Within the framework of these **preferential subjects**, CIGRE encourages the submission of papers representing all aspects of the electric power system, including, but not limited to: Generation, Transmission, Distribution, Storage and End Use.

**There is no individual presentation** of Papers during Group Discussion Meetings.

**Special Reports** give the essence of Papers with questions for the audience.

**Authors** will have the opportunity to present their Paper during Poster Sessions.

**If your Paper is accepted**, then you must attend both meetings.
A1 - ROTATING ELECTRICAL MACHINES PS 1 / GENERATION MIX OF THE FUTURE
- Impact and effect of increasing renewable power production, multi-energy systems, generator, generator auxiliaries and motors,
- Synchronous converter and high inertia machine design and performance for supporting power generation networks,
- Adaptation of international standards for electrical machine design & performance to current power grid requirements.

PS 2 / ASSET MANAGEMENT OF ELECTRICAL MACHINES
- Experience with refurbishment, replacement, conversions, power up-rating and efficiency improvement of generators,
- Novel techniques to overcome known operational and design problems,
- Optimised condition monitoring, diagnosis, prognosis and maintenance practices to improve reliability and extend operational life of conventional plant and in new volatile grid conditions, including data handling and digital modelling.

PS 3 / DEVELOPMENTS OF ROTATING ELECTRICAL MACHINES AND OPERATIONAL EXPERIENCE
- Latest design, specification, materials, manufacture, maintenance and performance and efficiency improvements,
- Operational experience: Failures, root cause analysis, recovery options, cost and time reduction initiatives,
- Evolution and trends in designs of rotating electrical machines for renewable generation.

A2 - POWER TRANSMISSORS & REACTORS PS 1 / EXPERIENCE AND NEW REQUIREMENTS FOR TRANSMISSORS FOR RENEWABLE GENERATION
- Operational experience: problems, maintenance, condition monitoring, monitoring , failure rate, lifetime, lessons learnt,
- Design, test, insulation, monitoring, maintenance of step-up, secondary substations and DC converter transformers,
- Design and operational requirements for future transmission and collection grid transformers.

PS 2 / BEYOND THE MINERAL OIL-IMMERSED TRANSFORMERS AND REACTORS
- Alternative technologies for improved safety and environmental performance: gas-insulated, ester-immersed, dry-type and solid-state transformers,
- Operational experience with transformers using these new technologies,
- Advantages and limitations, impact on specifications, high temperature applications, business cases.

PS 3 / BEST PRACTICES IN TRANSFORMERS AND REACTORS PRODUCTION
- Refurbishment, modernization, factory qualification, design reviews, implementation of new specifications, on-site vs virtual witnessing,
- Quality control and testing: manufacturing check points, sub-supplier qualification, validity period for new, renewals, enhancements to standards, special tests, short-circuit test, paper DP measurement,
- Dealing with non-conformities, performance guarantees, warranty.

A3 - TRANSMISSION & DISTRIBUTION EQUIPMENT PS 1 / DECENTRALISATION OF T&D EQUIPMENT
- New assets: e.g. DC switching equipment, fault current limited,
- Influence of system changes on existing conditions & transmission equipment,
- Equipment resilience against natural disasters.

PS 2 / DECARBONISATION OF T&D EQUIPMENT
- SF6 Alternatives for MV and HV application and HV vacuum applications,
- Life extension, the impact on the design of T&D equipment,
- Health, Safety and Environment aspects of T&D equipment.

PS 3 / DIGITALISATION OF T&D EQUIPMENT
- Advanced sensors, non-conventional instrument transformers, monitoring and condition assessment,
- Digital twin and equipment reliability modelling,
- Pandemic influence on equipment.

B1 - INSULATED CABLES PS 1 / LEARNING FROM EXPERIENCES
- Design, manufacturing, installation techniques, maintenance and operation,
- Quality, monitoring, condition assessment, diagnostic testing, fault location, upgrading and uprating methodologies and relevant management,
- Lessons learnt from permitting, consent and implementation.

PS 2 / FUTURE FUNCTIONALITIES AND APPLICATIONS
- Innovative reduces and systems, exploring the limits,
- Role and requirements of power cables in tomorrow’s grids,
- Prospective impacts from the Internet of Things, Big Data and Industry 4.0 on power cable systems.

PS 3 / TOWARDS SUSTAINABILITY
- Environmental challenges impacting current, planned and future cable systems,
- Safeguards, cybersecurity and physical security, including case studies,
- Projects and initiatives to promote access to affordable, reliable, sustainable distribution and transmission cable lines for all.

