CIGRE Study Committee A3

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

WG N° A3.48	**Name of Convenor:** Hiroki Ito **E-mail address**: Hiroki.Ito@MitsubishiElectric.co.jp
Strategic Directions #[2]: 1,2	**Technical Issues #[3]:** 1,2,3,5
The WG applies to distribution networks[4]: Yes / ~~No~~	
Potential Benefit of WG work #[6]:	

Title of the Group:

4th CIGRE Reliability Survey on Transmission and Distribution Equipment

Scope, deliverables and proposed time schedule of the Group:

Background:

Reliability of substation equipment in power systems is a major task for transmission and distribution system operators. Failures of equipment may result in significant system outages with the associated power restoration efforts as well as possible safety implications. There are also financial implications in case of poor reliability. In addition to the cost of a system outage and its restoration, poor reliability will contribute to higher system operating and maintenance costs to the operators and, ultimately, their customers.

The previous third CIGRE reliability survey on equipment such as circuit breakers, disconnecting switches, earthing switches, instrument transformers and gas insulated switchgear (GIS) was carried out in 2004-2007, and the results on these equipment were presented in CIGRE Technical Brochures 510, 511, 512, 513 and 514, respectively.

The fourth CIGRE reliability survey on equipment is currently in operation by AG A3.01: TF 1, which is collecting the recent population of various equipment and their failure experience serviced in 2014 to 2017 using a simplified questionnaire sheet. The innovate new simplified sheet is introduced to eliminate a time-consuming work for detailed failure analysis.

The scope of the fourth CIGRE reliability survey is expanded to cover generator circuit breakers, vacuum circuit breakers and MO surge arresters to provide field experience to related WGs. Due to a couple of new participations in the survey, the TF1 has already collected sufficient large number of the reliability data on the equipment and analysed them classified into different design categories. They show very interesting results including ageing assets serviced more than 40 years with considerable different tendency among the countries.

The WG will mainly summarize and update the results and publish the reliability data on transmission and distribution equipment showing these differences in the reliability dependence on specification, design, service-year, maintenance and replacement policy, country by country (but anonymously without showing the utilities name), by comparing the new results with the previous results. The WG will plan to publish the results on different equipment by a series of TBs as soon as possible after a WG establishment. However, WG will not pursue for the detail investigations and their backgrounds of these findings. SC A3 and the related SCs will discuss whether CIGRE should establish new WG to investigate to reveal the detailed background information of some important findings.

The WG will also consider the scope of next investigations (emerging equipment such as DC switching equipment, GIS with non-SF6, equipment installed in offshore platform, etc) and their effective procedure how to collect the reliability data on equipment periodically in the future (The next fifth reliability survey will cover equipment serviced in 2024-2027) in cooperated with some related SCs (A2: power transformers, A3, B1: cables, B2: line surge arresters, B3: GIS) involving in the reliability survey.

Scope:

The Working Group will report the information on reliability data on equipment

1. Update the recent population and major failure frequency on different transmission and distribution equipment serviced from 2014 to 2017 in different countries.
2. Provide failure frequency on equipment classified into specification, design, service-year, maintenance and replacement policy, country by country
3. Compare the recent results with the previous CIGRE reliability survey
4. Equipment ageing consequence throughout the lifetime with identical specific design and operating conditions
5. Background information on difference in reliability among the countries
6. Failure lessons to prevent a similar failure from reoccurrence
7. Plan the next reliability survey on equipment serviced in 2024-2027 and the scope of investigations

The evaluation of the reliability data will be performed closely in corroboration with SC B3 and related organizations.

Deliverables:

☒ A series of Technical Brochures and Executive summary in Electra

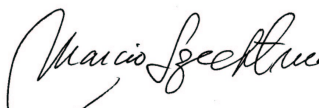
☒ Electra report, Session papers

☒ Tutorial[5]

Time Schedule: Start in June 2022 **Final Report**: March 2024

Approval by Technical Committee Chairman:

Date: July 7th, 2022



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