**CIGRE Study Committee SC A3**

# PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

<table>
<tr><td>WG N° A3.46</td><td colspan="2">Name of Convenor: Pavel Novak, Germany<br>E-mail address: pavel.novak@se.com</td></tr>
<tr><td colspan="2">Technical Issues #[2]: 6, 7, 10</td><td>Strategic Directions #[3]: 1, 2</td></tr>
<tr><td colspan="3">The WG applies to distribution networks[4]: Yes</td></tr>
<tr><td colspan="3">Potential Benefit of WG work #[5]: 1,4,5,7</td></tr>
<tr><td colspan="3">Title of the Group: Generator Circuit-Breakers: review of application requirements, practices, in-service experience and future trends</td></tr>
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**Scope, deliverables and proposed time schedule of the WG:**

**Background:**

Installing Generator Circuit-Breakers (GCBs) between a generator and Generator Step-Up Transformer (GSU) is widely accepted due to the increased reliability and thus high availability of the plant. GCBs will protect the GSU and generator from the fault currents which are more stressful than in conventional networks. Historically, GCBs have been successfully installed and operated in generator circuits as a special purpose breaker since late 1970's. Since 1989 they are used as a definite purpose breaker tested according to the standard IEEE C37.013 which is being the only standard available up to 2015 until the dual logo standard IEC/IEEE 62271-37-013 came into existence.

Today there are huge number of power plants in the world that incorporated GCBs of different switching technologies and there are still some power plants which did not incorporated GCBs. With different switching technologies available for this niche application and with different powerplant configurations and different challenges for each type of the plant, a new WG is proposed to focus on the GCBs and evaluate their impact on power plants. Some of the power plants without GCBs are reaching close to their end of life time and need to be modernised. This technical brochure serves as an educational document to highlight the advantages of GCBs to be considered while modernising the plant.

**Scope:**

Since it is the first WG ever had on GCBs, the aim is to come up with a technical brochure that can serve as an educational document as well as an application guide for the power plant owners and network engineers. The basic outline of the scope of the work is as follows

1. History of the GCBs
2. Different power plant layouts and their individual operational requirements
3. Special duties & challenges in generator circuits that necessitates the special circuit-breakers with dedicated standards
4. Overview of the State-of-the art switching technologies available and highlight the differences between each technology
5. Background on the specific test requirements, e.g. out of phase, delayed current zeros, TRV requirements
6. Testing methods / challenges (Especially short circuit tests & temperature rise tests)

7. Case studies and field experience with respect to life cycle cost & reliability analysis of power plants incorporating GCB and power plants without GCBs (regardless of generator circuit breaker technology)
8. GCBs – Then – Now – Tomorrow. How does the energy market transition will have impact on these circuit breakers?

We might need to collaborate with power generator experts (SC A1, utility members) and power system experts (SC C4).

**Deliverables:**

☒ Technical Brochure and Executive Summary in Electra

☒ Electra Report

☒ Tutorial[6]

☒ Webinar[6]

**Time Schedule**: start: December 2019 **Final Report**: December 2022

**Approval by Technical Council Chairman**:

**Date**: October 30th, 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

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|---|---|
| **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. |