Pregledni članak

ELECTRIC AUTOMOTIVE INDUSTRY IN THE WORLD
(Keynote paper)

Dr Branislav Dudić, associate professors, email: branislav.dudic@fm.uniba.sk
Comenius University, Faculty of Management, Slovakia and University Business Academy, Faculty of Economics and Engineering Management, Serbia.
Dr Pavel Kovač, full professors, email: pkovac@uns.ac.rs
University of Novi Sad, Faculty of Technical Sciences, Serbia.
Dr Borislav Savković, associate professors, email: savkovic@uns.ac.rs
University of Novi Sad, Faculty of Technical Sciences, Serbia.
Dr Marija Gavrilović, docent, email: marija.gavrilovic@kg.ac.rs
University of Kragujevac, Faculty of Agronomy in Čačak, Serbia.
Dr Alexandra Mittelman, email: alexandra.mittelman@fm.uniba.sk
Comenius University, Faculty of Management, Slovakia.
Dr Ľudmila Mitková, email: ludmila.mitkova@fm.uniba.sk
Comenius University, Faculty of Management, Slovakia.

Abstract: Global automotive industry has long and rich history in the world and it is very important for economic growth, industrial production, employment rate, direct investments, export and introducing new innovations. Automobile companies annually offer, and to a large extent, mainly focus on vehicles with electric drive. Electromobility is becoming an everyday part of people's lives. The number of electric cars is still growing all over the world. Electromobility is not only before the automobile, but also before the electrotechnics industry. Electric vehicles are considered to be quiet, fast and environmentally friendly vehicles that are easy to handle. Electric vehicles will increase their number on the roads every year, until they reach their maximum and will not be part of the comparison with the combustion engines.
Key words: Electric vehicle, Electromobility, Global market, Electric vehicle production.

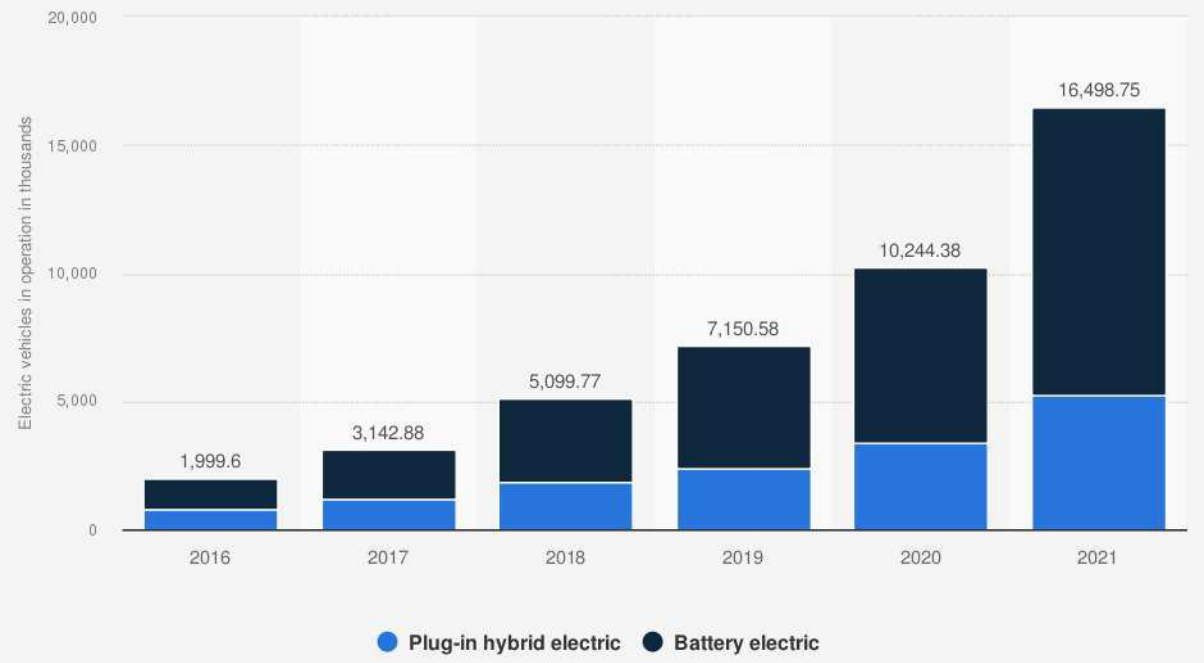
1. INTRODUCTION

Global sales in automotive industry are connected also to global economic development. The automotive industry represents a significant share of the total industry of the global economy. It belongs into fast advances in technology and science, fast growth of work production and high investment opportunity. Its main function is production, marketing, and sale of vehicles. All automobile companies and their sub-suppliers of spare parts belong into this industry. Automotive industry is closely connected to engineering industry, electronics, and chemical industry as well as with metallurgical industry. Passenger vehicles, trucks, buses, and motorbikes belong into the products of automotive industry.