B2 - OVERHEAD LINES PS 1 / CHALLENGES & NEW SOLUTIONS IN DESIGN & INSTALLATION OF NEW OHL
- Design for reliability, availability, future climate parameters, more frequent extreme loads, design against theft, vandalism,
- AC/DC Hybrid Lines, multi-purpose utilization for HVDC transmission, telecommunication,
- OHL challenging construction projects: multiple circuits lines, high towers, long spans, heavy wind and ice, high altitudes, geology, access to site, no proper machinery, long lines and variation in reliability criteria etc.

PS 2 / LATEST TECHNIQUES IN ASSET MANAGEMENT, CAPACITY ENHANCEMENT, REFURBISHMENT
- Preparedness and countermeasures for natural disasters and other emergencies,
- Decision making with respect to equipment maintenance, operation, historical data,
- Strengthening of existing lines to improve reliability, ampacity, lifespan.

PS 3 / ASPECTS FROM OHL (GROUP PS WITH C3)
- Safety of workers in construction and maintenance of lines (equipment, methods, etc.),
- Reducing environmental impacts from new and existing OHL,
- Innovative engineering solutions/design to deal with environmental challenges.

B3 - SUBSTATIONS & ELECTRICAL INSTALLATIONS PS 1 / INCREASED IMPACT OF CLEAN ENERGY TRANSITION ON SUBSTATION DESIGN
- Onshore wind, solar, hydro, geothermal, etc.,
- Energy storage, hydrogen, synchronous compensators, etc.
- GIS/GIL application for DC network.

PS 2 / SUSTAINABILITY MANAGEMENT CHALLENGES IN SUBSTATIONS
- External drivers for substation intervention such as resilience, reliability, security of supply, life expectancy coordination, etc.,
- SF6 alternatives and emission management, circular economy, materials of such as re-use, reduce, recycle,
- New set of skills for new technologies, knowledge transfer and high standards of education in engineering skills.

PS 3 / INTEGRATION OF INTELLIGENCE ON SUBSTATIONS (JOIN PS WITH B5)
- Data analytics, remote supervising & monitoring and automation application,
- IoT and machine learning applications based on protection automation and control data including asset management, monitoring and data analysis,
- Expectations and benefits from digital substation, IEC 61850 Principles and applications to substations.

B4 - DC SYSTEMS & POWER ELECTRONICS PS 1 / HVDC SYSTEMS AND THEIR APPLICATIONS
- Planning, implementation and commission of new FACTS and other PE devices including need, justification, for integration of renewables, environmental and economic assessment,
- Application of new technologies including cybersecurity and advanced controls to address emerging network situations, DC grid, multi-terminal HVDC, hybrid HVDC systems.

- Refurbishment and upgrade of existing HVDC systems, service and operating experience of converter stations including offshore converters, and implications for converter free energy resulting from the conversion of AC circuits to DC circuits.

PS 2 / DC FOR DISTRIBUTION SYSTEMS
- New concepts, technologies and designs of DC converters for distribution systems.

PS 3 / FACTS AND POWER ELECTRONIC (PE) TECHNOLOGY FOR DISTRIBUTION SYSTEMS
- Planning and implementation of new FACTS and other PE devices including need, justification, for integration of renewables, environmental and economic assessment,
- Application of new technologies in FACTS and other PE devices including need, justification, for integration of renewables, environmental and economic assessment,
- Application of new technologies in FACTS and other PE devices including need, justification, for integration of renewables, environmental and economic assessment.
> Expectations and benefits from digital substation and IEC 61850 principles and applications to digital energy systems

C1 - POWER SYSTEM DEVELOPMENT & ECONOMICS

PS 1 / SYSTEM TRANSITION RESILIENCE & ASSET MANAGEMENT RESPONSE
> Resilience metrics and measures to safeguard stakeholder value through grid forming, power electronics control, smart load shedding, fast restoration,
> Response to unexpected emerging system and business risks during the energy transition,
> New standards [equipment design and system planning in power systems] for resilient and life-cycle sustainable system.

PS 2 / ENERGY SYSTEM INTEGRATION AND TACKLING THE COMPLEXITY OF MULTI-FACETED NETWORK PROJECTS
> Energy sector integration, hydrogen & power-to-gas, deep electrification: technical and economic aspects,
> Multi-purpose, multi-terminal, multi-actor, multi-jurisdiction grid projects: how to tackle transitioning complexity,
> Including in the planning process the flexibility options from non-network-assets and non-electric solutions [storage, virtual power plants, DR, energy communities, behind-the-meter resources].

