Working Group PC37.302 - "Guide for Fault Current Limiter Testing" Sponsored by IEEE Switchgear ADSCOM

Fall Switchgear Committee Meeting
Nashville, Tennessee

October 10, 2011
Minutes

Mischa Steurer called the meeting of the Working Group to order at 8:00 AM CDT with 18 members and guests present.

- Introductions of the attendees were made.

- The IEEE required slides on Patents for Working Groups were discussed. Members were advised to abide by these requirements.

- The agenda was approved.

- The minutes of our September 26, 2011 meeting were approved.

- Three conference calls have been held since the May 18, 2011 Switchgear meeting. (7/5/2011, 8/1/2011 and 9/26/2011)

- A SharePoint website is being used for our Working Group. The draft Guide document, CIGRE Reports and other pertinent IEEE and IEC Standards have been placed on the SharePoint for WG use.

    Contact Paul Bishop pcbishop@bishopgroup.org to request user name / password for the SharePoint site.

    You can access the website at http://www.bishopgroup.net/links.htm
    Click on "view" next to Advanced Electrical Power Systems
    Click "OK" on pop-up (Digital Certificate)
    Enter user name and password
   Navigate to "FCL Testing Task Force"
    Documents under "Shared Documents" can be checked out for editing.
    New documents can be uploaded but must be checked in for others to view

- A copy of the document "IEEE PC37.302™/D0.0 Draft Guide for Fault Current Limiter (FCL) Testing" has been made available to the group on the share point site.
    o Writing assignments are noted therein.
    o Please send an e-mail to steurer@caps.fsu.edu if you would like to volunteer to draft a particular section.
    o New material should be added directly into the draft document
        - Check out the document from share point (this locks the master document so nobody else can make any changes while the author makes hers/his)
        - Make changes
        - Check the document back in to release it for other authors to make changes

- Chairman's Report:
    o Our goal is to prepare to ballot our Guide by the Spring Switchgear Meeting next year in St. Petersburg, FL, April 30 – May 3, 2012.
    o CIGRE WG A3.23 is in the final stages of finishing their work. Selected sections of the draft on Technology and Specifications / Testing have been placed on the share point site for use as

reference material for our Guide (under Shared Documents\REFERENCE_DOCUMENTS\Reports). The chairman reminded everyone that these documents are not to be used or distributed outside this working group.

- Mischa Steurer provided an update from Judith Schramm (on her behalf) on the status of the representative waveforms for the ongoing effort to develop a method for parameterization. The purpose of gathering these waveforms is to understand how the various FCL technologies may typically perform in the grid, not to "specify" a "standard waveform". After review of the waveforms, there appears to be three types of FCLs: limiting and interrupting, limiting with linear elements, and limiting with non-linear elements.

- Christian Schacherer provide an update on CIGRE WG D1.38. They also have been working to characterize representative waveforms for FCLs. A template has been developed to input customer requirements for the grid and the FCL as shown below.
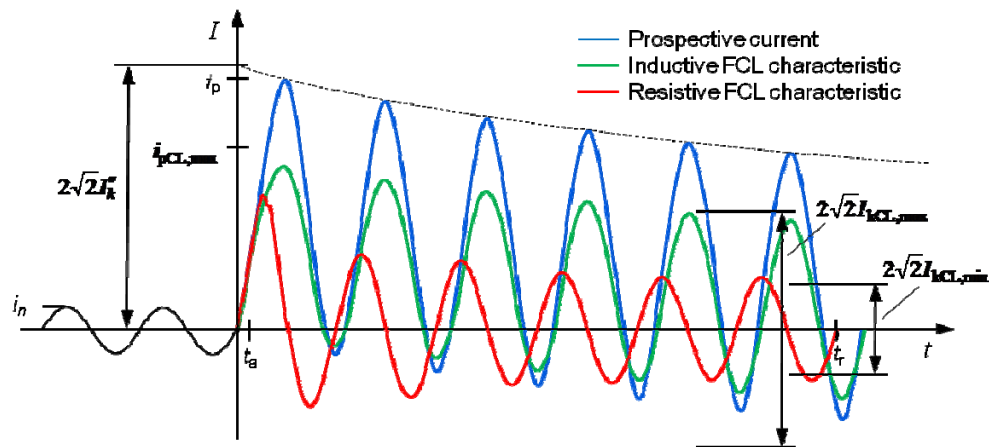
  o A motion was approved to adopt the principal approach of such a behavioral model for FCLs which switch from a low impedance path to a linear current limiting impedance (resistive or inductive). The waveform sub-group will continue work on this approach.
  o Manufacturers are requested to suggest additional parameters necessary to describe the typical waveforms of their FCL technology or technologies if that cannot be captured sufficiently only with the presented approach.

