

# Updates from A3

Matthew Iles



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For power system expertise

## Latest activities

- The last meeting of the A3 Study Committee met on the 29th August 2024 at the CIGRE Paris Session. The meeting took place in person.
- There has been a meeting of the Strategic Advisory Group in Milan in March 2024.
- The main SC last met at the Cairns symposium 2023.

## Existing working groups

| WG/JWG                      | Title  | Convener                         | Secretary                | UK Participation |
|-----------------------------|--|----------------------------------|--------------------------|------------------|
| <b>WG A3.39</b>             | Application and field experience with Metal Oxide Surge Arresters  | R. le Roux (IE)                  | F. Richter (DE)          |                  |
| <b>WG A3.40</b>             | Technical requirements and field experiences with MV DC switching equipment  | C. Heinrich (DE)                 | T. Miyamoto (JP)         |                  |
| <b>WG A3.42</b>             | Failure analysis of recent AIS instrument transformer incidents  | Z. Roman (US)                    | Fernando Lagos (BR)      |                  |
| <b>JWG A3.43 /CIRED</b>     | Tools for lifecycle management of T&D switchgear based on data from condition monitoring systems                   | N. Gariboldi (CH)                | J. Mantilla (CH)         |                  |
| <b>JWG A3/A2/A1/B1.44</b>   | Limitations in Operation of High Voltage Equipment Resulting of Frequent Temporary Overvoltages                    | B. Rusek (DE)                    | -                        |                  |
| <b>WG A3.45</b>             | Methods for identification of frequency response characteristic of voltage measurement systems                     | E. Sperling (CH)                 | M. Freiburg (DE)         |                  |
| <b>WG A3.46</b>             | Generator Circuit-Breakers: review of application requirements, practices. In-service experience and future trends | P. Novak (DE)                    | -                        |                  |
| <b>JWG B4/A3.86</b>         | Fault Current Limiting Technologies for DC Grids   | Z. He (CN)                       | -                        |                  |
| <b>JWG B3/A3.60</b>         | User guide for non-SF6 gases and gas mixtures in Substations   | K.P. (Piet) Knol (NL)            | -                        |                  |
| <b>WG A3.47</b>             | Lifetime Management of Medium Voltage Indoor Switchgear  | A. Maheshwari (AU)               | Matthew Ridgley          | Ian Naylor       |
| <b>WG A3.48</b>             | 4th CIGRE reliability survey on transmission and distribution equipment  | H.Ito (JP)                       |                          | Matthew Iles     |
| <b>WG A3.49</b>             | Aging effects on accuracy class of Instrument Transformers   | Roberto Tinarelli (IT)           |                          | Philip Orr       |
| <b>WG A3.50</b>             | On-site calibration and verification of the accuracy of instrument transformers                                    | Paolo Mazza (Italy)              | Christoph Datz           | Rui Zhang        |
| <b>WG A3.51</b>             | Requirements for HV T&D Equipment operating under Abnormal Weather Conditions                                      | Dr. Santosh Kumar Annadurai (IN) | Sasi Vettayappan (IN)    | Peter Curtis     |
| <b>JWG B3/A2/A3C3/D1.66</b> | Guidelines for Life Cycle Assessment in Substations considering the carbon footprint evaluation                    | Akshaya Prabaker (NL)            | Dennis van der Born (NL) | Mark Waldron     |
| <b>JWG B3/A3.67</b>         | Operational safety of Medium Voltage GIS in case of abnormal leakage   | Maik Hyrenbach (DE)              |                          | Tony Chen        |
| <b>JWG C4/A3/B2/B4.75</b>   | Guide to procedures for the creation of contamination maps required for outdoor insulation coordination            | Massimi Marzinotto (IT)          |                          |                  |
| <b>WG C4.76</b>             | Overvoltage protection in switching inductive devices with vacuum circuit breaker                                  | Q. Yang (CN)                     | Q. Sun (CN)              | G. Dakin         |

## New Working Groups and Proposals

- Digital Twin
  - A ToR was presented on the Application of Digital Twin for Switchgear. There was significant discussion on the scope of a digital twin and its potential applications. It was concluded that there needs to be a clear definition of the digital twin according to the application. IT was requested to revise the TOR by defining Digital Twin and introducing MV and that it would be beneficial to discuss with SC B3
- Working group for Green Book maintenance activities
- 5<sup>th</sup> Reliability survey
- Onsite testing
  - After review it was stated that the existing scope was too wide and should be limited to PD during on site dielectric tests. It was further suggested it should take into account IEEE testing guide and that SC D1 could be involved. IT was identified that it would be beneficial to harmonise the HV test levels between switchgear and cables.
- Temperature rise limits
  - B3 is not leading the WG. Limits have been increased quite recently. It was identified that the scope is too broad. IT was concluded that A whitepaper should be created first. An ad hoc WG should be established.
- Distance to Transmission lines
- Capability Assessment
  - Recognising there is a big push to standardise everything, any such WG should only look at the technical capability and not QMS. ToR requires re-scoping to be clearer and draw parallels to A2 equivalent and existing TB.

