EXECUTIVE SUMMARY
Session 4 – Distributed Energy Resources and Efficient Utilisation of Electricity

SUMMARY

Session 4 received 242 abstracts initially which produced 140 full papers, of which 128 were accepted into the session for presentation at the conference. Session 4 covered a broad range of topics around DER and the energy transition as detailed in the following sections.

MAIN SESSION 4.1 - Modelling, Optimisation and Planning

The first block highlighted papers related to modelling, optimisation, and planning of DER in the distribution system. Two papers presented solutions on how sensors, including smart meters, can support the modelling of the distribution system. Another contribution introduced a scalability and replicability analysis framework for large scale investigations of distribution grids. A German paper presented a co-simulation framework to assess multi-energy flows in coupled network including power to hydrogen and power to heat. A Belgium paper analysed the impact of aggregated peak demands of LV consumers on the upstream PV injection, while a second German contribution presented the influence of the spatial distribution of grid forming converter-based generation on frequency support. The excellent contributions covered solutions for power system planning as well as operation in presence of a high share of DER.

MAIN SESSION 4.2 Flexibility, Coordination, Markets and Solutions

This session showcased 6 papers examining the use of flexibility. Topics included the use of E-Mobility to provide ancillary services, prediction and modelling of flexibility, the impact of grid characteristics on flexibility and customer engagement. The 6 papers were excellently presented by the authors, and there was a good level of engagement from the audience.

MAIN SESSION 4.3 Case Studies, Industrial Applications and Field Tests

This session included papers discussing topics that included the impact of spot market pricing on EV charging patterns, the impact of IEC 61850-4-420 standard on the integration of DER and microgrids, the impact of DER and EV on LV grid stability, on how to identify unauthorised energy usage through smart meter data, assessment of the operation of a typical network with large penetration of RES and on the conversion of the electrical system of an island into a 100% renewable energy territory.

The pre-recorded presentations were engaging, and the quality of the papers encouraged the engagement of the audience, with several questions asked to the authors, particularly on the standardisation topic.

MAIN SESSION 4.4 Storage Solutions and Integration

The block for focused on high quality presentations around storage solutions and how they can support the power system. The first paper presented the impact of BESS deployment on a widescale at the residential level for different operation strategies for a residential feeder located in Northern Ireland. Two papers focused on frequency support. The first analysed the usage of residential batteries to provide primary frequency response (PFR) through droop settings in a realistic Australian MV-LV grid. The second analysed the potential of prosumer batteries coupled to PV units to cover the national frequency balancing needs in Sweden. They are found to be profitable with today's prices if access to balancing markets is granted. The final two papers from Finland presented the implementation of a battery energy storage systems in the grid as well as electricity market and the general utilisation potential in the distribution network.

ROUND TABLE 9 Good Practice in Enabling Innovation

This round table examined the challenges of successfully demonstrating and implementing innovative solutions in electricity networks. The presenters on the panel presented views from academia, utilities, equipment suppliers, and customers on the challenges of designing, trialling, and adopting innovative solutions, following a decade of industry focus. The Panel consisted of; Professor Keith Bell (University of Strathclyde, UK), Dr Britta Buchholz (Hitachi ABB, Germany), Dr Geraldine Paterson

(Electricity North West Ltd, UK) and Denis Nabereshnykh (Ricardo Energy & Environment, UK). The presentations were very interesting, and there was a good level of engagement with the audience with questions on the timely development of standards, and how innovation should be funded.

ROUND TABLE 11 New Role of Smart Metering in Grid Planning, Control and Operation

Preliminary results of a CIRED working group on smart meter rollouts and the increased availability of measured data in the low voltage networks was presented. DSO planning and operations processes can benefit from this data, and several use cases were presented. The distinguished panellists represented the main stakeholders in the development and integration of smart meter data in DSO processes.

Prof. Michael Finkel (University for Applied Sciences Augsburg, Germany) represented academia noting that more realistic worst-case scenarios can be provided for power flow calculations, and grid planning is heavily supported. He presented results of research projects proving it.
Cristina Martinez Ruiz (ZIV Automation, Spain) highlighted aspects from a smart meter manufacturers perspective. Current capabilities aid grid operation and planning. Future opportunities are in the areas of data access, billing transparency, and performance. IoT and big data analytics will pave the way.
Andreas Abart (Oberösterreich Netz GmbH, Austria) presented insights from a small-scale DSO and how voltage measurements support asset management by capacity management and prioritisation of grid reinforcement. Smart meter data can also support grid operators to get a first view of customer complaints and disturbances and optimizing MV/LV transformer steps. In addition, it is possible to improve load models implemented in power flow calculations.
Sebastien Brun (Enedis, France), as representative of a large-scale DSO, presented further examples of how smart meter data is supporting grid operation; in the application of integration into SCADA and MV dispatching for fault detection and the confirmation of automated switching. Furthermore, network mapping and quality of supply can be supported by improving GIS data quality. Finally, he highlighted how machine learning based smart meter data analysis can support predictive maintenance.

The discussion identified some challenges including legal constraints related to privacy and data protection as well as technical issues like interoperability across manufacturers, different generations of smart meters and communications systems.

ROUND TABLE 12 Blockchain, Transactive Energy and P2P trading (WG 2018-6)

The scope of this round table shared the insights produced by CIRED WG2018-6 on how Blockchain/P2P/Transactive energy can change the traditional energy process, and the challenges and opportunities. The session examined how blockchain can be a tool used by a legal entity to determine the rules for the allocation of the local production to each participant of a collective self-consumption project. The session included presentations from Luis Santos (EDP, Portugal), Victoria Tan (Enedis, France), Eduardo Rodrigues (EDP, Portugal) and Dr Radek Fujdiak (Brno University of Technology, Czech Republic) and had good discussions on the challenges and opportunities for the technology.

RESEARCH & INNOVATION FORUM SESSION 4

This session included papers discussing topics that included integration of DER in an aggregator platform, on how to increase the hosting capacity for EV charging through dynamic pricing, modelling of RES power plants considering transient stability, network a modelling and management approach through a "web-of-cells" concept and a case study of an active distribution network. The pre-recorded presentations were engaging, and the quality of the papers encouraged the engagement of the audience, with several questions asked to the authors, particularly on the DER aggregation topic.

POSTER TOURS

6 Poster tours were held, displaying the papers from across the four topic blocks. Each tour was attended by circa 20 delegates. The interaction between authors and delegates was less than hoped for, with a reduced number of questions from the floor, possibly due to the virtual nature of the tours.

CONCLUSIONS

The technical content exhibited on the several blocks from Session 4 was very high, with very good papers presented, illustrating the technical challenges and solutions that are being developed by DSOs and that respond to the challenges of energy transition technologies.

The online format resulted in less interaction during Q&A, particularly in the Poster Sessions.