

# T&I Meeting Minutes

## May 4th, 2020 – Virtual Zoom meeting



**Chair:** Nenad Uzelac  
**Secretary :** Alex Lizardo  
**Zoom meeting :** <https://gwelec.zoom.us/j/442596970?pwd=ZXJISlpuVlpyWXhUclF0eS96VVNEUT09>  
**Time:** May 4<sup>th</sup>, 3.45PM – 5.30PM.

### Meeting Minutes

#### 1. Call to order

The web meeting was opened at 3:15pm and called to order at 3:45pm

#### 2. Zoom meeting etiquette

A quick overview of web-based meeting etiquette, AKA “netiquette”, was presented to ensure a successful meeting.

#### 3. Introductions of guests

Introductions were given based on members displayed in Zoom list. The secretary clarified we will be using the meeting registration would be used to log guests and members

#### 4. Attendance

There were 10 members and 53 guests in attendance. Quorum was met.

#### 5. Approval of the agenda

The agenda was elucidated by the chair. Paul Leufkens made a motion to accept without changes and Jeff Mizener seconded the motion.

#### 6. Patent Slides

IEEE patent slides were shared with the attendees with no comments from the group.

#### 7. Meeting minutes approval

The meeting minutes from the October 7th, 2019 meeting were showed. No objections were stated. Paul Leufkens made a motion to accept without changes and Jeff Mizener seconded the motion.

#### 8. Chairman report

- Subcommittee scope: The chair affirmed messages from prior meetings:
  - T&I facilitates and conducts research, develops technical reports and makes recommendation, and coordinates with other technical committees, groups, societies, and associations as required.

- T&I will not be developing standards. The subcommittee deliverables will include technical reports and technical papers, which could later be used for the advancements of the switchgear standards.
- Subcommittee membership and structure: The chair shared the current members list – currently we have 16 members and 2 vacancies.  
People who want to become member should send an email to Nenad.

## 9. Task Force reports

- a. TF1: Review IEEE 1547 standard's impact on switchgear standards
  - Task Force chair Paul Leufkens confirmed the task force (TF) did have a few calls but the communications have dwindled. With no clear need for additional communication, Paul raised the question whether there is any need for additional work by the task force and there were no comments/actions indicating a need from the guest/members in attendance
  - With no other need, Paul confirmed the TF is done. Sterlin Cochran made motion to close TF with Albert Livshitz seconding the motion. No objections were stated.

## 10. New Proposals and Discussion

- a. "Testing for power frequency over-voltages >200% open gap" by *Mohit Chhabra and Dave Johnson*. Mohit shared the updated proposal (T&I Proposal 4-22) and summary of discussion is as follows:
  - Mohit clarified duration greater than a minute will be considered not less than (as they are covered by standards). The deliverable will be white paper and be done in a few months.
  - Aleksandar Vukojević from Duke Energy shared usage experience: there is a problem with switching the grid and switching the grounding transformers - which should be done before switching the grid. If you don't do that you can see the voltages, in their case, over by 70kV when switching without grounding. It's not 200% but it is an overage. Also of consideration is that batteries are not using the grid reference and it creates its own phase angle. Mohit said he understands not seeing 200% - the 200% is considering worst case.
  - Caryn Riley gave input that the testing at NETRAC considers the outdoor applications and it would be important to note the difference with "wet" withstand.
  - Albert Livshitz suggested we should say we would like to avoid the 180 degree out of phase condition as much as possible. Dave Johnson echoed the consensus that operating at 200% could create real issues for switches and it is important to capture switching duties/scenarios that are affected. Recommends that all switching applications really need to be studied - like cap switching and raised re-striking. This will take a lot of studies and coordination with CIGRE and support surveys. Nenad clarified that narrowed focus is to help with time frame - a larger scope would require larger cooperation of other committees
  - Roy Alexander comment that fundamentally 1547 talks all about nominal, we have ratings that have maximum voltage is considered. We need to know actual ratings because a MV has lots of margin in it and above 145 kV its less margin. Asked -

what is the baseline of the 200%? Nominal voltage is different than rated voltage. Mohit took it as an action to clarify what the voltage baseline.

- b. "T&D equipment for special applications" by *Sushil Shinde*. Sushil presented the background information; slides were included in the main PPT (see appendix) and summary of discussion is as follows:
- Sushil noted that the applications are somewhat common with no test protocol or user guidance readily available. His proposal is to set up a task force on certain applications and produce paper. He gave an example on gen circuit breaker. Nenad posed the question: is there other interest from other subcommittees?
  - Dave Johnson asked if the proposal that we have a dedicated group who can take these examples - like Cigre A3. Asked - is A3 where these should be or is the switchgear committee wanting a group to do this? Nenad agreed this is a large scope, we can look at what we have and determine what action our group can take.
  - Karthik noted that there is new group in CIGRE and that item #2 (gen synch) will likely be in their scope. Karthik will bring this up to the WG in CIGRE and get back to T&I. UPDATE: After the meeting, Karthik brought up the topic of Generator Sync application on HV side during the Cigre meeting May 6 and agreed to follow up this topic in our CIGRE WG A3.46.
  - On point #1 of the presentation slide, Sushil clarified that 110 standard IEC is working is similar to IEEE C37.015 but does not cover arc furnaces which are more severe. Albert Livshitz will look at reviews of other documents that can cover this item and get back to the group. Curtiss Frazier commented that as an end user he would find this extremely helpful.
- c. "Issue of aging equipment (diagnostics, end of life)" by *Albert Livshitz*. Albert presented the background information; slides were included in the main PPT(see appendix) and summary of discussion is as follows:
- Albert summarized what reviewed last meeting and that the topic's updates in the presentation has some additions: Point #3 and #4 out of the 9 listed items under scope and deliverables that are new.
  - George Becker noted that there is some cross over with C37.122.9 substations group so his work will dovetail into this. He will go back to that group and recommend that that someone from that working group contact Albert/Nenad.
  - Dave Gohil asked what voltage levels we are talking about. Nenad clarified it would affect all - MV and HV switchgear. Albert agreed that the relevancy affects every part of the system. Dave commented he thought it would be relevant up to 38kV/MV but understands and is OK with response. Albert L added that this mostly affects the transmission switchgear. There are several working groups in CIGRE stating that the age of switchgear is not an issue, but the condition is and how you identify that condition. A digital substation is not so far in the future so what we could do for self-diagnosis would be good to consider.
  - Curtiss Frazier commented that when the equipment is not major dollars, so replacement is not an issue. It's on the higher dollar larger equipment where a small investment could extend the life and make it worthwhile.

