results are going to be too low to be relevant to his company and they will have to rely on their own data (network transformers with High gas levels).

Claude asked for a show of hands who felt comfortable to release the document for ballot. There was no show of hands.

Claude indicated that a new straw ballot will be circulated with more time to allow people to more thoroughly review the document. A place for approve or disapprove will be included in the ballot comment form.

Tom Prevost asked if the wind transformer data will be removed from the data base due to the differences noted.

Jim Dukarm asked if the numbers would be the real numbers in what is sent out for review.

Don Platts asked that the members focus on the Technical rather than Editorial comments in the review of the next document.

The meeting was adjourned at 6:00PM

Claude Beauchemin
WG Chair

Don Platts
WG Vice-Chair

Norm Fields
WG Vice-Chair (not present)

Susan McNelly
WG Secretary

Appendix II – TF Insulating Liquids Guides Consolidation Minutes

Chairman Tom Prevost
Secretary Scott Reed

Task Force on Consolidation of Insulating Liquid Guides
Monday, April 3, 2017
9:30 – 10:45 AM
Grand Ballroom D
Astoria Crowne Plaza Hotel, New Orleans, LA

Chairman Tom Prevost
Secretary Scott Reed

The meeting was called to order at 9:39 am by Chair Tom Prevost.

There were 28 of 50 members present. There were 44 guests and 54 visitors. A membership quorum was achieved. Guests attending the WG meeting for the first time who request membership or who have not attended 2 meetings in a row (including the present meeting, will be deferred until the next meeting attended.

Agenda

1) Introductions
2) Quorum
3) Approval of agenda
4) Approval of Fall 2016 minutes
5) Call for patents
6) Review of current document status
    a. C57.147 "Guide for Acceptance and Maintenance of Natural Ester Insulating Fluids in Transformers and Other Electrical Equipment"
        i. In Revision process, PC57.147
        ii. PAR opened 6-Feb-2012
        iii. PAR Expiration 31-Dec-2016
        iv. Ballot Status
    b. C57.111 "Guide for Acceptance of Silicone Insulating Fluid and Its Maintenance in Transformers"
        i. Revision Due Date 12/31/2019
    c. C57.121 "Guide for Acceptance and Maintenance of Less-Flammable Hydrocarbon Fluid in Transformers"
        i. Revision Due Date 12/31/2019
        ii. Revision project planned, no PAR submitted
7) New Document:
    a. Title

b. Scope
c. Purpose

8) Establishment of Task Forces
a. Editorial
b. Test methods
c. Mineral Oil
d. High Molecular Weight Hydrocarbons
e. Silicon
f. Natural ester
g. Synthetic Ester
h. Others?

9) New Business
10) Adjourn

Due to the time constraints, attendees did not introduce themselves.

There was unanimous approval of the Agenda.

There was a unanimous approval to the Fall 2016 Vancouver meeting minutes.

Chairman Tom posted the Patent Claim. No notifications or comments were received.

Chair's Remarks:
As a review of the current document status:

-Patrick McShane announced that he intends to send the Draft C57.147 out for recirculation.

-Chairman Tom Prevost shared that he has talked to the SA about C57.111 and C57.121 and they may be withdrawn as a reference but will still be available as a reference.

Next, Chairman Prevost open the floor to discuss the Title and Scope as part of the requirement to form a PAR.

After consideration of various proposals, Patrick McShane made a motion and Jim Graham seconded the motion for the title called, 'Guide for Acceptance and Maintenance of Insulating Liquids in Transformers and Related Equipment.' The motion carried unanimously.

Regarding the Scope and Purpose, Chairman Prevost outlined the following parameters:

1. Analytical tests and their significance for the evaluation of insulating liquids.
2. The evaluation of insulating liquids as received, before and after filling into equipment.
3, Methods of handling and storage of insulating liquids.
4. The evaluation of service-aged insulating liquids.
5. Health and environmental care procedures for insulating liquids.

There was discussion about retrofilling and mixing of insulating liquids, so Mark Perkins made a motion and Diego Robalino seconded the motion to add to the scope, 'Mixing of Fluids.' The motion carried.

As such the Task Force finalized the Scope and the Purpose as listed below:

Scope:
This guide provides acceptance and maintenance criteria for insulating liquids used in transformers, tap changers, regulators and reactors.

Purpose:
To assist the user of the equipment in evaluating insulating liquids:

- As received from insulating liquid supplier prior to processing and/or filling into equipment.
- Received in new equipment filled prior to energization.
- In service-aged equipment.

This guide also discusses the following related in insulating liquids:

- Test methods and their significance
- Methods of handling and storage
- Mixtures of insulating liquids
- Re-processing, re-claiming and replacement

This guide does not cover dissolved gas analysis of insulating liquids, which is covered by other IEEE Standard Guides.

No New Business was discussed and the meeting was adjourned at 10:49 am.

Unapproved Minutes from the S16 SCIF WG and TF meetings

Appendix III – Presentation on Comment Referral to SCIF from WG C57.12.00.

Comment forwarded S16:

Balloted document: Page 32, 6.6.1, line 13; Standard needs to maintain the sentence "There are other insulating fluids that may be suitable and are commercially available..." from previous version; nowadays, there are other liquids as synthetic esters that are commercially available.

This was rejected as out of scope but could be considered in the future.

Background:

Section 6.6.1 Insulating Liquids:
Transformer shall be filled with a suitable insulating liquid such as the following:

a) M*ineral Oil*. "New, …… shall meet …..ASTM D3487."

Note: C57.106 provides information concerning the acceptance & maintenance of m.o. transformers

b) Less-flammable hydrocarbon fluid. "New,…..shall meet…..ASTM D222."

Note: C57.121 provides information …… of less-flammable hydrocarbon fluid in transformers

c) Silicone insulating fluid. "New, ……. shall meet…..ASTM D225."

Note: C57.111 provides information concerning …… of silicone insulating fluid in transformers

d) Natural Ester Insulating Liquid. "New, …… shall meet….ASTM D6871."

Note: C57.147 provides information concerning of natural ester insulating liquid in transformers

•C57.12.00 -A comment was submitted during recirculation ballot, but was deemed out of scope. It is not clear why. Matt Ceglia stated that during re-ballot process, a comment might be a non-modifiable part of the draft, aka "out of scope". Since the comment pertains to insulating liquids, the advisement was submitted to the SCIF Chair.

•Per Jim Graham, the purpose is that if the SCIF considers the comment has merit, it can make a suggestion to the next revision of C57.12.00 WG to accept the comment.

•At the time of the balloting of C57.12.00, no ASTM Acceptance Standard nor IEEE Guide for synthetic esters insulating liquids existed.

•ASTM has formed a WG to establish one.

•The TF on Consolidation of Insulating Liquid Guides is considering including synthetic esters, dependent on the availability of an ASTM Acceptance

Recommendation:

•Support C57.12.00 WG decision to continue limiting inclusion of insulating liquids to those that have a published ASTM Acceptance Standard.

•Respond to C57.12.00 of this SCIF position, and make a recommendation for their next revision to include all insulating liquids that have ASTM documentation at that time.

•Once operating experience is obtained for all types of insulating liquids that have a published ASTM Acceptance Std., such liquid types Guides should be developed by the SCIF for inclusion in the C57 series of Insulating Liquid Guides or preferably, incorporated in the future Consolidated Guide which is very close to being ready for a PAR request.

Annex H Insulation Life Subcommittee

April 5, 2017
Astor Hotel, New Orleans, LA

Chair: Sheldon Kennedy
Vice-Chair: Barry Beaster
Secretary: Sam Sharpless

The Insulation Life Subcommittee was called to order by the Chair in New Orleans, Louisiana on April 5, 2017 at 8:11 AM. 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 provided the dates of upcoming TC meetings as follows;

2017 Fall Meeting; October 29-30, 2017, Louisville, Kentucky, USA

2018 Spring Meeting; March 25-29, 2018, Pittsburgh, Pennsylvania, USA

2018 Fall Meeting; October 14-18 or 21-25, 2018, location to be determined.

The Chair requested that any person with knowledge of a patent essential to meet the requirements of any subcommittee standard to bring the issue forward for discussion. No one responded to this request.

The Chair requested the following items be included in all activity group minutes;

- The name of the activity
- The date and time of the meeting
- The number of members and guests in attendance. Full attendance should be recorded in the AMS system
- The presence or absence of a quorum
- Any essential patent issues raised during the meeting.
- A summary of discussion. Intricate detail not required. Use a separate document to explain decisions that are made.
- A record of the decisions made in the meeting
- If there will be another meeting. If so, state the time and place.
- Submit minutes as soon as possible, but no more than 15 days after the meeting.

The Chair reminded everyone that working groups must achieve a two-thirds majority to submit a document for Sponsor Ballot. The subcommittee must achieve a simple majority to submit a document for Sponsor Ballot.

The Chair discussed the membership requirements and recognized the following new members;

- Victor Garcia
- Weijun Li
- Juliano Montanha
- Marcos Ferreira
- Klaus Pointner
- Jimmy Rasco
- Alan Sbravati
- Hamid Sharifnia
- Ismail Guner
- Vladimir Abril
- Ali Naderian

The Chair discussed the requirements for continued membership and stated that the following members had been moved to guest status;

- Kiran Verdante
- Jerry Reeves
- Alvaro Portillo
- Jose Valencia
- Zoilo Roldan
- Keith Ellis

The Chair noted that the following guest had been removed from subcommittee rolls by request;

- David Harris

The Chair reported on the status of subcommittee Projects;

- C57.91 - IEEE Guide for Loading Mineral Oil-Immersed Transformers; C57.91 is valid until 2021.
- C57.100 - IEEE Standard Test Procedure for Thermal Evaluation of Liquid-Immersed Distribution Transformers; C57.100 is valid until 2021.

- C57.119 - IEEE Recommended Practice for Performing Temperature Rise Tests on Oil-Immersed Power Transformers at Loads Beyond Nameplate Ratings; C57.119 is valid until 2018. The working group chair for revision of this document is Gael Kennedy.

- C57.154 - Design, Testing and Application of Liquid-Immersed Transformers with High-Temperature Insulation; C57.154 is valid until 2022.

- C57.162 – Guide for the Interpretation of Moisture Related Parameters in Dry, Gas Insulated and Liquid Immersed Transformers and Reactors; The C57.162 PAR expires December 31, 2017. The standard is valid until 2018. The working group chair for revision of this document is Thomas Prevost.

- 1276 – Guide for the Application of High Temperature Insulation Materials in Liquid-Immersed Power Tranformers; The 1276 PAR expires December 31, 2016. The standard is valid until 2018. A PAR extension has been requested. The working group chair for revision of this document is Roger C. Wicks

- 1538 – IEEE Guide for Determination of Maximum Winding Temperature Rise in Liquid-Filled Transformers; 1538 is valid until 2021. Amendment approved September 2015. working group chair for revision of this document is Richard P. Marek.

H.2 Secretary's Report

The Secretary reported that according to the electronic check-in system, 64 of 109 members were present at the start of the meeting and that a quorum had been achieved.

The Fall 2016 subcommittee meeting minutes was provided to participants in advance of the meeting for review. Mr. Pat McShane stated that his post-meeting comments included in the minutes were in error and requested that the first sentence of his last point be deleted. The amended minutes were then approved with no objections.

The Spring 2017 subcommittee meeting agenda was provided to participants in advance of the meeting for review. The agenda was approved with no objections.

The Chair presented the agenda for the current meeting. Stephen Antosz noted that a representative the Chinese Society of Electrical Engineers desired to address the group and requested that they be placed on the agenda as new business and the Chair agreed to do so. Sanjib Som made a motion to approve the amended agenda. Don Ayers seconded the motion and there was unanimous approval.

Consolidation of the electronic check-in records and the written attendance rosters after the meeting provided the following final attendance totals;

Total Present	234
Members	76
Guests	105

Eight guests requested membership via the membership roster.

The following requestors met the membership criterion;

Jose Gamboa

Saurabh Ghosh

Jinesh Malde

Mickel Saad

Robert Thompson

Jason Varnell

Michel Veillette

The following requestors did not meet the membership criterion as of this meeting;

James Thompson

H.3 Project Status Reports

H.3.1.1 C57.91 IEEE Guide for Loading Mineral-Oil-Immersed Transformers

C57.91 is valid until 2021.

H.3.1.2 C57.100 IEEE Standard Test Procedure for Thermal Evaluation of Liquid-Immersed Distribution Transformers

C57.100 is valid until 2021.

H.3.1.3 C57.119 IEEE Recommended Practice for Performing Temperature Rise Tests on Oil-Immersed Power Transformers at Loads Beyond Nameplate Ratings

C57.119 is valid until 2018 and is Chaired by Gael Kennedy.

H.3.1.4 C57.154 Design, Testing and Application of Liquid-Immersed Transformers with High-Temperature Insulation

C57.154 is valid until 2022.

H.3.1.5 C57.162 - Guide for the Interpretation of Moisture Related Parameters in Dry, Gas Insulated and Liquid Immersed Transformers and Reactors

The C57.162 PAR expires December 31, 2017. The standard is valid until 2018 and is Chaired by Tom Prevost

H.3.1.6 1276 Guide for the Application of High Temperature Insulation Materials in Liquid-Immersed Power Transformers

The 1276 PAR expires December 31, 2016 and an extension has been requeseted. The standard is valid until 2018 and is Chaired by Roger C. Wicks.

H.3.1.7 1538 IEEE Guide for Determination of Maximum Winding Temperature Rise in Liquid-Filled Transformer

The 1538 guide is valid until 2021 and is Chaired by Richard Marek. An amendment was approved in September 2015.

H.3.2 Working Group and Task Force Reports

H.3.2.1 Working group on PC57.162 – Guide for the Interpretation of Moisture Related Parameters in Dry, Gas Insulated and Liquid Immersed Transformers and Reactors – Tom Prevost

April 3, 2017

The meeting of the PC 57.162 Guide for the Interpretation of Moisture Related Parameters in Dry, Gas Insulated and Liquid Immersed Transformers and Reactors (Moisture in insulation systems) Working Group was held on April 3, 2017.

Attendance	Members	51 out of 81
	Guest	77
	Guests Requesting Membership	11

The chairman skipped introductions in order to save time and established a quorum.

A quorum of the working group members were present (51 out of 81).

Approval of agenda and then approval of minutes with minor corrections in Task Force 4 belongs in Task Force 10.

The chairman then asked for notification of any essential patents related to the group's work. None were stated.

The chairman briefly described the working plan. The Par is allotted 4 years and the time is about up. The chairman discussed the need to ask for a PAR extension.

The meeting started with the purpose and scope of the WG.

The chairman asked about the need to address sealed dry types and it was determined that this was not in scope.

The task force leaders then updated the WG on the progress of their respective task forces. The chairman asked for any information from the Task Force leaders so the Secretary can start to assemble the document.

Task Force 1 Terminology and Definitions

Task Force Leaders - Jeff Golarz golarz@aol.com

Jeff Golarz has a list compiled from folks that has sent to him.

Task Force 2 Measurement and evaluation of moisture-in-gas insulation parameters

Task Force Leaders - Tom Melle tom.melle.us@ieee.org

Tom Melle stated that the dew point as referenced C57. 93 is outdated. He had asked for industry for help and is now looking at relative humidity instead. The Chairman mentioned to be careful not to add research into the standards. Tom Melle injected that there are some papers for verification. The team will have to use best practices for dew point. This information which goes back to 1946 and is outdated.

Task Force 3 Measurement and evaluation of moisture-in-liquid insulation parameters

Task Force Leaders- Claude Beauchemin beauchemin@tjh2b.com

The chairman has spoken with Claude and still needs a lot of work.

Task Force 4 Measurement of moisture in solid insulation

Task Force Leader - Paul Griffin pgriffin@doble.com/ Ronald Hernandez

They are basically done with the task.

Task Force 5 Evaluation of moisture in solid insulation using dielectric response methods

Task Force Leader - George Frimpong george.k.frimpong@us.abb.com

The task force is done.

Task Force 6 Inferring of moisture in solid insulation from measurements conducted in liquid or gaseous medium

Task Force Leader - Valery Davydov valery.davydov@ieee.org

The draft has been distributed and proceeding very well.

Task Force 7 Evaluation of aging and end of life of solid insulation parameters

Task Force Leader- Roger Wicks roger.c.wicks@usa.dupont.com

Roger has promised an initial draft soon

Task Force 8 Factory/workshop application of knowledge on moisture; establishing baselines

Task Force Leader - Poorvi Patel poorvi.patel@us.abb.com

This task force is done.

Task Force 9 Field application of knowledge on moisture

Task Force Leader – Jim Thompson serve1@svtv.com

* Note: This section lists the risks associated with moisture

Jim has a quick update presentation, in the past proposed a excel spreadsheet and wasn't working and he has taken some information for his company to come up with some data but it not complete. He is seeking anyone that can assist him with supplying him with industry data.

Task Force 10

Leader – Bruce Forsyth

This task force has been added half way through the working group. They have put together a scope for the task force. The chairman requested Bruce to resend it to him again.

Meeting adjourned.

H.3.2.2 Working Group for Application of High-Temperature Materials IEEE P-1276 – Roger Wicks

Sheraton Hotel – Vancouver, BC Canada
Room – Grand Ballroom AB
October 25, 2016, 3:15 - 4:30pm

A. Welcome & Chairman's Remarks — R. Wicks

Roger opened the meeting at 3:15pm with a brief description of the scope of the Working Group. The chair reviewed the patent topic and there were no essential patented described for work in the area of this standard.

B. Circulation of Attendance Rosters — J. Arteaga

Circulated

C. Attendance for Quorum — J. Arteaga

19 members were in attendance meeting the quorum requirement of 18 members. The attendance will be reviewed and new members will be added if they meet current attendance requirements. The attendance will be recorded in the AMS system. The automated attendance records (scanning system) recorded 19 members and 60 guests.

D. Approval of Spring 2016 Meeting Minutes – Atlanta, GA — J. Arteaga

Mike Shannon made a motion to approve the minutes as written, John Luksich seconded it and these were unanimously approved without changes.

E. Approval of Meeting Agenda R. Wicks

Eduardo Tolcachir made a motion to approve the agenda as written, Mike Shannon seconded it and these were unanimously approved without changes.

F. Status of PAR/Document R. Wicks

The PAR of this standard was requested for extension for 2 year. The standard expires at the end of 2018.

G. Assignments from Last Meeting R. Wicks

The assignments for the elaboration of the draft are as follows. Chair requested groups to complete the draft work before the end of year.

Section 5 – Insulation-system temperature ratings, test procedures, and material aging qualification:
Chair - Roger Wicks
Volunteers – Mike Franchek, Ken McNeish, Tom Golner, David Stankes, Solomon Chiang, Joshua Verdell, Dave Sundin, Jinesh Malde, and Mohamed Diaby.

Section 6 – Insulating Materials.
Chair – Javier Arteaga
Volunteers – Clair Claiborne, Julio Caldeira, Patrick McShane, Dave Sundin, Attila Gyore, Chuck Stevens, Shane Goydich, Jinesh Malde, Dustin Davis, and Mike Shannon.

Section 7 – Description of high-temperature transformers.
Chair – Mike Franchek
Volunteers – Kurt Kaineder, Arup Chakraborty and Evan Langran.

Section 8 – Loading guidelines for high-temperature transformers.
Chair – John Luksich
Volunteers - Arup Chakraborty and Jinesh Malde

Section 10 – Heat run test and average winding temperature.
Chair – Juan Castellanos
Volunteers – Mike Franchek, Alan Sbravati

H.3.2.3 Working Group on C57-119 IEEE Recommended Practice for Performing Temperature Rise Tests on Oil-Immersed Power Transformers at Loads Beyond Nameplate Ratings – Gael Kennedy

The document is undergoing ballot resolution. It is still on track to be completed prior to the end of 2018. This working group did not meet during the Vancouver Conference.

Submitted by: Gael R Kennedy

H.4 Old Business

The chair stated that the Chinese Society of Electrical Engineers "Standard for lead exits, 1000 volts and above", has been referred elsewhere by the and will therefore not be addressed by this subcommittee.

Regarding the work of the "C57.154 Annex B Clause B.5 Recommendation" working group;

- Mr. Rick Marek provided a presentation explaining his concern that thermal class data in C57.154-2012 Annex B regarding cellulose in ester was based upon insufficient data. He agreed that the data shows some improvement of temperature life improvement, but that the specific level of improvement has not been established.

- Mr. Alan Svarti provided a presentation supporting the C57.154-2012 Annex B data. He presented a case that the data in Annex B is sufficient to establish curves which support the thermal classes indicated. He provided data points from unpublished data which was consistent with the data extrapolations in Annex B.

- Mr. Roger Thompson, chair of the subject working group, provided a summary of the working group's meeting and reported the working group's recommendation to form a task force to review annex B for possible amendment. He then made a motion as follows; "A new task force be formed to review the Annex for possible amendment". The motion was seconded by Mr. Tom Prevost.

- Mr. Svarti and Mr. Patrick McShane spoke against the motion. Mr. Thompson and Mr. Prevost spoke for the amendment.

- Mr. Thompson amended his motion as follows; "A new task force be formed to review Annex B of C57.154 for possible amendment". Provost seconded the amended motion.

- A vote of members was taken and the motion was approved with 57 yes, 3 no, and 1 abstention.

- The Chair asked that anyone desiring membership in the new working group notify him so that work can begin promptly.

H.5 New Business

Mr. Phil McClure stated that C57.165 now has an approved PAR. He is the chair of the working group and requested that interested others contact him.

H.6 Adjournment

Mr. Phil McClure made a motion for Amendment. Gail Kennedy seconded and there were no objections.

Respectfully submitted,

Samuel L. Sharpless
Secretary, Insulation Life Subcommittee

Annex J Performance Characteristics Subcommittee

April 5, 2017
New Orleans, LA

Chair: Ed teNyenhuis
Vice Chair: Craig Stiegemeier
Secretary: Sanjib Som

J.1 Introduction / Attendance

The Performance Characteristics Subcommittee (PCS) met on Wednesday, April 5th, 2017 at 3pm with 176 people attending. Of these, 69 were members and 107 were guests. Prior to this meeting, the total membership of the PCS was 90 members; therefore, quorum was achieved with 76% of the membership in attendance.

There were 21 guests requesting membership (their meeting attendance will be reviewed and those that are acceptable will be added to the PCS membership prior to the Fall 2017 meeting). The Vice-Chair distributed rosters for the seating arrangement in the room.

J.2 Chairman's Remarks

The Chair provided the following updates and comments.

Status of PAR'ss

- C57.120 – Loss Evaluation Guide - DONE
- 2018 PAR's
    - P60076-16 IEEE/IEC Wind Turbine Transformers
    - C57.158 Tertiary/Stabilization Windings
    - C57.110 Non-sinusoidal Load Currents
    - C57.21 Shunt Reactors
- 2019 PAR's
    - C57.105 3-ph Transf. Connections
    - C57.109 Through-Fault-Current Duration
- 2020 PAR's
    - C57.164 Short Circuit Withstand Guide
    - C57.18.10 Semiconductor Rectifier Transformers
- 2021 PAR's
    - C57.142 Transient Guide
    - C57.32A Neutral Grounding Devices amendment

Status of Standards

- C57.133 Guide for Short Circuit Testing (Expired)
- C57.136 Sound Abatement Guide (2018 – will let expire)
- C57.123 Loss Measurement Guide (2020)
- C57.149 SFRA Guide (2022)
- C57.32 Neutral Grounding Devices (2025)
- C57.159 DPV Transformers (2026)

Attendance and Quorum

- The chair requested attendees to record their attendance on one of the rosters being circulated – only the attendee's name was required if it is not on the roster
- PCS now has 90 members after a review of the Spring 2016 meeting attendance and after review of previous meetings
- 10 "Corresponding Members" are counted as "Guests" in terms of attendance for a quorum
- Requests for membership will be granted if an attendee made the past 3 of the last 5 meetings
- Today's meeting quorum will be reached if 45 members are in attendance

The following 3 Members missed 3 or more of the last 5 meetings and have been moved to "Guest" status:

- Emil Bercea
- David Buckmaster
- Kirk Robbins
- Alan Traut
- Jane Ann Verner
- Jim Zhang

The following 10 Corresponding Members are being counted as guest status to support reaching the meeting quorum. They continue to receive communications and their guidance for the working group is most welcome:

- Donald Chu
- Larry Coffeen
- Jerry Corkran
- Alan Darwin
- Richard Dudley
- John Lackey
- Tamyres Machado Junior
- Dennis Marlow
- Paulette Powell
- Loren Wagenaar

The following 11 Guests had requested membership at the Fall 2016 meeting, attended the past 2 meetings and have been added as Members for the this meeting:

- Myron Bell
- Scott Dennis

- Jose Gamboa
- Neil Kranich
- Weijun Li
- Gregorio Lobo
- Rhea Montpool
- Mike Spurlock
- Kevin Sullivan
- Susmitha Tarlapally
- Krishnamurthy Vijayan

The Chair stressed that all attendees must be sure that their e-mail address is up to date in the AMS system – many undeliverable notices were received during WG communication attempts. Next the Chair made attendance roll call and requested attendees raise their hand if they see their name on the screen.

J.3 Approval of Agenda

The Chair presented the agenda. A motion to accept as proposed was given by Dan Sauer and seconded by Marcos Ferreira. The chair requested comments or objections - there were none. The agenda had been earlier sent to the members by email several weeks prior to the meeting

J.4 Approval of Last Meeting Minutes

The chairman presented the minutes of the last meeting held in Vancouver, BC, Canada in Oct, 2016. A motion to accept as proposed was given by Hugo Flores and seconded by Dan Sauer. The acceptance of the minutes was passed by unanimous vote.

J.5 Minutes from Working Groups and Task Force

The following WG and Task Force reports were received (the reports are appended later).

• WG Short Circuit Design Criteria C57.164	S. Patel
• WG on Tertiary/Stabilization Windings PC57.158	E. Betancourt
• TF on PCS Revisions to Test Code C57.12.90	H. Sahin
• WG on C57.109 - Through-Fault-Current Duration	V. Mehrotra
• TF on Audible Sound Revision to Clause 13 of C57.12.90	R. Girgis
• WG on Non-sinusoidal Load Currents C57.110	R. Marek
• TF on PCS Revisions to C57.12.00	T. Ansari
• WG Shunt Reactors C57.21	S. Som
• IEEE/IEC WG Wind Turbine Generator Transformers, P60076-16	P. Hopkinson
• TF on Neutral Grounding Devices PC57.32 amendment	S. Kennedy
• WG on C57.18.10 Semiconductor Rectifier Transformers	S. Kennedy
• WG on Loss Evaluation Guide C57.120	R. Marek
• WG 3-ph Transf. Connections C57.105	R. Verdolin
• WG on HV & EHV Transients C57.142	J. McBride

J.6 Unfinished (Old) Business

None

J.7 New Business and Motions

Vinay Mehrotra made a motion to on draft D1.1 of PC57.109 to take to ballot, this was seconded by Kiran Vedante. The motion was approved with overwhelming majority.

A motion was made by Marcos Ferriera to set up a new Task Force to investigate the need for a guide for various field tests for LTC's. This was seconded by Rogerio Verdolin. The task force would consider the following:

- Evaluate various field tests for LTC's
- Propose method of performing the tests
- Propose interpretation of test results
- Deliverable to PCS – Recommend if a guide is needed, recommend scope of the guide

The following discussion took place. Bertrand Poulin suggested to use the existing field guide and update it. Craig Steigemier agreed with Bertrand Poulin. Tauhid Ansari asked whether it should be included in tap-changer testing - Marcos Ferriera clarified that this will not be part of factory testing. Dan Sauer opined that this should be under standards committee. Jim Graham clarified that termininlogy "OLTC or "LTC" has not been finalized.

The motion carried without any opposition, two abstentions and all others approving.

Peter Zhao sought help from PCS on bushing thermal overloading. Bertrand Poulin opined that similar issues exists in LTC and such matters should be completed at design stage. Some members responded to Peter and the matter would be finalized amongst them after the meeting.

