

1. Welcome and introductions of all participants. The WG meeting was attended by 59 participants; 38 members and 21 guests.
2. Jeff Nelson, the chair, is presiding the meeting.
3. The WG Chair reviewed IEEE Policy on patents and Guidelines for IEEE WG Meetings
4. Meeting minutes from Fall meeting were approved.
5. Reviewed volunteer assignments.
6. Comments received were reviewed:
  - Need to add C0, S1 and S2 definitions
  - Normative references will include latest release dates on referenced documents
  - Temperature classes will be included in C37.04 in some manner similar to that of C37.100.1 sections 2.1.2 and 2.2.3. Wording like "...anything outside of range should be specified by the end user." And "Some typical ranges used in this industry are found in C37.100.1 Section 2.2.3."
7. EMC section from J. Webb reviewed:
  - Reviewed write up and slides provided by Mr. Webb.
  - Will reference C37.100.1 section, but not require it.
  - This is a design test, not a routine test.
8. Magnetic Actuated Mechanisms write ups by J. Webb and Eldridge B. were reviewed:
  - Discussed the write ups from both. Recommendations will be taken into account and modified in the next draft.
  - MTTF will be addressed generically rather than in the Magnetic Actuated section.
9. The addition of aux relay switch contact ratings was discussed. IEC 62271-1 has a table, but those values may not be adequate for our use. J. Webb and Eldridge B will make a recommendation to the WG.
10. Section 5.9 needs to add "...and 15s" to t' definition. Ordering of definitions should be t then t'...
11. Motion to adjourn.
12. Slides from meeting are attached.

# High-Voltage Circuit Breaker Standard Working Group C37.04 Revision

Chair – Jeffrey Nelson, TVA

Vice-Chair – Mike Crawford, MEPPI


17 May 2011

Lake Buena Vista, Florida

# Agenda

- Introductions
- Patent Slides
- Minutes of previous meeting
- Working Group Membership
- Review scope of revision
- Volunteer Assignments
- Review Draft 2
- Old Business
- New Business
- Next Meeting

# IEEE Patent Slides

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- **Advise the WG attendees that:**
    - The IEEE's patent policy is consistent with the ANSI patent policy and is described in Clause 6 of the *IEEE-SA Standards Board Bylaws*;
    - Early identification of patent claims which may be essential for the use of standards under development is strongly encouraged;
    - There may be Essential Patent Claims of which the IEEE is not aware. Additionally, neither the IEEE, the WG, nor the WG chair can ensure the accuracy or completeness of any assurance or whether any such assurance is, in fact, of a Patent Claim that is essential for the use of the standard under development.

# IEEE Patent Slides

- **Instruct the WG Secretary to record in the minutes of the relevant WG meeting:**
  - That the foregoing information was provided and that slides 1 through 4 (and this slide 0, if applicable) were shown;
  - That the chair or designee provided an opportunity for participants to identify patent claim(s)/patent application claim(s) and/or the holder of patent claim(s)/patent application claim(s) of which the participant is personally aware and that may be essential for the use of that standard
  - Any responses that were given, specifically the patent claim(s)/patent application claim(s) and/or the holder of the patent claim(s)/patent application claim(s) that were identified (if any) and by whom.

# IEEE Patent Slides

- The WG Chair shall ensure that a request is made to any identified holders of potential essential patent claim(s) to complete and submit a Letter of Assurance.
- It is recommended that the WG chair review the guidance in *IEEE-SA Standards Board Operations Manual 6.3.5* and in FAQs 12 and 12a on inclusion of potential Essential Patent Claims by incorporation or by reference.

Note: **WG** includes Working Groups, Task Groups, and other standards-developing committees with a PAR approved by the IEEE-SA Standards Board.

# Participants, Patents, and Duty to Inform

All participants in this meeting have certain obligations under the IEEE-SA Patent Policy. 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
  - “Personal awareness” means that the participant “is personally aware that the holder may have a potential Essential Patent Claim,” even if the participant is not personally aware of the specific patents or patent claims
- “Should inform the IEEE (or cause the IEEE to be informed)” of the identity of “any other holders of such potential Essential Patent Claims” (that is, third parties that are not affiliated with the participant, with the participant’s employer, or with anyone else that the participant is from or otherwise represents)

# Participants, Patents, and Duty to Inform

- **The above does not apply if the patent claim is already the subject of an Accepted Letter of Assurance that applies to the proposed standard(s) under consideration by this group**

Quoted text excerpted from IEEE-SA Standards Board Bylaws subclause 6.2

- **Early identification of holders of potential Essential Patent Claims is strongly encouraged**
- **No duty to perform a patent search**



