SCOPE OF WORK & ACTIVITIES

STUDY COMMITEES

2026

EDITORIAL

CIGRE is an international organisation based on volunteer work, who address timely and exciting subjects for discussion and publications. CIGRE at its core is the development and dissemination of unbiased technical knowledge for power system expertise. CIGRE focus on the whole One-Grid electricity system, including all facets of the energy transition.

CIGRE Technical Council is responsible for the technical activities of CIGRE, which comprise of all permanent activities of the 16 Study Committees. This includes the management of CIGRE Working Groups, as well as planning and organising all CIGRE activities like Symposia, Colloquia, Workshops, Tutorials and other related events.

The CIGRE Study Committee Chairs are true leaders in their respective fields. CIGRE Technical Council gathers the 16 Study Committee Chairs, the Technical Council Chair, the CIGRE Secretary General and two representatives of the CIGRE Administrative Council. The CIGRE Technical Council reports to the Administrative Council. The CIGRE Technical Council Chair is also a member of the Steering Committee and participate at the Administrative Council reporting on the technical activities and sharing views and decisions on recommendations delivered to the highest management levels of the organisation. With this formation, CIGRE becomes able to bring together the diverse range of issues and topics that are of interest to our stakeholders and to establish the appropriate work programmes to deliver valuable outputs in the target areas.

Within the framework established by the Technical Council, each Study Committee, consisting of National Committee representatives and active experts such as Working Group convenors and Strategic Advisory Groups. They have the responsibility to manage the programme of work within each of the Study Committee technical area of responsibility. Each Study Committee can have 34 Regular Members, in addition to 10 Observer Members from the about 60 National Committees of CIGRE. In addition, there are 2 additional Regular Members, one nominated from Women in Energy group and one from Next Generation Network group.

To support the diversity of CIGRE, members from CIGRE Technical Council take part in Women in Energy event as well as Next Generation Network events.

Delivery of the technical work of CIGRE, overseen by the Technical Council, assumes the following main forms: (i) publication of technical reports prepared by international Working Groups (Technical Brochures, ELECTRA articles, CSE); (ii) preparation of technical events such as the Paris Sessions, conferences, symposia, colloquia, tutorials & workshops, and, last but not least (iii) having in mind all current and future needs to align CIGRE with the most relevant and timely topics of the electric power industry and impacts of the so called Energy Transition topics. Through these routes we actively promote the development of skills and knowledge and provide a wide range of opportunities for stakeholders of all types to share knowledge and experience and to collaborate in the development of themselves and of the future of societies around the world.

One of the strengths of CIGRE are its well-established Working Group structure and its wide international engagement. CIGRE typically have about 260 active Working Groups and around 4500 active experts engaged in CIGRE activities. Many of topics that is discussed cover more than one of the Study Committees and CIGRE then create Joint working groups with cooperation between experts from the different Study Committee. We exploit the enormous expertise of our stakeholders worldwide to drive innovation, to develop solutions and to provide trusted, impartial, non-commercial guidance and advice.

At the same time, we are developing programmes to encourage active participation from a truly diverse range of interest groups and to ensure that CIGRE's enormous body of knowledge and expertise is exploited fully in support of nations & regions at all stages of economic development.

Whilst we have delivered excellent service to the electric power industry for almost 100 years, we are presently more focused than ever before on the timely issues of energy transition, active energy resources in the distribution area, hydrogen as a new fuel, full digitalization of installations, new materials, more effective asset management, new challenges for system operation among others to keep the added value for CIGRE members and how we can broaden our appeal and create a strong, sustainable organization which is fit for the present, and also robust enough to deal with an exciting but uncertain future. CIGRE, by being recognized as One-Grid organization, which covers all technical matters from the internal parts of generators to the consumer end of the electricity meter, demonstrates its continued worldwide technical & scientific leadership.

Please have a look at all the activities of the 16 Study Committees, and consider to take part in the activities of CIGRE, you are all and always most welcome to CIGRE!

"we actively promote the development of skills and knowledge and provide a wide range of opportunities for stakeholders of all types to share knowledge and experience..."



Rannveig S. J Løken

CIGRE
VICE-PRESIDENT
TECHNICAL

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ABOUT

The first Session of CIGRE took place in Paris in 1921. Today CIGRE is a non-for-profit association of professionals of the power systems, for promoting collaboration ona national and international level.

With more than **13 000 individual members** and **1500 collective members** in over **140 countries**, combining local expertise with global vision, the CIGRE community integrates all players in the electricity value chain.

It brings together researchers, engineers, suppliers, regulators, and other decision makers, all commited to sharing knowledge and collaborating to ensure reliable, affordable and sustainable electricity supply for all.

By offering access to **16 study committees**, **331 working groups**, state of the art technical publications, and world-class events such as the Paris Session, CIGRE helps its members consolidate their expertise, develop practical recommendations and find innovative solutions.

Over the years, CIGRE has been able to adapt to the incredible growth of the electricity sector. Today, as electricity penetrates every aspects of life (homes, mobility, healthcare, industry...), CIGRE meets current societal and environmental challenges, positioning itself as a key enabler of the energy transition.

More about CIGRE : www.cigre.org

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A1 POWER GENERATION AND ELECTROMECHANICAL ENERGY CONVERSION

Study Committee A1 covers all aspects of electromechanical energy conversion equipment, rotating electrical machines for power generation, grid support, and energy conversion within industrial applications. This includes research, development, design, manufacture and testing of power generation and electromechanical energy conversion equipment and their associated auxiliaries, commissioning, operation, condition assessment, maintenance, life extension, refurbishment, upgrades, efficiency improvement, conversion, storage and de-commissioning.

PRINCIPAL AREAS OF INTEREST

- **New technologies related to equipment** used in power generation and industrial applications.
- **Enhancements in the design**, construction and performance of rotating electrical machines including large turbogenerators, hydro generators and pump-storage schemes, large motors, high efficiency motors, generators for wind, solar, tidal, biomass & geothermal plant, and superconducting machines.
- **Synchronous compensator and high inertia machine** design and performance for supporting power generation networks, including conversion of existing decommissioned generators to synchronous compensators.
- **Power generation equipment** used in industrial process plant and microgrids, e.g., ships, aircraft etc.
- **Performance improvements of power generation** equipment and motors due to the development of new materials, improved cooling design, more effective insulation systems, enhanced excitation and auxiliary systems, and motor drive technologies.
- **Monitoring, diagnosis, and prognosis** of power generation equipment, motors and associated equipment to optimise maintenance strategies.
- **End-to-end lifecycle management** of assets to extend the life of existing machines or to recommend their replacement.

MAIN AREAS OF ATTENTION

Energy transition and Sustainability

- **The changing role of equipment** used for power generation and industrial applications to meet the evolving market, customer needs and expectations resulting from the energy transition to sustainable, low carbon energy sources.
- **Innovative solutions and concepts** considering economic, technical, and environmental requirements.
- **Impact and effect of hybrid power generation** and storage schemes on the design and operational duty of new and existing power generation equipment, synchronous compensators, associated auxiliaries and motors used in industrial applications.
- **Increased requirements on power generation equipment** to support the performance and reliability of power networks in the face of the increasing integration of renewable generation sources.
- **Adaptation of international standards** for equipment design and performance to reflect evolving power grid requirements.

Knowledge sharing

- **Providing a forum** where suppliers, consultants, users, and technical experts can share and exchange experiences and information.
- **Monitoring and reporting** on international developments.
- **Promoting beneficial** trends and best practices.
- **Issuing guidelines** and recommendations based on working group findings.
- **Reporting recent developments** in design, materials, insulation, cooling and bearing technology and improvements in efficiency, monitoring & diagnosis, and maintenance practices.
- **Development of younger engineers** through participation and knowledge sharing.

CURRENT ACTIVITIES

SC A1 currently has 22 active working groups addressing a range of aspects within the areas of interest. SC A1 also contributes to colloquia and symposiums including tutorials based on working group reports.

KEY PROJECTS FORTHCOMING EVENTS

August 2026 Paris Session.

TOPICS OF ACTIVE WORKING GROUPS

WG A1.42	Influence of key requirements to optimize the value of hydro generators
WG A1.43	State of the art of rotor temperature measurement
WG A1.45	Guide for Determining the Health Index of Large Electric Motors
WG A1.53	Guide on Design Requirements of Motors for Variable Speed Drive Application
WG A1.56	Survey on Lap and Wave Winding and their Consequences on Maintenance and Performance
WG A1.58	Selection of Copper Versus Aluminium Rotors for Induction Motors
WG A1.60	Guide on economic evaluation for refurbishment or replacement decisions on hydro generators
WG A1.61	Survey of Partial Discharge Monitoring in Large Motors
WG A1.62	Thrust Bearings for Hydropower - A Survey of Known Problems and Root Causes
WG A1.63	Turbo Generator Stator Winding Bushings – Design and Field Experience
WG A1.64	Guide for Evaluating the Repair/Replacement of Standard Efficiency Motors
WG A1.67	State of the Art in methods, experience and limits in end winding corona testing for Hydro Generators
WG A1.69	Hydro-Generator Excitation Current Anomalies
WG A1.70	Dielectric Dissipation Factor Measurements on Stator Windings
WG A1.71	Survey on damper-winding concepts and its operational experience on hydro generators and motor-generators
WG A1.72	Survey on multi-turn coils with dedicated turn insulation versus coils without dedicated turn insulation
WG A1.73	Customer Requirements for Qualification of Form Wound Stator Insulation Systems for Hydro Generators
WG A1.74	Evaluating quality of electric motors
WG A1.75	Large air-cooled turbo-generator – state of the art, limits and perspectives for Small Modular Reactors
WG A1.76	Study on Eco-Design, Circular economy and impacts on generator production process
WG A1.77	Survey on Insulation Reliability of Induction and Synchronous Motors
WG A1.78	Guide for the application of electrical and current signature analysis of electrical motors, generators and powertrain

LATEST PUBLICATIONS (2025)

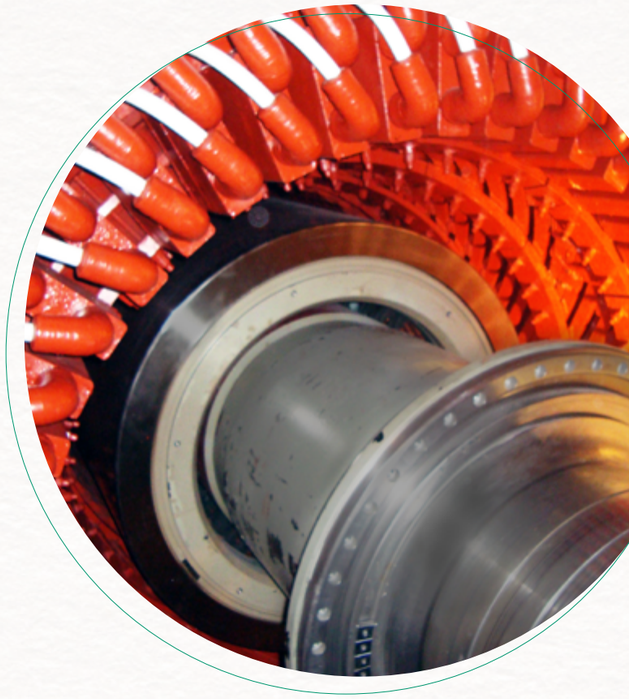
GREEN BOOK
Not applicable
TECHNICAL BROCHURES
No TBs in 2025
CIGRE SCIENCE AND ENGINEERING
No CSE articles in 2025

All of the above publications are available for download from www.e-cigre.org.

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A2 POWER TRANSFORMERS AND REACTORS

The technical field of activity of SC A2 comprises:

- **Power transformers, including, industrial, DC converter, phase-shifting and distributed energy resource (DER) transformers.**
- **Reactors, including shunt, series, saturated, and smoothing,**
- **Transformer components including bushings, tap changers and accessories.**

Within its technical field of activity, Study Committee A2 addresses topics throughout the asset management life-cycle phases; from conception; through research, design, production, deployment, operation, and end-of-life.

PRINCIPAL AREAS OF INTEREST

At all stages, technical, safety, economic, environmental, and social aspects are addressed as well as interactions with, and integration into, the evolving power system and the environment. All aspects of performance, specification, testing, and the application of testing techniques are within scope, with a specific focus on the impact of changing interactions and demands due to evolution of the power system. Life cycle assessment techniques, risk management techniques, education and training are also important aspects.

Within this framework additional specific areas of attention include:

- Theory principles and concepts, functionality, technology development, design, performance and application of materials, efficiency.
- Manufacturing, quality assurance, application guidance, planning, routing and location, construction, installation, erection, installation.
- Reliability, availability, dependability, maintainability and maintenance, service, condition monitoring, diagnostics, restoration, repair, loading, upgrading, uprating.
- Refurbishment, re-use/re-deployment, deterioration, dismantling, disposal.

MAIN AREAS OF ATTENTION

Recent SC A2 attention has been focusing on transformers for low carbon technologies, digitalisation, life management and sustainability.

CURRENT ACTIVITIES

On-going surveys on:

- Digital Twins.
- Transformer Breathing systems.
- Reliability of lower voltage generator transformers used for renewables.
- Transformer short circuit performance.

