

CIREC Workshop Shanghai 2022
21-22 September 2022
Call for papers

- Theme 1 – Planning and development of smart cities (Chair Prof. Wang, Co-chair Dr Valtorta)
- Theme 2 – Equipment and components for smart cities (Chair Mr. Lemerle, co-chair Mr. Hua Huang)
- Theme 3 Digitalization enabling new services, operation schemes and customer engagement (Chair Dr Prata, co-chair Dr Meyer)
- Theme 4 – Reliable and Resilient Smart Power Distribution (Chair Prof. Liu, co-chair Prof. Zdrallek)

Scope

Fast evolving cities will drive the transformation of the energy systems, with 60% of humanity expected to live as city-dwellers in 2030. Cities will use two-thirds of the world's energy and produce a similar proportion of global carbon emissions. Cities are then at the heart of the climate change discussion and sustainability. City authorities, planners, and utilities are investigating how to develop the electrical infrastructure to support economic growth and high quality-of-life while also integrating more renewable energy sources (RES) than ever before and radically reducing cities' impact on the environment. The answer is in the smart city paradigm that leverages data and digital connectivity to rethink the city planning and management for the long-term sustainability and wellbeing of cities. To scale up rapidly and substantially, most cities will need to focus on decarbonizing buildings, factories with electrification solutions, and smart mobility. Rooftop solar PV and solar water heating are easy to install in buildings and offer significant economic gains. In transport, electric mobility, when powered by renewable sources, reduces air pollution and is increasingly cost-competitive. Electric mobility and RES will be the main drivers for power distribution development. As renewable energy technologies spread, buildings and transport will become increasingly interconnected with the power system and the electricity, heat, water, and waste management sectors. Thus, cities need to plan for integrated urban energy systems, using expertise from multiple sectors from urban planning to waste management. In this context, digitalization – the increasing interaction and convergence between the digital and physical worlds – is crucial for enabling the fast, resilient, and sustainable development of cities. Digitalization with the three main areas of Data, Analytics, and Connectivity will inevitably play a vital role in the transition towards smart cities.

Theme 1: Planning and development of smart cities

Digitalization enables the convergence of several services in such a way that can completely reshape the urban texture of large cities. Data analytics techniques, such as machine learning and artificial intelligence, can produce the data for detailed planning studies that consider different energy and services by exploiting the real-time information on the consumption of energy in its different forms, on the traffic flows, on people habits, on city economy, on geography and orography, etc. The integrated planning of services and networks will be crucial to make the fast-growing of large cities in different time horizons possible.

Preferred topics for papers are:

- Planning the development and the upgrade of power distribution
- Planning the RES integration in fast-growing cities
- Impact of E-mobility on distribution planning
- Integrated urban planning (power, gas, thermal, water, communication, transportation, and waste)
- Integrated planning of digital infrastructures (e.g., integrated data centres)
- Inclusion of Cyber security in distribution planning and development
- Artificial intelligence, machine learning, expert systems for planning smart city distribution networks
- Smart buildings, smart districts, smart factories, microgrids
- Business models, markets, and regulatory framework impact on the smart city development

Theme 2: Equipment and components for the smart cities

Fast-growing smart cities require special components and technical solutions to cope with fast-increasing demand and integrate high shares of renewable and widespread e-mobility by meeting high-quality levels of service continuity and resiliency. Standardized, pre-built stations and sub-stations equipped with sensors and digital communications should be considered for the day-by-day development of smart cities. New digital conceived smart grid components will be the backbone of any smart city and permit the seamless, fast growth of large urban areas.

Preferred topics for papers are:

- Smart, compact, and eco-friendly substations and smart transformers
- Pre-built power stations and substations
- High ampacity underground cables and superconductivity cables
- Fault current limiters (for sub-grid connections, energy-demanding transport infrastructure, etc.)
- Components for active network operations (e.g., fault location, isolation and service restoration, dynamic load Management, power flow management, power quality conditioners)
- DC distribution and AC/DC hybrid solutions
- AC and DC charging stations for private and public transportation
- Distributed and centralized storage
- Technical solutions for upgrading existing assets
- Innovative condition monitoring

Theme 3: Digitalization enabling new services, operation schemes and customer engagement

The digitalization of the city distribution system enables new services and markets for consumers, producers, and energy service providers and impacts the operation of distribution systems. Many services can potentially postpone the need for infrastructural investments for reinforcing existing assets or building new ones by optimizing infrastructures associated with power distribution in a fast-growing city. Digitalization allows aggregating distributed resources to create smart districts and buildings and makes it possible to transition towards electric mobility and fully electric cities, significantly impacting the distribution system and its operation. With the emerging community systems operator (CSO) responsible for planning and operational control of the automated, blockchain-enabled energy community, the incoming Internet of Energy can significantly change the distribution business. The distribution network could be used for providing security and adequacy to local energy communities, having their own local production, generation, storage, and a local market.

Preferred topics for papers are:

- Aggregators and demand response in fast-growing cities (e.g., Virtual Power Plants, flexibility mechanisms)
- Multi-energy/multi-services networks and systems
- Operation and energy management of smart districts and buildings (e.g., community systems operator, etc.)
- Impact of pandemic situations on the operation of power distribution systems and the development of smart cities (risk and resiliency assessment, new insights on critical roles and skills, IT development, etc.)
- Integration and operation of E-mobility, smart public lighting, and distributed storage
- Peer to peer energy transaction and local markets (blockchain)
- Interoperable digital platforms for the integration of city services
- Big data and artificial intelligence to improve and optimize the operation of smart distribution systems
- Innovative operation schemes of the distribution system (e.g., IoT integration, etc.)

Theme 4: Reliable and Resilient Smart Power Distribution

Digitalization increases the level of reliability and resilience in smart cities and improves the quality and wellbeing of citizens, which must be at the centre of the digitalization process. In this context, condition-based asset management can benefit from interconnected sensors and devices, artificial intelligence and machine learning for better reliability and continuity of service. The use of decision support systems helps mitigate the impact of natural disasters or climate effects by increasing awareness and enabling the fast implementation of recovery plans. Digitalization brings many benefits, but it also opens the door to growing risks for energy security, both from natural hazards such as geomagnetic storms and from unintended cyber incidents and intentional cyber-attacks. Attacks on energy systems are likely to be particularly disruptive since power systems must operate in real-time and cannot simply install patches or updates or shut down and reboot as in the typical response to digital failures or breaches. Cybersecurity and resilience need to be a central part of energy research, development, and deployment. Finally, the growing use of digital technologies in the energy sector raises questions about data privacy and ownership. Smart grids and demand response technologies rely on vast consumer-specific, real-time electricity usage data. Viewed from an overall systems perspective, policymakers might consider that there is a broad public interest in making aggregate data publicly available, but, at the same time, they must also consider the privacy concerns of their constituents. An appropriate balance between consumers' privacy concerns and the operational needs of utilities and new market players should be found by using appropriate data management techniques to foster demand response, customer engagements and local markets.

Preferred topics for papers are:

- Digitalization and Asset Management
- Decision Support Systems and Risk Awareness for Resilient Distribution Systems
- Citizen awareness and resiliency
- Cyber security techniques for digital power distribution
- Cyber-physical modelling and simulation for smart cities
- Microgrids and smart districts for resiliency
- Cyber-attacks as high-impact, low-probability events
- Managing data protection and open data
- Impact of innovative market arrangements on resiliency