

Forecast of the development of demand for charging points for electric vehicles in Russian cities

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Abstract. Road transport is one of the main consumers of fossil fuels in the world. At the same time, ICE vehicle emissions form about a quarter of all greenhouse gases in the world. In this regard, the transition to electric vehicles is extremely important. Their operation is more economical and environmentally friendly. The massive shift away from liquid-fuel vehicles will have a significant positive effect on a global scale. At the moment, more than 20 countries of the world have planned the transition to electric vehicles by 2030-2040. They are beginning to be introduced into various areas: personal and public transport, special-purpose vehicles, cargo transportation, etc. At the same time, there are barriers that need to be overcome for the widespread mass transition to electric cars. In particular, the choice of models is limited and their price is high. The technologies for the production and disposal of individual components, such as batteries, remain insufficiently developed. Electric networks are not always ready for additional load. The network of electric filling stations is not sufficiently developed. Russia also supports this global trend and faces restrictions. Various scenarios for the development of electric vehicles have been predicted. Measures of state support for both consumers and manufacturers of electric vehicles are indicated, which are aimed at achieving the indicators of a balanced or accelerated scenario for this market. Keywords: road transport, electric vehicle, greenhouse gas emissions, fossil fuel consumer, electric charging stations, batteries, trend extrapolation, scenario analysis.

1 Introduction

The rejection of motor vehicles with internal combustion engines and the transition to electric vehicles is a pronounced development trend in the last 15-20 years. This trend is relevant both for Russia and for the whole world and as time goes by, it only gets stronger. Optimistic forecasts of growth in the number of electric vehicles around the world are coming true. At the same time, the infrastructure of charging stations is developing. Enterprises are beginning to produce electric vehicles, batteries and other components. Startups are launching service stations and the production of charging stations for electric vehicles. Well-known companies, and completely new companies, start-ups are starting

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production. Operators developing networks of charging stations and service stations in the regions appear. Energy networks adapt to new customers and their consumption patterns. Information networks and cybersecurity technologies in the industry are developing. Processes for the recycling of this type of transport are also being developed.

Experts distinguish several reasons for the emergence and strengthening of this trend.

First, a new world fuel and energy balance is being formed. Automobiles are one of the main consumers of energy. Reducing ICE vehicles around the world will reduce fossil fuel consumption.

Global climate change is the second significant reason. ICE vehicles emit greenhouse gases into the atmosphere. It is car exhausts that account for 23% of all greenhouse gases in the world. Many surveys and studies support this conclusion. The agreement to reduce greenhouse gas emissions and decarbonization in general formed the basis of the Paris Agreement and the policies of many countries regarding the development of road transport [2].

Thirdly, on the horizon of 7-10 years of using a vehicle, an electric car turns out to be more economical in terms of fuel resource costs, repairs and maintenance.

The purpose of this study is to identify key trends and limitations in the development of electric transport and related infrastructure.

The hypothesis is the assumption that Russia recognizes the relevance of the energy and environmental agenda and follows global trends, taking into account certain features.

2 Materials and Methods

The article used both general scientific methods of analysis and synthesis, and special statistical methods. In particular, a common predictive method of extrapolation of trends was used to obtain the results. Trend extrapolation methods are based on statistical observation of the dynamics of a certain indicator, determination of the trend (friction) of its development and the extension of this trend for the future period.

At the same time, economic features of supply and demand were taken into account in the forecast. The trend of demand for a new, not common in the market, product is different from market laws in the market of popular products. At a certain period, a "breaking point" appears in the trend. It is included in the forecast.

The main source of information was statistical data, analytical reports and scientific articles. The calculations were made by the authors.

3 Results

Electric transport has distinctive advantages that lead to the active development of its use in a number of areas. These advantages include - the absence of exhaust gases, which makes it possible to use electric vehicles indoors; reduction of operating costs and simplification of repairs, in comparison with engines on internal combustion engines; absence of noise and vibrations makes it convenient to use in public places. The reduction in operating and repair costs is due to lower fuel resource costs, as well as the fact that the electric vehicle is a simpler design and does not require replacement of belts, spark plugs, oil, and fewer problems with the engine.

