

CIGRE Study Committee A1

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

WG 1^{Nº} A1.77	Name of Convenor: SPEZIA, Fernando R. (Brazil)	
Strategic Directions #²: 1		Sustainable Development Goal #³:9
The WG applies to distribution networks: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No		
Potential Benefit of WG work #⁴: 3		
Title of the Group: Survey on Stator Insulation Reliability of Motors		
<p>Scope, deliverables and proposed time schedule of the WG:</p> <p>Background:</p> <p>Electric motors shall be available for service whenever needed, and shall reliably provide the mechanical power, required by the various existing applications. All types of industrial businesses are, somehow, dependent on the operation of those rotating electrical machines.</p> <p>The insulation system is a crucial part of an electric motor. Its durability is a key factor, directly affecting the equipment service life and, therefore, the availability and reliability of the processes. Different techniques are employed worldwide, from the manufacturing to the maintenance, through the FAT (Factory Acceptance Tests) and others, to assess and guarantee the condition of the insulation.</p> <p>Insulation failures are of major concern. Such failures can be caused by multiple factors, inherent or not to the regular service condition of the motors. Of major relevance is to deeply know the performance of the insulation in service, and this is part of the motivation for the proposed working group.</p> <p>Purpose/Objective/Benefit of this work:</p> <p>The main goal of this WG (Working Group) is to produce a stratified database, which can be used by developers, for example, to enhance their insulation solutions. Alternatively, it can support users of these machines, to update or complement their technical specifications, as well as develop (or review) their maintenance strategies. In addition, such a database can be used by multiple working groups.</p> <p>At the end of this work, at least the following shall be presented:</p> <ul style="list-style-type: none"> a) Stratified database. <ul style="list-style-type: none"> i. Failures and time-to-failure Vs Nominal voltage ii. Failures and time-to-failure Vs Market segment iii. Failures and time-to-failure Vs Special causes iv. Failures and time-to-failure Vs Symptoms v. Failures and time-to-failure Vs Power rating b) Qualitative analysis of the collected data, based on the stratified database. 		

Scope:

This WG (Working Group) shall focus on the survey of stator failures that have occurred around the globe, collecting data from multiple users, manufactures, service providers and others, that can be converted into a stratified database.

1. Main features of the motors:
 - 1.1. 3-phase industrial motors
 - 1.2. Induction motors (Squirrel Cage and Wound rotors)
 - 1.3. Synchronous motors (Cylindrical and Salient pole rotors)
 - 1.4. Supplied Direct Online or thru electronic drives (VFD, VSD, ASD, etc.)
 - 1.5. Form-wound windings
 - 1.6. Any power rating.

2. Minimum complementary information intended:
 - 2.1. Service conditions (Temperatures, cleanliness, maintenance practices, etc.)
 - 2.2. Application and Type of duty
 - 2.3. Time-to-failure
 - 2.4. Type of supply
 - 2.5. Market segment of application
 - 2.6. Region (Continent) of application and of manufacture
 - 2.7. Symptoms before failure
 - 2.8. Findings after failure
 - 2.9. Type of failure
 - 2.10. Consequences of the unavailability of the motor.

In order to keep the focus of the group on the right direction, the following subjects of interest shall be considered:

3. Main subjects of interest:
 - 3.1. Reliability of the insulation systems of stators
 - 3.2. Average time to failure
 - 3.3. Dominant types of failures and failure mechanisms
 - 3.4. Correlation between failures and market segments
 - 3.5. Symptoms detected before failure
 - 3.6. Effectiveness of assessment techniques employed
 - 3.7. Significance of FAT results for the service life
 - 3.8. Additional concerns when supplying through electronic drives.

Remarks:

A few exclusions are presented below. These subjects won't be approached by this WG:

- a) Random-wound windings
- b) Traction and e-Mobility application
- c) Windings with Roebel Bars or overmuch different from those mentioned above
- d) Rotors, exciters and other components, that are not the main stator.

By searching on e-cigre.org website, one only document was found, which can be, somehow, correlated to the proposed subject.

- a) WGR_258_1 – Motor Failure Survey – WG A1.19 – Published in 2011.
Focused on motor operating at Thermal and Nuclear Power Plants.
Considered any type of failure of the complete motors.

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) | Q2 2023 |
| • Develop final work plan | Q2 2023 |
| • Draft TB for Study Committee Review | Q2 2025 |
| • Final TB | Q1 2026 |
| • Tutorial | Q2 2026 |
| • Webinar | Q2 2026 |

Approval by Technical Council Chairman:

Date: April 4th, 2023

**Notes:**

¹ Working Group (WG) or Joint WG (JWG),

² See attached Table 1,

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

⁴ 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	SDG 7: Affordable and clean energy 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	SDG 9: Industry, innovation and infrastructure Facilitate sustainable infrastructure development; facilitate technological and technical support
11	SDG 11: Sustainable cities and communities 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	SDG 12: Responsible consumption and production 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	SDG 13: Climate action E.g. Increase share of renewable or other CO ₂ -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	SDG 14: Life below water E.g. Effects of offshore windfarms; effects of submarine cables on sea-life
15	SDG 15: Life on land E.g. Attention for vegetation management; bird collisions; integration of substations and lines into the landscape

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.

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)
- b. WG nominees 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.