

Distribution planning with hourly profiles for analysing electric vehicle charging strategies

C. Mateo Domingo; P. Frías Marín; A. Sánchez Miralles

Abstract-

This paper analyses the impact of plug-in electric vehicles (PEVs) on distribution networks. The reference network model (RNM) is used to model the grids and to carry out sensitivity analysis for several scenarios. The set of scenarios selected includes PEV penetration levels, charging strategies and location distributions. Each scenario is characterised in terms of the number of electric vehicles, the vehicles' class, technical parameters and charging time. Five large-scale real distribution networks are modelled and analysed. The topologies selected are intended to be representative of some typical European distribution networks. Results show that the charging strategies are critical. At least, new multi-tariff schemes should be established to encourage charging at valley hours. Depending on the PEV location distribution, smart charging may also be necessary to reduce the distribution network costs further.

Index Terms- electric vehicles; power system; distribution; smart charging; load management; power system planning; model; reinforcements; impact; assessment; hourly profiles; sensitivity; scenarios; large-scale.

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