Recently, however, there have been concerns regarding the environmental friendliness and sustainability of this type of transport. This is the reason why new alternatives have begun to be developed, which would help to reduce greenhouse gas emissions that arise from the use of motor vehicles. Electromobility could be a key area that could help in this area. He sees electric cars as a new opportunity for an environmentally friendly future. The history of electric cars is nothing new in the world and dates back to the 19th century. Thus, the first documented electric cars appeared. The turn of the 19th and 20th centuries was also significant, when the chemist

Camille Faure improved the rechargeable battery and thus enabled greater progress in the production of electric cars. In this period, the first electric car was created, which reached a maximum speed of 35 km/h with a range of 80 km. However, the racing electric car La Jamais Contente reached a speed of up to 105.88 km/h, making it the fastest driving vehicle on earth. [1] The biggest advantage of electric cars is their cheap operation. Consumers driving electric vehicles can save a significant amount of money. Electric energy is a cheaper source of energy than fuel for internal combustion cars, gasoline or diesel.

Estimated number of electric vehicles in use worldwide between 2016 and 2021



Source: IEA. (May 23, 2022). Estimated number of electric vehicles in use worldwide between 2016 and 2021, by type (in 1,000s) [Graph]. In Statista. Retrieved October 29, 2022, from https://www.statista.com/statistics/1101415/number-of-electric-vehicles-by-type/

There were about 10.2 million electric vehicles in operation worldwide in 2020. That year, all-electric vehicles accounted for about 67 percent of plug-in electric vehicles. Electric vehicle market growth. Globally, electric vehicle sales soared to more than three million units in 2020. While conventional vehicle sales slumped amid the outbreak of the coronavirus pandemic, the market share of electric vehicles increased to between four and five percent in 2020. China was the market with the largest battery electric vehicle fleet in 2019 with almost 54% of the world's battery electric vehicle population. [2]

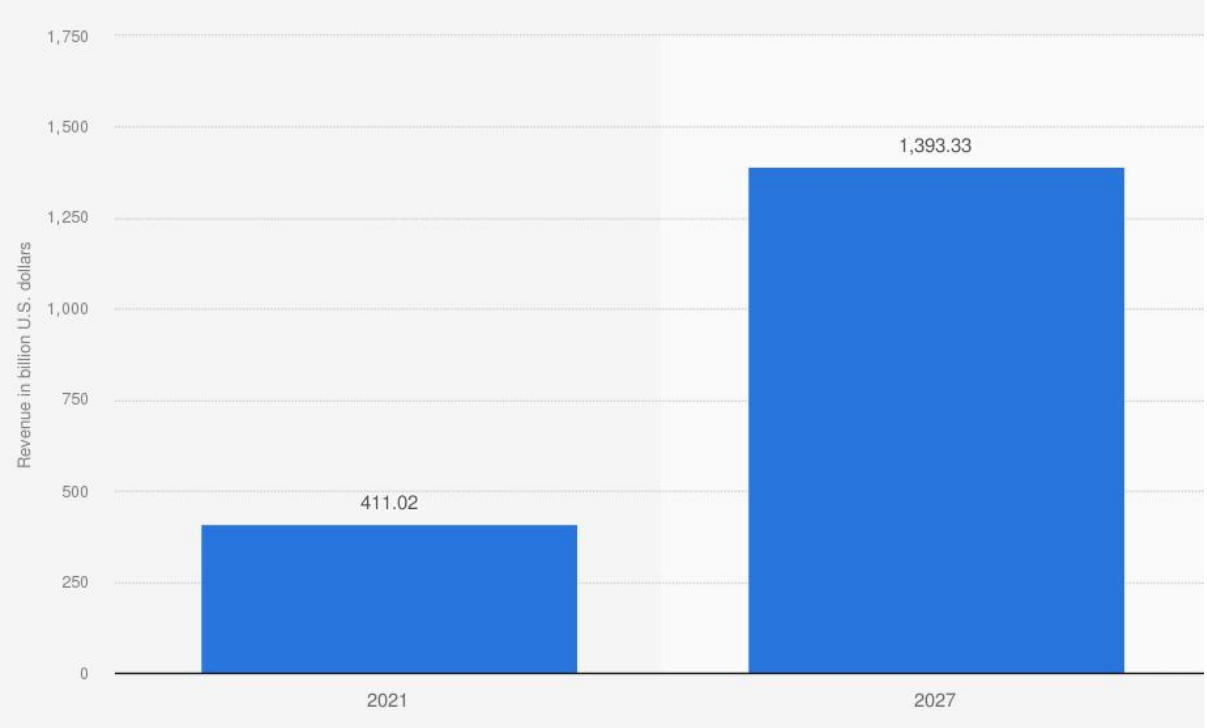
Among the electric vehicles, an electric car is earning - passenger, boat or bus, tram, motorcycle and bicycle. The concept of electromobility is connected with the concept of an electric car, which represents a means of transport powered by an electric motor. It should be noted that an electric car may not always be represented as a car. [3]

