

T&I meeting  
starting  
@3:45pm



# IEEE T&I Subcommittee Meeting



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Alex Cochran(Chair)  
Caryn Riley(Secretary)



# Agenda

## T&I Meeting Agenda

October 16, 2024 – Fort Lauderdale, FL Meeting



**Chair:** Alex Cochran  
**Secretary:** Caryn Riley  
**Location:** Omni Oklahoma City Hotel, Oklahoma City, Oklahoma – **Oklahoma 2**  
**Time:** Oct 16, 2024 3:45 PM – 5:30 PM (CST)

### Meeting Agenda

- |     |  |          |
|-----|--|----------|
| 1.  | Call to Order  | Alex C.  |
| 2.  | In-person meeting etiquette  | Alex C.  |
| 3.  | Introduction of Guests   | Caryn R. |
| 4.  | Attendance   | Caryn R. |
| 5.  | Approval of Fall Agenda  | Alex C.  |
| 6.  | Patent slides  | Alex C.  |
| 7.  | Approval of Minutes from Spring Meeting  | Caryn R. |
| 8.  | Chairman's report:   | Alex C.  |
|     | a. TI Scope review   |          |
|     | b. New Membership review   |          |
| 9.  | Task forces:   |          |
|     | a. "Testing for Power Frequency Over-Voltages $\geq 200\%$ open gap" <b>Vote</b>     | Mohit    |
|     | b. "Aging Switchgear: condition assessment and lifecycle management"                 | Andreas  |
|     | c. "T&D switchgear special applications"   | Mike C.  |
|     | d.   |          |
| 10. | Open discussion  |          |
|     | a. Discuss open inquiries.   | All      |
|     | b. Any new topics that T&I should discuss  | All      |
| 11. | Updates from relevant organizations:   |          |
|     | a. <u>CIGRE update</u>   | Nenad    |
| 12. | Future meetings  |          |
|     | a. Spring 2025: April 5 – 11, Wyndham Grand Orlando Resort Bonnet Creek, Orlando, FL |          |
|     | b. Fall 2025: October 5 – 9, Peppermill Resort, Reno, NV                             |          |
|     | c. Spring 2026: April 26 – 30, Sheraton Sand Key Resort, Clearwater Beach, FL        |          |
| 13. | Meeting adjourns   | Alex C.  |

# 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](mailto: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.

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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

## T&I Meeting Minutes

April 3, 2024 – Fort Lauderdale Beach, Florida



**Chair:** Alex Cochran  
**Secretary:** Caryn Riley  
**Meeting:** Westin Fort Lauderdale Beach Resort, Las Olas III  
**Time:** April 3, 2024 10:15 am - Noon (Eastern Daylight Saving Time)

### Meeting Minutes

#### 1. Call to order

The meeting was opened and called to order at 10:18 am EDT.

#### 2. Introductions of Guests

All attendees announced themselves and their affiliation. Sign-up sheet was circulated and attendees were asked to declare their primary subcommittee.

#### 3. Attendance

13 Members, 21 Guests

#### 4. Approval of the agenda

IEEE TI Spring 24 Agenda.pdf

Motion to approve the agenda from M. Christian, seconded by N. Uzelac. The agenda was approved by consensus.

#### 5. Patent Slides

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

#### 6. Meeting minutes approval

F23TImiRev0.pdf

No revisions.

Motion to approve the meeting minutes from T. Neighbours, J. Mizener seconded. The meeting minutes were approved by consensus.

#### 7. Chairman's report

##### a. TI Scope

##### b. Attendance review

The following attendees will act as liaisons back to the noted subcommittees the actions of this subcommittee today.

LVSD – Jeff Mizener

SA – Albert Livshitz

HVCB – Dan Benedict  
 HVF – Jeramie Cooper  
 RODE – Caryn Riley  
 HVS – Francois Trichon

#### 8. Task forces:

##### a. Power Frequency Over-Voltages $\geq$ 200% of Rated Voltage Across an Open Gap (M. Chhabra)

- Sent out paper for review; only comment received was that the PD test voltage should be increased for certain cases
- Document is ready for publishing.
- A. Cochran will talk to TCPC chair about next steps and direct M. Chhabra to publish.
- No further actions for this task force. Suggestion by N. Uzelac to review other aspects of the influence of inverter based technologies/DER effects on switchgear.

##### b. Aging Switchgear: condition assessment and lifecycle management (A. Nanning)

- Slides provided and will be added to minutes
- Document is on imeet Central here: <https://iee-SA.imeetcentral.com/wg-ae/>
- Work completed since Fall 2023 meeting
  - Survey was completed.
  - Paper was re-organized
    - 40 pages for beginning of paper on Survey Results
    - Maintenance Strategies – 1 page
    - Condition Assessment – 34 pages, finalized
    - Aging Process – 71 pages, finalized
    - Appendix – Addition information from Condition Assessment and Aging Process
    - References – 143
- Next Steps
  - Resolving the final details in the paper
  - Hand to IEEE editor, A. Cochran directed to talk J. Santulli, will plan to recirculate after the IEEE editor is complete
  - A. Cochran will review next steps at ERP and get back to Task Force Chair

##### c. T&D switchgear special applications (M. Christian)

- Appealed for volunteers
- Topics:

