The impact of a growing fleet of electric vehicles on energy markets - challenges and opportunities for the oil industry

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Abstract. The article examines how the development of electric vehicles and the tightening of environmental regulations affect oil companies. It analyses how these companies diversify their business. It is shown that Russia may lose a significant share of the supply of oil and petroleum products in the implementation of the scenario of electric mobilization in the world. Measures to respond to this to minimize the negative consequences for economy are proposed.

1 Introduction

The mass adoption of electric vehicles (EVs) will lead to a transition from traditional fuels for cars, such as gasoline and diesel fuel, to electric energy.

While EVs pose a potential threat to the oil industry, many global oil companies recognize the need to adapt to market evolution and seek to innovate to support the growth of the EV industry. They recognize the importance of reducing carbon emissions and developing sustainable energy. The article will look at what exactly oil companies are doing to diversify their business.

It will also be shown that due to electromobilization, Russian oil companies may lose up to a third of oil export potential by 2050, which can lead to a significant drop in revenues, on which the country's budget directly depends [1]. Therefore, it is necessary to start adapting to these threats now. It is important to assess how much it can cost to adapt one or another method of business diversification and how suitable foreign experience is for Russia.

2 Global experience in diversification of oil companies' business

2.1 Biofuels

Oil firms increasingly invest in biofuels to address renewable energy demand, reduce emissions, and create jobs. Biofuels, from plants and waste, cut emissions up to 80%. They can integrate into refineries with key steps like hydrotreating, aiding bio-based feedstock

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refinement [2]. The $116 billion biofuel market in 2022 could hit $200 billion by 2030. Major producers are USA (38%), Brazil (21%), and Indonesia (9%). Shell, BP, TotalEnergies, ExxonMobil invest heavily in biofuels, planning over $30 billion investment by 2030. The most common type of biofuel produced by oil companies is ethanol, which is made from corn or sugarcane. Other types of biofuels produced by oil companies include biodiesel, which is made from vegetable oils, and biojet fuel, which is made from sustainable aviation fuel. Oil companies are also investing in the development of new biofuels, such as those made from algae or waste. Projects include Shell's 0.82-million-ton per year plant, BP's 0.1 million barrel/day biorefinery, TotalEnergies' new waste-based tech, and ExxonMobil's stake in Norwegian biofuels producer. Biofuels help emissions goals, but challenges remain in feedstock, efficiency, and regulation. The industry's commitment could transform transport and emissions.

2.2 Hydrogen

Hydrogen is a clean fuel with global energy transition potential. It is abundant, but requires extraction from compounds like water or natural gas. Methods include steam methane reforming (SMR) and electrolysis, with SMR cheaper but emitting CO_2, while electrolysis, pricier, emits none with renewable power. Oil companies, leveraging expertise and infrastructure, can bolster hydrogen production, aligning with climate goals and securing competitive advantage. Yet, their investments remain modest compared to the $200 billion in 2023 greenfield CAPEX. Hydrogen could aid climate goals but faces uncertainty in broad market application, finding use in sectors like aviation and manufacturing. Its role in combating climate change is uncertain, despite industry hopes [3].

2.3 Charging infrastructure

Oil firms convert fuel stations into EV charging points, tapping existing customers and expanding into electric mobility. Diversifying aligns with emission reduction and energy transition. Their entry isn't just adapting but strategically securing relevance amidst evolving landscape, leveraging infrastructure expertise. Their investments in fast charging network growth, aiding EV adoption. Shell aims for more than 500 thousand EV points, collaborating with automakers and technology firm ABB for high-speed chargers [4]. The Shell Recharge app offers 275 thousand outlets across 35 countries. TotalEnergies targets 150 thousand points by 2025, extending beyond oil with acquisitions like Blue Charge. Oil companies embrace EV charging for cleaner future and business growth, highlighting energy sector's transformation capacity.

2.4 Renewable energy

Oil firms invest heavily in renewables like solar and wind, reducing environmental impact and ensuring long-term viability. This diversification hedges against fossil fuel market volatility, granting new revenue sources. Their expertise in large projects and supply chains transfers to renewables. TotalEnergies, Shell, and BP plan over 10 times renewable growth by 2030 [5]. Shell ventures globally in solar, wind, and biofuels, including offshore wind. BP aims for 50 GW renewable capacity, partnering with Equinor and expanding solar via BP's subsidiary, Lightsource BP. TotalEnergies targets 100 GW capacity, with solar and wind projects globally. This shift signals adaptability to market and societal changes, securing relevance and contributing to a sustainable energy future.