## **11. Updates from relevant organizations:**

- a. Nenad presented an CIGRE A3 update: Active working groups and strategic plan for 2020-2030 were summarized. A3 organizational structure change was also shared. All items were included in main PPT (see Appendix)
- b. CIGRE Knowledge Management System (KMS) is now accessible via the US National Committee Mirror Panels.
  - The KMS is how to get the engineers engaged in CIGRE to the full extent of networking, information exchange and active contribution.
  - To request access, please contact Albert Livshitz for SC A3 “T&D Switchgear” or George Becker for SC B3 “Substations”.
- c. IEC TC17 update: Liaison report of IEC TC 17 and SC 17A from February 2020 was included in main PPT (see appendix)

## **12. Future events / conferences of interest**

- CIGRE 2020: Going virtual, August 24 – September 4. There will be CIGRE 2021 in Paris
- IEEE PES General Meeting: Also virtual, August 2-6
- IEEE PES T&D: Oct 12, 2020 – Thu, Oct 15, 2020 in Chicago, IL USA

## **13. Future meetings**

- Fall 2020: Sheraton Sundance Square, Fort Worth, TX – October 4- 8, 2020
- Spring 2021: Hilton Charlotte University Place, Charlotte, NC - April 18-23, 2021
- Fall 2021: Peppermill Resort, Reno, NV - October 10 - 14, 2021

## **14. Group Photo**

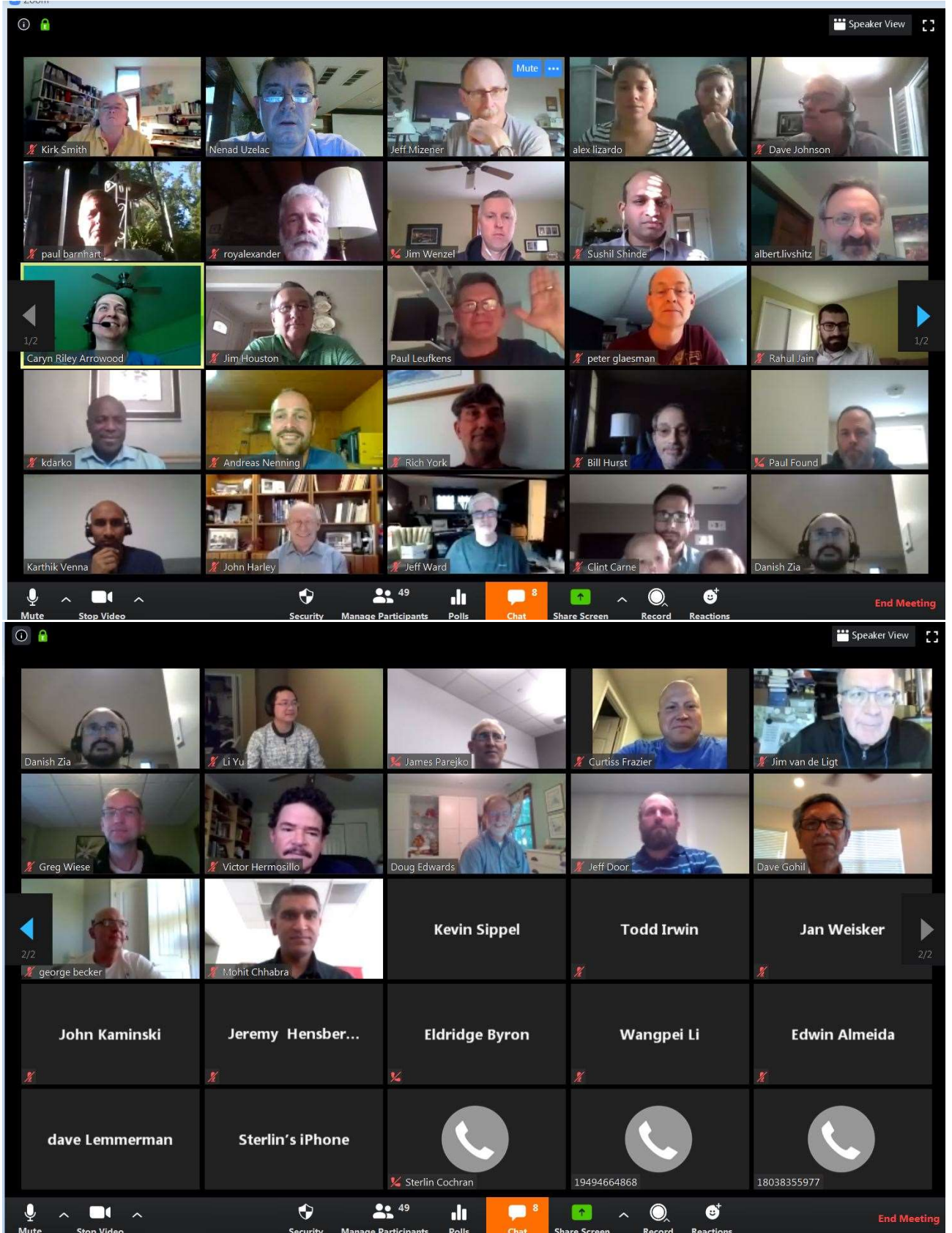
A zoom capture of the group was taken.

## **15. Adjourn**

Meeting adjourned at 5:30PM with group zoom photo.