# Patent Related Links

- All participants should be familiar with their obligations under the IEEE-SA Policies & Procedures for standards development.
- Patent Policy is stated in these sources:  
IEEE-SA Standards Boards Bylaws  
*<http://standards.ieee.org/guides/bylaws/sect6-7.html#6>*
- IEEE-SA Standards Board Operations Manual  
*<http://standards.ieee.org/guides/opman/sect6.html#6.3>*
- Material about the patent policy is available at  
*<http://standards.ieee.org/board/pat/pat-material.html>*

If you have questions, contact the IEEE-SA Standards Board Patent Committee Administrator at [patcom@ieee.org](mailto:patcom@ieee.org) or visit <http://standards.ieee.org/board/pat/index.html>

This slide set is available at <http://standards.ieee.org/board/pat/pat-slideset.ppt>

# 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:
  - Either speak up now 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
  - Cause an LOA to be submitted

# 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, including licensing costs of essential patent claims, of different technical approaches may be discussed in standards development meetings.
      - Technical considerations remain 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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See *IEEE-SA Standards Board Operations Manual*, clause 5.3.10 and "Promoting Competition and Innovation: What You Need to Know about the IEEE Standards Association's Antitrust and Competition Policy" for more details.

# New FAQ

## 12a. How should Working Groups handle Letters of Assurance when re-using portions of a non-IEEE standard in a [Proposed] IEEE Standard?

The Working Group Chair shall initiate a request for a Letter of Assurance from holders of potential Essential Patent Claims when re-using portions of an existing non-IEEE standard in a [Proposed] IEEE Standard. Any patent letters of assurance (or patent declarations) given to the developer of the non-IEEE standard cannot be stated to also apply to the [Proposed] IEEE Standard. In addition, there are specific requirements that must be incorporated into an IEEE Letter of Assurance in order for it to have the possibility of becoming an Accepted IEEE Letter of Assurance.

# Agenda

- Minutes of previous meeting
- Working Group Membership


# Scope of Revision

- General revision
- Incorporate C37.06
- Incorporate parts of NEMA SG 4
- Incorporate C37.04a
- Incorporate C37.04b
- Incorporate relevant portions of the C37.04 Corrigendum

# Standard Outline

1. Overview
2. References
3. Definitions
4. Service Conditions
5. Description of Ratings & Capabilities
6. Preferred Ratings
7. Construction & Functional Components
8. Nameplate Markings
9. Current Transformers

# Potential Annexes

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- A. Bibliography
  - B. TRV Symbols for Two-Parameter Method (Annex A from C37.06)
  - C. TRV Symbols for Four-Parameter Method (Annex B from C37.06)
  - D. Special Application – Repetitive Duty Circuit Breakers for Arc Furnace Switching - Section 5 of NEMA SG4
  - E. Free Standing Current Transformers



# Volunteer Assignments

## 2. Normative References

- Devki Sharma

## 3. Definitions, acronyms and abbreviations

- Devki Sharma
- Bill Long

## 4. Service Conditions

- Devki Sharma
- Bill Bergman
- Steve Lambert

# Volunteer Assignments

## 5. Description of Ratings and Capabilities

- Steve Lambert
- John Webb
- Kirk Smith (TRV)
- Paul Leufkens (TRV)

# Volunteer Assignments

## 6. Preferred Ratings

- Hua Liu
- Devki Sharma
- Bill Bergman
- Steve Lambert
- Georges Monitillet
- Eldridge Byron (MV)
- Bob Behl (MV)
- Kirk Smith (TRV)
- Paul Leufkens (TRV)

# Volunteer Assignments

## 7. Construction & Functional Components

- Bill Bergman
- John Webb
- Steven Chen
- Bill Long
- Eldridge Byron
- Bob Behl

## 8. Nameplates

- Bill Bergman

## EMC Requirements of C37.100.1

- John Webb

# Volunteer Assignments

## Long Line TRV Task Force

- Roy Alexander, Chair
- Denis Dufournet
- Mauricio Aristizabal
- Xi Zhu
- Daryl Hallmark

# Volunteer Assignments

## Mechanism Types Task Force

- Bob Behl
- Steven Chen
- Albert Livshitz
- Bill Long
- John Webb

- Review & discuss PC37.04-D2
- Old Business
- New Business
- Future Meeting
  - Oct 2011 – Nashville, Tennessee

C37.04 LLTF & Critical Currents Notes of Interest Meeting 17 May 2011 Lake Buena Vista, FL

Meeting held with 13 Members and 30 guests.