Jim Mcbride apprised all that a modeling conference was held in Spain where two models and measurements were compared. It was identified that models should include damping. He provided the following summary of Work from CIGRE A2-C4.52 HF Modeling Group. The CIGRE group on High Frequency (HF) Transformer Modeling met in Madrid, Spain in March 2017. The meeting was hosted by Xose Lopez-Fernandez. The group has performed measurements and HF modeling on both a single phase and a three phase transformer. The comparison between the measured data and the modeled data was presented at this meeting. A few observations from the results presented at the meeting are listed below:

1) It is important to include damping information in the model to get good agreement between the measured and modeled results. There may need to be more work to better learn the methods to predict the damping factors.
2) Most manufacturers model the transformer to determine that all stress in the transformer is below the level of the insulation system. Matching the exact time domain shape produced by the model is not as critical for manufacturers as the agreement between the stress envelope predicted by the model and the measured stress. There can be significant differences between different modeling software in the time domain. This is often due to small differences in the frequency estimates that present as larger time domain shape differences as the frequency differences accumulate with time. The models are considered good if the envelope of the time domain shapes are similar between the measured and various modeled results.
3) Significant amount of work to verify the HF models for White Box, Grey Box, and Black Box models

Adjournment was proposed by Marcos Ferreira and seconded by Dan Sauer.

Meeting was adjourned at 4.15 pm.

J.8 Minutes of Meetings of Working Group (WG) and Task Force (TF) Reports (all unapproved)

J.8.1 WG C57.164 Short Circuit Withstand - S. Patel

Minutes

Working Group C57.164 Short Circuit Withstand
New Orleans, LA – Apr 4, 2017

Ed teNyenhuis, April 4, 2017, Rev 0

- The Working Group met at 4.45 PM in the Grand Ballroom C on April 4, 2017
- The Vice Chair and Secretary were not able to be present so Ed teNyenhuis acted as secretary.
- The Chairman, Sanjay Patel, led the meeting.
- The previous attendance from the Vancouver meeting was not recorded so a record of the membership was not available. Thus the actual membership was not known and quorum was not established for this meeting.
- Per the roster sheets, there were 79 persons present with 37 signed guests and 42 new members (everyone who requested membership was made a member).
- The agenda and previous meeting minutes were shown but could not be approved.
- A request for patent disclosures was done and there were no responses.
- The Chair reviewed most the recent draft of the IEC 60076-5 short circuit guide which is being presently revised. Joe Watson agreed to review the Annex A for integration into the IEEE guide.
- Ed teNyenhuis will confirm that it is allowed that the IEC draft guide can be posted on the WG website for the members to review.
- The Chair reviewed the draft guide D1 which was prepared by the secretary, Rajendra Ahuja. The below was agreed upon for the guide revisions:
    - Section 3 – Definitions – Sanjib Som agreed to work on this section.
    - Section 5 – Guidelines for Design Review – Bob Ganser agreed to work on this section.
    - Section 6 – Forces – Ramsis Girgis agreed to work on this section and also on shell form transformer discussion.
    - Section 7 – Short Circuit Design Criteria – Andy Speigel, Bob Ganser and the Chair agreed to work on this section.
    - Section 8.3 should be renamed “Design Approach”

- It was suggested that a checklist of items to guide the user on what to look for in short circuit evaluation should be added to the guide

- The Chair will check with Kema if the SC presentation given in Vancouver could be put on the website

- The meeting was adjourned at 18.01

J.8.2 PCS Working Group on Guide for Application of Tertiary and Stabilizing Windings PC57.158

Performance Characteristics Subcommittee
IEEE / PES Transformers Committee
April 3, 2017 9:30 AM
The Aster Crowne Plaza Hotel, Grand Ballroom AB
New Orleans, LA, USA
UNAPPROVED MINUTES

The Chair called the PC57.158 WG to order at 9:30AM on April 3, 2017. A quorum was achieved to conduct regular business with **22** out of **33** WG Members in attendance (note that RFID system had a count of 58 WG Members). **67** Guests were present also, with one attendee requesting membership to the group. As the document is at the balloting stage, no new members were been considered since the last WG meeting.

The Chair proceeded to present the WG Statement of Assignment, proposed meeting agenda, call for essential patents related to this Guide and proceeded with introductions and the distribution of rosters. A motion to approve the WG minutes from the Vancouver meeting was made by Hugo Flores and seconded by Kushal Singh. The motion was unanimously approved.

The Chair reported that the PAR has been extended until December 2018.

The following is the redline review of the Draft 7 revision, based on the ballot comments resolution, to be recirculated in about one month.

- Definition of neutral shift was added to the Guide along with reference per C57.142 and Westinghouse Blue Book
- A definition for a “primary station power transformer” to be applied in this Guide was met with much resistance as several people had issues with the terminology. It was thought it would be confused as a transformer that supplies substation power and several different suggestions were made without success. An alternative name will be determined and distributed to the WG for resolution.
- Will use “transformer bank” instead of “transformation bank”
- Will use “insulating liquid” instead of “oil”
- Will use “OLTC” instead of “LTC”
- Literature references (Blume Chapter 7 among them) will be used as the reference for unbalanced loads of up to 10% in three legged core transformers without stabilizing windings
- Figure showing flux in the tank walls to be added
- Proper reference to “IEEE default short circuit condition” added

- Removed all references to “distribution transformers” since they fall outside of this PAR
- Improved brief description of examples of utility applications of tertiary windings
- Added the definitions for the symbols used in the positive and zero sequence diagrams
- Described how the zero sequence branch handles unbalanced loads
- The T-diagram in relation to short circuit currents now includes all cases
- Corrected the short circuit analysis diagram
- Reference to publication by Ramsis Girgis/Kiran Vedante on GIC and stabilizing windings
- Term “open delta” was changed to “delta with one corner open”
- Added a caution on the loading of an autotransformer common winding during step up transformer operation with a loaded tertiary winding
- Objection to the term “booster transformer” for regulating the terminal voltage on a loaded tertiary winding of a variable flux transformer. Sanjay Patel will provide a definition for a compensating winding for this purpose.
- Corrections required to the current distribution for thermal tests of three winding transformers due to tested verses application impedance differences
- Changed “shall” to “should” to conform to the IEEE requirements for Guide documents.
- Defined “floating neutral” as “not grounded terminal”
- Additional references were added to the list

The thermal loading of stabilizing windings described in C57.12.00 has been checked and verified as correct between the documents

Figure 14 to be corrected or removed, as currently redundant to Figure 3.

A new working draft is going to be distributed to the WG Members for review.

The WG shared the October 2016 Ballot statistics

- Size of ballot group – 134
- Response rate – 87%
- Approved – 91%
- 237 comments

With no New Business, the meeting was adjourned at 10:45 AM.

Respectfully submitted,

Enrique Betancourt ***Brian Penny, WG Vice-Chair***

WG Chair ***And acting Secretary for Marnie Roussel***

J.8.3 Working Group for Revision of C57.12.90

Meeting Minutes
Task Force on PCS Revisions to C57.12.90
April 3, 2017, 11:00am-12:15pm
Grand Ballroom C, Astor Crowne Plaza, New Orleans
Hakan Sahin, Chairman; Craig Stiegemeier, Secretary

1. The TF Chair called the meeting to order at 11am.

   Reiner Focher MR from Reinhausen did not agree that any other requirements for DGA with arcing compartments would be too complicated. PCS subcommittee minutes were too short. Later Reiner pulled his comment back and agreed to the approval of the fall 2016 meeting minutes.

   The chair went through a review of the purpose of the task force

2. Agenda – Steve Snyder motion, Vladimir second motion and the agenda was unanimous approved

3. Approval of the Fall 2016 meeting minutes. Dan Saur motion, Roger Vandolin second – unanimous approval - The Minutes of the fall 2016 Vancouver meeting were all approved unanimously. The task force moved on to old business, which is the LTC performance voltage test and current test to be included in future versions of C57.12.90.

4. Agenda comments

   The Chair reviewed the Agenda and asked for corrections or additions to the New Business section to be reviewed later during the meeting and to ensure enough time was allocated for new business. Subash Tuli asked for Clause 9.5 zero sequence measurement. 9.5.3 and 9.5.2 brought out or buried tertiary transformers. He proposed that 9.5.3 should have a disclaimer that the same value is only for two winding wye-wye transformers, not autotransformers. Kuchal Sincan ComEd – no requirement for infrared scanning during temp rise. Ronnie C57.12.90 talks about the ration test. Looking for definition of ratio when a winding is split – is there something to allow for the comparison of the ratio test on a winding when it is split into two parts.

5. Membership and attendance

   The current membership of the Task Force is 65 members, which is a correction from the 66 reported during the meeting. After a review of the attendance rosters, there were 43 of the 65 Task Force members present for the meeting. With 66% of the membership in attendance, a quorum was reached. In addition, 85 guests and one of the 4 Corresponding Members were in attendance. Of the 85 guests, 29 were first time attendees. Eleven (11) of those guests requested membership on the Task Force. After a review of past attendance, 6 met the criteria and will be added as Members for the Fall 2017 meeting. Also, 9 of the current Members will be removed due to a lack of ongoing participation, bringing membership of the Task Force to 62. The interest in the work of this Task Force remains high. The participant count is over 500, and many of those have not attended a meeting for quite some time. For the fall meeting roster, 310 people will be removed as those individuals have not made any of the past 5 Task Force meetings.
   Hakan Sahin thanked Mark Perkins, the former chair, for providing his guidance and moving the activities of this Task Force along.

6. Old Business

A proposal was to be developed and presented to the group at this meeting.

8.7 On-Load Tap Changer End to End Voltage Test

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 (from one extreme tap to the other extreme tap and back) with the transformer energized at rated voltage. The test may be performed in intervals if needed, but it is a requirement that the transformer be energized at no less than rated voltage for each tap change. 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. Note that with some types of tap changers, there will be an abnormally loud sound if components are not connected properly. The transformer will have passed this test if the tap changer operates normally, with no abnormal sound and with no abnormal combustible gas generated in the insulating liquid of the transformer.

Comments from the attendees:

Bertrand – noted on load tap changer

Reiner – sound when reversing switch operations will be different than operation in other positions. May be a slight amount of sparking due to capacitance of the windgs.

Daivid Walker – MJM Transformers. Suggested that the end to end is redundant.

Tauhid – how do we define normal and abnormal sound. How do we define what is normal? He suggested that we take the sound out. Hakan noted that the TF

Hakem form CG power – should mention criteria that voltage variation will vary dependant on the tap range. Say something about adjusting the voltage when we change taps. Should be allowed to have a voltage

Scott Marshall - Power Engineers - +/- range of the OLTC. He requires a run of 2 cycles of the OLTC, not just one. He also recommended that DGA should be performed both before and after each test.

Dan Sauer – Eaton – Section under current review. The end to end wording has been addressed multiple times. We should leave it as is. In regards to sound, that sound is what occurs most of the time. The passing through neutral will only happen 2-3 times during the course of a run of the full tap range from end to end. Leave the sound as presented should make it clear enough.

Chase Miller – PPL – Reference sound during applied test.

Don Ayers – consultant – DGA before and after is oil for vacuum OLTC. But for arcing oil OLTC

Gargis SPX – when to take DGAs is not well defined in C57.12.90. No need to take oil sample from the main transformer. Taking a sample when oil flow is low may not allow adequate mixing of the oil. He wants to leave DGA out of this section.

Reiner – DGA issue. Was included in the very first proposal. Gas was generated by the reversing switch. Wants to cover all types of tap changers. If there are issues with the tap selector or reversing switch this will show up in transformer oil for in-tank OLTC's. Joe, Tauhid and Reiner made a proposal that only works for the vacuum type OLTCs.

Comment from Joe Foldi - It would be good to add that the dissolved gasses should be checked for vacuum type LTC's in the main tank and in the LTC compartment. For other types in the main tank only.

Don Ayers – OLTCs with different ratios will have different sound

Tauhid – DGA of a vacuum type reactance tap changer. Good idea to do the test. This will confirm the PA lead connection. He's not worried about transformer experts. The definition of normal and abnormal. For safety reasons, most companies do not allow someone near the transformer during testing.

Dave Geibel – normal vs abnormal. Different turns give different sound. Sound should be defined by the manufacturer and the customer. Oil testing for gas, any OLTC should be testing the transformer oil for any OILTC that has contacts in the transformer oil.

The Chair presented the following as a suggestion for the section

9.6, Load Tap Changer End to End Current Test:
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 (from one extreme tap to the other extreme tap) with the transformer current at the top nameplate MVA rating. The test may be performed in intervals if needed, but it is a requirement that the transformer current be no less than 80% of the top MVA nameplate current for each tap change. 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. Note that with some types of tap changers, there will be an abnormally loud sound if components are not connected properly. The transformer will have passed this test if the tap changer operates normally, with no abnormal sound and with no abnormal combustible gas generated in the insulating liquid of the transformer.

Comments from the attendees:
Reiner suggested that a DGA be done on the Reiner and Tauhid
Scott Marshall - Recommened that 2 cycles be used. Allow 80% if there are equipment limitations. DGAs on the main tank can identify overheating of the oil.
Jeff Power Diagnostics – Comment that 80% may be a limit for inverter based sources. Maybe for on-site testing for inverter based systems may require a lower level of testing.
Doug – Normal and abnormal doesn't feel right, as it has something to do with feeling. Maybe some equipment should be used to measure sound so you don't have to rely on experience. A sonogram to compare with earlier experience would help.
Jon Fusha – SPX Waukesha – 80% is necessary. Abnormal is subjective and could lead to problems in definition of normal.
Mark Perkins – ABB – Asha said it right. If polarity on the PA is wrong, the sound will be extremely different.
The Chair noted that the purpose of the test was to
Ramsis Girgis – ABB – 2 parts. 1 is a mechanical issue or a problem with connections. The 2nd is briding position versus non-bridging position. If the PA is not manufactured well, the briding positon is much louder, with different frequencies being generated at bridging positions.
Gorgiz – something transfomrer – If the purpose of the paragraph is to show the customer we can withstand full voltage or full current, the working needs to be changed. There may be other ways to detemine that the OLTC is performing as expected. As an engineer, he would change it to be more subjective. He is for doing the test, just objects to the subjectivity of the sound level.
Chase Miller – PPL – If the goal is to have the testing crew to determine normal and abnormal. Cut the rest of the section in 9.6 after normal and abnormal.
Chair summarize discussions – We need to come up with a better wording to try to define what is abnormal. DGA should be kept into the text, but better worded. He suggested we send out a survey and gather comments.

7. New Business

Subash Tuli asked for Clause 9.5 zero sequence measurement. 9.5.3 and 9.5.2 brought out or buried tertiary transformers. He proposed that 9.5.3 should have a disclaimer that the same value is only for two winding wye-wye transformers, not autotransformers.
Bertrand Poulin – the test is non-linear. You only need 3 of 4 tests to work out the equivalent circuit. ABD and ABC would result in the same result. Working out the circuit gives redundant results. If B and D are not done at the same percentage would give a different result. This should be further analyzed, as he got identical results for autos as long as test is at the same level

Subhash says he is correct, more investigation should take place as his knowledge is based on hundreds of transformers. He suggests that a minor change should be made in relation to autotransformers. Manufacturers and labs should go back and investigate results.
Ajit from SPX – Z1, Z2 and Z3 is what the power systems needs. More discussions are needed.
Bertrand – since these tests are done at very reduced current, the value measured is only an approximation since these are non-linear. Test #2 and test #4 the differences are different. If it's fully linear, these tests are redundant.
Chair requested that this may need to be developed as a new business. Only 4 thought that this should be looked at as a new issue. Bertrand suggested that manufacturers offer data to proves the issue 9.5.3.

Kushal Singh ComEd – no requirement for infrared scanning during temp rise. This needs to go to insulation life.

Ronnie C57.12.90 talks about the ration test. Looking for definition of ratio when a winding is split – is there something to allow for the comparison of the ratio test on a winding when it is split into two parts.
Bertrand said that the real issue is whether both halfs of a center connected winding is identical. There is no way to test the halves separately once the manufacturer connects the windings together. This can't be part of a final test.
Baitan Yang – PA Transformer – they do the test before assembly. You will not see the difference. Core loss will be higher when there is a problem. Other tests will highlight the problem. Bertrand noted that a winding with 1000 turns will have very little difference if only a turn off.
Sakar - GA Transformer – every manufacturer verifies turns.
The Chair requested that the group decide that something needs to be added to standards for determination and the group agreed that this is more quality control and don't need to be in the standards.

8. Meeting adjournment

Dan Sauer – Marchel seconded to adjourn at 12:13pm.

J.8.4 Working Group for Revision of C57.109 - IEEE Guide for Liquid-Immersed Transformer Through–Fault-Current Duration

New Orleans, LA, April, 3 2017
Minutes of the Working Group Meeting

The meeting was held on Monday April 3, at 1.45 pm and five of the eight members were present and therefore there was a quorum. There were a total of 43 people present which consisted of 5 members and 38 guests. Six guests requested membership.

The meeting began with a patent call and there were none brought forward. After quorum was determined the Working Group unanimously approved the agenda for the current meeting as well as the meeting minutes from the Spring-Atlanta 2016 and Fall-Vancouver 2016 working group meetings.

The working group chair then displayed the current draft (draft D1.1) to the working group and highlighted the key areas that have changed from the original document. There was no discussion on the changes. Weijun Lei made a motion to take draft D1.1 to ballot and thereby requesting approval from the

subcommittee. Kiran Vedante seconded the motion and the WG unanimously approved the motion. It was agreed that the next step would be for the chair to request that the subcommittee go to ballot with draft D1.1.

A motion was raised by Weijun Lei to adjourn. Kiran Vedante seconded the motion. The working group unanimously approved the adjournment. The meeting adjourned at 2:20pm.

Respectfully submitted
Vinay Mehrotra
WG Chair

J.8.5 Unofficial Minutes of Spring 2017 Meeting of TF "Audible Sound Revision to Test Code C57.12.90", in New Orleans, Louisiana

The TF met at 1:45 PM, on Monday, April 3, 2017. Chairman Dr. Ramsis Girgis presided over the meeting. Secretary Barry Beaster assisted with the administrative duties.

After the Fall 2016 meeting, the membership had been adjusted to 49 members. For meeting preparation, a meeting agenda along with the unapproved Fall 2016 minutes were circulated to all members and guests of the last meeting. Additionally, proposed wording of text to be added to Table 17 of C57.12.00 explaining the purpose of the reference noise levels included in Annex – C was circulated to the membership asking for review of the proposed wording.

The meeting was attended by 31 of the 49 members and 63 guests for a total of 94 persons. A quorum was established at the start of the meeting by a hand count. This was later confirmed by the RFID tag in system. The unapproved agenda was presented and unanimously approved without change. The Fall 2016 meeting minutes had no requested changes or corrections and were also unanimously approved. There were seven requests for TF membership; which will be reviewed based on previous meeting attendance.

After the introductions, Chairman Dr. Ramsis Girgis presided over the technical portion of the meeting.

The first technical Agenda item presented was the previously agreed upon incorporation of the no load noise levels NEMA TR1 Tables 1 & 2 into Annex C of C57.12.00. Accordingly, reference to Annex – C will be introduced to the statement in Table 17 referring to these tables. The statement will read:

> ***Transformers shall meet standard audible No Load sound level as listed in NEMA TR1-2013, Table 1 for power transformers and Table 2 for distribution transformers <u>given in Annex C</u>, or as specified by the purchaser.***

In discussing this item, the chairman presented previously collected measured noise level data demonstrating that NEMA Sound pressure levels still represent no load sound levels of transformers where no design or external means of no load noise reduction are used. For example designs with cores made of regular grain oriented steel, high core flux density, high speed fans, and no external means of noise reduction.

Next item discussed was replacing the formulas presently included in Annex – C, for calculating reference load noise Sound Power levels, with tables of corresponding Sound Pressure levels. This is since the NEMA levels of no load noise are Sound pressure levels. Also, IEEE Standards deal with Sound Pressure levels not Sound Power Levels. Accordingly, the reference to Annex – C in the statement in Table 17 referring to these load noise tables will be slightly modified to read as follows:

Upon Purchaser's request, the transformer may be tested for its audible load sound level in order to determine the total sound level of the transformer under pre-specified load (s). For reference load sound <u>pressure</u> levels, refer to Annex C.

In response to a question on whether the proposed load noise levels apply to single phase transformers as well, the chairman answered that the difference between Load Sound levels of single phase and three phase transformers is small and is much smaller than differences in noise levels of transformers of the same MVA rating.

In response to a question on total noise level of banks of three single phase transformers, the chairman answered that noise levels given in Annex – C apply to individual transformers and relate to testing individual transformers in the factory.

Enrique Betancourt asked about small transformers as to whether there is need to use a different set of Reference load noise levels. The chairman responded that the Reiplinger's curve still runs in about the middle of the measured load noise level data for low MVA transformers. Also, load noise is not much a factor for small power transformers.

The next item of business was the review of the proposed wording of note to be added to Table 17 in C57.12.00 referencing noise levels incorporated in Annex – C. This wording was circulated prior to the meeting and several members responded with comments. This wording was reviewed and modified by the Chairman for the Task Force meeting. The proposal was reviewed and discussion was held. No disagreements were raised. Below is the modified text of that note:

Sound levels given in Annex – C for No Load and Load Sound Pressure levels correspond to Sound levels of transformers where no special design, or external, means of noise reduction, are used. The objective of these levels is to be used as a measuring stick for how much lower a guaranteed sound level of a transformer is from these levels. Specifying the sound level of a transformer should be based on the required sound level at the boundary.

The next item presented was data on effect of the position of the Tap Changer on the load noise level. Measured data on seven transformers of different designs, varying from 70 to 180 MVA was shown. In each case, the tap with all turns in consistently resulted in the highest sound level. Some variability exists when comparing all turns out with the neutral position. Sanjay Patel offered to collect corresponding data on his company's transformers and present it in the next TF meeting.

Another area of interest presented is the change of core and load noise with temperature. Core noise levels measured during an over- excitation test over a period of eight hours show. There was little change seen with this data. The chairman indicated that this is basically true for all good quality core steels with coating that applies sufficient surface tension on the steel. He also indicated that he has had experience with core steel with poor quality coating where core losses increased up to 15 % and core noise by several dB (s) after about a 4 – hour period of over-excitation.

A similar data set was shown for Load noise versus temperature of 7 different medium and large power transformers of different designs. This data showed that in 5 of the 7 transformers, the load noise level at the end of the heat run decreased by a fraction of a dB to about 1.5 dB compared to the levels measured at cold conditions before the start of the temperature test. In 2 cases, load noise levels increased about 2 dB. The chairman commented that, in these two cases, winding noise was not the main contributor to the total load noise of the transformer. A representative of a manufacturer commented that, in one case, load sound level increased by 3 dB after 3 hours into the heat run test but then stabilized around 1 dB increase after completion of the test.

Another area presented was the contribution of measuring the sound level above the transformer cover. Data was presented for examples of regular and low sound designs for core and load noise. The conclusion from this data is that measuring sound levels over the tank cover and including these

measurements in determining the average sound level of the transformer makes a difference of a fraction of a dB compared to determining the sound level of the transformer using measurements around the transformer only (per present IEEE Standards). Also, the IEEE formula for determining the sound power level of a transformer results in an average of 1 dB higher than calculated by adding the Sound power measured around the transformer and that measured above the cover.

Finally, the chairman showed a plot depicting how the cost of transformers is impacted by the choice of a core sound level. The impact is a bounded area that indicates the impact at several percent in cost can occur; especially for lower sound level transformers. The selection of guaranteed levels should be a result of study and not arbitrary as this may not be necessary. For load noise, the cost impact is low for a sound level reduction of up to about 3 dB but can be much higher when selecting a much lower load sound level.

The Chairman made another request for all manufacturers to continue to present no load and load sound data. This is important as work will continue.

As time, has expired, the meeting was concluded.

The meeting was concluded at 3:00 PM.

Respectively submitted,

Barry Beaster, TF Secretary

J.8.6 - WG for Revision of C57.110

Unapproved Meeting Minutes

IEEE/PES Transformers Committee

WG for Revision of C57.110

Astor Crown Plaza Hotel, New Orleans, La, USA

Chair: Rick Marek **Secretary:** Sam Sharpless

No meeting was held this time. The document has been approved by the WG and PCSC for ballot. Editing of substantial annex additions has delayed completion. The draft is expected to go to ballot before the next meeting.

J.8.7 ***PCS Task Force on General Requirements C57.12.00***

Performance Characteristics Subcommittee
IEEE / PES Transformers Committee

April 3, 2017 4:45 PM
Astor Crown Plaza Hotel
New Orleans, Louisiana USA

UNAPPROVED MINUTES

The PCS Task Force on General Requirements for C57.12.00 met on Monday, April 3, 2016. The Chair Tauhid Ansari called the Group to order at 16:45 and explained purpose and scope of the TF. **53** Members and **82** guests were present, and as Working Group membership stands at **81** members, we did have a quorum and were able to conduct official business. The following **15** guests requested membership:

Alwyn VanderWalt	Public Service Co. of New Mexico
Don Dorris	Nashville Electric Service
Fernando Leal	Prolec GE
Gregorio Lobo	Mitsubishi Electric Power Products
Hamid Abdelkamel	Ameren
Igor Simonov	Toronto Hydro
Joshi Akash	Black & Veatch
Kris Zibert	Allgeier, Martin and Associates
Liz Sullivan	ABB Inc.
Marcos Ferreira	Advisian-Worley Parsons
Rhea Montpool	Schneider Electric
Shamaun Hakim	CG Power Systems USA
Stephen Schroeder	ABB Inc.
Will Elliot	General Electric
William Boetger	Boetger Transformer Consulting LLC

The Agenda and the minutes from the Vancouver meeting were approved (Sangib Som/John Herron), with no comments or amendments.

Agenda Items were covered as follows.

1. OLD BUSINESS
   A. WG Item TF Item 106, 7.1.5.3 System characteristics, Table 14 Fault level of 46KV class is too high – Proposed by Shamun Hakim

The chairman explained that this request was not a question anymore, by explicit confirmation form Shamaun. There were no further comments from meeting attendees.

B. Inclusion of Sound Level values on transformer's nameplate

This item was brought up by Ramsis Girgis as a request received from transformers users during past activity of the Noise Level Task Force.
Ramsis explained how customers need to know transformer's sound levels to make decisions about suitable replacements for sensitive locations. Having that information only in test reports might not be useful enough a few years after installation. The chair opened the floor for discussion among members and guests.
Following arguments were brought up:

- The sound level stated on nameplate has to be the measured one in that unit, to fit customer's purpose (R.Girgis).
- Not all customers require measurement of transformer's sound level.
- Only first unit of a design should be tested.
- It could be better to state the guaranteed value, instead of the measured one.
- Utility OG&E requires by specification sound level measurement, and addition to nameplate for its transformers (R.Musgroove).

- It was proposed (Kushal S.) to define two levels of sound: “Low Sound” and “Standard”. No need of levels for Standard. For Low Sound, it has to be stated with level at nameplate.
- Another utility specifies sound level measurement and on nameplate, in case they have to move them (M. Weisensee).
- Total sound should not be specified to be on nameplate, as it would not have duplicates (S. Patel).
- Regarding extension of measured sound level to duplicates, Ramsis explained that there is a high variability on core noise levels (up to 8 dB, for same design), while by load noise it is significantly less. It’s not useful to put total noise, as not fully loaded. Today customer ask for sound level to be recorded. What does the C57.12.00 should state?
- Other participants objected that if it is in the standard, then every unit has to be tested.
- Specification of sound level should be in Std. C57.12.10 (Ajit Varghesse).
- Ramsis explained that PCS chairman referred the question to TF C57.12.00.
- What to do with old transformer that does not have sound level mentioned on nameplate (Dave Mark)?
- The TF Chair, Tauhid mentioned that already three more items will be added to nameplates in future revision of the standard.
- Another option proposed was to add a paragraph stating that the customer should request that the sound level be stated on the name plate, and action to take for sister units.
- Which nameplate,A, B or C does the noise level belong to? Would it be med in bridging position? How to know?
- Guaranteed sound level is not necessary maximum in operation (Shamaun H.).
- Noise level is a design test, not routine. We would have to change Table XVII (J.Arteaga).

A Motion was stated by Ramsis Girgis, supported by Subash Tuli:

- To add a paragraph to C57.12.00, that upon customer’s request, the measured sound level on individual units will be added to the nameplate. In the case of a multiple-units design, measured sound level of individual units could be added too.

Before taking a vote, there was still discussion on:

- The word “upon request” is not for a Std. Proposes something more standardized.
- Ramsis countered saying, it is used in many standards.
- Just leave to customer to specify.
- Sound level could be on nameplate drawing, only for special transformers.
- Customers can always ask for what they need on nameplate.
- Important to make customers aware that they should not accept duplicate unit results. This is an acceptance issue, not a test issue.
- Nameplate is for Operations people. Decision to move the transformer is for asset management people, with access to nameplate drawings and test report.
- Is it possible to include note on Table, instead.
- Toronto-Hydro- Request sound level test. Doesn’t want it in standards. It is the frequency (of sound) that can create problems.