# Appendix

## Group Photo:





**Attendance:**

First Name	Last Name	Company	Role	5/4/2020
Ken	Edwards	FirstEnergy Corp.	Guest	
Mauricio	Aristizabal	ABB	Guest	
John	Harley	FirstPower Group LLC	Guest	X
Xi	Zhu	GE Energy Management	Guest	
James	Houston	Southern Company Transmission	Guest	X
Roy	Alexander	RWA Engineering	Guest	X
Joe	Rostron	Southern States LLC	Guest	
Doug	Edwards	Siemens Industry, Inc.	Guest	X
Albert	Livshitz	CE Power Engineered Services	Member	X
Ted	Burse	Powell Industries, Inc	Member	
Dean	Sigmon	Eaton Corporation	Guest	
Richard	York	Mitsubishi Electric Power Products Inc.	Guest	X
Michael	Crawford	Mitsubishi Electric	Guest	
Peter	Glaesman	PCORE Electric Company, Inc.	Guest	X
Paul	Barnhart	Underwriters Laboratories	Guest	X
Jeff	Mizener	Siemens Industry, Inc.	Member	X
George	Becker	POWER Engineers Inc.	Guest	X
Jeffrey	Gieger	Thomas & Betts	Guest	
Sahadev	Gohil	AZZ Switchgear Systems	Guest	X
Anthony	Ricciuti	Eaton Corporation	Guest	
Mirko	Palazzo	ABB	Guest	
John	Webb	ABB	Guest	
Carl	Schneider	Schneider Electric	Member	
Eldridge	Byron	Schneider Electric	Member	X
Leslie	Falkingham	Vacuum Interrupters Limited	Guest	
David	Lemmerman	PECO/Exelon	Guest	X
Victor	Hermosillo	GE Grid Solutions	Guest	X
Christian	Heinrich	Siemens AG	Guest	
Thomas	Pellerito	DTE Energy	Guest	
Patrick	Di Lillo	Consolidated Edison Co. of NY, Inc.	Guest	
Bill	Hurst	GE	Guest	X
Todd	Irwin	GE Grid Solutions	Guest	X
Edgar	Dullni	retired	Guest	
David	Dunne	Schneider Electric	Guest	
Herman	Bannink	KEMA Netherlands	Guest	
James	van de Ligt	CANA High Voltage Ltd.	Guest	X
Henk	te Paske	KEMA Netherlands	Guest	
David	Johnson	HVCB	Member	X
Jon	Spencer	Utility Solutions	Guest	X
Paul	Leufkens	Power Projects Leufkens	Member	X
Sushil	Shinde	ABB Inc.	Guest	X

Stephanie	Montoya	Southern California Edison	Guest	
Lou	Grahor	Eaton Corporation	Guest	X
Brad	Leccia	Eaton	Guest	
Clint	Carne	Schneider Electric	Guest	X
Charles	Worthington	Hubbell Power Systems	Member	X
Robert	Foster	Megger	Guest	
John	Hall	Tennessee Valley Authority	Guest	X
Jan	Weisker	Siemens AG	Guest	X
Lise	Phan	Pacific Gas and Electric Company	Guest	
Carl	Schuetz	American Transmission Company (ATC)	Guest	X
Wangpei	Li	Eaton	Guest	X
Vincent	Chiodo	HICO	Guest	
Benjamin	Abebe	HICO America	Guest	
Robert	Sazanowicz	Avangrid - United Illuminating	Guest	
Raymond	Frazier	Ameren	Guest	
James	Wenzel	Eaton	Member	X
John	McClelland	Technibus	Guest	
Scott	Lanning	Eaton	Guest	
Scott	Lanning	Eaton	Guest	
Peter	Marzec	S&C Electric Co.	Guest	
Paul	Found	BC Hydro	Guest	X
Sterlin	Cochran	Oak & Shield LLC	Member	X
Richard	Rohr	Powell Electrical Systems	Guest	
Michael	Christian	ABB	Guest	
Brendan	Kirkpatrick	Southern California Edison	Guest	X
Nenad	Uzelac	G&W Electric	Chair	X
John	Kaminski	Siemens	Member	X
David	Beseda	S&C Electric Co.	Guest	
Dustin	Sullivan	Hubbell Power Systems	Guest	
Jared	Hines	Eaton Corp.	Guest	
Alex	Lizardo	Cargill	Secretary	X
Bradley	Lewis	AEP	Guest	
Roy	Hutchins	Southern Company Services	Guest	
Jacob	Blake	Hubbell Power Systems	Guest	
Christopher	Slattery	FirstEnergy	Guest	
James	Lagree	Eaton	Guest	X
Karla	Trost	G&W Electric	Guest	X
Wei	Zhang	Hitachi T&D Solutions, Inc.	Guest	
Daniel	Schiffbauer	Toshiba International Corporation	Guest	X
Anil	Dhawan	ComEd	Member	
Victor	Savulyak	DNV GL KEMA Laboratory	Guest	
Jeremy	Hensberger	Mitsubishi Electric Power Products Inc.	Guest	X
JaeHyun	Kim	HICO America/Hyosung	Guest	

James	Ruebensam	S&C Electric Co.	Guest	
Joseph	Jasinski	ITC Holdings Corp.	Guest	
Laura	Reid	Hubbell Power Systems	Guest	X
David	Caverly	Trench Ltd.	Guest	
Rahul	Jain	S&C Electric Company	Guest	X
Francois	Trichon	Schneider Electric	Guest	X
Li	Yu	Eaton Corporation	Guest	X
Kennedy	Darko	G&W Electric Co	Member	X
Kevin	Sippel	Eaton Electric	Guest	X
Scott	Lanning	S&C Electric	Guest	
Jeffrey	Door	The H-J Family of Companies	Guest	X
Brad	Armstrong	Meramec Instrument Transformer Co.	Guest	
Philippe	Corriveau	MindCore Technologies	Member	
Brian	ONeil	RMS Energy	Guest	
Andreas	Nenning	OMICRON electronics GmbH	Guest	X
Justin	Palmer	ELECTRONSYSTEM MD	Guest	
Jeffrey	Ward	Doble Engineering Company	Guest	X
Jennifer	Hunter	MEPPI	Guest	
Mark	Pattison	H-J Family of Companies	Guest	
Francisco	Guzman	Southern California Edison	Guest	
Torsten	Wirz	ABB AG	Guest	
Edwin	Almeida	Southern California Edison	Guest	X
Benson	Lo	Toronto Hydro	Guest	
Mark	Peterson	Xcel Energy	Guest	X
Jeff	Ward	Doble Engineering Company	Guest	
SangTae	Kim	HICO America	Guest	
Caryn	Riley	Georgia Tech/NEETRAC	Member	X
Danish	Zia	UL LLC	Guest	X
Christopher	Jarnigan	Southern Company Services	Guest	
Larry	Putman	Powell	Guest	
Leonel	Santos	Schneider Electric	Guest	X
Steven	May	Southern Company	Guest	
Luis	Osorio	The H-J Family of Companies	Guest	
Kelly	Cannon	Hubbell Power Systems	Guest	
Joshua	Arlund	MacLean Power Systems	Guest	
Robert	Wolf	Hubbell Power Systems, Inc.	Guest	
Majid	Fathi	Qualitrol	Guest	
Benjamin	Abebe	Qualitrol	Guest	
Jim	Sharkey	EPRI	Guest	
Randall	Creach	AZZ Switchgear Systems	Guest	
Rob	Eichelberger	Eaton	Guest	
Paul	Rakus	Eaton	Guest	
Jacob	Nelson	HPS	Guest	



