

EXECUTIVE SUMMARY

Session 5 – Planning of Power Distribution Systems

SUMMARY

The session accepted 143 papers (acceptance rate around 60%) divided into four blocks that reflect the traditional topics of S5: Risk Management and Asset Management, Network Development, Distribution Planning, and Methods and Tools.

MAIN SESSION 5.1

Risk Assessment and Asset Management

Two papers were selected for the session. One paper stimulated an interesting discussion on applying modern Asset Management techniques in distribution companies to analyze cost optimization and quality improvement benefits. The second paper investigated the impact of climate change with a forecast of major hazards in France. It clearly emerged the need of preparing defence plans against heatwaves in big cities that could be considered a general conclusion of the block

MAIN SESSION 5.2

Network Development

Six papers were presented. An emergent topic was sector coupling and assessing the conditions to integrate green energy production, green hydrogen production and natural gas networks. The case study emerged that the coupling of gas and electricity distribution could favour the energy transition. The opportunity of studying new schemes for distribution is another general point addressed by authors and attendees. Hybrid AC/DC microgrids and systems should now be considered a design option since there are cases with DC that might be convenient. Meshed topologies are an opportunity for distribution networks that should be exploited to favour the integration of renewable generation. Finally, it emerged the LV networks would play a central role since most flexibility is there, and new methodologies are necessary to improve their development.

MAIN SESSION 5.3

Distribution Planning

Ten papers were selected. The opportunity to use the flexibility of distributed energy resources as an alternative to infrastructural investments against temporary criticalities is one of the main topics of CIRED 2021. The topic of load modelling and forecast with great attention to the impact of Electric Vehicles was discussed. One general remark from the discussion is that load forecast is crucial for the new planning. Tools and methodologies are necessary to deal with geospatial information and the impact of novel loads. The second point is that a standardized approach to planning is needed to compare non-wires and infrastructural investments. Finally, the uncertainty of new planning has to be managed with suitable methodologies. Many of the papers presented are authored or co-authored by DSO, proving that the industry is now interested in using local ancillary services to cut costs and favour the connection of the new generation.

MAIN SESSION 5.4

Methods and Tools

The selected six papers proposed methods and tools well aligned with the general topics that emerged in the session. Load forecast and forecast are dealt with in the session. An interesting assessment methodology to calculate the impact of load forecast on flexibility usage was presented and discussed. The forecast can be further improved by considering the correlation with the information from other systems or simply analyzing some recurrent words in messages. Furthermore, it is worth mentioning one of the first applications of data-driven models for studying distribution.

ROUND TABLE 3

Distribution Planning and E-Mobility

The RT dealt with the impact of E-Mobility on development planning. The EDSO.E General Secretary presented the EU expected impact. Then, the situation in France, Portugal, Norway, Italy was presented. New tools and methodologies are necessary to predict the impact of EV and that probabilistic models should be finally used. EVs need significant investments, but they can be an opportunity for the system. The level of investment can be reduced with the appropriate management of charging points.

ROUND TABLE 5

CIRED Working Groups on Digital DSO and Flexibility in Active Distribution Networks

The RT addressed the impact of flexibility starting from the activities carried out by CIRED WGs. Panellists highlighted the opportunity to use flexibility. One crucial point is the need to establish a clear regulatory framework and the remuneration mechanism for flexibility providers and DSOs.

ROUND TABLE 6

Microgrids: Hosting Capacity

The hosting capacity has been used for many years without a precise definition, although it has been used by academia, regulators, and network operators since 2004. One of the original aims of the hosting capacity approach was to obtain a transparent communication tool between the different stakeholders. That aim has only been partly fulfilled. There is a range of diverse methods that it becomes difficult to obtain the transparency aim. The RT started the discussion for a standardized method for calculating hosting capacity.

ROUND TABLE 20

The Worth of Flexibility in Distribution Planning and Operation

The worth of flexibility for distribution planning and operation emerged from the number of papers dealing with this topic in CIRED 2021. The speakers in the RT, all from DSOs, described how the planning process in their companies has been or will be influenced by flexibility. The first experiences from the UK, where the most developed market for flexibility is in use, highlighted that the demand for flexibility could not be wholly fulfilled in many cases, and special actions are necessary to engage customers and producers. The need of Tso/DSO coordination as well as the methodologies to enable were also proposed.

RESEARCH & INNOVATION FORUM SESSION 5

Planning of Power Distribution and Operation

The session had six papers. Some innovative contributions were on autonomous agents, and artificial intelligence used to forecast loads and electric vehicle demand or predict the impact of different tariffs mechanisms. A significant achievement was the comparison of diverse load forecasting and the methodology to choose the most appropriate approach for any application (e.g., planning, operation).

POSTER TOURS

Eight poster tours were organized. The topics were the same as the ones addressed during the main sessions. On average, twenty persons interacted with authors addressing valuable comments and questions at each virtual tour.

CONCLUSIONS

The papers, presentations, posters, round table discussions were all high quality. The engagement level in main sessions, poster tours, round table, and RIF sessions was high and not limited by the virtual platform. The CIRED platform allowed running the first virtual so seamlessly that it was possible almost to forget not to be in a physical conference during the sessions. Concerning the technical content and prospective topics, the resilience of distribution systems and the connection of new high-coincident/high-peak loads are destined to play a crucial role in the distribution business. Advanced decision making now used to include flexibility in distribution development. The main problem is now how to deal with the high uncertainty on flexibility provision and find a standardized approach for the project appraisal when flexibility is an option to consider. Advanced mathematics and probabilistic models, big data analysis, and artificial intelligence have gained room and are now used by industry and academicians.