By taking a vote, the Motion was rejected with 9 Members in favor, and the rest opposed.

2. NEW BUSINESS

Shamoun Hakim: Impulse level for LV side of class I transformers can unnecessarily overstress transformers. Impulse level should be according to winding rated voltage.

The Chair Tauhid referred the subject to the Dielectric Tests SC.

Sanjay Patel about Clause 7.1.1 on short circuit: Multi-winding transformers should have fault contribution from all un-faulted terminals, if not otherwise specified by customers.

Being at end of official meeting time, the subject was phased for the next TF meeting.

The meeting was adjourned at 6:00 PM (Sangib Som/Craig Stiegemeir).

Respectfully submitted,

Tauhid Ansari
WG Chair

Enrique Betancourt
Secretary

J.8.8 IEEE Standard Requirements, Terminology, and Test Code for

Shunt Reactors Rated Over 500 kVA C57.21
New Orleans, LA
Astor Crowne Plaza Hotel

Tuesday April 4, 2017

The working group met in the Grand Ballroom D of the Astor Crowne Plaza Hotel on Tuesday April 4, 2017, at 9:30 AM.

The meeting was called to order at 9:30 AM by Chairman Sanjib Som.

There were a total of 89 participants: 12 Members and 77 Guests out of which 8 Guests requested membership.

- The meeting was opened with the circulation of attendance roasters and call for potentially essential patents. No patent issues were raised.
- 12 of the current 22 WG Members were present and quorum to carry out business was met.

Meeting notes:

- **Meeting Agenda**
  - Meeting agenda, which was circulated among members and guests on March 7, 2017 by email, was presented to the audience.
  - There were no objections or comments and the agenda was approved unanimously.

- **Minutes from previous meeting**
  - The minutes from the F16 meeting in Vancouver, which were circulated on March 7, 2017 by email, were presented to the audience.
  - There were no objections or comments and the F16 meeting minutes were approved.

- **Old Business:**

WG was advised that the PAR will expire in 2018. Work on the comments and draft for the standard revision will have to advance for prompt circulation among the WG members. Goal is to get documentation ready by January 2018 for SA ballot.

1. Comments on Section 12 by Mike Sharp:

1.1. On section 12.2, the use of the word ‘safety’ was questioned as its use in not clear within the context of a standard from the editorial standpoint. Steve Antosz suggested going back to IEEE SA editors for guidance on rules and legal implications. Jim McBride and Erin Spiewak clarified that the standard cannot use the word ‘safety’ if to imply that by following the standard,

equipment and people would be safe. It was suggested that the section could be renamed 'Installation' or 'Precaution'.

1.2. Inclusion of a section on nameplate information requirements, missing from existing revision, is needed.

1.3. The marked up section 12 will be circulated among the members for review.

2. Comments on Section 10 by Bertrand Poulin:

2.1. Section 10 has been reviewed with the collaboration of Luc Dorpmanns on variable shunt reactors, Klaus Pointner on air core Dry Type shunt reactor, and the impulse section revised by Pierre Riffon. Marked up draft with the revisions was circulated for comments.

2.2. Pending are annexes B and C related to testing that need to be reviewed. Annex C is in good shape, annex B which deals with switching transients may need work or wait for next revision. Annex B is close to the work being done on the TF PC57.142 on switching transients by J. McBride. Bertrand stated that he will review Annex B.

2.3. The revisions have been circulated for comments.

3. Comments on Section 10.6 Audible Sound test by Chris Ploetner:

3.1. Several comments were presented in a summary table. Main topics listed below.

3.2. A motion by Bertrand Poulin to specify the sound test at maximum 1.05 of nominal voltage was raised. Seconded by Shamaun Hakim. Accepted.

3.3. A motion was raised by Chris Ploetner seconded by Mike Sharp to set a minimum of 90% of nominal voltage for sound test as acceptable if 105% cannot be achieved. Levels lower that 90% cannot be used as basis for extrapolation to 105%. Accepted.

3.4. Other topics still under discussion for cold-warm sound test and sound pressure vs. sound intensity.

3.5. It was clarified that references on sound levels from a CIGRE publication cannot be used in the standard unless permission granted due to copyright issues. Coordination with IEEE-SA needed.

3.6. Compilation of comments has been circulated among the membership for further comments.

4. Presentation by Hem Shertukde on gapped-core shunt reactors.

4.1. Presentation of material for consideration to make it part of the standard or as an annex. Presentation has been circulated among the members.

5. Question from Joe Melanson of test requirements (for Bertrand Poulin):

5.1. Should front of wave test be included? Should test voltages in C57.12.00 annex on front of wave test levels.

5.2. Bertrand to investigate and provide recommendation.

5.3. Luc Dorpmanns pointed out that the annex in C57.12.00 is informative. Users may be referred to standard C57.12.90 test code for liquid immersed transformers to specify front of wave test for liquid immersed shunt reactors.

6. Art Del Rio to coordinate with Jim McBride (support from Bertrand) on the review of the Annex B on dielectric stresses on shunt reactors during switching.

No new businesses were presented.

Meeting was adjourned at 10:45 am.

Next meeting: Fall 2017, Louisville, KY, October 29-November 2, 2017.

Respectfully submitted,
Chairman: Sanjib Som (sanjib.som@siemens.com)
Secretary: Arturo Del Rio (a.delrio@ieee.org)

J.8.9 - WG P60076-16 Standard Requirements for Wind Turbine Generator Transformers

Chairman: Phil Hopkinson; Secretary: Donald Ayers

The Working Group on Wind Turbine Generator Transformers was called to order at 9:30 a.m. EST on Tuesday, April 4, 2017 at the Astor Crowne Plaza Hotel in New Orleans, Louisiana. There were 118 attendees, 34 members were present of a membership of 55 and 84.

The minutes from the Fall 2016 meeting were approved.

Don Ayers presented the results of the Rev 3 ballot as follows:

151 eligible people in this ballot group.
119 affirmative votes
6 total negative votes without comments
0 negative votes with new comments
0 negative votes without comments
8 abstention votes: (Lack of expertise: 3, Lack of time: 1, Other: 4)
133 votes received = 88% returned
6% abstention
This ballot has met the 75% returned ballot requirement.

Approval Rate - The 75% affirmation requirement is being met.
115 affirmative votes (4 comments submitted)
4 affirmative votes with comments
6 negative votes without comments
125 votes = 95% affirmative

As far as the IEEE is concerned, the standard can be submitted to RevCom.

Erin Spiewak, IEEE reported that IEC's CDV on Rev 3 is due to close on April 21, 2017 and a copy of the comments on the FDIS have been requested. The possibility of needing another recirculation may be required based on the comments from IEC.

With no new business, the meeting was adjourned at 10:25 a.m.

The working group was not disbanded waiting for the results of the IEC ballot.

Subhas Tulle motioned and Aniruddha Narawane seconded the adjournment of the meeting. The meeting was adjourned at 9:45 a.m.

Respectfully submitted,

Donald E. Ayers
Secretary

J8.8.10 - Working Group on Revision of C57.32

Name	Company	Designation	E-Mail	Phone	Present
Sergio Panetta	I-Gard Corp.	Chair	spanetta@ieee.org		✓
Yann Elassad	MS Resistances	Vice-Chair	yann.elassad@msresistances.com		✓
Tom Yingling	Hubbell Inc.	Secretary	tyingling@hubbell.com	859-292-4341	✓
Sinan Balban	Oz Direnc Ltd.		sinan@ozdirenc.com		✓
Bernard Audouard	MS Resistances		bernard.audouard@msresistances.com		✓
Ed teNyenhuis	ABB		edt@ieee.org		✓
Sheldon Kennedy	Niagara Transformer		skennedy@niagaratransformer.com		✓
Les Recksiedler	Manitoba Hydro		lrecksiedler@hvdc.ca		✓

IEEE/PES Transformer Committee
Spring 2017 Meeting
April 2-6, 2017
New Orleans, LA
Meeting Room: Bourbon Room
Date: April 4, 2017
Time: 9:30-12:40

1. Call to Order
2. Welcome (Sergio Panetta)
3. Self-introduction of those present (all)
4. Record of attendance. This is our first meeting. Future quorums will be based on membership per P&P requirements. All participants that requested membership status became members since this was the first meeting.
5. Issue 1: Coefficient of Resistivity language. Language will be submitted by members and circulated to all members for comment and review.
6. Issue 2: 1.1.1.1 Ten Second, One Minute and 1.1.1.2 Ten Minute Ratings paragraphs are accepted as currently written.
7. Sergio will look into broadening the scope of this task force to add nameplate requirements to the standard. Possibly by adding an Annex.
8. 1.9.2 Change Rated current to rated voltage and considered additional language to require initial current during temperature rise test to equal or exceed the rated current. Rated current is equal to rated thermal current Per Standard 100 Definitions.
9. Consider language requiring testing environment to be reflective of the installation.
10. Add 316 stainless steel to Table 5. Change SR-18 and 1JR in table 5 to ASM type III and IV.
11. Issue 3: Paragraph 7.6, Table 24 Move Lightning Impulse Test mark in "Routine" column to "Other" column.
12. Motion to adjourn by Tom Yingling, seconded by Bernard.
13. Next Meeting - 2017 Fall meeting in Louisville, KY.

J.8.11 Working Group on Semiconductor Power Transformers – C57.18.10

Unapproved Meeting Minutes

Astor Crowne Plaza Hotel, New Orleans, LA
Grand Ballroom D
11:00 am, April 4, 2017

The Working Group met in the Grand Ballroom D meeting room

There were 41 people present. 11 members and 30 guests present. A quorum was present.

The patent call was given. Nobody replied with any patent issues.

The agenda was approved unanimously.

The minutes of the October, 2016 meeting in Vancouver were unanimously approved as written.

Old Business

- Bill Whitehead updated the draft standard with new scope from PAR. Need to double check that PAR and Standard scopes are in exact agreement,
- Sheldon quickly reviewed the items discussed at the previous meeting.
- Sheldon reviewed the changes to the Draft Standard and urged the audience to review the changes and comment on the changes. Sheldon will send out the login and password for the Transformers Committee web site along with the minutes since most people couldn't read the Draft.
- Sheldon asked for a volunteer to add wording on interphase applications. Nobody volunteered and it was not clear who originally proposed this issue. Tabled for now.
- Interaction between transformers and breakers- The discussion was if the Standard should just note the issue or if it should add more information? No discussion on issue. Casey Ballard volunteered to write some wording about the issue for the draft.
- Non-classical harmonics and VSDs. David Walker volunteered to write something about non-traditional harmonics for inclusion in the Standard.
- Eddy Currents and Stray Losses- The current Standard uses fixed percentages in various windings. IEC does not have fixed percentages. Most manufacturers present in the meeting said that they used FEA for harmonic loss analysis. Subhas Sarkar– some customers don't understand the percentages and can misinterpret them so they should be removed. Sheldon Kennedy- Historically fixed percentages were conservative and tended to result in conservative (expensive) designs. Rick Marek- C57.110 has reduced some percentages and added some actual test data for reference. C57.110 is primarily for users who don't have design or FEA information and not for designers. Sheldon- C57.18.10 is for designers and FEA is recommended. Vijay Tendulkar- Recommended that we retain the existing information in the standard. Not everyone has FEA and it also gives customers a means of calculation. Chuck Johnson- There is free FEA software available. Numbers from 30 years ago aren't relevant. FEA is the only accurate method. C57.18.10 is not a user document and ought to give guidance to designers to make a cost-effective transformer. Harmonic loading and calculations should be a discussion between the designer and customer. Subhas Sarkar- moved that we delete percentage information from the standard. Motion seconded by Chuck Johnson. Dhiru Patel– proposed an amendment to the motion-move percentages to an annex. Vijay Tendulkar seconded

motion. 11 in favor. Motion passed. Will need to change examples or move existing examples to the annex. Subhas to supply text for annex.

- Short Circuits on multipulse windings- No comments.
- High Resistance Grounding- Sheldon to ask Paul Buddingh to write something about it since it was his initial concern.

New Business:

- Call for new business- no responses.

With no further business, the meeting was adjourned at 11:51.

The Working Group will meet again at the Fall 2017 meeting in Louisville, KY

Chairman: Sheldon Kennedy

Vice Chairman: Bill Whitehead

Secretary: David Walker

J.8.12 PC57.105 – IEEE Guide for Application of Transformer Connections in Three-Phase Electrical Systems

Tuesday, April 4th, 2016 - (1:45 PM – 3:00 PM)

Chair: Rogerio Verdolin
Vice-Chair: Benjamin Garcia

1. **Attendance:**

.	Members:	7
a.	Guests:	13
b.	Guests requested membership	2
c.	Total:	20
d.	Quorum:	Yes

2. **Patents:** Call for patents were made by the Chair. No patents were claimed by guests/members.

3. **Meeting Called to Order:** 1:45 pm on Tuesday, April 4th, 2016.

4. **Spring 2017 Agenda Approval:** A motion was made by John John, and seconded by Samuel Sharpless, to approve the Spring 2017 meeting agenda. The agenda was approved unanimously.

5. **Fall 2016 Minutes Approval:** A motion was made by John John, and seconded by Samuel Sharpless, to approve the meeting minutes from the Fall 2016 meeting in Vancouver, BC Canada. By unanimous vote, the minutes were approved.

6. **PAR Status:** PAR expires December 31st, 2019, which represents 3 meetings before we have to conclude the guide. The PAR was approved March 2015. The draft has to go to ballot at the end of 2018. We have to conclude our draft by fall of 2018.

7. **Old Business (Section 4 and 5):** John John and Samuel Sharpless reviewed Sections 4 and 5 and provided their comments at the Fall 2016 Vancouver meeting. Their edits are included in C57.105_D5. No further action was taken at today's meeting on these Sections with the exception to Section 4.6.1.

8. **Old Business (References and Bibliography for the whole Draft):** The Chair said that more references and bibliography, in addition the ones already submitted, are needed. The Chair asked for a volunteer to review the current reference list and to add to it if possible.
   - ACTION ITEM: Phil Hopkinson volunteered to review the current reference list and bibliography. He also stated that any document listed in this section has to be a public document and not an internal, proprietary OEM document.

   Samuel Sharpless reviewed C57.12.10 to see if we should copy over any of the connection diagrams to C57.105 with respect to terminal designation. Samuel recommended that we don't include these figures for 2 reasons:
   . Maintaining figures in 2 documents doesn't make sense.
   a. C57.105 is a "guide" not a "standard" and therefore won't be referenced when determining terminal designation.

   Rogerio Verdolin will send Samuel the latest published revision of C57.12.70 so that he can complete his review of 4.6.1.

   The Chair asked for another volunteer to review 4.6.1 for content and accuracy:
   - ACTION ITEM: David Walker volunteered to review Section 4.6 and provide comments.

9. **Old Business (Section 6: Harmonic Currents and Voltages):** Mike Thibault reviewed Section 6 and reported back to the Working Group that he had no comments or changes. The Chair asked for a second volunteer to review Section 6 for content and accuracy.
   . ACTION ITEM: Phil Hopkinson volunteered to review Section 6 and provide comments.

10. **Old Business (Sections 7, 8, and 10):** Dan Mulkey and Ben Garcia reviewed Sections 7, 8 and 10 and reported back to the Working Group with changes detailed in C57.105_D4. The Chair asked for a third volunteer to review the changes for content and accuracy.
    . ACTION ITEM: John John volunteered to re-review Sections 7, 8 and 10 and provide comments.

11. **Old Business (Section 4.4 T-T Connections):** Giuseppe Termini submitted a PowerPoint presentation to the Working Group showing T-T connection diagrams that he wants to have added to C57.105_D5:
    . Giuseppe would like to include the first 2 diagrams of his PowerPoint into the standard; PICO Energy is not the only utility to use this connection.

a. Phil Hopkinson thinks that this information belongs in the text of the standard; Samuel Sharpless said he thinks that the supporting documentation from the presentation should be included in the Annex.
b. Giuseppe will draft verbiage that fits into the standard and send it to the team for review.

12. New Business: None.

13. ACTION ITEM: Rogerio/Ben will send out an updated C57.105_D5 including all work done to-date, in a Word format for all working members to review and comment (with Track Changes on). All updates are due to the Working Group Chair by **May 4th, 2017**.

14. Meeting Adjourned at 2:45pm
    . Motion: Phil Hopkinson
    a. 2nd: John John.

Respectively submitted,
Rogerio Verdolin, Chair
Benjamin Garcia, Vice-Chair

J.8.13 Working Group for the revision of C57.142

New Orleans, Louisiana Tuesday,
April 4th, 2017 3:15 PM – 4:30 PM
Grand Ballroom C
Chairman – Jim McBride
Vice Chair – Xose Lopez-Fernandez
Secretary – Tom Melle

1) Welcome and Chair's Remarks

2) Circulation of Attendance Sheets - 134 Members and Guests Attended, 32 of 41 Members present (quorum achieved). Membership of prior TF will extended to new WG
Membership requested by 27 guests, Current Membership 68 Members

3) Approval of Agenda and Minutes from Last TF Meeting

Agenda Approved - First: Rogerio Verdolin / Second: Phil Hopkinson

Minutes Approved - First: Bertrand Poulin / Second: Phil Hopkinson

4) Status of TF Paper Submission

IEEE Transactions Paper must be resubmitted to IEEE with additional author information to be added for significant contributors (authors).

5) Status of C57.142 PAR Application

PAR approved. Expires December 31, 2021.

This work will be jointly sponsored by the Switchgear Committee

Administrative work and main meetings will take place at Transformers committee meetings, but the Transformers committee WG will receive contributions from Switchgear Committee.

6) Presentation was made on the Impact of the Transformer's Neutral Grounding Method on its Transient Performance under Lightning Impulse by Waldemar Ziomek
Presentation demonstrated significant differences in internal stress between the TV and LV windings based on solid grounded, resistive grounded, and reactively grounded neutral. These interactions were modeled and the models confirmed using a recurrent surge generator (RSG)

Motion was made to include neutral-grounding clauses presented in the revision of C57.142.

Motion by Waldemar Ziomek. Second: Bertrand Poulin

25 voted for motion. 1 vote against. Motion carried.

Jim McBride will request posting of Waldemar's presentation on the WG website.

7) Presentation on Measured 500kV Shunt Reactor Switching Transients – Jim McBride
Transients interactions were presented from energization and de-energization of 500kV reactors using breakers and SF6 interrupters. The de-energization transients with the circuit switcher demonstrated re-ignition transients at the terminals of the reactor.

Phil Hopkinson asked if there were any problems found with transformers or switchgear in study? Answer: No equipment quality problems were detected. However, problems occurred due to the system interactions between the devices.

Phil mentioned that many times involved parties are not willing to share data from failure events. He asked if this data would be available for the guide? Answer: The Chairman hopes that TF members who have already presented in the task force will allow the data/material to be used in the revision of the standard.

Rogerio Verdolin commented that the opening transient applied to the reactor at different opening points can create very different results. Answer: It was agreed that the opening point can make significant differences in the transients. This is demonstrated in the waveforms presented. These transients can be 1000 times faster than most instrument transformers are capable of measuring.

8) Discussion on Team for Mitigation Methods, Factory Testing, and Field Service Conditions. Examples include: use of coupling capacitor in parallel to ground, increase of BIL, or special factory tests. A separate TF is being formed to study options. Current membership of this group is:

Phil Hopkinson
Mike Spurlock
Hamid Sharifnic
Akash Joshi
Shekhar Vora
Jim McBride
Waldemar Ziomek
Pugal Selvaraj
Dave Caverly
John Hall
Amitabh Sarkar

Cihangir Sen

9) New Business - Chair suggested having all WG membership associate with writing or reviewing revisions to the guide in one of the following seven areas. The Chair will seek lead persons in the writing of the additions in each of these areas.
   1. System Faults and Cable Switching that produces traveling waves with reflections that excite lightly loaded transformers to resonance
   2. Generator step-up transformers operating in back feed mode are excited to resonance by system transients
   3. High frequency switching operations close to the transformer terminals excite internal resonance due to multiple re-ignitions and restrikes
   4. Incorporate more mitigation techniques into the document
   5. Include information on stress in the transformer due to the method of neutral grounding.
   6. Include information on reactor switching interactions
   7. Include information on upstream and downstream interactions in low power factor and highly inductive circuits. dividing.

10) Next Meeting (Louisville, Kentucky)
    Pierre Riffon to give presentation on special termination LI

11) Adjournment at 4:30 PM

Annex K Power Transformers Subcommittee

April 5, 2017
New Orleans, LA
Meeting Time: 1:30 p.m.

Chair: Bill Griesacker
Vice Chair: Kipp Yule
Secretary: Alwyn Vanderwalt

K.1 Meeting Attendance

The Power Transformers Subcommittee met on Wednesday, April 5, 2017, at 1:30 PM. The attendance recorded indicated that 76 out of 110 members of the subcommittee were in attendance; a quorum at the meeting was achieved. A total of 209 individuals attended the meeting; 36 guests requested membership.

K.2 Approval of previous meeting minutes, and meeting agenda

The agenda for the meeting was presented and it was approved; see Attachment K.2.

The Chair requested a motion to approve the Fall 2016 Vancouver meeting minutes. There were no objections to unanimous approval to the meeting minutes and they were therefore approved.

K.3 Chair's Remarks

Alwyn Vanderwalt has agreed to take on the responsibilities of secretary for this subcommittee.

K.4 Working group reports

K.4.1 Revision of C57.12.10 IEEE Standard Requirements for Liquid-Immersed Power Transformers – Gary Hoffman

See details of meeting minutes in Attachment K.4.1. The working group did not hold an official meeting but provided an update regarding the status of the balloting process. It was noted that the comment resolution process has just started and was not far enough along to provide specific details of the comments. The WG Vice-Chair indicated that a red-line comment resolution draft would be created and would be transmitted by email to WG members when.

K.4.2 Revision of C57.93 IEEE Guide for Installation and Maintenance of Liquid-Immersed Power Transformers – Mike Lau

See details of meeting minutes in Attachment K.4.2. A new PAR extension was approved through 2018. The latest draft was issued for a straw ballot of the WG membership. The chair reviewed the results of the straw ballot; there were 175 comments submitted that require resolution, a number of attendees volunteered to help with the resolution process. It was also discussed if sections 4 and 5 of the guide should be merged to eliminate overlapping material, a comparison will be made in the next month to move the issue along given the short time left on the PAR.

Unapproved Draft

K.4.3 Revision of C57.125 Guide for Failure Investigation, Documentation, Analysis and Reporting for Power Transformers and Shunt Reactors – W. Binder

No meeting was held.

K.4.4 TF to Compare C57.131-2012 Standard for Load Tap Changers and IEC 60214-1 ED 2.0 for consideration of recommending adoption of IEC standard (Also WG 60214-2 Tap-Changer Application Guide) - Craig Colopy

See details of meeting minutes in Attachments K.4.4.1. and K.4.4.2.

TF Comparison of IEC 60214-1 and IEEE C57.131: Craig Colopy reported that there are issues with IEC regarding the dual logo document that need to be resolved. The Group may form a joint IEC/IEEE WG to resolve these issues.

WG TC Application Guide IEC 60214-2: The final draft will be sent out to IEC for comments by June 2017 and at the same time the chair will send out the document to IEEE for ballot. The final draft of the document, when available from the convener sometime in June 2017, will be provided to the working group for review and approval to go out for ballot.

K.4.5 C57.140 Guide for the Evaluation and Reconditioning of Liquid-Immersed Power Transformers – Paul Boman

See details of meeting minutes in Attachment K.4.5. Comments were resolved to the first recirculation for ballot comments. A motion was made to accept the resolutions, the motion passed and the document will be sent to IEEE for publishing.

K.4.6 C57.143 – Guide for Application of Monitoring Equipment to Liquid-Immersed Transformers and Equipment – Mike Spurlock

See details of meeting minutes in Attachment K.4.6. Mike Spurlock reported that the WG met for the first time to revise the original document. General discussions were held and a presentation on the existing Guide and other documents was given by Brian Sparling as consideration for the direction for the WG to take with this first revision.

K.4.7 Revision of C57.148 Guide for Control Cabinets for Power Transformers

See details of meeting minutes in Attachment K.4.7. Joe Watson reported that the WG met and discussed comments from a straw ballot of the original document. Two task forces were created to review and resolve these comments.

K.4.8 Revision of C57.150 Guide for the Transportation of Transformers and Reactors Rated 10,000 kVA or Larger – Greg Anderson

The working group held its first meeting under a new PAR. No meeting minutes were submitted.

K.4.9 Development of PC 57.153 Guide for Paralleling Transformers - Tom Jauch

No meeting was held.

K.4.10 Development of PC57.156 Guide for Transformer Tank Rupture Mitigation of Liquid-Immersed Power Transformers and Reactors - Peter Zhao

Working group did not meet.

Unapproved Draft

K.4.11 Development of PC57.157 Guide for Conducting Functional Life Tests for De-Energized Tap Changer Contacts - Phil Hopkinson

Working group did not meet.

K.4.12 Development of Standard Requirements for Phase Shifting Transformers - IEEE/IEC 60076-57-12 - Raj Ahuja

No meeting. Work was completed in February of 2016. IEC approved the document and will now go to publishing.

K.4.13 Task Force on V/Hz Curve – Joe Watson

See details of meeting minutes in Attachment K.4.13. A motion in the subcommittee was made for the task force to continue its work; the motion was approved. The TF will continue to meet by conference call or web meeting and will request a small meeting room at the next meeting in Louisville.

K.4.14 Task Force on Condition Assessment Guide – Brain Sparling

See details of meeting minutes in Attachment K.4.14. The task force recommended to proceed with work to develop a guide on transformer condition assessment. The subcommittee approved a motion with this recommendation so a working group will be formed at the next meeting in Louisville.

K.5 Old Business

TF on Condition Assessment: The task force recommended that a guide be developed; the motion was approved. Brian Sparling reported that the TF met on Tuesday and is recommending that a Guide be developed on condition assessment of power transformers and a method of assigning some type of index to each transformer, based on criteria and test processes in several other standards and documents. After some discussion, Daniel Sauer made a motion to accept the TF report and to form a WG to develop the recommended Guide. The motion was seconded by Wallace Binder and approved by the SC with 30 affirmatives, 8 negatives and 9 abstentions.

TF on V/Hz curve: After discussion and several motions, it was agreed that the present task force would continue the work to determine if a guide should be created. Joe Watson reported that the small TF that was assigned to investigate the need for an IEEE document to cover V/Hz issues, had examined the subject and determined that there were no existing IEEE guides or standards that covered the subject in sufficient detail. The TF recommended that the TF be expanded with more transformer experts to re-evaluate the need and, if recommended, develop the groundwork for a new document. A motion was made by Paul Boman and seconded by Wallace Binder to accept the TF recommendations and continue their work. Phil Hopkinson offered a motion, which was seconded by Tauhid Ansari to form a task force to develop a spreadsheet to create a V/Hz curve for individual transformers, based on the design characteristics, but after discussion the consensus was that the motion proposed forming a TF with a similar scope as the original TF and did not pass when voted on by the SC. The original motion passed with 30 affirmatives, 12 negatives and 9 abstentions.

K.6 New Business

No new business.

Unapproved Draft

K.7 Adjournment

The meeting adjourned as scheduled.

