


Chapter 8

Accelerating the Future: Electric Vehicles and Charging Infrastructure Development

Shalini Jaiswal

 <https://orcid.org/0000-0003-0137-7734>

Amity University, Greater Noida, India

ABSTRACT

The pressing need to cut greenhouse gas emissions and reliance on fossil fuels is driving a global transition toward electric vehicles (EVs), which is changing the transportation environment. The crucial role that charging infrastructure plays in facilitating the broad adoption of EVs is examined in this chapter. It looks at important facets of the EV ecosystem, such as grid connectivity, charging technologies, connector standards, and the relationship between renewable energy and electric mobility. The chapter also discusses difficulties such interoperability problems, energy demand management, and gaps in infrastructure implementation. It also examines the laws, business practices, and technological advancements influencing EV charging networks in the future. Vehicle-to-grid (V2G) technologies, smart charging, and the significance of fair infrastructure access are all emphasized. Ultimately, the chapter underscores that a well-planned and future-ready charging infrastructure is essential to enabling sustainable, efficient, and scalable electric mobility worldwide

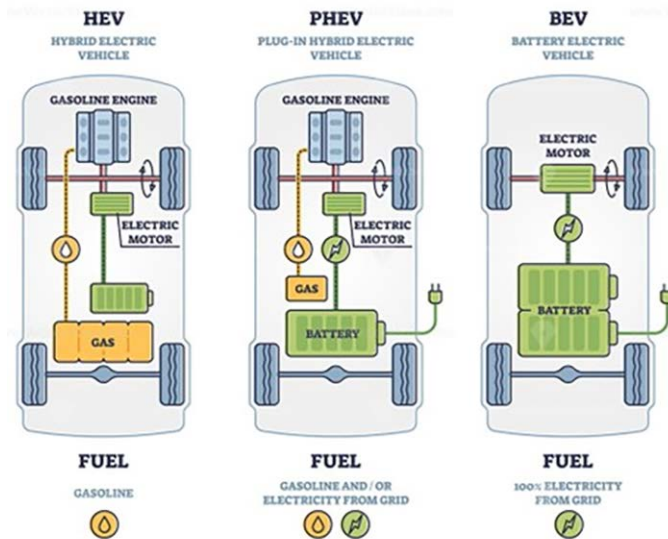
INTRODUCTION

As the world grapples with the urgent need to address climate change and reduce its dependency on fossil fuels, the electrification of the automotive industry has gained significant momentum (Mundra et al., 2021; Hemavathi et al., 2022; Akhtar et al.,

DOI: 10.4018/979-8-3373-3226-0.ch008

2023). Growing concerns about climate change and environmental harm have led to a global surge in the popularity of electric vehicles (EVs) as an environmentally friendly alternative. We should focus on the use of clean fuel to avoid any pollution (Dwivedi et al., 2022). Electric vehicles (EVs) have introduced a new age of mobility that promises a cleaner and more sustainable future by mitigating the environmental impact of traditional internal combustion engine motors (Ahmad et al., 2018). With the changing climate and growing environmental consciousness, electric vehicles (EVs) provide a sustainable alternative to gas-powered automobiles. EVs are vehicles that are propelled entirely or primarily by electricity. As seen in **Figure 1**, electric cars are divided into three categories: BEV, PHEV, and HEV (Das et al., 2020).

Figure 1. Categories of electric cars



The BEV is an all-electric car without an internal combustion engine that runs on rechargeable batteries. BEVs are commonly referred to as electric vehicles (EVs). Both regenerative braking and connecting to an external electrical power supply are methods that PHEVs can use to recharge their batteries (Kong & Karagiannidis, 2016). Both fuel and electricity can power HEVs. **Table 1** lists the various electric vehicles that are currently on the market, along with their technical specifications, battery capacity, and estimated charging time.

30 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igi-global.com/chapter/accelerating-the-future/389034

Related Content

Emerging 2D MXenes as Next-Generation Materials for Energy Conversion and Storage Applications

Chaima Garbi, Mohsen Mhadhbi and Lamia Khedhiri (2025). *Innovations in Next-Generation Energy Storage Solutions* (pp. 161-192).

www.irma-international.org/chapter/emerging-2d-mxenes-as-next-generation-materials-for-energy-conversion-and-storage-applications/379786

Autonomous Vehicle Performance Prediction System Using Support Vector Machine

Vishan Kumar Gupta, Anupriya Sharma Ghai, Paras Jain and Vidisha Wadhawan (2025). *Optimized Energy Management Strategies for Electric Vehicles* (pp. 283-300).

www.irma-international.org/chapter/autonomous-vehicle-performance-prediction-system-using-support-vector-machine/366329

Probabilistic Forecasting of Hourly Wind Power Load in South Africa

Katleho Makatjane, Claris Shoko and Ntebogang Dinah Moroke (2024). *Machine Learning and Computer Vision for Renewable Energy* (pp. 268-285).

www.irma-international.org/chapter/probabilistic-forecasting-of-hourly-wind-power-load-in-south-africa/346066

Intellectualized Control System for Anaerobic Bioconversion of Liquid Organic Waste

Andrey A. Kovalev, Dmitriy A. Kovalev, Vladimir Panchenko and Valeriy Kharchenko (2021). *International Journal of Energy Optimization and Engineering* (pp. 56-81).

www.irma-international.org/article/intellectualized-control-system-for-anaerobic-bioconversion-of-liquid-organic-waste/267785

Attaining Energy Conservation in Buildings Through the Integration of Barley Organic Fibers Into Construction Concrete for Thermal Insulation

Abdelmoutalib Benfrid, Mohamed Bachir Bouiadjra, Abdeldjalil Benbakhti, Soumia Dine El Hannani, Baghdad Krour, Mohammed Chatbi and Zouaoui Rabie Harrat (2024). *Modeling, Analysis, and Control of Smart Energy Systems* (pp. 155-180).

www.irma-international.org/chapter/attaining-energy-conservation-in-buildings-through-the-integration-of-barley-organic-fibers-into-construction-concrete-for-thermal-insulation/353383