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Title: Enabling Real-time, Network-admissible Disaggregation of Market Services with Convex Inner Approximations

Abstract: The talk presents a novel method to obtain a convex inner approximation that aims to improve the feasibility of optimal power flow (OPF) models in distribution networks. For a resistive distribution network, both real and reactive power effect the node voltages and this makes it necessary to consider both when formulating the OPF problem and the available dispatchable resources. Inaccuracy in linearized OPF models may lead to under and over voltages when dispatching flexible demand, at scale and in response to whole-sale, fast market or variable grid conditions. In order to guarantee feasibility, we obtain an inner convex set, in which the dispatchable resources can operate, based on their real and reactive power capabilities. This convex set is the effective dynamic DER hosting capacity and by disaggregating market signals within this set, we can a-priori guarantee a network admissible dispatch at any timescale. This DER hosting capacity enables us to employ feedback-based methods to perform real-time, network admissible disaggregation of market/grid signal across available DERs in the network. We will also adapt this method to develop a multi-period version of the dynamic DER hosting capacity and present simulation-based analysis on realistic test feeders.

Key words: Convex inner approximations, Fast market services, Disaggregating market signals