The 6th International Conference on Economic Management and Green Development (ICEMGD 2022)
DOI: 10.54254/2754-1169/3/2022814

The Influence of Several Factors on the Sales of New Energy Vehicles in China and the United States During the Covid-19

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Abstract: Covid-19 has hit various industries around over the world, including the automotive industry in different countries. The high unemployment rate and declining consumer spending due to travel restrictions such as stay-at-home orders related to the epidemic have led to a plunge in auto sale the United States, China and rest of the countries over the past two years. Under this circumstance, governments have increased subsidies for new energy vehicles as a grip to boost the economies, which means the global automotive sales remains a relatively high grow rate during the epidemic. Therefore, new energy vehicle policies as well as sales in different countries, especially in the United States and China, continue to maintain a stimulating pace. To better understand the future sales trends of new energy vehicles, and promote the transformation and upgrading of the automotive industry, the aim of the present study is to investigate the impact of policy, marketing, and supply chain on the sales of new energy vehicles, and to discuss the challenges, opportunities faced by the new energy vehicle industry in China and the United States. After collecting and integrating information from various sources, the data indicate that although the epidemic has had a significant impact on different industries, new energy vehicle industry will continue to benefit fully in the medium to long term in the industry chain of the times. The automotive industry in China and the United States is gradually recovering, but China's pace of progress may be relatively faster.

Keywords: Covid-19, China, the United States, New Energy Vehicles, Automotive Industry, Marketing, Policy, Supply Chain, Sustainable Economy.

1. Introduction

The global pandemic of the Covid-19 is prompting accelerated changes in the global automotive sector. Automobile sales have plummeted in the United States, Europe, East Asia, and worldwide in the last two years due to a high unemployment rate and decreased consumer spending induced by travel limitations such as stay-at-home orders connected to the outbreak. But on the other hand, the latest data shows that from the information collected since 2021, the sales of new energy vehicles in Europe, the United States and the mainland China have continued a relatively high growth pace year on year, and the worldwide automotive electrification trend is improving. Because of the strict carbon emission standard constraints, the EU countries are more aggressive in their new energy vehicle

DOI: 10.54254/2754-1169/3/2022814

development plans, while the Asia-Pacific region is relatively conservative. Overall, China and Europe are the world's new energy vehicle powerhouses, while the U.S. new energy vehicle development process is relatively late but has great potential for the future.

With the social isolation policies are being gradually relaxed in many countries, the global automotive industry's sales will back to normal, but the speed of recovery may differ significantly from region to region. In addition, if the epidemic continues in the future, the risk of another down ward spiral in the global automotive industry cannot be ruled out. Under the covid-19 epidemic, as a means of encouraging economic development, governments have increased subsidies for new energy vehicles as a grip to promote the progress of society as a whole. In terms of new energy vehicle development, many countries around the world have taken a position of encouragement: they have not only introduced various supportive policies one after another, but also vigorously forcefully pushed for the technological advancements and the marketing of alternative fuel cars. As a result, even under the influence of the epidemic, several countries' new energy vehicle policies have maintained a positive and stimulating pace.

Generally speaking, although the automotive industry around the world has gradually slowed down in the past few years, the new fashion trend of booming new energy vehicles is evolving into more and more prominent. In recent years, not only have policymakers have expanded their reinforcement for innovative energy vehicles, but the international significance auto giants have also substantially enlarged their investment and R&D efforts in new energy vehicles. At this moment, under the compulsion of the Covid-19, new energy vehicles are reaching a tipping point of development and may become one of the primary battle grounds in the global context rivalry landscape of the countries and automobile manufacturers all over the world in the future.

Developing new energy vehicles is a significant strategic in advanced industry that promotes sustainable economic development by saving energy and reducing emissions while also promoting the upgrading along with restructuring of the automotive industry. In order to better support the subsequent development and promote the healthy growth of new energy vehicle industry, this paper has made research on the overall situation and the possible future trend of new energy automotive industry under the epidemic by taking the advantages of the sales of new-energy vehicle in China and in the United States.

A variety of factors influence the purchase rate of the new energy vehicles. We examine how three elements (policy, supply chain, and marketing) have influenced new energy vehicle sales and draw conclusions about emerging trends and consequences for EV development. The outbreak of COVID-19 has resulted in several negative consequences, including travel restrictions and a scarcity of vital supplies, all of which have a severe impact on the electric vehicle industry. However, the new energy vehicles in China and the United States are now at the start of a new upward cycle, and the epidemic is only a temporary setback that will not disrupt the cycle's operation, and this type of automotive industry will continue to benefit fully in the medium to long term in the current industry chain.

