УДК 620.92

COMPARATIVE CHARACTERISTICS OF TYPES OF ELECTRIC TRANSPORT

Yeushchyk P. V., student
Shaliapin A. D., student
Scientific supervisor – Ladutska N. F., senior lecturer
English language department №1
Belarusian National University of Technology
Minsk, Republic of Belarus

Today, the logistics sector accounts for approximately 8-11% of all harmful emissions into the environment, with 24% of global greenhouse gas emissions attributed to this industry. Consequently, the implementation of environmentally sustainable solutions, particularly in the transport sector, is becoming increasingly relevant. One of the key directions in this field is the adoption of electric vehicles [1].

There are various types of electric vehicles (EVs) that differ in design and operational principles:

- Battery Electric Vehicle (BEV);
- Hybrid Electric Vehicle (HEV);
- Plug-in Hybrid Electric Vehicle (PHEV);
- Range-Extended Electric Vehicle (REEV);
- Fuel Cell Electric Vehicle (FCEV);
- Solar Electric Vehicle (SEV) [1].

The characteristics of each type of electric vehicle are below:

1. Battery Electric Vehicles (BEVs) operate solely on electricity, offering zero emissions, silent operation, and low maintenance costs. However, they have a limited range (300-500 km), and even fast-charging stations require significant time. The primary challenge is the high cost of batteries, which impacts vehicle pricing;

2. Hybrid Electric Vehicles (HEVs) combine an internal combustion engine (ICE) with an electric motor, reducing fuel consumption by 20-30%. They do not require charging but remain dependent on fossil fuels and still produce emissions. Their complex design also increases the risk of mechanical failures;

3. Plug-in Hybrid Electric Vehicles (PHEVs) can be charged from the grid and provide electric-only driving for up to 50-80 km, making

them convenient for urban commuting. However, their high cost and limited electric range reduce their versatility for long-distance travel;

4. Range-Extended Electric Vehicles (REEVs) feature an onboard ICE generator that extends the range to approximately 600 km, addressing range anxiety. However, they still rely on fuel and tend to be more expensive than purely electric models;

5. Fuel Cell Electric Vehicle (FCEVs) use hydrogen fuel cells, offering fast refueling (3-5 minutes) and an extended range. Nevertheless, the lack of refueling infrastructure and the high cost of hydrogen and vehicles (2-3 times that of conventional cars) present significant barriers;

6. Solar Electric Vehicles (SEVs) utilize solar energy to add 50-100 km of extra range. However, their efficiency declines in cloudy conditions, and their high cost and low power output make the technology unfeasible for mass adoption [2].

Based on this brief analysis, the following conclusions can be drawn. Certain types of electric transport are unsuitable for operation in Belarus. In particular, the use of solar-powered vehicles is limited due to the insufficient number of sunny days per year. At the same time, BEVs which are characterized by high environmental friendliness, are optimal for use in large cities with a well-developed charging infrastructure. However, their efficiency significantly decreases when travelling long distances beyond urban areas or in small towns. A similar situation applies to PHEVs, which, despite combining the advantages of BEVs and HEVs, are the most suitable for operation in Belarus, especially for long-distance travel, although they are not entirely environmentally neutral. Although Belarus is actively developing nuclear energy (e.g., the Belarusian Nuclear Power Plant), a significant portion of electricity in the country and neighbouring states (such as Russia) is still generated from coal and natural gas. Coal-fired power plants remain a key energy source in Eastern Europe, ensuring energy security but increasing the carbon footprint.

This presents a paradox: the production of electric vehicle batteries, which requires vast energy inputs, becomes environmentally problematic under such conditions. Furthermore, the extraction of lithium, cobalt, and nickel – essential for battery manufacturing – leads to ecosystem degradation and social conflicts.

This means that if coal-fired generation remains the main source of electricity, switching to electric vehicles may not reduce, but, on the con-

trary, increase greenhouse gas emissions. A striking example is the situation in Hong Kong in 2016: the massive switch of residents to electric cars led to a 20% increase in CO_2 emissions, as the local energy system was mainly dependent on coal [3].

The widespread introduction of electric transport requires solving key tasks: the transition to environmentally friendly energy sources, the development of infrastructure for charging stations and the organization of an electric vehicle recycling system. These issues are becoming particularly relevant due to the growing demand: in 2023, the share of electric cars in global car sales reached 23%, an increase of 1% compared to 2022. In order to prevent the aggravation of environmental problems and maximize the benefits of electric transport, global cooperation is needed to find effective solutions [4].

Energy sources in transportation can reduce costs and dependency on oil, provided that substantial investments are made. Government support, as observed in certain countries such as the USA, accelerates the return on investment. Lower emissions enhance economic stability, reinforcing the interconnection between ecology and economics. The key to success lies in technological innovation and international cooperation for the advancement of electric mobility. It is worth paying attention to alternative fuel sources, hydrogen and biogas. Integrating the latest inventions into the transport sector will help reduce the ecological footprint.

References

1. Climate Change // Carbon care – reduce emissions. – URL: https://www.carboncare.org/en/climate-change/ (date of access: 31.01.2025).

2. Что такое EV, BEV, HEV, PHEV, EREV? // Авто Китай сегодня. – URL: https://auto.prc.today/ (дата обращения: 23.03.2025).

3. Electric shock – Tesla cars in Hong Kong more polluting than petrol models, report claims // Blog. News clips. – URL: https://heresthenews.blogspot.com/2016/04/electric-shock-tesla-cars-in-hong-kong.html (date of access: 23.03.2025).

4. Trends and projections in Europe 2024 // European Environment Agency. – URL: https://www.eea.europa.eu/ (date of access: 02.02.2025).