CIGRE Study Committee D2

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

WG [1]N° D2.52	**Name of Convenor:** Kunlun Gao
Strategic Directions #[2]: 1	**Sustainable Development Goal #[3]: 9**
The WG applies to distribution networks: ☒ Yes / ☐ No	
Potential Benefit of WG work #[4] : 2,3,4	
Title of the Group: Artificial Intelligence Application and Technology in Power Industry	

Scope, deliverables and proposed time schedule of the WG:

Background:

Artificial intelligence (AI) technology has made great progress in recent years. A new generation of AI technologies, e.g., deep learning, generative adversarial network and reinforcement learning have led to rapid development of technologies such as autonomous driving, natural language processing and image recognition.

This technology will be increasingly utilized within the scope of all CIGRE's 16 Study Committees, as they in conjunction form the entire scope of CIGRE activities. Also, Study Committees D1 and D2 were formed to work transversally, i.e., interacting with all other SCs. Therefore, this new WG will focus on the technology developments; at the same time most or all other SCs will focus on applications under their own scopes as well as making proper use of the contributions and references produced by this WG. In other words, this WG should concentrate on the basic core technologies, and then give the opportunity to use its results as a basis for launching new WGs led by other SCs.

The widespread use of information and telecommunication technology in power systems has produced vast amounts of data that traditional data techniques cannot analyse. At the same time, newly emerged elements in power grid such as DER (Distributed Energy Resources), electric vehicle, electricity market and new power electronic equipment have made new requirements to the safety, reliability and intelligence of the power grid. EPUs have already integrated AI technology into its daily work. In all parts of the world, AI technology has been used in practical applications such as load forecasting, drone inspection image recognition, customer service chatbot, etc., in power generation, transmission, distribution, and utilization systems. With AI technology, EPUs evolved in multidimensional ways, e.g., it can reduce risks, replace repetitive work by programs, reduce operating costs, and create new business models. The study on theory and practice on AI in power domain is of great need and importance. Therefore, the creation of the "AI Application and Technology on Power Industry" Working Group is valuable.

AI is an emerging technology that is developing extremely rapidly. Its technical routes and applications in the power system need to be discussed extensively in a solid technical context. At the same time, the cooperation between AI technologies, cloud computing, big data, the Internet of Things technology needs to be studied.

Scope:

The aim of the WG is to establish a reference document on AI application and key technology on power industry, including recommendations and best practice.

1 Development and applicability of AI technology
Research on technology and current development status on different key fields of AI such as deep learning, knowledge graph, natural language processing, computer vision, and evaluation of applicability/maturity of technologies in the power industry.

2 AI system architecture for power industry
Research on heterogeneous computing platforms, management of data and samples, model training and evaluation of its performance, application integration, etc.

3 Typical practice and reference design of artificial intelligence technologies in power industry, including:
- Image recognition;
- Video recognition;
- Knowledge Graph;
- Natural Language Processing;
- Other technologies;

4 New Challenges applying AI technologies in power industry and demand and advice on technology and industry development.

Deliverables:

☒ Technical Brochure and Executive Summary in Electra
☒ Electra Report
☐ Future Connections
☐ CSE
☒ Tutorial
☐ Webinar

Time Schedule: start: Apr. 2020 **Final Report**: Apr. 2022

Approval by Technical Council Chairman:

Date: April 9th, 2022

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

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.