Technology and Innovation Subcommittee

IEEE Switchgear Fall 2019 standards meeting

Location:	Catamaran Resort, San Diego, CA
Date:	October 7th, 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 29th, 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, HVS and HVF**
   - Presentation file: **see Annex A**

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: **see Annex B**
   - 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 Livshitz 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 proposal: **see Annex C**

   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 bought 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).
   - The attendees shared the sentiment and agreed that this work would be valuable to the industry. Francisco Guzman commented that this could be a benefit and something we can take to management.
   - There is a concern that cross-work is being done – there is a need to double check the work mentioned in C37.122.9.
   - ISO 55000 was brought up as covering asset management and that there could be items to include here that would benefit end users.
   - The facilitator inquired if there are any attendees who are interested in working on this topic or know of anyone who would. Albert, Lise Phan, and Caryn Riley volunteered. No other comments from the group.

2) Need for longer product life (increased number of operations, etc)
   a. Sushil presented the proposal: **see Annex D**

- Shushil has changed the proposed title to "How to apply switchgear tested per current IEEE standards to special applications which are not covered by the IEEE standards.".
- The main thought behind the proposal is to form a taskforce around topics or areas were there is little to no coverage by the standards where the taskforce focuses and develops material that delves into it. 7 applications were included that fell under this criterion.
- Suggestion was made replace "renewable" in the 5th bullet point to inverted based technologies – which is really it's own topic (see #3 below).
- There was a comment made that the scope may be to big, Shushil clarified that once the areas of focus are chosen we can limit the scope around those subjects areas.
- Question was raised -has there been thought given to surge arresters? This could potentially be an 8th item to add to the list.
- The facilitator inquired if there were people interested in working on this topic or know of anyone who would. Dave made a note that he sees it's possible there he sees a possibility whitepaper as a way to cover some gaps. Cigre tends to do this but for larger issues or subjects. Todd commented that this was one thought of the TI Subcommittee. Dave recommended that he sees this as an ongoing activity were people are able to submit the issues they recognize that need to be addressed and form groups that work through theses.
- The question was raised if the output is a paper is there any way that this would be recognized by IEEE as a transactional paper? Todd clarified that we are in the early stages of coming together as a SC (we're still finalizing membership!) but eventually he sees it as being possible that the group can have a working list and that the output is technically recognized/published work.
- The facilitator inquired if there are any attendees who are interested in working on this topic or know of anyone who would.

3) Implications of inverter-based technologies on the switchgear
   a. Mohit Chhabra presented presentation (slides can be found in the attached T&I subcommittee slides)

- On the first item, the potential facing MV and HV switchgear as a result of inverter based DERs.
  - Dave surmised his thoughts on the repercussions in a change of voltages means we will be producing more and higher transients and that the problem cascades beyond this. Further perpetuating the problem is that most people (since they are not intimately familiar with switchgear) have little understanding of the problem.
- On the second item, where the PCC may see >200% of rated voltage:
  - There were no comments.

- On the 3rd item, on DER interconnection resulting in the transformer remaining on the grid, and some of the synchronization scheme being off grid:
  - Dave described these kind of occurrences as "inverter-based faults" because essentially the breaker serving the grids must operate for two different kinds of

grids (gave an example of SCE having significant cyclical parameters to consider). The harmonics are an additional problem, the idea is to investigate how this will impact the switchgear not to mention other places like transformers. The old synchronous condenser was brought up as a case to investigate. Dave believes Cigre may begin working on this topic so it may be possible to do a joint effort. He asked if anyone attending is aware of a group working on this topic and no one came forward.

  - Kevin Sippel commented that DER is affecting relays/relay programming because of the harmonic.
  - The IEEE committee on harmonics is doing a simulation study and they have observed an increase harmonic content when capacitors switch but they are still in the process of testing/exploring and that it may be work speaking with them.
  - Edwin Almeida from SCE commented that they are seeing these issues in distribution as well not just transmission and that both should be considered.
  - Jim Houston NESC is just beginning to look at it and if there was anything that surrounded worker safety would be of value.

- The facilitator inquired if there are any attendees who are interested in working on this topic or know of anyone who would. Edwin Almeida, Jim Ruebensam, George Becker and Clint Carne volunteered.