3 Development of economic policy measures to effectively respond and align the Russian economy with shifting demand for oil and its derivatives, as a consequence of the growing EV penetration

3.1. The impact of electromobilization on the Russian oil industry

Companies like BP, ExxonMobil and TotalEnergies are multinational corporations that produce oil worldwide. Russian companies are also represented in the world, but in a much more modest way, mainly operating in the domestic market. Russian oil industry is a backbone of whole economy, so any threats to it should be taken much more seriously.

In 2021, according to the Central Bank of the Russian Federation, Russia exported 231.6 million tons of crude oil worth $111 billion (22% of total exports) and 144.5 million tons of oil products worth $70 billion (14% of total exports). Together, oil and oil products accounted for 36% of all exports.

Russia's top energy partners in 2021 were China and the EU, they accounted for almost 80% of crude oil exports and about 60% of petroleum product exports, with China importing more crude oil and the EU importing both. It is in these two markets electromobilization is now most active.

It should be noted, that the second factor, which in the short and medium term even exceeds the impact of EVs, are sanctions, both direct restrictions on supplies and indirect ones (for example, a ban on insurance of ships). At the same time, despite EU sanctions, part of Russian oil products still enters the EU through third countries. Even after the start of the conflict in Ukraine and the imposition of sanctions by, including European countries, flows towards Europe decreased, but did not stop. And according to estimates for 2022, they remained at the level of 114 million tons and decreased by only 17%. Such a small drop is due to the fact that the embargo on Russian oil came into force only at the end of the year and we will see its main impact in 2023 and subsequent years. In the future, this reduction will continue, but it will not disappear through intermediaries or in other ways, which we can already observe from the first results of 2022 [6].

The implementation of forecasts for electric mobilization in the world (especially in Europe and China (read more in [1]) will lead to a significant drop in demand for petroleum products, and, accordingly, for crude oil, which will inevitably entail structural changes in the fuel and energy complex of Russia. In total, the difference between the two proposed scenarios (base and potential shortage of batteries) will be almost 600 million tons, which is comparable to the current level of oil production in Russia (fig. 1.). Most of the future oil consumption will be concentrated in other countries, most of which are neutral towards Russia. This opens a window of opportunity for a longer and smoother transition from a resource-based economy to a high-tech one, but should not be taken as a panacea or a signal for inaction.

3.2 Suggested approaches to address the potential decline in fuel demand

The implementation of forecasts for electric mobilization in the world (especially in Europe and China) will lead to a significant drop in demand for petroleum products, and, accordingly, for crude oil, which will inevitably entail structural changes in the fuel and energy complex of Russia. If our base scenario is implemented and the government has not taken steps to change policy, Russian export deliveries may decrease relative to the level of 2021 by 8% by 2030, by 19% by 2040 and by 28% by 2050 [1]. In absolute terms, this is a drop of 16, 38 and 56 billion US dollars in 2030, 2040 and 2050 for the prices and conditions of 2020,

respectively. It can also be assumed that the fall in oil demand will have a negative impact on oil price levels on average over the period relative to the previous 20-30 years. And on average, in terms of revenue and income, the decline could be more significant.

