CIGRE Study Committee A2

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

WG [1]N° A2.64	**Name of Convenor:** Claes BENGTSSON (SE) **E-mail address**: claes.t.bengtsson@se.abb.com
Technical Issues #[2]: 7, 10	**Strategic Directions #[3]:** 2
The WG applies to distribution networks[4]: Yes	
Potential Benefit of WG work #[5]: 1, 3	
Title of the Group: Condition of cellulose insulation in oil immersed transformers after factory acceptance test	

Scope, deliverables and proposed time schedule of the Group:

Background:

This Working Group is a direct result of the conclusions presented in RP_299_1 (2018), The reference paper gives a general review of the present situation regarding insulation condition during transformer manufacturing, identifies gaps in present knowledge and provides recommendations for future work.

It is of vital interest to ensure that the buyer gets a transformer that is fit for service. There is, however, no agreement or guidelines of what shall be expected from a new transformer in terms of insulation properties. There are also identified uncertainties with respect to what material parameters are relevant for problem free and long future operation of the transformer.

Due to the large magnitude in investments involved, in particular for large power transformers, it is of high importance that there are commonly accepted guidelines within the industry how to specify, guarantee and verify cellulose insulation material properties of new transformers leaving the factory as well as how to compensate for potential deviations from specified values.

Scope:

The Working Group shall address the following main issues and questions:

- Which insulation material parameters have a significant impact on and are relevant and representative for the long-term function of a transformer?
- If physical cellulosic insulation samples are required, what material to use and how to get representative samples before and after the drying process?
- What are the guidelines for acceptance criteria for the properties of the insulation system after completed Factory Acceptance Test, including repeated tests?
- What are the guidelines for measures and compensation in case the criteria are not met?

The scope of the Working Group includes

- Mineral oil-cellulose insulated transformers and reactors (distribution and transmission including HVDC converter transformers)
- Insulation material properties during the manufacturing process, starting when the insulation material enter the transformer factory and ending when the transformer leaves the factory. This includes the requirements om moisture after tanking.
- All cellulose material parameters that affect the long-term function of the transformer,

e.g. Degree of Polymerisation and moisture content of insulation
- Guarantee aspects

Out of scope:
- Measurement techniques for the properties identified as relevant
- Short circuit withstand properties (already being studied by Working Group D1.65)
- Dielectric withstand properties
- Aspects related to residual air in the insulation system
- Manufacturer specific design aspects
- All aspects related to pressing of windings and active part
- Drying processes procedure and details, e.g. impregnation time or time between vapor phase drying and oil filling
- Transport and site installation (already being studied be Working Group A2-58)
- Dry type insulation systems or insulation systems based on non-cellulose materials and alternative liquids, e.g. esters, aramid solid insulation

Deliverables:

☒ Technical Brochure and Executive Summary in Electra

☐ Electra Report

☒ Tutorial[6]

☐ Webinar[6]

Time Schedule: start: October 2019 **Final Report**: July 2021

Approval by Technical Council Chairman:

Date: July 24th, 2019

Notes: [1] Working Group (WG) or Joint WG (JWG), [2] See attached Table 1, [3] See attached Table 2, [4] Delete as appropriate, [5] See attached Table 3,
[6] Presentation of the work done by the WG

Table 1: Technical Issues for creation of a new WG

1	Active Distribution Networks resulting in bidirectional power and data flows within distribution levels up to higher voltage networks
2	Digitalization of the Electric Power Units (EPU): Real-time data acquisition includes advanced metering, processing large data sets (Big Data), emerging technologies such as Internet of Things (IoT), 3D, virtual and augmented reality, secure and efficient telecommunication network
3	The growth of direct current (DC) and power electronics (PE) at all voltage levels and its impact on power quality, system control, system operation, system security, and standardisation
4	The need for the development and significant installation of energy storage systems, and electric transportation, considering the impact they can have on the power system development, operation and performance
5	New concepts for system operation, control and planning to take account of active customer interactions, and different generation types, and new technology solutions for active and reactive power flow control
6	New concepts for protection to respond to the developing grid and different generation characteristics
7	New concepts in all aspects of power systems to take into account increasing environmental constraints and to address relevant sustainable development goals.
8	New tools for system technical performance assessment, because of new Customer, Generator and Network characteristics
9	Increase of right of way capacity through the use of overhead, underground and submarine infrastructure, and its consequence on the technical performance and reliability of the network
10	An increasing need for keeping Stakeholders and Regulators aware of the technical and commercial consequences and keeping them engaged during the development of their future network

Table 2: Strategic directions of the Technical Council

1	The electrical power system of the future: respond to speed of changes in the industry
2	Making the best use of the existing systems
3	Focus on the environment and sustainability
4	Preparation of material readable for non-technical audience

Table 3: Potential benefit of work

1	Commercial, business, social and economic benefits for industry or the community can be identified as a direct result of this work
2	Existing or future high interest in the work from a wide range of stakeholders
3	Work is likely to contribute to new or revised industry standards or with other long term interest for the Electric Power Industry
4	State-of-the-art or innovative solutions or new technical directions
5	Guide or survey related to existing techniques; or an update on past work or previous Technical Brochures
6	Work likely to contribute to improved safety.
7	Work addressing environmental requirements and sustainable development goals.