

Preface

Plug in Electric Vehicles (PEVs) use energy storages usually in the form of battery banks that are designed to be recharged using utility grid power. One category of PEVs are Electric Vehicles (EVs) without an Internal-Combustion (IC) engine where the energy stored in the battery bank is the only source of power to drive the vehicle. These are also referred to as Battery Electric Vehicles (BEVs). The second category of PEVs, which is more commercialized than the EVs, is the Plug in Hybrid Electric Vehicles (PHEVs) where the role of energy storage is to supplement the power produced by the IC engine. These two types of PEVs are predicted to dominate the automobile market by 2030. Widespread adoption of PEVs allows the world to reduce carbon emissions in transportation needs significantly. Therefore, it is vital to the success of a collective global effort in meeting the climate energy targets and to reduce the dependence on increasingly scarce fossil fuels. However, significant challenges are thrust upon utility grid operators on how best to integrate the PEVs into smart grids.

This book covers the recent research advancements in the area of integration techniques, infrastructure needs, and effects on power systems related to the anticipated high deployment of PEVs in smart grids. The topics that are covered in this book include the concept of dynamic wireless power transfer for EVs to increase their range and reduce the size of battery bank, PEV parking lots and their planning, management, and control in a smart grid environment, using a scaled-down test bed and advanced cosimulator to evaluate PEV coordination strategies, exploring the cyber security issues of the smart grid with significant PEV penetrations, applying the probabilistic PEV charging model in a distribution grid to evaluate the PEV impacts, V2G and photovoltaics for peak demand reduction in urban regions, PEV impact on power system steady state voltage stability, coordinated wind-PEV energy dispatching approaches in the V2G context, modeling

the effects of voltage unbalances due to PEV penetration, and using PEVs to implement ancillary services in smart distribution grids. Hence, this book introduces many new strategies proposed recently by researchers around the world to integrate PEVs in smart grids and to evaluate their impact on system performance and reliability. The book is aimed at engineers, system planners, researchers, and graduate students interested in the latest developments in this field of research.

Plug In Electric Vehicles in Smart Grids

Integration Techniques

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