Nowadays, in the national economy, electric vehicles are used for:

- personal use as a vehicle for transportation;
- transportation of goods inside workshops and warehouses (electric cars and electric forklifts);
- housing and communal services

- for the needs of municipalities (police, patrol services, etc.)
- cargo electric vehicles for industrial areas;
- transportation of passengers by public transport (electric buses);
- transportation of people indoors (airports, stadiums, shopping centers, amusement parks, excursions).

According to experts, the driver for the introduction of electric cars in Russia, as in other countries, will primarily be urban passenger transport. At first, the development of the market may follow the path of expanding municipal buses, road equipment, as well as taxis and car sharing services. Despite the higher cost of electric buses, their operating costs are lower. And with the cost of batteries falling, the cost of electric buses will almost equal the cost of diesel buses. So commercial carriers will gradually replace their vehicles with electric vehicles. The entry of electric cars into the commercial sector of freight transportation and into the sphere of private personal transport will require subsidies from the state, experts say.

In Moscow, the first electric bus was launched in 2018. Now there are already 700 of them, they operate on 57 routes. In just three years since the delivery of the first vehicles, the capital's electric bus fleet has become the largest in Europe. Today, there are 400 electric buses in London, 150 in Paris, 200 in Berlin, and 211 in Amsterdam. In the Moscow park, the share of electric buses is still about 10 percent of the total Mosgortrans network, but by 2030 the capital intends to completely replace buses with electric buses. Such indicators illustrate the fact that with the state support of individual regions, the increase in the number of electric transport will be faster.

4 Autostatistics of the Russian Federation

Consider the statistics on the Russian car fleet [3]. As of January 1, 2022, the fleet of passenger cars in the Russian Federation amounted to 45.5 million units. The modern Russian car park has a high average age. Thus, the share of cars over 10 years old accounts for 61.5% of the total car park, which in quantitative terms equals 27.99 million copies. The share of new cars (up to 3 years) is 9.3%, which corresponds to 4.25 million units. Domestic brands in the country account for 34.4% of the car park, the undisputed leader among which is LADA. It currently owns 29.7% of the Russian park, i.e. 13.53 million cars of this brand are operated in the country. Other Russian brands account for 4.7% of passenger cars registered with the traffic police of the Russian Federation, which corresponds to 1.91 million cars. The remaining part, more than 65% of the park, is occupied by foreign cars, of which there are 29.84 million units.

Leadership among the foreign brands is held by the Japanese manufacturer Toyota (4.14 million units), whose share increased by 0.1 p.p. and amounted to 9.1% of the entire Russian car park. Following are two Korean brands - Hyundai (2.55 million units) and Kia (2.53 million units).

The largest number of cars in 2021 was registered in the Central Federal District (12.87 million units), which owns 28.3% of the total car park. The second position in the ranking is occupied by the Volga Federal District, which accounts for every fifth car (9.15 million units). The share of cars in 11.5%, registered with the traffic police, is listed in the Siberian Federal District (5.25 million units). Moscow (3.67 million units), Moscow Region (2.79 million units) and Krasnodar Territory (1.96 million units) are leading in the regional car park rating. They are followed by St. Petersburg (1.73 million units) and the Sverdlovsk region (1.39 million units).

5 Statistical analyses of the diffusion of electric vehicles in the regions of the Russian Federation

An analysis of statistical data on the number of electric vehicles in the Russian Federation shows that since 2017, the annual growth has been from 12 to 398%, see Fig. 1.

