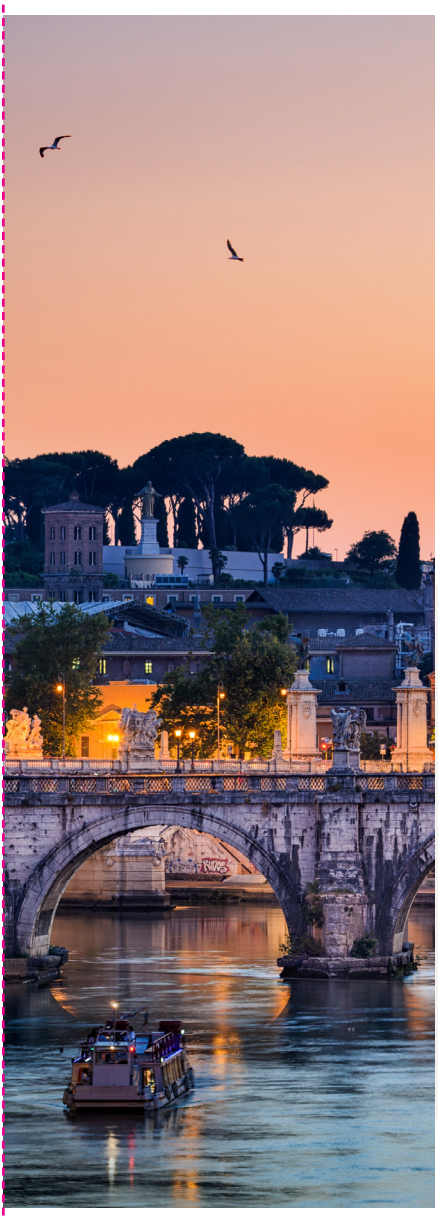
CIRED

ROME, ITALY

**12-15 JUNE 2023**



# CALL FOR PAPERS

## The 27th International Conference & Exhibition on Electricity Distribution

Europe's leading international conference & exhibition on power distribution engineering

Deadline for abstract submission

**14 SEPTEMBER 2022**

*Asset management • Flexibility management & DSO/TSO interface • Microgrids, citizens energy communities, local markets • Energy transition, sector coupling, hydrogen, E-mobility & smart cities • Resiliency, reliability, & the impact of climate change • Digital transformation, artificial intelligence & cybersecurity*

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# WHAT'S ON FOR CIRED 2023 ?

Three full days of technical presentations and discussions covering the very latest challenges and issues facing electricity distribution today and in the future, including:

- **Main sessions** with extended presentations of papers by selected authors
- **Internationally recognised keynote speakers** of the distribution industry
- Lively **panel discussions and round-tables** with the industry's current experts
- Structured and attractive **poster sessions, with pre-arranged guided tours** > your opportunity for in-depth discussion with presenting authors
- **International industry exhibition** with leading global companies > your chance to get a view of the technology of the future
- **Research and Innovation Forums** (RIFs) > your first chance to hear and discuss what could affect your industry's future.

**This exciting programme will be completed with:**

- An **opening forum** with high level keynotes and debate on topical challenges
- **Pre-conference tutorial sessions** to update your knowledge on the latest developments linked to electricity distribution
- A selected programme of stimulating **technical visits**

# WHY SHOULD YOU SUBMIT A PAPER?

Submitting a paper to **CIRED 2023** is a unique opportunity to present your views and share your ideas with hundreds of leading professionals. CIRED provides a unique forum to discuss and debate technical, operational and business matters, including the opportunity to interact with key players from utilities, industrial users, manufacturers, regulators, consultants and academics.

