Status of CIGRE JWG A2/B4-28
HVDC Converter Transformers

Ugo Piovan
Guidelines for conducting design reviews for HVDC converter Transformers

• The design review guide is now complete and is in process of being published end of 08 / beginning of 09

• One of the main novelty regards the extensive use of numerical simulations to address dielectric and loss/thermal aspects which cannot be replicated during tests.
HVDC Transformers reliability survey

- The survey is almost complete.
- Latest data show an improvement in HVDC transformer reliability
PR Test

Present PR test can be inadequate (less stress during test than in service) because of insufficient polarization time.

This problem can be addressed by:

- increasing the PR test level by 20% 
  \[ U_{pr} = 1.5((N - 0.5)U_{dm} + 0.35U_{vm}) \]
- lengthening the PR test by 45 min, i.e. 90-120-60 min

However the JWG has decided that it is more urgent to address oil conductivity issues and to leave recommendations about PR test to IEC / IEEE
Issues related to uncertainty about oil conductivity

HVDC transformer Manufacturers and End Users, pay great attention to some properties (particle content for example) of oil used in their HVDC transformers.

However from the information gathered by the group, we learned that:

• oil electrical conductivity is not measured on a regular basis (not even by oil producers)
• there is no test method employed consistently
Issues related to uncertainty about oil conductivity (continued)

• existing standard test methods measure oil conductivity at dielectric stress below 0.5 kV/mm while during a polarity reversal the oil can be subject to dielectric stresses in the range of 5-10 kV/mm

Considering that it is very common that the HVDC transformer in service will be filled with an oil different from the one used during tests, it follows that we have no information about the effectiveness of the DC and PR tests performed until now.
Goals of a new CIGRE A2/D1 JWG

• Understanding of the effect of insulation material characteristic on reliability of HVDC converter transformers
• To come up with a methodology for measuring and monitoring these values
• Guidance for evaluation and interpretation for these values
• Recommendation for new standards
Goals of a new CIGRE A2/D1 JWG (continued)

• Advise on a simple test of oil quality to be used by supplier, OEM and End Users. This is to be used for tests and during service
• Understanding of aging under repetitive overvoltages
• Effects of E on conductivity of oil/board systems
• Understanding of conductivity variation with aging
• Effects of polarization and charge migration on apparent conductivity