Doctoral Defense

An Optimization Framework for Resilience-based Power Grid Restoration

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Abstract

Extreme weather or disaster can result in a power system outage that needs to be restored quickly to mitigate the adverse effects. This dissertation presents an optimization framework to optimize the restoration process and improve the resilience of a power system. A bi-level mathematical model is provided to facilitate the supply of critical loads while minimizing the restoration time. The proposed model is designed to maximize the level of resiliency. The resilience level is quantified by a resilience vector which covers multiple features of the resilience concept. An iterative optimization algorithm (IOA) and a mathematical program with equilibrium constraints (MPEC) are developed to solve the proposed bi-level model. Furthermore, the hurricane's aftermath on a power system is investigated. So, a reliable restoration plan is offered to consider any possible failure of transmission lines via a robust optimization. Finally, the network partitioning approach of a power system restoration is generalized to any network partitioning towards invulnerable partitions.