KEY PROJECTS FORTHCOMING EVENTS

August 2026 Paris Session.

Spring 2027 CIGRE Symposium, Heidelberg, Germany.

Fall 2027 CIGRE Symposium, Bangkok, Thailand.

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TOPICS OF ACTIVE WORKING GROUPS

A2/C4/D1.77	Design of transformers for very fast transient overvoltages
A2.78	Bushing Diagnostics Off-Line Testing and On-Line Monitoring Systems
A2/C3.79	Power Transformers and Reactors Sound Levels On Site
A2.80	Guide to Transformer Supplier Qualification and Development
A2.81	Guide for power transformer design review
A2.58	Site installation and pre-commissioning of power transformers and shunt reactors
A2.60	Dynamic Thermal Behaviour of Power Transformers
A2.63	Transformer Impulse Testing
A2/D2.65	Transformer Digital Twin
A2/D1.66	Transformer Breathing Systems
A2/D1.67	Guideline for online dissolved gas analysis monitoring
A2.68	Failure survey of lower voltage generator step up transformers installed in wind farms and photovoltaic parks
A2/C3.70	Life Cycle Assessment (LCA) of Transformers
A2/D1.71	Modern insulating liquids qualification for OLTC, bushings and other accessories
A2/D1.72	Retrofill of Mineral Oil in Transformers – Motivations, Considerations and Guidance
A2.73	Enhancing the exchange of Transformer information through digitalisation
A2/D1.74	Online moisture monitoring of transformers for ageing assessment
A2.75	Tap Changer Specification, Condition Assessment, Testing and Maintenance Guidelines
A2.76	Power transformer passive protection against internal arcing faults
A2/C4/D1.77	Design of transformers for very fast transient overvoltages
A2.81	Guide for power transformer design review
TASK FORCE	Explore how Differences Internationally in Regulation, Society Expectations and Government Policies Impact the Replacement Age of Power Transformers

LATEST PUBLICATIONS (2025)

TECHNICAL BROCHURES	
TB 962	Guide for Transformer Maintenance
TB 971	Transformer efficiency
CIGRE SCIENCE AND ENGINEERING	
CSE NO 38	Silver Corrosion in Transformers

All of the above publications are available for download from www.e-cigre.org.



A3 TRANSMISSION AND DISTRIBUTION EQUIPMENT

The scope of SC A3 covers the whole life cycle of AC and DC Transmission and Distribution (T&D) Equipment. This includes theory, development, design, performance, testing, installation, operation and maintenance of all switching devices, current limited fuses, surge arresters, capacitors, busbars, instrument transformers and other equipment not covered under other study committees

PRINCIPAL AREAS OF INTEREST

- Innovative design and technologies for changing network conditions (e.g., DC circuit breakers, higher ratings, smaller, smarter, environmentally friendly).
- Focus on environment and sustainability (e.g., lower carbon footprint of T&D equipment with alternative solutions to sulphur hexafluoride).
- Incorporation of intelligence into T&D equipment (e.g., controlled switching).
- Impact of inverter-based technologies on T&D equipment
- Advanced, high accuracy sensors, monitoring and diagnostics of T&D equipment.
- New and improving testing techniques.
- Reliability assessment and lifecycle management of ageing equipment.
- More resilient equipment for harsh conditions, (e.g. flooding, strong winds, ice storms, offshore).
- Digital twins, machine learning, virtual and augmented reality.

MAIN AREAS OF ATTENTION

- SC A3 provides the information on new technologies, improved specifications, reliability, and lifecycle management of transmission and distribution equipment. This scope is well suited to the various technical needs of utilities that require technical and sustainable solutions for emerging problems and challenges in changing network conditions.
- SC A3 increases its educational and tutorial activities on all relevant subjects not only within the CIGRE community but also to IEEE, IEC, and many related international conferences and exhibitions.
- SCA3 continuous supporting the Africa projects for enhancing knowledge of emerging countries of this continent participating in the Workshop organized by CIGRE.

CURRENT ACTIVITIES

Energy Transition, requirements for T&D equipment in a more powerful and interconnected grid

- Higher short circuit current, and time constant, lower inertia .
- Higher power requirements at distribution level due to Electric Vehicle charging stations, Storage, Photovoltaic.
- Increasing of HVDC. Innovative designs and technologies (e.g. DC circuit breakers).
- Impact of harmonics and other Power Quality issues.
- More frequent switching, and transients, due to less predictable energy production and consumption.

Change of environmental conditions

- Climate: Increasing temperature, more severe storms.
- Offshore Installations.

Reduction of environmental footprint

- Material shortage and circular economy.
- Impact of policies on T&D equipment (GWP reduction, SF6 ban, PFAS ban).
- Closer CONTACTS with international and regional initiatives and regulations for better understanding the rules, estimate their impact and sustainability.

Digitalization

- Impact on T&D equipment, shared common vision within CIGRE and other organizations (e.g. IEC, IEEE, ...).
- Instrument Transformers, transition to digital, impact in terms of linearity, bandwidth, co-existence with analogue equipment.
- Digital Twin, advanced models for T&D Equipment, application of AI.
- Monitoring and diagnostics of T&D equipment: integration of monitoring in IEC 61850, common database for more accurate statical models.

KEY PROJECTS / FORTHCOMING EVENTS

SC MEETINGS

- The next SC A3 Meeting will take place jointly with Paris Session 2026.
- The over next will take place jointly with CIGRE B3/A3 Colloquium 2027 (see below for further details).

SYMPOSIA / COLLOQUIA / SESSION

August 2026 CIGRE Session, Paris France.

May 2027 CIGRE Symposium, Heidelberg, Germany.

Autumn 2027 CIGRE B3/A3 Colloquium, Japan.

TOPICS OF ACTIVE WORKING GROUPS

WG A3.39	Application and field experience with Metal Oxide Surge Arresters
WG A3.42	Failure analysis and risk mitigation for recent incidents of AIS instrument transformers
WG A3.46	Generator Circuit-Breakers: review of application requirements, practices, in-service experience and future trends
WG A3.47	Lifetime Management of Medium Voltage Indoor Switchgear
WG A3.48	4th CIGRE Reliability Survey on Transmission and Distribution Equipment
WG A3.49	Aging effects on accuracy class of Instrument Transformers
WG A3.50	On-site calibration and verification of the accuracy of instrument transformers
WG A3.51	Requirements for HV T&D Equipment operating under Abnormal Weather Conditions
JWG A3/D2.52	Application of Digital Twin in Switchgear
JWG A3/A2/B3/B4/C4.53	Inductive load Switching in transmission and distribution systems
JWG A3/B3/D2/IEEE PES.54	Global database for circuit breaker testing data
JWG B3/A3.60	User guide for non-SF6 gases and gas mixtures in Substations
JWG B3/A2/A3/C3/D1.66	Guidelines for Life Cycle Assessment in Substations considering the carbon footprint evaluation
JWG B3/A3.67	Operational safety of Medium Voltage GIS in case of abnormal leakage
JWG C4/A3/B2/B4.75	Guide to procedures for the creation of contamination maps required for outdoor insulation coordination

LATEST PUBLICATIONS (2025)

TECHNICAL BROCHURES	
TB 947	Results of the 4th International Reliability Survey (2014–17).
TB 953	Tools for lifecycle management of T&D switchgear based on data from condition monitoring systems.
TB 976	Methods for identification of frequency response characteristic of voltage measurement systems
CIGRE SCIENCE AND ENGINEERING	
CSE NO 36	In-service circuit breaker condition assessment
CSE NO 38	Long-term transient signal monitoring at inductive load switching with VCB – objectives and first experiences

All of the above publications are available for download from www.e-cigre.org.



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The scope of SC B1 covers the whole life cycle of AC and DC insulated cables for land and submarine power transmission, from conception through research, development, design, production, deployment, operation and end-of-life.

Life cycle assessment, risk management, education and training are also important aspects. Added focus on optimizing cable design for "unconventional" usage as part of the energy transition.

PRINCIPAL AREAS OF INTEREST

- Theory, principles and concepts, functionality, technological development, design, performance and application of materials, efficiency.
- Manufacturing, testing, quality assurance, application guidance, planning, routing and location, construction, erection, installation.
- Reliability, availability, dependability, maintainability and maintenance, service, condition monitoring, diagnostics, restoration, repair, loading, upgrading, uprating.
- Refurbishment, re-use/re-deployment, deterioration, dismantling, disposal.

MAIN AREAS OF ATTENTION

- Advancing insulated cable system technology (AC/DC, land/submarine), including designs supporting the energy transition.
- Integrating cable systems into power networks and the environment across the full life cycle.
- Providing unbiased, state-of-the-art guidance on key engineering topics (technical, economic, ecological and social).
- Monitoring and assessing trends in cable technology and applications.

CURRENT ACTIVITIES

- Preparation of recommendations for further standardization by IEC and the usage of cables to facilitate the energy transition.
- Tutorials and webinars for technical and non-technical audiences.

KEY PROJECTS FORTHCOMING EVENTS

August 23-28, 2026 Paris Session.

September 2027 Jicable'27 – In connection with SC B1's 100th years anniversary, Lyon.

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TOPICS OF ACTIVE WORKING GROUPS

WG B1.67	Loading pattern on windfarm array and export cables
JWG B1/C4.69	Recommendations for the insulation coordination on AC cable systems
WG B1.70	Recommendations for the use and the testing of optical fibres in submarine cable systems
WG B1.72	Cable rating verification – application in complex situations
JWG B1/B3.74	Recommendations for a performance standard of insulated busbars
WG B1.76	Enhancing Quality Assurance/Quality Control procedures for (E)HV cable systems
WG B1.80	Guidelines for site acceptance tests of Distributed Temperature Sensing (DTS) and Distributed Acoustic Sensing (DAS) systems when used for power cable systems monitoring
WG B1.82	MVDC cable system requirements
WG B1.83	Grounding aspects for HVDC land cable connections
JWG B1/C3.85	Environmental impact of decommissioning of underground and submarine cables
WG B1.86	Assessment, prevention and mitigation of safety risk in cable systems
WG B1.88	Non-SF6 GIS terminations
WG B1.89	Guidance for conducting cable systems failure analysis
WG B1.90	Cable systems electrical characteristics (update of TB 531)
WG B1.91	Transient thermal modelling of power cables (update to IEC 60853)
WG B1.92	Qualification of lead-free submarine cables at 72.5 kV < Um < 170 kV
WG B1.94	Grid operations (switching etc ...) and Transient voltages in XLPE insulated cable systems possibly causing accelerated failure modes
WG B1.95	Mechanical performance and limits of submarine cables – modelling and testing
WG B1.99	Evaluation of sustainable power cables system and their installation
WG B1.100	Guide for robust qualification procedures of DMR cable
WG B1.101	DC Superconductive Cable Systems
WG B1.102	Specific tests and characteristics of cable systems with conductor cross sections larger than 2500mm²
WG B1.105	Enhancing Thermal Monitoring, Dynamic Rating and Digital Integration by use of Fibre Optic Elements in Power Cable Systems
WG B1.107	Cable accessory failure hazard mitigation

LATEST PUBLICATIONS (2025)

TECHNICAL BROCHURES (SELECTION)	
TB 957	Recommendations for dielectric testing of HVDC gas insulated system cable sealing ends
TB 959	Behaviour of cable systems under large disturbances (earthquake, storm, flood, fire, landslide, climate change)
TB 963	Finite Element Analysis for Cable Rating Calculations: IEC 62095 update
TB 968	Interaction between cable and accessory materials in HVAC and HVDC applications
ELECTRA 341	Application of autonomous platforms/robots in power cable operation and maintenance

All of the above publications are available for download from www.e-cigre.org.



B2 OVERHEAD LINES

Study Committee B2 covers the design, construction and operation of overhead lines. This includes the mechanical and electrical design and experimental validation of new line components (e.g. conductors, ground wires, insulators, accessories, structures and their foundations), the study of in-service line performance and assessment of aged line components, line maintenance, the refurbishment and life extension as well as upgrading and uprating of existing overhead lines.

Overhead lines play an important role for the Power System of the Future and its challenges. The activities of SC B2 are fully aligned with this important aspect of CIGRE´s mission.

All aspects of overhead line design (AC and DC), construction and maintenance, including modification of existing lines and environmental considerations.

PRINCIPAL AREAS OF INTEREST

- Route selection.
- Optimized line design.
- Line maintenance & service.
- Refurbishment of existing lines.
- Design specifications.
- Increased power flow of existing lines.
- Asset management guidelines.
- Real-time monitoring systems.
- New materials.
- Sustainability of line components.
- Minimizing the environmental impact of lines.

MAIN AREAS OF ATTENTION

Electrical Performance

- Deals with utilization of new and existing overhead power lines including modification of existing lines to allow increased power flow and economic design of new lines.

Towers, Insulators and Foundations

- Seeks to improve diagnostic tools and modelling of in-service components, both dynamic and static, foundation and structure loads, repair of corrosion in structures, and evaluation of new materials for line supports.