Electric vehicles parts to three categories:

- battery electric vehicles, BEVs - battery electric vehicles are fully electric vehicles that use the battery installed in the vehicle as their only source of energy. Such a vehicle is not fuelled, only charging the battery from an external source.

- electric vehicles equipped with, FCEV – fuel cell electric vehicle are vehicles powered by electric energy produced in fuel cells. The electrical energy produced is the result of the reaction of oxygen and hydrogen.
- battery-powered electric vehicles with extended range, REEV – range extender electric vehicle, are equipped with an electric motor and a battery, which is used exclusively to obtain the battery, in order to extend the range of the electric vehicle.

Size of the global market for electric vehicles in 2021 and 2027*(in billion U.S. dollars)*



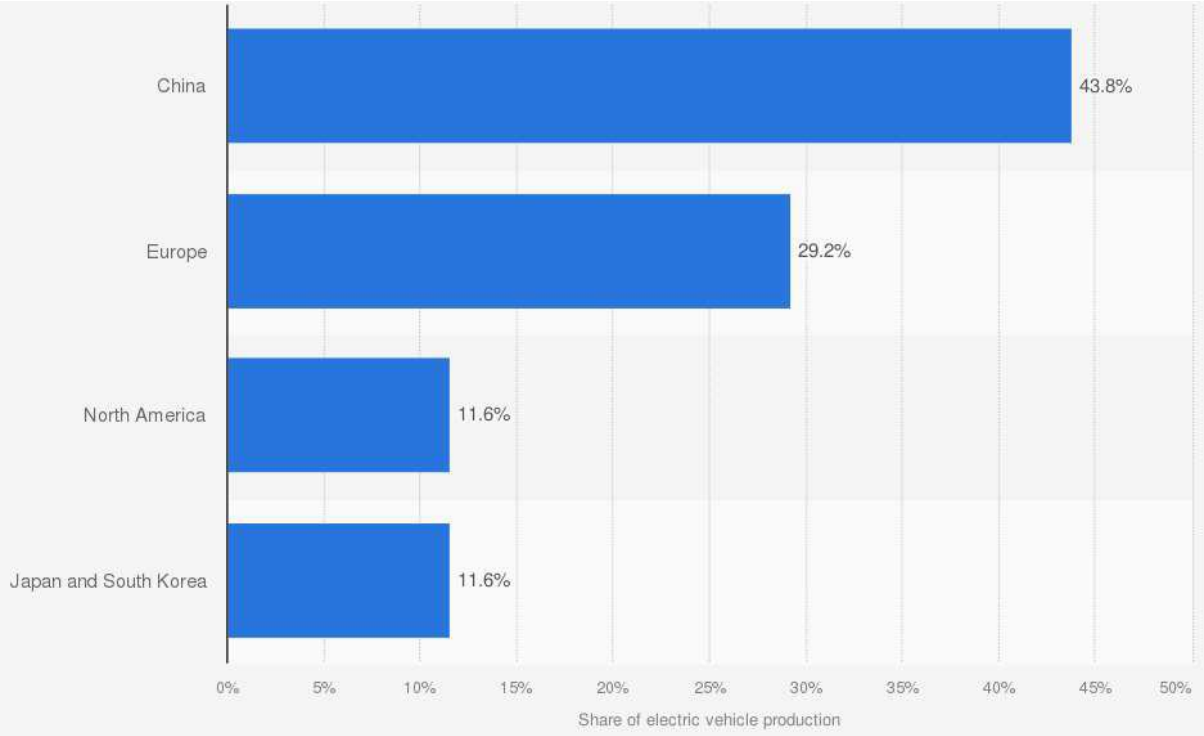
Source: Mordor Intelligence. (July 25, 2022). Size of the global market for electric vehicles in 2021 and 2027 (in billion U.S. dollars) [Graph]. In *Statista*. Retrieved October 29, 2022, from https://www.statista.com/statistics/271537/worldwide-revenue-from-electric-vehicles-since-2010/

Between 2021 and 2027, the size of the global electric vehicle market is expected to increase over four-fold to reach an estimated global market size of some 1.4 trillion U.S. dollars by 2027. This translates to a notable compound annual growth rate (CAGR) of more than 19.19 percent between 2022 and 2027. Electric vehicles (EVs) have become a much more attractive choice to consumers in recent years thanks to increased range, battery life, efficiency, and affordability. [4]

2. Production of electric vehicles in the future

People's interest in electric cars is increasing every day. Electromobility is attracting more attention every day, which is reflected in the high level of innovation in the field of automobiles. Manufacturers are trying to react as quickly as possible to the state of the market and, once again, to focus on the development and development of electric cars due to the increase in people's desire for this type of car.

