

CIGRE Study Committee D2

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

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|---|--|---|---------------------------------------|
| WG¹ D2.59 | Name of Convenor: Kunlun GAO (China) | | |
| Strategic Directions #²: 1 | Sustainable Development Goal #³: 9 | | |
| <p>This Working Group addresses these Energy Transition topics:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"> <input type="checkbox"/> Storage <input type="checkbox"/> Hydrogen <input checked="" type="checkbox"/> Digitalization <input type="checkbox"/> Sustainability and Climate Change <input type="checkbox"/> Grids and Flexibility <input type="checkbox"/> Solar PV and Wind <input type="checkbox"/> Consumers, Prosumers and Electrical Vehicles <input type="checkbox"/> Sector Integration </td> <td style="width: 50%; border: none; vertical-align: top;"> <input type="checkbox"/> None of them </td> </tr> </table> | | <input type="checkbox"/> Storage <input type="checkbox"/> Hydrogen <input checked="" type="checkbox"/> Digitalization <input type="checkbox"/> Sustainability and Climate Change <input type="checkbox"/> Grids and Flexibility <input type="checkbox"/> Solar PV and Wind <input type="checkbox"/> Consumers, Prosumers and Electrical Vehicles <input type="checkbox"/> Sector Integration | <input type="checkbox"/> None of them |
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| <p>Potential Benefit of WG work #⁴ : 2,3,4,5</p> | | | |
| <p>Title of the Group: Intelligent Computing for Power Industry</p> | | | |
| <p>Scope, deliverables and proposed time schedule of the WG:</p> <p>Background:</p> <p>In recent years, the field of artificial intelligence has undergone explosive growth, primarily driven by generative artificial intelligence, leading to widespread adoption of foundation models like large language models (LLM) or AI For Science (AI4S) models. It has shifted from the use of "small models + discriminative" to "foundation models + generative," expanding from traditional applications like object detection and text classification to current capabilities encompassing text generation, image generation and procedural problem-solving. This surge has propelled the information age into the era of intelligent computing, profoundly impacting various industries. The advent of intelligent computing has spurred an influx of data, breakthroughs in AI algorithms, and a surging demand for computational power.</p> <p>The rapid progress in the power industry also faces technical challenges related to decision interpretability, technology maturity adaptability and business support. Leveraging the capabilities of faster computation, improved accuracy, and enhanced decision-making, state-of-the-art intelligent computing methods presents a promising approach to mitigate most challenges in the transition to clean energy, while simultaneously enhancing system reliability, economics, and sustainability.</p> <p>In order to follow the technology trends, this working group (WG) differs from the existing AI Applications in Power Industry Working Group (D2.52), which focused on the general AI topics in power industry. Instead, this WG targets a dedicated study on the intelligent computing for power industry, especially with foundation models and AI4S models.</p> <p>Purpose/Objective/Benefit of this work:</p> <p>The purpose of the Working Group (WG) is to establish a reference document on intelligent computing for power industry, achieving consensus on cutting-edge technologies among power industry enterprises and institutions (power utilities, generation companies, independent system operators, load aggregators, etc.), research institutions, academia as well as equipment and system vendors, promoting conceptual consistency and technology</p> | | | |

recognition and adoption, exploring and identifying practical application scenarios and key technologies, formulating recommended use cases, laying the foundation for large-scale implementation for power utilities.

Scope:

The working group will cover:

The Developmental Trend of Intelligent Computing Application in Industrial Fields

Development of intelligent computing industrial applications.

Intelligent Computing Key Techniques and Architecture For Power Industry

Large language models (LLM),
Vision-Language models (VLM),
AI For Science (AI4S) models,
Emerging models,
Technical architecture.

Potential Scenarios and Use Cases

System operation with LLM and AI4S,
Asset management with LMM and VLM,
Corporate Management with LLM.

Intelligent Computing Challenges in Power Industry

Maturity analysis,
Challenges.

5) Prospect

Future development trends of intelligent computing for power industry.

Remarks:

Identify previous or related activity: The WG shall review the WG D2.52 scopes and results. The WG D2.52 focused from general AI scope, whose technologies were relatively basic and mature. This new WG will focus on how emerging intelligent computing techniques enable the power industry, whose technologies are more advanced.

Since the focus of this working group potentially relates to other Study Committees, we invite a liaison member from the relevant Study Committees to participate in this work. When the call for members is issued, Chairs from relevant Study Committees are invited to nominate a person to be a liaison member.

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 4 2024
- Develop final work plan Qtr 2 2025

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|---------------------------------------|------------|
| • Draft TB for Study Committee Review | Qtr 3 2026 |
| • Final TB | Qtr 4 2026 |
| • Webinar | Qtr 1 2027 |
| • Tutorial | Qtr 3 2027 |

Approval by Technical Council Chair:

Date: August 22nd, 2024



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

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| 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

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| | 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

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|---|--|
| 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, 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.