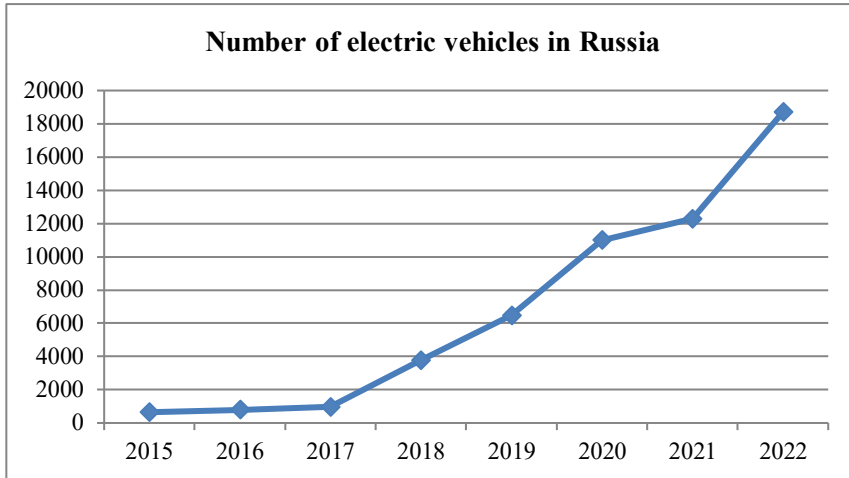


Fig. 1. Number of electric vehicles in Russia 2015-2022.

Let's analyze the distribution of electric vehicles in the regions of the Russian Federation. The leader in the number of electric vehicles is Primorsky Krai. As of mid-2021, 1 572 electric vehicles were registered there. Proximity to Japan effects, from where right-hand drive Nissan Leafs are imported.

In second place is the Irkutsk region with 1381 electric vehicles. On the third — Moscow with 1360 electric vehicles. These three regions account for 35% of all passenger electric vehicles in the country, and 98% of all electric cars are registered in ten regions, Fi

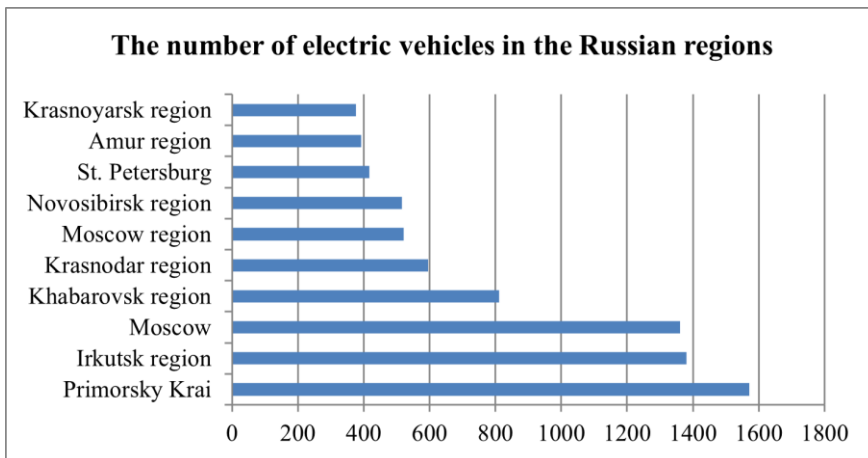


Fig. 2. The number of electric vehicles in the Russian regions, 2021.

Such data indicates an uneven distribution of electric vehicles in the regions. The main factors that influenced this type of diffusion of a new product are the proximity to transport hubs through which this type of vehicle is imported into the country and the high level of income of the population of these regions.

6 State policy of the Russian Federation in the field of development of electric vehicles

In order to increase the share of electric transport in the car park of the Russian Federation, in August 2022, the Concept for the development of the production and use of electric road transport in the Russian Federation for the period up to 2030 (hereinafter referred to as the Concept) was adopted. The Concept takes into account the disproportions in the distribution of electric vehicles in the Russian Federation, the features of the current geopolitical situation and the focus of state policy aimed at developing this industry in the Russian Federation.

The concept is being implemented in 2 stages and it includes the following indicators, Table 1.

Table 1. Target indicators of the Concept.