PS 3 / PLANNING UNDER UNCERTAINTY AND WITH CHANGING EXTERNAL CONSTRAINS
> Modelling the impact of environmental, technical advancements, greater stakeholder involvement, generation fleet shift, new type of contingencies, use of data driven network methods for long-term load forecasting, including impact of COVID pandemic on load profiles, planning scenarios, investments patterns and assets’ maintenance schemes,
> Decision-making under pervasive energy policies: optimising economic vs environmental benefits for consumers and matching centralized energy targets with private driven investments,
> Leveraging the evolving system services, market products and load profiles to optimize investment and timing, aligning stranded assets [also from fossil plants disposal].

C2 - POWER SYSTEM OPERATION & CONTROL

PS 1 / SYSTEM CONTROL ROOM PREPAREDNESS: TODAY AND IN THE FUTURE
> Operator training, situational awareness and decision supporting tools,
> Effective and efficient use of synchrophasor data in power systems operation,
> Advanced and intelligent methods applied to power systems operation.

PS 2 / OPERATIONAL PLANNING STRATEGIES, METHODOLOGIES AND SUPPORTING TOOLS
> High share of grid-connected and distributed power electronic interfaced resources including hybrid AC-DC systems,
> Advanced and intelligent methods applied to power systems operational planning and day-ahead provisions,
> Impact of load demand and other predictable extreme operating conditions.

C3 - POWER SYSTEM ENVIRONMENTAL PERFORMANCE

PS 1 / SETTING AMBITIOUS CLIMATE STRATEGIES IN THE ENERGY SECTOR
> Standards and methods used to define goals and can be reduced pathways,
> Reasons for setting ambitious climate strategies and benefits resulting from them,
> Company internal and external challenges to commit to an ambitious climate strategy and possible solutions.

PS 2 / BIODIVERSITY AND THE SUPPLY OF ELECTRICITY, RENEWABLES-BASED OR NOT: RISK, CHALLENGES, SOLUTIONS AND OPPORTUNITIES
> Show how biodiversity has been enhanced in a generation, transmission or distribution projects,
> Show how biodiversity has been accommodated in a generation, transmission or distribution projects,
> Highlight special measures or actions taken to protect biodiversity impacted by a generation, transmission or distribution project.

PS 3 / ENVIRONMENTAL AND SAFETY ASPECTS FROM OH (JOIN PS WITH B2)
> Safety of workers in construction and maintenance of lines [equipment, methods],
> Reducing environmental impacts from new and existing O&H,
> Innovative engineering solutions/design to deal with environmental challenges.

C4 - POWER SYSTEM TECHNICAL PERFORMANCE

PS 1 / CHALLENGES AND ADVANCES IN POWER QUALITY (PQ) AND ELECTROMAGNETIC COMPATIBILITY (EMC)
> Modelling, measurement and assessment of PQ phenomena including emerging areas such as supra-harmonics, harmonic instability, geo-magnetically induced currents and other similar phenomena,
> Integration and application of advanced signal processing, artificial intelligence techniques and big data analytics for event diagnostics and system planning purposes such as hosting capacity or emission limit calculation,
> Impacts on equipment compatibility and immunity, and system resilience.

PS 2 / CHALLENGES AND ADVANCES IN INSULATION COORDINATION AND LIGHTNING RESEARCH
> Insulation coordination practices for end-to-end power networks, including the effects of long lines, long cables and frequency dependent models,
> Development of insulation coordination in AC systems interfaced with power electronics based systems and the need for standardisation,
> Lightning evaluation of transmission and distribution systems covering new asset designs and extreme meteorological events.

PS 3 / CHALLENGES AND ADVANCES IN POWER SYSTEM DYNAMICS
> Modelling, analysis and validation of individual components and wide-area system interactions including system level protection schemes considering changing system dynamics,
> Impact of emerging technologies such as hydrogen and other storage devices, grid forming inverters and demand side management,
> Analysis of security and resilience of power systems having high share of grid-connected or distributed generation technologies, including feasibility of providing system support such as black start, islanding, system strength and inertia.

C5 - ELECTRICITY MARKETS & REGULATION

PS 1 / THE EVOLUTION OF MARKET DESIGN AND REGULATION TO INTEGRATE DISTRIBUTED ENERGY RESOURCES
> Market design developments to facilitate the integration of new participants and renewable resources,
> The role of retail electricity markets in the transition towards distributed energy resources, (DGs) both within and between countries,
> Innovative contracts/services between market participants and with customers/distributed energy resource owners.

