Flexibility management in terminal distribution systems as a way for increasing the penetration of EV chargers and renewable energies

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Twenty years ago, the term Microgrid was introduced as the solution for coordinate different distributed resources in a small portion of the network, most of the times isolated or connected to the grid through a point of common coupling. Since then, many researchers worked on different aspects of this new paradigm, most of them related to the real time coordination and control of the resources.

The term Microgrid evolved into the so called SmartGrids. In this case the topological constraints were relaxed considering not only semi-isolated small portions of the grid. We can define a smart grid as an electricity distribution network that can be monitored and operated in real time in some cases in a semi-automatic or in an automatic way. Implicit in the SmartGrid concept we can find other concepts like Demand Response of the Flexibility management. Technological advances made high voltage distribution networks smart in some way but this is not the case of the terminal distribution systems.

In recent years, researchers made another “terminology upgrade” introducing the term Transactive Energy. Basically, the term groups a set of economic management techniques that are combined with “traditional” control techniques which allow a holistic management of power systems. In this case, we extend the functionalities of a SmartGrid making it more participative. All agents can take active roles in the network and it is possible the interactions between different levels of the whole power system by means of the so-called Aggregators.

Nowadays, we are living this evolution of the distribution system, a grid that can be monitor and operated in real time that incorporates transactive energy tools enabling the active participation of all agents or devices. The role of the aggregator will be in charge of this coordination between agents allowing the coordination between different power system agents and levels (transmission, distribution, market …). Many researchers are fully convinced that this is the only path for a real massive penetration of distributed resources like distributed generation, storage, electric vehicles and other flexible loads like heat pumps.

In this webinar we will review the current situation of the network, describing the difficulties and barriers that exist for the implementation of this disruptive concept and motivating its necessity. We will look in depth at existing catalysts that will make the development of this paradigm critical in the short term and the enabling technologies that will make it viable.

Bio:

Pablo Arboleya received the M.Eng and Ph.D. (with distinction) degrees from the University of Oviedo, Gijon, Spain un 2001 and 2005 respectively, both in electrical engineering. Nowadays, he Works as an associate professor at the University of Oviedo. He was visiting professor at institutions like University of Illinois, University of British Columbia, University of Rome (La Sapienza) and Conservatoire National des Arts et Métiers (Paris) among others. He is co-founder of the LEMUR research group in which he carries out his research activities related to the modelling and analysis of electrical systems and the implementation of operation and energy management techniques.

Pablo is holding the SmartCities Chair at University of Oviedo funded by the city of Gijón. Aligned with the target of this chair he participated in the development of the Gijón DemoLab in which an IoT infrastructure at city level is being tested and developed. He is also co-founder of Plexigrid, a University of Oviedo spin-off technology-driven company, that develops software tools specially designed for grid operators, aggregators and energy communities.

Regarding his editorial role, since 2015, he is managing editor of the International Journal of Electrical Power & Energy Systems from ELSEVIER a top ranked journal in the power systems field, and associated editor of eTransportation journal, a newly created magazine that aims to be ELSEVIER's flagship for transport electrification in which he has participated since its very creation in 2019.

At the Institute of Electrical and Electronic Engineers (IEEE) level, he has been an active member during the last 16 years (senior member since 2013). Pablo is vice-chair of the IEEE Ad’hoc Committee for Electrical Railway Systems, vice-chair of the IEEE Vehicular Technology Society Spanish Chapter and General Chair of the IEEE Vehicular Power and Propulsion Conference (VPPC’2020) that will be celebrated in Gijón in October 2020.

About his teaching activities, it has to be remarked that he was one of the designers of the Electrical Energy Conversion and Power Systems (EECPS) Master Course at the University of Oviedo and the Erasmus Mundus Master Course in Sustainable Transportation and Electrical Power Systems (STEPS) financed by the European Education, Audiovisual and Culture Executive Agency (EACEA) and tough by a consortia formed by the University of Oviedo, University of Nottingham, Coimbra Institute of Engineering and University of Rome (La Sapienza). He coordinated the EECPS from 2011 to 2015. Currently, and since 2015, he is coordinating the STEPS programme.