K.8 Attachments –Working Group Meeting Minutes and Agenda

Attachment K.2 – S16 PTSC Agenda
Attachment K.4.1 – PC57.12.10 Standard Requirements
Attachment K.4.2 – PC57.93 Installation Guide
Attachment K.4.4.1 – TF IEC 60214-1 / IEEE C57.131 Tap Changer harmonization
Attachment K.4.4.2 – WG 60214-2 IEC Tap Changer Part 2 Application Guide
Attachment K.4.5 – PC57.140 Evaluation and Reconditioning Guide
Attachment K.4.6 – PC57.143 Monitoring Guide
Attachment K.4.7 – PC57.148 Control Cabinets
Attachment K.4.13 – Task Force on V/Hz Curve Guide
Attachment K.4.14 – Task Force on Condition Assessment Guide

Unapproved Draft

AGENDA

Power Transformers Subcommittee
IEEE PES Transformers Committee
Wednesday, April 5, 2017, 1:30-2:45 PM
Astor Crowne Plaza Hotel, Grand Ballroom, New Orleans LA, USA
Bill Griesacker – Chair, Kipp Yule – Vice Chair, TBD – Secretary

1. Call to order
2. Distribution of attendance sheets
3. Determine quorum
4. Approval of previous meeting minutes
5. Chair remarks
6. Working Group and Task Force reports
    a. WG Revision to C57.12.10, Standard Requirements .....G. Hoffman
    b. WG Revision to C57.93, Installation Guide .....M. Lau
    c. WG 60214-1-57-131, Tap Changers .....C. Colopy
    d. WG Tap Changer Application Guide IEC 60214-2 .....C. Colopy
    e. WG Revision of C57.140, Life Extension Guide .....P. Boman
    f. WG Revision of C57.143, Monitoring Guide .....M. Spurlock
    g. WG Revision of C57.148, Control Cabinet Standard .....J. Watson
    h. WG Revision of C57.150, Transportation Guide .....G. Anderson
    i. TF Transformer V/Hz Curves .....J. Watson
    j. TF Transformer Condition Assessment Guide .....B. Sparling
7. New business
8. Old business
9. Adjournment

Unapproved Draft

Attachment K.4.1

PC57.12.10 - WG for the Revision of IEEE Standard Requirements for Liquid-Immersed Power Transformers

8:00 to 9:15 AM, April 4, 2017
Astor Crowne Plaza Hotel, New Orleans

Unofficial Session Summary

WG Chair Gary Hoffman was unable to attend the IEEE Transformers Committee meetings this week so WG Vice-Chair Brian Penny filled in with Gary's absence. WG Vice-Chair Brian Penny called the session to order at 8:00 a.m., Tuesday, April 4, 2017, with WG Secretary Scott Digby also present. The WG Vice-Chair noted that this was not to be considered an official WG meeting, but would just be a short update regarding the status of the balloting process. Introductions were not conducted beyond the WG Vice-Chair and Secretary.

It was reported that the minutes to the previous WG meeting had been approved via an email circulation process, with 41 of the 65 WG members responding (63% of membership responding), with 36 voting to approve the minutes (88% of respondents approving, or 55% of WG membership), 1 voting to disapprove (with no comments regarding disapproval provided), and 4 abstaining. So based on the results the minutes of the Fall-2015 WG meeting in Vancouver are approved.
The WG Vice-Chair reported that the balloting of the document had closed on March 15th, reporting the following statistics regarding the ballot:

Ballot Pool	224
Ballot Returns	188 (84% return rate…meeting the 75% required return rate)
Votes to Approve	167 (89% approval rate…meeting the 75% required approval rate)
Votes to Disapprove	19
Abstentions	2
Comments received	271

The WG Vice-Chair noted that the comment resolution process has just started and was not far enough along to comment on specific items or comments. The WG Vice-Chair indicated that a red-line comment resolution draft would be created and would be transmitted by email to WG members when available. D. Giebel posed the question as to whether there were any common threads or themes in the comments, but the WG Vice-Chair reiterated that it was still too soon after the closure of the ballot to discuss any at this time.

The meeting was adjourned at approximately 8:15 a.m.

Respectfully Submitted,
Scott Digby, WG Secretary

Unapproved Draft

Attachment K.4.2

Working Group to Installation of Power Transformers C57.93
Monday, April 3, 2017er 24, 2016
1:45 – 3:15 PM
Capital Central Ballroom
Sheraton Hotel, Vancouver, BC

Chairman Mike Lau
Vice Chairman Alwyn VanderWalt
Secretary Scott Reed

The meeting was called to order at 1:45 am by Chair Mike Lau.

There were 13 of 25 members present. There were 55 guests and 37 visitors. A membership quorum was achieved. Guests attending the WG meeting for the first time who request membership or who have not attended 2 meetings in a row (including the present meeting, will be deferred until the next meeting attended.

Agenda
1. Attendance Roster Sign In / Quorum Check
2. Approval of the Agenda
3. Approval of the Fall 2016 minutes
4 Items of Discussion
- Straw Vote Ballot results
    Approved – 20
    Approved with Comments – 11
    Disapproved - 0
    Disapproved with Comments – 3
    Abstained – 1

- Resolution of negative ballots and comments
- Merging Clause 4 and 5 ?
- Any other outstanding comments for discussion

5. Unfinished Business
6 New Business
7 Adjournment

Due to the time constraints, attendees did not introduce themselves.

The Spring 2017 Agenda was unanimously approved. The Fall 2016 Minutes were unanimously approved.

Chairman Lau posted the Patent Claim. No notifications or comments were received.

Chair's Remarks:

Unapproved Draft

Chairman Lau reviewed the results of the straw ballot of draft version 1.4. There were 175 comments submitted that require ballot resolution. The following individuals volunteered to participate in the resolution review:

Don Dorris	Pat Rock	Paul Mushill	Pugazhenthi Selvaraj
Marcos Ferreira	Attila Gyore	Rich Simonelli	Mike Lau
Alywn VanderWalt	Scott Reed	Paul Bowman	

Next, there was discussion about potentially merging sections 4 and 5 of the guide to eliminate duplication. The concern is whether there is enough time to merge the sections so it could pass a ballot before the PAR expired. Alywn VanderWalt made a motion to 'Review Merging Sections 4 and 5' by comparing the two sections side by side to determine how much duplication there is. If it is feasible to do, then go ahead and proceed. Chairman Lau commented that the review needs to be done in the next month. Allen Peterson seconded the motion and the motion carried. The following individuals volunteered to participate in the merger review:

Mike Lau
Alwyn VanderWalt
Scott Reed
Wally Binder
Allen Peterson
Jim Graham

Alwyn will head up the review.

No new business was discussed.

The meeting was adjourned at 2:20 pm.

Unapproved Draft

Meeting Minutes	Page 9 of 20	REV 0
P60214-1-57-131	Working Group #	
Tap-Changers - Part 1: Performance requirements and test methods	Working Group Title	

Chair: **Craig A. Colopy** **Vice-Chair** **Axel Kraemer**

Secretary **Adam M. Sewell**

Current Draft Being Worked On: NA **Dated:** **NA**

PAR Expiration Date: December 31, 2020

Meeting Date: **04 April 2017** **Time:** **13:45 to 15:00**

Location: **New Orleans, LA**

K.9 **Attendance:**	**K.10**	**Members**	**23**
	K.11	**Guests**	**40**
	K.12	**Guests Requesting Membership**	**0**
	Total		**63**

Meeting Minutes / Significant Issues / Comments:

1. Meeting was called to order at 1:45 pm, April 4, 2017.
2. Introductions were made and attendance sheets were passed out.
3. Call for patents were made with no response from any attendees.
4. Chairman created a PAR for adopting IEC 60214-1 as IEEE C57.131. PAR was approved by IEEE SA Board after the Vancouver meeting. Task force group became a working group for the New Orleans meeting.
    a. TF membership was used for this WG as a start. Guests requesting membership for this WG will be given membership since this was the first meeting of the WG.
5. Per IEC, adoption of IEC standards is solely for the purpose of making that standard a national body standard. As IEEE is not affiliated with any single national body, pulling itself from the USNC, it is inappropriate for IEEE to adopt an IEC standard on this basis. Currently, there is no process in place for IEEE-SA to directly adopt an IEC standard, and due to the infrequent need to do so, it is not anticipated that IEEE-SA will approach IEC to negotiate such an agreement at this time. Erin Spiewak (IEEE-SA) met with IEC in Geneva, March 2017 and spoke about this point. Even though there is a process for adopting an IEEE standard into IEC, there IS NOT an approved process in place for IEEE to adopt an IEC standard. IEC will allow a national body to adopt their standards but not IEEE which is a global body currently. Erin also checked if using ANSI to adopt the standard from IEC would work, but IEC won't approve this direction due to no procedures in place.
6. Because of the inability to directly adopt the IEC 60214-1, the chair recommends doing a joint revision by IEEE/IEC of IEC 60214-1 allowing the IEEE C57.131 to expire in 2022 or have it officially superseded. Full support was given from the attendees. With a stability date for IEC 60214-1 coming up in 2019, a

reaffirmation is likely. The Convenor, Axel Kraemer, will discuss the possibilities of an early joint revision work the IEC administration.

7. Meeting closed at 2:15 pm.

Submitted by: Craig A, Colopy Date: 4/04/17

Meeting Minutes	Page 11 of 20	REV 0
P60214-2	Working Group #	
Tap-Changers - Part 2: Application guide	Working Group Title	

Chair: **Craig A. Colopy** **Vice-Chair** **Axel Kraemer**

Secretary **Adam M. Sewell**

Current Draft Being Worked On: 8WD **Dated:**

PAR Expiration Date: December 31, 2018

Meeting Date: **04 April 2017** **Time:** **15:15 to 16:30**

Location: **New Orleans, LA**

K.13	**Attendance:**	**K.14 Members**	**18**
		K.15 Guests	**45**
		K.16 Guests Requesting Membership	**0**
		Total	**63**

Meeting Minutes / Significant Issues / Comments:

8. Meeting was called to order at 1:45 pm, April 4, 2017.
9. Introductions were made and attendance sheets were passed out.
10. Call for patents were made with no response from any attendees.
11. Agenda for this meeting was unanimously approved.
12. Minutes from October 2016 in Vancouver were unanimously approved.
13. Timing was discussed and it was noted by the chair and vice chair that a CD (committee draft) of the final draft will be sent out to IEC for comments by June 2017 and at the same time the chair will send out the document to IEEE for ballot. The final draft of the document, when available from the convenor sometime in June 2017, will be provided to the working group for review and approval to go out for ballot..
14. The latest document draft 8WD of 60214-2 from the London work session (February 2017) was presented to the WG by Axel Kramer, IEC TC14 convenor. Highlighted key text was reviewed and discussed.
    a. Tauhid Ansari volunteered to send his suggestions on the clause regarding continuity tests to the chair and vice chair
    b. Several comments were received from the working group on subclause 12.1.3.1 regarding winding resistance measurements on each tap. Changes to draft will be made to reflect the input.
15. Next work session is TBD and may be set up directly after the October 2017 Louisville, KY IEEE TC meeting.
16. Meeting closed at 4:30 pm.

Submitted by: Craig A, Colopy Date:_____

Unapproved Meeting Minutes from Guide for the Evaluation and Reconditioning of Liquid Immersed Power Transformers PC57.140

Meeting was held in New Orleans, LA USA from 4:45-6:00pm April 3, 2017
Chairman: Paul Boman
Vice Chairman: Brian Sparling

There were 27 of 54 members present. There were 32 guests present. The WG meeting had a membership quorum present.

The Patent Disclosure statement was read and no submission made by the attendees.

Motion to accept the agenda as proposed, and was approved without comment.

The Fall 2016 WG Meeting Minutes were circulated prior to the meeting and the WG approved them without correction or comment.

The Chairman reviewed the 1st recirculation ballot comments on Draft 7 for the Guide. There were 11 comments received that included 9 editorial and 2 rejected comments.

All ballot comments have been resolved and the changes presented to the WG.

A motion by Joe Watson was proposed to accept the resolutions as made, and seconded by Patrick McShane. There was a short comment made by Joe Watson on the need for guidance by the Subcommittee or Committee about future usage of LTC. The vote on the Motion by those members present was unanimous.

The motion passed, and the Guide will be submitted for processing by IEEE SA.

Meeting was adjourned at 5:00PM.

Respectfully Submitted,
Paul Boman, Chairman

Revision to C57.143 – "Guide for Application of Monitoring Equipment to Liquid-Immersed Transformers and Components"
Transformer Monitoring Working Group
Monday, April 3, 2017
New Orleans, Louisiana, USA

Minutes of WG Meeting
The meeting was called to order at 3:15pm by Chair Mike Spurlock. Vice Chair Brian Sparling and Secretary Mark Cheatham were also present.
This was the first meeting of the working group and thus rosters were circulated and membership will be created based on the attendees present requesting membership. A complete list of attendees and membership status will be provided to the group. The WG does plan to meet at the Fall 2017 Transformers Committee Meeting in Louisville, KY.

Attendance (roster): 122
Attendance (RF Scanner): 133
Requested Membership: 65

MEETING AGENDA

A. Welcome & Introduction
B. Roster Circulation
C. *Quorum Roll Call (move to next meeting?)*
D. Chair Remarks
E. New Members – Indicate on Roster
F. Status of PAR Submission
G. Working Group Activities
    1. Presentation of the Tutorial on Cigré Technical Brochure No. 630, "Transformer intelligent condition Monitoring"
    2. Comparison of IEEE C57.143-2012 and Cigré TB 630, common themes, and gaps.
    3. Feedback from users of C57.143-2012. What was useful, what gaps exist, what needs improvement.
        a. This item is important to have active participation from the potential WG, in order to begin assignment of tasks for the revision.
        b. From this we need to establish a rough outline of the revised guide from a content point of view.

H. New Business

If you have any new business items to present at the meeting, please inform the Chairman, and Vice Chairman, as well as the Secretary, with your suggestion, for review, to make sure it fits within the scope and time of this meeting.

I. Adjourn

Introductions of the Vice Chair and Secretary were made. Attendees were asked to introduce themselves and indicate their affiliations when making comments or asking questions.

Mike Spurlock asked for any patent claims against C57.143 to be raised by attendees, none were expressed.

Mike Spurlock provided an update of the PAR. C57.143 was approved/published in 2012 and set to expire 2022.

PAR Status: PAR for a Revision to an existing IEEE Standard
Type of Project: Revision to IEEE Standard C57.143-2012
PAR Request Date: 19-Nov-2016
PAR Approval Date: 17-Feb-2017
PAR Expiration Date: 31-Dec-2021

Mike Spurlock gave an overview of the current C57.143 document, reviewing the previous scope, Purpose and overview of Major Sections included in the document.

- Mike Spurlock asked the attendees if anyone in the room had used the current guide and if they had feedback on the current guide. Feedback from several attendees indicated that the revision should include more real world applications of monitoring and interpretation of the data for actionable intelligence.

Vice Chair– Brian Sparling presented a Tutorial on Cigre Technical Brochure No. 630 “Transformer Intelligent Condition Monitoring”

Brian Sparling introduced a comparison of IEEE C57.143-2012 and Cigre TB630, common themes and gaps that will be provided for the attendees to review. Due to time constraints, the comparison was not presented or discussed.

- Roger Fenton – City of Riverside indicated that the current C57.143 guide does not provide guidance to the end user on location of the monitoring sensors on the Transformer and suggested that this should be included in the scope of the revision.

- Mike Spurlock proposed 3 areas of Focus for the Revision of the Guide as follows: o New
    - Sensors/Technology missing from the current guide
    - Data Interpretation and Classification. Task Force?
    - Communications - Protocols, Architectures and Regulatory Considerations. Task Force?

- Luiz Cheim – ABB suggested that the focus for revision is for the group to determine the structure of the guide before determining to add additional sensors.

- Mike Spurlock requested volunteers for helping to identify the structure needed for the revision and to work toward developing tasks forces to address gaps/revisions required.
- The Following Volunteers were received: o Mohamed Diaby – ABB
    - Scott Marshall – Power Engineers
    - Jeff Benach – Weidmann
    - Daniel Berler – ZTZ
    - Rogerio Verdolin – Verdolin Solutions
    - Donald Lamontagne – APS
    - Mickel Saad – ABB
    - Luiz Cheim – ABB
    - Bill Whitehead – Camlin
    - Emilio Morales –
    - Jeff Golarz –
    - Gustavo Leal – Dominion
    - Joe Watson –
    - Roger Fenton - City of Riverside
    - Poorvi Patel - ABB

- Gustavo Leal – Dominion noted that consideration should be given to senor standards. e.g. Bushing Monitoring sensors today are not covered by any standard to ensure that their design is safe for installation on a Transformer bushing.

A motion to Adjourn was given by Luiz Cheim of ABB and seconded by Bill Whitehead from Camlin. Adjourned Meeting at 4:30pm.

Revision of C57.148 Standard for Control Cabinets for Power Transformers
Joe Watson: Chair, Weijun Li: Vice-Chair, Jean-Francois Collin: Secretary

The working group met at 11:00 AM on Monday 4/3/2016 in Grand Ballroom A-B at the Astor Crowne Plaza Hotel in New Orleans, Louisiana. 52 attendees were recorded, including 23 of the 38 members. A quorum was reached. It was the second official Working Group meeting for this project. The complete attendance record is available in the AMS System. 3 guests requested membership.

As required by the main committee, the Patent question was asked at the beginning of the meeting. No essential patents were claimed. The Vancouver Fall 2016 meeting minutes were approved unanimously.

The comments from the straw ballot were reviewed and the discussions were summarized below:

Multiple comments were about requirement for drawings. Ryan Musgrove of Oklahoma Gas & Electric stated that utility personnel would like to see minimum drawing requirements for NERC/FERC compliance and consistency purposes. Items of interest include wiring diagrams, control schematics, CT classes & thermal ratings, breaker ratings, etc. Devki Sharma of Entergy stated that the IEEE/PES Switchgear Committee has a sample drawing list and standard requirements that may be used as a reference.

Several design/construction details, including cabinet dimensions, ground studs, swing panels and conduit entry, were discussed. Javier Arteaga of ABB noted that the standard should not get too deep into the details. Markus Stank of Reinhausen also stated that there should not be any regulation on construction details. It appeared that the group had the consent that the amount of details should be limited in the standard; instead such details shall be discussed and agreed between the manufacturer and the purchaser. Markus Stank also pointed out that 5.18 should be revised so the use of LED lights won't be prohibited.

During discussion of electrical devices, Kris Zibert of Allgeier, Martin & Associates stated that they use single-pole fuses and breakers. Whether lamps, switches, breakers, etc. should be UL listed was also discussed. Markus Stank suggested that such requirement would be too restrictive and perhaps may raise other concerns. The WG chair also noted that getting certain devices UL-listed would be no easy task.

In response to comments on 5.22 regarding material requirements, Hakim Dulac of Qualitrol pointed out that such requirements are either included in other section of the control cabinet standard or other existing standards; therefore there is no need to edit the language that is currently in the standard.

Ryan Musgrove stated that it is not unreasonable to have clear requirements for device nameplates as they will be extremely beneficial for field troubleshooting. Stacy Kessler of Basin Electric suggested that section 6.3 may be expanded to include the nameplate info.

After multiple discussions of ground bus, CT circuits and other electrical devices, the group agreed that sections 5.10 through 5.22 definitely need some work and a task force reviewing section 5 would be the best approach.

The WG chair proceeded with calling the formation of two task forces to review sections 5, 6 and 7. The task force members are as follows:

Section 5:
Ryan Musgrove (leader) of Oklahoma Gas & Electric
Kris Zibert of Allgeier, Martin & Associates

Markus Stank of Reinhausen
Patrick Rock of American Transmission Co.
Stacey Kessler of Basin Electric

Sections 6 & 7 (leader - to be determined)
Tad Daniels of Weidmann
Ryan Musgrove of Oklahoma Gas & Electric
Gustavo Leal of Dominion Virginia Power
Shankar Nambi of Bechtel
Rakesh Rathi of Virginia Transformer
Javier Arteaga of ABB

The WG officers will review the other general and editorial comments.

The group will meet again in Louisville, Kentucky in October 2017.
The meeting was adjourned at 12:05 PM.

Minutes for the V/Hz Taskforce

The Task Force members were Ramsis Girgis, Joe Watson and Kipp Yule. The TF held two conference calls to discuss the topic and communicated by emails before the PTSC meeting in New Orleans.

A copy of the GE V/Hz curve for transformers was obtained and discussed by the group. Ramsis Girgis was familiar with the curve and noted that it was the only standard curve that was being widely used and that it was being applied to all types of GSU transformers.

The TF determined that the curve was developed by GE in the 60's or 70's and is specific to the GE design for core-form type transformers using the type of insulation commonly used at that time. The curve may not be accurate for shell form transformers, and may not be accurate for modern core-form designs with Nomex insulation in certain areas like between the core and flitch plates.

The TF concluded that more work is needed in this area and that the TF should be expanded with experts in the field to help define and develop criteria for limits based on designs and materials used, and to develop a standard process for developing V/Hz curves and to develop standard curves for different types of transformers, if needed.

During the PTSC meeting, we reported our progress and the following people volunteered to join the TF:

- Ed teNyenhuis
- Phil Hopkinson
- Waldemar Ziomek
- Jim McIver
- Javier Arteaga
- Mike Craven

The TF will continue to meet by conference call or web meeting and will request a small meeting room at the next meeting in Louisville.

Joe Watson

2017 Spring Meeting

Location: New Orleans LA

Meeting Room: "Bourbon Room", 2nd Floor Mezzanine Level (M2)

Date: Tuesday, April 4th 2017

Time: 13:45 hours – 15:00 hours

MINUTES of Task Force on Need for Guide for Condition Assessment of Transformers

The TF group met with 15 people in attendance. Membership list was updated

A. Welcome & Introduction
B. Roster Circulation
C. Chair Remarks:
    1. Scope: Provide recommendation to the Power Transformers subcommittee if a transformer condition assessment guide should be written by the IEEE PES Transformers Committee.
    2. Consider as a group why document may be needed, relevance etc. Review information already published to help develop basis for decision of recommendation. We need to provide a technically sound recommendation that does not weigh in commercial interests.
D. Review of:
    1. Cigré WG A2.49 Scope and Table of Contents
    2. What other published Guides and/or Standards may be applicable to the work
    3. Freedom to contribute comments, ideas, suggestions, open forum with all members

A good discussion amongst the group with respect to how they are doing a condition assessment and the reasons why they do it. Most have designed their own methods to address the needs of their company. It was clear that there are many uses of a condition they use, for various purposes, being maintenance strategies, asset replacement, assessing the risk of units to the system and/or network.

The foundation of these various methods does use various IEEE Guides published or those published by the US Bureau of Reclamation (FIST Volume 3-31), and/or Cigré to assist them in determine the condition of their units.

IEC has initiated a new TC number 123, that is intended to produce a Guide (or Standard) for condition assessment of ALL major substation components. There has not yet been a meeting, but is to be arranged for later this year.

Cigré has initiated a new WG in the Substations section (B3) to produce a Guide for Condition Assessment of Substation components. The transformer portion will be using the output of the current A2.49 working group as its contribution to this new Guide.

It was determined that many of the uses of a condition assessment can serve different purposes. The common element in all methods, was the use of the basic measurements, findings, inspection observations that are now published in these various guides produced.

It was agreed to not try to be a guide to address all the possible uses of an output, but to try to guide the reader, (utility, industrial, commercial owner), as to what to consider, and a simple methodology, of establish the condition, give the common underlying basis of the assessment.

The **SCOPE** we all agreed to is as follows and is submitted to the Power Transformers SC for consideration:

A Guide for the Assessment of Liquid Immersed Transformers, Reactors and their components, to determine and quantify the overall condition by means of an index.

Brian Sparling, Chair — Dynamic Ratings Inc
Email : bsparling@ieee.org

Ismail Guner, Vice Chair — Hydro Québec TransÉnergie.
Email : Guner.Ismail@hydro.qc.ca

Annex L Standards Subcommittee – Unapproved Minutes

April 5, 2017
New Orleans, LA
USA

Chair: Jerry Murphy
Vice Chair: Kipp Yule
Secretary: Daniel Sauer
Standards Coordinator: Jim Graham

The Chair, Jerry Murphy opened the meeting calling for a show of members to establish quorum which was met.

L.1 Meeting Attendance

The Standards Subcommittee met on Wednesday, April 5, 2017, at 4:30 PM. A show of hands indicated 18 of 34 members in attendance at the beginning of the meeting which met the quorum requirement. Overall the attendance roll showed there were 85 attendees, 21 members, 64 guests, including 13 that requested membership upon tabulation of the circulated rosters and will be reviewed for eligibility. Phil Hopkinson moved to approve the agenda with second by Jim Graham; motion was carried with unanimous acclamation approving. Jerry then requested a review of the Vancouver minutes; motion was made by Steven Snyder and seconded by Bruce Forsyth which was carried with unanimous acclamation approving.

L.2 Chair's Remarks

Jerry stated that Kipp was not able to make this meeting, but we look forward to his return at the Louisville meeting. Additionally, Jerry mentioned that the RFID system appeared to be working, so please make sure you tap-in, but for the present also make sure you sign the paper rosters.

L.3 Working group reports

L.3.1 Continuous Revision of C57.12.00-2015 – Steve Snyder

The purpose of this WG is to compile all the work being done in various TF/WG/SC's for inclusion in the continuous revision of C57.12.00 in a consistent manner. This WG coordinates efforts with the companion Standard C57.12.90 so that they publish together.

The current standard was approved by the IEEE-SA Standards Board on December 5, 2015, with an official publication date of May 12, 2016. The standard is good for 10 years, but is under continuous revision and will be next balloted when sufficient new material is available.

A new PAR to cover the ongoing, continuous revisions to the document was requested on November 4, 2016, and approved February 17, 2017. This PAR is good through December 31, 2021.

As agreed at the Fall 2016 Standards Subcommittee meeting, any new material provide to me for inclusion in the next revision, will first be presented to this subcommittee for the "official" vote of approval. As of this date, no new material has been received.

Respectfully submitted by Steven L. Snyder, WG Chair, on April 5, 2017

L.3.2 Continuous Revision of C57.12.90-2015 & Cor. corrections – Steve Antosz

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. This is a working group by committee. There are no meetings held.

Summary

The new Standard C57.12.90-2015 was approved by the Standards Board on December 15, 2015. It was published on March 11, 2016.

Status

Shortly after the document was published in March 2016, one error and one omission was discovered in the document.

- There is an error in Equation (2) in subclause 8.3 Waveform correction of no-load losses, where the exponent "2" was lost during editing. It needs to be added back.
- There is a sentence in 10.8 Induced Tests for Class II Power Xfmrs, that refers to this test being applied to terminals 115 kV and above. Since Class II now extends down to 69 kV, this sentence needs to be revised, changing the 115 to 69.

It was decided that these should be corrected immediately, so a corrigendum was done. The number and title of the balloted version was *PC57.12.90-2015/Cor1/D3.1 Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers Corrigendum 1: Editorial and Technical Corrections*. It was balloted at the end of 2016. The Corrigendum ballot closed successfully on Jan 16, 2017. 118 of 137 people voted (88%); 100% approved, 2% abstain. 3 comments, none meaningful, nothing to change. It was approved by IEEE-SA Standards Board Review Committee (SASB RevCom) at their March 23, 2017 meeting, and should be published soon.

Motion to proceed with a new PAR for C57.12.90; moved by Steve Antosz, Seconded by Vinay Mehrotra; carried with unanimous acclamation approving.

FUTURE REVISIONS AND PENDING WORK

Since this is a continuous revision document, there continues to be ongoing work in the various Task Forces.

Changes *already approved* for the next revision:

- Changes to 9.3.1 Wattmeter-voltmeter-ammeter method from Mark Perkins' PCS WG for Revision of C57.12.90. Final survey circulated in late 2015.
- Add in subclause 10.3.1 and 10.3.1.1 Lightning Impulse, the following words in red; by Pierre Riffon's WG Revision to Impulse Test in Dielectric Test Subcommittee. Submitted on 11/4/2016. These subjects have been surveyed within the Dielectric Tests SC and within the TF. The 4th survey got a 100% approval rate.

10.3.1 Impulse tests shall be made without excitation. The impulse waveshape parameters such as peak voltage, front time and tail time are determined on the test voltage curve which is obtained after having processed the recorded curve using the test voltage function method, as defined in IEEE Std. 4.

10.3.1.1 Full-wave test

The test wave rises to crest in 1.2 μs and decays to half of crest value in 50 μs from the virtual time zero. The crest value shall be in accordance with the assigned basic impulse insulation level (BIL), subject to a tolerance of ± 3%; and no flashover of the bushing or test gap shall occur. The tolerance on

virtual front time should be ± 30%, and the tolerance on time to half of crest should be ± 20%. However, as a practical matter, once the manufacturer has proven that they have test equipment limitations, the following shall be considered:
a) If the standard impulse shape cannot reasonably be obtained because of low winding inductance or high capacitance to earth and the resulting impulse shape is oscillatory so that the relative overshoot magnitude exceeds 5 % then the front time may be increased to reduce the overshoot amplitude. In all cases, the front time shall not exceed 2.5 μs regardless of the overshoot amplitude.
Note 1: The overshoot can be reduced by increasing the front resistor value of the impulse generator. The use of low inductance connections between the impulse generator and the tested transformer are also recommended.

pending work

- Possible future addition of a new clause for a Load Tap Changer Performance Test, from Hakan Sahid (formerly Mark Perkins) PCS TF for Revision of C57.12.90.

- Possible future revision to subclause 10.8.2 from Bertrand Poulin's TF regarding a limit of pressure applied inside a transformer tank during induced voltage test. Ongoing work continues. Latest proposed addition to paragraph 10.8.2: The pressure inside the transformer tank during induced test must not be increased by artificial means by more than 3.5 kPa (0.5 psi) over its normal operating pressure. Should the pressure be increased by more than this value for any reason such as the use of an oil conservator installed in the test facility higher than the one made for the transformer, the customer must be made aware of this fact and approve it before proceeding with the test.