Projected electric vehicle production in 2027



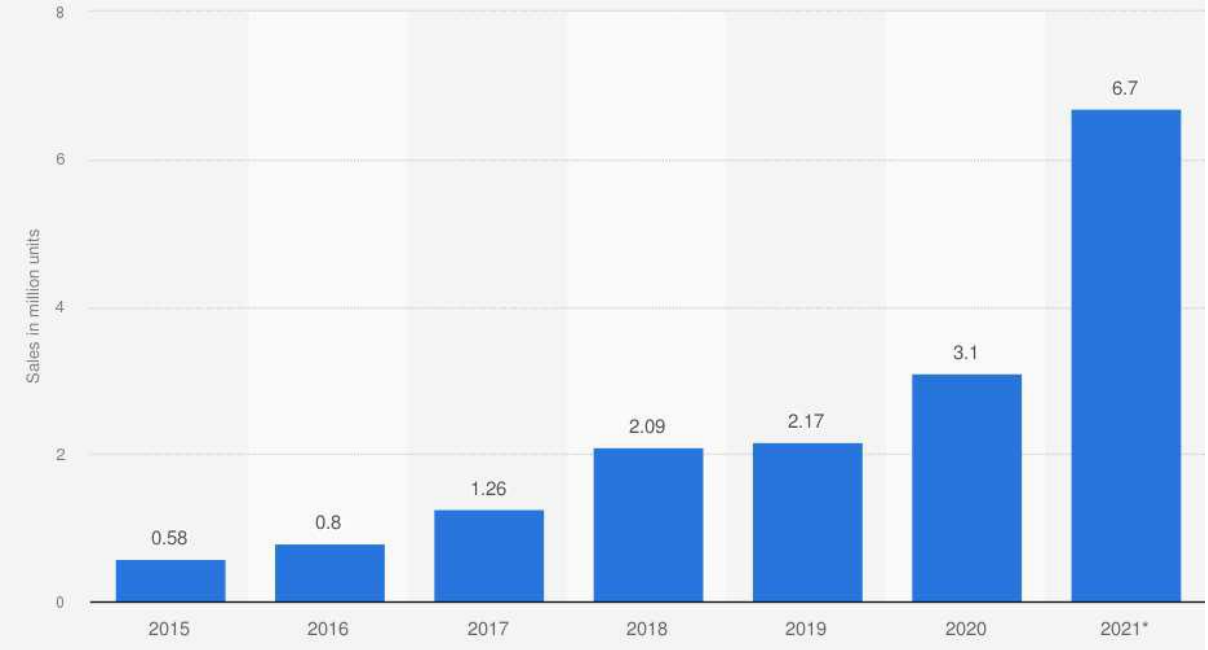
Source: Website. (August 31, 2020). Projected electric vehicle production in 2027, by region [Graph]. In *Statista*. Retrieved October 29, 2022, from https://www.statista.com/statistics/974263/electric-vehicle-production-by-region/

It is expected that China's automotive industry will produce about 44 percent of electric vehicles in 2027. That year, global electric vehicle production is anticipated to reach some 13 million units.

3. Sales and the use of electric vehicles

The use of electric vehicles is a growing trend from year to year, and a larger number of people are attracted to switching to electric or hybrid drive. However, there are many different reasons for investing in electric cars, and among those reasons, electric cars are fully charged with electricity provided by you, which means that you no longer have to buy any fuel. Every year, the world's automobile companies offer, and to a large extent, they mainly focus on electric vehicles, even though their price is still relatively high. Electromobility represents advantages for society, it is considered a trend and has potential for the future, thanks to which the world's leading manufacturers transports aim precisely at this type and constantly create new possibilities.

