

Optimal critical load restoration in distribution system using network reconfiguration considering electric vehicles discharging capability

P.Parhizgar, Z.Deighani, P.Parhizgar

1. Master Student, Department of electrical Engineering, Shahid Beheshti University, Tehran, Iran

2. PhD in Electrical Engineering at Department of Electrical Engineering, Islamic Azad university, Shiraz Branch, Shiraz, Iran

3. PhD Student in Electrical Engineering at Department of Electrical Engineering, Isfahan University of Technology, Isfahan, Iran

*Corresponding author Email: parsa001100par@yahoo.com

Abstract

In this research, an optimal recovery strategy for re-energizing the critical loads of the reconfigurable power distribution network in the presence of electric vehicles under the conditions of possible events has been proposed. In this regard, scattered production sources and electric car charging stations are used to supply the critical loads of the electricity distribution network (in case of outage). In order to more accurately model the behavior of electric vehicles in the process of recovering critical loads of the electricity distribution network, the limitations of the transportation network have been accurately modeled. The recovery strategy proposed in this research is presented in the framework of a two-level optimization problem. In the first level of this problem, the random location distribution of the cars in the transportation network is determined and then the optimal routing of the cars to the nearest charging station is done so that the cars can help to recover the load in the fastest time. In the second level, taking into account the possibility of changing the arrangement in the distribution network and discharging the batteries of the available cars, while the losses of the entire network are reduced to an acceptable level, the problem of probabilistic planning of load recovery in the distribution network is investigated and a comparison is made between the obtained results and the state before. Changing the composition and participation of cars in the load recovery program can be done. The proposed method is implemented in a standard IEEE 33-bus network, and the simulations will be coded and evaluated in MATLAB and GAMS software environment.

Keywords: Electric vehicle, battery charging and discharging, Critical load management, power grid