Conductors and Fittings

- Covers conductor fatigue and endurance capability, protection against wind induced vibrations, assessment of aged fittings and support in the preparation of standards, e.g. for fittings, conductor self-damping and conductor fatigue.

Asset management

- Considers electrical and civil aspects of line reliability and availability, including climatic loads, electrical clearances and live-line working.



CURRENT ACTIVITIES

- CIGRE Africa Workshop in Dakar, Senegal March 2026 (SCs involved: B2 (lead) along with SCs A3, C1 and, C5).
- CIGRE Centennial Session Paris August 2026.
- B2 Annual Meeting at the Paris Session 2026.

KEY PROJECTS FORTHCOMING EVENTS

CIGRE Germany 2027.

CIGRE Thailand 2027 (B2-Technical Co-Chair).

TOPICS OF ACTIVE WORKING GROUPS

B2.60	Affordable Overhead Transmission Lines for Sub-Saharan Countries
B2.66	Safe handling and installation guide for high temperature low sag (HTLS) conductors
B2.67	Assessment and Testing of Wood and Alternative Material Type Poles
B2.68	Sustainability of OHL conductors and fittings – Conductor condition assessment and life extension
B2.70	Aircraft warning markers and bird flight diverters for Overhead Lines – Experience and recommendations
B2.71	Recommendations for Interphase Spacers of Overhead Lines
B2/D2.72	JWG Condition Monitoring and Remote Sensing of Overhead Lines (lead B2)
B2.73	Guide for Prevention of Vegetation Fires Caused by Overhead Line Systems
B2.74	Use of unmanned aerial vehicles (UAVs) for assistance with inspection of overhead power lines
B2.75	Application guide for insulated and un-insulated conductors used on medium and low voltage overhead lines
B2.77	Risk Management of Overhead Line networks: A model for identification, evaluation and mitigation of operational risks
B2.78	Use of High Temperature Conductors in New Overhead Line Design
B2.79	Enhancing Overhead Line Rating Prediction by Improving Weather Parameters Measurements
B2.80	Numerical Simulation of electrical fields on AC and DC Overhead Line Insulator Strings
B2.82	Overhead Line Foundations for Difficult Soil and Geological Conditions
B2.83	Mitigation of induced noises by corona activity in overhead AC and DC lines
B2.84	Assessment of the methodologies to analyse wind induced overhead line conductor motion: applications and limitations.
B2.85	Emergency Restoration Systems for Overhead Lines - Guide for Design, Planning and Installation
B2/C1.86	Approach for Asset Management of Overhead Transmission Lines
B2.87	Live line and vicinity working on overhead lines: Safe Management Guidelines
B2.88	Guidelines for safety of overhead line construction, maintenance & operation
B2.89	Impact of rain upon the characteristics of corona discharge from HV AC and DC overhead transmission lines
B2/B1.90	Transition facilities between overhead and underground lines
B2.91	Long overhead line spans design practices and field experience
B2.92	Update on overhead transmission lines construction methodologies
B2.93	Artificial Intelligence (AI) Augmented Image-Based Transmission Line Inspection and Condition Assessment
B2.94	Inspection after installation, maintenance and end of life of high temperature conductors and fittings
B2.95	Climate change impacts on the design standards for high voltage overhead lines
B2.96	Composite Insulated Cross-arms for New-build and Retrofitted Transmission Line Supports
B2.97	Galloping effect on overhead line (OHL) components and mitigations

LATEST PUBLICATIONS (2025)

Green Books

- Compact overhead line design, AC and DC lines, Rob Stephen, Javier Iglesias, January 2024 (Translation in Chinese December 2025).
- Dynamic Loadings on towers and foundations (Expected date of publication 2026).
- Innovative solutions for overhead line supports (Expected date of publication 2027).
- Coatings for Protection of Overhead Power Lines (Expected date of publication 2027).

TECHNICAL BROCHURES	
TB 964	Increasing the strength capacity of existing overhead transmission line structures, May 2025, 101 pages
TB 969	Forecasting dynamic thermal line ratings, August 2025, 94 pages
TB 978	Detection, prevention and repair of sub-surface corrosion in overhead line supports, anchors and foundations March 2026 342 Pages
TB 979	Lightning & Grounding Considerations for Overhead Line Rebuilding and Refurbishing Projects, AC and DC March 2026, 285 Pages
CIGRE SCIENCE AND ENGINEERING	
CSE NO 35	Improved model for overhead line audible noise prediction, Oliver Pischeler, Uwe Schichler, Isobel Green, David Borrie , December 2024
CSE NO 36	Potential Wildfire-induced Tripping Section Assessment of Transmission Line Based on Tree Identification and Flame Combustion, Linmeng Fan, Enze Zhou, Lei Wang, You Zhou, February 2025
CSE NO 36	Drag coefficient modelling for OHL conductors, S. Steevens, E. Ulloa Jimenez, J. Unterfinger, N. Holscher, I. Guven, M. Passman, February 2025

All of the above publications are available for download from www.e-cigre.org.

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B3 SUBSTATIONS AND ELECTRICAL INSTALLATIONS

SC B3 has a focus to facilitate and promote the progress of engineering and the international exchange of information and knowledge in the field of electrical substations. SC B3 acts to add value to the utility community and knowledge by means of synthesizing state-of-the-art practices, developing recommendations and providing best practice.

PRINCIPAL AREAS OF INTEREST

The activities cover the design, construction, maintenance and ongoing management of substations and the electrical installation in power stations excluding generators. SC B3 serves a wide range of target groups in the Electric Power Industry whose needs include the technical, economic, environmental and social aspects in varying degrees.

Major objectives include increased reliability and availability, cost effective engineering solutions, managed environmental impact, effective asset management and the adoption of appropriate technological advances in equipment and systems to achieve these objectives.

MAIN AREAS OF ATTENTION

- Electrical Substations for Distribution, Transmission and Generation installations.

CURRENT ACTIVITIES

PROJECTED TO PUBLISH THIS YEAR	
WG B3.52	Neutral grounding mode selection and fault handling for substation in distribution grid
WG B3.54	Earthing System Testing Methods
WG B3.56	Application of 3D Technologies in Substation Engineering Works
JWG B3/A3.60	Application: User guide for non-SF6 gases and gas mixtures
WG B3.61	Risk and asset health-based decision making in existing substations
JWG B3/D2.62	Life-long Supervision and Management of Substations by use of Sensors, Mobile Devices, Information and Communication Technologies
WG B3.64	Guidelines on Optimising Seismic Design of Substations for Power Resiliency
WG B3.65	Guidelines for the Selection and Design of escape routes for substations rated above 1kV AC and 1.5 kV DC
B3 Annual Report	June 2026

KEY PROJECTS / FORTHCOMING EVENTS

23rd-28th August 2026
Paris, France, Symposium 2026.

21st -24th, September 2026
Calgary, Alberta, Canada, Colloquium.

26th 30th, April 2027
Heidelberg, Germany, Symposium 2027.

25th -29th, October 2027
Tokyo, Japan, Colloquium 2027.

8th -11th, November 2027
Thailand, Bangkok, Symposium 2027.

TOPICS OF ACTIVE WORKING GROUPS

WG B3.73	Guidelines for the Use of Advanced Technologies for Information and Knowledge Management in Substations
WG B3.73	Asset management and digital integration of mobile substations for a resilient and flexible transmission grid
WG B3.72	Integration of asset information in modern substations for (asset) management of substation equipment
WG B3.71	Substations Improvements to Support Black Start Capability
WG B3.70	Guidelines for the Use of Advanced Technologies for Information and Knowledge Management in Substations
WG B3.69	Process Requirements for Commissioning and Inspection of Air Insulated Substations (AIS) and Gas Insulated Substations (GIS)
WG B3.68	Experience of Offshore Substation (OSS) operation and maintenance
WG B3.65	Guidelines for the Selection and Design of escape routes for substations rated above 1kV AC and 1.5 kV DC
WG B3.64	Guidelines on Optimizing Seismic Design of Substations for Power Resiliency
WG B3.61	Risk and asset health based decision making in existing substations
WG B3.56	Application of 3D Technologies in Substation Engineering Works
WG B3.54	Earthing System Testing Methods - historic approaches, recent developments and recommended approaches
WG B3.52	Neutral Grounding Method Selection and Fault Handling for Substations in the Distribution Grid
WG A3/A2/ B3/B4/C4.53	Inductive load Switching in transmission and distribution systems
WG B1/B3/ D1.79	Recommendations for dielectric testing of HVDC gas insulated system cable sealing ends
WG B1/B3.74	Recommendations for a performance guideline of Polymer Insulated Busbars
WG B3/A2/ A3/C3/D1.66	Guidelines for Life Cycle Assessment in Substations considering the carbon footprint evaluation
WG B3/A3.60	User guide for non-SF6 gases and gas mixtures
WG B3/A3.67	Operational safety of Medium Voltage GIS in case of abnormal leakage.
WG B3/D1.63	Guideline for assessing the toxicity of used SF6 gas onsite and in the lab of T&D equipment above 1 kV in substations
B3/D2.62	Life-long Supervision and Management in Substations by Sensors, Mobile Devices and ICTs

LATEST PUBLICATIONS (2025)

There was no new brochure published.

Future Connections:
December 2025 Edition Process Requirements Experience of Offshore Substation Operation and Maintenance.

All of the above publications are available for download from www.e-cigre.org.

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B4 DC SYSTEMS AND POWER ELECTRONICS

The scope of Study Committee B4 includes the technologies and applications of Direct Current (DC) and Power Electronics (PE) in both transmission and distribution systems. The study committee also addresses DC Converters for the integration of distributed renewable (PVs) and energy storage as well as power quality control. SC B4 covers the full spectrum of DC systems and PE devices including specification, performance, design, implementation, operation, maintenance, refurbishment of DC, FACTS and other power electronic devices from transmission to distribution systems.

PRINCIPAL AREAS OF INTEREST

The principal areas of interests include the following:

- Application of increased power and voltage rating of VSC HVDC for both offshore and onshore renewable energy interconnections.
- Advancing the technologies of inverters with Grid-Forming control capabilities to improve and enhance the reliability and stability of the PE dominated power system with integration of growing renewable generations and battery storage resources.
- Implementation of Interoperability of HVDC systems constructed by various HVDC OEMs for flexible and reliable operation and control of largely interconnected power system through HVDC system.
- Tackling the technical challenges associated with increasing penetration of power electronics system/devices in the power system.
- DC interconnectors and establishment of DC grid(s) to increase power transmission capacities and to reduce existing network congestions, to enable power trading, to share spinning reserve, and to reduce energy costs etc.
- Application of higher power, voltage rating, active filtering of FACTS device to support the flexible transmission of AC power, improve voltage stability, the change of generation patterns and power quality within the ac networks.
- Application of DC technologies and PE in distribution system for better power quality control.
- Learning the project and operational experience of VSC HVDC systems to further improve the application of this technology
- Application of DC and PE technology in Hydrogen production.

CURRENT ACTIVITIES

The members of SC B4 come from manufacturers, utilities, transmission system operators (TSOs), distribution system operators (DSOs), consultants and research institutes. SC B4 has 539 experts from 39 countries including 48 women engineers. The B4 members are actively involved in 18 Working Groups including 4 JWGs and 1 task force. SC B4 has completed Green book on HVDC in 2025. The activities of SC B4 WGs focus on the following areas.

- Grid forming converters including HVDC, FACTS, IBR, and energy storage system.
- Interaction between nearby VSC-HVDC converters, FACTs devices, HV power electronic devices and conventional AC equipment.
- Electric energy storage systems embedded in HVDC systems.
- HVDC for renewable generation such as PV and wind interconnection.
- Dynamic active and reactive power supporting devices for VSC HVDC Systems.
- Offshore DC converter design aspects.
- Interoperability in HVDC system.
- Integration of DC systems to meshed DC/AC Transmission networks.
- Harmonization of voltage designations and definitions across different HVDC component technologies.
- Insulation coordination and interface management of VSC converters and DC cables.
- DC system/converter modelling and study guidelines and methodologies.
- DC grids power control and protection including DC breakers, fault current limiting.
- Operation and maintenance (O&M), reliability and availability (RAM), Digital Twin of HVDC/FACTS.
- PE in distribution system.

KEY PROJECTS FORTHCOMING EVENTS

SC B4 had the following key events in 2025

CIGRE TRONDHEIM SYMPOSIUM (MAY 2025)

Three paper sessions

- DC-Hub, DC-Grid and Multi-Terminal HVDC (8 papers).
- HVDC Planning, Design, Standardization (8 papers).
- Energy Storage, HVDC Auxiliary Equipment and Components (8 papers).
- Grid Forming, analysis methodologies (4 papers).

Tutorials

- The impact of offshore wind hybrid AC/DC connections on system operations and system design(C2/B4).
- Interoperability in HVDC systems using partially open-source software.

Workshop

- InterOPERA at Crossroads – advancing multi-vendor HVDC interoperability.
- Modelling and tools for resilient power system design: a HVDC-WISE workshop (B4/C4).

CIGRE MONTREAL SYMPOSIUM (SEPTEMBER 2025)

SC B4 Study Committee meeting

The B4 SC meeting was held in Montreal on Sunday, September 28. Approximately 60 people attended the meeting.