9. Updates from relevant organizations:

a. Karla shared a presentation with the CIGRE A3 update put together by Nenad:

- Published TB
- Open Working Groups
- New WG discussions

b. IEC TC17 update:

- New development

10. Future events / conferences of interest

a. CIGRE Grid of the Future 2019
b. CIGRE 2020, Paris
c. IEEE T&D, Chicago

11. Future meetings

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

12. Adjourn

The meeting was adjourned at 5:00PM

ANNEX A: Fall 2019 T&I Subcommittee Presentation

T&I Subcommittee Meeting
October 7, 2019

Nenad Uzelac (Chair)
Karla Trost (Facilitator)

Self-Introductions

Agenda

1. Call to Order
2. Introduction of Guests
3. Attendance
4. Approval of the Agenda
5. Patent slides
6. Approval of Minutes from Spring 2019 Meeting
7. Chairman's report:
   A. TI Scope review
   B. TI subcommittee membership
8. Task Force reports
   A. TF1: Update of IEEE 1547 standard
   B. TF2: Alternative gases
9. New Proposals and Discussion:
   A. "Issue of aging equipment (diagnostics, end of life)
   B. "Need for longer product life (increased number of operations, etc)
   C. "Implications of inverter-based technologies on the switchgear"
10. Updates from relevant organizations:.
    - CIGRE A3 update:
      - Published TB
      - Open Working Groups
    - IEC TC17 update:
      - New development
11. Future events / conferences of interes
    - CIGRE Grid of the Future 2019
    - CIGRE 2020, Paris
    - IEEE T&D, Chicago
    - Others
9. Next Meeting
10. Adjournment

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

Approval of Minutes

echnology and Innovation Subcommittee

IEEE Switchgear Fall 2019 standards meeting

Location: Hilton Hotel, Burlington, VT
Date: April 29th, 2019
Room: Green Mountain A
Time 1:30PM to 3:15PM
Chair: Nenad Uzelac
Minutes: Paul Leufkens

Meeting Minutes

1. **Call to order**

   The meeting was called to order at 1.30PM.

2. **Introductions and Circulation of the subcommittee sign-in sheet.**

   Sign-in sheets were circulated, and introductions were made.
   Paul Leufkens volunteered to write minutes.

3. **Attendance**

   There were 68 guests in attendance.

4. **Approval of the agenda**

   The agenda was elucidated by the chair and accepted without changes.

5. **Meeting minutes approval.**

   The meeting minutes from the October 15th, 2018 meeting were showed. No objections or changes.

6. **Chairman report:**

   - Subcommittee scope: The chair stated that this is the third Technology & Innovation (T&I) subcommittee meeting but the first official one as the T&I subcommittee is approved by IEEE PES Technical committee.
     - Important point is that 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 also stated that as now the new O&P are approved, the subcommittee will need members. People interested should be eager to participate and have to be nominated by a Subcommittee chair, we look to 3 per SC.
     The job of T&I subcommittee members is:

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 submitt 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 Leufkans
- SA:
  - Alex Lizardo
  - Eldridge Byron
- HVS
  - Pending
- HVF
  - Pending
- RODE
  - Pending

Task Force reports

IEEE 1547 influence on C37 standards Task Force (Innovation Subcommittee)

Clinton Carne, Mohit Chhabra, Sterlin Cochran, David Dunne, Paul Leufkens

San Diego, October 2019

Agenda

1. The IEEE 1547-2018 and the IEEE 1547.1
2. Potential issues with C37 standards
3. Progress Switchgear Committee and IEEE 1547
4. Next steps

1. The IEEE 1547-2018 and IEEE 1547.1

- The **IEEE 1547**, Standard for Interconnection and **Interoperability** of Distributed Energy Resources with Associated Electric Power Systems Interfaces published in 2018
  - It contains elements that may conflict with C37 elements
  - Thinking has mostly Low Voltage background
- One “urgent” amendment by P1547a WG is under ballot “Amendment to IEEE Std 1547-2018 to provide more flexibility for adoption of abnormal operating performance Category III”
- First ballot **P1547.1** “Conformance **Test Procedures** for Equipment Interconnecting Distributed Resources with Electric Power Systems” closed last June
  - 86% response rate and a 79% approval rate, (above required approval rate of 75%).
  - 1167 comments to be addressed
  - Former version 2005
- As far as we would like to change elements it should have been done in the 1547 – too late for that now.