Estimated plug-in electric light vehicle sales worldwide from 2015 to 2021*(in million units)*



Source: IEA. (February 1, 2022). Estimated plug-in electric light vehicle sales worldwide from 2015 to 2021 (in million units) [Graph]. In *Statista*. Retrieved October 29, 2022, from https://www.statista.com/statistics/665774/global-sales-of-plug-in-light-vehicles/

It is estimated that 2021 saw plug-in electric light vehicle (PEV) sales of around 6.7 million units. The Chinese market picked up steam after a period of slowdown in 2020, as vehicle manufacturing and demand was at a standstill due to the COVID-19 pandemic. Meanwhile, electric vehicle sales in Europe's five largest markets surged in 2021. Germany could become the largest market for plug-in electric vehicles. Through November and December of 2021, it is estimated over one in three new cars sold in the country were electric vehicles. Global automobile production dropped significantly with the pandemic, with millions of jobs in the industry at risk globally. Later in the year when lockdowns were lifted, supply and demand for new cars bounced back. The electric car market experienced a record year, with a slight increase in global electric car sales, and notable market share growth. [5]

Support for the sale of electric cars in the world

The future of electric cars is largely influenced by the reduction of emissions, which after the decisions and declarations of some countries is already becoming an important factor, as a complete ban on the sale of combustion cars is announced to improve the environment by reducing emissions from the air.

Each state has set its own direct and indirect support for electromobility on:

1. Subsidies – tax breaks, reduction of costs for the purchase or operation of an electric vehicle
2. Priority registration – determines priority registration in countries with restrictions on car ownership
3. Public procurement - deliberate favouring of electromobility in the framework of announcing public tenders of the state administration

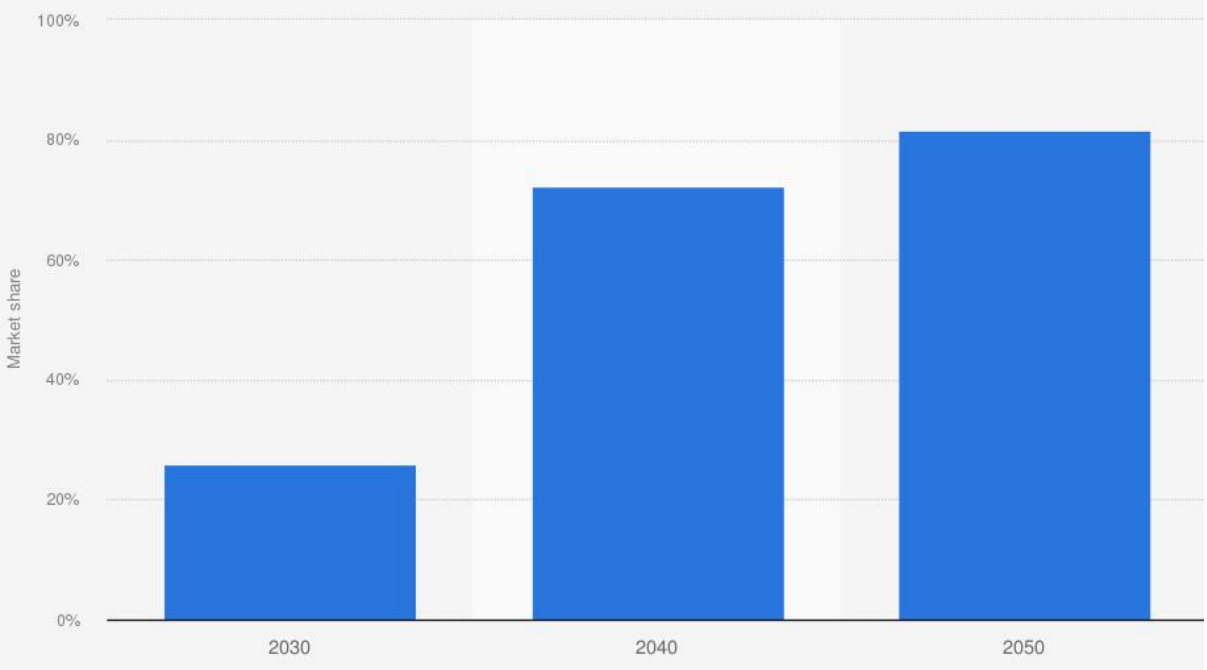
4. Traffic regulation - preferential parking for owners of electric vehicles to reserved parking spaces

Thanks to ambitious zero-carbon measures and financial assistance under the global green deal, the electric vehicle market is experiencing great growth and sales.

More internal combustion cars are still being sold, but it is estimated that:

- By 2030, 1 in 5 new cars sold is expected to be electronic.
- By 2040, 2 out of 5 new cars sold are expected to be electronic.
- By 2050, 4 out of 5 new cars sold are expected to be electronic.

