

Chapter 13

An Overview of Electric Vehicle Technology: A Vision Towards Sustainable Transportation

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ABSTRACT

Modern studies on green technologies for transportation sector are attaining attraction among the research communities from diverse parts. We learn the significance of plug-in hybrid electric vehicles which play a key role toward the policy option to reduce the environmental concern. There are major uncertainties in the diffusion of electric vehicles timing of market diffusion among consumers. However, there has been a considerable effort made towards the benefit of electric vehicles demand. Yet, the debates on consumer behavior towards the adoption of electric vehicles are less recognized. Researcher's highlighting the significance of plug-in hybrid electric vehicles from a combined perspective considering V2G technology which allows bi-directional flow of electricity. On the other hand, when electric vehicles are recharged from electricity produced from conventional technology power plants such as oil or coal-fired plants, they may produce equal or sometimes more greenhouse gas emissions than conventional gasoline vehicles.

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INTRODUCTION

Although road transportation is not considered the leading source of greenhouse-gas emissions, but it's a debatable topic. Recent researches on green technologies for transportation sector are gaining popularity among the research communities from different areas. In this wake, Plug-in hybrid electric vehicles (PHEVs) have great future because of their charge storage system and charging facilities from traditional grid system. Several researchers have proved that a great amount of reductions in greenhouse gas emissions and the increasing dependence on oil could be accomplished by electrification of transport sector. Transportation in recent days are the major unsustainable source of energies, depend on the liquid fossil fuels. Research suggest that the transportation sector at present consume over 55% of oil and emit around 25% of CO₂ in total (Howey, 2012). As the light vehicle fleet moves to electric drive, an opportunity opens for "vehicle-to-grid" (V2G) power. V2G only make sense if the vehicle and power market are matched (Kempton & Tomić, 2005a). The societal advantages of developed V2G include additional profit for green cars, enhanced stability and reliability of the power grid, cost reduction and backup for renewable sources of energy. With the introduction of Electric vehicles technology marked a considerable amount of carbon-free transportation in current market trend. By keeping a close consideration of the research on electric vehicle technology, where the main idea was to in cooperated electrically charged battery supported vehicles i.e. PHEVs came into the current market trend. We scale out our domain to study their potential introduction from an integrated perspective, further, we extend our domain to observe its interactions between technology and behavior and its market diffusion influence. Few analysis gets extended by taking major confirmation and verifications from Western Europe and North America and Asia in general, on the contrary, the analysis of energy implications are also being kept in close consideration throughout world-wide. The current marketing trend suggests that the transport sector is accountable for over 27% of total energy utilization. In the wake of future growth, it is expected to increase by 50% possibly by 2035 (Tran, Banister, Bishop, & McCulloch, 2012). Keeping in mind overall 94% dependency on oil fuel, passenger vehicle considered to be another source of CO₂ emissions weigh up to 6.3 Gt or over 24% in general of the total, on the other hand electricity generation (40%), industrial usage (16%), building usage (12%), agricultural sector and other usage (8%) (Tran et al., 2012). In a border sense, reduction of CO₂ emission encounters a couple of major key issues which address overall changing trend in the volume of travel as well as the total fuel efficiency towards the actual mode of travel (Tong, Jaramillo, & Azevedo, 2015). Since early 90's till last quarter of 2004, traveling through Light-Duty Vehicles (LDVs), including public transportation namely passenger cars, buses, and sports cars, at major countries increased by 15% (Tong et al., 2015). Research suggests that the increment goes from 13,000 to 15,000 km per person annually specially in Organization for Economic Co-operation and Development (OECD) countries. Heavy Duty Vehicles (tonne-km per capita) increased to 36% along with the global air travel increment of 90% since 90's (Howey, 2012). Rapid growth in transportation led to air travel, road freight, and Low-voltage differential signaling LDVs. However, second major impact that influences the trend of CO₂ emission is considered as high oil consumption or economic downturns. Based on recent findings one can hardly predict about these recent trends would hardly reverse in future. Under the supposition of the current trend, we observe that the lower average rates of vehicle purchasing within emerging economies along with rapid increment in gross domestic product (GDP) rates, increased the overall vehicle travel.

The study suggests that the passenger vehicles contribute a total of 60–70% of CO₂ emissions, as compared to other vehicles. Suitable enforcement of energy policies should be implemented to cope

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