

Identification and SWOT analysis of ecological and security issues of battery electric vehicles

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Abstract. Environmental sustainability is critical; else, the whole planet would face climatic disasters in the near future. A transportation system based on electric vehicles is assumed to be capable of providing long-term mobility. However, despite several attempts by national and international authorities, a great aim could not be met in India or the rest of the globe. Existing electric cars have a number of limits and obstacles. This report highlighted significant environmental and safety-related constraints that contribute to the low adoption rate of BEVs in India. A SWOT analysis was also carried out to identify the important elements influencing the future of BEV penetration in India.

Keywords: BEVs; environmental and safety barriers; environmental pollution; safety hazards

1. Introduction

Beginning with human development, the rapid expansion of economic activities resulted in a sharp increase in global energy consumption (Senpong and Wiwattanadate 2022). Fig. 1 shows that many countries anticipate more than doubling their energy consumption in the near future (Statistical Review of World Energy 2021, 2021). For the accomplishment of various economic as well as welfare activities, energy is generally obtained by burning different types of fossil fuels, which results in CO₂ emissions. Traditional transportation systems obtain propellant energy by burning fossil-based petroleum such as diesel and gasoline in IC engines, which emit significant amounts of harmful greenhouse gases when burned. With the contribution of tailpipe emission of the IC engine based transportation, environmental pollution has reached such a critical level that the entire world must take the necessary steps to reduce it, or else a slew of negative environmental issues will appear on the face of our planet. Fig. 2 depicts the IEA's estimate of the increase in CO₂ emissions over the last three decades (IEA 2021). Emissions from the transportation sector have become a worldwide issue, due to enhanced greenhouse gases, air pollution, particularly local air pollution, ozone layer depletion, global warming, increased suspended particulate matter and other hazardous chemicals in the atmosphere, all of which make the environment excruciating for humans and other living things (Sharma and Sahoo 2022). The stock of global fossil fuels is assumed to reduce at a very low level. Due to these drawbacks, the operation of the conventional transportation system, based on the burning of fossil fuel is facing

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Abbrevitions

AHP - Analytic hierarchy process
ANP – Analytical Network Process
BEVs – Battery Electric Vehicles
CNG, - Compressed Natural Gas
CRDi, Common Rail Direct Injection
CSR- Corporate Social Responsibility
DEMATEL- Decision Making Trial and Error Laboratory
CEEW - The Council on Energy, Environment and Water
FAME – Faster Adoption and Manufacturing of Hybrid and Electric Vehicles
GDI, - Gasoline Direct Ignition
IC engines – Internal Combustion Engines
IEA - International Energy Agency.
ISM- Interpretive Structural Modelling
LDEV - Light Duty Electric Vehicle
Li-ion- Lithium Ion
MCDM – Multi Criteria Decision Making
MPFI, - Multi Point Fuel Injection
NEMMP – National Electric Mobility and Mission Plan
NITI - National Institution for Transforming India
RMI - Rocky Mountain Institute
VCR - Variable Compression Ratio
SWOT - Strength, Weakness, Opportunity, and Threat
TOPSIS - Technique for order performance by similarity to ideal solution