

Minutes of Meeting

PC37.100.7 Working Group: Performance Evaluation of Sulfur Hexafluoride Alternatives

Tuesday, May 5, 2020

Web meetings

08:00 to 09:45 and 10:15 to 12:00 (CDT)

4th Meeting, Spring 2020

Chair: Daniel Schiffbauer

Vice Chair: George Becker

Secretary: Victor Hermosillo

Session #1. Tuesday May 5th, 2020, 08:00 to 09:45

Agenda

- Introductions
- IEEE copyright and patent slide review
- Review and vote on approval of fall 2019 MOM
- Chapter personnel updates
- PC37.100.7 guide schedule
- Review of working draft
- Closing remarks

Call to order: 08:00

Chair called to order.

Introductions:

Chair used the attendance feature in Skype and asked those identified by phone number only to introduce themselves.

IEEE copyright and patent slide review:

Secretary reviewed the IEEE copyright and patent slides.

Approve October 2019 Minutes:

Motion: Paul Leufkens

Second: Sushil Shinde

Personnel Updates:

Stephanie Montoya (SCE) has moved to another position and will not continue with PC37.100.7 – we thank her for her work. Carl Kurinko (ABB) has agreed to lead chapter 9 “Continuous current performance” going forward.

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Session #2. Tuesday May 5th, 2020, 10:15 to 12:00

Chapter 6 – Health and Safety

Li Yu

Includes Acute Toxicity Estimation with tabulated values for different categories as well as comparison between different toxicity classifications around the world. Discusses classification of mixtures depending on components. Presented LC50 calculation procedure and other hazard classification aspects. Toxicity estimations shown for individual gases and some mixtures. Effects of electrical arcing on gases, partial discharge and breaking conditions and species formation for individual gases and some gas mixtures. Figure 15 shows fault duty versus toxicity. Chair asked chapter leader to change color gradient, yellow and red to be replaced with other color choices since they may give the impression of high toxicity. Example for LC50 after interruption test included in Table 15. Reach registration provided for SF₆ and some gases used in mixtures.

Chapter 8 – Dielectric Insulation Performance

Sushil Shinde

Topics to be covered include: dielectric strength versus density, influence of composition, statistical breakdown behavior, influence of voltage duration (impulse compared to power frequency), polarity effects, behavior under uniform/non-uniform fields and effect of surface roughness. Statistical behavior based on Weibull plots of breakdown probability. Charts prepared comparing dielectric strength versus pressure for SF₆ and some alternative gas mixtures. Need to indicate specifics of mixture. Particle sensitivity section to be expanded with some available information comparing SF₆ to other gases.

Chapter 9 – Continuous Current Performance

Carl Kurinko

Table comparing temperature limits according to IEC, IEEE and Japanese standards. Section included with validation of contact stability with temperature. Contact aging discussed. Considerations during validation tests for contact systems. Heat transfer characteristics comparing SF₆ with alternative gas mixtures. Thermal overload capability to be covered and compared with existing equations (IEC, IEEE) for estimations.

Chapter 10 – Mechanical Performance

Dan Schiffbauer

Mechanical performance to include: pressure vessel proof test, contact resistance measurement after mechanical endurance test and pressure relief under internal arc. More work needed in this section.

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Chapter 11 – Low Temperature Performance

Mike Crawford

Comparison between low temperature behavior of SF₆ and mixed gas. Pressure change smaller for minor components of the mixture. Need to associate dielectric recovery with gas behavior during loss of power section of low temperature test. Possible to make assessment of dielectric characteristics for variations in gas mixture and relate them to composition measurement taken during the test.

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Attendance: [51 members, 26/51 members attending (51%), 53 total attending]