2. Potential issues

1. Surge Withstand (ref 4.11.2)
2. Paralleling device, 220 % rated Voltage (ref 4.11.3)
3. EPS reclosing (ref 6.3)
4. Shall Trip requirements (ref Tables 11, 12, 13)
5. Operation at 110% of Vn (ref Tables 14, 15)

3. Progress Switchgear Committee and IEEE 1547

- C84.1 position paper submitted at the IEEE PES GM in Atlanta last August.
  - Conclusion: WG C84.1 no longer pursues increases to the maximum voltage ratings as a part of this revision
- Many comments delivered on draft IEEE 1547.1
  - The real problem is with the 1547 itself, not the .1
- more push-back by UL, American applicants, NEMA, …

4. Next steps

- Follow-up looked for at the IEEE PES Tech Council upcoming November (Keith a.o.)
- More and better understanding and getting education:
  - proposal tutorial next spring
    - Mark Siira –ComRent–IEEE SCC21 Chair
    - Charlie Vartanian– PNNL – IEEE SCC21 Treasurer
- White paper

App: Standards Coordinating Committee 21

- IEEE P1547.1: DER interconnection and interconnection test requirements
  - Sponsor Ballot Started May 10, 2019
- IEEE P1547.2: Guide to 1547
- IEEE P1547.3: Monitoring, information exchange and control (MIC) for DER (PAR Not Approved)
- IEEE P1547.9: Guide for Energy Storage System Interconnection
- IEEE P2030.4: Guide for Control and Automation Installations Applied to the Electric Power Infrastructure
- IEEE P2030.5: Standard for Smart Energy Profile 2.0 Application Protocol
- TBD: Smart Infrastructure Network Project
  - The smart infrastructure network project will define the necessary requirements for a truly interactive infrastructure of the system serving customers and multiple venues, that expand beyond the traditional smart grid concept and even smart cities

New Proposals and Discussion

A. "Issue of aging equipment (diagnostics, end of life)" *Albert*
B. "Need for longer product life (increased number of operations, etc)" *Sushil*
C. "Implications of inverter-based technologies on the switchgear" *Dave and Mohit*

Research Proposal(s) Discussion: Impact of Inverter-Based Distributed Energy Resources on Switchgear

Mohit Chhabra, David Johnson

San Diego, October 2019

Agenda

1. Potential issues facing MV and HV switchgear as a result of inverter-based DERs
2. Next steps

1. Potential issues facing MV and HV switchgear as a result of inverter-based DERs

1. IEEE-1547 (Tables 14 and 15) allows DERs to operate continuously at 110% of rated voltage. ANSI-C84.1 was considering increasing stead-state voltage limits as well until recently. Currently some switchgear standards allow for up to +10% tolerance in test voltages, but not all. Capacitive and inductive switching especially might be affected, with increased re-strike probabilities, and higher transient and recovery voltages.

   – breakers, switches, fuses, capacitors, surge arrestors, reactors, insulation

1. Potential issues facing MV and HV switchgear as a result of inverter-based DERs

2. In the case of DER interconnecting at MV or HV, if the DER operator is allowed to form an intentional island, the PCC may see >200% of rated voltage due to phase angle differences. This is well beyond what such devices are tested to in accordance with current standards.

   – switches, insulation

1. Potential issues facing MV and HV switchgear as a result of inverter-based DERs

3. As DER capacity grows, traditional (synchronous) generation plants may remain offline for longer durations. Also, DER interconnection typically involves an intertie transformer to match the interconnection voltage. During a fault, while the DER itself may trip out downstream of the intertie transformer (as required by IEEE-1547), the transformer may remain in the circuit thus impacting grid characteristics.

   – breakers, switches, fuses

1. Potential issues facing MV and HV switchgear as a result of inverter-based DERs

4. Inverter-based DERs are known to add higher harmonic currents to the grid. Alternative gas designs may be even more sensitive to these stresses, except for vacuum. Short circuit currents may be reduced, but high harmonic content may be problematic for interruption, even for lower short circuit duties. High harmonics could expedite thermal and dielectric failure of switchgear and other equipment.