- Other possible revisions to subclauses 10.2 to 10.4 from Pierre Riffon's TF for revision of impulse tests. Ongoing work continues …

- Other possible revisions to subclauses 10.5 to 10.10 from Bill Griesacker's TF (formerly Bertrand Poulin) for revision of low frequency tests. Ongoing work continues. A TF has been formed to look at reducing the limit for PD level Failure Detection in 10.8.5.

- Possible additional revisions to Clause 13 Audible Sound by Ramsis Girgis' TF in the Performance Characteristics Subcommittee.

Respectfully submitted by Stephen Antosz, WG Chair, on April 5, 2017

L.3.3 Corrigenda for C57.12.70 – Steve Shull

Steve Shull called the meeting to order and introductions were made. The roster was circulated. The names of those in attendance are recorded in the AM system. To establish a quorum, a members list was displayed on the screen and those who saw their names were asked to hold up their hand. From this count of hands, it was determined that a quorum was established. A motion was made by Lee Mathews and seconded by Cory Morgan to accept the agenda as shown. The motion passed unanimously. The Patent Slide statement calling for Essential Patent Claims was read and no patents were brought up. A motion was made by Cory Morgan to accept the minutes of the Fall 2016 meeting. This was seconded by Lee Matthews. The motion passed unanimously. Under Old Business, the chair stated that he believed that all of the suggested changes as brought up from the last meeting had been made in the document he handed out to the group. Steve requested that all members and guests review this for correctness. If errors were found, Steve asked that these be marked on the appropriate sheet. He further requested that these be scanned and sent back to Him. Any comments will need to be received by May 1st to be considered. Steve will incorporate them into the document and distribute them to the

Working Group. This will once again be reviewed in view of the hope that it can be moved to ballot at the fall meeting. There wasn't any new business and the meeting was adjourned. A meeting will be required at the upcoming fall meeting in Louisville, Kentucky.

Respectfully submitted by Jerry Murphy, WG Vice-Chair, on April 4, 2017.

L.3.4 WG Standard Transformer Terminology C57.12.80

1. Chair's remarks: This was the initial meeting for the working group. The PAR was approved by IEEE Standards Association Board on March 23, 2017.
2. Quorum was achieved with six of six members present.
3. A call for essential patents was made. No essential patent issues were reported.
4. This was the initial meeting, so no previous meeting minutes were available.
5. The agenda for this meeting was approved by acclimation.
6. Technical topics
   a. The chair made a request for new terms to be included, or redefined. One known issue was to develop a definition for wind turbine GSU transformers.
   b. No motions were made this meeting.
7. Next meeting—October 31, 2017 Louisville, LA

Respectfully submitted by Jim Graham, WG Vice-Chair, on April 5, 2017.

L.3.5 TASK FORCE for Comparison of IEEE & IEC Standards for Cross Reference

This task force did not meet and has nothing to report at this time.

L.3.6 Corrigenda for C57.163

The corrigenda was approved by RevCom and will be published later this year.

L.4 Old Business

- Don Platts asked about the status of the What goes Where project that Kipp Yule was working on. The chair, Jerry stated that this work had been completed and that he would forward the info to Adcom as well as Sue for posting to the website.

L.5 New Business

Craig Stiegemeier announced that the tutorial on Thursday, April 6 would cover field testing of OLTCs and further noted that there will be a guide Task Force on this topic forming at the next meeting.

L.6 Adjournment

The meeting and was adjourned by the Chair without objection at 4:55 p.m.

Respectfully submitted by Daniel M Sauer, Standards SC Secretary

Annex M Subsurface Transformers & Network Protectors Subcommittee

May 6, 2017
New Orleans, Louisiana
Chair: Dan Mulkey
Vice Chair: George Payerle

M.1 Meeting Administration

Introductions – The meeting was called to order at 11:00 AM Wednesday, April 5, 2017 in the Toulouse AB room of the Astor Crowne Plaza Hotel in New Orleans, Louisiana. Introductions were made and sign-in sheets were routed. In the chair's absence, George Payerle ran the meeting and Giuseppe Termini acted as secretary.
Chairman's Comments –.
Membership Changes – At the Vancouver meeting, Jermaine Clonts, Mark Faulkner, and Kwasi Yeboah requested and were accepted as members. Prior to this meeting, Adam Bromley, Justin Pezzin, and Anastasios Taousakis (Taz) announced that they would no longer be attending and have resigned from the subcommittee. We wish them well in their new endeavors and we will miss their input at these meetings.
Quorum – The members were listed on the screen and by a show of hands, it was determined that there was a quorum in attendance.
Members and Guests --There were 18 members and 25 guests in attendance. Their names can be found in the AM system. Nine guests requested membership.
Approval of Minutes – The minutes from the Fall 2016 meeting in Vancouver, BC, Canada were approved. They were motioned for approval by Brian Klaponski and seconded by Cory Morgan. The subcommittee approved these without opposition.

M.2 Working Group and Task Force Reports

M.2.1 C57.12.23 Working Group Report – Single-Phase Submersible Transformer

Alan Traut, Chairman, Jermaine Clonts, Secretary.
Revision Due Date**: 3/19/2019**
PAR Approval Date: **8/21/2014**
PAR Expiration Date: **12/31/2018**

Introductions – The meeting was called to order and everyone was asked to introduce themselves. Paper rosters were sent around in addition to asking for all attendees to scan their badge.

At the start of the meeting the working group was asked to disclose of any essential patent claims. No essential patent claims were disclosed

Quorum – We had 68 attendees, 25 members present out of 34 active members, which gave us enough members to establish a quorum.

Approval of agenda - unanimous approval of agenda

Approval of meeting minutes- unanimous approval of meeting minutes

Chair Report – Al talked about when the PAR expires and how long we have to complete our work. PAR expires December 31, 2018. 10-year life cycle of the standard is December 31, 2019. Al informed the

working group of his desire to send to the ballot in the spring meeting of 2018, which would give us two more meetings.

Old Business

1. **Tank Materials**

   Jermaine Clonts reviewed the results of the minimum material thickness survey. The survey was sent to all 34 members. 8 responses were received from a mix of OEM's and end users. One end user recommends the use of copper bearing steel and one manufacture responded with requirements for 409 stainless steel. All other responses were for 304L and 316L stainless steel with the 16-gauge steel being the minimum value received for auxiliary coolers, 14 gauge was the minimum thickness for the tank wall and 13 gauge was minimum value received for the cover and tank bottom. The table was populated during the meeting with the minimum value received from the survey with 409 stainless steel being one gauge thicker than 304L and 316L stainless steel except for the auxiliary coolers. After discussion around the basis for the data presented, the following note was added "this table was developed for round tank construction with the intent to specify the minimum thickness for corrosion resistance. Thicker material may be needed for rectangular tank construction or other mechanical requirements. "Al Traut and Jermaine Clonts agreed to finalize the table with consideration to the industry tolerances on the base materials and consideration to specifying the requirements in gauge versus inches/mm. The finalized table is to be reviewed at the fall 2017 meeting. Brian Klaponski made a motion to accept the table as listed with the note included Ronald Stahara seconded the motion

2. **Low Voltage terminals 7.2.2**

   Al Traut led the discussion with the comment that other transformer standards define the minimum low voltage bushing stud size by kVA. In addition, some end users questioned what stud size they should specify for their transformers. Based on the previous comments Giuseppe Termini and the working group agreed we should include the table defining the minimum stud size by kVA in the standard.

   Discussion took place around the type of bushing typically used in the industry, Brian Klaponski mentioned a design in past with a cable sent all the way through the bushing. Ed smith commented that the industry standard is a threaded copper stud surround by molded epoxy. Brian Klaponski commented when constructing the table for the bushing stud sizes consider a 200 % overcurrent requirement. Bill Wimmer, Ed Smith, and Josh Verdell agreed to propose a table for review in the fall 2017 meeting defining low voltage bushing stud size by kVA.

The group ran out of time and placed the review of the final minimum material thickness table and the low voltage bushing stud size table on the agenda for next meeting. We adjourned at 10:40 AM. We will meet at the Fall 2017 meeting in Louisville, Kentucky

M.2.2 C57.12.24 Working Group Report – Three-Phase Submersible Transformers

Giuseppe Termini, Chairman; George Payerle Secretary
Approved: **12/7/2016**
Revision Due Date: **12/7/2026**
PAR Approval Date:
PAR Expiration Date:

The meeting was called to order at 9:30 AM in the Tolouse AB room at the Astor Crown Plaza in New Orleans on Monday, April 3, 2017. Introductions were made and an agenda was presented. The meeting was attended by 16 members and 35 guests. Membership stands at 25 and with 16 members present, there was a quorum. Thirteen guests requested membership. The chairman asked if there were any patent claims. There were none.

George Payerle acted as recording secretary. Since this group did not meet in Vancouver, the minutes of the spring 2016 meeting in Atlanta were presented. Corey Morgan made a motion to approve the meeting minutes, Kent Miller seconded the motion and it was unanimously approved.

The standard was officially approved on December 7, 2016 and will expire in December 7, 2026. The Chair expressed gratitude to everyone who worked on the standard revision. The Chair stated that a new Project Authorization Request (PAR) needs to be initiated in order to start work on the next revision. A PAR is good for 4 years. The chair suggested taking a 3 year (6 meetings) break before beginning to work on a new revision.
Brian Klaponski stated the need to maintain continuity and suggested to meet in the fall of 2017 to plan topics for the next revision. One topic Brian suggested was the tank material requirements and the use of stainless steel. He mentioned that according to a material expert, the tank material requirements in the standard could be improved. Lee Welch also suggested maintaining continuity so that work on a standard would be uninterrupted. The continuity on the standard would make it easier for utility personnel to continue attending the WG meetings.
After a prolonged discussion on when to hold the next meeting, a suggestion was made to meet as a task force and hold an off schedule meeting to plan the next revision. Greg Anderson suggested taking a break in order to clear a spot in the schedule for other meetings. Anil Dhawan made a motion to take a 1 year (2 meetings) break before starting on a new revision. Said Hachichi seconded the motion. The members voted, and the motion was approved. The next official meeting of C57.12.24 was set for the fall of 2018. In the meantime, the Chair proposed to solicit input from the WG members, via email, on whether or not to meet off schedule in the fall 2017 as a task force to plan the next revision of the standard.
The meeting was adjourned at 10:50 AM.
Respectfully Submitted by: Giuseppe Termini, Chairman C57.12.24 Working Group

M.2.3 C57.12.40 Working Group Report – Secondary Network Transformers

Brian Klaponski, Chairman; Giuseppe Termini, Secretary
Revision Due Date: **12/31/2021**
PAR Approval Date: **8/30/2012**
PAR Expiration Date: **12/31/2017**
Stage: Submitted to Revcom
RevCom Agenda 04-May-2017

1) The WG met on Tuesday, April 4, 2017 at 11:00 am with 12 members and 37 guests. Requests for membership came from 15 guests.
2) An agenda was presented and approved; and introductions were made.
3) The Chairman asked if anyone in the Working Group knew or had knowledge of any existing or pending patents that may affect the work on this standard. There was no positive response.
4) The minutes of the October 25, 2016, meeting in Vancouver BC, Canada were reviewed.
5) Jeremy Sewell made a motion to approve the Meeting Minutes. Cory Morgan seconded the motion and the minutes were approved unanimously.
6) The Chairman stated that the standard was recirculated for re-balloting after the two negative comments were resolved. The recirculated standard was successfully approved.
7) One of the negative comments dealt with tank corrosion and was rejected since it was impractical to consider it in a timely manner before the standard was published. The Chairman stated that there was validity in investigating the issue brought up by the negative ballot and suggested that this topic should be addressed in the next revision of this standard.

8) The Chairman stated that the standard has been submitted to RevCom for their May 4, 2017 meeting. He expects that our new revised standard will be officially published in 2017.

9) Under new business, the Chairman stated that the WG will keep working on the next standard revision probably under a Task Force format. The Chairman suggested we investigate several topics starting at the next meeting at the next WG upcoming Fall meeting in Louisville, KY. After that investigation we would apply for a PAR (perhaps in 2018) to begin the next revision. Some of the topics for the next revision are:

   a) Tank corrosion
   b) Location of the primary disconnect and grounding switch within the network transformer
   c) Cathodic protection

10) The Chairman stated that representatives from ConEd had agreed to make two presentations starting with our Fall meeting:

   a) Placement of the network switch within the network transformer and the reasons why.
   b) Cathodic protection used in the ConEd system for network transformers.

11) The meeting was adjourned at 11:50 am with the next meeting set for Louisville, KY in October 2017.

Respectfully submitted
B. Klaponski, Chairman

M.2.4 -C57.12.44 Working Group Report – Secondary Network Protectors

Mark Faulkner, Chairman, Alex Macias, Secretary
Revision Due Date: **12/31/2024**
PAR Approval Date: **3/26/2015**
PAR Expiration Date: **12/31/2019**

Meeting Administration:

- The meeting was called to order at 1:45 PM
- Essential Patents Disclosure
  - *None cited*
- Attendance
  - *Rosters passed out*
  - *Roster Scanned and Sent to DHM*
- Introductions
- Quorum Determination
  - *A total of 26 individuals attended the meeting. Membership stands at 10; members present 5, a quorum was met on people in attendance*
  - *Those that have requested membership and have attended two consecutive sessions will be members at next meeting.*
- Approval of the last meeting minutes
  - *Mark Faulkner presented the meeting agenda to the WG for review and acceptance. Charles (Cory) Morgan motioned to approve the meeting agenda as presented, Doug*

Craig, seconded the motion, the motion was approved unanimously. No one opposed.

Items Discussed during meeting:

Mark Faulkner announced that a Draft (1) will be routed to Group/Members to review changes made from the previous meetings. Responses to be presented at the next meeting.

1st Item – External Fusing Height
Group/members approved not to include any reference to Heights

- Drawings were received from Eaton and Richards on terminator pads.
- Discussion held between the differences between EATON and Richards terminator mounting pads for terminals prior to making decision on figure notation.

2nd Item – Spades 11.5.7
Four drawings were presented reflecting EATON and Richards spades

- Drawings were all eight holes; Lee Welch inquired about 6-hole pattern. Mark Faulkner commented that Westinghouse had 6-hole pads but were changed to 8 holes later.
- Eight holes to be kept, no request made to include the historical 6-hole pattern.
- Group /members requested descriptions be added with respect to ratings and secondary voltages (i.e. Figure 7)

3rd Item – Spade Type

- Lee inquired about the need to add type of material and plating to the terminals.
    - Copper- Silver or Tin plated
- Group/members approved to include information into the spec

4th Item – 500kVA Losses : F3 annex paragraph 5
Brian Klaponski stated the paragraph is correct as noted.

- Group/Members (Mark Faulkner motion, Cory Morgan 2nd) not to make any changes, approved.

5th Item – Remote Racking Section 9

- This will be tabled for future revisions/changes submittals (i.e. PAR)
    - Define
    - Write up
    - Include viewing windows “as specified by end user”

6th – Section 10.5.3 Inspection Window
Group/Member concurred this needs to be rewritten

- Doug Craig (Richards) to email a rewritten sentence based on his version verbally stated

7th – Define “Dry Contact”

- Suggested to be “no voltage”
- Group/Members accepted

8th - Windows for remote racking
Discussion held about the need to include or remove

- Group/Member held open discussion for keeping in the spec.
- Also discuss its construction requirements
    - Igor Simonov commented that the IEEE standard C37.20.2 from Switchgear should be obtained and reviewed for possible reference notation in this section.

- This spec will address Group/member concerns

9th – Lee Welch commented that should the WG consider DG (distributed generation) clause in standard. Group/members accepted to make reference only of C1547.6 in Annex

10th – Table B4

#3 & #4 amp rating were changed

- Group/Member accepted

11th – Mark Faulkner motioned to remove the term Solid State and replace with Digital for the relay references.

Group/members accepted to change to the term "micro-processor"

12th - Section 6.1.1.2 Voltage Test Min.

Pedro Salgado and Doug Craig volunteered to review this section and forward a proposed re-write to define and clarify min. voltage and trip percentages verbiage.

Next meeting: Louisville, KY

M.3 Old Business

None

M.4 New Business

Brian Klaponski suggested to have Dan Mulkey to explain the rationale for changing the SC title to Subsurface Transformers & Network Protectors Subcommittee at the next SC meeting in Louisville, KY.

There was a discussion led by Brian Klaponski regarding the future course of 12.40. While we voted at the 12.40 meeting to take a 1 year (2 meeting) break before requesting a PAR, Brian wants to have a meeting slot at the Louisville and Pittsburgh meetings to informally discuss the items that we should consider in the next revision. Greg Anderson strongly does not want to assign a slot to 12.40 since the standard is complete.

Al Traut stated that it was his understanding that a working group has a two meeting time frame where the group can meet and prepare for a new PAR. In the case of 12.40, Brian has ConEd preparing a presentation for the fall of this year and may also consider having a corrosion expert make a presentation to the group in the near future

Greg says he will assign a room for an off schedule meeting but Brian felt that was not an effective way to get people to show up. Giuseppe stated that inviting people to an off schedule meeting is a further administrative task that we don't need and it would be easy for people to do other things instead attend such a meeting.

M.5 Adjournment

The meeting was adjourned at 12:00 PM with the next meeting set for Louisville, Kentucky on November 1, 2017.

APPENDIX 1

Meeting Schedule

IEEE/PES TRANSFORMERS COMMITTEE

www.transformerscommittee.org

Spring 2017 Meeting; April 2-6

Hosted by Entergy

Astor Crowne Plaza Hotel; New Orleans, Louisiana USA

-- See Page 5 for a key to abbreviations.
-- Room locations designated as (1), (2), (M2), etc., indicate the "button to press" in the elevator. For instance, a room on (1) is located on First Floor/Lobby, and a room on (M2) is located on Second Floor Mezzanine.

DATE/TIME	ACTIVITY	SUB-COM	ACTIVITY CHAIR	ROOM CAP/ARR/AV	MEETING ROOM
Thursday, March 30					
8:00 am - 5:00 pm >	IEC MT 60076-4 Impulse Test Guide	++	T. Hochanh	10 BD	Royal (M2)
Friday, March 31					
> 8:00 am - 5:00 pm	IEC MT 60076-4 Impulse Test Guide	++	T. Hochanh	10 BD	Royal (M2)
Saturday, April 1					
	No Technical Tours planned				
8:00 am - 5:00 pm	WG Step-Voltage Regulators C57.16/60076-21	Dist	C. Colopy	20 US	Bourbon (M2)
6:15 pm until ??	Early Bird Event: Dinner, Music & Fun at BB King's Blues Club. Advance on-line registration necessary. -- Meet in hotel lobby at 6:15 pm. We will walk together to BB King's (5-10 minute walk). -- Cash bar opens at 6:30 pm; dinner served at 6:45. Live music begins ~7:00 pm. See flyer for details.				
Sunday, April 2					
	No Technical Tours planned				
1:00 pm - 5:30 pm	Meeting Registration				Grand Ballroom Foyer (2)
2:00 pm - 5:30 pm	Administrative SC -- Closed meeting, by invitation only	Admin	S. Antosz	24 US w/buffet	Toulouse AB (M2)
2:00 pm - 5:30 pm	NEMA Transformers -- Closed meeting, by invitation only	++	J. Caskey	20 US w/beverage cart	Bourbon (M2)
6:00 pm - 8:00 pm	Welcome Reception			500 Reception	Grand Ballroom (2)
Monday, April 3 -- Monday Breaks Sponsored by Brockhaus Measurements **					
7:00 am - 5:00 pm	Meeting Registration				Grand Ballroom Foyer (2)
7:00 am - 7:50 am	Newcomers Orientation -- Breakfast Meeting; arrive early! -- Newcomers & Guests are encouraged to attend!		S. McNelly	60 CL w/buffet in room	St. Charles AB (1)
7:00 am - 7:50 am	Distribution SC Leaders Coordination -- Closed breakfast meeting, by invitation only		S. Shull	12 BD	St. Louis (M2)
7:00 am - 8:00 am	Breakfast - Attendees (no spouses/companions please)			272 RT (8/tbl) w/buffet in Gallery	Astor Ballroom (2)
8:00 am - 9:30 am	Breakfast - Spouses/Companions (no meeting attendees please)			80 RT (8/tbl)	Bourbon House Restaurant (1)
9:15 am - 5:00 pm	Spouses/Companions Tour: Houmas House Plantation & Swamp Tour. Advance registration required. -- Bus departs front of hotel at 9:15 am, and returns ~5:00 pm. Includes lunch. See flyer for details.				
8:00 am - 9:15 am >	Opening Session -- All attendees are encouraged to attend -- See separate document for meeting agenda -- Attendance required to maintain Committee Member status.		S. Antosz	550 MX S1	Grand Ballroom ABCD (2)
9:15 am - 9:30 am	*Break (beverages only)*			Foyers, Floors 2 & M2	

** Contact Ed Smith (edsmith@ieee.org) if you are interested in sponsoring a coffee break at a future meeting.

DATE/TIME	ACTIVITY	SUB-COM	ACTIVITY CHAIR	ROOM CAP/ARR/AV	MEETING ROOM
Monday, April 3 (continued)					
	~~WG Thermal Evaluation of Insulation Systems, Dry Type C57.12.60~~	~~Dry~~	moved to Tuesday 1:45 pm		
9:30 am - 10:45 am	--	--	--	60 MX (30 CL + 30 TH)	Iberville (M2)
9:30 am - 10:45 am	WG Submersible Transf. C57.12.24	UTNP	G. Termini	80 MX	Toulouse AB (M2)
9:30 am - 10:45 am	TF External Dielectric Clearances	DiTests	E. Davis	100 MX (60 CL + 40 TH)	St. Charles AB (1)
9:30 am - 10:45 am	WG Tertiary/Stabilizing Windings PC57.158	PCS	E. Betancourt	175 MX S3	Grand Ballroom AB
9:30 am - 10:45 am	TF Consolidation of Insulating Fluid Guides	IF	T. Prevost	175 MX S3	Grand Ballroom D
9:30 am - 10:45 am	TF Transformer Efficiency and Loss Evaluation (DOE Activity)	Dist	P. Hopkinson	200 MX S1	Grand Ballroom C
10:45 am - 11:00 am	*Break (beverages only)*			Foyers, Floors 2 & M2	
11:00 am - 12:15 pm	WG Ventilated Dry Type PC57.12.51	Dry	S. Som	60 MX	Iberville (M2)
11:00 am - 12:15 pm	--	--	--	80 MX	Toulouse AB (M2)
11:00 am - 12:15 pm	WG Overhead Distr. Transf. C57.12.20	Dist	A. Traut	100 MX	St. Charles AB (1)
11:00 am - 12:15 pm	WG Control Cabinets PC57.148	Power	J. Watson	175 MX S3	Grand Ballroom AB
11:00 am - 12:15 pm	WG Moisture in Insulation PC57.162	IL	T. Prevost	175 MX S3	Grand Ballroom D
11:00 am - 12:15 pm	TF PCS Rev. to Test Code C57.12.90	PCS	H. Sahin	200 MX S1	Grand Ballroom C
12:15 pm - 1:30 pm	Lunch Meeting: Standards Development Review -- Everyone welcome to attend. All SC/WG/TF leaders are highly encouraged to attend. -- Doors open ~12:00 pm. Come early, get a good seat, and start eating. -- Advance registration necessary. No paper tickets. Admission verified with name badge at the door. -- Anyone can join us for this luncheon, and sit & listen to the presentation, without eating lunch. Suggested time to arrive for only the presentation (without lunch) is 12:30 pm.		J. Graham	240 RT (7/tbl)	Astor Ballroom (2)
1:45 pm - 3:00 pm	WG Dry Type Gen. Require. C57.12.01	Dry	C. Ballard	60 MX	Iberville (M2)
1:45 pm - 3:00 pm	WG Sec. Network Protectors C57.12.44	UTNP	M. Faulkner	80 MX	Toulouse AB (M2)
1:45 pm - 3:00 pm	WG 1-ph Padmount Dist Transf C57.12.38	Dist	A. Ghafourian	100 MX	St. Charles AB (1)
1:45 pm - 3:00 pm	WG Thru-Fault Current Duration PC57.109	PCS	V. Mehrotra	175 MX S3	Grand Ballroom AB
1:45 pm - 3:00 pm	WG Installation of Power Transf. C57.93	Power	M. Lau	175 MX S3	Grand Ballroom D
1:45 pm - 3:00 pm	TF Audible Sound Revision to Test Code	PCS	R. Girgis	200 MX S1	Grand Ballroom C
3:00 pm - 3:15 pm	*Break (beverages and treats)*			Foyers, Floors 2 & M2	
	~~WG Natural Ester Based Fluids C57.147~~	~~IF~~	Work is complete.		
	~~WG Transformer Capability with Non-sinusoidal Loads PC57.110~~	~~PCS~~	Work is complete.		
	~~WG Dielectric Freq. Response PC57.161~~	~~DiTests~~	Balloting on final document.		
3:15 pm - 4:30 pm	**SC HVDC Converter Transformers and Smoothing Reactors**	HVDC	M. Sharp	60 MX	Iberville (M2)
3:15 pm - 4:30 pm	--	--	--	80 MX	Toulouse AB (M2)
3:15 pm - 4:30 pm	WG 3-ph Padmount Dist Transf. C57.12.34	Dist	R. Stahara	100 MX	St. Charles AB (1)
3:15 pm - 4:30 pm	TF PD Limits **(New!)**	DiTests	V. Mehrota	175 MX S3	Grand Ballroom AB
3:15 pm - 4:30 pm	WG Transformer Monitoring C57.143	Power	M. Spurlock	175 MX S3	Grand Ballroom D
3:15 pm - 4:30 pm	--	--	--	200 MX S1	Grand Ballroom C
4:30 pm - 4:45 pm	*Break (beverages only)*			Foyers, Floors 2 & M2	
4:45 pm - 6:00 pm	WG Dry Type Reactors PC57.16	Dry	A. Del Rio	60 MX	Iberville (M2)
4:45 pm - 6:00 pm	--	--	--	80 MX	Toulouse AB (M2)
4:45 pm - 6:00 pm	WG Step-Voltage Regulators C57.15 / 60076-21	Dist	C. Colopy	100 MX	St. Charles AB (1)
4:45 pm - 6:00 pm	WG PD in Bushings & PT/CTs PC57.160	DiTests	T. Hochanh	175 MX S3	Grand Ballroom AB
4:45 pm - 6:00 pm	WG Life Extension C57.140	Power	P. Boman	175 MX S3	Grand Ballroom D
4:45 pm - 6:00 pm	TF PCS Revisions to C57.12.00	PCS	T. Ansari	200 MX S1	Grand Ballroom C
	No technical tours or socials planned				

