

**CIGRE Study Committee B5**

**PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP**

|  |  |   |                                       |
|--|--|---|---------------------------------------|
| <b>WG<sup>1</sup> SC B5.85</b>   | <b>Name of Convenor:</b> Andreas Gehm (DE)           |   |                                       |
| <b>Strategic Directions #<sup>2</sup>:</b> 1   | <b>Sustainable Development Goal #<sup>3</sup>:</b> 7 |   |                                       |
| <p><b>This Working Group addresses these Energy Transition topics:</b></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> <input type="checkbox"/> Storage<br/> <input type="checkbox"/> Hydrogen<br/> <input type="checkbox"/> Digitalization<br/> <input type="checkbox"/> Sustainability and Climate Change<br/> <input checked="" type="checkbox"/> Grids and Flexibility<br/> <input type="checkbox"/> Solar PV and Wind<br/> <input type="checkbox"/> Consumers, Prosumers and Electrical Vehicles<br/> <input type="checkbox"/> Sector Integration         </td> <td style="width: 50%; vertical-align: top;"> <input type="checkbox"/> None of them         </td> </tr> </table>  |  | <input type="checkbox"/> Storage<br><input type="checkbox"/> Hydrogen<br><input type="checkbox"/> Digitalization<br><input type="checkbox"/> Sustainability and Climate Change<br><input checked="" type="checkbox"/> Grids and Flexibility<br><input type="checkbox"/> Solar PV and Wind<br><input type="checkbox"/> Consumers, Prosumers and Electrical Vehicles<br><input type="checkbox"/> Sector Integration | <input type="checkbox"/> None of them |
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| <p><b>Potential Benefit of WG work #<sup>4</sup>:</b> 1, 2, 3, 4, 5</p>  |  |   |                                       |
| <p><b>Title of the Group:</b> Protection, Control and Supervision principles of “Grid Stabilizing Generation”</p>  |  |   |                                       |
| <p><b>Scope, deliverables and proposed time schedule of the WG:</b></p> <p><b>Background:</b></p> <p>Over the last decades, significant and fast increase of Decentralized Energy Resources (DER) Inverter Based Generation (IBG) have been observed in many countries to facilitate the integration and transmission of renewable energy (e.g., solar and wind farms, HVDC links, etc.). It becomes more and more obvious that this (r)evolution will go on in the foreseeable future and will probably accelerate due to the urgent need for decarbonization and the decision made by some countries to leave the nuclear technology in relatively short term.</p> <p>It became obvious that all these changes could have strong impacts on many aspects of power systems, including short-circuit contributions to faults, voltage stability, frequency stability, transient stability. To cope with the corresponding risks, one of the most common mitigations is to install Synchronous Condensers, in order (for example) to provide extra short-circuit current contribution, to support voltages and to provide additional global system inertia. Synchronous Condensers are one of the solutions that fall in the family of the so-called “Grid Stabilizing Generation” (GSG). It is proposed to introduce this term to cover all generators providing this kind of ancillary services.</p> <p>Most of the time, the decision to deploy GSG fall into the responsibility of the Transmission System Operators (TSOs) as market facilitators, and they will own and operate these GSGs. However, since the introduction of deregulation and the unbundling of power systems between Generation, Transport and Distribution companies, most of TSOs do not have competences any more in Protection, Control and Supervision of generators. Accordingly, the general goal of this working group is to provide utilities with a complete and comprehensive overview of the protection, control and supervision concepts that should be applied in such applications, together with concrete examples. A possible approach would be based on comparable generator protection applications. Rotating generators behave similarly in protection and control as GSG.</p> |  |   |                                       |

Finally, it must be underlined that the time aspect is a critical success factor for this working group. As mentioned above, power systems transformation (as described above) is on the way and will probably accelerate over the next years. The sooner the deliverables of the working group are made available to the community, the better.

**Purpose/Objective/Benefit of this work:**

The aim of the Technical Brochure (TB) developed by the working group is to give a general overview about different applications for “Rotating Grid Stabilizing Generations” and to describe the state of the art regarding protection, control, and supervision of this kind of grid element. The availability constraints of GSG will be covered. It should also give recommendations about the asset life cycle management of the deployed solutions.

**Scope:**

The TB shall in particular discuss the following points:

- GSG definition
  - General definition
  - Concrete examples/ applications
  - Typical single-line diagrams
- Protection and Control of GSGs
  - For the most typical single-line diagrams, overview of typical fault types and of the appropriate protection principles/functions that are commonly used with the corresponding justifications.
  - List of special requirements enabling control of GSG (specific alarms, communication of setpoints to GSG, principles to connect GSG to the grid)
  - Current transformer requirement recommendations
  - Neutral point treatment, grounding/ neutral point transformer and load resistor requirements and design recommendations to provide full cover stator ground fault protection.
  - If needed: description of specific automatism to be foreseen in this kind of applications.
- Supervision of GSGs
  - List of critical parts of GSGs that must be supervised in order to maximize their availability, and recommendations about the type of solutions that should be deployed accordingly.
  - Recommendations regarding the secondary systems architecture to be used for the supervision system.
  - Communication networks.
- Asset life cycle management of GSG Secondary Systems components
  - Recommendations on maintenance strategies (insourcing/outsourcing?); competences management, tools management (including IT/OT tools), replacement strategies.

