

EXECUTIVE SUMMARY

Session 5 – PLANNING AND SYSTEM DEVELOPMENT

SUMMARY

The research in the field of planning for distribution networks and smart-grids is focusing on three areas: new load and generation models, preferably probabilistic, in order to capture the inherent stochastic behaviour of production and consumption; new algorithms that include operational actions in the list of available planning options for long and short term plans; new network models and architectures better suited for smart grid applications.

The Session received 322 proposals of contributions and 160 abstracts were accepted. Finally, 146 papers were received and published.

MAIN SESSION 5 - BLOCK 1

Risk Assessment and Asset Management

Four papers have been selected for this block. The discussion was mainly on the impact of ageing in distribution cables. Particularly, it has been discussed that the current level of information on distribution can lead to conclusions too much comfortable but very risky. Starting from a real case in the Netherlands, it has been highlighted the need of a profound renovation in companies in order to collect information accurate enough to reduce the variance of estimates. Finally, the application of probabilistic methodologies in condition based asset management and reliability has been proposed and discussed.

MAIN SESSION 5 - BLOCK 2

Network Development

Two papers have been selected for this block. With reference to the interface between transmission and distribution system the topic of reactive exchange were deeply discussed. It was found that under some circumstances it might be more convenient reinforcing the transmission system instead of asking reactive services to the distribution system. Finally, the benefit of LV DC distribution was analysed and discussed with a concluding recommendation to include in final calculations also the impact on voltage stress of existing assets.

MAIN SESSION 5 - BLOCK 3

Distribution Planning

The 13 oral presentations dealt with the hottest topics in distribution planning. Distribution planning had been deeply analysed with interesting contribution focused on operational, medium and long term planning. Some general conclusions emerged by the discussion. Big opportunities are brought by the inclusion of operational – “smart grid” like actions - in planning. Such inclusion requires more accurate, time dependent, models of generation and demand, to capture the contribution of regulation and flexibility. New planning methodologies are high demanding and software packages are then necessary to reduce the number of planning options to be examined and to manage the complexity of calculations, particularly if LV systems are considered. In the long term planning, the incremental approach is no longer valid and real long term planning algorithms must be used. In this context, all options should be considered as the exploitation of super conducting cables for supplying mega cities.

MAIN SESSION 5 - BLOCK 4

Methods and Tools

Five oral contributions were selected for this block. Several topics were covered by the discussion. First, the inclusion of demand flexibility in planning was discussed in order to find the expected contribution of active demand in system operation. The analysis of LV demand also showed that power factor is no longer a problem in developed countries since it is normally higher than 0.9; the concept of power factor is really something that comes from the past and Volt/VAR regulation and

reactive power regulation are better suited to modern distribution. Finally, techniques to calculate the short circuit level with power inverters, to optimally reconfigure the distribution network and to assess the benefits of LV meshed networks have been discussed.

ROUND TABLE 5

Efficiency at component vs system level

The RT deals with the comparison of possible actions to increase the energy efficiency of power delivery. Traditionally, the strongest efforts have been devoted to reducing the individual consumption of electrical equipment, components and appliances. Another area of potential interest in terms of energy savings is related to the possibility to go for system efficiencies instead. The discussion was mainly centred on the benefit of system efficiency since the panellists proved that significant improvements can be achieved by reconfiguring the network two times per year with a very high benefit/cost ratio.

ROUND TABLE 3

MIDDLE EARTH: BRINGING OPERATION IN PLANNING, INTRODUCING PLANNING INTO OPERATION

The RT dealt with the new complexity of the distribution business that requires a major integration of planning and operation.

RESEARCH & INNOVATION FORUM SESSION 5

Research and innovation in distribution planning

The S5 RIF was devoted to more theoretical applications. Three main topics had been discussed. The first one was the reduction of complexity with the application of clustering techniques to represent LV systems with enough accuracy. The second topic was about the inclusion of operational techniques in long-term strategies. Thirdly, the fundamental topic of the contamination between power and communication system had been dealt with. Finally, the observability of distribution systems and the optimal connection of measurement devices were dealt with by an original methodology.

POSTER TOURS

Eight poster tours were organised. The general topics were the same as the ones of the main session. On average 20-25 persons were present at each tour with the exclusion of the last one that was in the last block of the conference and less crowded.

CONCLUSIONS

The papers in S5 were high level contributions to the field of asset management and distribution planning that offer a clear state of the art of what is currently used by companies as well as a picture of most advanced researches in academia and research institution. It emerged from RT, Main Session and RIF as well as from the interactive tours that asset management and planning and key functions in distribution companies. Both are much more complex than in the past since the strong integration with operation requires explicit consideration of time dependent stochastic models and planning studies should go deep in the system including customers and their inherent flexibility. This means that is necessary to reducing complexity without losing accuracy with clustering and data analytics that are not so common in power distribution. The word "integration" is a keyword for S5. Indeed, condition based asset management and asset management is often integrated with planning tools; planning software packages are integrated within DMS and SCADA and ICT systems; etc.. Planning distribution is thus very much dependent on technologies external to the power distribution business – namely information and communication technologies – and techniques for the simultaneous planning of both systems are fundamentals but at the early stages of development. Anyway, from the discussion in the Session, it can be concluded that the research is on the good track and that what is used by industries is in very good agreement with recommendation from CIRED and CIGRE confirming the role of both associations in bridging academia researches and industry applications