Last Name	First Name	5/5/2020	Role	Company
Aldakka	Qais		Member	Los Angeles Department of Water and Power
Almeida	Edwin		Member	Southern California Edison
Aristizabal	Mauricio		Member	ABB
Baker	Daniel		Member	LADWP
Bannink	Herman		Guest	KEMA Netherlands
Barbera	Steven		Guest	Arizona Public Service
Becker	George	X	Vice-Chair	POWER Engineers Inc.
Beseda	David	X	Member	S&C Electric Co.
Bisewski	Bruno		Guest	RBJ Engineering Corp
Boulus	Michael		Guest	PSE&G
Boyce	Russell		Member	Eaton
Brown	Steven		Guest	Allen & Hoshall
Bufi	Arben	X	Guest	Hitachi T&D Solutions, Inc.
Burse	Ted		Guest	Powell Industries, Inc
Byron	Eldridge	X	Member	Schneider Electric
Cary	Stephen		Guest	Eaton
Chhabra	Mohit		Guest	S&C Electric Company
Chiodo	Vincent		Member	HICO
Chovanec	Andrew	X	Member	GE Power
Cleaveland	Charles		Guest	Cleaveland/Price Inc.
Collette	Lucas	X	Guest	Duquesne Light
Collette	Dave		Guest	Mitsubishi Electric
Connor	Brad		Corresponding Member	Xcel Energy
Cosby	Bianca		Member	San Diego Gas & Electric
Crawford	Michael	X	Member	Mitsubishi Electric
Crist	Daniel		Guest	Siemens Industry, Inc.
Culhane	Michael		Guest	Eaton
Cunningham	Jason		Guest	Southern States, LLC
Darko	Kennedy	X	Member	G&W Electric Co
Dhawan	Anil		Guest	ComEd
Di Lillo	Patrick	X	Member	Consolidated Edison Co. of NY, Inc.
Di Michele	Federico		Guest	CESI S.p.A.
Door	Jeffrey		Guest	The H-J Family of Companies
Duncan	Kirk		Guest	Hitachi T&D Solutions
Dwyer	Bernie		Guest	PECO
Edwards	Ken		Guest	FirstEnergy Corp.
Edwards	Doug	X	Guest	Siemens Industry, Inc.
Eftink	Emily		Guest	Burns & McDonnell
Evans	Aaron		Guest	HICO America
Fender	Karl		Guest	Southern States LLC
Fennell	Howard		Guest	Nashville Electric Service
Frazier	Raymond		Guest	Ameren
French	Christopher		Guest	Eaton Corporation
Frye	Richard		Guest	Eaton
Gerzeny	Brian	X	Member	Powell Electrical Systems Inc
Glaesman	Peter		Member	PCORE Electric Company, Inc.
Glinsky	Ilya	X	Guest	Southern California Edison
Grahor	Lou		Guest	Eaton Corporation
Hall	John	X	Corresponding Member	Tennessee Valley Authority
Hastreiter	Christopher		Guest	Eaton
Heiermeier	Helmut	X	Member	ABB
Heintzelman	Travis		Guest	Burns & McDonnell
Hensberger	Jeremy	X	Guest	Mitsubishi Electric Power Products Inc.
Hermosillo	Victor	X	Secretary	GE Grid Solutions
Hester	Edward		Guest	Entergy
Hu	Jingxuan (Joanne)		Guest	RBJ Engineering Corporation
Hunter	Jennifer		Guest	MEPPI
Hutchins	Roy		Member	Southern Company Services
Hyjek	Katarzyna		Guest	DTE
Irwin	Todd	X	Corresponding Member	GE Grid Solutions
Jacobs	Allan	X	Guest	ABB Inc,
Jagadeesan	Bharatwaj		Corresponding Member	Southern States LLC
Jain	Rahul	X	Member	S&C Electric Company
Jarnigan	Christopher	X	Member	Southern Company Services
Jasinski	Joseph		Guest	ITC Holdings Corp.
Johnson	David	X	Member	HVCB
Johnson	Travis		Guest	Xcel Energy
Jung	Wolfgang	X	Corresponding Member	Siemens AG
Keels	Thomas		Member	kEElectric Engineering
Kim	SangTae		Member	HICO America
kim	jungdae		Guest	hyosung
Kowalik	Peter		Guest	Cleaveland/Price Inc.
Kurinko	Carl	X	Member	ABB Inc.
Lanning	Scott		Member	S&C Electric
Lavrinoff	Benedict	X	Guest	Kinectrics Inc
Leccia	Brad		Guest	Eaton
LEE	CHANG HOON		Guest	HYOSUNG Heavy industries
LEE	JOOHYUN		Guest	HYOSUNG
Lemmerman	David	X	Guest	PECO/Exelon
Leufkens	Paul	X	Guest	Power Projects Leufkens