**Benefits to submitting:**

- Every accepted and presented paper will be distributed to all attendees via the CIRED 2023 proceedings
- Every accepted and presented paper will published on the IET library https://digital-library.theiet.org
  They will be Scopus indexed and available on IEEE Xplore
- Every author of an accepted paper will be given the opportunity and will be strongly encouraged to display his/her work in the CIRED interactive poster session with guided tour
- Selected authors will be invited by the session chairs to give a 12-minute presentation in the main sessions with the aim of ensuring an interesting and balanced debate
- Papers with a special focus on research and innovation will be selected for presentation and discussion in the Research and Innovation Forum

## TECHNICAL COMMITTEE

| CHAIRPERSON: MARKUS ZDRALLEK (GERMANY) | | |
|---|---|---|
| | CHAIRPERSONS | RAPPORTEURS |
| SESSION 1 | Christophe Boisseau (France) | Arnaud Allais (France), François Gentils (France) |
| SESSION 2 | Britta Heimbach (Switzerland) | Jan Desmet (Belgium), Jan Meyer (Germany), Herwig Renner (Austria) |
| SESSION 3 | Carsten Böse (Germany) | Andreas Abart (Austria), Marie-Cécile Alvarez-Herault (France), Helfried Brunner (Austria) |
| SESSION 4 | Ignaz Hübl (Austria) | Ricardo Prata (Portugal) |
| SESSION 5 | Fabrizio Pilo (Italy) | Riccardo Lama (Italy), Giovanni Valtorta (Italy) |
| SESSION 6 | Peter Söderström (Sweden) | Ben Gemsjaeger (Germany), Peter Kjaer Hansen (Denmark), Dag Eirik Nordgård (Norway) |

# HOW TO SUBMIT A PAPER

Prospective authors are invited to submit an abstract of 2 A4 pages (including diagrams and illustrations) by 14 September 2022. All the papers will be peer reviewed by the Technical Committee and by the National or Liaison Committee of the author's country, if any. Successful authors will be invited to submit a full paper by 23 January 2023.

**Simply go to the website to download the abstract template and submit online www.cired2023.org**

Deadlines

| | |
|---|---|
| 14 September 2022 | Abstract submission deadline |
| 14 November 2022 | Notification of acceptance |
| 23 January 2023 | Full paper submission deadline |

**CIRED 2023 Organisers**

Michèle Delville, Céline Dizier & Louisa Kara | AIM, Rue des Homes 1, 4000 LIEGE (Belgium) | Tel. +32 4 222 29 46

m.delville@aim-association.org | c.dizier@aim-association.org | l.kara@aim-association.org | www.cired2023.org