Stage	Production of electric vehicles	Component base production	Charging network	Incl. "fast" charging stations	Additionally
1st stage 2021 - 2024	at least 25 thousand vehicles	-	at least 9 400 points	at least 2 900 points	-
2nd stage 2025 - 2030	at least 10% of total vehicles produced	- launch of production of cells for traction batteries; - launch of production of cathode and anode materials	at least 72 000 points	at least 28 000 points	- at least 1000 hydrogen charging stations; - creation of an additional at least 39 thousand highly productive jobs

According to the Concept, it is planned to localize the production of electric vehicles, key components and materials, and charging stations for electric vehicles in Russia. The indicated rates of substitution of vehicles with internal combustion engines for electric vehicles are lower than in the leading countries in this area. This is due to a number of barriers (from climatic to technological and infrastructural).

Despite changes in the global geopolitical situation, the development of electric transport and related infrastructure remain relevant.

In 2022, several plants in Russia announced their success projects in this area, for example:

- Avtotor Holding has launched production and will release a pilot series of electric vehicles in the spring of 2022. Serial production is planned to begin in 2023. It is important that Russian-made batteries (ROSATOM) are used in the assembly.

- Motorinvest LLC, with the support of regional authorities, signed a special investment contract for the implementation of a project for the mass production of Chinese electric vehicles at the company's enterprise. Thus, electric vehicles under the Evolute brand will be produced in the Lipetsk region.

- The Sarapul Power Generation Plant began serial production of UMTET electric vehicles. They are intended for the sphere of housing and communal services. The electric car was developed by specialists of the engineering center "IzhSpetsTech" at the Izhevsk State Technical University named after M. T. Kalashnikov. The advantages are called

efficiency (energy consumption is 3 times lower than that of the Nissan Leaf), reliability and maintainability.

At the same time, the state is taking measures to stimulate demand for electric vehicles. In particular, in the summer of 2022, the Ministry of Industry and Trade of the Russian Federation resumed preferential car loans and leasing. An electric car can be bought on credit with an increased discount of 35%, but not more than 925 thousand rubles.

The reduction of liquid fuel transport is one of the most important global challenges. It is important from the point of view of ecology and economy. Many countries of the world are working on the creation of industries and infrastructure for electric vehicles. Modern world geopolitical changes do not change this trend.

7 Restrictions

Despite the growth in the supply of electric vehicles and government support, according to marketing surveys, only 20% of Russians are considering purchasing an electric car.

The following factors were cited as the most significant when making a purchase decision, Table 2.

Table 2. Factors influencing the decision to purchase an electric vehicle.

Factor	The weight, %
Availability of infrastructure	24
car price	20
Electricity price	18
Reliability in winter	15
Charging duration	12
Environmental friendliness	7
Prestige / innovation	3

The lack of developed infrastructure is the first thing that stops potential buyers in the Russian Federation. At the moment, the network of charging stations is developed very poorly and unevenly. At the end of 2021, according to Rosstat, there are 208 charging station in Russia, of which 66 and 48 (54.8% of the total number of charging staition) are located in the Central and Siberian Federal Districts. Moreover, most of the charging staition is located on local roads (51.9%). Thus, the main problem of using an electric car in Russia is the inability to charge the vehicle when traveling long distances. The price of the car and oil energy also play an important role. The ability to charge the car in the parking lot of the residential complex at night at reduced rates is a great deal. But electric charging stations are still located in separate places. Night rates are also not common yet.

The reliability and duration of charging in winter are also of great concern to potential consumers. Many regions of Russia are located in harsh climatic conditions. Energy must be enough not only for movement, but also for heating the car in the cold season or cooling it in the hot season. Average temperatures in winter in most cities range from -10 to -20C, so the problem of maintaining battery charge in winter is an urgent one.

Despite the active dynamics of growth in the number of EVs in Russia [2] in 2015–2021 (growth by 33.2 times), even on the scale of the Russian electric vehicle park, their number remains insufficient to meet demand. So, in Russia in 2021, there were 71 electric vehicles per charging station, while in Germany - 14 electric vehicles. With the relatively rapid expansion of the electric vehicle park, EV infrastructure needs to be developed to support the demand for EVs.

