Chapter 17
Electric Vehicle Safety:
Risks and Mitigation Strategies

Yasser Al Balushi
https://orcid.org/0009-0005-4816-4594
Middle East College, Oman

Hussin Yahia
https://orcid.org/0000-0002-1843-8663
Middle East College, Oman

ABSTRACT

This chapter discusses the safety aspects of electric vehicles (EVs), examining potential risks and challenges while suggesting effective mitigation strategies. It highlights the rapid growth of the EV market and the importance of prioritizing safety in their design, manufacture, and use. Unique features of electric propulsion systems and battery technology introduce new safety considerations compared to traditional internal combustion engine vehicles. The chapter identifies key safety risks, including thermal discharge events, battery fires, electric shock hazards, and high-voltage system failures, based on research and real-life events. It stresses the need for proactive measures to address risks from battery misuse, manufacturing defects, accidents, and extreme weather conditions. Strategies for improving EV safety are discussed, including advancements in battery management, thermal management technologies, and safety features. Additionally, the chapter addresses ecosystem-level safety aspects that are vital for safe EV operation.

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Overview of the Electric Vehicle market

The Electric Vehicle (EV) market has experienced unprecedented growth in recent years, reflecting significant change in the global automotive industry (Graham, 2021). This growth is due to a combination of technological advances, environmental concerns, and supportive government policies. According to recent data, global sales of electric vehicles will exceed 10 million units in 2023, a significant increase compared to a few years ago. This rapid adoption is particularly evident in regions such as Europe, China, and North America, where strong policy frameworks and incentives have accelerated the transition from traditional combustion engines to electric vehicles (Cano et al., 2018). In Europe, countries like Norway and the Netherlands are leading the charge, and Norway has reached an important milestone where electric vehicles account for more than 70 percent of new car sales (Nanaki, 2021). In China, the largest car market in the world, the use of electric cars has also grown strongly, supported by significant government subsidies and investment in charging infrastructure (Yeung, 2018). In the United States, policy changes and increased consumer awareness of climate change have fueled interest in electric vehicles, and states such as California have set ambitious goals to phase out ICE vehicles entirely by 2035 (Grimaldi & Capaldi, 2023). The development of technology has played a decisive role in the expansion of the electric car market. Innovations in battery technology have greatly expanded the range of electric vehicles, which has solved one of the biggest concerns of consumers. The development of fast charging networks has further alleviated range anxiety, making electric cars a more practical choice for everyday use. In addition, the reduction in battery production costs has made electric vehicles more affordable and broadened their appeal to a wider audience. The importance of putting safety first in this rapidly growing market cannot be overstated. As more and more consumers use electric cars, ensuring their safety becomes an important priority.

Unlike ICE vehicles, electric vehicles present unique safety issues, particularly with respect to their battery systems and high-voltage components. The risks of thermal runaway, battery and electric shock are concerns that must be addressed with strict safety standards and innovative engineering solutions (Zhang et al., 2018). In addition, maintaining high safety standards is essential to increase consumer confidence in electric vehicles. As potential buyers weigh the benefits and risks of switching to electric cars, ensuring their safety is a key factor in their decision-making. Manufacturers and regulators must work together to implement and enforce strict safety practices so that the rapid growth of the electric vehicle market does not compromise vehicle safety. The rapid growth of the electric car market worldwide