A Robust Optimization Approach for Resiliency improvement in Power Distribution System

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Abstract

Recently, power interruptions with high impact effects are increased by occurring natural disasters. Furthermore, the uncertain nature of data creates the considerable challenges for enhancing the resiliency of power distribution systems after occurring events. Regarding this, this paper presents a robust optimization approach for resiliency improvement in power distribution system. The robust approach uses the crew teams for switching action as restoration process, demand response programs and Mobile Generators (MGs) simultaneously for improving the resiliency with considering the uncertainty of electrical load and electrical price. The objective function is tri-level consists of minimum, maximum and minimum function. The first level is minimum function that is for minimizing cost of commitment of CHPs with considering location of MGs and reconfiguration structure in power distribution systems. The second level is maximum function that is for finding the worst-case scenario of the uncertainty variables. The third level is minimizing total operation cost in the condition with worst scenario of stochastic data by using demand response programs. The aforementioned algorithm is implemented on an IEEE 33-bus test distribution system with four different cases. Furthermore, several cases and sensitivity analysis are accomplished in order to show the efficiency of the proposed model.

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