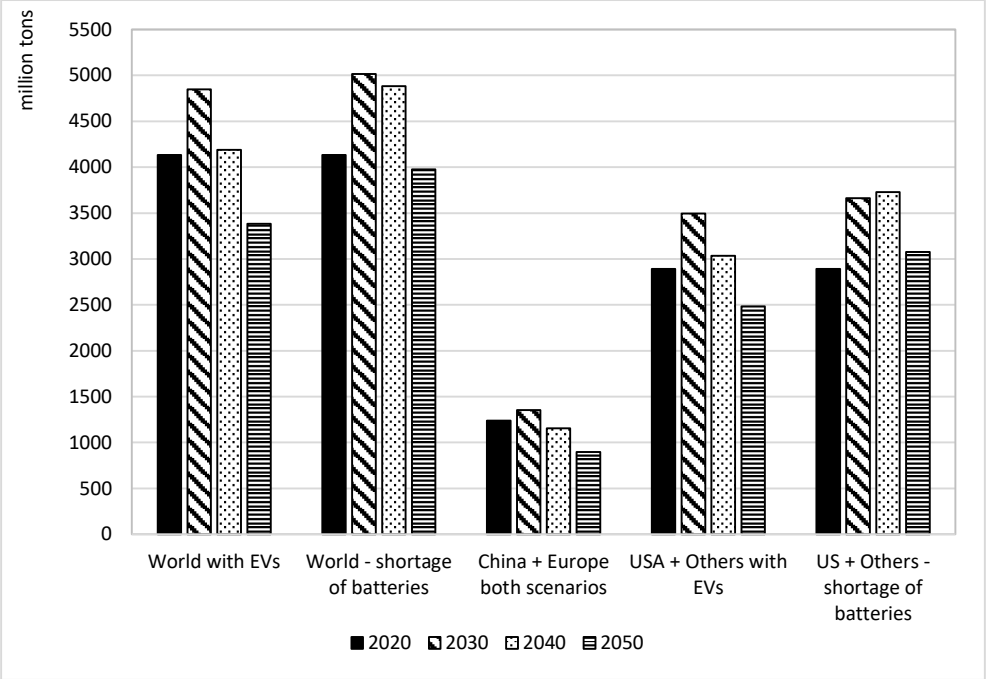

Fig. 1. Forecast of oil consumption by regions until 2050, million tons.
Source: Author's calculations based on IEA and EIA historical data.

Revenues from the export of hydrocarbons provide more than 40% of the income of the federal budget of the Russian Federation and are a source not only for financing the implementation of the current tasks of the state, but also for the formation of reserves. To prevent or mitigate the effects of these potential revenue losses in the future, it is necessary to already begin to take measures that may require restructuring the oil industry in order to make it more flexible and adaptive [7-9]. Options for diversifying and modernizing the Russian oil industry are proposed below in figure 2.

Fig. 2. Scheme of diversification and modernization of the Russian oil industry.

In order to diversify and modernize the Russian oil industry, several promising areas are proposed. First, the main thing to do is to diversify exports to countries with growing or continuing demand for crude oil and gasoline/diesel, which will help reduce the risks of falling demand in current key markets. To do this, it is necessary to diversify export supplies in transport and logistics areas (for example, prepare for scenarios of limiting the use of the Baltic Sea, or passage through the Bosphorus). Also, avoid excessive concentration in individual country markets (for example, supplies of crude oil and oil products to China, India and Turkey in 2022). It is also necessary to diversify the range of products, which will take into account the specifics of new markets.

Secondly, some of the current refining capacities in Russia have the potential to be modernized and switched to the production of petrochemicals. By introducing new technologies and updating production lines, Russian refineries can improve their flexibility and adapt to the growing demand for petrochemicals [10]. Switching to petrochemicals can also have a positive environmental impact, as the production of chemicals and materials can be more energy efficient and have a lower carbon footprint.

The production of petrochemicals has a wide range of applications in various industries, such as the plastics industry, the production of fertilizers, pharmaceuticals, synthetic fibers and other consumer goods [11].

However, switching to petrochemicals requires significant investments (tens of billions of US dollars [12]) in research and development, technological innovation, and the development of petrochemical infrastructure. In this context, it is important to develop supportive policies and measures aimed at attracting investment and stimulating cooperation with international partners.

Thirdly, development of a network of electric charging stations is another area that can help diversify the business of oil companies. They can use their distributed network of gas stations to build a fast-charging infrastructure for electric vehicles [13].

To accelerate diversification processes, the government can develop and implement support and training programs for oil industry workers to help them retrain and adapt to changes in the market situation. This may include support for the acquisition of new skills and knowledge, the creation of jobs in other sectors of the economy, and the provision of financial benefits during periods of transition.

4 Conclusions

The adoption of electric vehicles forces global oil companies to diversify their business to align with market changes and sustainability goals. They invest in biofuels, hydrogen and EV charging infrastructure. Furthermore, they heavily invest in renewables like solar and wind.

Shift towards EVs poses a particular challenge to the Russian oil sector, as it heavily relies on oil exports for revenue. Russian oil companies face the risk of losing a significant portion of their oil export potential by 2050 due to electromobilization and sanctions. In 2021, 36% of all Russian exports were crude oil and oil products.

In China and the EU EVs grow faster than world average. Currently those two markets are most crucial for Russia. These factors show that it is necessary to start structural changes in Russia's fuel and energy complex now. Otherwise, this could lead to significant revenue losses, affecting the federal budget and the country's overall financial stability. To address these challenges, Russian oil companies must consider diversification and modernization strategies. These include diversifying exports to countries with growing demand, shifting refining capacity towards petrochemicals, and participating in the development of electric charging infrastructure. By adopting these approaches, the Russian oil industry may mitigate the potential decline in fuel demand, reduce risks in key markets, and ensure its relevance and economic stability in a changing energy landscape.

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