

EXECUTIVE SUMMARY

Session 4 – Distributed Energy Resources and efficient utilisation of electricity

SUMMARY

Session 4 presented 147 papers at CIRED 2019. The papers were divided into 3 Blocks, focusing on the Co-ordination of DER, planning and managing DER, and optimal use of DER.

MAIN SESSION 4 - BLOCK 1: *DER co-ordination, flexibility and services*

Six papers on commercial and technical solutions for DER co-ordination, flexibility and services were presented. They have been jointly provided by researchers, network operators and technology providers. The papers included practical experiences from field testing as well as academic research. The topics included market and grid service provision by DER as well as DER grid integration, network management and related technologies. Different promising use cases and applications for the provision of market and grid services by aggregated DER (including storage) have been presented and discussed with the audience. Several papers tackled the topic of TSO related services provided at DSO level demonstrating the feasibility.

MAIN SESSION 4 - BLOCK 2: *Planning for and understanding the impact of DER*

Six papers on planning for DER were presented, again by a mixture of researchers, network operators and technology suppliers. Topics included; a description of the recommended RES modelling practices in North America; the need to model distribution grids, to better understand the impact of distribution networks and DER on the stability of the European wide electrical system; the impact on LV networks of the “fit and inform” practice for units up to 50 kW; conditions to increase anti-islanding protection, given that the protection frequency range recommended by the European Network Codes established a wider frequency range to be complied with by DG modules; results associated with the Leighton Buzzard substation storage system, using the inverters to control the voltage in the busbar, minimizing the number of operations of OLTC; and a model for a battery storage system sizing for island power systems. The presentations were received by the audience with interest, with several questions posed both by “show of hands” and through the CIRED app, particularly regarding the anti-islanding protection issues and on the advantages of using inverters associated with storage systems for voltage control.

MAIN SESSION 4 - BLOCK 3a: *Optimising DER (Part 1)*

Block 3 started with 6 presentations focusing on the optimisation of DER. 5 of the presentations focused on the use of Energy Storage systems, including electric vehicles, in modern power networks, including a mix of the findings from research and practical experience from trials. The 6th paper described the results from operation of a microgrid energy system on an island.

MAIN SESSION 4 - BLOCK 3b: *Optimising DER (Part 2)*

Block 3 continued the presentation and discussion on the optimisation of the various DER technologies. Two papers focused on different aspects of DER Management systems. One showed the possibility of integrating DERMS in an industrial environment and the second one analysed different DERMS control methods. Another two papers focused on optimal sizing and allocation of storage including cross vector aspects. A paper from Czech Republic presented different possibilities to increase the DER hosting capacity of the distribution grid. An Austrian contribution demonstrated how to integrate e-vehicles from a taxi fleet into the distribution system of the city of Vienna.

ROUND TABLE 1: *Coordination of response from DER*

This round table discussed the technical network conditions DER can be used to assist with, and methodologies for providing a co-ordinated response. Four speakers were invited to present to provide a diverse range of opinions and experience to the audience members. The first speaker was Prof Hannu Laaksonen from University of Vasa who provided an academic perspective to the need for flexibility from DER and two projects that he has been involved with called DeCAS and FLEXIMAR. The second speaker

was Jonathan Berry from Western Power Distribution (WPD) who discussed how WPD were procuring flexibility using a new brand called Flexible Power. The third speaker was Tim Manandhar from UK Power Networks who discussed their ANM rollout to enable the integration of DER and presented two of their innovation projects called Power Potential aiming to sell flexible services to the TSO and Optimise Prime aiming to understand fleet EV behaviour. The RTs final speaker was John Dirkman who presented Nexants software offering and the different building blocks required to enable DSOs to manage DER. The audience were engaged in the round table providing more questions than was possible to answer in the session. Questions ranged from the general benefits of DER to project specifics of how the DNOs were utilising DER.

ROUND TABLE 3: *Network Optimisation: Methodologies, Benefits and Risk*

This well attended round table presented views from Academia, Network Utilities and a technology provider on the use of optimisation techniques in electricity networks. A well-rounded series of presentations were delivered, covering many aspects of the topic, and a lively discussion followed with a series of very insightful and interesting questions from the audience. Many more questions were asked via the CIRED app than was possible to answer, and discussions between audience members and panellists continued after the session ended. Panellists for the session were Professor Damien Ernst (University of Liege, Belgium), Mr Luca Grella (UK Power Networks, UK), Mr Robert MacDonald (Smarter Grid Solutions, UK), Professor Tomas Gomez (Comillas Pontifical University, Spain) and Mr Pierre Lemerle (EDF, France).

ROUND TABLE 5: *Data: Transforming large volumes of data into useful information for utilities and network users*

This round table, whose scope dealt with the usage of the amount of data provided by smart meters and sensors in the network, and how to transform it to yield useful information for utilities and network users, namely through analytic tools that enhance data-based planning, maintenance, and operation of the Digital DSO, while providing better, user-friendly services to network users. The speakers present were **Silva A.**, from jungle (Portugal), a company that develops machine-learning algorithms, representatives from two research institutions – **McGranaghan, M.**, (EPRI, USA) and **Guangyi L.**, (Global Energy Interconnection Research Institute, China/USA) –, and from two DSO – **Prado, G.**, (Iberdrola, Spain) and **Cauchois, P.**, (Enedis, France).

Before a full room, the panellists demonstrated the importance of using data to extract useful information, fostering the development of low-carbon energy systems. The audience was engaged, with multiple questions raised. They included concerns on the impact of Europe's GDPR and how it might hinder innovation and data sharing between DSO and research institutes, the importance of the role of research institutes in using large volumes of data from multiple sources and using that data to enhance DSO's asset management and planning capabilities

RESEARCH & INNOVATION FORUM SESSION 4

The Session 4 RIF showcased 6 presentations of innovative projects. These included: a high frequency measurement and control system for low voltage grids; Access to DER via a Web of Things metadata registry; A novel EV Charging solution for locations with constrained grid capacity; local energy community self-consumption optimisation using Blockchain; An innovative network operation planning tool; and a project demonstrating the use of automatic reconfiguration and Power Electronic devices to defer reinforcement.

POSTER TOURS

Tours for each of the blocks were completed, with each tour being presented twice. Each of the 147 papers received by the session had an opportunity to display and present their poster. Attendance for each tour was between 15 and 30 persons

CONCLUSIONS

Session 4 provided a rich programme of material showcasing research and project from around the world in the field of Distributed Energy Resources, and their efficient use. Session were well attended with a good degree of engagement from attendees.