The sale of electric cars has accelerated, we can also see it on the graph: projected electric vehicle sales as a percentage of car sales worldwide between 2030 and 2050



Source: Morgan Stanley. (September 18, 2020). Projected electric vehicle sales as a percentage of car sales worldwide between 2030 and 2050 [Graph]. In *Statista*. Retrieved October 29, 2022, from https://www.statista.com/statistics/1202364/ev-global-market-share/

The market share of electric vehicles is growing rapidly. It is projected that this figure will increase to over 80 percent by 2050. Electric vehicles are tipped to account for almost 70 percent of the global car parc by 2050.

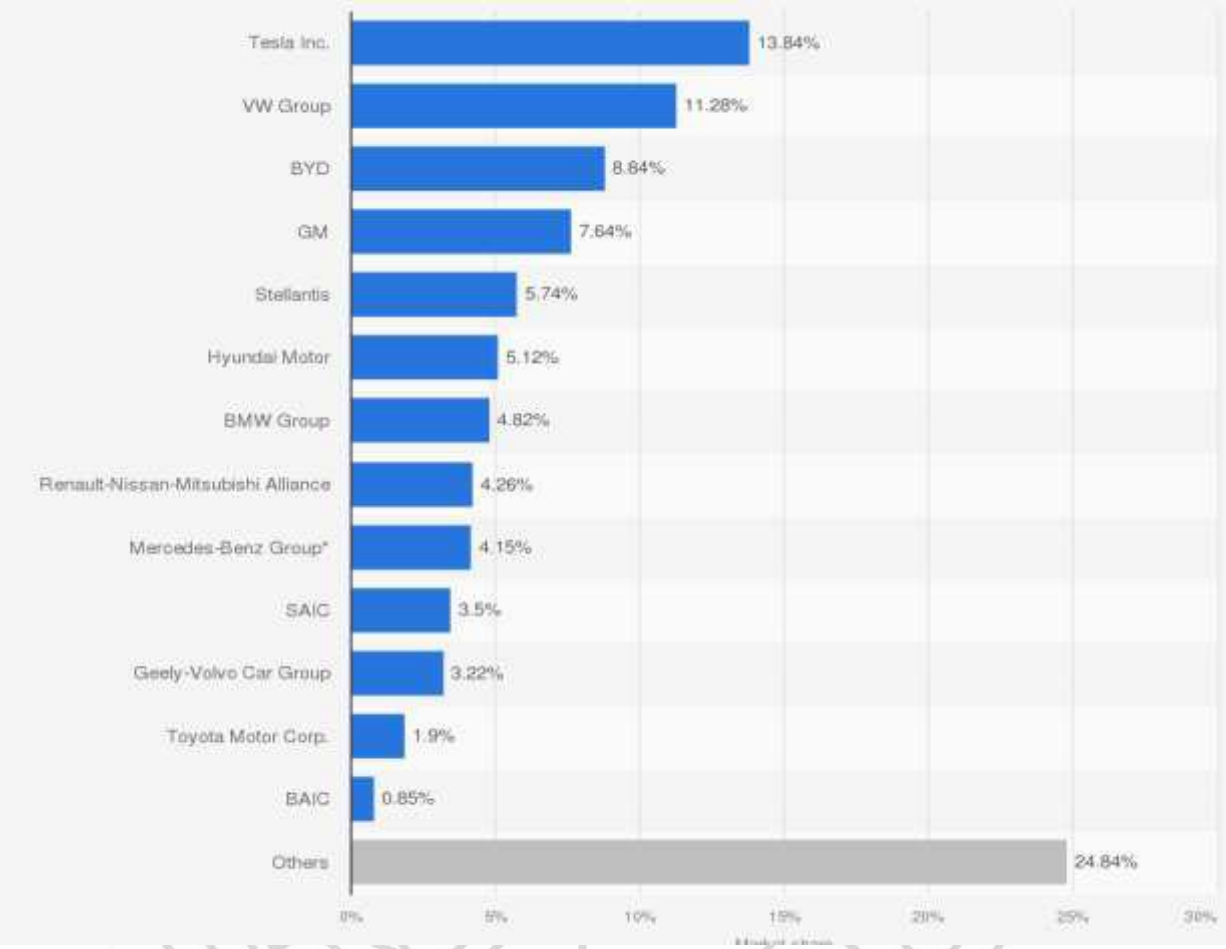
4. Leaders in the production of electric cars

Electromobility is an important technological element of the 21st century. It is highly likely that its development will continue, with acceleration of year-on-year growth expected. The results show that its potential for the future is great, but this industry still has a long way of several years ahead of it.

Today, there is a huge competition between the leaders in the production of electric cars for the first positions in the market. Tesla ranks among the leaders in the production of electric cars and is the most valuable car company in the world with a net worth of about 650 billion

dollars. Tesla's sales volume translates into a market share of just under 14 percent. Volkswagen Group and BYD were among the runners-up. Other manufacturers include: GM, Stellates, Hyundai, BMW and others.