Topics discussed at the meeting included:

- CIGRE Paris Session 2026.
- Updates from CIGRE Central Office and Technical Committee.
- Reports from B4 Advisory groups.
- Reports from B4 working groups.
- Proposals for new B4 working groups.
- Future locations for B4 meetings.
- Reports from liaisons.
- New HVDC / FACTS projects.
- Emerging technologies in HVDC / FACTS.

Eight paper sessions

- HVDC/FACTS – Interaction & Coupling (8 papers).
- HVDC – Project Planning, Design & Testing (6 papers).
- HVDC – Control, Protection & Performance (9 papers).
- Multiterminal HVDC (9 papers).
- Meshed AC/DC Systems (6 papers).
- FACTS – Application, Design, Control & Performance (8 papers).
- HVDC/FACTS – Reliability, performance, monitoring and cybersecurity (6 papers).
- Application of Real Time Simulation and Hardware in the Loop in HVDC/FACTS/IBRs (4 papers).

Tutorials

- B4.89 Condition Health Monitoring and predictive maintenance of HVDC Converter Stations.
- AG04 – Protocol for operational performance of HVDC systems and FACTS.
- B4.90 – Operation and maintenance of HVDC and FACTS facilities.

TOPICS OF ACTIVE WORKING GROUPS

B4.64	Impact of AC System Characteristics on the Performance of HVDC schemes
B4.69	Minimizing loss of transmitted power by VSC during Overhead line fault
B4.71	Application guide for the insulation coordination of Voltage Source Converter HVDC (VSC HVDC) stations
B4/A3.86	Fault Current Limiting Technologies for DC Grids
B4.87	Voltage Source Converter (VSC) HVDC responses to disturbances and faults in AC systems which have low synchronous generation
TF B4/B1.88	Insulation coordination procedure for DC cable systems in HVDC stations with Voltage Source Converters (VSC)
B4.89	Condition Health Monitoring and predictive maintenance of HVDC Converter Stations
B4.90	Operation and maintenance of HVDC and FACTS Facilities
B4.91	Power-electronics-based transformer technology, design, grid integration and services provision to the distribution grid
B4C4.93	Development of Grid-Forming Converters for Secure and Reliable Operation of Future Electricity Systems
B4.94	Application of grid-forming VSC-HVDC system in black start restoration
B1/B3/B4/C4/D1.95	Harmonization of voltage designations and definitions across different HVDC component technologies
C4/B4.72	Lightning and Switching Induced Electromagnetic Compatibility (EMC) issues in DC power systems and new emerging power electronics-based DC equipment
B4.95	Developments in Power Semiconductor Technologies and Applications in HVDC/FACTS
B4.96	HVDC connection of power system with high proportion of photovoltaic (PV) generation
C4/A3/B2/B4.75	Guide to procedures for the creation of contamination maps required for outdoor insulation coordination
B4/C1.97	Benchmarking of simulations models for control interaction in meshed AC networks with multiple converters
C1/B4.49	Offshore transmission planning
B4.98	Design considerations in integration of DC systems to meshed DC/AC Transmission networks
B4.99	Design and Construction of offshore Voltage Sourced Converter (VSC) Stations
B4.100	Dynamic Active and Reactive Power Supporting Devices for VSC HVDC Systems
B4.101	Industrial Implementation and Application of Grid Forming Energy Storage Systems (GFM ESS)
B4.102	Technical Requirements and Scenario Considerations on Grid-Forming Capabilities of VSC-HVDC Systems
B4/C4.103	AC Network Equivalents for HVDC and FACTS Project Studies
B4.104	HVDC Digital Twin - concepts and roadmap
C4/B1/B2/B4	Interference effects between HVDC circuits and nearby metallic pipelines
B4/C4.100	Guide for Electromagnetic Transient Studies of VSC-HVDC connected offshore or onshore islanded wind farms
B4/B1.106	Guideline for VSC HVDC Converter and DC Cable Interface Management
C1/B4.58	VSC-HVDC transmission system planning

LATEST PUBLICATIONS (2025)

TECHNICAL BROCHURES (SELECTION)

TECHNICAL BROCHURES (2024)	
B4.79	Hybrid LCC/VSC HVDC systems – TB 950
B4.81	Interaction between nearby VSCHVDC converters, FACTs devices, HV power electronic devices and conventional AC equipment – TB 934
B4.84	Feasibility study and application of electric energy storage systems embedded in HVDC and STATCOM systems
TECHNICAL BROCHURES (2025)	
B4.82	Guidelines for Use of Real-Code in EMT Models for HVDC, FACTS and Inverter based generators in Power System Analysis – Garth Irwin – TB 958
B4.85	Interoperability in HVDC systems based on partially open-source software –Staffan Norrga – TB 961
C2/B4.43	The impact of offshore wind power hybrid AC/DC connections on system operations and system design – Christer Norlander – TB 972
AG04	Protocol for Reporting the Operational Performance of HVDC Systems – Josh Burroughs – TB 956
CSE PAPERS (2024)	
	Small-Signal Analysis Benchmarking of Three Control Algorithms for Grid-Forming Inverters – CSE032
	Methodology to select the arm inductance in Modular Multilevel Converters for HVDC applications based on steady-state and DC pole-to-pole fault – CSE033
	Hydro-Québec's Châteauguay back-to-back HVDC converter replacement project: Integration of new operating modes for system resiliency improvement and water management effectiveness using VSC-HVDC – CSE035
CSE PAPERS (2025)	
	Overvoltages experienced by Metallic Return Cables in Bipolar HVDC Configuration – CSE036
FUTURE CONNECTION (2024)	
	HVDC Digital Twin – concepts and roadmap
ELECTRA (2025)	
	IGCT in High-voltage direct current Transmission – N343

All of the above publications are available for download from www.e-cigre.org.

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Study Committee B5 (SC B5) - Protection and Automation focuses on protection, control, monitoring and metering, and aims to cover the whole power system, end to end related to this topic, from transmission, to distribution systems, including generation.

THE MISSION OF SC B5 IS AS FOLLOWS

- The mission of SC B5 is to facilitate and promote international advancements in engineering, exchange of information, and expansion of knowledge in the field of protection and automation, covering the whole power system, including transmission, distribution and generation.
- This includes adding value to this information and knowledge by means of synthesizing state-of-the-art practices, identifying and evaluating technological and functional evolutions and developing recommendations.

THE VISION FOR SC B5 IS AS FOLLOWS

- Be recognized as the leading global reference on protection, control, monitoring, metering, and fault location.
- Provide a global perspective on the issues and challenges related to protection, control, monitoring, metering, and fault location.
- Provide independent expertise on emerging and existing technologies.
- Realise high-quality unbiased publications about protection, control, monitoring, metering and fault location.

SCOPE OF WORK

Within its technical field of activity, Study Committee B5 addresses the following aspects of functions, systems, components and devices over their life-cycle:

- Research and development,
- Conception, specification and design,
- Engineering and manufacturing,
- Configuration,
- Deployment and documentation,
- Operation and maintenance,
- End of Life.

A specific focus lies on the impact of changing interactions and demands due to technology evolution and changing power systems. Life cycle assessment techniques, risk management techniques, education and training are also included.

PRINCIPAL AREAS OF INTEREST

- Theory, principles and concepts, functionality, technological development, design, performance and application of materials, efficiency.
- Application guidance, planning, installation, service conditions.
- Reliability, availability, dependability, maintainability and maintenance, service, Condition Monitoring, diagnostics, operation and failure analysis, restoration, repair, loading, upgrading, uprating.
- Refurbishment, re-use/re-deployment, deterioration, dismantling, disposal

MAIN AREAS OF ATTENTION

The following areas are of principal interest for SC B5;

- Power system protection, automation and control principles, methods and applications, including protection of networks connected to renewable energy resources.
- Functional integration, virtualisation and implementation in the cloud of protection systems and substation automation systems.
- Protection, automation and control system architectures including process interfaces, digital signal transmission, communication architecture, time synchronisation, and related issues.
- New network requirements.
- design and application of digital technology and modern communication system.
- embedded generation.
- smart grid techniques.
- new protection requirements, including wildfire detection and protection.
- protection of networks with a high penetration of inverter based devices (HVDC, renawbale generation).
- IEC 61850 based data modelling, protection, automation and control configuration and engineering.
- Metering.
- Process data acquisition, modelling and publication for protection, fault recording, monitoring, metering and asset management applications (interface to HV equipment monitoring).
- Monitoring of protection, control, metering, fault locating devices and systems including associated communication equipment.
- System-wide protection and control schemes.
- Protection, control and monitoring applications based on telecommunication links, satellite, or cell phone communications.
- Exploring and evaluating emerging technology for protection, automation, and control across power system.
- Design, engineering, monitoring and performance assessment of System Integrity Protection Schemes (SIPS).
- Design, engineering, monitoring and performance of protective function based power system security and stability enhancing schemes like Automatic Under Frequency Load Shedding (AUFLS), Automatic Under Voltage Load Shedding (AUVLS), anti-islanding, fault ride through, auto-reclosure scheme etc.

CURRENT ACTIVITIES

The following aspects are of current interest for SC B5:

- Substation automation and remote control covers all aspects of co-ordinated and integrated systems for protection and automation of substations (TM51).
- Protection and monitoring covers the protection and monitoring of primary plant and circuits, to maintain power system security, to limit plant damage and to ensure the safety of personnel (TM52).
- New network requirements covers the design and application of digital technology and modern communication systems for the benefit of modern and future networks featuring embedded generation and smart grid techniques (TM53).

Activities towards new CIGRE topics:

Hydrogen

- In the future there could be advancement of protection and automation used in the hydrogen plants.

Storage

- In the future there will be a need for protection and automation optimization for long duration energy storage (such as utility scale battery systems).

Wind & Solar

- Power system protection, automation and control principles, methods and applications, including protection of networks connected to renewable energy resources, in particular those connected via converters.
- New network requirements covering the design and application of digital technology and modern communication system for the benefit of modern and future networks featuring greater embedded generation and smart grid techniques.
- Impact of harmonics and low inertia on protection and automation.

Grids, Microgrids integration & Flexibility

- Protection and automation for microgrid integration.
- Sensor integration.
- Condition monotoring and assessment.

Consumer, Prosumers and EV

- In the future there could be protection and automation for integration of new technologies (such as power electronics).
- In the future there could be circular economy, end of life of protection and automation, condition assessmen.t

Sustainability & Climate Change

- Protection and automation used to monitor and protect substations, power plants and overhead lines under severe weather conditions etc.
- Use of protection and automation to improve grid resilience related to climate change.
- Evolution of requirements of protection and automation hardware digitalization.
- Functional integration and virtualization of protection systems and substation automation systems.
- IEC 61850 based data modelling, Protection, Automation and Control configuration and engineering.
- Digital twins for Protection, Automation and Control.

KEY PROJECTS FORTHCOMING EVENTS

- CIGRE Paris session August 2026.
- PS1: Knowledge management in the field of protection, automation, control, metering and monitoring.
- PS2: Protection and control in networks with unconventional sources.
- CIGRE SC B5 Colloquium Toronto, September 2027.
- PS1 Experience and challenges regarding SIPS and WAMPAC.
- PS2 New requirements of network protection and control for renewable energy integration.
- PS3 Artificial Intelligence in PACS.