## New Publications

| Ref.                          | WG              | Title   |
|-------------------------------|-----------------|---|
| <a href="#"><u>TB 947</u></a> | A3.48           | Fourth CIGRE international reliability survey on equipment operated in 2014-17 - Part 1: General results on transmission and distribution equipment |
| <a href="#"><u>TB 931</u></a> | A3.40           | Technical requirements and field experiences with MV DC switching equipment   |
| <a href="#"><u>TB 921</u></a> | JWG<br>C4/A3.53 | Applying Low-Residual-Voltage Surge Arresters to Suppress Overvoltages in UHV AC Systems  |
| <a href="#"><u>WBN053</u></a> | CZC             | Fundamentals of Current Interruption in (High-Voltage) Vacuum Circuit Breakers  |
| <a href="#"><u>TB 914</u></a> | JWG<br>B3/A3.59 | Guidelines for SF6 end-of-life treatment of T&D equipment (>1kV) in Substations   |
| <a href="#"><u>WBN041</u></a> | CZC             | The fundamentals of current interruption in SF6 and its alternatives  |
| <a href="#"><u>TB 873</u></a> | JWG<br>B4/A3.80 | Design, test and application of HVDC circuit breakers   |
| <a href="#"><u>TB 871</u></a> | A3.41           | Current interrupting in SF <sub>6</sub> -free switchgear  |
| <a href="#"><u>TB 830</u></a> | A3.36           | Application and benchmark of multi-physics simulation tools and temperature rise calculations   |
| <a href="#"><u>TB 817</u></a> | A3.38           | Shunt capacitor switching in distribution and transmission systems  |
| <a href="#"><u>TB 816</u></a> | A3.30           | Substation equipment overstress management  |
| <a href="#"><u>TB 757</u></a> | A3.35           | Guidelines and best practices for the commissioning and operation of controlled switching projects  |

## A3 Preferential Subjects for CIGRE Paris Session 2026

- The preferential subjects for Paris 2026 were discussed and agreed during the 2024 Paris session. These are going to be:
  - PS1 Transformation of T&D Assets for Evolving Grid conditions
  - PS2 Sustainability and Circuit Economy of T&D Equipment
  - PS3 Asset Management strategies for T&D Equipment

# Updates from B3

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## Study Committee B3 Scope

SC Chair: Mark McVey (US)

SC Secretary: Samuel Nguefeu (FR)

### **Key strategic directions**

- New substation concepts
- Substation ownership issues
- Life-cycle management
- Integration of intelligence for digitalisation on substations

AA1 - Substation Concepts and Developments – Mark Osborne (UK)

AA2 - Gas Insulated Substations (GIS) – Mark Kuschel (GE)

AA3 - Air Insulated Substations (AIS) – Mark McVey (US)

AA4 - Substation Management and Digital Integration – Johan Smit (NE)



## New Working Groups since 2022

| Number                                | Title   | Convener         | UK Member        |
|---------------------------------------|---|------------------|------------------|
| <b>B3.68</b>                          | Experience of Offshore Substation operation and maintenance   | Simon Waddington | Simon Waddington |
| <b>B3/A3.67</b>                       | Operational safety of medium voltage GIS in case of abnormal leakage  | Maik Hyrenbach   | Tony Chen        |
| <b>B3.64</b>                          | Guidelines on Optimising Seismic Design of Substations for Power Resiliency   | Atsushi Eto      | TBC              |
| <b>B3.65</b>                          | Guidelines for the Selection and Design of escape routes for substations rated above 1 kV AC and 1.5 kV DC                        | Espen Masvik     | TBC              |
| <b>JWG<br/>B3/A2/A3/C3/<br/>D1.66</b> | Guidelines for Life Cycle Assessment in Substations considering the carbon footprint evaluation                                   | Akshaya Prabakar | Mark Waldron     |
| <b>B3/D1.63</b>                       | Guideline for assessing the toxicity of used SF <sub>6</sub> gas onsite and in the lab of T&D equipment above 1 kV in substations | Roland Kurte     | Tony Chen        |