Global plug-in electric vehicle market share in 2021, by main producer

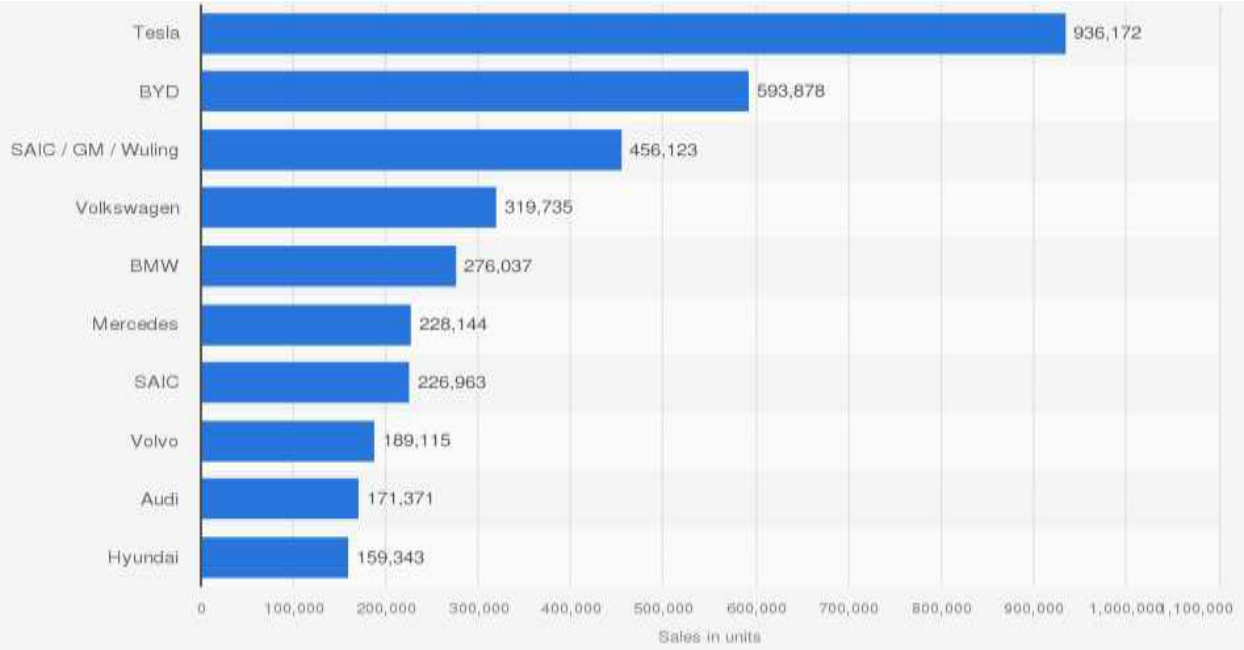


Source: EV-Volumes.com. (March 7, 2022). Global plug-in electric vehicle market share in 2021, by main producer [Graph]. In *Statista*. Retrieved October 29, 2022, from https://www.statista.com/statistics/541390/global-sales-of-plug-in-electric-vehicle-manufacturers/

We can say that 2021 was one of the best years for electric vehicles. Sales increased by 43% compared to the previous year, with more than 3.1 million units sold. The largest share was attributed to Tesla, which sells almost 936,200 electric cars, while the second was BYD with 593,878 units sold. With Europe-based brands Volkswagen, BMW, Mercedes, Renault, and Audi all impressively ranked in the plug-in electric vehicle (PEV) market, there is no doubt that Europe's incumbent automakers are ready to zoom past rivals when it comes to electric mobility.

In the following graph, it can be seen how many electric vehicles were sold by other manufacturers in 2021.