TOPICS OF ACTIVE WORKING GROUPS

WG B5.51	Requirements and Use of Remotely Accessed Information for SAS Maintenance and Operation
WG B5.55	Application of Travelling Wave Technology for Protection and Automation
WG B5.57	New challenges for frequency Protection
WG B5.58	Faster Protection and network Automation systems: implications and requirements
WG B5.59	Requirements for Near-Process Intelligent Electronic Devices
JWG B5/C4.61	Impact of Low Inertia Network on Protection and Control
WG B5.63	Protection, Automation and Control System Asset Management
WG B5.65	Enhancing Protection System Performance by Optimising the Response of Inverter-Based Sources
WG B5.68	Optimisation of the IEC 61850 Protection, Automation and Control Systems (PACS) Engineering Process and Tools
WG B5.71	Protection, Automation and Control Systems Communication Requirements for Inter-Substation and Wide Area Applications
WG B5.72	Modelling, Assessment, and Mitigation of Protection Performance Issues caused by Power plants during Dynamic Grid Events
WG B5.73	Experiences and Trends related to Protection Automation and Control Systems Functional Integration
WG B5.74	Busbar Protection Considerations When Using IEC 61850 Process Bus
WG B5.75	Documentation and version handling related to Protection, Automation and Control functions
WG B5.76	Architecture, Standards and Specification for Metering system in a Digital Substation and Protection, Automation and Control (PACS) Environment
WG B5.77	Requirements for Information Technologies (IT) and Operational Technology (OT) managed of Protection, Automation and Control Systems (PACS)
WG B5.78	New requirements of network Protection and Control for renewable energy integration
JWG B5/C4.79	Protection Roadmap for Low Inertia and Low Fault Current networks
WG B5.81	Obsolescence Management for Protection, Automation and Control Systems
WG B5.83	Protection for modern distribution networks
WG B5.84	Recommendations and constraints for development and interfacing of virtual Intelligent Electronic Device implemented in Protection, Automation and Control Systems
WG B5.85	Protection, Control and Supervision principles of “Grid Stabilizing Generation”
WG B5.86	Protection Automation and Control System interfaced asset management and condition monitoring using innovative technologies
WG B5.87	Digital Transformation of Protection, Automation and Control Systems expanding the Application of IEC 61850
WG B5.88	Implementation Guide for fully digital IEC 61850-based Protection, Automation and Control Systems
WG B5.89	Protection Redundancy and Backup for Modern Power Systems
WG B5.90	Guidelines for commissioning and testing of fully digital PACS
WG B5.91	Monitoring and Diagnostic of PACS in Digital Substation
JWG C2/B5.46	System Integrity Protection Schemes and the (N-1) criteria

LATEST PUBLICATIONS (2024 AND 2025)

TECHNICAL BROCHURES FROM FINALISED WORKING GROUPS IN SC B5 IN 2024 AND 2025:	
TB 926	Methods for specification of functional requirements of protection, automation, and control
TB 949	Experience Gained and Recommendations for Implementation of Process Bus in Protection, Automation and Control Systems
TB 977	Education, qualification and continuing professional development of engineers in protection, automation and control
TECHNICAL BROCHURES (2010-2025)	
TB 977	Education, qualification and continuing professional development of engineers in protection, automation and control
TB 949	Experience Gained and Recommendations for Implementation of Process Bus in Protection, Automation and Control Systems
TB 926	Methods for specification of functional requirements of protection, automation, and control
TB 896	Protection for Developing Network with Limited Fault Current Capability of Generation
TB 891	Protection, Automation and Control Architectures with Functionality Independent of Hardware
TB 884	Time in Communication Networks, Protection and Control Applications – Time Sources and Distribution Methods
TB 854	Analysis and comparison of fault location systems in AC Power networks

LATEST PUBLICATIONS (2024 AND 2025)

TB 843	Life Cycle Testing of Synchrophasor Based Systems used for Protection, Monitoring and Control
TB 829	Challenges with series compensation applications in Power systems when overcompensating lines
TB 819	IEC 61850 based substation Automation systems – Users expectations and stakeholders interactions
TB 810	Protection and Automation issues of islanded systems during system restoration/black start
TB 800	Network protection performance audits
TB 790	Cybersecurity Requirements for PACS and the Resilience of PAC Architectures
TB 789	Improved Metering Systems for Billing Purposes in Substations
TB 768	Protection Requirements on Transient Response of Digital Acquisition Chain
TB 760	Test Strategy for Protection Automation and Control (PAC) Functions in a Fully Digital Substation based on IEC 61850 Applications
TB 739	Protection and Local Control of HVDC Grids
TB 716	System conditions for and probability of out-of-phase
TB 711	Control and Automation systems for Electricity Distribution Networks (EDN) of the future
TB 687	Experience concerning availability and reliability of digital substation Automation systems (DSAS)
TB 664	Wide area protection & Control technologies
TB 637	Acceptance, Commissioning and Field Testing Techniques for Protection and Automation Systems
TB 629	Coordination of Protection and Automation for Future Networks
TB 628	Documentation requirements from design to operation to maintenance for Digital Substation Automation Systems
TB 613	Protection of Distribution System with Distributed Energy Resources
TB 603	Application and management of cyber security measures for Protection & Control systems
TB 599	Education, Qualification and Continuing Professional Development of Engineers in Protection and Control
TB 587	Short circuit protection of circuits with mixed conductor technologies in transmission networks
TB 584	Implications and Benefits of Standardised Protection and Control Schemes
TB 546	Protection, Monitoring and Control of Shunt Reactors
TB 540	Applications of IEC 61850 Standard to Protection Schemes
TB 539	Life-time Management of Relay Settings
TB 479	International Guide on the Protection of Synchronous Generators
TB 466	Engineering Guidelines for IEC 61850 Based Digital SAS
TB 465	Modern Techniques for Protecting and Monitoring of Transmission Lines
TB 464	Maintenance Strategies for Digital Substation Automation Systems
TB 463	Modern Techniques for Protecting, Controlling and Monitoring Power transformers
TB 448	Refurbishment Strategies based on Life Cycle Cost and Technical Constraints
TB 432	Protection Relay Coordination
TB 431	Modern Techniques for Protecting Busbars in HV Networks
TB 427	The Impact of Implementing Cyber Security Requirements using IEC 61850
TB 424	New Trends for Automated Fault and Disturbance Analysis
TB 421	The Impact of Renewable Energy Sources and Distributed Generation on Substation Protection and Automation
TB 411	Protection, Control and Monitoring of Series Compensated Networks
TB 404	Acceptable Functional Integration In HV Substations

All of the above publications are available for download from www.e-cigre.org.

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MISSION

- To support energy system planners, asset managers and decision makers worldwide in anticipating and successfully managing the system changes raised by Energy Transition. To address emerging needs, seize opportunities and tackle growing uncertainties, while respecting multiple constraints: security of operations, adequacy, resilience, affordability and sustainability.
- To facilitate and promote the progress of engineering and planning methods, to share state-of-the-art, best practices and recommendations.

SCOPE OF WORK

- The scope of work of Study Committee C1 covers all system development and economic issues relevant to a sustainable electricity industry and focuses on grid planning enshrined within the broader power system development framework.
- To elaborate scenarios and investment economics, identify mega trends and game changers, develop approaches for energy sectors integration and hydrogen economy deployment.
- To improve planning criteria and methodologies, in particular analysis of projects' costs, benefits & risks, to modernise asset management strategies.
- To introduce in system development processes all flexibility means, all forms of storage (short and long term) and the new active role of end users / demand management; to leverage on digitalisation, on results of innovation in technology and in processes, to strengthen stakeholders' involvement for the realisation of the planned infrastructures, to support evolution of environmental and regulatory frameworks.

ENGAGEMENT TOWARDS THE ENERGY TRANSITION

Grid planning and the development of the broader energy system are undergoing major changes due to the fast decarbonisation of electricity system. Being forward-oriented by mission, Energy Transition for C1 is already present as main driver of studies and knowledge sharing activities on:

- Decarbonisation ambitious targets and implications.
- Deep digitalization.
- Governance changes & new actors/roles.
- Resilience to crisis and multiple threats.
- How to design a smooth transition path towards the final goal, avoiding stranded assets.
- Offshore grid development

In particular, C1 has fully embraced Cigre End-to-End approach, extending its activities to the outer edges of the transmission system:.

- New generation mix.
- Transmission-Distribution convergence.
- New role of demand and of consumers.
- Pivotal role of storage.
- Increasing interconnections, spreading from Super Grids to microgrids .
- Sector coupling.
- Hydrogen as third pillar of energy system

PRINCIPAL AREAS OF INTEREST

- Holistic scenarios towards an energy System of Systems.
- Energy sector integration and impact on power grids.
- Electrification of transport, heating and industrial processes.
- Role of storage in energy transition.
- Role of Hydrogen in energy transition and impact of electrolysers in grid planning.
- Grid planning with high penetration of distributed resources, including energy communities and virtual power plants.
- Resilient system by design and reserve needs assessment.
- Flexibility needs and sources, including demand response management.
- Demand and variable generation forecasting methods .
- Evolving methodologies and metrics in Cost-Benefit Analysis.
- Infrastructure investments and business models .
- Interconnections and TSO-DSO coordinated planning.
- Global grids pre-feasibility studies .
- Power system development trends in large city and metropolitan areas

MAIN AREAS OF ATTENTION AND CURRENT ACTIVITIES

System planning

- Planning criteria and methods in competitive and regulatory structures and with stakeholder involvement for public acceptance. Progress and new approaches in application of power system planning criteria and resilience (reliability, security, adequacy,) assessment.
- Methods and tools for steady state and dynamic analysis in system planning.
- Capacity enhancement by use of risk-based security assessment and advanced information, communication and power-electronics technology for improving system stability and dynamic performance.
- Future dependence, requirements and economy of ancillary services for frequency and voltage control and other system needs (grid codes).
- System planning issues in newly industrialised and developing countries including metropolitan areas.
- System planning and technology issues in specific contexts e.g. off-shore wind, large surpluses/deficits in available RES, low inertia systems, bi-directional power exchanges with distribution systems, HVDC and meshed DC grids.
- Power system development under increasing uncertainty and energy sectors integration: Transport, Heating, gas, hydrogen and synthetic fuels.
- System planning and technology issues in specific contexts e.g. off-shore wind, large surpluses/deficits in available RES, and power exchange with distribution systems.
- Timely engagement of stakeholders in investment decision processes.
- Bridging the gap in the understanding of specialists and wider societal stakeholders.
- Cost-Benefit Analysis with evolving multi-criteria.
- Developing a technically rigorous and practically applicable framework for the system-level co-optimization of flexibility resources in high-renewable power systems undergoing structural transformation.
- Proposing power VSC-HVDC transmission system planning methods based on the scenario of large volumes of renewable energy being transmitted via long-distance and large-capacity transmission lines to multi-HVDC feed-in load centers.

Asset management

- Asset management strategies, probabilistic and risk-based, and tools, total life cycle cost of ownership, scarce resources management.
- Growing inter-relationships between asset management, digitalisation and system planning (e.g. asset analytics platforms).
- Break-even conditions between preventive, containment and restoration measures.
- High level asset management strategies in defining sustainable policies and optimal practices.
- Using total life cycle cost of asset ownership to inform investment decisions.
- Risk-based analysis aimed at identifying existing assets that require attention.
- Asset analytic data platforms and tools to support asset management.
- Benchmarking the use of Asset Investment Planning practices and systems.

Business management

- Scenario and methodologies definition/adoption for quantitative studies on future power systems.
- Prioritizing investments across a multitude of projects and programs addressing different system needs.
- Adapting to the changing levels of investment risk as the nature of the power system evolves.
- Impact on system development of new solutions and technologies in fields such as generation, demand side management (DSM), energy storage, smart grids and active distribution systems.
- The impact of pricing and tariff methods for transmission services on system development and project priorities in the context of market design and grid ownership structures.
- The impact of business models, cost-benefit-analyses and privatisation on system development (prioritisation of investments, infrastructure tenders, merchant lines, public-private partnerships, etc.).
- The impact of market design and regulation (pricing, tariffs, incentives, other aspects of market design etc.) on planning scenarios, and on transmission and distribution planning and investments.
- Addressing the technical issues in the developing of concrete use cases of power-heat sector integration and assess state-of-the-art research in different countries.
- Evaluating widespread EV adoption's technical, economic, and operational impacts in transmission and distribution grid planning process, and developing strategies to optimize grid interaction while mitigating potential risks.

Interconnections – horizontal, vertical

- Planning issues related to long distance transmission and international interconnections.
- Interface and allocation issues in transmission and distribution planning, and delivery of multi-party/cross-jurisdiction projects.
- Global electricity network, including effects of storage, demand response and trading rules.
- Planning regulated/non-regulated transmission assets in parallel, optimal sizing of interconnectors.
- Coordinated planning with "smart" and evolving distribution systems, especially with uncertain evolution and markets for demand response, electric vehicles, empowered customers, dynamic pricing, distributed generation and battery costs.
- Planning methodologies and issues related to electrification of end uses in heating/cooling and transport.
- Assessing the potential of demand response by data centres to respond to system flexibility needs, specifically considering the MESH concept and its benefits in managing the complex interaction between large-scale digital infrastructure and renewable energy.

KEY PROJECTS / FORTHCOMING EVENTS

- At Paris Session 2026, where C1 will meet in person, besides the traditional Group Discussion Meeting, C1 will also deliver.
- Tutorial by C1.50 on Global grids including Hydrogen.
- Workshop on Large Inverter Based Loads (joint with C2 and C4).
- Workshop on Mediterranean systems cooperation by MedTSO.
- Workshop joint with IEC TC 123 on standards for coordinated management of network assets.
- Participation and SC meeting in person at Symposium in Thailand (November 2027).

TOPICS OF ACTIVE WORKING GROUPS

WG C1.33	Interface and Allocation Issues in Multi-party and/or Cross-jurisdiction Power Infrastructures Projects
JWG C1/C6.42	Planning tools and methods for systems facing high levels of distributed energy resources.
WG C1.45	Harmonised metrics and consistent methodology for benefits assessment in interconnections' Cost-Benefit Analysis (CBA)
JWG C1/C4.46	Optimising power system resilience in future grid design.
JWG C1/B4.49	Offshore transmission planning
WG C1.50	Global sustainable energy system coupling electricity and hydrogen.
WG C1.51	The potential roles of energy storage in electric power systems
WG C1.52	Virtual Power Plants: Role/ deployment in large power systems' operation & planning
JWG C1/C5.53	Forecasting demand to include consumer behaviour decisions influenced by market
WG C1.54	System reserves and flexibility needs in future power systems
WG C1.55	Benchmarking the use of Asset Investment Planning practices/systems
JWG C1/D2.56	Electro-Cyber Integration to meet Net Zero Goal
WG C1.57	EV charging infrastructure impact on grids
WG C1/B4.58	VSC-HVDC transmission system planning
WG C1.59	Power-Heat Sector Integration
WG C1.60	Multi-Domain Co-Optimization of Flex. Resources for High-RES systems
JWG B2/C1.86	Approach for Asset Management of Overhead Transmission Lines
JWG C5/C1.43	Approaches to account for the contribution of short-duration electric storage systems in capacity adequacy assessment
JWG C6/C1/ CIRED.50	Planning distribution networks under significant uncertainties

LATEST PUBLICATIONS (2025)

TB 973 (C1)	Energy Sectors Integration and Impact on Power Grids
TB 970 (C1)	The Potential Roles of Energy Storage in Power Systems
TB 960 (C5/C1)	Certification of the electricity used to produce hydrogen
TB 951 (C1)	Transmission investment decision points and trees
TB 942 (C1)	Role of Hydrogen in energy transition opportunities and challenges from technical and economic perspectives
TB 948 (C1)	Integration of hydrogen in electricity markets and sector regulation
TB 938 (C1)	Global Interconnected and sustainable electricity system – Effects of storage, demand response and trading rules

A Green Book on 'Asset Management' has been printed by Springer and it was translated into Chinese in 2025 (GB12 CN).

