OPEN INVITED TRACK-IFAC WORLD CONGRESS 2020

Distributed optimization for active and reactive power management in Smart Grids

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The electrical grid has been changing in the last decade due to the presence of renewables, distributed generation, storage systems, microgrids, and electric vehicles. Each of these new entities introduces a host of challenges due to uncertainties and intermittencies associated with their presence. Therefore, there is an increasing need to make fast, accurate, and reliable decisions for an efficient, affordable, and resilient grid. Each of these new entities is equipped with advanced ICT systems, allowing real-time monitoring, communication, computation, and control. This in turn enables advanced decision and control schemes that can lead to optimal grid performance. The specific performance we will focus on in this session is the active and reactive power management in the new emerging smart grid. As much of the changes in the emerging grid are occurring at its edges, and spatially distributed, distributed decision making represents one of the best solutions to deal with this kind of systems. In fact, this method has a number of advantages like plug and play, improving resiliency, fault robustness, and privacy, ensuring optimal agent coordination with limited information exchange. Several important tools are expected to play a major role in order to understand how such distributed decision making can be carried out for active and reactive power management, which include distributed optimization, distributed control, integration of demand response, inclusion of storage, interconnection with microgrids, and design of wholesale and retail electricity markets that support the implementation of these tools.

The proposed Open Invited Track will seek contributions related to all of these tools for active and reactive power management in an emerging grid. Theoretical methods, algorithms, and tools, as well as validation using real case studies through high fidelity simulations will be considered. The topics of the proposed Open Invited Track are specifically related (but not limited to) to the following methods and application areas:

- Distributed optimization
- Demand response
- Distributed storage planning and management
- Distributed control for microgrids and distribution grids
- Wholesale and retail electricity markets
- Cluster of microgrids