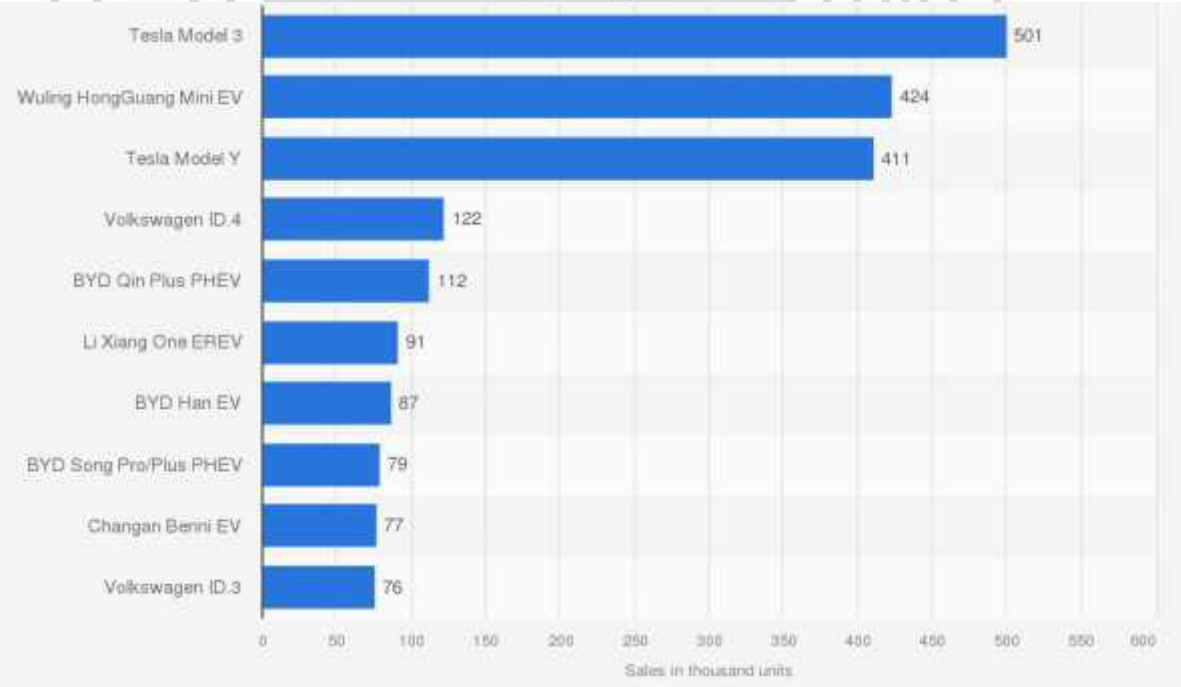
Estimated plug-in electric vehicle sales worldwide in 2021



Source: CleanTechnica. (January 31, 2022). Estimated plug-in electric vehicle sales worldwide in 2021, by automaker (in units) [Graph]. In Statista. Retrieved October 29, 2022, from https://www.statista.com/statistics/977407/global-sales-of-plugin-electric-vehicles-by-brand/

The structure of the best-selling electric models

Best-selling plug-in electric vehicle models worldwide in 2021



Source: Inside EVs. (February 2, 2022). Best-selling plug-in electric vehicle models worldwide in 2021 (in 1,000 units) [Graph]. In *Statista*. Retrieved October 29, 2022, from https://www.statista.com/statistics/960121/sales-of-all-electric-vehicles-worldwide-by-model/

The Tesla Model 3 was the world's most popular plug-in electric vehicle with worldwide unit sales of roughly 501,000 in 2021. That year, deliveries of Tesla's Model 3 and Model Y have more than doubled year-over-year, and these two models accounted for 97 percent of Tesla's sales volume in 2021.

5. CONCLUSION

In the future, car manufacturers and investors will invest massively in the production and development of electric drives and electric cars. An electric car can be a great way for the consumer to save a lot of money on fuel. The main reason why this area will develop is that consumers driving electric vehicles can save a significant amount of money, electric energy is a cheaper source of energy than fuel such as gasoline or diesel. Another advantage is that, unlike gasoline and oil, energy can also be obtained from renewable sources such as the sun, wind, etc. The price of oil is a dwindling supply and will continue to rise in price. Service fees for electric cars are lower than for classic cars.

REFERENCES

[1] ČIŠKOVÁ, Lucia a kol. Ročenka 2019: Elektromobilita v SR. 1. vyd. Bratislava: Digital Visions, s.r.o., 2018, 98 s., ISBN 978-80-971112-8-1

[2] Statista. IEA. (May 23, 2022). Estimated number of electric vehicles in use worldwide between 2016 and 2021, by type (in 1,000s) [Graph]. In Statista. Retrieved October 29, 2022, from https://www.statista.com/statistics/1101415/number-of-electric-vehicles-by-type/

[3] MOM, Gijs. 2013. The electric vehicle: Technology and expectations in the Automobile Age. 1.vyd. Baltimore, 2013. ISBN: 978-1-4214-0970-2

[4] Statista. Mordor Intelligence. (July 25, 2022). Size of the global market for electric vehicles in 2021 and 2027 (in billion U.S. dollars) [Graph]. In *Statista*. Retrieved October 29, 2022, from https://www.statista.com/statistics/271537/worldwide-revenue-from-electric-vehicles-since-2010/

[5] Statista. Estimated plug-in electric light vehicle sales worldwide from 2015 to 2021 (in million units) [Graph]. In *Statista*. Retrieved October 29, 2022, from https://www.statista.com/statistics/665774/global-sales-of-plug-in-light-vehicles/