All of the above publications are available for download from www.e-cigre.org.

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C2 POWER SYSTEM OPERATION AND CONTROL

Study Committee C2 (SC C2) focuses on System Operation and Control, addressing the technical, human, and institutional dimensions required for secure, resilient, and efficient system operations. Our updated strategic plan for 2026 and beyond integrates new challenges such as large load centers, automation, cybersecurity, and the need to transition from deterministic to probabilistic approaches for power system analysis and forecasting.

- **Secure and economic operation of power systems under evolving conditions.**
- **Operational planning, real-time control and restoration strategies.**
- **Human factors, training, and organizational readiness.**
- **Integration of new technologies, including automation and digital tools.**



PRINCIPAL AREAS OF INTEREST

- Real-Time System Operation and Control.
- System Operational Planning and Performance Analysis.
- Control Center Infrastructure and Human Resources

EMERGING TRENDS AND CHALLENGES

- Large Load Centers.
- Automation in System Operations.
- Cybersecurity and Digitalization.
- Probabilistic Approaches

MAIN AREAS OF ATTENTION

- Wide-area control and coordination across interconnected systems.
- Integration of new technologies and protection schemes.
- Roles and responsibilites of human operators vs. automated systems to ensure accountability and safety.
- Transition from deterministic to probabilistic planning approaches to better manage uncertainty and variability.
- Impact of new generation mixes, storage, and load behavior.
- Operator Training: Simulation tools, continuous education and certification programs.
- Decision support systems and situational awareness tools.
- Enhanced observability, flexibility and data exchange across voltage levels.
- EMS/SCADA evolution and WAMS integration.
- Control center resilience, cybersecurity and organizational development.

KEY PROJECTS FORTHCOMING EVENTS

- Task Force on Large Loads in collaboration with SC C4 and C1.
- 2026 Paris Session
  - Large Disturbance Workshop in collaboration with SC C5.
  - C1/C2/C4 Inverter Based Large Loads Workshop.
  - C2 in person meeting.
- Bangkok, Thailand Symposium – November 2027.

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TOPICS OF ACTIVE WORKING GROUPS

WG C2.44	Operational strategies to manage power system minimums
WG C2.45	Estimation, evaluation and provision of power system inertia in networks with high share of renewable generation
JWG C2/B5.46	System Integrity Protection Schemes and the N-1 criteria
JWG C2/C4.47	Wide Area Operational Security Systems to enable the Energy Transition

LATEST PUBLICATIONS (2025)

TECHNICAL BROCHURES	
TB 972	The impact of offshore wind power hybrid AC/DC connections on system operations and system design
TB 975	REVIEW OF ADVANCEMENTS IN SYNCHROPHASOR MEASUREMENT APPLICATIONS

All of the above publications are available for download from www.e-cigre.org.

The mission of the SC C3 is to facilitate and promote the principles of sustainable development through the global exchange of information and knowledge in the field of system environmental performance. To add value to this information and knowledge by means of synthesizing state-of-the-art practices and developing recommendations in line with global best practice.

PRINCIPAL AREAS OF INTEREST

- Environmental impacts of power system development and operation (life cycle approach).
- Role of the power system regarding sustainable development (positive and negative): impact on climate change and achievement of SDGs.
- Stakeholders' engagement and communication, effective communication and cooperation with the public and regulatory authorities, public acceptance of power system infrastructure.

MAIN AREAS OF ATTENTION

- The scope of the SC C3 covers the identification, assessment, and management of the interactions between the natural and social environments, and the end-to-end electric power system, recognising the importance and influence of a wide range of stakeholders and communities. Recommendations for appropriate monitoring, management, and control measures in fields such as greenhouse gases (SF6), air, soil and water pollution, electromagnetic fields, noise, visual amenity, land use and biodiversity.
- In 2019, by the approval of a new Strategic Plan, the focus of the group's activities was broadened towards a sustainability approach. The goal is to facilitate and promote the principles of sustainable development through the global exchange of information and knowledge, by synthesizing state-of-the-art practices and developing recommendations in line with global best practice.

CURRENT ACTIVITIES

- Integrate energy facilities into the environment, considering their entire life cycle: from the planning phase to decommissioning (end-to-end).
- Identify the interaction between nature and infrastructure, and define tools and measures to minimize its negative impact and enhance its positive contribution.
- Address emerging trends in the energy sector from a sustainability perspective.
- Anticipate future sustainability challenges and their implications.
- Develop engagement strategies to improve infrastructure development and maintenance.

KEY PROJECTS FORTHCOMING EVENTS

- SC3 meeting/ Paris Session 2026.
- SC3 meeting/ Bangkok Symposium 2027.



TOPICS OF ACTIVE WORKING GROUPS

AG C3.01	EMF and Human Health (Advisory group)
WG C3.20	Sustainable Development Goals in the electric power sector
WG C3.22	Vegetation management in substations
WG C3.25	Eco-design methods for the power system"
JWG B1/C3.85	Environmental impact of decommissioning of underground and submarine cables
JWG C3/B2.24	Methods of reducing electrocution of birds from power lines
JWG B3/A2/A3/ C3/D1.66	Guidelines for Life Cycle Assessment in Substations considering the carbon footprint evaluation
JWG A2/C3.70	Life Cycle Assessment (LCA) of Transformers
JWG A2/C3.79	Power Transformers and reactors sound levels On Site

LATEST PUBLICATIONS (2025)

TECHNICAL BROCHURES	
TB 965	Best environmental and socioeconomic practices for improving public acceptance of high voltage substations
TB 966	Sustainable corridor management

All of the above publications are available for download from www.e-cigre.org.

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C4 POWER SYSTEM TECHNICAL PERFORMANCE

Study Committee C4 is responsible for advanced methods and tools for analysis related to end-to-end power systems, with particular reference to dynamic and transient conditions and to the interaction between the power system and its apparatus/sub-systems (including external causes of stress, other installations and non-standardised waveforms).

This scope includes the development of tools, models and methods of analysis for identification of power system needs, scarcities, technical envelope and design requirements, and new power system phenomena caused or accelerated by the energy transition. Key drivers, from the system perspective, include increased penetration of non-synchronous generation technologies such as wind, solar and storage into the power system, and the resultant changes in transmission and distribution networks. Accurate modelling of the controls of new (IBR-based) technologies has become increasingly important for power system studies in both, steady state and transient, as well as inter-stability issues and harmonics. The Study Committee also addresses modelling and performance issues related to demand and integration into bulk power systems. Demand types considered include, but are not limited to, traditional industry plants (e.g., arc furnace, traction systems, etc) and their decarbonisation efforts, and new large energy consumers (e.g., Data Centres, electrolysers, crypto mining farms).

PRINCIPAL AREAS OF INTEREST

- Power System Dynamics Performance and Numerical Analysis.
- Power Quality.
- Electromagnetic Compatibility and Electromagnetic Interference (EMC/EMI).
- Lightning, Electromagnetic Transients and Insulation Coordination.

MAIN AREAS OF ATTENTION

The scope of SC C4 covers power system technical performance phenomena that range from nanoseconds to many hours. Areas of attention include:

- **Power System Dynamics**: Development of processes and best practices for performing power system dynamic studies, in particular for grid connection studies. Development of advanced tools, models and new analytical techniques for the assessment of traditional and emerging new forms of power system dynamic/transient performance, security and stability. Design of controls, modelling of existing and new equipment, real time stability evaluation and control. Modelling of transient and unsymmetrical conditions of power systems. Black-start analysis using IBR.
- **Keywords**: Steady-State, Power System Dynamics, RMS, EMT, PDT, Voltage Stability, Frequency Stability, Transient Stability, Rotor Angle Stability, Resonance Stability, Converter-driven Stability, Control Interactions, Small Signal Stability, Sub-Synchronous Oscillations, Super-Synchronous Oscillations, Low Inertia, RoCoF, Grid Following (GFL), Grid Forming (GFM), IBR, IBL, Storage, Wind and Solar, Off-Shore Wind, SPS, System Strength, PMU, Model Development, Model Validation, Power System Resilience, Dynamic Frequency Scan, Impedance-Based Analysis.
- **Power Quality**: Continuity of end-to-end electric power supply and voltage waveform quality (magnitude, frequency, symmetry). Analysis covers emission assessments from contributing installations (e.g. HVDC, FACTS controllers, inverter-based resources, inverter-based loads, arc furnaces) in radial and meshed networks, measurement and simulation methods, identification of quality indices, monitoring techniques, immunity of sensitive installations, and mitigation techniques taking into account a co-ordinated approach across all voltage levels.
- **Keywords**: Power Quality, Voltage fluctuation, Voltage Dip, Flicker, Voltage Imbalance, Frequency Variation, Waveform Distortion, Harmonics, Sub-harmonics, Inter-harmonics, Emissions, PQ Compliance, PQ Monitoring, PQ mitigation.
- **Electromagnetic Compatibility and Interference (EMC/EMI)**: High frequency disturbances on the end-to-end electricity supply and all disturbances (HF or LF) reaching equipment other than through the electricity supply. Studies include measurement and simulation methods including EM vulnerability, immunity of sensitive installations, EMC in the vicinity of power systems, effects of intentional EMI and HEMP on the power system, understanding geomagnetic phenomena and their impacts on the power system. SC C4 will support the evaluation of health effects related to low-frequency EMF with measurements, calculations, mitigation, etc.
- **Keywords**: EMC, EMI, HEMP, GMD, Supra-harmonics, Radiated Interference, Conducted Interference, Radio Interference, Communications Interference, Impulsive Transient, Oscillatory Transient, Digitalisation.
- **Lightning**: Analysis and modelling of lightning characteristics and interactions of lightning with electric power systems and equipment, including the evaluation of the lightning performance of power systems as well as lightning detection technologies. Design of protection measures against lightning effects and their standardisation in power transmission and distribution networks, power stations, sensitive infrastructures, industrial sites and tall structures.
- **Keywords**: Back-Flashover, EMT analysis, FDTD, Ground Flash Density, Grounding, Induced overvoltages, Lightning, Lightning characteristics, Lightning data analysis, Lightning detection systems, Lightning induced overvoltages, Lightning measurements, Lightning monitoring, Lightning performance, Lightning protection, Shield wire, Surge arresters.
- **Insulation Co-ordination**: Methods and tools for insulation co-ordination and electromagnetic transient analysis (e.g. harmonic instability, ferroresonance, lightning, switching, transformer energization, IBR driven transients) in electric power systems and equipment, contributing to optimisation of their cost and reliability. Development of accurate models for network components and equipment, appropriate for the phenomena of interest, as well as modern sources for LF, HF, and VHF transients.
- **Keywords**: Insulation Co-Ordination, BIL, BSL, Low Frequency Oscillation, Temporary Overvoltage, Slow-Front Surges, Fast-Front Surges, Very-Fast-Front Surges, Harmonic Instability, Ferroresonance, Resonance, Inrush current, Transformer Energisation, EMT, Switching Transient, Black-start.

CURRENT ACTIVITIES

- Review of Power System Stability Definitions and Classifications.
- Power System Performance aspects of Large Inverter-Based Loads.
- Advanced Modelling and Analysis Techniques to facilitate Energy Transition.
- Grid Forming Controls.
- EMT Modelling and Simulation.
- Stability Analysis in Converter-Based Modern Power Systems.
- Power Quality and EMC: Modelling, Assessment and Standardization.
- Power System Resilience.
- Evaluation of Lightning Performance of Power Systems.
- Advanced Lightning Monitoring Systems.
- Evaluation of Over-voltages and their Withstand Characteristics.
- Insulation Co-Ordination of HVDC Overhead Lines.
- Pollution Maps for Insulation Co-Ordination Applications.
- Interference between HVDC Circuits and Nearby Metallic Structures

KEY PROJECTS FORTHCOMING EVENTS

- Joint B4/C4 Task Force on “Grid Forming Controls”.
- Joint C4/C2/C1 Task Force on “Role and requirements for large, inverter-based loads”.
- Joint CIGRE C4/IEEE Task Force on “Reassessment of Power System Stability Definitions and Classifications for Converter-Dominated Grids”.
- New Working Group on “Quantum Information Science and Technology (QIST) for Reliable and Secure Power Systems”.
- New Working Group on “Best practice modelling and study methods for large inverter-based loads for connection, planning and operation”.
- New Working Group on “Impedance-based stability assessment of modern power systems”.
- CIGRE Session, 2026, Paris, France.
- CIGRE Symposium, 2027, Bangkok.



