

Modeling of Electric Vehicle Fast Charging Station and Impact on Network Voltage

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Abstract

Excessive greenhouse gas emissions from conventional internal combustion engine vehicles have encouraged governments worldwide to seek for alternative solutions and electric vehicles seems to be a promising replacement. However, the interconnection of high penetration of electric vehicles into the power grid can alter the operation of the existing network. Fast charging mechanism of electric vehicle worsens the situation as this kind of charging drains high power from the power grid, thus stressing the local power grid. This paper presents the impact of 30 fast charging electric vehicles on the power network with two case studies, using PSCAD/EMTDC software. The study is performed for the worst-case scenario, where fully-depleted electric vehicles are connected to the power network during the peak load. This paper also highlights the detailed modeling of DC fast charging station as constant-impedance load. For this specific network, the results show that both the network voltage level of 400V and 11kV system go beyond the safe voltage operating limits for 10 and 13 electric vehicles connection, respectively.