Electric Vehicles Market in Poland

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Abstract:

Purpose: Identification of situations and trends in the electric vehicles market in Poland. Design/Methodology/Approach: The study covers the analysis of the Polish electric vehicles market. Methods of systematic review and critical analysis have been applied. The authors of the study proposed the model of market development established on the basis of data obtained from secondary sources with the use of the Least Squares Method. Findings: In consequence of the carried out study, a segment, geographic and dimension structure of the Polish market of electric vehicles has been determined. We proposed a model of market development in time in the form of the function of a linear trend. It has been proved that in the years 2019-2021, month by month, the share of electric vehicles in the market has increased by 0.016% on average. We obtained good adjustment of the linear trend ($R^2=0.68$). Practical implications: The obtained results may be the base for the establishment of the strategy in the electric vehicles market for marketing departments as well as sales departments importers of particular brands, especially the planning of the sale advertising campaign. This is particularly important when taking into consideration present fluctuations in production and sale of vehicles. Originality/Value: The novelty element is the synthetic establishment of present situation and identification of trends in the market of electric vehicles in Poland.

Keywords: Battery Electric Vehicle, Market.

JEL codes: M31, O14, O33.

Paper Type: Research study.

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1. Introduction

A vehicle has become a fundamental attribute of developing societies and one of the most important goods, thanks to which people may increase their mobility and improve the comfort of travelling. Popularizing a vehicle as a mean of transport is often named as *The first automotive revolution* (Freyssenet, 2009). In 1960 there were around 100 million cars in the world. In 1990 the number increased up to 450 million in order to reach 1 billion in 2017 (Davis and Boundy, 2020). It is worth emphasizing that on the turn of the 20th and 21st century the achievement of this level was expected to emerge in the year 2030 (Urry, 2004).

The market of passenger cars is an important part of every developed economy (Stryjakiewicz et al., 2021) due to: (1) the share in the volume and value of the turnover, (2) the share in the National Gross Product, (3) the scale of employment and (4) the introduction of innovations. Development of the automotive sector is connected with a number of social, economic and environmental consequences. Systematic increase of the need for transportation required taking up actions which allowed for the limitation of its negative effects. It is expected that in the future in accordance with the adopted transportation policy within the scope of the minimization of the emission of harmful substances, the electric motor vehicles should be one of the most important means of public as well as individual transport.

This results mainly from the achievement of one of the goals included in the *White Paper on Transport* (2011), which assumes the reduction of the half of the vehicles with conventional drive in the urban transport by the year 2030 and the elimination of the above mentioned vehicles from the cities by the year 2050.

Due to the volume of sale, development dynamics and consequences, the passenger car market is the object of the analyses conducted by the researchers representing various scientific disciplines. The analysis of literature allowed to indicate two groups of publications concerning the market of the passenger cars. Firstly, in Poland in publications written in the years 2011-2018 this topic was discussed by Močko (2011), Wojciechowski and Ornowski (2011), Merkisz-Guranowska and Stańko (2014), Waśkiewicz and Gis (2014), Ambroziak (2015), Gis, Menes, and Waśkiewicz (2015), Sendek-Matysiak (2018), Łosiewicz and Sendek-Matysiak, (2018). Secondly reports concerning foreign or global market prepared by Gawilokwska-Fyk (2017), Kosowska (2018), Czuba, Konewka, and Krasowska (2019), Munzel et al. (2019), Du and Ouyang (2017), Palencia et al. (2017), Teure (1980) and Austmann (2020), are available.

The above mentioned positions concerning the Polish market, were published in the years 2011-2018, whereas the publications concerning the domestic market, are lacking in the foreign literature. Thus it has been considered that this issue deserves a scientific elaboration and in consequence the continuation of the study concerning
the domestic market. Due to the above, the purpose of this paper is the identification of situations and trends in the Polish market of electric vehicles.

2. Electric Vehicles – Facts and Numbers

Definition of an electric vehicle (BEV – Battery Electric Vehicle) refers to the unit which is in 100% operated by the battery. The electric vehicle is a road vehicle in which the energy is transformed by an electric machine into mechanic energy used for the drive. The unit is powered by energy coming from the deck source, most frequently by batteries (Encyklopedia PWN, 2021). According to the Act on electromobility and alternative fuels (Journal of Laws of 2018, item 317) the electric vehicle is a motor vehicle according to article 2 point 33 of the Traffic Law Act (Journal of Laws No. 98, item 602, 1997), which for its drive uses only the battery energy being connected with the external source of power. Moreover the electric vehicles have specially marked registration plates (Journal of Laws of 2018, item 137 and may move on the lanes intended for the buses. Electric passenger cars pursuant to the Excise Tax Act (Journal of Laws of 2017, item 43, 60, 937, 2266 and of 2018 item 137) have been exempted from the excise tax.