TOPICS OF ACTIVE WORKING GROUPS

WG C4.36	Winter lightning – parameters and engineering consequences for wind turbines
JWG C4.40/CIRED	Revisions to IEC technical reports 61000-3-6, 61000-3-7, 61000-3-13, and 61000-3-14
JWG C4.42/CIRED	Continuous assessment of low-order harmonic emissions from customer installations
WG C4.43	Lightning problems and lightning risk management for nuclear power plants
WG C4.44	EMC for large photovoltaic systems
WG C4.47	Power system resilience
WG C4.50	Evaluation of transient performance of grounding systems in substations and its impact on primary and secondary systems
WG C4.51	Connection of railway traction systems to power networks
WG C4.54	Protection of high voltage power network control electronics from the High-altitude Electromagnetic Pulse (HEMP)
WG C4.55	EMC related very-fast transients in gas-insulated substations - EMC interferences, measured characteristics, modelling and simulations
WG C4.57	Guidelines for the estimation of overhead distribution line lightning performance and its application to Lightning protection design scope
WG C4.59	Real-time lightning protection of the electricity supply systems of the future
WG C4.60	Generic EMT-type modelling of inverter-based resources for long term planning studies
WG C4.63	Harmonic power quality standards and compliance verification – a comparative assessment and practical guide
WG C4.64	Application of real-time digital simulation in power systems
WG C4.65	Specification, validation and application of harmonic models of inverter-based resources
WG C4.66	New concept for analysis of multiphase back-flashover phenomena of overhead transmission lines due to lightning
WG C4.67	Lightning Protection of hybrid overhead lines
WG C4.68	Electromagnetic Compatibility (EMC) issues in modern and future power systems
WG C4.69	Quantifying the lightning response of tower-footing electrodes of overhead transmission lines: methods of measurement
WG C4.70	Application of space-based lightning detection in power systems
WG C4.71	Small signal stability analysis in inverter based resource dominated power system
JWG C4/B4.72	Lightning and switching induced electromagnetic compatibility (EMC) issues in DC power systems and new emerging power electronics-based DC equipment
WG C4.73	Insulation coordination of HVDC overhead lines
WG C4.74	Accurate line and cable models for steady-state and transient studies
JWG C4/A3/B2/ B4.75	Guide to procedures for the creation of contamination maps required for outdoor insulation coordination
WG C4.76	Overvoltage protection in switching inductive devices with vacuum circuit breaker
WG C4.77	Best practices for individual and collective conformity assessment of inverter-based resources during their lifetime
JWG C4/B1/B2/ B4.78	Interference effects between HVDC circuits and nearby metallic infrastructure
JWG C4/A3.79	Temporary overvoltage protection technologies for high-voltage transmission systems with large-scale renewable energy bases
JWG A1/C4.52	Wind generators and frequency-active power control of power systems
JWG B1/C4.69	Recommendations for the insulation coordination on AC cable systems
JWG B4/B1/C4.73	Surge and extended overvoltage testing of HVDC cable systems
JWG B4/C4.93	Development of grid forming converters for secure and reliable operation of future electricity systems
JWG B5/C4.61	Impact of low inertia network on protection and control
JWG B2/C4.76	Lightning & grounding considerations for overhead line rebuilding and refurbishing projects, AC and DC
JWG C1/C4.46	Optimising power system resilience in future grid design
JWG B5/C4.79	Protection roadmap for low inertia and low fault current networks
JWG B4/C4.97	Benchmarking of simulation models for control interaction in meshed AC networks with multiple converters
B4/C4.103	AC Network equivalents for HVDC and FACTS project studies
JWG A2/C4/D1.77	Design of transformers for very fast overvoltages
JWG C2/C4.47	Wide area operational security systems to enable the energy transition
JWG A3/A2/B3/B4/ C4.53	Inductive load switching in transmission and distribution systems
JWG B4/C4.100	Guide for electromagnetic transient studies of VSC-HVDC connected offshore or onshore islanded wind farm

LATEST PUBLICATIONS (2024-2025)

TECHNICAL BROCHURES	
TB 975	Review of Advancements in Synchrophasor Measurement Applications
TB 955	Lightning Transient Sensing, Monitoring and Application in Electric Power Systems
TB 943	Evaluation of Voltage Stability Assessment Methodologies in Modern Power Systems with High Penetration of Inverter-Based Resources
TB 928	Multi-frequency stability of converter-based modern power systems

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C5 ELECTRICITY MARKETS AND REGULATION

Study Committee C5 bridges the gap between engineering, economics and regulation. It analyses the impacts of different approaches to markets, regulation and differing market structures (institutions, participants and stakeholders) on the planning, operation and regulation of electric power systems. Examining the role of competition and regulation in the electricity industry is important for the orderly transition of the power system as well as for improvements to its end-to-end efficiency.

PRINCIPAL AREAS OF INTEREST

The study committee focuses on three key areas:

- **Market structures and products** - Market design, physical & financial markets and their interaction, isolated and interconnected systems, interactions with hydrogen systems.
- **Market approaches and tools** - Demand & price forecasting, financial risk management, demand management and active customer integration, integration of blockchain technologies.
- **Regulations** - Regulatory objectives, regulatory approaches, transmission pricing, ancillary service pricing, reliability and economics.

MAIN AREAS OF ATTENTION

- Market structures and products such as physical and financial markets and the interaction between them, contracts, and internationally integrated markets. Emerging technologies, including renewable gases, and sector coupling.
- Techniques and tools to support market actors such as demand and price forecasting profit estimation, financial risk management, etc.
- Regulation and legislation such as regulation objectives, extensions and limits, price regulation of transmission and ancillary services, transmission/distribution coordination and interactions, international harmonization, environmental objectives, etc.
- Evolution of markets and regulation from a focus on wholesale transmission to include retail distribution. The increasing interaction between regulation and markets throughout the electric power system value chain and the ability of markets and regulation to cater to rapid evolutions in dynamic/variable generation, demand and storage technologies and behaviours.
- Coordination of regulation, funding and trading arrangements for new assets and technologies expansion in new market structures, including the trend of decentralization of operations with distributed applications; the remaining assets coexisting with the retirement of others in utilities; the consideration of legacy trading arrangements in the new market arena.

CURRENT ACTIVITIES

- Changes in regulatory roles and jurisdictional regulation related to the interaction between the transmission system and the distribution system.
- The role of markets and regulation regarding:
  - the integration and coordination of distributed energy resources, energy community resources, and new technologies;
  - wholesale market price formation, including emission pricing and the impact of non-wholesale market participants;
  - sector integration between gas (including renewable gases) and electricity, including EV integration;
  - validation of low emission technologies.
- The impact of emerging technologies on market operations.
- Market clearing procedures, techniques and principles used to take advantage of the flexibility of aggregating large numbers of end-users.
- Potential Market rule changes to address changes in traditional ancillary service products to cater to the changes in the supply and demand for electricity:
  - generation and demand flexibility to manage intermittent supply,
  - integration of storage into ancillary services,
  - incentivising system strength and inertia in energy systems.

KEY PROJECTS FORTHCOMING EVENTS

- 2026 CIGRE Africa Academy – Senegal (2 tutorials)
  - 25 March 2026.
- 2026 CIGRE Session
  - 23-28 August 2026.
  - SC C5 Annual Meeting – 28 August 2026.
- 2027 Heidelberg Symposium
  - 26-30 April 2027.
  - SC C5 Annual Meeting.
- 2027 Bangkok Symposium
  - 22-26 November 2027.

TOPICS OF ACTIVE WORKING GROUPS

JWG C5/C6.29	New Electricity Markets, Local Energy Communities
WG C5.31	Wholesale and retail electricity cost impact of flexible demand response
WG C5.34	Summary of current uses of electric vehicle charge/discharge flexibility in wholesale energy markets and reliable grid operations
WG C5.37	Regulatory framework on modernization and extension of useful life of transmission & distribution assets
WG C5.38	Certificates of origin for electricity in power markets
WG C5.39	Regulatory frameworks and market integration for assets under non-firm grid connection
WG C5.40	Framework for retail competition in electricity markets
WG C5.41	Regulation and market design to foster decarbonation through industry electrification
WG C5.42	Market pricing issues and solutions for low short-run marginal-cost systems
JWG C5/C1.43	Approaches to account for the contribution of short-duration electric storage systems in capacity adequacy assessment

LATEST PUBLICATIONS (2025)

TECHNICAL BROCHURES	
TB 948	Integration of hydrogen in electricity markets and sector regulation
TB 960	Certification of the electricity used to produce hydrogen
ELECTRA PAPERS	
	(Global Connections) : Improve the rules to connect more and faster - Rule-maker's and system operator's views

All of the above publications are available for download from www.e-cigre.org.

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C6 ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES

CIGRE Study Committee (SC) C6 is at the forefront of driving innovation and global collaboration in active distribution systems and distributed energy resources (DER). SC C6 addresses critical challenges such as managing the variability of DER, enhancing grid flexibility, optimizing congestion management and integrating smart grid technologies. It also explores the transformative impact of emerging technologies like electric vehicles on power distribution networks.

Our community of leading experts plays a vital role in advancing industry knowledge worldwide by producing authoritative technical brochures, delivering insightful tutorials and shaping best practices. Join Study Committee C6 in shaping the future of energy distribution through cutting-edge research and international knowledge-sharing.

PRINCIPAL AREAS OF INTEREST

SC C6 concentrates on assessing the technical impacts of widespread distributed energy resource (DER) adoption on distribution system planning and operations. We explore enabling technologies and innovative solutions that drive effective DER integration into active distribution networks.

MEMBERSHIP PROFILE

SC C6's diverse membership ensures our work remains relevant to all stakeholders involved in modern power distribution, including:

- Distribution system operators (DSOs), with expertise in asset management, system planning and operations.
- Power engineering consultants and technology providers.
- Electricity consumers and prosumers.
- Experts from regions with varying levels of renewable and DER penetration.
- Rural electrification specialists.
- ICT professionals and academia.
- Professionals in economics, regulation and legal frameworks related to emerging "edge markets".
- Strong collaboration with aligned industry organizations.

CORE TOPICS OF INTEREST

The committee's strategic focus covers a broad spectrum of emerging and evolving topics:

- DER technologies: generation, renewables (PV, wind), storage systems, integration challenges, sizing, performance and modelling.
- DER control strategies: monitoring, operational tactics, reliability, locational value.
- Enhancing distribution network resilience through DER integration.
- DER deployment frameworks: hosting capacity, grid compliance, microgrids, virtual power plants and DER management systems.
- Enabling technologies: power electronics, smart inverters, sensing, communication and ICT integration.
- Platforms delivering flexible grid services via DER aggregation.
- Operational and planning management of DER through forecasting, data analytics and mining.
- Microgrid operations: islanded and grid-connected modes.
- Distribution equipment: power flow control, power quality solutions.
- Grid modernization: design, planning, state estimation, smart metering, asset management, ancillary services focused on technological innovations.
- Customer integration: enhancing controllability, visibility, metering and power quality.
- Demand-side integration: evolving customer behaviours, behind-the-meter generation, demand response, smart load management and implications for distribution.
- Smart city frameworks supporting DER deployment and management.
- Rural electrification and off grid systems.

CURRENT INITIATIVES

Our working groups are actively developing technical recommendations and best practices that address:

- Advanced DER technologies and solutions.
- The influence of emerging load types, such as electric vehicles and energy storage systems.
- Enhancing resilience and energy efficiency in distribution networks.
- Planning distribution networks in the face of increasing uncertainty.
- Energy efficiency in distribution networks.
- The impact of DER on distribution network reliability and resilience.
- TSO / DSO and customer interface management.
- Demand-side integration and customer empowerment.
- Multi-energy system deployment in urban environments, .
- Electric transportation and electric railways.
- Rural electrification.

EMERGING AND CROSS-CUTTING THEMES

Additional areas of exploration in collaboration with other SCs include:

- Battery storage technologies — technical, economic, and reliability aspects.
- Hydrogen and power-to-X integration in distribution systems.
- Hydropower pumped storage and other storage technologies.
- Sector coupling and multi-energy systems.
- Electrification of transport — EVs, electric trains and beyond.
- Power system compensation and voltage regulation techniques.
- Medium and low voltage DC distribution systems.

KEY PROJECTS / FORTHCOMING EVENTS

23-28 August 2026 Paris Session.
26-30 April 2027 International Symposium Heidelberg, Germany.
August 2028 Paris Session.