Utilities, according to the average standard, for electricity consumption in case of reaching the target of 1.4 million electric vehicles must put into operation 1.2 GW of installed capacity by 2030. Or 0.5% of the planned installed capacity of the allocated power supply zone of Russia in 2030 - according to a careful classification of electric power facilities until 2035, random allocated capacity from June 9, 2017, by 2030 8 GW.

This requires 1.1 GW to be commissioned each year. Taking into account additional demand from electric transport, this value increases to 1.3 GW. At the same time, if the target in terms of production volume, also set by the concept, is met, the number of electric vehicles in 2030 will be 745.5 thousand, in this case, in order to meet demand from the electric vehicle segment, it will be necessary to increase both electricity generation and installed capacity by 0.2 % to the level of 2021. To do this, it is necessary to add 1.2 GW of installed capacity annually.

8 Stimulating the development of charging infrastructure

The main issue within the framework of the direction of the state policy of the Russian Federation on the development of production and use of electric road transport is the lack of a sufficient number of charging stations for electric vehicles throughout the Russian Federation. The main areas of action on this issue are:

- determination of the list of pilot territories and roads of federal importance for the creation of charging infrastructure for electric vehicles until 2024;
- development of a mechanism for co-financing part of the cost of creating a charging infrastructure;
- phased extension of the requirements for the creation of a charging infrastructure for the use of electric vehicles to the constituent entities of the Russian Federation.

The implementation of this direction of state policy is planned to be carried out in 2021-2030. As part of the direction, it is necessary to ensure the achievement of the following targets by 2024:

1.1 determination of the list of pilot territories and roads of federal importance for the creation of charging infrastructure for electric vehicles until 2024;

1.2 creation within the framework of pilot territories and federal roads of infrastructure for charging electric vehicles using fast charging stations (150 kW, charging time up to 80 percent in 20-30 minutes) - at least 2.9 thousand;

1.3 creation in the pilot areas of an infrastructure for charging electric vehicles using slow charging stations (44 kW, charging time up to 40 percent of 2 hours) - at least 6 thousand;

until 2030:

2.1 creation on the territory of the Russian Federation of an infrastructure for charging electric vehicles using fast charging stations (150 kW, charging time up to 80 percent in 20-30 minutes) - at least 29 thousand;

2.2 creation on the territory of the Russian Federation of an infrastructure for charging electric vehicles using slow charging stations (44 kW, charging time up to 40 percent of 2 hours) - at least 44 thousand.

However, for the implementation of plans for the production of electric vehicles in the Russian Federation, there is already some groundwork. The sector for the development and production of electric vehicles in Russia has already been formed, several projects are being implemented by the companies KAMAZ, GAZ, Volgabas, the concept indicates. 300 electric buses are produced annually in Russia. Serial production of electric vehicles under the Zetta brand has been launched on the basis of Zetta LLC in Togliatti. As previously reported, in the coming years, the company plans to enter the production of 15,000 cars a year. In Kaliningrad, Avtotor Holding plans to launch the assembly of KIA and Hyundai

electric vehicles in 2023. The production of LADA electric vehicles is planned to be launched in 2027-2028 at AvtoVAZ, the concern said.

At the same time, the city authorities are trying to create an infrastructure so that the owners of electric cars have somewhere to recharge. According to the press service of the Department of Transport, the Energy of Moscow project is operating in the city: special parking zones are being created only for electric vehicles. Every year they plan to install up to 200 new charging stations, by 2023 their number will reach 600. The owners of such vehicles can park for free throughout Moscow, even in areas with a higher tariff. And they don't pay road tax. The popularity of electric cars is slowly but still growing. Over the past year, the number of "green" cars registered in Moscow, according to the agency "AUTOSTAT", has increased by 20 percent. Now there are about 700 electric cars in the city.