Mohit	Chhabra	S&C Electric Company	Guest	X
Michael	Boulus	PSE&G	Guest	
Bharatwaj	Jagadeesan	Southern States LLC	Guest	
Justin	Palmer	ELECTRONSYSTEM MD (EMD)	Guest	
Karthik Reddy	Venna	Siemens AG	Guest	X
William	Weishuhn	ABB	Guest	X
Robert	Hanna	ABB INC	Guest	
Ralf	Methling	Leibniz Institute for Plasma Science and Technology	Guest	
Ryan	Sherry	ITC Holdings Corp.	Guest	
Christopher	Hastreiter	Eaton	Guest	
Edward	Hester	Entergy	Guest	
Michael	Shook	Hubbell Power Systems	Guest	
Douglas	Mason	ComEd	Guest	
Ashley	Moran	IEEE Standards Association (IEEE-SA)	Guest	
Justin	Johnson	RMS Energy	Guest	
nadia	El khattabi	Hydro-Quebec	Guest	
Bianca	Cosby	San Diego Gas & Electric	Guest	
Jose	Gamboa	The H-J Family of Companies	Guest	
Yingjie	Ling	GE	Guest	
Zheng	Shen	Illinois Institute of Technology	Guest	
Anthony	Natale	HICO America	Guest	X
Daniel	Crist	Siemens Industry, Inc.	Guest	
Shahab	Mehraeen	Louisiana State University	Guest	
Greg	Wiese	Schneider Electric	Guest	X

## IEEE T&I Subcommittee Meeting



Image credit: ipopba | Getty Images

Nenad Uzelac (Chair)  
Alex Lizardo (Secretary)



May 4, 2020





# Netiquette

- Attendance collected during registration
- Introduction in alphabetical order
- Mute your microphone if not speaking
- Use video only if presented
- “Raise your hand” to enter discussion
- Answer poll questions when asked





# Self-Introductions



# Agenda

1. Call to Order *Nenad U.*
2. Zoom meeting etiquette *Alex L.*
3. Introduction of Guests (virtual) *Alex L.*
4. Attendance (virtual) *Alex L.*
5. Approval of the Agenda *Alex L.*
6. Patent slides
7. Approval of Minutes from Fall 2019 Meeting
8. Chairman's report: *Nenad U.*
  - a. TI Scope review
  - b. TI subcommittee membership (approved nominations)
9. Task Force reports *Paul L.*
  - a. TF1: Update of IEEE 1547 standard
10. New Proposals and Discussion:
  - a. "Aging Switchgear: condition assessment and lifecycle management" *Albert L.*
  - b. "T&D switchgear special applications" *Sushil*
  - c. "Testing for Power Frequency Over-Voltages  $\geq 200\%$  open gap" *Dave and Mohit*
  - d. *Any other?*
11. Updates from relevant organizations: *Nenad U.*
  - a. CIGRE A3 update
12. Future events / conferences of interest
  - i. CIGRE 2020, Paris
  - ii. IEEE PES
13. Future meetings
  - Fall 2020: Sheraton Sundance Square, Fort Worth, TX – October 4<sup>th</sup> to 8<sup>th</sup>, 2020
14. Meeting adjourns *Nenad U.*





## **Participants have a duty to inform the IEEE**

- Participants **shall** inform the IEEE (or cause the IEEE to be informed) of the identity of each holder of any potential Essential Patent Claims of which they are personally aware if the claims are owned or controlled by the participant or the entity the participant is from, employed by, or otherwise represents
- Participants **should** inform the IEEE (or cause the IEEE to be informed) of the identity of any other holders of potential Essential Patent Claims

**Early identification of holders of potential  
Essential Patent Claims is encouraged**

## Ways to inform IEEE

- Cause an LOA to be submitted to the IEEE-SA (patcom@ieee.org); or
- Provide the chair of this group with the identity of the holder(s) of any and all such claims as soon as possible; or

- **Speak up now and respond to this Call for Potentially Essential Patents**

If anyone in this meeting is personally aware of the holder of any patent claims that are potentially essential to implementation of the proposed standard(s) under consideration by this group and that are not already the subject of an Accepted Letter of Assurance, please respond at this time by providing relevant information to the WG Chair

## Other guidelines for IEEE WG meetings

- All IEEE-SA standards meetings shall be conducted in compliance with all applicable laws, including antitrust and competition laws.
  - Don't discuss the interpretation, validity, or essentiality of patents/patent claims.
  - Don't discuss specific license rates, terms, or conditions.
    - Relative costs of different technical approaches that include relative costs of patent licensing terms may be discussed in standards development meetings.
      - Technical considerations remain the primary focus
  - Don't discuss or engage in the fixing of product prices, allocation of customers, or division of sales markets.
  - Don't discuss the status or substance of ongoing or threatened litigation.
  - Don't be silent if inappropriate topics are discussed ... do formally object.