**Out of scope:**

- Discussion on deployment strategy of GSG Secondary Systems
- Discussion/ recommendations on algorithms aimed at implementing the desired ancillary services. However, the way to implement them (integrated into “classical” Secondary Systems components? Segregated in other equipment?) will be addressed.

- The technical brochure will not discuss in detail all protection setting recommendations but will give some explanations and general guidelines for specific protection functions (e.g. stator ground fault protection). Specific protection studies required for particle cases are out of scope of the Technical Brochure.
- The WG will not focus on unique applications.

**Remarks:**

Liaison member from Study Committees A1, C2, C4 and D2

**Deliverables:**

- Annual Progress and Activity Report to Study Committee
- Technical Brochure and Executive Summary in Electra
- Electra Report
- Future Connections
- CIGRE Science & Engineering (CSE) Journal
- Tutorial
- Webinar

**Time Schedule:**

- |   |            |
|---|------------|
| • Recruit members (National Committees, WiE, NGN) | Qtr 1 2024 |
| • Develop final work plan                         | Qtr 2 2024 |
| • Draft TB for Study Committee Review             | Qtr 4 2026 |
| • Final TB  | Qtr 1 2027 |
| • Tutorial  | Qtr 3 2027 |
| • Webinar   | Qtr 3 2027 |

**Approval by Technical Council Chair:**

**Date:** March 19<sup>th</sup>, 2024



**Notes:**

<sup>1</sup> Working Group (WG) or Joint WG (JWG),

<sup>2</sup> See attached Table 1,

<sup>3</sup> See attached Table 2 and CIGRE reference Paper: Sustainability – at the heart of CIGRE's work.

<sup>4</sup> See attached Table 3

WG Membership: refer Comments at end of document

**Table 1: Strategic directions of the Technical Council**

|   |  |
|---|--|
| 1 | The electrical power system of the future reinforcing the End-to-End nature of CIGRE: respond to speed of changes in the industry by preparing and disseminating state-of-the-art technological advances |
| 2 | Making the best use of the existing systems  |
| 3 | Focus on the environment and sustainability (in case the WG shows a direct contribution to at least one SDG)   |
| 4 | Preparation of material readable for non-technical audience  |

**Table 2: Environmental requirements and sustainable development goals**

|    |  |
|----|--|
|    | CIGRE selected the 7 SDGs that are the most relevant to CIGRE. In case the WG work refers to other SDGs or do not address any specific SDG, it will be quoted 0.   |
| 0  | Other SDGs or not applied  |
| 7  | <b>SDG 7: Affordable and clean energy</b><br>Increase share of renewable energy; e.g. expand infrastructure for supplying sustainable energy services; ensure universal access to affordable, reliable, and modern energy services; energy efficiency; facilitate access to clean energy research and technology   |
| 9  | <b>SDG 9: Industry, innovation and infrastructure</b><br>Facilitate sustainable infrastructure development; facilitate technological and technical support   |
| 11 | <b>SDG 11: Sustainable cities and communities</b><br>Increase attention on sustainable and resilient buildings utilizing local (raw) materials, power for electric vehicles, strengthening long-line transmission and distribution systems to import necessary power to cities, developing micro-grids to reinforce the sustainable nature of cities; protect and safeguard the world's cultural and natural heritage; reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and waste management |
| 12 | <b>SDG 12: Responsible consumption and production</b><br>E.g. Promote public procurement practices that are sustainable; address reducing use of SF6 and promote alternatives, encourage companies to adopt sustainable practices and to integrate sustainability information into their reporting cycle, address inefficient fossil-fuel subsidies that encourage wasteful consumption  |
| 13 | <b>SDG 13: Climate action</b><br>E.g. Increase share of renewable or other CO <sub>2</sub> -free energy; energy efficiency; expand infrastructure for supplying sustainable energy; strengthen resilience and adaptive capacity to climate-related hazards and natural disasters; integrate climate change measures into national policies, strategies and planning; improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning                                    |
| 14 | <b>SDG 14: Life below water</b><br>E.g. Effects of offshore windfarms; effects of submarine cables on sea-life   |
| 15 | <b>SDG 15: Life on land</b><br>E.g. Attention for vegetation management; bird collisions; integration of substations and lines into the landscape  |

**Table 3: Potential benefit of work**

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

**Comments:**

**1) CIGRE Official Study Committee Rules: WG Membership**

<https://www.cigre.org/GB/about/official-documents>

- a. Only one member per country: by exception of SC Chair, WiE and NGN nominees.
- b. WG nominees by NCs must first be supported by their National Committee (or local SC Member) as an appropriate representative of their country.
- c. Acceptance of the nomination is granted by the SC Chair and advised to the WG Convener.

**2) Collaboration Space**

<https://www.cigre.org/article/GB/collaborative-tools-2>

CIGRE will provision the WG with a dedicated Knowledge Management System Space.

The WG will use the KMS for drafting collaboration, capture and retention of discussion and meeting records.

Official country WG Members will be sent registration instructions by the Convener.

Official country WG Members may request the WG Convener to allow additional access for an extra national subject matter specialist to aid in the work at the national level, including NGN members.