Although the capital is only at the beginning of the path of transport "electrification", this has already affected the state of the air. In 2018-2020, the replacement of diesel buses with electric buses has reduced pollutant emissions from public transport by 400 tons, primarily nitrogen dioxide. From 2011 to 2020, gross emissions of harmful substances from vehicles decreased by 64 percent. Accordingly, for large cities such as Moscow, St. Petersburg, Novosibirsk, Yekaterinburg, Kazan, Nizhny Novgorod, etc., an increase in the share of electric transport will lead to a significant reduction in harmful emissions and gas pollution.

To understand the trends in the development of electric transport, consider three scenarios for the spread of electric vehicles in the world:

1.1 business-as-usual - 10.2 million electric vehicles in 2025 and 19.5 million electric vehicles in 2030 (7.3 and 12.5 percent of the total car market, respectively);

1.2 balanced scenario - 14 million electric vehicles in 2025 and 25 million electric vehicles in 2030 (respectively 10 and 16 percent of the total market);

1.3 accelerated development scenario - 45 million units in 2030 (30 percent of the total market).

The Russian market shows a significant gap. According to the traffic police and autostat in Russia in 2022, there are 64 million trucks and cars, in 2022, according to the analytical agency Autostat, the share of electric vehicles was 2.9%. The forecast for the consumption of electric vehicles in the Russian Federation is also considered in 3 scenarios:

2.1 inertial scenario - a complete lack of incentives for the development of transport and infrastructure. In this case, in 2030 the Russian Federation will produce about 100 thousand electric vehicles and the total number of electric vehicles will not exceed 540 thousand units. The share of electric vehicles will be 5 percent of the total car market;

2.2 balanced scenario - a scenario in which in 2030 the share of electric vehicles in the Russian Federation will be 15 percent of the total volume of the motor vehicle market, in 2030 the Russian Federation will produce about 220 thousand electric vehicles and the total number of electric vehicles will exceed 1400 thousand units. This scenario is based on the fact that support for infrastructure development and demand is maximized in the first 3 years of the project;

2.3 accelerated development scenario - proactive infrastructure support, demand stimulation and restriction on the use of motor vehicles with an internal combustion engine (the countries of Western Europe, the USA and China are moving according to this scenario). This approach allows reaching 30 percent of the market by 2030 and the total fleet of electric vehicles will amount to 3.23 million electric vehicles.

To predict the distribution of electric vehicles in the Russian Federation, linear regression was used, using which the graphs in Fig. 3.

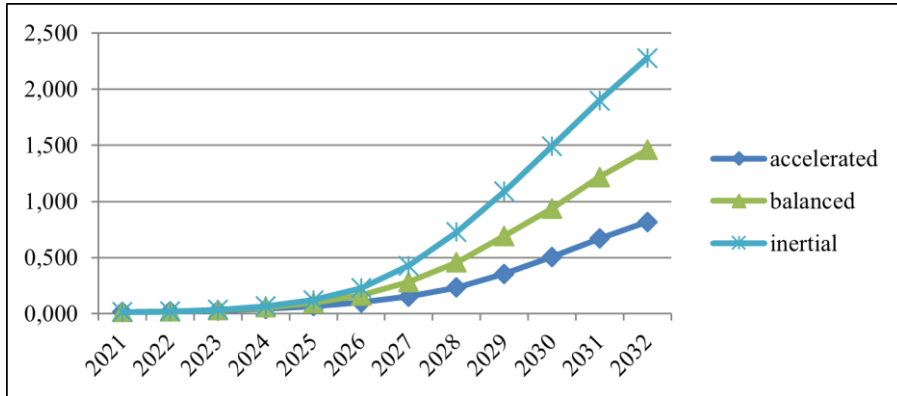


Fig. 3. Forecast the distribution of electric vehicles in the Russian Federation, 2021-2032.

In further study, it is proposed to use a balanced scenario as the main development scenario. The use of linear regression allowed us to obtain the following results. The R-square value describes the degree of accuracy of the description by the process model, respectively, the value of 0.967 indicates a high approximation accuracy, Tab, 3.

