CIGRE Study Committee A3

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP[1]

WG N° A3.42	**Name of Convenor:** Helvio Jailson Azevedo Martins (Brazil)
Strategic Directions #[2]: 2, 3	**Technical Issues #[3]:** 9, 10
The WG applies to distribution networks[4]: No	
Potential Benefit of WG work #[6]: 1; 6	
Title of the Group: Example of title of the WG: Failure analysis of recent AIS instrument transformer incidents	

Scope, deliverables and proposed time schedule of the Group:

Background:

Instrument transformers are a crucial component for the operation of existing and future power systems but have a proven history of major failures, including explosions of some instrument transformers that can also lead to the collapse of supporting insulator.

Some utilities face problems with high failure occurrences of instrument transformers with oil and paper insulation installed in air-insulated substations (AIS). Several papers reported recent catastrophic damage of instrument transformers supplied by different vendors and gave potential failure causes such a steep ITRV's. For example, Brazil, the Netherlands, Ireland and Belgium presented the statistics of these exploding instrument transformers and the utilities' policies for managing the associated catastrophic risks. Some experience with VFTO field measurements on 500 kV AIS showed excessive overvoltage above the standard values due to switching operation of disconnecting switches.

Upon urgent request by these utilities, SC A3 will establish this WG, which will study the frequency and detailed phenomena of the major failures of these instrument transformers, and provide the possible causes analysis, countermeasures, adequate diagnostic techniques and recommendation for improvement. The WG will also suggest additional type testing and routine testing requirements of instrument transformers to reduce the possibility of these failures.

Scope:

The WG will investigate the following subjects mainly focusing on field experience.

- Collect the failure analysis data regarding service age, application, circumstances, type, design details, etc.: failure causes (excessive stress or design and manufacturing responsible), operating conditions, imposed field stresses.
- Collect field experience with type of insulator (e.g. polymeric, prepared rupture spots).
- Collect, review and compile the Utilities' policy with respect to life management: replacement of sub-populations, inspection and diagnostics, reporting, risk assessment, specifications. Then recommend useful inspection, maintenance and diagnostic techniques.
- Investigate and perform transient simulation of VFTO due to AIS disconnector switching taking into account substation arrangement
- Analyse the failures, simulation results and determine the most probable root causes.
- Recommend specific requirements for IT, additional type tests and routine tests, and advanced diagnostic techniques,
- Recommend the risk mitigation techniques,

Deliverables:

The WG will present some papers during Cigré sessions and colloquia and produce a Technical brochure making recommendations for appropriate replacement and maintenance strategies for instrument transformers that may be likely to suffer similar failures. Recommendations for type tests and routine test requirements to avoid or mitigate such failures will also be presented.

☒ Technical Brochure and Executive summary in Electra

☒ Electra report

☒ Tutorial[5]

Time Schedule: start: September 2018 **Final Report**: 2021

Approval by Technical Committee Chairman:

Date: 19/03/2018

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

Table 1: Technical Issues of the TC project "Network of the Future" (cf. Electra 256 June 2011)

1	Active Distribution Networks resulting in bidirectional flows
2	The application of advanced metering and resulting massive need for exchange of information.
3	The growth in the application of HVDC and power electronics at all voltage levels and its impact on power quality, system control, and system security, and standardisation.
4	The need for the development and massive installation of energy storage systems, and the impact this can have on the power system development and operation.
5	New concepts for system operation and control to take account of active customer interactions and different generation types.
6	New concepts for protection to respond to the developing grid and different characteristics of generation.
7	New concepts in planning to take into account increasing environmental constraints, and new technology solutions for active and reactive power flow control.
8	New tools for system technical performance assessment, because of new Customer, Generator and Network characteristics.
9	Increase of right of way capacity and use of overhead, underground and subsea infrastructure, and its consequence on the technical performance and reliability of the network.
10	An increasing need for keeping Stakeholders aware of the technical and commercial consequences and keeping them engaged during the development of the network of the future.

Table 2: Strategic directions of the TC (ref. Electra 249 April 2010)

1	The electrical power system of the future
2	Making the best use of the existing system
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 or economic benefit 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 direction
5	Guide or survey related to existing techniques. Or an update on past work or previous Technical Brochures
6	Work likely to have a safety or environmental benefit