DATE/TIME	ACTIVITY	SUB-COM	ACTIVITY CHAIR	ROOM CAP/ARR/AV	MEETING ROOM
Tuesday, April 4 -- Tuesday Breaks Sponsored by SPX Transformer Solutions **					
7:00 am - 11:30 am	Meeting Registration				Grand Ballroom Foyer (2)
7:00 am - 8:00 am	Breakfast - Attendees (no spouses/companions please)			272 RT (8/tbl) w/buffet in Gallery	Astor Ballroom (2)
8:00 am - 9:30 am	Breakfast - Spouses/Companions (no meeting attendees please)			80 RT (8/tbl)	Bourbon House Restaurant (1)
7:00 am - 7:50 am	EL&P Delegation (End-users only please) -- Breakfast Meeting; arrive early		J. Murphy	60 CL w/buffet in room	St. Charles AB (1)
9:15 am - 4:15 pm	Spouses/Companions Tour: Mardi Gras World & New Orleans Cooking School. Advance registration required. -- Bus departs front of hotel at 9:15 am, and returns ~4:15 pm. Lunch at cooking school. See flyer for details.				
8:00 am - 9:15 am	WG Station Service Volt. Transf. C57.13.8	IT	D. Wallace	60 MX	Iberville (M2)
8:00 am - 9:15 am	WG Enclosure Integrity C57.12.28, C57.12.29, C57.12.31, C57.12.32	Dist	D. Mulkey	80 MX	Toulouse AB (M2)
8:00 am - 9:15 am	--	--	--	100 MX (60 CL + 40 TH)	St. Charles AB (1)
8:00 am - 9:15 am	TF Limits for Winding Insulation PF/Resistance	DiTests	S. Tarlapally	175 MX S3	Grand Ballroom AB
8:00 am - 9:15 am	WG Dry Type PD Detection PC57.124	Dry	T. Prevost	175 MX S3	Grand Ballroom D
8:00 am - 9:15 am	WG Revision to C57.12.10	Power	G. Hoffman	200 MX S1	Grand Ballroom C
9:15 am - 9:30 am	*Break (beverages only)*			Foyers, Floors 2 & M2	
9:30 am - 10:45 am	WG Tests for Instrument Transf. C57.13.5	IT	P. Riffon	60 MX	Iberville (M2)
9:30 am - 10:45 am	WG 1-Ph Submersible Transf. C57.12.23	UTNP	A. Traut	80 MX	Toulouse AB (M2)
9:30 am - 10:45 am	--			100 MX	St. Charles AB (1)
9:30 am - 10:45 am	WG GSU Bushings PC57.19.04	Bush	S. Digby	175 MX S3	Grand Ballroom AB
9:30 am - 10:45 am	WG Shunt Reactors C57.21	PCS	S. Som	175 MX S3	Grand Ballroom D
9:30 am - 10:45 am	WG Wind Turbine Transf. P60076-16	PCS	P. Hopkinson	200 MX S1	Grand Ballroom C
10:45 am - 11:00 am	*Break (beverages only)*			Foyers, Floors 2 & M2	
	~~WG Loss Evaluation Guide C57.120~~	~~PCS~~	Will not meet. Work complete.		
11:00 am - 12:15 pm	WG PLC Caps & CCVTs PC57.13.9	IT	Z. Roman	60 MX	Iberville (M2)
11:00 am - 12:15 pm	WG Liquid-immersed Secondary Network Transformers C57.12.40	UTNP	B. Klaponski	80 MX	Toulouse AB (M2)
11:00 am - 12:15 pm	WG PD Acoustic Detection C57.127	DiTests	D. Gross	100 MX	St. Charles AB (1)
11:00 am - 12:15 pm	WG Distrib. Transf. Bushings PC57.19.02	Bush	S. Shull	175 MX S3	Grand Ballroom AB
11:00 am - 12:15 pm	WG Semiconductor Power Rectifier Transformers C57.18.10	PCS	S. Kennedy	175 MX S3	Grand Ballroom D
11:00 am - 12:15 pm	WG Transportation Issues PC57.150	Power	G. Anderson	200 MX S1	Grand Ballroom C
12:15 pm - 1:30 pm	Awards Luncheon -- Doors open ~12:00 pm. Come early, get a good seat, and start eating. -- Advance registration necessary. No paper tickets. Admission verified with name badge at the door. ***All meeting attendees are encouraged to attend this luncheon.*** ***It's a great way to show your appreciation and help us recognize our accomplishments.***		D. Platts	240 RT (7/tbl)	Astor Ballroom (2)
	~~WG DPV Grid Transformers PC57.159~~	~~PCS~~	Work is complete.		
1:45 pm - 3:00 pm	WG 3-ph Transf. Connections PC57.105	PCS	R. Verdolin	60 MX	Iberville (M2)
1:45 pm - 3:00 pm	WG Distr. Substation Transf. C57.12.36	Dist	J. Murphy	80 MX	Toulouse AB (M2)
1:45 pm - 3:00 pm	WG Thermal Evaluation of Insulation Systems, Dry Type C57.12.60	Dry	R. Wicks	100 MX	St. Charles AB (1)
1:45 pm - 3:00 pm	WG Std Require for Bushings C57.19.01	Bush	S. Zhang	175 MX S3	Grand Ballroom AB
1:45 pm - 3:00 pm	WG Tap Changers 60214-1-57-131	Power	C. Colopy	175 MX S3	Grand Ballroom D
1:45 pm - 3:00 pm	TF Revision to Low Frequency Tests	DiTests	B. Griesacker	200 MX S1	Grand Ballroom C
3:00 pm - 3:15 pm	*Break (beverages and Pretzels!)*			Foyers, Floors 2 & M2	

** Contact Ed Smith (edsmith@ieee.org) if you are interested in sponsoring a coffee break at a future meeting.

DATE/TIME	ACTIVITY	SUB-COM	ACTIVITY CHAIR	ROOM CAP/ARR/AV	MEETING ROOM
Tuesday, April 4 (continued)					
	~~WG Dry Type Reactors PC57.16~~	~~Dry~~	moved to Monday 4:45 pm		
3:15 pm - 4:30 pm	WG Std Terminal Markings C57.12.70	Stds	S. Shull	60 MX	Iberville (M2)
3:15 pm - 4:30 pm	--	--	--	80 MX	Toulouse AB (M2)
3:15 pm - 4:30 pm	WG High-Temp Insulat. Materials, P-1276	IL	R. Wicks	100 MX	St. Charles AB (1)
3:15 pm - 4:30 pm	WG Bushing Applicat. Guide C57.19.100	Bush	T. Spitzer	175 MX S3	Grand Ballroom AB
3:15 pm - 4:30 pm	WG Tap Changer Applicat. Guide 60214-2	Power	C. Colopy	175 MX S3	Grand Ballroom D
3:15 pm - 4:30 pm	TF Switching Transients Induced by Transf/Breaker Interaction PC57.142	PCS	J. McBride	200 MX S1	Grand Ballroom C
4:30 pm - 4:45 pm	*Break (beverages only)*			Foyers, Floors 2 & M2	
4:45 pm - 6:00 pm	WG Std Transf. Terminology C57.12.80	Stds	C. Clairborne	60 MX	Iberville (M2)
4:45 pm - 6:00 pm	WG Tank Pressure Coordinat. C57.12.39	Dist	C. Gaytan	80 MX	Toulouse AB (M2)
4:45 pm - 6:00 pm	WG Dry Type Test Code C57.12.91	Dry	D. Foster	100 MX	St. Charles AB (1)
4:45 pm - 6:00 pm	WG Short Circuit Withstand PC57.164	PCS	S. Patel	175 MX S3	Grand Ballroom AB
4:45 pm - 6:00 pm	WG Gas Interpretation Guide C57.104	IF	C. Beauchemin	175 MX S3	Grand Ballroom D
4:45 pm - 6:00 pm	TF Revisions to Impulse Test Sections of C57.12.00 and C57.12.90	DiTests	P. Riffon	200 MX S1	Grand Ballroom C
	No technical tours or socials planned				

Wednesday, April 5 -- Wednesday Breaks Sponsored by HICO America **					
	No Meeting Registration, No Technical Tours, No Spouse/Companion Tours				
7:00 am - 8:00 am	Breakfast - Attendees (no spouses/companions please)			272 RT (8/tbl)	Astor Ballroom (2)
8:00 am - 9:30 am	Breakfast - Spouses/Companions (no meeting attendees please)			80 RT (8/tbl)	Bourbon House Rest
7:00 am - 7:50 am	**SC Meetings Planning**	Mtgs	G. Anderson	30 CL w/buffet in room	Iberville (M2)
7:00 am - 8:30 am	IEC TC-14 Technical Advisory Group -- Breakfast Meeting; arrive early -- All interested individuals welcome	++	P. Hopkinson	60 CL w/buffet in room	St. Charles AB (1)
8:00 am - 9:15 am	**SC Instrument Transformers**	IT	R. McTaggart	60 MX	Toulouse AB (M2)
8:00 am - 9:15 am	**SC Insulation Life**	IL	S. Kennedy	375 MX S1 (175+200)	Grand Ballroom AB+C (2)
9:15 am - 9:30 am	*Break (beverages only)*			Grand Ballroom Foyer only	
9:30 am - 10:45 am	**SC Bushings**	Bush	P. Zhao	175 MX S3	Grand Ballroom D
9:30 am - 10:45 am	**SC Distribution Transformers**	Dist	S. Shull	375 MX S1	Grand Ballroom ABC
10:45 am - 11:00 am	*Break (beverages only)*			Grand Ballroom Foyer only	
11:00 am - 12:15 pm	**SC UG Transf. & Network Protectors**	UTNP	D. Mulkey	60 MX	Toulouse AB (M2)
11:00 am - 12:15 pm	**SC Dielectric Tests**	DiTests	A. Varghese	375 MX S1	Grand Ballroom ABC
12:15 pm - 1:30 pm	Lunch (on your own)				
1:30 pm - 2:45 pm	**SC Dry Type Transformers**	Dry	C. Johnson	60 MX	Toulouse AB (M2)
1:30 pm - 2:45 pm	**SC Power Transformers**	Power	B. Griesacker	350 MX S1	Grand Ballroom ABC
2:45 pm - 3:00 pm	*Break (beverages and treats)*			Grand Ballroom Foyer only	
3:00 pm - 4:15 pm	**SC Insulating Fluids**	IF	D. Wallach	175 MX S3	Grand Ballroom D
3:00 pm - 4:15 pm	**SC Performance Characteristics**	PCS	E. teNyenhuis	375 MX S1	Grand Ballroom ABC
4:15 pm - 4:30 pm	*Break (beverages only)*				
4:30 pm - 5:45 pm	**SC Standards**	Stds	J. Murphy	175 MX S3	Grand Ballroom D
6:30 pm - 9:30 pm	Evening Social: Dinner at the Audubon Aquarium of the Americas. Advance registration is necessary. -- Paper tickets will not be provided. Admission confirmed with list at entrance of Aquarium. -- Approx 5-10 minute walk from hotel; shuttle bus available if desired. -- Event begins at 6:30 pm with reception and music at entrance of Aquarium. -- Exhibits, cash bar and 1st floor gift shop also open at 6:30 pm. Dinner begins at 7:30 pm. -- Exhibits stay open until 9:30 pm. Gift shop closes at 7:30 pm.				

** Contact Ed Smith (edsmith@ieee.org) if you are interested in sponsoring a coffee break at a future meeting.

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"
S1 = special sound set-up, w/podium & lapel mics, table mics, stand mics at mid-room
S2 = stand mic in front only; S3 = one stand mic in front & stand mic(s) at mid-room

BD = boardroom; US = U-shape
RT = multiple roundtables
CL = classroom seating (w/head table for 2)
TH = theater seating (w/head table for 2)
MX = mix classroom & theater (w/head table)

SUBCOMMITTEES					
Admin	Administrative	HVDC	HVDC Converter Transformers and Smoothing Reactors	Mtgs	Meetings
Bush	Bushings			PCS	Performance Characteristics
DiTests	Dielectric Tests	IF	Insulation Fluids	Power	Power Transformers
Dist	Distribution Transformers	IL	Insulation Life	UTNP	Underground Transformers and Network Protectors
Dry	Dry Type Transformers	IT	Instrument Transformers		
				Stds	Standards

Thursday, April 6

	No Meeting Registration, No Spouses/Companions Tours or Technical Tours planned			
7:00 am - 8:30 am	Breakfast - Attendees (no spouses/companions please)		272 RT (8/tbl)	Astor Ballroom (2)
8:00 am - 9:30 am	Breakfast - Spouses/Companions (no meeting attendees please)		80 RT (8/tbl)	Bourbon House Restaurant (1)
8:00 am - 9:15 am	Technical Presentation #1: "Field Testing of LTCs". See flyer on website. **		375 MX S1	Grand Ballroom ABC (2)
9:15 am - 9:30 am	*Break (beverages only)*		Grand Ballroom Foyer only	
9:30 am - 10:45 am	Technical Presentation #2: "Aging Markers for Estimation of Paper Degradation". See flyer on website. **		375 MX S1	Grand Ballroom ABC (2)
10:45 am - 11:00 am	*Break (beverages only)*		Grand Ballroom Foyer only	
11:00 am - 12:00 pm	Closing Session -- <u>All attendees</u> are encouraged to attend -- See separate document for meeting agenda	S. Antosz	375 MX S1	Grand Ballroom ABC (2)
	Lunch on your own			
1:00 pm - 5:00 pm	-- -- --		10 BD	Royal (M2)

Friday, April 7

	No Meetings, No Technical Tours			

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

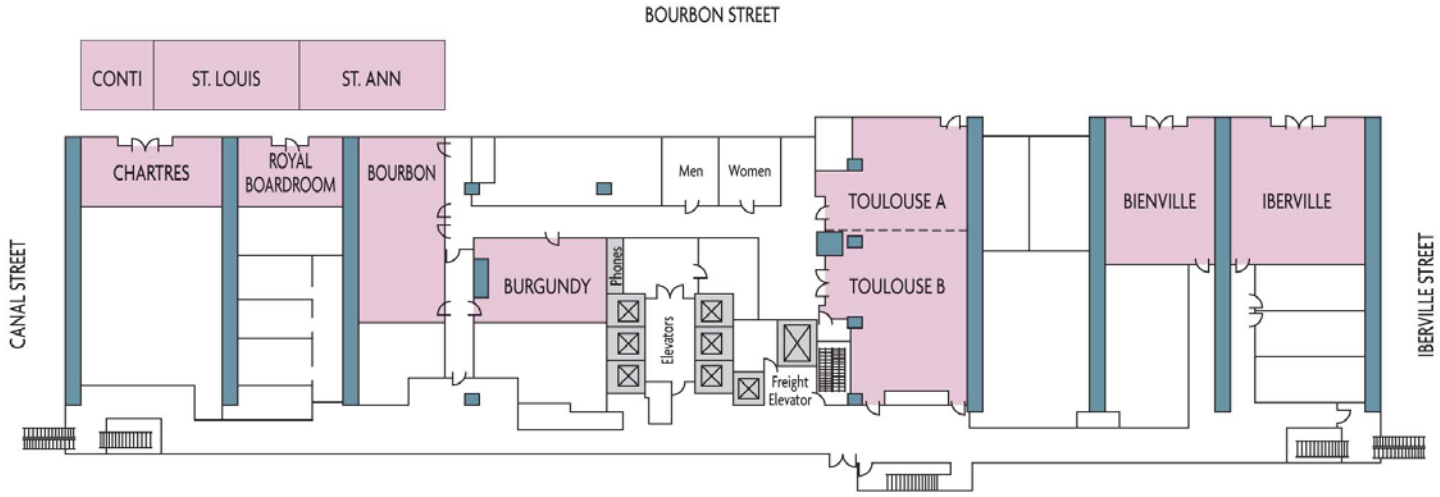
FUTURE COMMITTEE MEETINGS

<u>Fall 2017</u>: October 29 to November 2; Louisville, Kentucky USA
<u>Spring 2018</u>: March 25-29; Pittsburgh, Pennsylvania USA -- Our 100th Year Anniversary Celebration!
<u>Fall 2018</u>: October 14-18 or 21-25, or November 4-8; USA Location (to be determined)
<u>Spring 2019</u>: March 10-14 or 17-21 or 24-28; USA Location (to be determined)

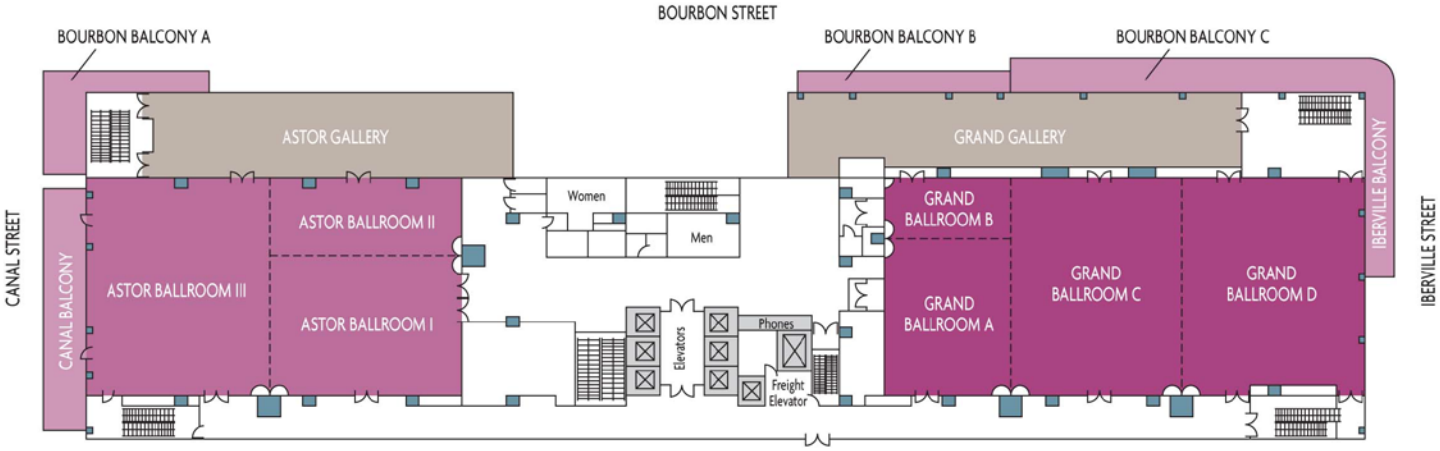
Astor Crowne Plaza Hotel

739 Canal Street (corner of Canal and Bourbon Streets)
New Orleans, Louisiana USA
+1.504.962.0500

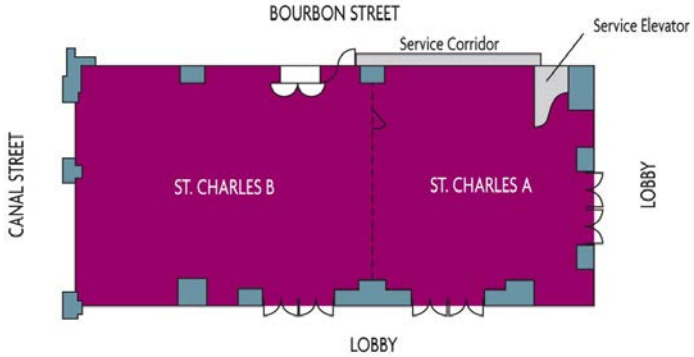
SECOND FLOOR MEZZANINE (M2)



SECOND FLOOR (2)



FIRST FLOOR / LOBBY (1)



APPENDIX 2

Semi-Annual Standards Report

IEEE / PES /TRANSFORMERS COMMITTEE

Standards Report

To: Members of Transformers Committee March 23, 2017

From: Jim Graham, Standards Coordinator

Executive Summary

This report covers Transformers Committee Standards activity from September 22, 2016 to March 24, 2017. During this time no new Standards, three Revisions, and three Corrigenda were approved by the Standards Board. In this same period, the Standards Board approved four PARs for new standards; six PARs for Revisions; no PAR modifications; no PARs for Corrigenda, and six PAR extensions.

Twenty-two (22) standards will expire in 2018, including one standard which does not have an active PAR.

In this Report:

I. Standards approved since Sep 20, 2016

Approved New Transformer Standards *None*

Approved Revisions to Transformer Standards *(All expire 31 Dec 2026)*

PC57.12.24 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

PC57.138 Recommended Practice for Routine Impulse Test for Distribution Transformers

PC57.120 Guide for Loss Evaluation of Distribution and Power Transformers and Reactors **(2017)**

Approved Standards Corrigenda *(does not affect the expiration date of the document)*

PC57.12.38-2014 Cor 1 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 - Corrigendum 1

PC57.163-2015 Cor 1 Guide for Establishing Power Transformer Capability while under Geomagnetic Disturbances – Corrigendum 1

C57.12.90 2015 Cor 1 Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers – Corrigendum 1

II. PARs approved since Sep 20, 2016

Approved PARs for New Projects (Expires as noted)

P60214-1-57-131 Standard Requirements for Tap Changers **(2020)**

PC57.13.9 Standard for Power-Line Carrier Coupling Capacitors and Coupling Capacitor Voltage Transformers **(approval pending)**

PC57.32a Standard for Requirements, Terminology, and Test Procedures for Neutral Grounding Devices Amendment: Neutral Grounding Resistor Section **(2021)**

PC57.165 Guide for Temperature Measurements for Liquid Immersed Transformers and Reactors **(2021)**

Approved PARs for Revision of Standards (Approved until December 2021)

P1277 Standard General Requirements

PC57.12.00 Standard for General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers

PC57.12.80 Standard Terminology for Power and Distribution Transformers

PC57.142 Guide to Describe the Occurrence and Mitigation of Switching Transients Induced by Transformers, Switching Device, and System Interaction (approval pending)

PC57.143 Guide for Application of Monitoring Equipment to Liquid-Immersed Transformers and Components

PC57.150 Guide for the Transportation of Transformers and Reactors Rated 10,000 kVA or Higher

Approved PAR Modifcations *None* *(PAR Modifications do not change the Expiration Date)*

Approved PARs for Corrigenda *None*

Approved PAR Extensions (All extended as noted)

P1276 Guide for the Application of High-Temperature Insulation Materials in Liquid-Immersed Power Transformers **(2018)**

PC57.12.20 Standard for Power Transformers - Part 16: Transformers for Wind Turbine Application **(2017)**

PC57.12.39 Standard Requirements for Distribution Transformer Tank Pressure Coordination **(2017)**

PC57.13.7 Standard for Current Transformers with a Maximum mA Secondary Current of 250 mA **(2017)**

PC57.120 IEEE Loss Evaluation Guide for Power Transformers and Reactors **(2017)**

PC57.158 Guide for the Application of Tertiary and Stabilizing Windings in Power Transformers **(2018)**

III. 2017 IEEE Standards Board Meeting Schedule

The Standards Board has three *physical* board meetings per year and three teleconference meetings. The full list of 2017 meetings is shown in the calendar on the next page.

Deadlines for 2017 Standards Board Submissions:

Standards Board Meeting	Submission Deadline
May 2017 (teleconference)	**March 24, 2017**
June 2017	**May 5, 2017**
September 2017 (teleconference)	**July 28, 2017**
December 2017	**October 16, 2017**

Please Note: Anything that expires at the end of 2017 must be submitted to Standards Board (PARs to NESCOM, standards to REVCOM) by **October 16, 2017**

IV. Transformers Committee Ballot Status *(as of Sep 24, 2016)*

PAR Number	Project Type	PAR Expiration	Invitation Close Date	Ballot Close Date	Status
Bushings					
PC57.19.01	Revision	12/31/2017	2/25/2017	4/2/2017	Sponsor Ballot: Ballot
Dielectric Test					
PC57.161	New	12/31/2017	12/4/2016	2/9/2017	Sponsor Ballot: Comment Resolution
Distribution Transformers					
PC57.12.39	New	12/31/2017	4/13/2016	7/14/2016	Sponsor Ballot: Comment Resolution
PC57.12.20	Revision	12/31/2017	2/7/2016	4/8/2016	Sponsor Ballot: Comment Resolution
PC57.12.36	Revision	12/31/2017	10/2/2014	2/27/2017	Sponsor Ballot: Comment Resolution

PAR Number	Project Type	PAR Expiration	Invitation Close Date	Ballot Close Date	Status
Distribution Transformers					
PC57.15	Revision	12/31/2018	2/17/2016	10/23/2016	Sponsor Ballot: Comment Resolution
Dry Type Transformers					
PC57.12.58	Revision	12/31/2019	8/28/2016	4/1/2017	Sponsor Ballot: Ballot
HVDC Converter Transformers & Smoothing Reactors					
P60076-57-129	Revision	12/31/2018	8/11/2016	3/17/2017	Sponsor Ballot: Comment Resolution
Insulating Fluids					
PC57.147	Revision	12/31/2018	2/27/2016	3/31/2016	Sponsor Ballot: Comment Resolution
PC57.119	Revision	12/31/2018	12/18/2014	3/15/2017	Sponsor Ballot: Comment Resolution
Instrument Transformers					
PC57.13.7	New	12/31/2017	10/13/2016	12/28/2016	Sponsor Ballot: Comment Resolution
Insulating Fluids					
PC57.158	New	12/31/2018	5/18/2016	10/27/2016	Sponsor Ballot: Comment Resolution
Power Transformers					
PC57.12.10	Revision	12/31/2019	12/28/2016	3/15/2017	Sponsor Ballot: Comment Resolution
PC57.140	Revision	12/31/2017	7/15/2016	3/30/2017	Sponsor Ballot: Ballot

V. Transformer Committee Active PAR Status *(as of Mar 24, 2017)*

PAR Number	Project Type	Title	Approval Date	PAR Expiration
Bushings				
PC57.19.01	Revision	Standard Performance Characteristics and Dimensions for Outdoor Apparatus Bushings	8-Dec-2010	12/31/2017
PC57.19.02	New	Standard for the Design and Performance Requirements of Bushings Applied to Liquid Immersed Distribution Transformers	5-Feb-2016	12/31/2020
PC57.19.04	New	Standard Performance Characteristics and Dimensions for High Current Power Transformer Bushings with Rated Continuous Current in Excess of 5000 A in Bus Enclosures	16-Jun-11	12/31/2017
Dielectric Test				
PC57.127	Revision	Guide for the Detection, Location and Interpretation of Sources of Acoustic Emissions from Electrical Discharges in Power Transformers and Power Reactors	16-Feb-15	12/31/2019
PC57.161	New	Guide for Dielectric Frequency Response Test	23-Aug-13	12/31/2017
PC57.160	New	Guide for the Electrical Measurement of Partial Discharges in High Voltage Bushings and Instrument Transformers	6-Mar-2013	12/31/2017
Distribution Transformers				
PC57.12.39	New	Standard Requirements for Distribution Transformer Tank Pressure Coordination	5-Feb-2016	12/31/2017
PC57.12.20	Revision	Standard for Overhead-Type Distribution Transformers 500 kVA and Smaller: High Voltage, 34 500 V and Below; Low Voltage, 7970/13 800Y V and Below	8-Jun-2012	12/31/2017
PC57.12.32	Revision	Standard for Submersible Equipment - Enclosure Integrity	11-Jun-15	12/31/2019
PC57.12.34	Revision	Standard Requirements for Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers, 10 MVA and Smaller; High-Voltage, 34.5 kV Nominal System Voltage and Below; Low-Voltage, 15 kV Nominal System Voltage and Below	22-Sep-16	12/31/2020
PC57.12.36	Revision	Standard Requirements for Liquid-Immersed Distribution Substation Transformers	7-Dec-2011	12/31/2017
PC57.15	Revision	Standard Requirements, Terminology, and Test Code for Step-Voltage Regulators	5-Feb-2016	12/31/2018

PAR Number	Project Type	Title	Approval Date	PAR Expiration
Dry Type Transformers				
PC57.12.01	Revision	Standard for General Requirements for Dry-Type Distribution and Power Transformers	12-May-16	12/31/2020
PC57.12.51	Revision	Standard for Ventilated Dry-Type Power Transformers, 501 kVA and Larger, Three-Phase, with High-Voltage 601 V to 34 500 V; Low-Voltage 208Y/120 V to 4160 V- General Requirements	21-Aug-14	12/31/2018
PC57.12.58	Revision	Guide for Conducting a Transient Voltage Analysis of a Dry-Type Transformer Coil	3-Sep-2015	12/31/2019
PC57.12.60	Revision	Standard Test Procedure for Thermal Evaluation of Insulation Systems for Dry-Type Power and Distribution Transformers	11-Jun-15	12/31/2019
PC57.12.91	Revision	Standard Test Code for Dry-Type Distribution and Power Transformers	3-Mar-2016	12/31/2020
PC57.16	Revision	Standard for Requirements, Terminology, and Test Code for Dry-Type Air-Core Series-Connected Reactors	5-Feb-2016	12/31/2020
HVDC Converter Transformers & Smoothing Reactors				
P1277	Revision	Standard General Requirements and Test Code for Dry-Type and Oil-Immersed Smoothing Reactors and for Dry-Type Converter Reactors for DC Power Transmission	17-Feb-17	12/31/2021
P60076-57-129	Revision	Converter Transformers for HVDC Applications	10-Dec-14	12/31/2018
Insulating Fluids				
PC57.104	Revision	Guide for the Interpretation of Gases Generated in Oil-Immersed Transformers	5-Feb-2010	12/31/2017
PC57.147	Revision	Guide for Acceptance and Maintenance of Natural Ester Insulating Liquid in Transformers	5-Feb-2016	12/31/2018
Insulation Life				
P1276	Revision	Guide for the Application of High-Temperature Insulation Materials in Liquid-Immersed Distribution, Power and Regulating Transformers	27-Mar-14	12/31/2018
PC57.119	Revision	Recommended Practice for Performing Temperature Rise Tests on Oil-Immersed Power Transformers at Loads Beyond Nameplate Ratings	27-Oct-14	12/31/2018
PC57.162	New	Guide for the Interpretation of Moisture Related Parameters in Dry, Gas Insulated and Liquid Immersed Transformers and Reactors	23-Aug-13	12/31/2017
PC57.165	New	Guide for Temperature Measurements for Liquid Immersed Transformers and Reactors	17-Feb-17	12/31/2021