Table 3. Regression statisticsa.

Regression statisticsa	
Multiple R	0.983
R-square	0.967
Normalized R-square	0.963
standard error	0.584
Observations	10.000

The analysis of variance table evaluates the overall quality of the resulting model: its reliability in terms of the significance level of the Fisher test - p, which should be less than 0.05 (row Regression, column Significance F). In our case, the value is much smaller, which indicates the quality of the model, Tab, 4.

Table 4. Analysis of variance.

	Df	SS	MS	F	Significance F
Regression	1	79.773	79.773	234.0245	3.3083E-07
Remainder	8	2.726996	0.340875		
Total	9	82.5			

Next, consider the distribution of filling stations by regions of the Russian Federation. To smooth out the disproportion, it is proposed to introduce coefficients:

K1-Kn - the share of electric vehicles in the total amount of transport;

J1-Jn - standard of living of the population

G1-Gn - state support for the development of filling infrastructure for electric vehicles

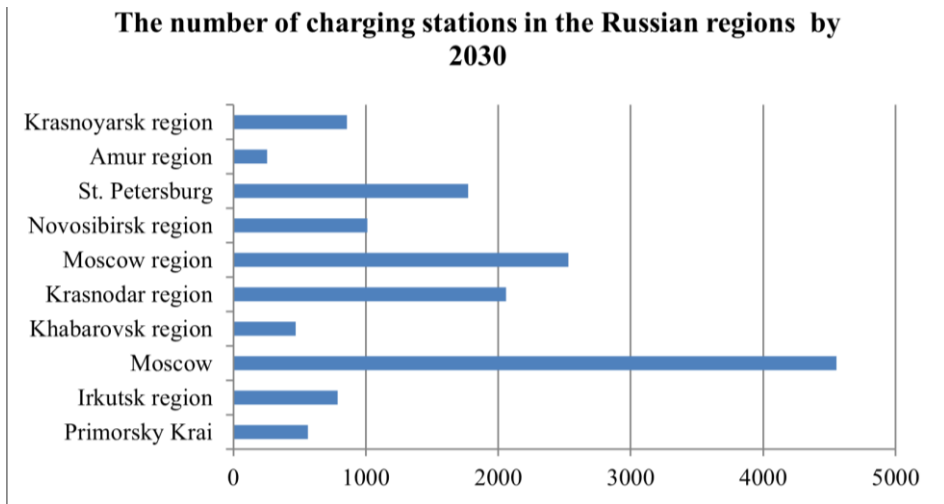
$Y_n = F(X_n; K_n; J_n; G_n)$

For calculation, we take the forecast of the number of chargin stations presented in Table 5.

Table 5. Forecast of the number of charging stations.

year		2022	2023	2024	2025	2026	2027	2028	2029	2030
Charging infrastructure	slow charging stations	1178	2163	3206	4284	5031	5856	6703	7620	8573
	fast charging stations	528	970	1473	2856	3354	3904	4469	5080	5715
	Total	1706	3133	4679	7140	8385	9760	11172	12700	14288

Based on the results of expert assessments, the values of the indicators K, J were collected and the values for the indicator G were formulated. The final forecast of the need for charging stations by region is shown in Figure 4.

**Fig. 4.** Forecast of distribution of charging stations by regions of Russia in 2030.

As shown in the figure, the number of filling stations will be numerous in large logistics hub regions with a population of more than 2 million people. This forecast provides a basis for the development of business in the field of filling stations and maintenance of electric vehicles in these regions in the first place. And the tasks of state policy are to subsidize regions in which the use of electric transport requires state support.

9 Discussion

China is the world leader in the introduction and use of electric vehicles. Since 2009, China has begun to purposefully stimulate the production of electric vehicles and the demand for them. In order to maintain the high-quality development of the Chinese auto industry, the country approved the “Development Plan for the New Energy Vehicle (NEV) Industry for 2021-2035.” By 2035, 60% of cars sold should be electric and plug-in hybrids.