Electric vehicles attract increasing interest, new models of already recognizable brands are constantly appearing in the market. Table 1 presents advantages and disadvantages of vehicles powered by energy.

| Table 1. Advantages and disadvantages of electric vehicles |
|---------------------------------------------------------|
| **Advantages**                                           | **Disadvantages**                                  |
| Increased efficiency – higher performance               | High price                                         |
| Lower failure rate (the construction of BEV engine is simple) | Limited number (and the network) of loading stations |
| Quiet functioning of the engine                         | Necessity of frequent loading                      |
| Simple operation                                         | Repairs only at specialist service stations        |
| Stable exploitation costs (the prices of Energy are more stable than the prices of fuel) | Necessity of grating a loading station (optional) |
| Long battery vivacity                                    | Lower comfort of the ride (e.g. resignation from air-conditioning in favor of larger range) |
| Eco-friendly engine (possibility of using renewable energy sources and lack of the emission of toxic substances into the atmosphere) | Higher consumption of energy in low temperatures |
| Maximum comfort of exploitation                          | Silent engine operation (other participant of the road traffic can’t hear the car) |
| Purchase subsidies (ecology-firendly granting)          |                                                  |
| Possibility of entering limited traffic zones           |                                                  |
| Higher safety level in case of an accident              |                                                  |
(no fuel- no risk of explosion)

Possibility of driving on the bus lanes

Separate often free of charge parking places

Source: Author’s own study based on: http://car-master.com.pl; http://elektromasters.com.pl; http://autotesto.pl; http://moje-auto.pl; http://motocontroller.com.pl; http://autoswiat.pl.

The analysis of advantages and disadvantages presented in Table 1 and information available on specialist services allows to indicate higher performance (high torque), stabilized (prices of energy are more stable than the fuel prices) costs of exploitation and ecology-friendly feature as the most frequently named advantages of electric vehicles. Among disadvantages the majority of indications concerned the high price, necessity of frequent loading and limited range of electric vehicles. It should be emphasized that the low level of noise (quiet engine operation) has been indicated both as a strong (high usage standard) and weak (greater risk of an accident as the other traffic participants can’t hear the engine) feature of electric vehicles.

3. Research Methodology

The empirical research, the results of which are presented in this paper, has been carried out with the use of systematic review and critical analysis of source texts, which are the techniques typical of the quality analyses (Jemielniak, 2012; Kostera, 1996; Juszczyk, 2013; Filck, 2012; Charmaz, 2009). After Bentkowski (2006) the research area was focused on the identification of trends existing in the Polish market of electric vehicles.

Table 2 presents the procedure of preparing and conducting empirical research divided into particular tasks as well as methods, tools and techniques of their realization.

| No. | Task                              | Methods, techniques, tools                  |
|-----|-----------------------------------|--------------------------------------------|
| 1.  | Conceptualization of the research area (identification of the research problem) | Systematic review and analysis of literature |
| 2.  | Selection of research sample      | Purposive selection                        |
| 3.  | Conduct of empirical research     | Review and analysis of identified bibliography positions |
| 4.  | Analysis and interpretation of results | Semantic and comparative text analysis      |
| 5.  | Conclusion                        | Synthesis and generalization               |

Source: Author’s own study.
In the empirical part, the review covered 46 bibliography positions in the form of complex elaborations, scientific articles, regulations of government programs, Internet websites, reports of research institutes and commercial units.

4. **Structure of the Market of Electric Vehicles in Poland**

The analysis of data taken from *Elektromobility meter* kept by PZPM (Polski Związek Przemysłu Motoryzacyjnego – Polish Association of Automotive Industry) and PSPA (Polskie Stowarzyszenie Paliw Alternatywnych – Polish Society of Alternative Fuels) proves that in Poland at the end of September 2021, there were 31,633 electric passenger cars registered. In this part of vehicle park BEV units constituted 48% (15,255). In the same period of the last year this number amounted to 6056 cars, therefore an explicit increase of the share in the general number of used vehicles is visible (Electromobility meter, 2021). Figure 1 presents the share of passenger electric vehicles in the total number of registrations.

