EXECUTIVE SUMMARY

Session 5 – Planning of Power Distribution Systems

SUMMARY

The session accepted 175 papers (acceptance rate around 55%) 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 - BLOCK 1

Risk Assessment and Asset Management

Six papers were selected for the block. The discussion was on how to include climate change adaptation in asset management to increase the resiliency of distribution systems. Papers proposed novel methodologies to assess the reliability and resiliency of systems using Markov chains and artificial intelligence. The inclusion of climate adaptation in asset management in real-life asset management concluded the block with a specific focus on underground cables and the risk on joints.

MAIN SESSION 5 - BLOCK 2

Network development

The six selected papers covered three main topics relevant to the development of distribution systems. The first point was the need to plan the development of distribution systems considering the sector coupling of different energy vectors and systems that can increase the level of flexibility of systems with high shares of RES. The second main point was on the worth of MV and DC power distribution as a facilitator of the energy transition. In this context, it has been proved that new schemes, such as microgrids and hybrid AC-DC microgrids, could relieve the impact of the energy transition. Finally, special attention was given to the flexibility offered by EV charging stations and demand response to face the electrification of final energy uses.

MAIN SESSION 5 - BLOCK 3

Distribution planning

The six papers in the block were all focused on the exploitation of flexibility in planning. One interesting contribution came from the paper awarded the Best Young Paper Award that proposes a methodology to optimally exploit the flexibility of networks with reconfiguration obtained with soft open points. All other papers contributed to the discussion on how to include flexibility in long-term planning, highlighting the benefits of deferral investments and the need to manage the inherent significant uncertainty. It is worth noticing that the use of services as a planning option is now part of planning processes in the DSOs' real life.

MAIN SESSION 5 - BLOCK 4

Methods and Tools

The six papers covered different aspects that are crucial for future distribution systems. One remarkable point of discussion was the need for reliable forecasts of demand and services. Another significant contribution was related to the dynamic modelling of thermal storage to allow the integrated analysis of power, gas and heat networks. The final goal was to enable the study of coupled energy systems. Finally, the proposal of a novel method for power flow calculations and the assessment of non-technical losses is worth mentioning.

ROUND TABLE 9

Capacity Management for PV and EV

Assessing the capacity of distribution systems is crucial for energy transition, as Agostino Galati (e-distribuzione) highlighted. Alexis Meletiou (EU JRC) described the EU state. Marie-Cecile Halvarez(University of Grenoble) showed the complexity of hosting capacity assessment and stressed the need for standardised and and reliable methodologies. Luciano Martini (RSE) showed results confirming the positive impact of local flexibility. Finally, Galati and Halvarez showed how capacity assessment can be done by DSOs at utility-scale. The need for local short-term flexibility markets should be rethought was suggested by audience.

ROUND TABLE 11

Getting authorisations to enable energy transition fast developments

RT 11 included contributions from panelists Joao Filipe Nunes (e-Redes), Jean Galand (Enedis) and Juan Ortiz Noval (e-distribuzione) and was moderated by Riccardo Lama. The speakers have presented some successful examples of initiatives developed to streamline the end-to-end processes related to energy transition. The focus spanned from DSOs' project management to the support to network users' initiatives.

ROUND TABLE 13

New role of smart metering functionalities

Helfried Brunner (AIT) chaired the RT. Andreas Abart (Netz Oberösterreich GmbH), Sebastien Brun (Enedis), Ifigeneia Stefanidou (Landis+Gyr), Roberto Cimadevilla (ZIV) discussed the perspectives of smart metering. There was a consensus that smart meter data is enabling first using cases (i.e. fault detection) but also integrating use cases in DSOs processes entails integration in IT systems. Nevertheless the panel expects more smart meter based functionalities for planning and operation. The discussion reflected the outcomes of the CIRED WG report on the future role of smart metering in planning, control and operation (WG 2018-5).

RESEARCH & INNOVATION FORUM

The session had six papers. Some innovative contributions were autonomous agents and artificial intelligence used to forecast loads and electric vehicle demand or predict the impact of different tariff 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 organised. On average, twenty-five persons interacted with authors addressing valuable comments and questions at each virtual tour. During the discussion emerged the coupling of energy systems, the inclusion of flexibility in planning and operation, the worth of DC distribution systems and the expected benefit of new schemes, often based on microgrid and energy communities as research drivers. Artificial intelligence is increasingly frequent in many applications to improve forecasts.

CONCLUSIONS

The sessions and discussions highlighted the importance of climate adaptation, resilience, and flexibility in asset management, planning, and operation of distribution systems. Integrating energy vectors, microgrids, and AI applications showed promise for the energy transition. Future developments will focus on climate resilience, flexibility markets, and technology advancements for load forecasting and system optimisation. Key drivers will be coupling energy systems, standardisation, and the potential of DC distribution.

The session confirmed a commitment to innovation and a vision for sustainable, efficient distribution systems capable of facilitating the energy transition by optimising the use of existing capacity and new investments without jeopardising quality and reliability and creating value for people and the economy.