For more details, see *IEEE-SA Standards Board Operations Manual*, clause 5.3.10 and *Antitrust and Competition Policy: What You Need to Know* at <http://standards.ieee.org/develop/policies/antitrust.pdf>

## Patent-related information

The patent policy and the procedures used to execute that policy are documented in the:

- *IEEE-SA Standards Board Bylaws*  
(<http://standards.ieee.org/develop/policies/bylaws/sect6-7.html#6>)
- *IEEE-SA Standards Board Operations Manual*  
(<http://standards.ieee.org/develop/policies/opman/sect6.html#6.3>)

Material about the patent policy is available at  
<http://standards.ieee.org/about/sasb/patcom/materials.html>

**If you have questions, contact the IEEE-SA  
Standards Board Patent Committee  
Administrator at [patcom@ieee.org](mailto:patcom@ieee.org)**

# Approval of Minutes

## Technology and Innovation Subcommittee



IEEE Switchgear Fall 2019 standards meeting  
 Location: Catamaran Resort, San Diego, CA  
 Date: October 7<sup>th</sup>, 2019  
 Room: Macaw  
 Time: 3:45PM to 5:30PM  
 Chair: Nenad Uzelac with meeting facilitated by Karla Trost in his absence  
 Minutes: Karla Trost & Alex Lizardo

### Meeting Minutes

1. Call to order  
The meeting was called to order at 3:45PM.
2. Introductions and Circulation of the subcommittee sign-in sheet.  
Sign-in sheets were circulated, and introductions were made. Karla agreed to facilitate the meeting in Nenad's absence and Alex Lizardo volunteered to write notes.
3. Attendance  
There were 49 guests in attendance.
4. Approval of the agenda  
The agenda was elucidated by the facilitator and accepted without changes.
5. Meeting minutes approval.  
The meeting minutes from the April 29<sup>th</sup>, 2019 meeting were showed. No objections or changes.
6. Chairman report:
  - TI Subcommittee scope review. The facilitator shared a presentation prepared by the chair which summarized and reiterated important points.
  - TI Subcommittee membership and structure. The facilitator shared the subcommittee nominations so far and emphasized to those in attendance should contact their SC chairs if they want to be nominated.
    - LVSD: Ted Burse, Carl Schneider, Jeff Mizener
    - HVCB: Dave Johnson, Paul Leufkens
    - SA: Alex Lizardo, Eldridge Byron
    - Waiting for nominations from RODE, HV5 and HVF
  - See attached presentation



### 7. Task Force reports

- a. TF1: Review IEEE 1547 standard's impact on switchgear standards
  - Task Force chair Paul Leufkens was absent. In advance of the meeting he summarized the findings in the presentation "TF IEEE 1547 San Diego Oct 2019" attached below. Mohit Chhabra gave a quick background on the presentation and Paul's activity in brief
  - Presentation File:



- The discussion became focused on the increases in maximum voltage in C84.1 and the position paper that the switchgear committee submitted. Todd Irwin updated the group about a general message received from C84.1. Todd finalized by saying we will have to keep an eye out on this standard and that this WG directly impacts switchgear. He believes the switchgear committee now has enough people signed up so that we are not caught off guard in the future. A question was asked if we believe this problem will happen again and Todd clarified that while they are not pursuing this topic in the current revision, any new revision always makes it a possibility, which is why we must keep actively involved in this WG.
- Albert Lubitz brought up that A3/A2 working group was created to discuss increased voltages. He will send Karla the information for her to include in the minutes.

### 8. New Proposals

Carry over of last T&I meeting agreed to be prepared before Fall 2019 meeting

- 1) Issue of aging equipment (diagnostics, end of life)
  - a. Albert presented the attached proposal:



The facilitator brought up the need to confirm the scope as a SC - do we feel it is too broad and do we have the right people working on it? Below is the input received from attendees:

- George Becker brought up there is ongoing work being done by C37.122.9. Albert clarified that he was planning to implement Nenad's comments which were to include the pre-existing and ongoing efforts by other groups (B3.43 Cigre group for example).



# Chairman's report





## IEEE Switchgear T&I sub-committee

- **Facilitates** and **conducts** research related to Switchgear, Circuit breakers and Fuses that are covered under IEEE switchgear standards. The need for innovations arises because of the changing business environment and technology offerings.
- **Develops** technical reports and makes recommendations for further advancement of IEEE switchgear standards.
- **Coordinates** with other technical committees, groups, societies, and associations as required.

## IEEE Switchgear T&I sub-committee

- Will not develop standards
- Will cover the projects that are of interest to more than one switchgear subcommittee
- Anyone can write and submit a project proposal
- Subcommittee members will decide which projects to take.
- Initial members are chosen based on nominations, after will follow IEEE attendance rules.
- Today we will be welcoming the first subcommittee members.

# T&I Membership

## LVSD:

- Ted Burse
- Carl Schneider
- Jeff Mizener

## HVCB:

- Dave Johnson
- Paul Leufkens
- vacant

## RODE:

- Kennedy Darko
- Anil Dhawan
- Caryn Riley

## SA:

- Alex Lizardo
- Eldridge Byron
- Albert Livshitz

## HVF:

- Sterlin Cochran
- Charles Worthington
- Jim Wenzel

## HVS:

- John Kaminski
- Phillip Corriveau
- vacant





# Task Force reports





# IEEE 1547 update

Paul Leufkens  
T&I subcommittee remote  
May 2020



# 1547 and connected standards

- [IEEE 1547-2018](#), for Interconnection and Interoperability of Distributed Energy Resources with Associated Electric Power Systems Interfaces. Revision to 2003
- [IEEE 1547a-2020](#), Amendment 1: To Provide More Flexibility for Adoption of Abnormal Operating Performance Category III
- [IEEE 1547.1](#), old 2005, new 2020 - IEEE Approved Draft Standard - testing of the interconnection in order to determine whether or not it conforms to standards.
- [IEEE 1547.2](#), published in 2008, Application Guide, technical background
- [IEEE 1547.3](#), published in 2012, Guide For Monitoring, Information Exchange, and Control of Distributed Resources Interconnected With EPSs. (PAR not approved)
- [IEEE 1547.4](#), published in 2011, Guide for Design, Operation, and Integration of Distributed Resource Island Systems with EPSs.
- [IEEE 1547.5](#), draft 2012 withdrawn Technical Guidelines for Interconnection of Electric Power Sources Greater than 10MVA to the Power Transmission Grid
- [IEEE 1547.6](#), published in 2011, practices for secondary network interconnections.
- [IEEE 1547.7](#), published in 2013, distribution impact studies for distributed resource



interconnection





## Biggest issues

1. Continuous operation at 110% rated voltage
2. > 200% rated voltage between contacts
3. During a fault, while the DER itself may trip out downstream of the intertie transformer, the transformer may remain in the circuit thus impacting grid characteristics
4. High harmonics could expedite thermal and dielectric failure of switchgear and other equipment