![Figure 1. Share of electric passenger vehicles in the total number of registrations](source)

The analysis of data presented in Figure 1 proves that in 2019 the electric passenger vehicles constituted less than 0.1% of the number of registered units. On the turn of the year 2020 and 2021 the share of electric vehicles in the total number of registrations grew up to 0.7%. The model of linear trend was created with the use of Least Squares Method. In consequence it has been stated that in the analysed period, month by month, the share of the electric vehicles increased by 0.016% on average. It has been proved that the identified trend is linear and the adjustment of the model should be deemed good ($R^2=0,68$).

Electromobility in Poland is intensely developing only in few places. Since 2019, 80% of electric vehicles has been registered only in seven voivodships (Masovian, Lesser Poland, Upper Poland, Silesian, Łódzkie, Lower Silesian, Pomeranian
voivodship). The largest group, almost 25% has been reported in Masovian voivodship and the smallest in Łódzkie voivodship and Pomeranian voivodship – 7% (http://300godpodarka.pl).

Table 3. Electric vehicles with the widest range

| Make, model               | Range (km) |
|---------------------------|------------|
| Tesla Model S             | 652        |
| Tesla Model 3             | 580        |
| Tesla Model X             | 561        |
| VW ID.3                   | 549        |
| VW ID.4                   | 500        |
| Hyundai Kona electric     | 484        |
| Jaguar I-Pace             | 470        |
| BMW iX3                   | 460        |
| Kia e-Niro                | 455        |
| Kia e-Soul                | 452        |

Source: Author’s own study based on http://e-autokult.pl; http://naprądzie.pl.

A small percentage of the share of units with electric drive in the total number of the cars is caused by a relatively high prices of the cars (Table 6) and limited accessibility of the loading points. The ranking of the vehicles with the widest range is presented in Table 3 above. Today in Poland there are 1719 public loading stations of this kind (http://pspa.com.pl). The number of loading stations divided into cities, in which they are situated, is presented in Figure 2.

Figure 3. Public loading stations

Source: Author’s own study based on http://pspa.com.pl.

The analysis of the above diagram shows that the biggest number of loading stations for electric vehicles is located in Warsaw – 160. Almost 100 stations is situated in
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K Katowice, Wrocław, Kraków, Poznań and Gdańsk, around 60 stations in each city. The smallest number of loading stations is in Gliwice (15), Lublin (16) and Białystok 918).

Figure 3 presents the number of units with electric drive in the national market with consideration of (1) type of the vehicle, (b) state of a vehicle at the moment of purchase, (c) the origin of the vehicle and (d) type of ownership.

**Figure 3. Number of electric vehicles registered in Poland**

5. The Size of the Market of Electric Vehicles in Poland

Table 4 includes data concerning the number of electric vehicles most frequently registered in Poland. The analysis of information presented in Table 5 shows a significant increase of the number of cars registered in 2020 compared to the analogous period in the year 2019. Among the models, which unchangeably keep the 2nd and 3rd position in the ranking are Nissan Leaf and Renault Zoe. The largest decrease has been noticed for BMW i3 (2019 – 603 cars., 2020 – 205 cars).

Source: Author’s own study based on http://automotyw.com; http://pspa.com.pl.

The analysis of information presented in Figure 3 proves that 79% of cars among the total number of electric vehicles registered in Poland are the brand new units, 72% of the cars is form the domestic market and 70% of the cars is the ownership of the companies.
Table 4. The number of electric vehicles most frequently registered in Poland

| Make, model   | Number (item) | Make, model   | Number (item) | Make, model   | Number (item) |
|---------------|---------------|---------------|---------------|---------------|---------------|
| BMW i3        | 603           | Skoda Citigo e | 516           | Renault Zoe   | 23            |
| Nissan Leaf   | 106           | Nissan Leaf   | 491           | Mercedes EQC  | 23            |
| Renault Zoe   | 50            | Renault Zoe   | 355           | Peugeot e-208 | 17            |
| Jaguar I-Pace | 43            | Mazda MX30    | 222           | Audi e-tron   | 14            |
| Audi e-tron   | 42            | Kia e-Niro    | 210           | Tesla Model   | 11            |
| VW e-Golf     | 27            | Hyundai Kona  | 206           | Fiat 500 e    | 8             |
| Hyundai Kona  | 23            | BMW i3        | 205           | Nissan Leaf   | 6             |
| Tesla Model 3 | 16            | Mercedes EQC  | 191           | VW ID.3       | 6             |
| Tesla Model S | 10            | VW ID.3       | 189           | Peugeot e-208 | 5             |
| Tesla Model X | 8             | Opel Corsa e  | 159           | BMW i3        | 5             |

Note: * state as of 31.01.2021;
Source: Author’s own study based on http://e-autokult.pl; http://naprädzie.pl.

