

Assessment of the impact of plug-in electric vehicles on distribution networks

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Abstract— Plug-in electric vehicles (PEVs) present environmental and energy security advantages versus conventional gasoline vehicles. In the near future, the number of plug-in electric vehicles will likely grow significantly in the world. Despite the aforementioned advantages, the connection of PEV to the power grid poses a series of new challenges for electric utilities. This paper proposes a comprehensive approach for evaluating the impact of different levels of PEV penetration on distribution network investment and incremental energy losses. The proposed approach is based on the use of a large-scale distribution planning model which is used to analyze two real distribution areas. Obtained results show that depending on the charging strategies, investment costs can increase up to 15% of total actual distribution network investment costs, and energy losses can increase up to 40% in off-peak hours for a scenario with 60% of total vehicles being PEV.

Index Terms— Distribution investment, distribution network planning, electricity distribution, network energy losses, plug-in electric vehicles

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