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Title: Optimal Scheduling of Flexibility for a Portfolio of Power System Assets

Abstract: Some important factors in the evolution towards energy transition are an increase in the number of distributed energy resources (DERs) and variable renewable energy resources (VREs), as well as a higher occurrence of peak loads. The intermittent nature of wind and solar PV generation leads to a system, which is more difficult to schedule than before. A side effect of the distributed and intermittent nature of new setting is that new problems occur in the grid. Depending on the voltage level of the grid, these problems might be voltage fluctuations, frequency deviations, power losses, or congestion. In Europe, there is an increased focus that these grid problems should be handled at the distribution level (DSO) or in cooperation with the TSO. In any case, there is an increased need to make available different types of flexibility or security of supply related services to the system, for example in terms of peak power, ramping capacity, frequency control, reactive power, inertia response products. These services could be avoided by active prosumers, by demand response, by generators that can be scheduled, by storage, and by grid operations. In this paper, we consider the problem of an actor that schedules a portfolio of assets that can provide solutions for low voltage (LV) grid problems. We present a stochastic AC-optimal power flow programming model for the dynamic scheduling of a portfolio of assets. DSO uses multiple flexibility assets from a centralized scheduling mechanism to fix grid problems by minimizing its cost of flexibility procurement. In this way, a DSO can schedule flexibility assets into LV network as a solution for voltage, power loss, and congestion problems. Consequently, our mathematical model is applied on real world case study.

Key words: Flexibility usage, optimal power flow, scheduling, low voltage network