# FAST TRACKS FROM TOPICAL SUBJECTS TO SESSIONS (DETAILED PREFERENTIAL SUBJECTS INSIDE)

| Session | Asset management | Flexibility management & DSO/ TSO interface | Microgrids, citizens energy communities, local markets | Energy transition, sector coupling, hydrogen, E-mobility & smart cities | Resiliency, reliability, & the impact of climate change | Digital transformation, artificial intelligence & cybersecurity |
|---|---|---|---|---|---|---|
| **SESSION 1** Network Components | • New, recycled and bio-sourced materials<br>• Standards<br>• Safety and ergonomics<br>• Life extension, upgradeability, increasing capacity<br>• Components for DC and AC/ DC hybrid networks | • Components and sensors for voltage control and power flow management<br>• Components for the connection of distributed generation<br>• Power electronics based components<br>• Storage devices | • Components for microgrids, sensors, storage devices, renewable energy integration and power electronics<br>• Components for disconnection and reconnection with main grid | • Components for E-mobility<br>• Components for large cities (high ampacity cables, superconductivity, fault current limiters…)<br>• Reduction of losses<br>• Limitation of visual and noise impact | • Condition assessment, ageing models<br>• Diagnostics and monitoring<br>• Resilient components, impact of climate change<br>• Greener components eco design, life cycle analysis | • Solutions for maintenance<br>• Data analytics and AI for asset management<br>• Local intelligence and communication capabilities<br>• Components for smart metering systems |
| **SESSION 2** Power Quality & Electromagnetic Compatibility | • New measurement techniques and indices (DC to 500 kHz)<br>• Integration of PQ functionalities into secondary equipment<br>• Immunity issues<br>• PQ and life time of equipment | • PQ requirements for advanced distribution automation schemes<br>• Novel ride through solutions<br>• PQ management between DSO and TSO<br>• PQ data format and data interchange | • Challenges related to DC grids and microgrids<br>• Voltage and frequency stability as well as PQ in islanded microgrids<br>• Aspects of PQ regulation and benchmarking | • PQ Issues related to storage systems, distributed energy resources and loads<br>• Challenges related to future grids with very high share of power electronics (large wind- and farms, PV farms, HVDC and FACTS) | • Voltage dip immunity and ride through capability of grid-interactive inverters<br>• Lightning and switching overvoltages<br>• Revision of PQ standards and EMC concepts driven by energy transition | • Data mining and data analytics for PQ related data, including the application of AI<br>• Novel methods for PQ data visualisation<br>• Efficient design and implementation of PQ monitoring campaigns |
| **SESSION 3** Operation | • Maintenance strategies<br>• Condition monitoring<br>• Training and Education | • Management strategies for DER, generation, storage and flexible loads<br>• Reactive power management<br>• Capacity calculation and management | • Operation of microgrids and local energy communities<br>• Detection and operation of islanded grids | • Multi-energy system operation - storage and power2X<br>• Role of distribution networks in delivering low carbon, sustainable energy supplies | • Crisis management<br>• Blackout and restoration strategies<br>• Operation in case of cyber security disturbances | • Larger scale DER data analytics for grid operation<br>• New applications in grid operation (e.g. AI)<br>• Augmented reality in manual operation and inspection |
| **SESSION 4** Protection, Control & Automation | • SCADA Systems regarded as an asset, with a limited lifecycle due to new requirements<br>• Refurbishment strategies for secondary technology to implement innovative schemes and functions | • TSO/DSO interface for use flexibility<br>• New Protection schemes and system protection features<br>• IT-Security and resilience aspects for access and exchange of information | • Detecting islanding grids<br>• Protection and control for grids hosting lot of decentralized generation units and microgrids | • Control and Monitoring systems developments for sectors coupling energy systems<br>• Contribution of automation to the energy transition | • Solutions of resiliency for converging communication and power systems<br>• SCADA and local automation concepts for large outages, blackout and crisis scenarios | • AI in SCADA and network<br>• Remote access and IT-security<br>• Multivendor solutions – security and interoperability |
| **SESSION 5** Planning of Power Distribution Systems | • Managing ageing in complex installations<br>• DC distribution<br>• Multi- annual experiences<br>• AI applications | • Flexibility and distribution development<br>• DSO as system dispatcher.<br>• Integrated/coordinated TSO/DSO | • Microgrids and local energy communities<br>• Rural Electrification | • Distribution planning in smart cities<br>• E-mobility and sector coupling<br>• Fast development of distribution systems | • HILP events in planning<br>• Reliability vs resiliency<br>• Resiliency and reliability in smart grids | • Data analytics and AI<br>• Customer segmentation<br>• P2P markets in planning |
| **SESSION 6** Customers, Regulation, DSO Business & Risk Management | • Standardization ISO55000 & PAS55<br>• Risk management methods, processes & tools | • Regulation incentives for flexibility, lower loses and more efficient use of the grid | • Local flexibility markets integration<br>• Role of DSOs in relation to energy communities, microgrids and storage<br>• Off-grid possibilities | • Impacts of hydrogen economy<br>• Challenges and opportunities related to EV charging<br>• Sector integration for DSOs including local energy optimization | • Climate risk management<br>• Short- and long-term forecasting | • Security and privacy by design<br>• DSO as neutral data hub<br>• Progress in digitalization and AI |

# SESSION 1
# NETWORK COMPONENTS

Session 1 deals with all aspects related to the components used in the electricity distribution networks: cables, overhead lines, primary and secondary substations, transformers, switchgear, protection and monitoring systems, power electronics. It covers topics related to the life cycle of assets from design to end of life management. The session also covers environmental concern including eco-design and life cycle analysis, standardisation, ergonomics and safety. It aims at providing an overview of the state-of-the-art and proposals for future components, including those needed for smart grids, E-mobility, smart cities and microgrids, as well as components for more resilient networks in the context of climate change anticipation. This session is an opportunity for DSOs and manufacturers to share their challenges.