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Li	Wangpei		Guest	Eaton
Ling	Yingjie	X	Guest	GE
Liu	Hua Ying	X	Guest	Southern California Edison
Lo	Benson	X	Member	Toronto Hydro
Lopez	Leo		Guest	WIKA Instrument, LP
Ma	Chunming		Corresponding Member	Burns and McDonnell
Mannarino	Antonio		Guest	PSE&G
Marshall	Vincent		Guest	Southern Company Services
Martin	Donald		Guest	G&W Electric Co.
Marx	Benjamin		Guest	Sargent and Lundy
Marzec	Peter	X	Member	S&C Electric Co.
Mason	Douglas		Guest	ComEd
May	Steven		Guest	Southern Company
Meiners	Steven		Corresponding Member	Retired
Methling	Ralf		Guest	Leibniz Institute for Plasma Science and Technology
Midkiff	Jacob		Guest	Dominion Energy
Montoya	Stephanie		Member	Southern California Edison
Moran	Ashley	X	Guest	IEEE Standards Association (IEEE-SA)
Morris	Tim		Guest	Whitehead & Assoc
Mulakken	Nikil		Guest	Facebook
Natale	Anthony	X	Guest	HICO America
Nelson	Jeffrey	X	Guest	Tennessee Valley Authority
Nelson	Jacob		Corresponding Member	HPS
ONeil	Brian		Member	RMS Energy
Owens	John		Member	3M
Palmer	Justin		Member	ELECTRONSYSTEM MD
Patel	Pathik		Corresponding Member	Duke Energy
Pattison	Mark		Guest	H-J Family of Companies
Pellerito	Thomas		Guest	DTE Energy
Perrin	Damian		Guest	Entergy Services, LLC.
Peterson	Mark		Guest	Xcel Energy
Phan	Lise		Member	Pacific Gas and Electric Company
Phouminh	John		Guest	PEPCO HOLDINGS, INC.
Polchinski	Craig	X	Guest	MEPPI
Pruitt	Al		Guest	The Durham Company
Putman	Larry		Member	Powell
Reid	Laura		Guest	Hubbell Power Systems
Rich	Bobby		Member	Dominion Energy
Riley	Caryn	X	Corresponding Member	Georgia Tech/NEETRAC
Ringham	Grant	X	Guest	BC Hydro
Roberts	Brian	X	Member	Southern States, LLC
Rogers	Jon		Member	Siemens Energy, Inc
Rohr	Richard		Guest	Powell Electrical Systems
Rostron	Joe		Guest	Southern States LLC
Ruebensam	James		Guest	S&C Electric Co.
Salinas	Alex		Guest	Director of Operations
Santos	Leonel	X	Guest	Schneider Electric
Savulyak	Victor		Guest	DNV GL KEMA Laboratory
Sazanowicz	Robert		Guest	Avangrid - United Illuminating
Schaben	Chase		Guest	Burns & McDonnell
Schiffbauer	Daniel	X	Chair	Toshiba International Corporation
Schuetz	Carl		Member	American Transmission Company (ATC)
Schumann	Jon		Corresponding Member	American Transmission Company
Sharma	Devki		Guest	Entergy
Shinde	Sushil	X	Member	ABB Inc.
Sicker	Robert		Guest	FirstEnergy Corp
Sims	Garett		Guest	Eaton Corp.
Skidmore	Michael		Guest	AEP
Slattery	Christopher		Member	FirstEnergy
Stage	James	X	Member	Dominion Energy
Steigerwalt	Don	X	Corresponding Member	Duke Energy
Tabakovic	Dragan		Corresponding Member	Meramec Hubbell Power Systems
Toups	Vernon	X	Member	Siemens
Trichon	Francois	X	Member	Schneider Electric
Trost	Karla	X	Guest	G&W Electric
Tuveson	Lars		Guest	Burns & McDonnell
Uzelac	Nenad	X	Member	G&W Electric
Ward	Jeffrey		Guest	Doble Engineering Company
Weeks	Casey		Member	Siemens Energy
Weisker	Jan	X	Member	Siemens AG
Wen	Jerry		Guest	BC Hydro
Whitney	Michael		Guest	CSA America
Wilkie	William	X	Corresponding Member	Eaton
Wirz	Torsten		Guest	ABB AG
Wolf	Robert		Corresponding Member	Hubbell Power Systems, Inc.
Woodyard	Terrance	X	Member	Siemens Industry Inc.
Xiao	Ang	X	Guest	3M company
York	Richard	X	Corresponding Member	Mitsubishi Electric Power Products Inc.
Youssef	Mina		Member	Eaton Corporation
Yu	Li	X	Member	Eaton Corporation
Zhang	Jiong		Guest	MEPPI
Zhang	Wei	X	Corresponding Member	Hitachi T&D Solutions, Inc.
Zhong	Jim		Guest	American Transmission Company
Zhu	Xi		Member	GE Energy Management