PAR Number	Project Type	Title	Approval Date	PAR Expiration
Instrument Transformers				
PC57.13.5	Revision	Standard of Performance and Test Requirements for Instrument Transformers of a Nominal System Voltage of 115 kV and Above	3-Mar-2016	12/31/2020
PC57.13.7	New	Standard for Current Transformers with a Maximum mA Secondary Current of 250 mA	30-Sep-10	12/31/2017
PC57.13.8	New	Standard Requirements for Station Service Voltage Transformers	11-Dec-13	12/31/2017
PC57.13.9	New	Standard for Power-Line Carrier Coupling Capacitors and Coupling Capacitor Voltage Transformers	23-Mar-17	12/31/2021
Performance Characteristics				
PC57.18.10	Revision	Standard Practices and Requirements for Semiconductor Power Rectifier Transformers	30-Jun-16	12/31/2020
PC57.21	Revision	Standard Requirements, Terminology, and Test Code for Shunt Reactors Rated Over 500 kVA	21-Aug-14	12/31/2018
PC57.32a	Amendment	Standard for Requirements, Terminology, and Test Procedures for Neutral Grounding Devices Amendment: Neutral Grounding Resistor Section	17-Feb-17	12/31/2021
PC57.105	Revision	Guide for Application of Transformer Connections in Three-Phase Electrical Systems	26-Mar-15	12/31/2019
PC57.109	Revision	Guide for Liquid-Immersed Transformers Through-Fault-Current Duration	26-Mar-15	12/31/2019
PC57.110	Revision	Recommended Practice for Establishing Liquid-Immersed and Dry-Type Power and Distribution Transformer Capability When Supplying Nonsinusoidal Load Currents	12-Jun-14	12/31/2018
PC57.142	Revision	Guide to Describe the Occurrence and Mitigation of Switching Transients Induced by Transformers, Switching Device, and System Interaction	23-Mar-17	12/31/2021
PC57.158	New	Guide for the Application of Tertiary and Stabilizing Windings in Power Transformers	15-May-12	12/31/2018
PC57.164	New	Guide for Establishing Short Circuit Withstand Capabilities of Liquid Immersed Power Transformers, Regulators, and Reactors	30-Jun-16	12/31/2020
Power Transformers				
P60214-1-57-131	New	Standard Requirements for Tap Changers	7-Dec-2016	12/31/2020
P60214-2	New	Tap-Changers - Part 2: Application Guide	12-Jun-14	12/31/2018
PC57.12.10	Revision	Standard Requirements for Liquid-Immersed Power Transformers	26-Mar-15	12/31/2019

PAR Number	Project Type	Title	Approval Date	PAR Expiration
Power Transformers				
PC57.93	Revision	Guide for Installation and Maintenance of Liquid-Immersed Power Transformers	29-Mar-12	12/31/2018
PC57.140	Revision	Guide for Evaluation and Reconditioning of Liquid Immersed Power Transformers	31-Mar-11	12/31/2017
PC57.143	Revision	Guide for Application of Monitoring Equipment to Liquid-Immersed Transformers and Components	17-Feb-17	12/31/2021
PC57.148	Revision	Standard for Control Cabinets for Power Transformers	30-Jun-16	12/31/2020
PC57.150	Revision	Guide for the Transportation of Transformers and Reactors Rated 10,000 kVA or Higher	23-Mar-17	12/31/2021
Standards				
PC57.12.00	Revision	Standard for General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers	17-Feb-17	12/31/2021
PC57.12.90-2015 Cor 1	Corrigendum	Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers - Corrigendum 1: Editorial and Technical Corrections	30-Jun-16	12/31/2020
PC57.12.70-2011 Cor 1	Corrigendum	Standard Terminal Markings and Connections for Distribution and Power Transformers - Corrigendum 1: Correction of Annex A	5-Feb-2016	12/31/2019
PC57.12.80	Revision	Standard Terminology for Power and Distribution Transformers	23-Mar-17	12/31/2021
Subsurface Transformers & Network Protectors				
PC57.12.23	Revision	Standard for Submersible Single-Phase Transformers: 250 kVA and Smaller; High Voltage 34 500GrdY/19 920V and Below; Low Voltage 600 V and Below	21-Aug-14	12/31/2018
PC57.12.40	Revision	Standard for Network, Three-Phase Transformers, 2500 kVA and Smaller; High Voltage, 34 500 V and Below; Low Voltage, 600 V and Below; Subway and Vault Types (Liquid Immersed)	30-Aug-12	12/31/2017
PC57.12.44	Revision	Standard Requirements for Secondary Network Protectors	26-Mar-15	12/31/2019
P60076-16	New	Power Transformers - Part 16: Transformers for Wind Turbine Application	10-Dec-14	12/31/2018

VI. Transformers Standards Status *(as of Sep 24, 2016)*

Standard Number	Title	Year	SASB Expiration	ACTIVE PAR?
Bushings Subcommittee		**SC Chair: Peter Zhao email: peter.zhao@HydroOne.com phone: (417) 345-5926**		
65700-19-03	IEC/IEEE International Standard -- Bushings for DC application	2014	12/31/2024	No
C57.19.00	IEEE Standard General Requirements and Test Procedure for Power Apparatus Bushings	2004	12/8/2020	No
C57.19.01	IEEE Standard Performance Characteristics and Dimensions for Outdoor Apparatus Bushings	2000	**12/31/2018**	**Yes - PAR expires in 2017, In Sponsor Ballot**
C57.19.100	IEEE Guide for Application of Power Apparatus Bushings	2012	12/31/2022	No
Dielectric Tests Subcommittee SC Chair:		**SC Chair: Ajith Varghese email: ajith.varghese@spx.com phone: (262) 442-7197**		
C57.113	IEEE Recommended Practice for Partial Discharge Measurement in Liquid-Filled Power Transformers and Shunt Reactors	2010	6/17/2020	No
C57.127	IEEE Guide for the Detection and Location of Acoustic Emissions from Partial Discharges in Oil-Immersed Power Transformers and Reactors	2007	**12/31/2018**	Yes - PAR expires 2019
C57.138	IEEE Approved Draft Recommended Practice for Routine Impulse Test for Distribution Transformers	2016	12/31/2026	No
C57.98	IEEE Guide for Transformer Impulse Tests	2011	12/31/2021	No

Standard Number	Title	Year	SASB Expiration	ACTIVE PAR?
Distribution Transformers Subcommittee		**SC Chair: Steve Shull email: sshull@empiredistrict.com phone: (417) 625-611**		
C57.12.37	IEEE Standard for the Electronic Reporting of Distribution Transformer Test Data	2015	12/31/2025	No
C57.12.20	IEEE Standard for Overhead-Type Distribution Transformers 500 kVA and Smaller: High Voltage, 34 500 V and Below; Low Voltage, 7970/13 800Y V and Below	2011	6/16/2021	**Yes, PAR expires 2017, in comment resolution**
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	2014	12/31/2024	No
C57.12.38-2014/Cor 1	IEEE Approved Draft 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 - Corrigendum 1: Correct an omission in the label of Figure 1.	2016	12/31/2026	No
C57.12.28	IEEE Standard for Pad-Mounted Equipment--Enclosure Integrity	2014	12/31/2024	No
C57.12.29	IEEE Standard for Pad-Mounted Equipment--Enclosure Integrity for Coastal Environments	2014	12/31/2024	No
C57.12.30	IEEE Standard for Pole-Mounted Equipment--Enclosure Integrity for Coastal Environments	2010	12/31/2020	No
C57.12.31	IEEE Standard for Pole-Mounted Equipment--Enclosure Integrity	2010	12/31/2020	No

Standard Number	Title	Year	SASB Expiration	ACTIVE PAR?
Distribution Transformers Subcommittee		**SC Chair: Steve Shull email: sshull@empiredistrict.com phone: (417) 625-611**		
C57.12.31-2010/Cor 1	IEEE Standard for Pole-Mounted Equipment--Enclosure Integrity - Corrigendum 1: Correction to the SCAB Corrosion Test in 4.5.6	2014	12/31/2024	No
C57.12.32	IEEE Standard for Submersible Equipment - Enclosure Integrity	2002	**12/31/2018**	Yes - PAR expires 2019
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	2015	12/31/2025	Yes, PAR expires in 2020
C57.12.35	IEEE Standard Bar Coding for Distribution Transformers and Step-Voltage Regulators	2013	12/31/2023	No
C57.12.36	IEEE Standard Requirements for Liquid-Immersed Distribution Substation Transformers	2007	**12/31/2018**	**Yes - PAR expires 2017 , in comment resolution.**
C57.15	IEEE Standard Requirements, Terminology, and Test Code for Step-Voltage Regulators	2009	12/31/2019	**Yes PAR Expires in 2018, in comment reslution**

Standard Number	Title	Year	SASB Expiration	ACTIVE PAR?
Dry Type Transformers Subcommittee		**SC Chair: C.W. Johnson email: charles.w.johnson@us.abb.com phone: (276) 688-1512**		
259	IEEE Standard Test Procedure for Evaluation of Systems of Insulation for Dry-Type Specialty and General-Purpose Transformers	1999	12/31/2020	No
C57.12.01	IEEE Standard for General Requirements for Dry-Type Distribution and Power Transformers	2015	12/31/2025	Yes, PAR expires in 2020
C57.124	IEEE Recommended Practice for the Detection of Partial Discharge and the Measurement of Apparent Charge in Dry-Type Transformers	1991	12/31/2019	No
C57.12.51	IEEE Standard for Ventilated Dry- Type Power Transformers, 501 kVA and Larger, Three-Phase, with High- Voltage 601 V to 34 500 V; Low- Voltage 208Y/120 V to 4160 V- General Requirements	2008	**12/31/2018**	**Yes PAR expires in 2018. Modified PAR on the Agenda**
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	2012	12/31/2022	No
C57.12.58	IEEE Guide for Conducting a Transient Voltage Analysis of a Dry-Type Transformer Coil	1991	**12/31/2018**	Yes PAR expires in 2019, in comment resolution
C57.12.59	IEEE Guide for Dry-Type Transformer Through-Fault Current Duration	2015	12/31/2025	No

Standard Number	Title	Year	SASB Expiration	ACTIVE PAR?
Dry Type Transformers Subcommittee		**SC Chair: C.W. Johnson email: charles.w.johnson@us.abb.com phone: (276) 688-1512**		
C57.12.60	IEEE Standard Test Procedure for Thermal Evaluation of Insulation Systems for Dry-Type Power and Distribution Transformers, Including Open-Wound, Solid-Cast, and Resin-Encapsulated Transformers	2009	12/31/2019	Yes, PAR expires in 2019
C57.12.60-2009/Cor 1	IEEE Standard Test Procedure for Thermal Evaluation of Insulation Systems for Dry-Type Power and Distribution Transformers, Including Open-Wound, Solid-Cast, and Resin-Encapsulated Transformers	2013	12/31/2023	Yes, PAR to revise std expires in 2019
C57.12.91	IEEE Standard Test Code for Dry-Type Distribution and Power Transformers	2011	12/31/2021	Yes , PAR expires 2020
C57.134	IEEE Guide for Determination of Hottest-Spot Temperature in Dry-Type Transformers	2013	12/31/2023	No
C57.16	IEEE Standard for Requirements, Terminology, and Test Code for Dry-Type Air-Core Series-Connected Reactors	2011	12/31/2021	Yes , PAR expires 2020
C57.94	IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers	2015	12/31/2025	No
C57.96	IEEE Guide for Loading Dry-Type Distribution and Power Transformers	2013	12/31/2023	No

Standard Number	Title	Year	SASB Expiration	ACTIVE PAR?
HVDC Converter Transformers & Smoothing Reactors Subcommittee		**SC Chair: Mike Sharp email: mikes@ca.trenchgroup.com phone: 416-298-8108**		
1277	IEEE Standard General Requirements and Test Code for Dry-Type and Oil-Immersed Smoothing Reactors for DC Power Transmission	2010	12/31/2020	Yes, PAR expires 2021
C57.129	Standard for General Requirements and Test Code for Oil-Immersed HVDC Converter Transformers	2007	**12/31/2018**	**Yes PAR expires in 2018, in Sponsor Ballot**
Insulating Liquids Subcommittee		**SC Chair: Dave Wallach email: david.wallach@duke-energy.com phone: (980) 373-4167**		
C57.637	IEEE Guide for the Reclamation of Mineral Insulating Oil and Criteria for Its Use	2015	12/31/2025	No
C57.104	IEEE Guide for the Interpretation of Gases Generated in Oil-Immersed Transformers	2008	**12/31/2018**	**Yes PAR expires in 2017**
C57.106	IEEE Guide for Acceptance and Maintenance of Insulating Mineral Oil in Electrical Equipment	2015	12/31/2025	No
C57.111	IEEE Guide for Acceptance of Silicone Insulating Fluid and Its Maintenance in Transformers	1989	12/31/2019	No
C57.121	IEEE Guide for Acceptance and Maintenance of Less-Flammable Hydrocarbon Fluid in Transformers	1998	12/31/2019	No

Standard Number	Title	Year	SASB Expiration	ACTIVE PAR?
Insulating Liquids Subcommittee		**SC Chair: Dave Wallach email: david.wallach@duke-energy.com phone: (980) 373-4167**		
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	12/31/2025	No
C57.139	IEEE Guide for Dissolved Gas Analysis in Transformer Load Tap Changers	2015	12/31/2025	No
C57.146	IEEE Guide for Interpretation of Gasses Generated in Silicone-Immersed Transformers	2005	12/31/2021	No
C57.147	IEEE Guide for Acceptance and Maintenance of Natural Ester Fluids in Transformers	2008	**12/31/2018**	**Yes, PAR expires in 2018, comment resolution**
C57.155	IEEE Guide for Interpretation of Gases Generated in Natural Ester and Synthetic Ester-Immersed Transformers	2014	12/31/2024	No

Standard Number	Title	Year	SASB Expiration	ACTIVE PAR?
Insulation Life Subcommittee		**SC Chair: Sheldon Kennedy email: skennedy@niagaratransformer.com phone: (716) 896-6500**		
1276	IEEE Guide for the Application of High-Temperature Insulation Materials in Liquid-Immersed Power Transformers	1997	**12/31/2018**	**Yes PAR Expires in 2018**
1538	IEEE Guide for Determination of Maximum Winding Temperature Rise in Liquid-Filled Transformers	2000	12/31/2021	No
1538a	IEEE Guide for Determination of Maximum Winding-Temperature Rise in Liquid Immersed Transformers -- Amendment 1	2015	12/31/2025	No
C57.100	IEEE Standard Test Procedure for Thermal Evaluation of Insulation Systems for Liquid-Immersed Distribution and Power Transformers	2011	12/31/2021	No
C57.119	IEEE Recommended Practice for Performing Temperature Rise Tests on Oil-Immersed Power Transformers at Loads Beyond Nameplate Ratings	2001	**12/31/2018**	**Yes PAR expires in 2018, in Sponsor Ballot**
C57.154	IEEE Standard for the Design, Testing, and Application of Liquid-Immersed Distribution, Power, and Regulating Transformers Using High-Temperature Insulation Systems and Operating at Elevated Temperatures	2012	12/31/2022	No
C57.91	IEEE Guide for Loading Mineral-Oil-Immersed Transformers and Step-Voltage Regulators	2011	12/31/2021	No
C57.91-1995/Cor 1	IEEE Guide for Loading Mineral-Oil-Immersed Transformers - Corrigendum 1	2002	**12/31/2018**	**No**

Standard Number	Title	Year	SASB Expiration	ACTIVE PAR?
Instrument Transformers Subcommittee		**SC Chair: Ross McTaggart email: rossdm@ca.trenchgroup.com phone: (416) 751-8570**		
C57.13	IEEE Standard Requirements for Instrument Transformers	2016	12/31/2026	No
C57.13.2	IEEE Standard for Conformance Test Procedure for Instrument Transformers	2005	12/31/2020	No
C57.13.5	IEEE Standard of Performance and Test Requirements for Instrument Transformers of a Nominal System Voltage of 115 kV and Above	2009	12/31/2019	Yes, PAR expires in 2020
C57.13.6	IEEE Standard for High Accuracy Instrument Transformers	2005	12/31/2020	No
Performance CharacteristicsSubcommittee		**SC Chair: Ed TeNyenhuis email: ed.g.tenyenhuis@ca.abb.com phone: (519) 837-4691**		
C57.105	IEEE Guide for Application of Transformer Connections in Three-Phase Distribution Systems	1978	**12/31/2018**	Yes, PAR expires in 2019
C57.109	IEEE Guide for Liquid-Immersed Transformers Through-Fault-Current Duration	1993	**12/31/2018**	Yes PAR expires in 2019
C57.110	IEEE Recommended Practice for Establishing Liquid-Filled and Dry-Type Power and Distribution Transformer Capability When Supplying Nonsinusoidal Load Currents	2008	**12/31/2018**	**Yes, PAR expires in 2018**
C57.120	IEEE Approved Draft Guide for Loss Evaluation of Distribution and Power Transformers and Reactors	2017	12/31/2027	No
C57.123	IEEE Guide for Transformer Loss Measurement	2010	12/31/2020	No

Standard Number	Title	Year	SASB Expiration	ACTIVE PAR?
Performance CharacteristicsSubcommittee		**SC Chair: Ed TeNyenhuisemail: ed.g.tenyenhuis@ca.abb.com phone: (519) 837-4691**		
C57.136	IEEE Guide for Sound Level Abatement and Determination for Liquid-Immersed Power Transformers and Shunt Reactors Rated Over 500 kVA	2000	**12/31/2018**	**No**
C57.142	IEEE Guide to Describe the Occurrence and Mitigation of Switching Transients Induced by Transformers, Switching Device, and System Interaction	2010	12/31/2020	PAR on NesCom agenda
C57.149	IEEE Guide for the Application and Interpretation of Frequency Response Analysis for Oil-Immersed Transformers	2012	12/31/2022	No
C57.159	IEEE Guide on Transformers for Application in Distributed Photovoltaic (DPV) Power Generation Systems	2016	12/31/2026	No
C57.18.10	IEEE Standard Practices and Requirements for Semiconductor Power Rectifier Transformers	1998	12/31/2019	Yes, PAR expires in 2020
C57.18.10a	IEEE Standard for Practices and Requirements for Semiconductor Power Rectifier Transformers Amendment 1: Added Technical and Editorial Corrections	2008	**12/31/2018**	Yes, PAR to revise std, PAR expires 2020
C57.21	IEEE Standard Requirements, Terminology, and Test Code for Shunt Reactors Rated Over 500 kVA	2008	**12/31/2018**	**Yes, PAR expires 2018**
C57.32	IEEE Standard for Requirements, Terminology, and Test Procedures for Neutral Grounding Devices	2015	12/31/2025	Yes, a PAR to amend PC57.32a,PAR expires 2021

Standard Number	Title	Year	SASB Expiration	ACTIVE PAR?
Power Transformers Subcommittee		**SC Chair: Bill Griesacker email: bgriesacker@doble.com phone: (617) 393-3074**		
60076-57-1202	IEC/IEEE Approved Draft International Standard Requirements for Liquid Immersed Phase-Shifting Transformers	2016	12/31/2026	No
638	IEEE Standard for Qualification of Class 1E Transformers for Nuclear Power Generating Stations	2013	12/31/2023	No
C57.12.10	IEEE Standard Requirements for Liquid-Immersed Power Transformers	2010	12/31/2020	Yes, PAR expires 2019, in Sponsor ballot
C57.12.10-2010 Cor 1	IEEE Standard Requirements for Liquid-Immersed Power Transformers--Corrigendum 1: Correction of 5.1.9--Sudden Pressure Relay	2012	12/31/2022	Yes, PAR to revise std expires in 2019, in sponsor ballot
C57.12.10-2010 Cor 2	IEEE Standard Requirements for Liquid-Immersed Power Transformers -- Corrigendum 2: Correction of A.3.2.13 Autotransformer LTC application considerations	2013	12/31/2023	Yes, PAR to revise std expire in 2019, in sponsor ballot
C57.116	IEEE Guide for Transformers Directly Connected to Generators	2014	12/31/2024	No
C57.125	IEEE Guide for Failure Investigation, Documentation, Analysis, and Reporting for Power Transformers and Shunt Reactors	2015	12/31/2025	No
C57.131	IEEE Standard Requirements for Tap Changers	2012	12/31/2022	PAR for P60214-1-57-131 expires in 2020

Standard Number	Title	Year	SASB Expiration	ACTIVE PAR?
Power Transformers Subcommittee		**SC Chair: Bill Griesacker email: bgriesacker@doble.com phone: (617) 393-3074**		
62032	IEC 62032 Ed.1 (IEEE Std C57.135(TM)-2001): Guide for the Application, Specification and Testing of Phase-Shifting Transformers	2005		NOTES: IEC/IEEE dual logo standard; replaces IEEE C57.135-2001
C57.135	IEEE Guide for the Application, Specification, and Testing of Phase-Shifting Transformers	2011	12/31/2021	No
C57.140	IEEE Guide for Evaluation and reconditioning of Liquid Immersed Power Transformers	2006	**12/31/2018**	**Yes, PAR expires in 2017, is on the May 2017 RevCom Agenda**
C57.143	IEEE Guide for Application for Monitoring Equipment to Liquid-Immersed Transformers and Components	2012	12/31/2022	Yes, PAR expires 2021
C57.148	IEEE Standard for Control Cabinets for Power Transformers	2011	12/31/2021	Yes, PAR expires in 2020
C57.150	IEEE Guide for the Transportation of Transformers and Reactors Rated 10 000 kVA or Higher	2012	12/31/2022	PAR on NesCom agenda
C57.153	IEEE Guide for Paralleling Regulating Transformers	2015	12/31/2025	No
C57.156	IEEE Guide for Tank Rupture Mitigation of Liquid-Immersed Power Transformers and Reactors	2016	12/31/2026	No
C57.157	IEEE Guide for Conducting Functional Life Tests on Switch Contacts Used in Insulating Liquid--Immersed Transformers	2015	12/31/2025	No
C57.17	IEEE Standard Requirements for Arc Furnace Transformers	2012	12/31/2022	No

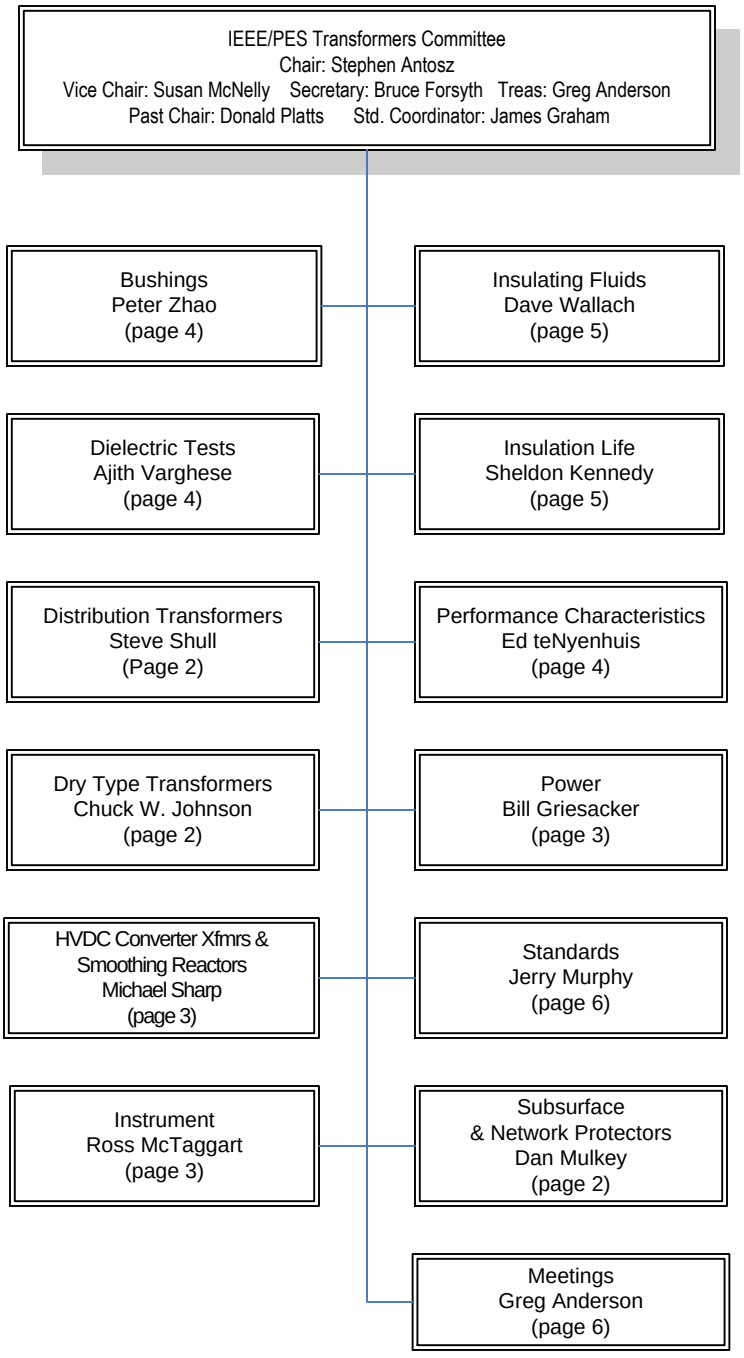
Standard Number	Title	Year	SASB Expiration	ACTIVE PAR?
Power Transformers Subcommittee		**SC Chair: Bill Griesacker email: bgriesacker@doble.com phone: (617) 393-3074**		
C57.93	IEEE Guide for Installation and Maintenance of Liquid-Immersed Power Transformers	2007	**12/31/2018**	**Yes, PAR expires in 2018**
Standards Subcommittee		**SC Chair: Jerry Murphy email: jerry.murphy@ieee.org phone: (407) 824-4194**		
C57.12.00	IEEE Standard for General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers	2015	12/31/2025	Yes, PAR expires 2021
C57.12.70	IEEE Standard for Standard Terminal Markings and Connections for Distribution and Power Transformers	2011	12/31/2021	Yes, corrigendum PAR expires 2019
C57.12.80	IEEE Standard Terminology for Power and Distribution Transformers	2010	12/31/2020	Yes PAR on NesCom Agenda
C57.12.90	IEEE Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers	2015	12/31/2025	Yes, corrigendum PAR expires 2020
C57.144	IEEE Guide for Metric Conversion of Transformer Standards	2004	12/31/2020	No
C57.152	IEEE Guide for Diagnostic Field Testing of Fluid-Filled Power Transformers, Regulators, and Reactors	2013	12/31/2023	No

Standard Number	Title	Year	SASB Expiration	ACTIVE PAR?
Standards Subcommittee		**SC Chair: Jerry Murphy email: jerry.murphy@ieee.org phone: (407) 824-4194**		
C57.163	IEEE Guide for Establishing Power Transformer Capability while under Geomagnetic Disturbances	2015	12/31/2025	No
C57.163-2015 Cor 1	IEEE Guide for Establishing Power Transformer Capability while under Geomagnetic Disturbances - Corrigendum 1	2016	12/31/2026	No
Subsurface Transformers & Network Protectors Subcommittee		**SC Chair: Dan Mulkey email: dhmuhlkey@ieee.org phone: (707) 776-7346**		
C57.12.23	IEEE Standard for Submersible Single-Phase Transformers: 167 kVA and Smaller; High Voltage 25 000 V and Below; Low Voltage 600 V and Below	2009	12/31/2019	**Yes, PAR expires in 2018**
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	2016	12/31/2026	No
C57.12.40	IEEE Standard for Network, Three-Phase Transformers, 2500 kVA and Smaller; High Voltage, 34 500 GrdY/19 920 and Below; Low Voltage, 600 V and Below; Subway and Vault Types (Liquid Immersed)	2011	12/31/2021	**Yes , PAR expires 2017, on RevCOm agenda.**
C57.12.44	IEEE Standard Requirements for Secondary Network Protectors	2014	12/31/2024	Yes PAR Expires in 2019

Appendix A

Transformers Committee Organization Chart

Revised J.Graham
31 Mar, 2017



Revised J.Graham
31 Mar, 2017

IEEE/PES Transformers Committee
Chair: Stephen Antosz
Vice Chair: Susan McNelly Secretary: Bruce Forsyth Treas: Greg Anderson
Past Chair: Donald Platts Std. Coordinator: James Graham