   – breakers, fuses, capacitors, surge arrestors, reactors, insulation

2. Next Steps

1. Develop research proposal(s) to be studied under IEEE Switchgear Committee task forces

2. Collaborate with other IEEE committees (e.g. PSRC) on protection and control related issues

3. Collaborate with CIGRE

4. Workshop for future IEEE Switchgear Committee meetings

Updates from relevant organizations

Highlights & Technical Directions of SC A3

- Highlights for ‘18
  - 10 active A3 working groups, 2 JWG approved in ’18
    - 4 new working groups started, 2 disbanded
    - 278 members, 13 female, 21 young
  - Published Green book “Switching Equipment”
  - Published 3 Technical Reports and Presented 5 tutorials
- Important activities in ‘19
  - 2 Technical brochures and 1 Electra paper planned for ’19
  - Reorganizing A3 committee (adding Distribution experts, Utility Advisory board, etc). Have open positions, let Nenad know if interested.
  - Participating in 3 conferences (Cairo, Hakodate, Bucharest)
  - Started WG A3.45 (“*Methods for identification of frequency response characteristic of voltage measurement systems*”)
  - Will start soon WG A3.46 (“*Generator circuit breakers*”)
- Technical Directions:
  - Impact on T&D Equipment under introduction of renewables, distributed generation and storage
  - Lifetime management and new developments in T&D Equipment

Updates from relevant organizations

- TC17

BACKGROUND

Questionnaire on the impact of Renewable Energy Generation on the network operations

The high voltage electrical network is changing under the new requirements coming from the change to a renewable energy generation scenario. With this change the technical needs for high voltage equipment will change to. Changes are expected in the increasing number of switching operations, load cycles toward longer time sequences in the case of strong wind and long distance transmission to the consumers, higher maximum voltages for longer times in less stable network because of changing generation power and may be other not yet identified changes.

ACTAD had discussed this topic at their last meeting and the members in general saw such changes in the network too

Proposals

1. Notice the votings and comments and bring it up at the next SC 17C plenary meeting in 2019
2. Set up an adhoc working group to investigate the topic futher to present results at the next SC 17C meeting in 2019
3. To start a workin group to combine the available knowledge in a TR to be available in 2020
4. To transfer the task for more investigation to CIGRE B3 Substations Committee for a technical report in 2021

Future events / conferences of interest

- CIGRE Grid of the Future 2019
- CIGRE 2020, Paris
- IEEE T&D, Chicago
- Others

ANNEX B: Fall 2019 TF IEEE 1547 Report

IEEE 1547 influence on C37 standards Task Force (Innovation Subcommittee)

Clinton Carne, Mohit Chhabra, Sterlin Cochran, David Dunne, Paul Leufkens

San Diego, October 2019

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2. Potential issues with C37 standards
3. Progress Switchgear Committee and IEEE 1547
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5. Operation at 110% of Vn (ref Tables 14, 15)

3. Progress Switchgear Committee and IEEE 1547

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- Many comments delivered on draft IEEE 1547.1
  - The real problem is with the 1547 itself, not the .1
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4. Next steps

- Follow-up looked for at the IEEE PES Tech Council upcoming November (Keith a.o.)
- More and better understanding and getting education:
  - proposal tutorial next spring
    - Mark Siira –ComRent–IEEE SCC21 Chair
    - Charlie Vartanian– PNNL – IEEE SCC21 Treasurer
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App: Standards Coordinating Committee 21

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  - The smart infrastructure network project will define the necessary requirements for a truly interactive infrastructure of the system serving customers and multiple venues, that expand beyond the traditional smart grid concept and even smart cities

ANNEX C: T&I Project proposal draft – Aging Equipment

IEEE Switchgear Technology
& Innovation subcommittee

New Research Group Proposal

Date	9/26/2019
Rev #	0

	Submitters' Name:	Affiliation	Email
1	Albert Livshitz	CE Power Engineered Services	livshitz@ieee.org
2			
3			