TOPICS OF ACTIVE WORKING GROUPS

WG C6/C2.34	Flexibility Provision from Distributed Energy Resources
WG C6.35	DER Aggregation Platforms for the Provision of Flexibility Services
WG C6.39	Distribution Customer Empowerment
WG C6.42	Electric Transportation Energy Supply Systems
WG C6.44	Nodal Value of Distributed Renewable Energy Generation
WG C6.45	The Impact of DER on the Resilience of Distribution Networks
WG C6.46	Energy Efficiency in Distribution Systems
WG C6.47	DSO – Customer Interfaces for Efficient System Operation
WG C6.48	DER integration into Distribution Systems Operations and Control
WG C6.49	Virtual Power Plant Aggregation of DER
JWG C6/C1/ CIRED.50	Planning of Distribution Networks under Increasing Uncertainty

LATEST PUBLICATIONS (2025)

TB 721	The Impact of Battery Energy Storage Systems on Distribution Networks
TB 726	Asset Management for Distribution Networks with High Penetration of DER
TB 727	Modelling of Inverter-based Generation for Power System Dynamic Studies
TB 733	System Operation Emphasizing DSO/TSO Interaction and Coordination
TB 782	Utilization of Data from Smart Meter System
TB 793	Medium Voltage Direct Current (MVDC) Grid Feasibility Study
TB 826	Hybrid Systems for Off-Grid Power Supply
TB 835	Rural Electrification
TB 863	Multi-energy System Interactions in Distribution Grids
TB 875	Medium Voltage DC Distribution Systems
TB 906	Distributed Energy Resource Benchmark Models for Quasi-Static Time-Series Power Flow Simulations
TB 923	Optimal Transmission and Distribution Investment Decisions under Increasing Energy Scenario Uncertainty
TB 929	Advanced Consumer Side Resource Management Systems
TB 932	Aggregation of Battery Energy Storage and Distributed Energy Resources
TB 954	Electric Vehicles as Distributed Energy Resource (DER) Systems

All of the above publications are available for download from www.e-cigre.org.

Latest Publications – CIGRE Green Book

- Distributed Energy Resources in Active Distribution Systems, Springer 2026.



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D1 MATERIALS AND EMERGING TEST TECHNIQUES

The scope of Study Committee D1 covers new and existing materials for electrotechnology, diagnostic techniques and related knowledge rules, as well as emerging test techniques with expected impact on power systems in the medium to long-term.

PRINCIPAL AREAS OF INTEREST

- Insulating gases.
- Liquid and liquid impregnated insulation systems.
- Solid materials.
- High voltage and high current testing and diagnosis.

MAIN AREAS OF ATTENTION

The Study Committee deals with the performance of materials and electrical insulation systems (EIS) subjected to electrical, thermal, mechanical, chemical, and environmental stresses. Based on this knowledge, test and measurement procedures are evaluated and developed. These methods can be applied to generate new diagnostic tools for asset management of electrical apparatus to aid the work of the equipment, subsystem, and system committees. Current hot topics include:

- Materials and testing methodologies to support the energy transition.
- Performance of non-SF6 insulating gases.
- Testing and performance of UHVAC and UHVDC technologies.

The Study Committee facilitates and promotes the international exchange of information and knowledge through developing best practices, recommendations and guidelines. It also supports standardisation bodies by providing relevant technical and scientific background information to support the development of international standards.

CURRENT ACTIVITIES

- Characterisation of materials and electrical insulation systems (EIS).
- Study of emerging test and diagnosis techniques for HVDC.
- Development of diagnostic tools and related knowledge rules.

KEY PROJECTS FORTHCOMING EVENTS

- SC D1 Meeting at CIGRE Session 2026 in Paris.
- SC D1 participating at CIGRE Symposium, 2027 in Thailand.

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TOPICS OF ACTIVE WORKING GROUPS

WG D1.60	Traceable measurement techniques for very fast transients
WG D1.61	Optical corona detection and measurement
WG D1.62	Surface degradation of polymeric insulating materials for outdoor applications
WG D1.63	Partial discharge detection under DC voltage stress
WG D1.68	Natural and synthetic esters – evaluation of the performance under fire and the impact on environment
WG D1.69	Guidelines for test techniques of High Temperature Superconducting (HTS) systems
WG D1.72	Test of material resistance against surface arcing under DC
WG D1.73	Nanostructured dielectrics: multi-functionality at the service of the electric power industry
WG D1.74	PD measurement on insulation systems stressed from HV power electronics
WG D1.76	Tests for verification of quality and ageing performance of cellulose insulation for power transformers
JWG D1/A2.77	Liquid tests for electrical equipment
WG D1.78	Partial discharge properties of non-SF6 insulating gases and gas mixtures
JWG D1/A2.79	Improved understanding of dynamic behaviour of winding insulating materials in liquid insulated power transformers
WG D1/A2.80	Functional properties of non-metallic solid materials for liquid filled transformers and reactors and their compatibility with insulating liquids
WG D1.81	Methods and common data file format for Time-Domain Reflectometry
WG D1.82	Additive manufacturing/3D printing in service of the electrical power industry
WG D1.83	Optical spectral sensing technologies for partial discharge (PD) and arc detection in gas-insulated equipment
WG D1.84	Revised test method for the tracking and erosion resistance under DC voltage stress
JWG D1/A2.84	Silver corrosion in power transformers
JWG A2/D1.66	Breathing systems of liquid filled transformers and reactors
JWG A2/D1.67	Guideline for online dissolved gas analysis monitoring
JWG A2/D1.71	Modern insulating liquids qualification for OLTC, bushings and other accessories
JWG A2/D1.72	Retrofill of mineral oil in transformers – motivations, considerations and guidance
JWG A2/D1.74	Online moisture monitoring of transformers for ageing assessment
JWG A2/C4/D1.77	Design of transformers for very fast transient overvoltages
JWG B1/D1.75	Interaction between cable and accessory materials in HVAC and HVDC applications
JWG B1/B3/D1.79	Recommendations for dielectric testing of HVDC gas insulated cable sealing ends
JWG B3/D1.63	Guideline for assessing the toxicity of used SF6 gas onsite and in the lab of T&D equipment above 1 kV in substations
JWG B3/A2/A3/C3/ D1.66	Guidelines for Life Cycle Assessment in substations considering the carbon footprint evaluation

LATEST PUBLICATIONS (2024 & 2025)

TECHNICAL BROCHURES	
TB927	New laboratory methodologies for investigating of insulating liquids - further developments in key functional properties
TB933	Requirements and application of UHF PD monitoring systems for gas insulated systems
TB952	Evaluation of dynamic hydrophobicity of polymeric insulation materials under AC voltage stress
TB967	Mechanical properties of insulation materials for power transformers
TB974	Strategies and tools for corrosion prevention for cable systems
CIGRE SCIENCE AND ENGINEERING	
CSE NO 35	Evaluating the Interfacial Compatibility of Dielectric Materials for Cable Joints

All of the above publications are available for download from www.e-cigre.org.

D2 INFORMATION SYSTEMS, TELECOMMUNICATIONS AND CYBERSECURITY

Develop, facilitate collaboration and disseminate knowledge in the areas of information systems, telecommunications and cybersecurity for power systems.

PRINCIPAL AREAS OF INTEREST

- The use of information technology and data, including extraction, analysis and processing in the domain of power system, to enable a reliable and efficient system.
- The transport of information technology and data in the domain of power system, to enable a resilient telecommunications and networking infrastructure suitable for critical systems.
- Securing of information and safeguarding of critical power systems to ensure continuity of supply and safety of the power system operation.

MAIN AREAS OF ATTENTION

- **Digitalisation:** Machine learning algorithms and drones to improve asset lifecycle management, use of artificial intelligence (AI) to enhance cybersecurity posture of critical systems.
- **Renewables Systems Connections (Solar PV, Wind, Hydrogen, Storage):** Agile and resilient telecommunications methods, including 5G and wireless technologies, in supporting diverse and distributed generation participants' connectivity into the grid securely.
- **Grids and Flexibility:** Edge computing and data storage at the edge to support the increasingly distributed grid; resilient telecommunications methods using packet based networks, advanced telecommunications methods such as SDN and cloud-based applications.
- **Consumers, Prosumers and EVs:** Secure information exchange between a diverse set of grid participants including IoT devices, infrastructure, hardware and software interfaces, APIs (Application Programming Interfaces), and telecommunications considerations for virtual power plants.
- **Interoperability and Data Exchange:** Methods in ensuring legacy and new applications to communicate between Electricity Network Grid Operators, System Operators, Market Operators, Generation Companies, Industrial Product Manufacturers, Telco Operators, ICT services providers, Energy Regulators, and Certification Entities.
- **Telecommunications Technologies and Management:** Assessment of technologies and architecture to ensure resilience for power utility use cases; telecommunication network management systems for a resilient and agile utility telecommunications network.
- **Implementation of the networks of the future:** Monitoring of on-the-field experiences and proof of concepts of smart technologies; Impact on the existing ICT systems such as telecommunication network and equipment; SCADA, enterprise business functions (Smart Grid Architecture Model domain).
- **New digital trends used by EPU and new business services:** Monitoring on the field experiences on the deployment of digital equipment such as IEDs, PMUs, IoT, Fog and Cloud Computing, Network Function Virtualization, as well as the processing of large quantity of information (Big data) in the domains of asset health, system operation, smart metering.
- **Cybersecurity:** Assessment of best practices, adoption of standards, tools and solutions of cybersecurity from the OT domain, for example, protection relays, SCADA control centres, to core corporate business systems such as asset management systems; development of recommendations for a resilient strategy in the system life cycle, from design, through to implementation, testing, operation and maintenance of solutions for power utilities; cybersecurity challenges related to emerging services, technologies and DER interconnection and the flexibility required to support increased data exchanges between market participants in a modern grid, including transmission system operators, distribution system operators, renewable resources operators, and consumers.

CURRENT ACTIVITIES

- SC D2 has over 200 experts contributing to international exchange by means of participation in Working Groups and Joint Working Groups, strengthening communication with other SCs as well as external International Standardisation Organisations, developing technical recommendations and best practices through Technical Brochures and Green Books, delivering tutorials at CIGRE web platform as well as during the international conferences, Symposiums, Colloquiums, etc.

KEY PROJECTS FORTHCOMING EVENTS

- CIGRE Session 2026 (August 23 – August 28), with a tutorial on "Application of AI for Power Utilities" and a workshop on "Challenges and Recommendations for DER integration to the grid from the perspective of information exchange, cybersecurity and telecommunications".
- The CIGRE Symposium 2027 in Thailand, participation with a tutorial on a theme to be defined.
- Update of the SC D2 Green Book "Utility Communication Networks and Services".

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TOPICS OF ACTIVE WORKING GROUPS

WG D2.44	Usage of public or private wireless communication infrastructures for monitoring and maintenance of grid assets and facilities
WG D2.49	Augmented reality / Virtual reality to support Operation and Maintenance In Electric Power Utilities
WG D2.51	Implementation of Security Operation Center in Electric Power Industry as Part of Situational Awareness System
WG D2.52	Artificial Intelligence Application and Technology in Power Industry
WG D2.53	Technology and Applications of Internet of Things in Power Systems
WG D2.54	Regulatory approaches to enhance EPU's cybersecurity frameworks
WG D2.55	Application of 5G Technology to Smart Grids
WG D2.56	Interdependence and Security of Cyber-Physical Power System (CPPS)
WG D2.57	CIM (Common Information Model) Methodology
WG D2.58	Monitoring, Maintenance and Control of Packet Networks & Services – From Situational Awareness to Network Control
WG D2.59	Intelligent Computing for Power Industry
WG D2.60	Consumer-side Digital Models and Twins Application
WG D2.61	High Voltage Power Line Carrier Communications Current State and Future Application
WG D2.62	Efficient spectrum allocation and utilisation for electric power industry private communication networks
WG D2.63	Inter-Control Center Communications Protocol (ICCP) Security and Resilience for Grid Reliability
WG D2.64	Application of AI in Cybersecurity Defence of Power Systems
WG D2.65	Optical Transport Communication Networks for Electric Power Utilities
WG D2.66	Low Voltage Power Line Carrier Communications Application
WG D2.67	Power Embodied Intelligence Technology and Application
WG D2.68	Enhancing Access Management Cybersecurity in Power Utilities
JWG A2/D2.65	Transformer Digital Twin – concept and future perspectives
JWG B2/D2.72	Condition Monitoring and Remote Sensing of Overhead Lines
JWG A3/D2.52	Application of Digital Twin in Switchgear
JWG B3/D2.62	Life-long Supervision and Management of Substations by use of Sensors, Mobile Devices, Information and Communication Technologies

LATEST PUBLICATIONS (2025)

TECHNICAL BROCHURES	
TB 929	Advanced Consumer Side Energy Resource Management Systems
TB 936	Enhanced Information and Data Exchange to Enable Future TSO-DSO Coordination and Interoperability
WEBINARS	
WBN 060	Security mechanisms over R-GOOSE messages
WBN 065	Smart Solutions for Power Systems: From AI Data Magic to Superfast Simulations
ELECTRA	
ELECTRA NO 339	CIGRE D2 Roundtable
ELECTRA NO 342	The Human Factor: Why Usable Security is Critical for the Power Grid
CIGRE SCIENCE AND ENGINEERING	
CSE NO 36	Quantum Key Distribution for MPLS-TP Traffic Encryption

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