### COMPONENTS FOR SMART DISTRIBUTION GRIDS

- Smart substations
- Components with capabilities for data acquisition, information generation, communication and cybersecurity
- Components and sensors for voltage and power flow management
- Power electronics based grid components
- Components for DC and AC/DC hybrid networks
- Components for integration of distributed generation
- Storage devices
- Components for E-mobility
- Components for the disconnection and reconnection of microgrids

### COMPONENTS RELIABILITY, DIAGNOSIS AND MAINTENANCE STRATEGY

- Condition assessment, aging models, lifetime assessment
- Diagnostics of network components
- Online monitoring of distribution system assets
- Use of new solutions like digital tools, big data, machine learning, drones for diagnostics and maintenance
- Life extension, upgradeability, increased power capacity, retrofit operations of existing components
- Reliability and lifetime assessment of smart components and their integration in existing systems
- Components for more resilient networks
- Impact of climate change on network components.

### COMPONENTS FOR LARGE CITIES DISTRIBUTION NETWORKS

- Compact substations
- Modular components for fast installation and extensibility
- High reliability solutions
- Short circuit current mitigation solutions
- Components with increased power capabilities

### TOWARDS "GREENER COMPONENTS"

- Circular Economy, eco-design, use of bio-sourced and recycled materials, life-cycle analysis
- Reduction of losses
- Limitation of visual and noise impact
- Management of hazardous substances

### INNOVATION IN DESIGN OF COMPONENTS

- Modelling including digitalization e.g. Digital twins of components
- Testing
- New materials
- Safety aspect, ergonomics and usability
- Evolution of standards
- New functional specifications

# SESSION 2
# POWER QUALITY & ELECTROMAGNETIC COMPATIBILITY

Session 2 deals with any phenomena related to power quality (PQ). This includes e.g. flicker, unbalance, distortion in the frequency range from DC up to 500 kHz as well as events like sags or swells. The session covers also all aspects of electromagnetic compatibility (EMC) including emission, immunity, its coordination and the related standardisation. Conducted and radiated electromagnetic interferences, electric and magnetic fields (EMF) and grounding issues are also included.

### PQ RELATED TO NEW TECHNOLOGIES

- Modern equipment, like storage and DER, EV, LED
- Future grids with high share of power electronic devices
- Challenges and opportunities in microgrids, including islanded operation
- DC distribution networks and DC equipment
- Requirements for advanced distribution automation schemes

### PQ MEASUREMENT, ANALYSIS AND SYSTEM MONITORING

- Resonances and frequency-dependent network impedance
- Measurement techniques and indices from DC up to 500 kHz
- Integration of PQ functionalities into secondary equipment
- Accuracy of measurement systems including voltage and current transducer
- Strategies to include PQ management in planning and operation
- Efficient design and implementation of monitoring campaigns
- Techniques for data analytics and visualization, including AI
- PQ data format and data interchange

### CONTINUITY OF SUPPLY, PQ STANDARDS AND REGULATORY ISSUES

- Efficient design and implementation of monitoring campaigns
- Data mining and data analytics, including AI techniques
- Novel techniques for data visualization and reporting
- PQ data format and data interchange

### ELECTRIC AND MAGNETIC FIELDS, IMMUNITY AND SAFETY ISSUES

- Low frequency electromagnetic interference
- Immunity issues related to PLC, ripple control systems and smart electronic devices
- Impact of PQ on life time of equipment
- Earthing systems, step and touch voltages, neutral grounding practices, risk evaluation
- Immunity and safety issues related to DC and microgrids

### PQ ISSUES AT THE INTERFACE BETWEEN DISTRIBUTION AND TRANSMISSION GRIDS

- PQ management at the interface, including coordination of planning levels and emission limits
- Interactions related to large PV and wind farms, HVDC, FACTS
- Resonances related to long cables and increased cabling

# SESSION 3
# OPERATION

Session 3 deals with operational use of components (Session 1) and systems (Session 4) in public, industrial and private distribution networks in normal operation as well as in any case of disturbance. Session 3 covers all aspects of grid operation including strategies and management topics, challenges and new application, the integration of DER and special applications. Focus is on the use of new technologies like artificial intelligence and the operational challenges to integrate and operate new types of load like electric vehicles and storage.

