MINUTES OF THE MEETING OF THE HVDC CONVERTER TRANSFORMERS & SMOOTHING REACTORS S.C. IN NASHVILLE, TENNESSEE, MARCH 12, 2012

On March 12, 2012, the HVDC Converter Transformers and Smoothing Reactors S.C. met at 3:15 p.m., in the Belmont 2 & 3 Meeting Room of the Renaissance Hotel, in Nashville, Tennessee. There were 7 members and 18 guests present. The following are the highlights of the meeting:

1. Introductions were made and the attendance list circulated.

2. The total membership of the SC is 24, but currently includes 6 corresponding members. If there are no corresponding members present at the meeting, they are not included in the evaluation for a quorum. That means that at least 9 members (50% of 18) should have been present in order to get quorum. Therefore there was no quorum. Since no quorum was established, no decisions could be taken at the meeting. (i.e. the minutes from the Boston meeting could not be approved.) It was suggested that the membership list be reduced further in order to only include members that attend the SC meetings (except for the corresponding members). The chairman will resend minutes of the Boston meeting to all subcommittee members to obtain approval prior to the next meeting in Milwaukee.

3. The Chairman provided a summary of the following key issues discussed at the Administrative SC meeting: Effective Jan. 1, 2012;

    i) The lifetime of a standard is now increased from 5 to 10 years.

    ii) The possibility to extend the lifetime of a standard has been eliminated.

    iii) The option of reaffirming a standard has been removed.

    iv) A PAR life is still four years and it can be extended if necessary.

    v) IEEE C57.129 will expire in 2018.

    vi) IEEE 1277 will expire in 2020.

4. The question, if an annex for converter reactors for voltage source converters (VSC) should be included in IEEE 1277 (smoothing reactors), was discussed. Following are the highlights from that discussion:

    i) An annex for converter reactors might be more appropriate in IEEE C57.16 (series reactors).

    ii) We should produce an annex and later decide in which standard it should be included.

    iii) Klaus Pointner, with help by Ulf Radbrandt, will prepare input to such an annex.

5. Members are encouraged to do presentations in future meetings regarding possible update work for the standards within this SC. At the meeting nobody volunteered to do any such presentations.

6. Ulf Radbrandt had prepared an annex on insulation coordination prior to this meeting. Les Recksiedler was the only one that had given comments to the annex before the meeting. Those comments, and a few that come up during the meeting, were discussed and below are the highlights from that discussion:

   i) The editorial proposals were all accepted.

   ii) The proposed adding of “lightning” was not accepted since “impulse protective levels” also includes “switching”.

   iii) The proposed new item regarding special arrester design due to ac filters, will be rephrased to include the wording “high energy” and “several parallel columns of matched arresters”.

   iv) The proposed new item regarding same insulation levels if the HVDC system shall be capable of reversing the power will be modified. The reason is that the reverse power capability for large bulk transmission often is the inherent capability. i.e. all equipment is designed for normal power direction and the dc voltage is reduced during reversed power operation in order to not over-stress any equipment.

   v) The proposal to add that firing angles are also used to control the dc voltage was accepted.

   vi) The proposal to add the word “can” in the phrase “Very short distances between equipment and surge arresters <u>can</u> justify lower insulation margins” was accepted.

   vii) The proposal to add that the arresters also can be placed on the transformer was accepted.

   viii) The proposal to add the word “dc” in the phrase “the station with the highest <u>dc</u> voltage rating” was not accepted since the voltage rating for much of the equipments is a combination of both ac and dc voltage.

   ix) The proposed text about reverse power in the conclusions was rejected since it will be written earlier in the annex and does not have to be repeated in the conclusions.

   x) At the reference to IEC 60071-5 regarding insulation margins, those margins (ratios) should be repeated in the annex together with the information that the margins for HVDC projects can be both higher and lower.

xi) Something regarding insulation levels related to dc grids should be given even though dc grids mainly are intended for voltage source converters and our standards in general only cover line commutated converters.

xii) Ulf Radbrandt will produce a new annex draft including the changes noted above, that will be sent to all SC members prior to our next meeting.

7. Are there any other changes recommended to IEEE 1277 and IEEE C57.129 that should be made in light of UHVDC projects energized or in progress at 660 kV and 800 kV? The conclusion was that these standards are “neutral” in regards to voltage levels. i.e. No tables with test levels are given. The equations provided are valid for all voltage levels. Therefore, we don’t see any need for modifications at this time but SC members should consider if there are issues for UHVDC, which differ from lower voltage levels, which should be stated in the standards.

8. Output of the Cigré WG A2/B4-28 was the Cigré brochures 406 " Design review, test procedures, Aging Evaluation and Reliability in Service " and 407 "Guidelines for Conducting Design Reviews". Our standards should refer to those brochures. We should also copy the highlights since not everyone has access to the Cigré brochures. The chairman will check to determine what procedures should be followed in order to include sections of the Cigré documents in an IEEE standard.

9. The SC will consider creation of a guide on life assessment and life extension for converter transformers. Les Recksiedler will check if the Cigré guide 406 covers this.

10. The SC will continue to follow the works of Cigré Joint Working Group A2/D1.41 "HVDC transformer insulation - Oil conductivity.". Progress there has been in defining a test procedure that is both simple and relevant to transformer operation. That group decided to gather experience with this approach from measurements with two different oils: a low-conductivity new oil and a more highly conductive aged oil from a transformer. The Cigré group is looking for highly conductive oil from an aged HVDC transformer. If anybody can provide such an oil, then please contact the group chairman Prof. A. Küchler (Andreas.Kuechler@fhws.de).

11. We should aim for harmonization between the standards for converter transformers, i.e. for IEEE C57.129 and IEC 61378-2 and even evaluate if it is possible to go for a joint standard (dual logo). As a first step we will start to list differences between those two standards. The SC members should start to consider in what areas this evaluation can be divided into, e.g. “rating”, “dielectric tests”, “other tests”, etc. At the Milwaukee meeting we should have a list of areas ready and to divide that list among the SC members to perform more thorough evaluations.

12. The meeting was adjourned at 4 p.m.

Mike Sharp, Chairman Les Recksiedler, Vice Chairman Ulf Radbrandt, Secretary