Optimal Allocation of Smart Substations in a Distribution System Considering Interruption Costs of Customers - DTU Orbit (10/07/2019)

One of the major functions of a smart substation (SS) is to restore power supply to interrupted customers as quickly as possible after an outage. The high cost of a smart substation limits its widespread utilization. In this paper, a smart substation allocation model (SSAM) to determine the optimal number and allocation of smart substations in a given distribution system is presented, with the upgrade costs of substations and the interruption costs of customers taken into account. Besides, the reliability criterion is also properly considered in the model. By linearization strategies, the SSAM is simplified into a mixed integer linear programming problem which could be solved efficiently with commercial solvers. Finally, the performance of the proposed methodology is demonstrated by the standard RBTS-BUS 4 test system and a medium voltage power distribution system in Denmark.

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