Part 1 LLTF ( 3 phase line faults)

Roy Reviewed the document he sent out 17 January 2011 (below)

Denis Dufournet presented a demonstration that a line drawn between L90 and L75 first peaks, "covers" the L90 3 phase first peak. the L90 demonstrates the thermal capability to manage the steep rate of rise, while the L75 demonstrates dielectric capability to handle the peak that is 1.5 times the L90 peak.

Discussion ensued, but no conclusions were drawn, therefore Roy will propose wording indicating why a new line fault test is not required, for consideration of the TF by August 2011.

It is hoped this will end the 3 phase line fault discussion so we can concentrate on Critical Currents.

Part 2 Critical Currents

Roy reviewed the Critical current document he sent out January 2011.

Denis Dufournet suggested we start with the IEC treatment as a beginning.

Roy will make a proposal for consideration before the Fall 2011 meeting.

Grace & Peace

Roy Alexander

C37.04 LLTF and Critical Currents

## C37.04 Long Line Fault TF (Three Phase line Fault TRVs)

CIGRE Brochure 408 deals with this subject in detail. The Summary pp. 8,9; Risk Tolerance pg. 99; Long Line Fault conclusions pg. 106; and General Conclusions pg. 109 cover what we need to deal with.

Synopsis: The Standard SLF (Short Line Fault) test protocol is based on single line to ground faults. However keeping fault current constant a 3 phase line fault will exhibit a TRV first peak (peak value of the sawtooth wave) 1.5 times higher than a single phase



line fault. The slope of the TRV ( $dV/dt$ ) will be only about 80% of the phase to ground fault TRV. For various reasons presented in CIGRE Brochure 408, the slope of the TRV is considered a more onerous requirement than the magnitude of the first peak. While many experts believe the higher first peak is of little consequence, the fact remains that there is no direct test to demonstrate that is so.

The probability of getting the worst case line fault TRV first peak is small because

- 1) 3 phase line faults are less likely than 1 phase faults by at least an order of magnitude.
- 2) Having a 3 phase line fault with more than 80% of the rated short circuit at the supply bus is highly unlikely.

IEC has taken the position that its treatment of line faults is good enough for standardization purposes. World-wide, there are no known cases of 3 phase line faults that caused breakers to fail to interrupt.

For IEEE C37.04 we must decide either to follow IEC's lead on this subject, or that a new line fault test protocol is required. If a new test series is desired, what should it be?

The high TRV peak due to long line faults is considered to be adequately covered by the T10 test (which requires a 1.5 first pole to clear factor) and for higher currents the OOP test with the shorter time to peak. (A T30 with a 1.5 first pole to clear factor would also cover most all long line fault TRV peaks.)

Because many users of IEEE Switchgear Standards operate in a litigious society, IEEE may wish to take a more risk averse approach to the 3 phase line fault issue.

One possible approach is to offer an alternate SLF test which raises the first peak of the line TRV by a factor of 1.5. In the treatment of SLF this would be a "D" factor of 2.4. Such an alternate would follow the pattern of offering a 1.5 first pole to clear factor for ratings above 170kV.

As I see it, the above issue is what we have to discuss.

I look forward to any advance email discussion before our Orlando Meeting 16 May 2011.

Grace to you and Peace

Roy Alexander  
Chair C37.04 LLF TF

# Critical Current Discussion

Several TRV related SF6 breaker failures have been attributed to breakers suffering from “critical currents” These are usually designs that use arc energy to significantly aid in the interruption process, often referred to as “self blast” Since many (actually most in utility systems) circuit breakers are applied with terminal fault duties much below the rated short circuit current, Fast TRVs at low currents (i.e. T30) need to be considered.

SLF with a low supply side short circuit current is a different stress than say an L30, where the reduction in short circuit is achieved by a relatively long line length.

## Critical Currents

If the arcing time for T30 is >4ms longer than the arcing time for T60 (i.e. the breaker suffers from “critical currents”) A search must be made for the Terminal fault condition that produces the longest arcing time, to the nearest 10% of rated short circuit current.

Once found, that current must be marked on the nameplate as the critical current. (or a % of the rated short circuit current)

In addition, the breaker must pass an SLF test, with a time delay < 0.1μs, at 90% of the critical current, with the line voltage drop being 10% of  $U_{rated}/\sqrt{3}$  [i.e the short circuit strength of the source must be equal to the critical current.]

**We may wish to make the actual SLF current = to the critical current.**

RWA 11/20/2010