

## **EXECUTIVE SUMMARY**

### **Session 5 – PLANNING AND SYSTEM DEVELOPMENT**

#### **SUMMARY**

The session accepted 158 papers (acceptance rate around 60%) divided into 4 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 have been presented in this block. The discussion dealt with the new models proposed to improve reliability in distribution systems. It was clearly stated that in order to increase the profitability of investments, reliability indexes should be deeply analysed to better allocate investments. The network automation is in some cases the best way to obtain good SAIDI, but it is not the only one. The resiliency of distribution networks is another topic of discussion that was covered in the session with a significant contribution on planning methodologies capable of resiliency-oriented distribution planning.

#### **MAIN SESSION 5 - BLOCK 2**

##### ***Network development***

The six papers selected for the oral session stimulated the discussion on novel network and system arrangements capable to enable the energy transition or to fill the energy gap between developed and developing countries. In the first case, multi-energy/multi-services have been discussed as well as new meshed schemes based on MVDC. In the second case, the focus was on the most appropriate schemes for rural villages. Microgrids (DC or AC) proved to be the most effective way to rural electrification.

#### **MAIN SESSION 5 - BLOCK 3**

##### ***Distribution planning***

The seven papers in this block cover all trends in modern planning such as the role of demand and flexibility in distribution planning; the impact of electric vehicles and heat pumps on the systems; the improvement of reliability by using Microgrids and local energy communities. Modern distribution planning – it was concluded – needs new approaches and methodologies capable to transform the complexity in novel opportunities.

#### **MAIN SESSION 5 - BLOCK 4**

##### ***Methods and tools***

The six papers in this block stimulated the discussion on the most appropriate model and tools for distribution planning. It was clearly stated that new tools should have a better representation of demand and generation (spatial forecast), consider as a planning alternative smart grid operation of DER and, finally, an explicit assessment of the risk of each planning choice. A new role for the DSO is absolutely needed and consequently Regulation will have to be adapted in each country.

#### **ROUND TABLE 13**

##### ***The future role of the DSO***

The future role of DSO has been deeply discussed with panelists and attendees. It has been clearly stated that the Regulation has to be adapted in order to allow the implementation of new EU directives that clearly design a novel role to DSO. It has been also underlined that the DSOs have a lot of information with high economic potential; DSO can in future compete with other data companies or offer data to them.

#### **ROUND TABLE 14**

##### ***Resiliency in distribution planning and operation***

The topic of resiliency was discussed in the RT with particular reference to the Italian experience on novel Regulation that aims at remunerating investments against high-risk low probability events. The CIRED WG report of resiliency was also presented.

## **ROUND TABLE 16**

### ***New Planning Guidelines for Smart Distribution Grids***

The RT started from the results of an ERA-Net international research project proposed guidelines for modern planning that can be accepted in both the EU and the USA. The main outcome of the discussion is again the need to change the Regulation to allow the DSOs to operate the distribution system in a different way by purchasing services from producers and consumers (as stated by the recent EU Clean Energy for All package). Finally, the potential role of AI in future distribution planning was discussed.

## **ROUND TABLE 18**

### ***Distributed energy resources aggregation platforms for the provision of flexibility services***

The RT discussed the role of a platform for the aggregation of DER for the provision of flexibility services. The discussion focused on the role of TSO and DSO and their mutual interaction. Indeed, it was said, the energy transition will finally allocate the vast majority of generation on the distribution systems, and for sure the TSO/DSO interaction has to change without forgetting the peculiarities of distribution systems. The standardization of aggregator's interface has been found of utmost importance for the success of aggregation platforms.

## **RESEARCH & INNOVATION FORUM SESSION 5**

Five oral presentations led the discussion deeply on the use of probabilistic methodologies as well as on the application of analytical and heuristic techniques for optimal distribution design and planning. New models for power electronics used to interface DER have been presented; the topic of novel planning with particular reference to modelling uncertainties has been covered by Paper 877 that was awarded the Best Young Academic. Interesting unconventional approaches have been presented with the application of fractals to distribution network planning and the usage of big data in LV planning.

## **POSTER TOURS**

Eight poster tours were organised. 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 tour.

## **CONCLUSIONS**

The papers, presentations, posters, round table discussions and other contributions across all Session 5 activities have been of high quality. It is my great pleasure to report good levels of engagement from participants in main sessions, poster tours, round table, and RIF sessions and this emphasises the topicality, diversity and quality of contributions. The CIRED app enabled the participative, open and high for interaction at the Session events.

With reference to 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 will be necessary to allocate investments in the most efficient way, and new methodologies have to be designed. Furthermore, it should be noticed that the energy transition is making the power system more distribution centric being new capacity mostly connected at that level. The integrated planning of transmission and distribution systems is, for this reason, becoming pretty necessary. The roles and the duties of both TSOs and DSOs will have to be reviewed in order to minimize the risk of conflicts on the use of flexibility. Advanced mathematics and probabilistic models, big data analysis and artificial intelligence will be the day-by-day tools for planner engineers to take account time intercorrelations, storage in different forms, and uncertainties of generation and production and to design the digital power distribution. The first signals of such a deep change can be found in 2019 papers and it is expected that this trend will be even more consolidated in the next years.