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

# 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.

# T&I Membership

- LVSD
  - Brian Gerzeny
  - Jeff Mizener
- SA
  - Alex Cochran
  - Albert Livshitz
- HVCB
  - Stephanie Montoya
  - Carl Schuetz
  - Dan Benedict
  - Ivan Contreras
- HVF
  - Charles Worthington
  - Jeramie Cooper
  - James Wenzel
- RODE
  - Kennedy Darko
  - Anil Dhawan
  - Caryn Riley
- HVS
  - Francois Trichon
- At-Large Members
  - Mohit Chhabra
  - Michael Christian
  - Andreas Nenning
  - Nenad Uzelac

# T&I Membership

## Removed

- LVSD :  
Ted Burse  
Carl Schneider
- HVCB:  
Dave Johnson  
Paul Leufkens
- HVS:  
John Kaminski  
Phillip Corriveau

## New Members

- LVSD:  
Brian Gerzeny
- HVCB:  
Stephanie Montoya  
Carl Schuetz  
Dan Benedict  
Ivan Contreras
- HVS:  
Francois Trichon

# Task Force reports

# Task Forces

VOTE TO PUBLISH

- 1) "Monitoring for power frequency over-voltages >200% open gap" (**paper**) **Lead: Mohit**
- 2) "Aging Switchgear: condition assessment and lifecycle management" **Lead Andreas** (*tech. report*)
- 3) "T&D switchgear special applications" **Lead: Mike C** (*technical report*)

# iMeetCentral Location

The screenshot displays the IEEE SA Standards Association web interface. At the top, there is a search bar for workspaces and files, along with 'Create' and 'Help/Resources' options. The main navigation bar includes 'Dashboard', 'Workspaces', and a breadcrumb trail: 'IEEE Switchgear T...' > 'Home' > 'Wiki' > 'Files & Discussions' > 'Project Management' > 'Calendar' > 'Help' > 'Settings' > 'People' > 'Properties' > '+ Add Tab'.

The left sidebar shows a 'Files by Folder' view with a tree structure. The 'Draft Documents' folder is expanded, and the 'Mature Draft(s) (2)' sub-folder is selected and highlighted in blue.

The main content area shows the path 'IEEE Switchgear ... / Draft Documents / Mature Draft(s)'. A green notification bar at the top of the content area states '1 file uploaded successfully:'. Below this, there are 'Upload' and 'New' buttons. A list of files is displayed, including:

- PES Technical Report on Aging Switchgear.docx** by Alex Lizardo Cochran, uploaded a moment ago.
- Testing for Power Frequency Voltage  $\geq 200$  Percent of Line-Neutral Voltage Across an Open Gap\_v3.docx** by Alex Lizardo Cochran, uploaded a minute ago.

A red arrow points from the URL below to the second file in the list.

<https://iee-sa.imeetcentral.com/wg-ae/>



# TESTING FOR POWER FREQUENCY VOLTAGE $\geq 200\%$ OF LINE-NEUTRAL VOLTAGE ACROSS AN OPEN GAP

## ABSTRACT

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 power-frequency line-neutral voltage across an open gap in switchgear due to phase angle differences when both sides of the gap are energized via independent power sources. Under steady state conditions, with independent power sources operating across either side of an open gap, the voltage across the gap could be as high as 2.2x of the line-neutral system voltage, assuming a +10% allowable tolerance used by some utilities.

A common application where such a phenomenon would exist is at the point of common coupling (PCC) of a microgrid. The PCC device would periodically experience  $\geq 2x$  line-neutral system voltage as the frequencies and phases of the voltage waveforms on both sides of the device drift over time. Existing switchgear standards require power frequency withstand tests at  $\geq 3x$  a device's line-neutral voltage, however for relatively short durations; generally, 60 seconds for dry, and 10 seconds for wet withstand. There is no clear guidance on how to test for durations of several hours or days where 2.2x of line-neutral voltage could periodically occur across an open gap. In the absence of such guidance, manufacturers' current testing practices vary based on the application.

If the frequencies of the grid and the microgrid were constant at 60Hz, Table 1 shows the number of times number of times the voltage across the device's open gap is  $\geq 2x$  line-neutral system voltage in 60 seconds. If the frequencies were to drift within  $\pm 2\%$  (58.8 - 61.2Hz)<sup>1</sup>, Table 2 shows the maximum number of times the voltage across the device's open gap is  $\geq 2x$  line-neutral system voltage in 60 seconds.

# REPORT ON AGING SWITCHGEAR

- ERP Review (6 weeks)
- Release the document to Main Committee for Vote

# Special Applications

c. T&D switchgear special applications (M. Christian)

- Appealed for volunteers
- Topics:
  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

# Open Discussion

## 1) *Open Topics:*

- Barcoding (Charles)
- Microgrids (Jeff M)
- NFPA 70E Maintenance Requirements (Alex)
- TRV parameters (Sterlin C)
- How switchgear is influenced by inverter-based technologies (Nenad)

## 2) *Any new topics that T&I should discuss*

# Updates from CIGRE A3

# Next Meeting

- Spring 2025: April 5 – 11, Wyndham Grand Orlando Resort Bonnet Creek, Orlando, FL
- Fall 2025: October 5 – 9, Peppermill Resort, Reno, NV
- Spring 2026: April 26 – 30, Sheraton Sand Key Resort, Clearwater Beach, FL
- Fall 2026: October 4 – 8, Catamaran Resort, San Diego, CA
- Spring 2027: April 3 - 8, Hyatt Regency, Orlando, FL
- Fall 2027: October 10 – 14, Alohilani Resort, Waikiki Beach, HI
- Spring 2028: April 23 - 27, Marriott Rivercenter, San Antonio, TX
- Fall 2028: October 8-12, Hyatt Regency, Columbus, OH



*That's all Folks!*