The European Commission in July 2021 published a proposal to switch to electric vehicles by 2035 [4] This proposal is part of the European Green Deal. The EU will reduce greenhouse gas emissions by 55% by 2030. By 2035, new cars must be completely CO₂-free. At the same time, networks of electric charging stations will develop. Public and

private investments will be directed to these purposes. From 2035 onwards, we expect that 100 % of new cars sold in Europe to be electric [5].

US policy is also aimed at reducing internal combustion engine vehicles and replacing them with electric vehicles, hybrid vehicles and hydrogen-powered vehicles. The United States plans to increase the share of electric vehicles in the total volume of new cars sold to 50% by 2030 [6]. And in some states, for example, in California, as well as in the EU, to ban the sale of new cars powered by internal combustion engines by 2035. Statistics show a slower transition to cars without emissions in the US from China and the EU. The government intends to support new production of electric vehicles in the United States. Also, it is supposed to allow the purchase of electric vehicles for municipal needs. Funds will also be allocated for the development of a network of charging stations. Today, charging stations are concentrated in large metropolitan areas. California leads in the number of electric charging stations.

In general, more than 20 states (including India, Japan, South Korea, etc.) have adopted or are preparing to adopt restrictive measures regarding the production and sales of vehicles with internal combustion engines. Norway plans the fastest results. 100% of passenger cars must be electric as early as 2025. Most countries plan to completely phase out passenger cars with internal combustion engines from the market in 2030–2040. Yet, the amount of public charging infrastructure that has been announced might be insufficient to power the size of the EV market being targeted [5].

In Russia, electric transport is slowly entering the car market. The active development of electric transport in the world was the result of the actualization of the climate agenda, in particular, the policy to reduce greenhouse gas emissions into the atmosphere. According to the IEA, from 2010 to 2019, CO₂ emissions from road transport increased by 15.8%, and its share in total emissions in 2019 was 16.8% (+0.7 percentage points compared to 2010). The territory of Russia is large-scale, the concentration of population and cities on it is much lower than, for example, in Europe and China. The Russian authorities recognize the importance of the environmental agenda and are taking stimulus measures. Residents do not consider the environmental situation critical, so this factor is not a key factor when choosing a personal vehicle.

At the same time, the size of the territory and climatic features form the main risks of owning an electric car. A large area requires a high power reserve from a charged battery, as well as a developed infrastructure of charging stations, which is difficult and expensive to create quickly on a large area. In the conditions of the Siberian winter, energy should be enough not only for movement, but also for heating. It is also known that in cold climates, battery range may be reduced. The two main advantages of an electric car - cost-effectiveness compared to traditional vehicles and the absence of direct greenhouse gas emissions - are leveled in Russian conditions by its high price, as well as the risks associated with the lack of refueling infrastructure. But the government stimulates demand with preferential conditions for buyers and support for producers. That allows you to meet the key global trends, but with some delay.

10 Conclusions

Global trends demonstrate the active spread of electric vehicles. More than 20 leading countries of the world plan to move away from liquid fuel cars as much as possible by 2030-2040.

Russia is also on the world agenda on this issue. Measures are being introduced to support manufacturers of electric vehicles, their components and infrastructure elements. But for a number of objective reasons, the transition to electric vehicles here is slower than in the European Union, China, Japan, South Korea and a number of other countries. Such

factors include, for example, the size of the territory, the relatively low density of large cities and population, as well as harsh climatic conditions.

Nevertheless, extrapolation of trends and scenario analysis allow us to conclude that even under a pessimistic (inertial) development scenario, by 2030 the spread of electric vehicles in the country will reach a turning point. The share of electric vehicles will be 5% of the total, after which more intensive growth will follow. According to the optimistic (accelerated) scenario, the share of electric vehicles will reach 30% in the same time frame. This is much less ambitious than planned in the US, China and the EU, but significant against the global background. The Balanced Scenario is the basis of the Transport Development Concept of the Russian Federation. It assumes an increase in the share of electric vehicles to 10% by 2030.

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