As it was mentioned above, the most frequently indicated disadvantage of an electric vehicle is its high price. The prices of the cars with electric drive is presented in Table 5.

Table 5. Prices of electric vehicles in Poland – state as of 31.07.2021

| Segment A and A-SUV | Make, model   | Price* (zl) |
|---------------------|---------------|-------------|
| Dacia Spring el     | 84 700        |
| Smart EQ For Two    | 96 900        |
| Smart EQ For Four   | 98 400        |

| Segment B | Make, model   | Price* (zl) | Make, model   | Price* (zl) |
|-----------|---------------|-------------|---------------|-------------|
| Renault Zoe | 124 900 – 147 400 | Hyundai Kona electric | 118 800 – 201 900 |
| Peugeot e-208 | 124 900      | Kia e-Soul  | 139 990 – 160 990 |
| Mini Cooper SE  | 142 000      | Opel Mokka e | 142 800       |
| BMW i3         | 169 700 – 184 200 | Peugeot e-2008 | 149 400       |
| Opel Corsa e   | 132 490      |              |               |

Segment C | Segment C SUV
The analysis of data included in Table 5 shows that the lowest price – PLN 76 900 was reported for the car Dacia Spring electric, and the highest for the car Audi e-tron GT RS – PLN 599 230. Three models, Nissan Leaf, Kia e-Soul and Hyundai Kona electric are included in the price range between PLN 120 000 – PLN 150 000. Taking into consideration the costs of additional payments to the electric vehicles (program My electric) among the models whose price does not exceed PLN 225 000 we may indicate, VW ID.4, Skoda Enyaq IV, Audi Q4 e-tron and Tesla Model Y. Model of premium makes such as Tesla (Model Y i V), Ford (Mustang Mach), BMW (Xi3, i4), Porsche (Tycan), Mercedes (EQC) and Audi (e-tron GT) are above this price threshold.

Due to relatively high purchase prices (Table 6) electric vehicles constitute a small percentage of vehicles on the Polish roads. In 2021 within the framework of the National Fund for Environmental Protection and Water Management another subsidies program called “My electric” has been launched (Electromobility, 2021).

The purpose of this enterprise is the avoiding of the increased emission of pollution by way of giving support for the purchase of zero-emission vehicles, among others electric vehicles. This project is not brand new, it is another opening of an enterprise established in 2020. In this year the novelty is the possibility of purchasing a car in the form of a leasing (http://superauto.pl).
In the current edition of the competition, the value of the payments amounts to PLN 18 750 for physical persons; in this group the owners of Large Family Cards may be granted higher funding—PLN 27 000. The remaining petitioners (who are not physical persons) obtain subsidies the amount of which depends on the category of a vehicle and declared annual mileage.

The amounts of subsidies are included in the range PLN 27 000 – PLN 70 000 (http://muratorplus.pl).

6. Conclusions

Electric vehicles, despite numerous disadvantages enjoy constantly increasing interest among consumers in the Polish automotive market. According to data taken from the Electromobility Meter over 30 000 cars have been registered in Poland. Nissan Leaf and Renault Zoe are the three most frequently registered models.

The analyzed market is developing in distinct linear trend. In the last two years, month by month, the share of the electric vehicles in the entire market has been increasing by 0.016% on average.

The greatest problem of the purchasers of electric vehicles is their high price. The cheapest electric vehicle available in the Polish market is Dacia Spring el and its price is PLN 84 700. Limited number (and network) of loading stations is another weakness of electric vehicles. If a vehicle is used in urban conditions the range of 400 km is not a problem, however when the owner has to drive longer distances this may constitute a significant purchase barrier. Stabilized costs of exploitation are a considerable advantage, because the prices of energy are more stable than the prices of other fuels, as well as the ecology-friendly features of the vehicle.

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