# Updated Proposals and Discussion

- A. “Testing for power frequency over-voltages >200% open gap” *Dave and Mohit (white paper)*
- B. “Issue of aging equipment (diagnostics, end of life)” *Albert (technical report)*
- C. “T&D equipment for special applications” *Sushil (technical report)*



# 1) 200% open-gap testing

- This would be the first step into “influence of renewables

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**Scope of Work and deliverables:**

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1. Introduction
2. Define scope of switchgear to be covered in the White Paper.
3. Define extended duration of time for open gaps to be covered in the White Paper.
4. Identify applications where an open gap may be energized on both sides for extended durations.
5. Identify factors stressing open gaps when exposed to power frequency over-voltages.
6. Conduct user surveys to determine testing practices for open gaps exposed to  $\geq 200\%$  of rated voltage for extended durations.
7. Develop recommendations for standardization of testing practices for open gaps exposed to  $\geq 200\%$  of rated voltage for extended durations.



## 2) Special applications

### Background information:

There are few special applications which are not covered by IEEE standards such as:

1. Arc furnace switching,
2. Gen synch application with HV circuit breakers in the absence of generator circuit breaker
3. Circuit breakers used in HVDC station on the AC side for filter banks
4. Power factor testing of CB in the field (this test is not done part of routine production)
5. Influence of renewables on HV circuit breakers in terms of harmonics, SC rating, X/R ratios, overvoltage
6. Electronics which is integrated into switchgear such as electronics used for fiber optic current sensors, electronics used with motor operating drives
7. Impact of HV disconnect switch transients on HV circuit breaker

The HV circuit breakers designed and tested per existing standards IEEE Std C37.04 & 09 do not cover the requirements and testing needs. The switchgear is typically installed by a user with an assumption that it covers every possible switching application in the industry. Hence, it is important to highlight the uniqueness of each application and what special precautions need to be considered while applying the switchgear designed based on the existing standards which do not cover these applications.

### Scope of Work and deliverables:

Task force can be setup to study each application challenges. The deliverables can be in the form of white paper or technical paper describing each application in detail and how current standards do not cover the application-specific requirements. The guidance can be provided to users for the proper selection of the switchgear to reduce field failures.



## 3) Asset management / EOL

### Scope of Work and deliverables:

1. Define scope of equipment to be covered by the Technical Report. Propose to include all equipment in scope of IEEE C37 Main Committee;
2. Identify the factors and stresses impacting the premature of equipment failure or equipment aging process;
3. Identify technical and financial feasibility to install on-line condition monitoring on different models type of T&D Switchgear
4. Identify and evaluate the present-day techniques to pre-detect potential failure and mitigate the aging of T&D Switchgear including:
  - a. Periodic maintenance and testing;
  - b. On-line condition monitoring and diagnostics;
  - c. Identify manufacturer design deficiency and life cycle management of the potential design failure equipment;
  - d. Reconditioning and upgrades using new manufacture' supplied components and materials;
  - e. Retrofit of the existing T&D switchgear with new sensing and condition diagnostic equipment;
  - f. Retrofill the aging components of T&D switchgear using pre-qualified modular assemblies;
5. Identify the right quantity of spare parts and recycling of stock;
6. Conduct users survey to evaluate the practices of the T&D switchgear lifecycle management;
7. Consolidate a list of equipment had failed due to manufacturer design, lack of maintenance, aging or climate change;
8. Digital Substation and self-diagnosing equipment as applied to aging T&D switchgear
9. Develop recommendations for standardization of the lifecycle management of T&D switchgear



## Updates from relevant organizations

CIGRE A3 “T&D Equipment”  
IEC TC 17 “HV Switchgear”