PS 2 / CHANGES TO MARKETS AND REGULATION TO ENHANCE RESILIENCE AND RELIABILITY
> The lessons for markets and regulation from major system disturbances and social disruptions,
> Market designs for reliability and resilience in systems with high penetration of asynchronous and low inertia generation,
> Markets to coordinate resources that are not responsive to demand or price.

PS 3 / WORKING WITH INNOVATION AND DISRUPTION – PREPARING FOR THE FUTURE
> Innovative approaches to markets and regulation to achieve energy policy targets and to include edge-of-grid activities,
> The design and structure of retail and wholesale electricity markets to support capital-intensive investments,
> Sector regulation and tariff design in the face of technological disruption, e.g. vehicle to grid, hydrogen and new forms of storage.

C6 - ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES TRANSFORMATION

PS 1 / DER SOLUTIONS AND EXPERIENCES FOR ENERGY TRANSFORMATION AND RESILIENCE
> Electric mobility charging systems configuration and operation,
> Demand response and intelligent load configuration for customer empowerment,
> Electrification of transportation, heat systems and industrial processes.

PS 2 / INNOVATION AND OPERATIONAL PLANNING AND OPERATION OF ACTIVE DISTRIBUTION SYSTEMS
> Aggregation and management platforms for active distribution systems with DER,
> Strategies and tools for DER integration, hosting capacity, congestion management, and system service provision by DER,
> Greening rural and green-field electrification, off-grid distribution and zero emission industrial systems.

PS 3 / AGGREGATED DER FOR ENHANCING RESILIENCE, RELIABILITY AND ENERGY SECURITY OF DISTRIBUTION SYSTEMS
> Coordination of local energy storage systems for managing uncertainties,
> Communication, efficiency & security of the grid
> Coordination of multi-energy systems supported by state-of-the-art technologies including intelligent inverters and local energy communities’ control and network integration.

D1 - MATERIALS AND EMERGING TEST TECHNIQUES

PS 1 / TESTING, MONITORING AND DIAGNOSTICS
> Testing and experience with non-standardized, composite and combined voltages,
> PD measurement under DC, rectifier and impulse stress,
> Requirements of systems for testing, monitoring and diagnostics.

PS 2 / MATERIALS FOR ELECTRO TECHNICAL PURPOSES
> Ageing under electrical, mechanical & thermal stress [e.g. power electronics and semiconductors, load cycling, higher temperatures, compact applications, corrosion and radiation ageing, etc.],
> Functional properties of insulation materials & testing for validation,
> Materials for battery and charging devices.

PS 3 / SIMULATION TOOLS PARTNERED WITH MEASUREMENT TECHNOLOGY (MET)
> Application and development of new multi-physical simulation methods,
> Digital twin for insulation components and insulation systems,
> Physical models and sensors.

D2 - INFORMATION SYSTEMS & TELECOMMUNICATIONS

PS 1 / THE OPPORTUNITIES AND CHALLENGES Brought by emerging information and communication technologies to electric power utilities in their path to digitalisation: new technologies and emergent applications
> IoT technologies and architectures in physical asset management,
> Artificial intelligence, big data and analytics tools to improve asset management in electric power utilities,
> Augmented and virtual reality technologies in electric power utilities and power plants.

PS 2 / GRID FORMATION, ICT, TELECOMMUNICATIONS, TECHNOLOGIES AND APPLICATIONS FOR SECURING CRITICAL INFRASTRUCTURE ASSETS
> Cybersecurity directives, supporting standards and certification schemes – experiences from electric power utilities worldwide,
> Cyber incident management and experiences in the implementation of security operation centres for electric power utilities,
> Impact assessment and mitigation strategies for cyber-attacks to power system operations.
> Studies and experiences in the integration of information and communication technology (ICT) network and cybersecurity simulators with existing power system analysis tools.

PS 3 / MEETING THE DEMANDS OF THE MODERN UTILITY AND DER WITH AN AGILE AND RESILIENT TELECOMMUNICATION NETWORK
> Supporting operation technology [OT] services and applications using current and next generation cellular [4G/5G] and IoT-based wireless technologies.
> Increasing efficiency and cyber security with the use of cloud-based technologies and intelligent networks including modern network management systems, network automation and service orchestration, network function virtualization [NFV] and software-defined wide area network [SD-WAN],
> Improving and maintaining reliability and resilience of critical services including protection services using modern telecommunication technologies and techniques.

