MINUTES OF THE MEETING OF THE HVDC CONVERTER TRANSFORMERS & SMOOTHING REACTORS S.C. IN ST. LOUIS, MISSOURI, OCTOBER 21, 2013

On October 21, 2013, the HVDC Converter Transformers and Smoothing Reactors S.C. met at 3:15 p.m., in the Landmark 1 Meeting Room of the Renaissance Grand Hotel, in St. Louis, Missouri. There were 11 members, plus one corresponding member and 44 guests present. Three of the guests requested membership. 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 that includes 4 corresponding members. If a corresponding member is not present at the meeting, then he/she is not included in the evaluation for the quorum. Since we had one corresponding member attending the meeting we needed at least a total of 11 members including the attending corresponding member (greater than 50% of 21) present in order to have a quorum. This was achieved.

   The agenda for this meeting was approved.

   The minutes from the Munich meeting (Spring 2013) were approved.

3. Work towards a Dual Logo converter transformer standard (between IEEE C57.129 and IEC 61378-2).

   Ulf Radbrandt presented the review of the differences and similarities between the two standards. The work has been performed by him plus Eric Davis, Frank Trautmann, Fred Elliott, Les Recksiedler and Chris Ploetner. The major differences that were found in the review are listed below together with some comments during the discussion at the meeting:

   - Reference to different standards (the IEEE standard refers to a lot of IEEE standards and a few IEC standards and the IEC standard refers to a lot of IEC standards).
     Comment during meeting. Paul Jarman (also Chairman of IEC TC 14) mentioned that there is a possibility to have double references (IEEE and IEC) at several locations in a dual logo standard and in the beginning of it state that the end user must select which track (IEEE or IEC) that shall be followed.

   - Rated current includes harmonics in IEEE but not in IEC

   - Rated power is output from transformer in IEEE and input to transformer in IEC.

   - Reference to different standards for AC side Insulation levels

   - IEEE tables are based on nominal voltages while IEC tables are based on maximum system voltage. Some voltage classes have different levels.
     Comments during meeting. Paul Jarman mentioned that in IEC they are going towards nominal voltages as reference for AC voltage tests. That is a step towards IEEE.

- Chopped Lightning test is mandatory in IEEE but optional in IEC.
  Comment during meeting. Paul Jarman mentioned that in IEC they are going towards chopped tests as routine test for the highest voltages. That is also a step towards IEEE.

- IEEE includes but IEC excludes switching impulse testing across valve windings.
  Comment during meeting. The induced switching test gives voltage across the windings. This must be investigated further.

- AC applied test on AC side bushings is 1 minute for IEEE and 1 hour for IEC
  Comment during meeting. This must be investigated further. The intention at IEC is also to have a 1 minute test.

- Different reference temperatures for the load losses, 85 °C for IEEE and 75 °C for IEC.

- Different tolerances on losses

- Different measurement of load losses

- The two standards are very differently structured
  Comments during meeting. We will probably have to start from the beginning and create a totally new standard, which is based on both IEEE and IEC.

Besides the major differences that are listed above, there are a lot of similarities also. E.g., the DC tests are practically the same.

The IEEE document expires in December 2018. The revision to the IEC document should be completed by 2016. That might give too short time for this extensive work. If we will go for dual logo then we must start quite soon. The timing is perfect now since we are about to start the revision process for both standards in the same time. It will take long time until we have such good possibility again.

Remarks were made that it might be too difficult to succeed with this. As an alternative to dual logo, we could create two new standards (one IEEE and one IEC) which should be as similar as possible (harmonized) and a final step to dual logo standard could be taken some time in the future.

If IEEE submits a PAR for a dual logo standard, then IEC must produce a review report.

There was some discussion regarding establishing a joint IEEE/IEC task force (TF), that would continue to analyze the differences and similarities and also give proposals of recommendations on how to resolve the differences. The output from that TF should then be a base for the final decision to go or not to go for a dual logo standard. This work should be performed within the next six months. If IEC starts a Maintenance

Team (MT) for their standard, then that MT can contribute members to a joint TF together with IEEE. Anders Lindroth will, in that case, be the convener from the IEC side.

A motion was put forward by Eric Davis and seconded by Les Recksiedler to go for a joint TF (according to above). The vote result from SC members was reported at the meeting as 9 for and 0 against. We should therefore start that process. The Chairman asked for volunteers to be members or lead the task team from IEEE side. Eric Davis, Les Recksiedler and Ulf Radbrandt volunteered to take a role on the team. The Chairman will ask for further volunteers via e-mail.

4. Les Recksiedler informed the SC about the work on CIGRE B4.54-Life Extension and Assessment, for which he is the convener. The work is now about 50% ready. Important sections are:

   - Selection between Refurbish and Greenfield when HVDC transmissions are to be upgraded.
   - History of HVDC Performance issues.
   - Ground Electrodes and Electrode Lines (does not include sea electrodes).
   - Guideline for identifying techno-economic life of major equipment.
   - Recommendation for specification of refurbished HVDC system

5. Klaus Pointner informed the SC about the status of his work on an Annex for Converter Reactors, which are used for VSC converters. That Annex should be incorporated in IEEE 1277. The first draft of the Annex was presented. Different topologies and a detailed section on recommended tests are introduced. Mike Sharp and Ulf Radbrandt volunteered to review the draft after which it will be circulated among members of the SC for any further comments and discussion at our next meeting.

   It was also pointed out that other Annexes regarding VSC technology must inform that unsymmetrical topologies (when one DC terminal is connected to ground) gives half of the DC voltage at all equipment between the transformer (including the valve side windings) and the converter valve. It should also state that that equipment must be specified accordingly.

6. The meeting was adjourned at 4:24 p.m.

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