## **SC A3 T&D Equipment**

- a) Active Working Group
- b) Strategic plan 2020–2030

	Number	Name	Convener	Finish
WG	A3.30	Overstressing of HV substation equipment	A. Carvalho (BR) <a href="mailto:antonio.carlos@ons.org.br">antonio.carlos@ons.org.br</a>	2020
WG	A3.31	Instrument transformers with digital output	F. Rahmatian (CA) <a href="mailto:frahmatian@nugridpower.com">frahmatian@nugridpower.com</a>	(2020)
WG	A3.36	Application and Benchmark of Multi Physic Simulations and Engineering Tools for Temperature Rise Calculation	M. Kriegel (CH) <a href="mailto:martin.kriegel@ch.abb.com">martin.kriegel@ch.abb.com</a>	(2020)
WG	A3.38	Shunt capacitor switching in distribution and transmission systems	E. Dullini (DE) <a href="mailto:edqar.dullini@de.abb.com">edqar.dullini@de.abb.com</a>	(2020)
WG	A3.39	Application and field experience with Metal Oxide Surge Arresters	R. le Roux <a href="mailto:robert.leroux@esbi.ie">robert.leroux@esbi.ie</a>	(2020)
WG	A3.40	Technical Requirements and Testing Recommendations for MV DC switching equipment at distribution levels	Christian Heinrich (DE) <a href="mailto:christian.heinrich@siemens.com">christian.heinrich@siemens.com</a>	(2022)
WG	A3.41	Interrupting and switching performance with SF6 free switching equipment	René Smeets (NL) <a href="mailto:rene.smeets@kema.com">rene.smeets@kema.com</a>	(2021)
WG	A3.42	Failure analysis and risk mitigation for recent incidents of AIS instrument transformers	Helvio Jailson Azevedo Martins (BR) <a href="mailto:helvio99@gmail.com">helvio99@gmail.com</a>	(2021)
JWG	A3.43/ CIRED	Tools for lifecycle management of T&D switchgear based on data from condition monitoring systems	Nicola Gariboldi (CH) <a href="mailto:nqariboldi@qualitrolcorp.com">nqariboldi@qualitrolcorp.com</a>	(2022)
JWG	B4/A3.80	HVDC Circuit Breakers - Technical Requirements, Stresses and Testing Methods to investigate the interaction with the system	Dr. Junzheng Cao (CN) <a href="mailto:caojunzheng@sgepri.sgcc.com.cn">caojunzheng@sgepri.sgcc.com.cn</a>	(2022)
JWG	C4/A3.53	Application Effects of Low-Residual-Voltage Surge Arresters in Suppressing Overvoltages in UHV AC Systems	Jinliang He (CN) <a href="mailto:hejl@tsinghua.edu.cn">hejl@tsinghua.edu.cn</a>	2021
JWG	A3/A2/A1/ B1.44	Consequence of High Voltage Equipment operating exceeding highest system voltages	Bartosz Rusek (DE) <a href="mailto:Bartosz_Rusek@amprion.net">Bartosz_Rusek@amprion.net</a>	(2023)
WG	A3.45	Methods for identification of frequency response characteristic of voltage measurement systems	Erik Sperling (CH) <a href="mailto:ERIK.SPRLING@PMW.CH">ERIK.SPRLING@PMW.CH</a>	(2023)
WG	A3.46	Generator Circuit-Breakers: review of application requirements, practices, in-service experience and future trends	Pavel Novak (DE) <a href="mailto:pavel.novak@se.com">pavel.novak@se.com</a>	(2023)
JWG	B4/A3 86	Fault Current Limiting Technologies for DC Grids	Dr Zhiyuan He (CN) <a href="mailto:hezhiyuan@qeiri.sgcc.com.cn">hezhiyuan@qeiri.sgcc.com.cn</a>	(2022)

## Potential Future work (discussions started)

- T&D equipment 4<sup>th</sup> reliability survey
- Influence of renewables on T&D equipment
- Influence of pandemic on T&D equipment (Electra paper, 2020)
- Climate change impact (flooding, earthquakes, high wind, fire....)

## Main challenges:

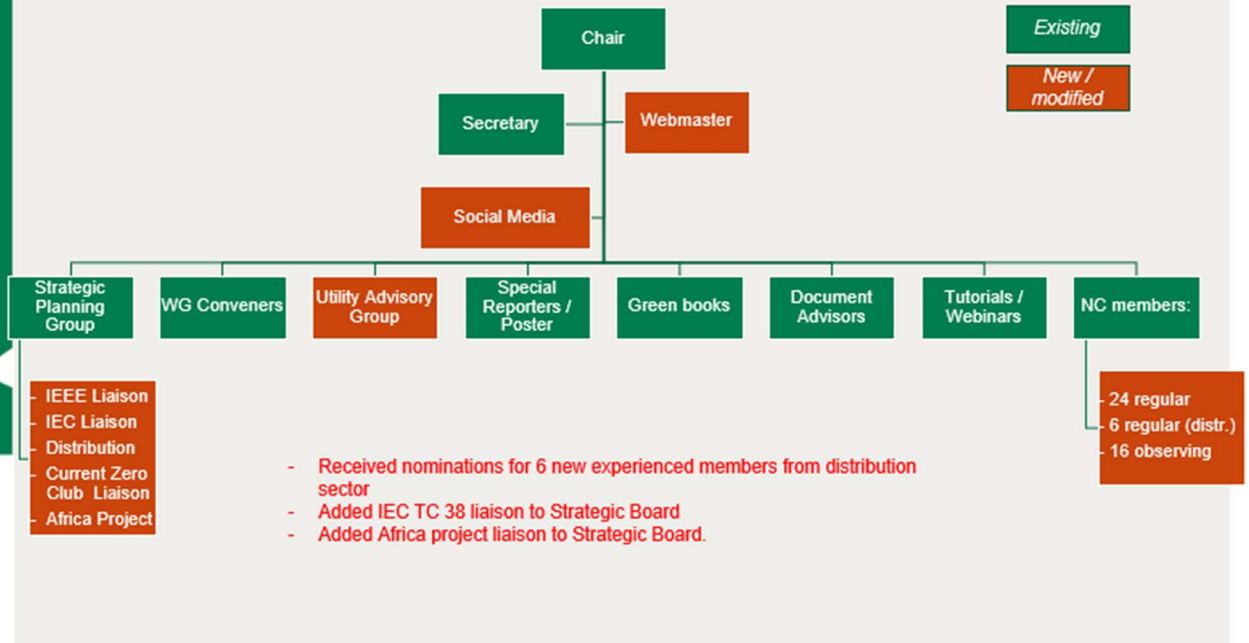
- **Organizational:**

- Integrating distribution experts
- Forming Utility Advisory Board
- Handling increased number of WG and papers
- Breaking silos between organizations and handling JWG
- Website / social media

- **Technical:**

- 3Ds
- Innovation and trends in Distribution
- Impact of renewables on T&D equipment
- Environmental and climate impact on T&D equipment
- Digitalization & automatization
- Advanced sensors and data analytics
- Asset management / Condition assessment

## A3 organizational structure



## Focus areas

- **Prepare for the Grid of the Future**
  - Cover new T&D equipment technologies
  - Digitalization and automation
  - Advanced sensors and data analytics
  - Impact of renewables on T&D equipment
- **Make the best use of the existing equipment**
  - Improve Condition assessment and diagnostics
  - Investigate reliability of T&D equipment
  - Consider all aspects of Life Cycle Management
  - Consider influence of severe weather
- **Cover environmental and sustainability aspects**
  - Consider sustainable principles in the whole life cycle of T&D equipment
  - Study environmentally friendly current interruptions and insulation media
  - Reduce visual and spatial impact of T&D equipment
- **Develop knowledge and distribute information:**
  - Number of T&D equipment engineers on decline.
  - Create content and distribute (include new channels like Linked In)
  - Grow A3 community

Kept the same  
4 focus areas,  
updated items  
underneath.