Distribution
Steve Shull

- Step Voltage Regulators C57.15 — Craig Colopy
- OH Dist. Xfmrs C57.12.20 — Alan Traut
- Equip Enclosure Integrity C57.12.28, C57.12.29, C57.12.30, C57.12.31, & C57.12.32 — Robert Olen
- Req. for 3ph Pad Mount C57.12.34 — Stephen Shull
- Bar Coding C57.12.35 — Lee Matthews
- Dist. Sub. Xfmrs C57.12.36 — Jerry Murphy
- Elec Rpt of Test Data IEEE 1388/C57.12.37 — Thomas Callsen
- Pad-Mount 1ph Self-Cool <2500kVA C57.12.38 — A Ghafourian
- Tank Pressure Coordination C57.12.39 — Carlos Gaytan

Dry Type
Chuck W. Johnson

- General Requirements. C57.12.01 — Casey Ballard
- Dry Type Air-Core Reactors C57.16 — A Del Rio
- Req.for Vent. >500KVA PC57.12.51 — Sanjib Som
- Req. for Sealed >500kVA PC57.12.52 — Sheldon Kennedy
- Transient Analysis C57.12.58 — Roger Wicks
- Dry-Type Through Fault Current Duration C57.12.59 — Paulette Payne
- Thermal Eval. for Dry-Type C57.12.60 — Roger Wicks
- Test Code for Dry Type Xfmrs C57.12.91 — Derek Foster
- Dry Type Op & Maint. Guide C57.94 — David Stankes
- Loading Guide for Dry Type Xfmrs C57.96 — Rick Marek
- Dry-Type PD & Apparent Charge Measurement C57.124 — Tom Prevost
- Dry-Type Hottest Spot C57.134 — Paulette Payne
- Thermal Eval of Vented Dry Type Insulation C57.12.56 (Open)
- Eval of Dry Type Insulation Systems IEEE 259 — David Stankes

Subsurface & Network Protectors
Dan Mulkey

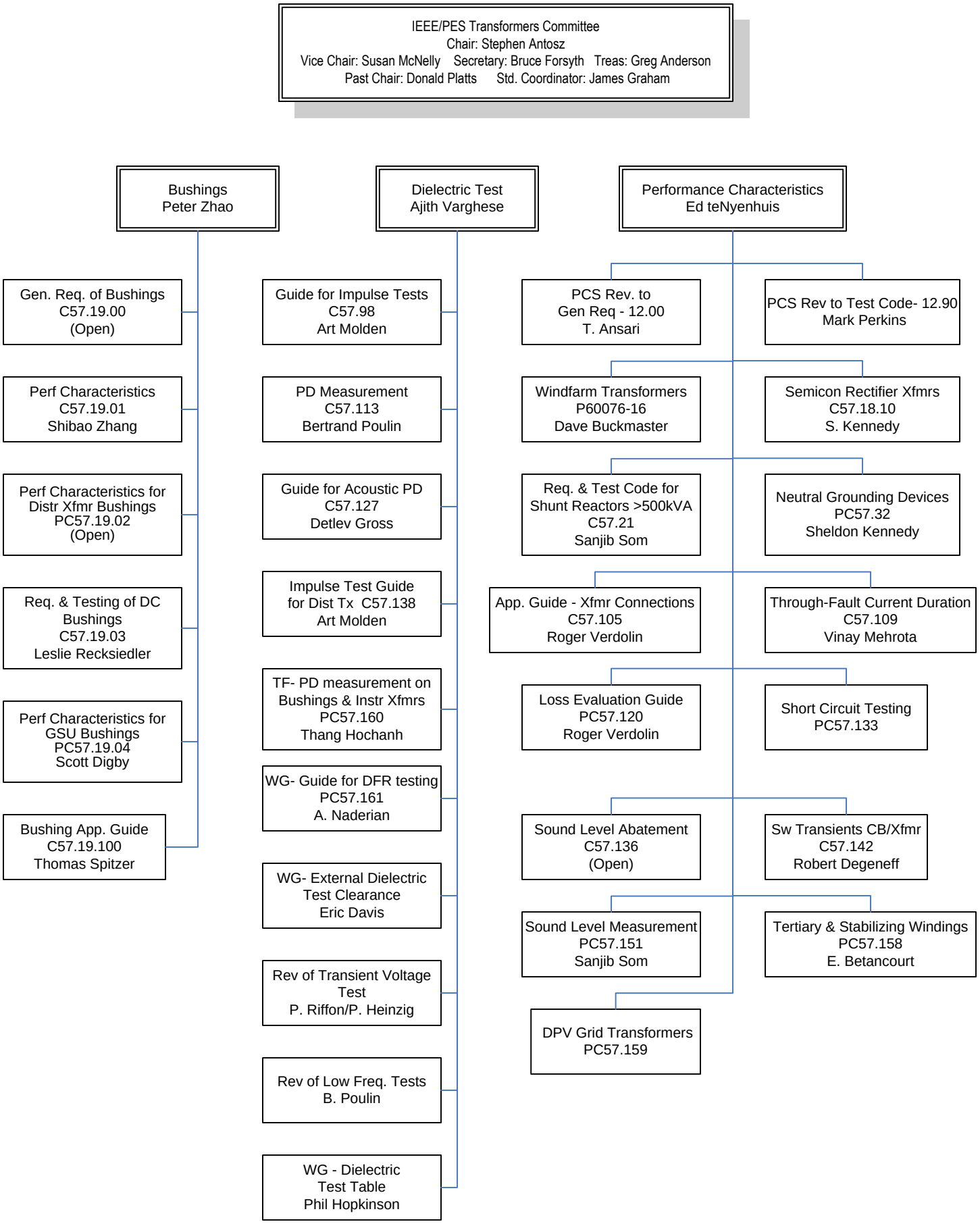
- UG Self-Cool 1-ph C57.12.23 — Allan Traut
- UG 3ph Dist Xfmr < 2500KVA C57.12.24 — G Termini
- Std. Req. for Sec. Network Xfmrs C57.12.40 — Brian Kaplonski
- Std. Req. for Sec. Network Protectors C57.12.44 — W Wimmer
- Vent Dry-Type Network Xfmrs <=2500KVA C57.12.57 — A Robinson

Revised J.Graham
31 Mar, 2017

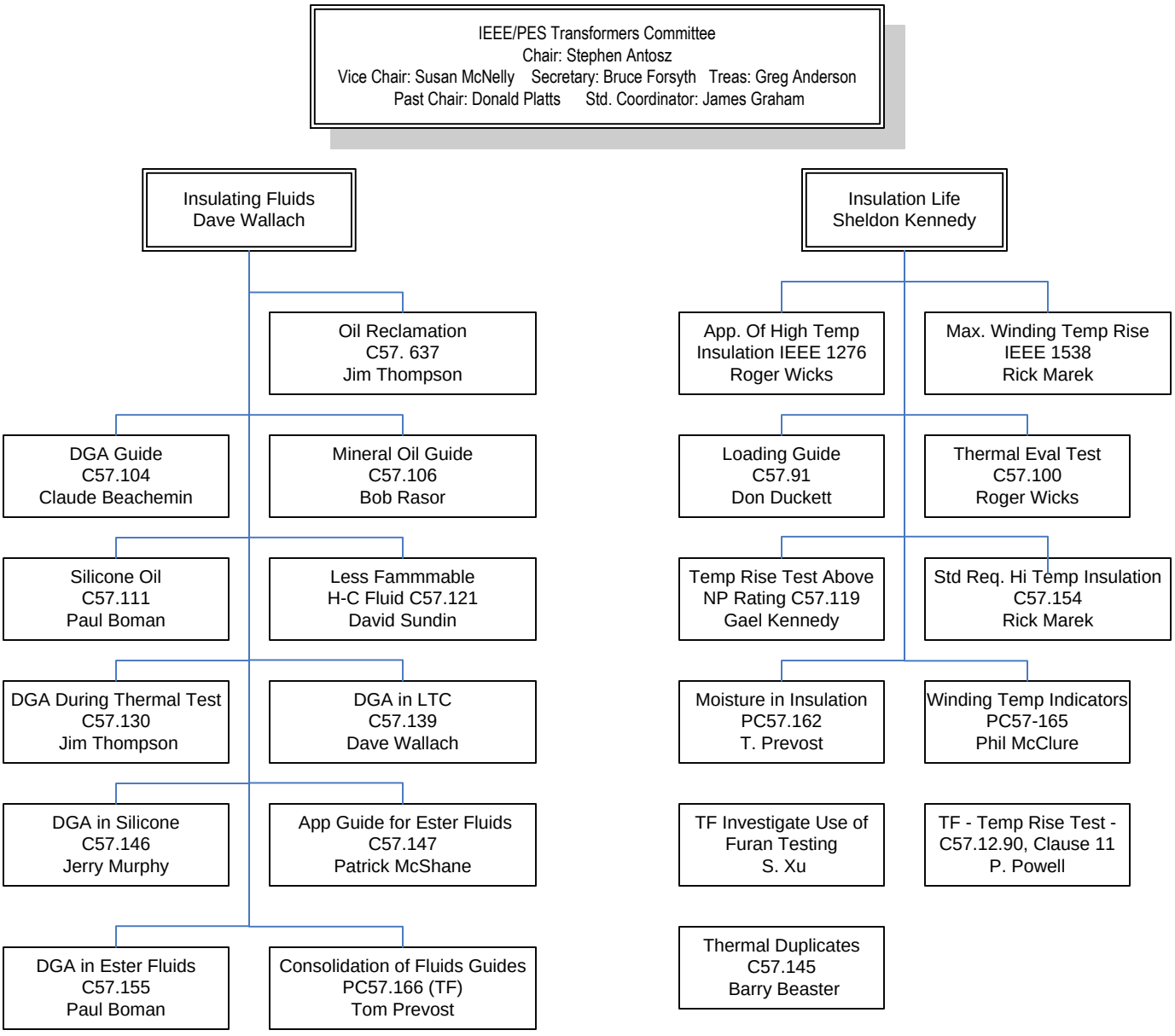
IEEE/PES Transformers Committee
Chair: Stephen Antosz
Vice Chair: Susan McNelly Secretary: Bruce Forsyth Treas: Greg Anderson
Past Chair: Donald Platts Std. Coordinator: James Graham

- HVDC Converter Xfmrs & Smoothing Reactors — Michael Sharp
  - Req. & Test Code for HVDC Smoothing Reactors IEEE 1277 — Klaus Pointner
  - Req. & Test Code for HVDC Con. Xfmr C57.129 — R Dudley
- Instrument Xfmrs — Ross McTaggart
  - Req for Inst. Xfmrs C57.13 — Ross McTaggart
  - Test Proc. For Inst. Xfmrs C57.13.2 (Open)
  - Test Req. for >= 115kV PC57.13.5 — Pierre Riffon
  - Requirements. for Elect Revenue Metering C57.13.6 (Open)
  - Req. for mA CT C57.13.7 — Henry Alton
  - Requirements for SSVTs PC57.13.8 — Dave Wallace
  - Requirements for CCVTs PC57.13.9 — Zoltan Roman
- Power Transformers — Bill Griesacker
  - Tap Changers – Gen Requirements P60214-1-57-131 — Craig Colopy
  - Tap Changers Application Guide P60214-2 — Craig Colopy
  - Std Requirements Phase Shifters P60076-57-1202 — Raj Ajhuja
  - IEEE 638 –1E Xfmrs at Nuc Gen Stations IEEE 638 — Craig Swinderman
  - Req. for L.I. Power Xfmrs C57.12.10 — Gary Hoffman
  - Arc Furnace Xfmr C57.17 — R Ganser
  - Installation & Maint Guide C57.93 — Mike Lau
  - Directly Connected GSU C57.116 — Gary Hoffman
  - Failure Investigations C57.125 — Wally Binder
  - Guide - Phase-Shift Xfmrs C57.135 Open
  - Eval & Reconditioning C57.140 — Paul Boman
  - Guide for Monitoring C57.143 — Michael Spurlock
  - Std for Control Cabinet C57.148 — Joe Watson
  - Transportation Guide PC57.150 — Greg Anderson
  - Guide for Paralleling C57.153 — Tom Jauch
  - Tank Rupture Mitigation C57.156 — Peter Zhao
  - Functional Life Tests for DETC C57.157 — Phil Hopkinson

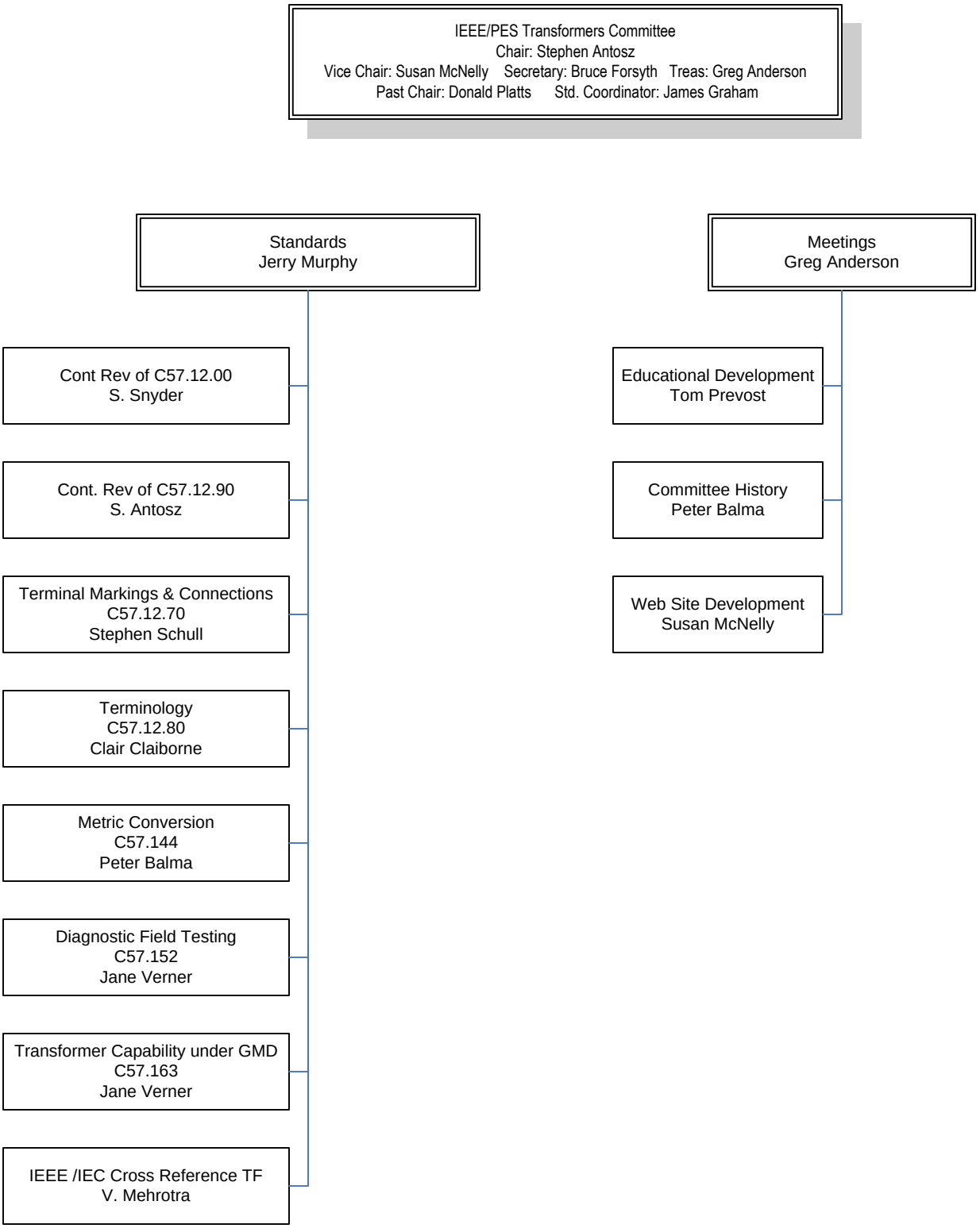
Revised J.Graham
31 Mar, 2017



Revised J.Graham
31 Mar, 2017



Revised J.Graham
31 Mar, 2017



APPENDIX 3

IEC TC14 Liaison Report

IEC TC 14
Philip J Hopkinson, PE & TA

- International Electro-Technical Commission TC 14 Power Transformers
- Voting Relationships between standards
- P-Member Active Countries
- Members of US TAG
- Documents and Programs
- Last Plenary Meeting October 11-12, 2016 in Frankfurt, Germany
- Meeting this year October 26-27 in Boston, MA.
- Stability Dates

IEC TC 14
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- International Electro-Technical Commission TC 14 Power Transformers:
  - Headquartered in Geneva, Switzerland
  - Scope > = 10 kVA, Voltage classes >1,000 Volts, ac and dc
- Voting Relationships between standards organizations
  - IEEE and Cigre: 1 person, 1 vote
  - NEMA and EEI: 1 company, 1 vote
  - IEC: 1 country, 1 vote
- All votes cast by Technical Advisers to National Committees to Geneva

IEC TC 14
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Member Countries in IEC TC 14

Circulation Date: 2016-01-22

IEC 60076-10 Ed. 2.0 IEC 60076-10 Ed.2: Power transformers - Part 10: Determination of s

Country	Status	Vote
Australia	P	Y
Austria	P	Y
Belarus	O	Y
Belgium	P	Y
Brazil	P	A
Canada	P	Y
China	P	Y
Colombia	O	A
Croatia	P	Y
Czech Republic	P	Y
Denmark	P	A
Egypt	O	Y
Finland	P	Y
France	P	Y
Germany	P	Y
Greece	-	A
Hungary	P	Y
India	P	Y
Iran	O	N
Ireland	P	Y
Italy	P	Y
Japan	P	Y
Korea, Republic of	P	Y
Mexico	P	Y
Netherlands	P	Y
Norway	P	Y
Pakistan	O	Y
Poland	P	Y
Portugal	O	Y
Qatar	-	Y
Romania	O	Y
Russian Federation	P	Y
Slovenia	P	Y
South Africa	P	A
Spain	P	Y
Sweden	P	Y
Switzerland	P	Y
Turkey	P	Y
Ukraine	P	Y
United Kingdom	P	Y
United States of America	P	Y

		Approval Criteria	Result
P-Members voting: 29			
P-Members in favour: 29 = 100%		>=66.7%	APPROVED
Total votes cast: 36	Total against: 1 = 2.8%	<=25%	APPROVED
Final Decision:			**APPROVED**

IEC TC 14
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US TAG in IEC TC 14 as currently active

NAME	COMPANY	POSITION
Raj Ahuja		Vice President Engineering
Robert (Casey) Ballard	Schaffner	Director of Engineering
Jeff Britton	Phenix Technologies	Chief Engineer
Craig A. Colopy	Eaton	Product Sales Manager
Eric Davis	Burns & McDonnell	Project Manager
Larry Dix	Quality Switch, Inc.	President
Joseph Foldi	Foldi & Associates, Inc.	President
David Geibel	ABB	Technical Director
Philip J. Hopkinson	HVOLT Inc.	President & CEO
Matthew Kennedy	Doble Engineering	Product Manager
Sheldon P. Kennedy	Niagara Transformer	Vice President Engineering
Mario Locarno	Doble Engineering	Principal Engineer
Richard P. Marek	DuPont	Applications Development/Sales Technical, Energy Solutions
Emilio Morales Cruz	Qualitrol LLC	Technical Application Specialist
Ken Pagenkopf	Hubbell Acme	Principal Engineer
Sanjay Patel	SMIT Transformers	Manager, Engineering-North America
Kevin Rapp	Cargill	Senior Chemist Global Technology
Mahesh Sampat	EMS International	President
Daniel M. Sauer	Cooper Power/Eaton	Lead Engineer
Vijay B. Tendulkar	ONYX Power Inc.	CTO
Dharam Vir	SPX Transformer	Vice President - Engineering

21 Currently active TAG members

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70 Attendees in Frankfurt, Germany, October 11-12, 2016

Jarman	Paul	Chairman	Shinde	Rajaram	India
Boyer*	Christophe	IEC CO	Soebardjo	Bartien	Indonesia
Price*	Alexandra	Australia	Baggini	Angelo	Italy
Jackson*	Jemima	Australia	Ferrari	Fabrizio	Italy
Buchgeher	Erich	Austria	Mauri	Flavio Mario	Italy
Popp*	Hartmut	Austria	Giorgi*	Gianfranco	Italy
Feukam Djoko*	Hubert	Cameroon	Ghioldi	Gianmarco	Italy
Tenyenhuis	Ed	Canada	Miyawaki	Fumihiko	Japan
Zahedi*	Polad	Canada	Kishimoto*	Yuki	Japan
Hochanh	Thang	Canada	Shirasaka	Yukiyasu	Japan
Wei	Bengang	China	Al-Assaf*	Eid	Jordan
Mi	chuanlong	China	Bakolas*	B.	Netherlands
wang	jian	China	Hanique	Ernst	Netherlands
Liu	Jie	China	Susa*	Dejan	Norway
Yi	Jiliang	China	Larin	Vasily	Russia
Su	Lei	China	Al shammary*	Badr	Saudi Arabia
Guo	Mansheng	China	Jerman Kuzelicki	Istok	Slovenia
zhang	xianzhong	China	Mtombeni	John	South Africa
Zheng	Xu	China	George*	Nevin	South Africa
Li	Yunlong	China	Tshivhilinge*	Mercy	South Africa
Guo	Zhenyan	China	Bergman*	Anders	Sweden
Zhang	zhongguo	China	Sadr-Momtazi*	Nima	Sweden
Boto*	Eugène Boto	Côte D'Ivoire	Rutström	Sofia	Sweden
Hemait Alla*	Ahmed	Egypt	Walker	David	United Kingdom
Kolehmainen	Harri	Finland	Breckenridge	Tom	United Kingdom
Guediri	Adel	France	Hussain*	Zahangir	United Kingdom
Elleau	Christophe	France	Graham*	John	United Kingdom
Walter*	Frédéric	France	Colopy	Craig	USA
Riboud	Jean-Christophe	France	Kennedy	G	USA
Lauzevis	Patrick	France	Winstanley	Gerard	USA
Krämer	Axel	Germany	Rapp	Kevin	USA
Ploetner*	Christoph	Germany	Dix	Larry	USA
Tepper	Jens	Germany	Hopkinson	Philip	USA
Fengel*	Marc	Germany	Marek	Richard	USA
Sciacca*	Sam	IEEE	Maghar	Mick	Secretary

IEC TC 14
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Current statistics

28 Documents

14 Current Active Projects

BACKGROUND

1. Statistics on TC 14 activities:

Number of P-members:	34
Number of experts:	173
Number of NPs submitted over the last 3 years:	5
Number of publications approved in last 5 years:	13
Number of current active projects:	14
Number of meetings since 5 years:	5

2. Concerns expressed by relevant IEC Technical Officer: none.

3. Projects older than 5 years:

IEC 60076-10 Ed.2.0, initiated in 2009, FDIS has been circulated for voting on 2016-01-22.

4. Requests for extension of target dates: Yes, see Annex B.

5. Other important matters: none.

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Current status-1

Recently published

- **IEC 60076-10 Determination of Sound Levels**
  - Published March 2016
- **IEC 60076-10-1 Determination of Sound Levels – Application Guide**
  - Published March 2016
- **IEC TS 60076-20 Energy efficiency**
  - Published January 2017

IEC TC 14
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Current status-2

New documents in development

- **IEC 60076-57-1202 Phase Shifting Transformers**
  - IEC Standards Management Board voted to accept dual IEC/IEEE references
  - FDIS circulated and returned with a positive vote.
  - Publication expected in IEC and IEEE very soon
- **IEC 60076-22 Transformer and Reactor Fittings**
  - -1 Protective devices (alarms and trips)
  - -2-6 Cooling equipment (decided to split into fans, pumps, radiators, liquid/air and liquid/water coolers
  - -7 Accessories and fittings
  - CDs on parts 1-4 issued comments returned November 2016
  - Working on CDV for these parts
  - Working on CD for other parts– decided to add gas relays, fans, bags, terminal boxes and valves. Electronic monitoring will be separate proposal

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Current status-3

New documents in development

- **IEC TS 60076-23 DC current suppression devices**
  - CD circulated comments due back 31st March
- **Voltage Regulating Distribution Transformers**

  IEC 60076-24
  - Work by the IEC team has started on the project transferred from CENELEC, progressing towards first draft.

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Current status-4

revisions in progress

- **IEC 60076-16 Transformers for wind turbines**
  - Revision with IEEE for future joint standard
  - CDV issued for vote, closing date 21st April 2017
- **IEC 60214-2 Tap-changers application guide**
  - Work continues on revising this to be a dual logo document, CD target March 2017
- **IEC 60076-7 Loading guide for liquid immersed transformers**
  - CDV issued comments received March 2016
  - Approved with comments so working on FDIS was expected November

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Current status-5

Revisions in progress

- **IEC 61378-2 (60076-57-129) HVDC converter transformers**
  - FDIS is with IEC following incorporation of editor's and other comments.
- **IEC 60076-21 Step voltage regulators**
  - Joint revision in progress
  - Second CD circulated comments received November 2016
  - Working on CDV
  - Decided to keep existing IEC/IEEE numbering
- **IEC 60076-11 Dry type transformers**
  - First draft CD circulated comments received December 2016
  - Working on CDV

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Current status-5

Revisions in progress

- IEC 61378-2 (60076-57-129) HVDC converter transformers
  - FDIS is with IEC following incorporation of editor's and other comments.
- IEC 60076-21 Step voltage regulators
  - Joint revision in progress
  - Second CD circulated comments received November 2016
  - Working on CDV
  - Decided to keep existing IEC/IEEE numbering
- IEC 60076-11 Dry type transformers
  - First draft CD circulated comments received December 2016
  - Working on CDV

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Current status-6

Revisions in progress

- **IEC 60076-4 Impulse test guide**
  - First meeting held in Frankfurt, October 2016
  - Next meeting with IEEE in New Orleans April 2017
- **IEC 60076-5 Short Circuit capability**
  - Several meetings held, working on first draft CD
- **IEC 60076-19 Uncertainties in Loss Measurement**
  - CENELEC document circulated December 2015
  - Comments received March 2016
  - Working on CDV

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Current status-6

New Work agreed

- **Revisons**
  - IEC 60076-2 Temperature rise
  - IEC 60076-6 Reactors
  - IEC 60076-14 Transformers using high temperature insulation
  - IEC 60076-3 Dielectric tests (minor revision)
- **Ad Hoc Group**
  - Look at functional requirements of liquids for use in transformers.
  - Call for experts return date 5th May 2017

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Current status-7

New Work Proposed

- **Neutral Grounding Resistors**
  - Proposed by France
  - Return date for vote and nominations 12th May 2017
- **Adoption of C57.142**
  - Out to vote by National Committees closing date 14th April 2017

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Stability Dates

Standard number	Title	Old date	New date
IEC 60076-1 Ed. 3.0	Power transformers - Part 1: General	2018	2019
IEC 60076-3 Ed. 3.0	Power transformers - Part 3: Insulation levels, dielectric tests and external clearances in air	2016	2017
IEC 60076-4 Ed. 1.0	Power transformers - Part 4: Guide to the lightning impulse and switching impulse testing - Power transformers and reactors	2017	2018
IEC 60076-7 Ed. 1.0	Power transformers - Part 7: Loading guide for oil-immersed power transformers	2016	2017
IEC 60076-8 Ed. 1.0	Power transformers - Part 8: Application guide	2017	2018
IEC 60076-11 Ed. 1.0	Power transformers - Part 11: Dry-type transformers	2017	2018
IEC 60076-16 Ed. 1.0	Power transformers - Part 16: Transformers for wind turbine applications	2016	2017
IEC 60076-18 Ed. 1.0	Power transformers - Part 18: Measurement of frequency response	2018	2020
IEC 60214-2 Ed. 1.0	Tap-changers - Part 2: Application guide	2017	2018
IEC/TR 60616 Ed. 1.0	Terminal and tapping markings for power transformers	2017	2018

8.4 To update the Program of Work of TC 14 as recorded by IEC Central Office

The following new forecast dates were requested:

IEC 60076-22-1	CDV 2017-03	FDIS 2018-03	
IEC 60076-22-2	CDV 2017-03	FDIS 2018-03	
IEC 60076-22-3	CDV 2017-03	FDIS 2018-03	
IEC 60076-22-4	CDV 2017-03	FDIS 2018-03	
IEC 60076-22-5	CD 2017-05	CDV 2017-12	FDIS 2018-12
IEC 60076-22-6	CD 2017-05	CDV 2017-12	FDIS 2018-12
IEC 60076-22-7	CD 2017-05	CDV 2017-12	FDIS 2018-12

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Come to my meeting at 7:00 AM Wednesday, April 5 in St. Charles!

Better yet, Join the TAG!