ACRONYMS
AC Alternating current
DC Direct current
DER Distributed energy resources
DP Differential pressure
DR Demanding resource
EMC Electromagnetic compatibility
GIL Gas insulated line
GIS Gas insulated substation
HV High voltage
HVD C High voltage direct current
ICT Information and communication technology
IoT Internet of things
MW Medium voltage
NFV Network function virtualization
OHL Overhead line
OT Operation technology
PV Power
PD Power distribution
PQ Power quality
PV Photovoltaic
T&D Transmission and distribution
SD-WAN Software-defined wide area network
SF6 Sulphur hexafluoride
At CIGRE Sessions Authors do not present their papers during Discussion Group Meetings. They have this opportunity during specific meetings – The Poster Sessions – for which full detailed information is made available after the selection process. The delegates read the papers in advance and they discuss them around a set of questions given in a Special Report which incorporates the gist of the papers. To discuss the papers in depth, Session papers must therefore address a strictly limited list of topics, referred to as “Preferential Subjects” and selected by each Study Committee of CIGRE.

The Preferential Subjects are the main part of this Call for Papers.

**SESSION PAPERS FULL PROCESS**

**SYNOPSIS SELECTION**

As a first step, the papers are selected on the basis of synopses. Synopses are collected, checked and reviewed by National Committees. A second review and final selection decision is made by Study Committee Chairpersons, who are in charge of the running of the discussions. Authors are notified of the synopses selection results and invited to forward their full Paper to National Committees in case of acceptance.

**PEER REVIEW OF FULL PAPERS BY EXPERTS**

Full Papers are collected by National Committees. Study Committees manage the process of final Papers review with a Peer Review Panel composed by experts. Authors may be asked to make changes or adjustments to their papers. Final acceptance or non-acceptance is duly notified to authors.

**WHO CAN PROPOSE A PAPER?**

The main author [assuming there is more than one] must be an individual member or must be collective member staff. Co-authors are not required to be CIGRE members. Co-authors may be from different countries.

A paper must focus on one preferential subject and only one.

One single synopsis must be drawn up for each paper proposal.

The synopsis – 500 words minimum – must closely reflect the various points to be developed in the paper. When sending the synopsis, the name and address of the main author – and more importantly the email address that will be used for notification of the selection results – the Study Committee reference and Preferential Subject addressed must be clearly specified. Template: Authors will make use of the sample pages for layout of synopses; these are available on the CIGRE website, 2022 Session page.

**WHERE ARE SYNOPTSES TO BE DIRECTED?**

If the main author is from a country with a CIGRE NC: The synopsis must be sent by the main author to the involved CIGRE National Committee. See the contact details on the CIGRE website. Any synopsis sent directly to the Central Office will be returned to the sender. For Papers with authors from different countries, the proposal must be sent to the National Committee of the main Author only. If the main author is from a country where there is no National Committee: the synopsis must be sent in PDF format to the CIGRE Central Office to sessionpapers@cigre.org. If the proposed paper is written on behalf of a Study Committee: the synopsis should sent directly to the Study Committee Chair, who will transfer it to the Central Office.

**FULL PAPERS PEER REVIEW**

Authors who received the notification of acceptance for the synopsis should then draw up the corresponding full Paper and forward it to the National Committee involved. Final acceptance of full Papers will be notified to authors after a peer review from a panel of experts.

**MAIN DEADLINES**

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<th>Type</th>
<th>Submission Deadline</th>
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<tr>
<td>SYNOPSES</td>
<td>30th April 2021</td>
<td>2nd July 2021</td>
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<tr>
<td>FULL PAPERS</td>
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Deadlines for synopses and Full Papers submission are firm dates and will not be extended.

National Committees are required to observe the deadlines which implies that National Committees will have received synopses/full papers earlier. HENCE AUTHORS must contact their National Committee who will let them know by which date they need to receive the synopses/full Papers [allowing time for screening and meeting the Central Office deadlines]. AUTHORS FROM COUNTRIES where there is no National Committee will be sending their synopsis/full Papers directly to the Central Office strictly observing the deadlines.

**ACKNOWLEDGEMENT OF RECEPTION**

Authors with no National Committee who send their synopsis/full Paper directly to Cigre Central Office will receive an acknowledgement.

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CIGRE website, 2022 Session page.