CIGRE Study Committee C2

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

WG [1]N° C2.44	**Name of Convenor:** Greg Hesse (AU) **E-mail address**: gahesse@aapt.net.au
Strategic Directions #[2]: 1, 2, 3	**Sustainable Development Goal #[3]: 7, 9**
The WG applies to distribution networks: ☐ Yes / ☒ No	
Potential Benefit of WG work #[4] : 2, 4, 5	
Title of the Group: Operational strategies to manage power system minimum operating conditions	

Scope, deliverables and proposed time schedule of the WG:

Background:

The transition of the power system to a decarbonized grid is occurring at a rapid pace. Significant increases in the integration of clean energy sources from inverter-based resources (IBR) at transmission and distribution levels is continuing to change the face of power system operation.

The increased generation from low-cost IBR has accelerated the retirement of traditional synchronous generators. The reduced availability of the traditional synchronous generators reduces inertia, fault current, voltage control, system strength etc. Power systems with low inertia experience a higher rate of change of frequency following a disturbance compared to power system with high inertia. Reduced fault current in the system can impact the performance of protection system and system standards. It can also result in adverse and unwanted interactions between control systems of IBR plant and lead to power system instability. With less voltage control capabilities, the complexities of the steady state and dynamic voltage control increases.

The increased installation of distribution connected IBR such as roof-top photo-voltaic (PV) systems reduce the operational demand to be supplied from the transmission grid during high generation from roof-top PV systems. The low operational demand impacts the emergency control schemes such as load shedding and measures that are often exercised to safeguard the power system during extreme events.

Purpose/Objective/Benefit of this work:

The work will:

1. identify and articulate the key risks to the operation of the power system that arise from the emergence of minimum operating conditions such as minimum inertia, minimum system strength, and minimum operational demand;
2. identify gaps and improve the understanding of these minimum operating conditions; and
3. propose remedial actions and strategies to manage power system operation during minimum operating conditions.

Scope:

The scope of this WG is to.

1. Consolidate current best practices worldwide, including the review of the previous and ongoing CIGRE work relevant to the topic (e.g. JWG C2.C4.41, WG B5.28,

JWG B5.C4.79) to determine the gap associated with operating the power system during minimum operating conditions

2. Prepare a questionnaire of the existing operational practices to manage power system operation during minimum operating conditions, approach relevant system operators to gather information on the measures already in place and identify existing gaps.
3. Study real world experience (case study) of challenges faced by power system operators in real time operation and operations planning time frame, during minimum operating conditions such as low inertia, system strength, operational demand, fewer online synchronous generators etc.
4. Through real-time experiences and demonstrated power system studies, lay out consequences of not effectively managing power system minimum operating conditions, such as inertia, system strength, fault current, demand, and its relationship to power system security and reliability.
5. Develop a methodology to investigate various power system minimum operating conditions, success criteria, and safety margins.
6. Determine operational actions to manage power system operation during minimum operating conditions including development and integration of necessary operational tools.
7. Prepare and present the agreed deliverables.

Exclusion:

Investigation of the remediation measures in the investment planning horizon.

Investigation of the impact of minimum operating conditions / remedial actions on the expected duty / performance requirements placed on connected equipment. The impact on connected equipment could be the subject of a future joint WG.

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 Q3 2023
- Draft TB for Study Committee Review Q2 2025
- Final TB Q3 2025
- Tutorial Q3 2025
- Webinar Q3 2025

Approval by Technical Council Chairman:

Date: June 23rd, 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.