Title	Aging T&D Switchgear: condition assessment and lifecycle management					
Deliverable	**Quick feasibility (0-6 mon)**		**White paper (6 – 12 mon)**		**Technical Report (1-3 years)**	
					X	
Affected subcommittees	**HVCB**	**RODE**	**HVF**	**HVS**	**SA**	**LVSD**
	X	X	X	X	X	X
Affected IEEE committees	substation committee, relay committee					
Other	NETA, CIGRE, EPRI					

Background information:

The reliability of the operation of the power grid is largely influenced by the condition of the transmission and distribution (T&D) switchgear. Various utilities and end users of T&D switchgear facing the task of lifecycle management of their equipment. Industry offers no commonly accepted approach on this topic. The solutions may vary from "run–to–failure", to frequent periodic maintenance and testing, to replacement with new regardless of remaining equipment capabilities and condition.

At the same time, equipment manufacturers, engineering, maintenance and testing companies offer a wide variety of sensing and diagnostic equipment as well as testing and maintenance services to address the lifecycle management of the T&D switchgear. Unfortunately, in many cases the state-of -art methods of testing and diagnostic of the existing equipment either not used or misapplied. These results in premature equipment failures, wrong and costly decisions on equipment replacement, significant increase in maintenance cost, unplanned or unnecessary outages, etc.

Significant progress has been made in upgrading the T&D power grid using digital technologies for protection and control purposes. The new digital infrastructures could and should be used for condition monitoring and diagnostics of T&D switchgear.

Some of the topics associated with the lifecycle management of the T&D Switchgear have been addressed in previously published documents:

- IEEE C37.10 Guide for Investigation, Analysis and Reporting of Power Circuit Breaker Failures,
- IEEE C37.10.1 Guide for Selection of Monitoring for Circuit Breakers,
- IEEE C37.59 Requirements for Conversion of Power Switchgear Equipment,
- CIGRE TB167 User Guide for the Application of Monitoring and Diagnostic Techniques for Switching Equipment for Rated Voltages 72.5kV and Above,
- CIGRE TB725 Aging High Voltage Substation Equipment and Possible Mitigation Techniques.
- CIGRE TB737 Non-Intrusive Methods for Condition Assessment of Distribution and Transmission Switchgear,

Also, there are several active Working Groups at CIGRE that are currently working on new Technical Brochures:

- JWG A3.43 Tools for Lifecycle Management of T&D Switchgear Based of Data from Condition Monitoring Systems,
- WG B3.48 Assets Health Indices for Equipment in Existing Substations, just to name the few.

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 equipment aging process;
3. Identify and evaluate the present-day techniques to detect and mitigate the aging of T&D Switchgear including:
    a. Periodic maintenance and testing;
    b. On-line condition monitoring and diagnostics;
    c. Reconditioning and upgrades using new manufacture' supplied components and materials;
    d. Retrofit of the existing T&D switchgear with new sensing and condition diagnostic equipment;
    e. Retrofill the aging components of T&D switchgear using pre-qualified modular assemblies;
4. Conduct users survey to evaluate the practices of the T&D switchgear lifecycle management;
5. Digital Substation and self-diagnosing equipment as applied to aging T&D switchgear
6. Develop recommendations for standardization of the lifecycle management of T&D switchgear

Comments from T&I Chair		
Approval by T&I subcommittee		
Date		
Research group timing	**Start**	**Finish**

ANNEX D: T&I Project proposal draft – Special Applications

IEEE Switchgear Technology
& Innovation subcommittee

New Research Group Proposal

Date	10/2/2019
Rev #	1

	Submitters' Name:	Affiliation	Email
1	Sushil Shinde	ABB Inc	Sushil.Shinde@us.abb.com
2			
3			

Title	How to apply switchgear tested per current IEEE standards to special applications which are not covered by the IEEE standards.					
Deliverable	**Quick feasibility (0-6 mon)**		**White paper (6 – 12 mon)**		**Technical Report (1-3 years)**	
			X		X	
Affected subcommittees	**HVCB**	**RODE**	**HVF**	**HVS**	**SA**	**LVSD**
	X				X	X
Affected IEEE committees	Switchgear					
Other	IEC / CIGRE					

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.

Comments from T&I Chair		
Approval by T&I subcommittee		
Date		
Research group timing	**Start**	**Finish**