

Annex E HVDC Converter Transformers and Reactors Subcommittee

**March 21, 2016, 3.15 pm
Atlanta, Georgia**

**Chair: Michael Sharp
Vice Chair: Les Recksiedler
Secretary: Ulf Radbrandt**

E.1 Introduction / Attendance

Introductions were made and the attendance list circulated.

There were 13 members and 15 guests present. No guests requested membership

The total membership of the SC is 17. We needed at least a total of 9 members to be present in order to have a quorum. This was achieved.

The agenda for this meeting was approved.

E.2 Approval of the minutes of the October 20, 2014 meeting in Washington, DC

The minutes from the Memphis meeting (Fall 2015) were approved after a motion by Pierre Riffon, which was seconded by Klaus Pointner.

E.3 Brief report on the meeting of the Administrative SC

Each SC shall review their scope in the Transformers Committee Operations Manual.

E.3.1 Review of the scope for the HVDC SC

The HVDC Converter Transformers and Smoothing Reactors Subcommittee section in Clause 3 “IEEE Transformers Sub-Committees’ Scope” in the Transformers Committee Operations Manual was shown on the screen and discussed.

At a previous meeting there had been discussion to include converter reactors (for voltage source converters) in IEEE Std 1277. Therefore a vote took place regarding if we should include converter reactors in the scope. The result of the voting was unanimous to do that. The 2/3 approval rate was thereby met.

E.4 Working Group Reports

E.4.1 WG IEC/IEEE 60076-57-129 – Ulf Radbrandt (IEEE) and Mats Berglund (IEC), Co-Chairs

This joint workgroup has had one joint meeting since the last IEEE Transformers Committee Meeting (Memphis, Fall 2015). That meeting was in Atlanta 1.5 days in March 18-19 2016, just prior to this IEEE meeting.

The agreements and actions from the Milan meeting were the following:

- Mats Berglund (ABB, Sweden) has now taken over as IEC chair for this joint WG. However, the preceding IEC chair, Anders Lindroth, did still chair this meeting.
- Result from a CD within IEC were discussed and actions on each comment were decided
 - There were 64 editorial comments. 50 were accepted, 5 were partly accepted, 1 was decided to be checked and 8 were not accepted

- There were 33 technical comments. 20 were accepted, 10 were partly accepted and 3 were not accepted.
- Comments/proposals from the IEEE HVDC SC meeting in Memphis were discussed and actions on each comment were decided
 - There were 18 comments/proposals, including 12 proposals from Pierre Riffon from his check if we can refer to general standards for requirements on sections, of the actual edition of IEEE C57.129, that have been excluded from the dual logo document. 9 were accepted, 3 were partly accepted and 6 were not accepted
- The action list from the joint WG meeting was as follows
 - Anders Lindroth will introduce numbering of the equations and also check that they are correct
 - Anders Lindroth will change font in title of document
 - Should we use a.c. and d.c. alternatively AC and DC? It should be consistent in the document.
 - Anders Lindroth will check with Paul Jarman what is preferred within IEC.
 - Eric Davis will check with Erin Spiewak what is preferred within IEEE.
 - Ulf Radbrandt to correct the text “c, d)” in Figure B.2 to be consistent
 - Anders Lindroth will number the notes if more than one in a section.
 - Anders Lindroth will revise the figure for the polarity reversal test to have 30 min test time after the second reversal.
 - Anders Lindroth will check all links in Table 1 (test table).
 - After the document is updated with the above it will be circulated within the joint WG for final comments.
 - Thereafter it will be sent to IEC TC 14 secretary to be issued as a CDV.
 - The same text should be sent out for ballot within IEEE in parallel.
 - The need for any further meeting with the joint WG will be decided based on the comments on the IEC CDV and the IEEE ballot.

E.5 Discussions and agreements regarding the work for a Dual Logo standard for converter transformers

Ulf Radbrandt made a presentation of the progress of the joint IEC/IEEE WG meetings (according to clause E.4 above). The discussions and agreements during and after the presentation were as follows:

- Clause 6.1 “General” in IEEE C57.129 handles requirements on rapid replacement of converter transformers or components. That is often a requirement in HVDC installations. The dual logo document does now include information (that this kind of requirements should be given by the purchaser) in an informative Annex (Annex D, Transformer Specification) but not in the normative part of the document.
- Clause 6.4.2 “Bushing current transformers” in IEEE C57.129 is not represented in the dual logo document. The reason is that this should be handled by the general transformer standards. Information that requirements on current transformers should be given by the purchaser is given in Annex D (Transformer Specification) in the dual logo document.
- Clause 6.4.4 “Accessories” in IEEE C57.129 is not represented in the dual logo document. The reason is that this should be improved in the general transformer standards and not in the dual logo document. IEEE C57.12.10 covers most of this, but not fiber optic sensors. IEC 60076-22 is

under creation and will probably cover most of this.

During discussion regarding the optical fibers, it was commented that the optic fiber sensors are extra important for converter transformer since it is much more difficult to estimate the hot-spot factor and the hot-spot locations due to the harmonics. The question, if information regarding fiber optic sensors should be included, will go back to the joint WG.

- The table with limits for the increase in concentration of dissolved gases in oil during overload testing has been removed from Annex A “In service overloading of HVDC converter transformers”. The reason is that limits should be agreed between manufacturer and purchaser. Information that additional information is available in IEC 60072-2 and IEEE C57.130 is added. During discussion regarding this, it was commented that the limits were included in IEEE C57.129 since it is important the transformer does not produce excessive gases during overload tests.
- It was requested and agreed that when the updated dual logo document is circulated within the joint WG, then it should be circulated within the IEEE HVDC SC also.
- The parallel review process (CDV in IEC and Ballot in IEEE) was discussed. What would happen if there are very few comments in the IEC CDV but a lot of negative comments in the IEEE Ballot? Could the situation occur, that the document must be changed a lot to satisfy IEEE but it is impossible from IECs point of view? This question will go back to the joint WG. Erin Spiewak and Paul Jarman should be consulted regarding this.

E.6 Old Business

E.6.1 Revision of IEEE Std 1277

The chair (Michael Sharp) had earlier asked for volunteers to chair a working group to review and update IEEE Standard General Requirements and Test Code for Dry-Type and Oil-Immersed Smoothing Reactors for DC Power Transmission, IEEE Std 1277. Klaus Pointner has volunteered and will be chair. Members for the WG are needed. A vice chair and a secretary would also be valuable. One of these should be experienced in the formalities within IEEE.

Requirements on converter reactors (for voltage source converters) should be included in IEEE Std 1277.

E.7 New Business

None.

E.8 Adjournment

The meeting was adjourned at 4.15 pm.