

1.0 INTRODUCTION

1.1 BRIEF HISTORY OF ELECTRIC VEHICLES

Since the 19th century, researchers from various countries have started a series of research and development and breakthroughs from batteries to electric motors. At the beginning of this century, innovators in Hungary, the Netherlands and the United States began to look at the concept of battery-powered vehicles and created some small electric cars. It was not until the second half of the 19th century that French and British inventors built the first practical electric vehicles. In the United States, the first successful electric car debuted around 1890 (Huaman, 2018). By 1900, electric vehicles were at their peak in the United States, accounting for about one-third of all vehicles. However, in the 1910s and 20s, due to the introduction of Model T, gasoline-powered vehicles were widely available and reasonably priced. With the discovery of Texas crude oil, natural gas became cheaper and convenient to use, and gas stations began to emerge throughout the country. Eventually, electric vehicles almost disappeared in 1935. In the next 30 years or so, the technology related to electric vehicles has made little progress. Cheap, rich gasoline and continuous improvements in internal combustion engines have hampered demand for electric vehicles. Until the late 1960s and early 1970s, the soaring oil prices, gasoline shortages, and environmental and resource challenges made countries aware of the need for research and development of new energy vehicles. Until the beginning of the 21st century, electric vehicles began to revive (Matulka, 2014).

Overall, the history of electric vehicles is far older than most people think. Nevertheless, Henry Hirshland believes that the reason why gasoline vehicles can take over the automobile market is because the early failure of electric vehicles made fuel vehicles have the chance. Furthermore, GM's former chairman Bob Lutz also predicted: "by 2039, almost all private transportation will be done by electric vehicles." Hence, the research and development of electric vehicles as well as the

policy to support and encourage electric vehicles is the general trend of governments.

1.2 TYPES OF ELECTRIC VEHICLES

According to the way and degree of electricity being used, electric vehicles (EVs) are mainly divided into three types: Hybrid Electric Vehicles (HEVs), Plug-in Hybrid Electric Vehicles (PHEVs), and Battery Electric Vehicles (BEVs) (Ergon, 2018).

The Hybrid Electric Vehicles (HEVs) is powered by gasoline and electricity. The electrical energy is generated by "regenerative braking", which is to charge the battery when the vehicle is braking. The HEV uses an electric motor at start-up, and then the gasoline engine starts working when the load or speed rises. The typical vehicle model of HEV is the Honda Civic Hybrid and the Toyota Camry Hybrid (Ergon, 2018).

Plug-in Hybrid Electric Vehicles (PHEV) also operates in the combination of an electric motor with a conventional internal combustion engine, but this kind of electric vehicle is charged through a special external charging device. Since the PHEV has an average mileage of 35 miles, when the vehicle's power is exhausted, the internal combustion engine will start working to ensure that the vehicle can continue to operate (Transportenergy, 2016).

Battery electric vehicles (BEVs) is completely and only electrically powered vehicles which means they are not equipped with a gasoline engine, fuel tank or exhaust pipe. BEVs are also known as "plug-in" EVs because they use an external power infrastructure to charge the battery. Simultaneously, the BEVs can also charge the battery through regenerative braking (Transportenergy, 2016). Typical BEV models include the BMW i3 and the Nissan Leaf which produce zero emissions (Gumtree, 2018).

1.3 BACKGROUND OF PROJECT

Nowadays, all countries in the world attach great importance to the issue of environmental protection. The goal of sustainable development is also reflected in all walks of life. In order to reduce carbon emissions, all countries in the world have established corresponding standards for vehicle emissions (CCA, 2014). For example, Canada has developed the Canadian Environmental Protection Act (CEPA) (Government of Canada, 2013); U.S. states have established different emission standards based on U.S. National Ambient Air Quality Standards (EPA, 2017); Several local authorities in the UK have introduced Euro 4 or Euro 5 standards to regulate the emission standards for taxis and licensed private rental vehicles (Chichester district council, 2013; Plymouth city council, 2013); China implemented the EU IV standard in 2010 (AW, 2009), etc.

The above facts show that reducing vehicle emissions has become the top priority for the automotive industry in various countries. As a result, countries all over the world have stepped up their efforts to promote new energy vehicles. Through investigation and research on the electric vehicle market in recent years, it has been found that the number of newly registered electric vehicles reached a new record in 2016, with sales exceeding 750,000 vehicles worldwide (IEA, 2017). However, the development of electric vehicles in the UK is not so ideal (Marketline, 2018). Therefore, finding out the factors that have an impact on the situation and proposing feasibility for specific situations can help the future development of the electric vehicle industry in the UK.

1.4 OUTLINE AND RATIONALE

1.4.1 OUTLINE

The paper is to analyze the status quo of the UK electric vehicle market, compare it