

Enhanced Root Mean Square Model for Electric Vehicle Chargers: Addressing Balanced Faults With Multi-Manufacturer Variability

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Japan aims to achieve carbon neutrality by 2050, with a target of 100% sale of electric vehicles (EVs) by 2035. An increase in EV charging demand changes the characteristics of load demand and in turn, affects power system stability. Therefore, a load model that considers EV charger characteristics is required. We had developed and verified an EV charger model through a root mean square analysis following balanced faults. To an extent, this model represents the voltage and frequency responses caused by balanced faults. However, it is based on only one representative manufacturer, and the model's versatility and practicality need improvement. This study experimentally investigated the responses of EV chargers manufactured by several manufacturers. Each EV charger's response was characterized. The developed model was improved to represent the response of each EV charger. The model parameters for each charger type were identified by comparing and validating the measured and simulated responses following balanced faults. An excellent match between the measured and simulated responses demonstrated that the developed model and the identified parameters accurately simulated the response following balanced faults. This model and the identified parameters can enable a more accurate assessment of EV charger impact on power system stability.