


# Chapter 6


## Energy Storage for Renewable Sources in Electric Vehicles

**Suriya Ponnambalam**

 <https://orcid.org/0000-0002-8775-0474>

*Bharath Institute of Higher Education and Research, India*

**Ilampoornan M. K.**

 <https://orcid.org/0000-0002-6233-8141>

*Bharath Institute of Higher Education and Research, India*

### ABSTRACT

*Imminent environmental problems and growing concerns for global energy disasters are driving the essential for novel opportunities and technologies that can meet expressively higher demand for cleaner energy and eco-friendly energy systems. This requires the development of new conveyance and power generation systems. The electrification of the transportation system is a capable method to green the transportation systems and to reduce the issues of climate change. This chapter examines the current status, modern organization, and challenges in the employment of infrastructural and charging systems for EVs. It further analyses EVs' impacts on the environmental society and its penetration into society. The current challenging issues due to the massive deployment of EVs, as well as upcoming trends are presented in this chapter. Also, the functional as well as significant impacts of EVs are categorized and thoroughly discussed.*

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## **INTRODUCTION**

Rising concerns around the situation and the call for clean energy has contributed in the direction of the demand for electric vehicles as a method of transportation. Currently, various countries in the world are contributing to attain assured targets in clean energy atmosphere. To decrease the influence of developed fuel prices and to implement the environmental strategies with higher standards, the electric vehicle is an alternative to encounter the desire of a green source of transportation with smaller discharges and enhanced fuel economy (Larminie, J., & Lowry, J, 2012). The additional of internal combustion engines by EVs is a additional enhanced economical method due to the electrification of main parts in the power and transportation parts (Saber, A. Y., & Venayagamoorthy, G. K. 2009). EVs can be generally categorized into Hybrid EVs (HEVs) and Plug-in EVs (PEVs). PEVs are further sub-categorized into Plug-in Hybrid EVs (PHEVs) and Battery EVs. In HEVs, battery cannot be recharged from an external power source in opposition to PEVs.

To reduce the battery cost by extending its lifetime, enhancing the efficiency of the battery energy storage systems (BESS) presented in (Colucci, R, 2024), and minimizing the overall electricity cost for the consumer. This can be accomplished by providing an optimized strategy for charging and discharging the batteries. The possibility of implementing a vehicle to home system (V2H) with real generation data from PV and wind presented in (Martinez, I. J, 2017) as well as consumption data of different users is analysed. User preferences have been taken into account, such as comfort level and consumption priorities in household. Studying a micro grid with the seizure of renewable and non-renewable energy, electrical loads, and EVs is presented in (Abdelsattar, M, 2024). Energy storage system (ESS) possesses tremendous potential to counter both the rapid growth of intermittent renewable energy resources (RESs) and provide frequency support to the microgrid (MG) presented in (Jan, M. U. et.al, 2021). Since the deployment of ESS has overcome the imbalance between generation and consumption, however, their massive cost, as well as degradation tendency, is the restricting considerations that demand alternative solutions to provide stable microgrid operation. Load scheduling, battery energy storage control, and improving user comfort are critical energy optimization problems in smart grid presented in (Albogamy, F. R, et.al., 2022).

Electric vehicles are a sustainable alternative to the conventional vehicles due to the negligible emissions and the possibility of the renewable energy integration presented in (Liaqat, M. et.al., 2022). However, the electric vehicles require the separate storage systems and the selection of the proper storage system is a major concern in the electric vehicles markets. An optimal and coordinated EV charging/discharging approach enhances the profit a BMG involving in an electricity market. It also shows the optimal EV charging/discharging presented in (Eseye, A. T,

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