### STRATEGIES AND MANAGEMENT

- Organization strategies and schemes for grid operation
- Training and Education
- Maintenance strategies
- Condition monitoring
- Management strategies for DER, generation, storage and flexible loads (electric vehicles, heat pumps)
- Larger scale DER integration data analytics and intelligence for distribution network management

### OPERATION CENTER

- Energy efficiency in operation (use of e.g. optimized power flow)
- Reactive power management
- Capacity calculation and management
- Planning of operation
- Detection and operation of islanded grids
- Interaction between DSO and TSO
- Crisis management
- Blackout and restoration strategies
- Operation in case of cyber security disturbances
- Ergonomics of operation center

### OPERATION IN THE FIELD

- Occupational safety in grid operation (acc. EN 50110)
- Augmented reality in manual operation and for inspection
- Workforce management tools and techniques to improve operation efficiency

### NEW USE CASES & SPECIAL APPLICATIONS

- New applications in grid operation (e.g. Artificial Intelligence)
- Role of distribution networks in delivering low carbon, sustainable energy supplies
- Multi-energy system operation - storage and P2X (gas, heat, ...)
- Operation of microgrids and local energy communities

# SESSION 4
# PROTECTION, CONTROL & AUTOMATION

Session 4 deals with design and implementation of systems for protection, control and automation in distribution networks. The consideration of historical grown concepts as well as the latest developments in the world of protection, control, communication, and automation are topics in this session. Emphasis is also placed on practical application and experience in operating the systems. But the latest developments, scientific findings and considerations as well as algorithms and simulations are also of great importance.

### PROTECTION

- New protection schemes and functions for up-to-date grid structures
- Protection algorithms and simulation models as well as tools for protection virtualization
- Protection management considering remote access and IT security
- Impact of distributed generation on existing, traditional protection systems
- Protection communication, interface, reliability, IT security
- Fault location, fault records and analyses
- Testing of protection relays, functions and systems as well as type tests

### CONTROL AND MONITORING

- SCADA systems merging with different databases (weather, lightning detector etc.)
- Concepts for SCADA systems in a productive environment in coordination with decentralized control (topological concept) as well as their development environment
- Management systems of power flow, voltage, stability and ancillary services
- Challenges associated with the integration of new DER assets and technologies, including energy storage, flexibility, demand side management and control solutions
- TSO/DSO-Interface, providing system services and flexibility on distribution level

### COMMUNICATION AND IT-SECURITY

- Requirements for communication technology in technical systems at various process levels, including connection to customer sites
- Convergence of power grids and communication grids
- IT-Security and resilience aspects of information access and information exchange
- Measures to ensure confidentiality in integrity in communications (e.g. encryption, key exchange, certificate management)
- Centralized management and monitoring of communication networks

### AUTOMATION

- Automation on distribution level e.g. voltage and load control
- Manufacture-independent multi-vendor solutions and interoperability
- Optimization potential of digital substations with regard to new automation tasks
- Artificial Intelligence (AI) in the automation environment (analyses, diagnostics etc.)

# SESSION 5
# PLANNING OF POWER DISTRIBUTION SYSTEMS

Session 5 deals with short- and long-term development of high, medium and low voltage distribution networks, concerning the changing requirements for electricity distribution including, but not limited to, smart grids and active distribution networks, electrification and electromobility, energy storage, flexibility, distributed energy resources integration, present and future customer quality of supply requirements, and optimum asset utilisation techniques and strategies. Papers dealing with meeting the energy transition goals, rural electrification, and strategies to increase resiliency are also expected.