## New Publications

| <b>TB number</b> | <b>Title</b>  | <b>WG</b> |
|------------------|---|-----------|
| <b>TB 914</b>    | Guidelines for SF <sub>6</sub> end-of-life treatment of T&D equipment (>1kV) in Substation. | B3/A3.59  |
| <b>TB 907</b>    | Mobile Substations Incorporating HV GIS – (UK WG Convenor Paul Fletcher)                    | B3.41     |
| <b>TB 898</b>    | Knowledge transfer of substation engineering and experiences                                | B3.58     |
| <b>TB 895</b>    | Impact on Engineering and Lifetime management of Outdoor GIS                                | B3.57     |
| <b>TB 886</b>    | Guidelines for Fire Risk Management in Substations  | B3.53     |

## New B3 WG proposals under development

### AA1 – Substation Concepts (Mark Osborne)

- Guidelines for Managing Black Start Resilience in substations (possible Crina Costan)
- Earthing system design guidelines for high voltage systems (possible Stephen Palmer)
- Harmonization of voltage designations and definitions across different HVDC component technologies (convenor Bruno Bisewski)

### AA2 – GIS, GIL, SF<sub>6</sub> and Alternative Gases (Mark Kuschel)

- Return of operational experiences of SF<sub>6</sub> free equipment (after completion JWG B3/A3.60 “User guide for non SF<sub>6</sub> gases and gas mixtures in substations”)

### AA3 – Air Insulated Substations (Mark McVey)

- Process Requirements for Commissioning and Inspecting Substations

## B3 Preferential Subjects for CIGRE Paris Session 2026

### PS1 - Innovative Concepts, Designs and Operation Experience in Substations

- Experience with Digital design, Training Tools Using 3D Software, AI and Machine Learning.
- Modular Substations and Prefabricated Material Design Methods for all Voltage Classes.
- Operational Experience with Renewable Substations for Onshore and Offshore UHV or HVDC.

### PS2 - Life Cycle & Asset Management in Substations

- Monitoring, Diagnostics and Testing Equipment to Improve Energy Efficiency and Functionality to Reduce Carbon Footprint as well as Improve Resiliency.
- Substation Up-Rating, Upgrading Experience and Operation Concepts.
- Asset Management Strategies Including Optimized Maintenance, Substation LCA and SF<sub>6</sub> transitions.

### PS3 - Impacts of Grid Transformation and New Reliability Threats in Substations

- Physical Security Designs and Experience for Substations.
- Substation Designs, Upgrades and Concepts to Mitigate Severe Weather effects.
- Experience Building Substations to Connect Large Customers such as Data Centers, Reliably and Safely.

## Upcoming CIGRE Events in 2025

- CIGRE B3/A3 Colloquium, Klingenberg, Germany, 24-28<sup>th</sup> March. The A3 Strategic Advisory Group will also be meeting during this event.
- Cigre Symposium, Trondheim, Norway, 12-15<sup>th</sup> May. Focus on changes required in the power system for the energy transition.
- Cigre Symposium, Montreal, Canada, 29<sup>th</sup> September to 2<sup>nd</sup> October. The A3 and B3 Study Committies will also be meeting during this event.

# CIGRE A3/B3 Meeting Schedule for Day 1

13:30 – **Consequences of the EU F-gas regulation 2024/update on the EU PFAS -**

Maik Hyrenbach (ABB)

14:00 – **MVDC Circuit Breaker Development (Horizon MISSION project) -** Andres Laso (G&W Electric)

14:30 – **State-of-the-Art on Circuit Breaker Technology Development -** Colin Davidson (GE Vernova)

15:00 – Comfort/Refreshment Break

15:20 – Supplier updates on SF<sub>6</sub> alternative updates

16:20 – Network expansion and the impact on networks, suppliers and utilities

17:20 – Wrap-up and Day's Summary

17:30 – Finish

**Networking Dinner: 19:00 - 21:00**

Hyatt Regency Manchester: 18th Floor lounge

**PFAS**

**Cost to clean up toxic PFAS pollution could top £1.6tn in UK and Europe**

Exclusive: Costs of UK cleanup will reach £9.9bn a year in UK if emissions of 'forever chemicals' remain uncontrolled

- Industry using 'tobacco playbook' to fend off 'forever chemicals' regulation

**Leana Hosea and Rachel Salvidge**

Tue 14 Jan 2025 05:00 GMT