- Jim van de Ligt provided a review of voltage withstand tests across current limiting reactors (CLR). The standard for air insulated series CLRs (C57.16, Table 5, Note 5) makes the following statement – "In the case of series reactors, the BIL across the coil may be different than the BIL across the support insulators (to ground). The purchaser shall specify if the BIL across the coil is to be at a reduced level. Such a decision will be based on factors such as knowledge of the system characteristics and protection practices. Reduced BIL levels shall be selected from the standard values in Table 5."
  o Investigation of these test requirements will be made and reported back to the group.

- John Kappleman made a presentation on "V/I Tests for FCLs – Testing Electron Tube FCLs". The chair requested AFS to make recommendations for tests specific to their electron tube technology and to start working on clause 6.14 (EMC) for which AFS has volunteered in the past.

- Document Review:
  o Priority chapters for the first edition of the Guide were designated as 6.1, 6.2, 6.5, 6.7, 6.8, 6.10, 6.11, and 6.14.
  o The following members volunteered to chair sections:
    - Section 7 - Production (Routine) Tests – Jim van de Ligt
    - Section 8 – Field Tests – Pat DiLillo
    - 6.17 Polarity – Jerry Earl
    - 6.18 Visual Inspection – Franco Moriconi
    - 6.14 EMC – Curtis Birnbach
    - 6.13 Protective Device – Jim van de Ligt

- 6.15 Audible – Gil Carmona
  - o The preferred language for IEEE Guides is "May" or similar non-normative language. "Should" is permissible, but must not dominate the document. "Shall" or "Must" is not to be used.

  - o 6.10 Current Limiting Review – Comments from Prafulla Deo
    - "Short circuit test is the only functional test of an FCL. It should be included as a Routine test for every FCL sent to a customer. It is very important." This comment was rejected for 6.10. It should be moved to Section 7 - Production tests at the customer request.
  - o Section 3.1 Definitions Fault current limiter: a device, which offers rapid increase in resistive and/or reactive impedance to limit the prospective peak and RMS fault current in an alternating current power system to the desired value. The change in the resistive and/or reactive impedance is due to the change in electrical conductivity or the magnetic permeability of the device or a combination of both.
    - A motion was approved to delete the last sentence of the definition.
    - A motion was also approved to delete "/or" in the first sentence.
    - The definition now is, "a device, which offers rapid increase in resistive and reactive impedance to limit the prospective peak and RMS fault current in an alternating current power system to the desired value."

- The Working Group operating procedures from ADSCOM will be investigated for guidance on the requirements for membership and voting.

- The possibility of additional face to face meetings will be discussed at our next conference call.

- Carried Over Action Items:
  - o **OPEN -** Request **all manufacturers** to submit a waveform for their technology to describe the fault current for the worst case condition for fault inception. Voltage across the FCL should be added to their waveforms.
  - o **OPEN - Simon Bird** will investigate the impact of a surge current through the Solid State FCL on the various components to provide a better understanding of the test requirements.
  - o **OPEN - Mischa Steurer** will request the resistive superconductor FCL manufacturers to perform surge current through the device analysis.
  - o **OPEN – Judith Schramm** will review literature to recommend lightning voltage waveshapes for liquid N_2 based insulation systems.
  - o **OPEN - Tom Tobin** will investigate control circuit test requirements in C37.11,), relevant relaying committee documents about surge testing for control circuitry, and fuse standards IEEE 37.41 regarding "rated minimum breaking current" (test duty 3).
  - o **OPEN – Ram Adapa** volunteered to investigate and group the different FCL technologies into Type 1 or 2. (Type 1 effectively inserts a constant impedance with a new X/R and impedance for the combined system. Type 2 is "everything else".)

- Next Conference Call will be held on Monday, November 14th from 10:30AM to 12:30 PM EST.

The meeting was adjourned at 5:35PM CDT.

Submitted by:
Frank Lambert

Approved by:
Mischa Steurer