## DEMAND AND GENERATION FORECAST

- Evolution of the demand (e.g., the electrification, electromobility and transport systems, hydrogen and green gas production, etc.)
- Methodologies for demand and generation forecast
- Impact of COVID on-demand and generation

## PERFORMANCE REQUIREMENTS, RESULTS, AND BENCHMARKING

- Economical versus technical performance
- System reliability and degree of adequacy
- Performance assessment and benchmarking
- Evaluation of technical and non-technical losses
- Increasing resiliency against low probability high-risk extreme events
- Microgrids and local energy communities to provide security of supply

## NETWORK SCHEMES AND DESIGN CRITERIA

- Innovative solutions for enabling energy transition (e.g., RES integration, electric vehicles, DC distribution, flexibility procurement, etc.)
- Active networks and smart grids
- Distribution systems for offshore wind farms
- Low-losses distribution systems
- Sector-coupling and distribution development
- Design criteria for increasing resiliency
- Distribution network schemes for developing countries

## NETWORK PLANNING

- Distribution planning and flexibility (forecast, uncertainties, market, standardisation, etc.)
- Integrated/coordinated transmission and distribution planning with flexibility
- Sector-coupling and distribution development
- Improving efficiency in distribution networks
- Integration of distributed energy resources (distributed generation, storage, EV, etc.)
- Planning criteria for electrification in low load density areas
- Integration of EV fast-charging installations in the network
- Microgrids and local energy communities in distribution planning
- The resilience of smart grid when deployed at scale and the impact on network planning standards (i.e., IT/ telecoms requirements, common-mode failures)

## INVESTMENT STRATEGIES

- Least cost investment plans
- Financial planning and cash flow for investment
- Network ageing
- Risk analysis and asset management implications
- Non-network solutions
- Obsolescence: shorter life-cycles due to automation and ICT technologies

# SESSION 6
# CUSTOMERS, REGULATION, DSO BUSINESS & RISK MANAGEMENT

The energy transition is impacting the DSO's business management. The vision to be the enabler of the transition is clear; however, the grid infrastructure is nothing that can be changed over-night. While traditional assets typically have long life-times, new business tools, methods and processes need to be adapted and demonstrated to match new priorities and the necessary speed of transition. The focus of Session 6 is to take the DSO business perspective including regulation compliance, cooperation with stakeholders including sector integration, reasonable risk management for flexibility and cybersecurity, customer expectation and overall business digitalization.

## REGULATION, MARKETS, NETWORK CODES & DSO/ TSO COORDINATION

- Incentive regulation for smart grid technologies, flexibility, lower loses and more efficient use of the grid
- Regulation enabling energy transition
- Local flexibility markets and market integration
- DSO-TSO interaction in system flexibility
- Implementing network codes
- Regulation benchmarking and sandboxes
- Tariff structures and designs
- WACC / financing of investments in a regulated regime

## DSO BUSINESS RISK MANAGEMENT

- Novel DSO business models and model innovations
- Efficient business processes for the evolving DSO roles
- New DSO competence needs
- Adapting DSO business processes for flexibility
- Risk management methods, processes & tools
- Balance investment risk, cost and timing
- Short and long-term forecasting
- Standardization ISO55000 & PAS55
- Climate risk management

## CUSTOMERS, ENERGY COMMUNITIES & E-MOBILITY, ELECTRIFICATION, SECTOR INTEGRATION

- Role of DSOs in relation to energy communities, microgrids, storage and off-grid possibilities
- Active customers - new needs (incl energy poverty), requirements and incentives
- Improving customer engagement and interaction
- Sector integration for DSOs including electrification of transport, heating/cooling and local energy optimization
- Challenges, opportunities and solutions in E-Mobility
- Impacts of hydrogen economy
- Capacity maps and other real-life experiences – communicating with transparency

## DIGITALIZATION, METERING, IT-SYSTEMS & CYBERSECURITY

- Progress in digitalization and AI application of DSO business
- Cybersecurity-physical threats and protection
- Social factors and data privacy by design
- Next generation AMR and usage of smart meter data
- Managing information and data integration
- Data platform and hub solutions
- Innovations in information exchange (e.g. data hubs)
- IoT for DSOs