# Liaison Report IEC TC 17 and SC 17A February 2020



**Anne Bosma  
Secretary TC 17  
and SC 17A**





## Contents

- **TC 17/SC 17A Activity**
  - Recently published documents
  - Work in progress
- **Future work of TC 17/SC 17A**
- **TC 17/SC 17A – CIGRE SC A3**



## TC 17/SC 17A – Recently published

- IEC 62271-109: Series capacitor by-pass switches – Edition 3 published in April, 2019

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## TC 17 – Work in progress

- **Revision of the first edition of IEC 62271-4: First CD was discussed in Shanghai, in October, 2019**
- **A second CD will be circulated May 1, 2020**
- **Parts of the first edition will be transferred to IEC 60376 and 60480**

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## SC 17A – Work in Progress

- **Awaiting publication**
- **IEC 62271-108: Disconnecting circuit-breakers**
- **IEC 62271-104: HV switches, new edition 3**
- **IEC 62271-107: Fused circuit-switchers**

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## SC 17A - Work in progress

- **IEC 62271-37-013: Generator circuit-breakers, CDV March 13, 2020**
- **IEC 62271-100: CDV has been registered**
- **IEC 62271-101: First CD of new edition 3 has been circulated**
- **IEC 62271-103: MV switches, CDV has been registered**
- **IEC 62271-105: MV switch-fuse combinations, CDV March 13, 2020**
- **IEC 62271-106: Contactors, FDIS**

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## SC 17A – Work in progress

- **IEC 62271-302: Circuit-breakers with intentional non-simultaneous pole operation**
  - The work to transfer the document to a standard was terminated by SC 17A

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## Future work

- **Work has been initiated to elaborate standards for DC switchgear**
  - Common specifications (TC 17)
  - Current transfer switches (SC 17A)
  - Disconnectors and earthing switches (SC 17A)
  - By-pass switches (SC 17A)
  - DC circuit-breakers (SC 17A)
- **WGs have been formed for all the 5 topics**

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- **New CIGRE WG proposed for generator circuit-breakers**
  - To address small generators < 10 MVA
  - To address pumped storage application
  
- **Tor A3-46 was approved October 31, 2019, convenor Pavel Novak (DE)**

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## Future Events

- **CIGRE 2020**
  - Going virtual: August 24 – September 4
  - Papers and tutorials will be presented via webinar
  - TC committee working on the details
  - There will be CIGRE 2021 in Paris
- **IEEE PES**
  - Also virtual
  - August 2-6



# Group photo time



## IEEE Switchgear Technology & Innovation subcommittee



### New Research Group Proposal

	<b>Submitters' Name:</b>	<b>Affiliation</b>	<b>Email</b>
1	Mohit Chhabra	S&C Electric	<a href="mailto:Mohit.Chhabra@sandc.com">Mohit.Chhabra@sandc.com</a>
2	Rahul Jain	S&C Electric	<a href="mailto:Rahul.Jain@sandc.com">Rahul.Jain@sandc.com</a>
3	Paul Leufkens	PowerProjectsLeufkens	<a href="mailto:Paul@PowerProjectsLeufkens.com">Paul@PowerProjectsLeufkens.com</a>
4	Dave Johnson	Independent	<a href="mailto:dsjohnson@ieee.org">dsjohnson@ieee.org</a>

<b>Date</b>	4/22/2020
<b>Rev #</b>	

<b>Title</b>	Testing for Power Frequency Over-Voltages of $\geq 200\%$ of Rated Voltage Across an Open Gap					
<b>Deliverable</b>	<b>Quick feasibility (0-6 mon)</b>		<b>White paper (6 – 12 mon)</b>		<b>Technical Report (1-3 years)</b>	
			X			
<b>Affected subcommittees</b>	<b>HVCB</b>	<b>RODE</b>	<b>HVF</b>	<b>HVS</b>	<b>SA</b>	<b>LVSD</b>
	X	X	X	X	X	X
<b>Affected IEEE committees</b>	substation, T&D					
<b>Other</b>	CIGRE, EPRI, UL					



**Background information:**

During the last two decades there have been significant technological advancements and increasing installations of distributed energy resources (DERs), on the power grid. The impact of these developments on the grid has so far been outside the purview of medium voltage (MV) and high voltage (HV) utilities until recently where switchgear is now being deployed in new applications that include DERs, e.g. microgrids. It is however unclear whether existing switchgear standards adequately account for such applications.

A particular issue is the occurrence of  $\geq 200\%$  of rated voltage across an open gap in switchgear due to phase angle differences, when both sides of the gap are energized via independent power sources. Such a scenario is allowed under IEEE-1547, however switchgear standards do not specifically account for it.

Current switchgear standards require power frequency withstand tests at  $>200\%$  of rated voltage, however for relatively short durations (generally 60 seconds for dry, and 10 seconds for wet withstand). There is a lack of guidance on how to test for durations of several hours or days where  $\geq 200\%$  of rated voltage could periodically occur across an open gap. In the absence of such guidance, manufacturers' current testing practices vary based on the application.

Studies should be done to understand the various applications and voltage classes (LV, MV, HV) where  $\geq 200\%$  of rated voltage may occur across an open gap, and the effect of such occurrences on different types of open gaps. Recommendations for standardized testing practices should also be developed for such applications.

**Scope of Work and deliverables:**

1. Introduction
2. Define scope of switchgear to be covered in the White Paper.
3. Define extended duration of time for open gaps to be covered in the White Paper.
4. Identify applications where an open gap may be energized on both sides for extended durations.
5. Identify factors stressing open gaps when exposed to power frequency over-voltages.
6. Conduct user surveys to determine testing practices for open gaps exposed to  $\geq 200\%$  of rated voltage for extended durations.
7. Develop recommendations for standardization of testing practices for open gaps exposed to  $\geq 200\%$  of rated voltage for extended durations.

<b>Comments from T&amp;I Chair</b>		
<b>Approval by T&amp;I subcommittee</b>		
<b>Date</b>		
<b>Research group timing</b>	<b>Start</b>	<b>Finish</b>

