Chair for Theoretical
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Service Restoration Algorithm for Large Smart Grids

Research Area
Constraint optimization problem

Keywords
FLISR, binary decision diagram (BDD), Dijkstra's algorithm

Description
Fault location isolation and service restoration (FLISR) is an important functionality for reliable and sustainable power grid operation. FLISR is usually a part of the advanced distribution management system (ADMS) used by the distribution system operators (DSOs). Basically, FLISR can be performed and understood in two parts: detecting the fault location and isolating it, and reconfiguring the grid topology such that any isolated loads due to this fault are reconnected to the grid and provided with electricity. The service restoration (SR) part of FLISR is the main task of this thesis work.

Goal
This thesis aims to provide a solution for SR in power grids. The SR implementation can be formulated as a constraint optimization problem, to choose the best configuration of the appropriate switches (to open or close) in order to reconnect the isolated loads. Thus, the grid topology is changed in an optimal way after the occurrence of a fault to reconnect any isolated load. The optimization problem can be understood as finding the shortest path in a grid given some topological and electrical constraints. The topological constraints ensure for example that any section of the grid is connected to one feeding point, whereas the electrical constrains ensure that the line current and voltage drop are within certain ranges. The formulated problem can be tested on several benchmark power systems.

Requirements
- Excellent knowledge in Python programming.

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