This paper will:

(I) Analyze the impact of policy, marketing, and supply chain on the sales of new energy vehicles respectively;

(II)Discuss the challenges, opportunities faced by the new energy vehicle industry in China and the United States.

2. Analysis

2.1. Policy

As society pays greater attention to the economy's long-term growth, new energy vehicles, as a growing industry of energy conservation and pollution reduction, have garnered a lot of attention.

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Energy electrification is being looked at globally as a solution to reduce greenhouse gases, about 20% of which are transportation-related [1]. In our research object, China is a country where policy, as a visible hand, plays an important role, China has achieved remarkable results in air pollution control through policy [2].

In terms of new energy development and promotion, the United States is ahead of China. In the United States, the government is responsible for providing the essential legal and social foundation for a free market economy. The government acts as referee [3]. One of the primary sources of air pollution is traffic. The Chinese government has devised a variety of rules and methods to stimulate the expansion of the new energy vehicle sector in order to reduce exhaust emissions and urban smog. From January 2017 through June 2020, the Chinese government provided incentive schemes directly related to new energy vehicles. This paper will discuss the purchase subsidies, traffic control and taxation of new energy vehicles from three dimensions. The first and most controversial is the purchase subsidy. The subsidy is based on the battery energy of new energy vehicles. In 2017, the subsidy of 1,500 YUAN per kWh for electric vehicles below 30KWh, 1,200 yuan per kWh for electric vehicles between 30 and 50KWh, and 1,000 yuan per kWh for electric vehicles above 50KWh will decrease as the battery energy consumption increases. The subsidy ceiling is 150, 000 yuan. In 2018, with the popularity of new energy vehicles, the battery subsidy of each grade is decreasing. The subsidy of 850 yuan /kWh for less than 30kWh, 750 yuan /kWh for 30-50kwh, and 650 yuan /kWh for more than 50kWh. The maximum subsidy is 100,000 RMB. In 2019, subsidies will apply only to electric trucks and plug-in hybrids. Pure electric truck can get 350 yuan /kWh, plug-in truck can get 500 yuan /kWh. Compared with the subsidy changes in 2019 and 2018, the new policy in 2020 continues to raise the requirements on the technical index of battery life, and the subsidy amount also falls back again, with the overall reduction of 10% (pure electric) and 15% (plug-in hybrid). As seen in the graph below, pure electric vehicles have a higher market share than plug-in hybrid electric vehicles, which is due to the fact that subsidies for pure electric vehicles are higher than for plug-in hybrid electric vehicles with the same type of battery.

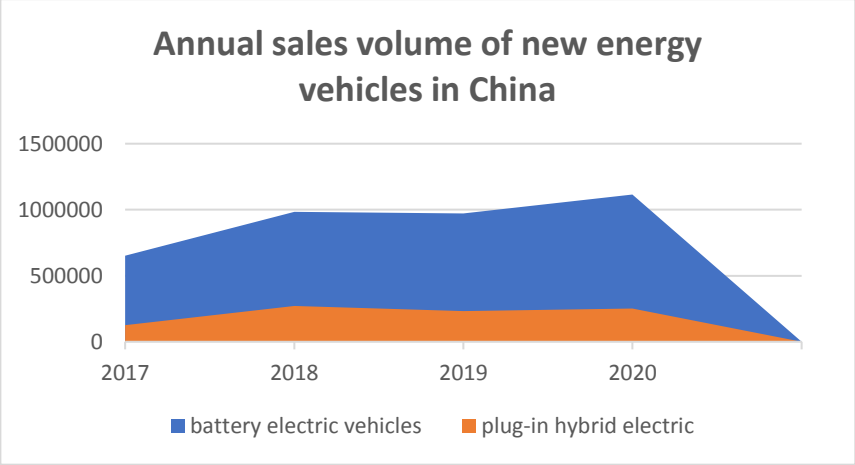

Figure 1: Annual Sales Volume of New Energy Vehicles in China [4].

Focusing on The United States, California began to implement The Zero Emission Vehicle Program in 1990 in terms of promoting new energy vehicles, which includes ZEV Regulation and a series of policies and incentive measures (see figure 1). The plan aims for more than 10 percent of new car sales in California to be new-energy vehicles by 2025 and all new car sales by 2050. The plan aims to reduce emissions and in effect sets a target for sales of new energy vehicles [5].

In terms of taxation, The United States launched The Freedom CAR and Vehicle Technologies project as early as 2001. Both China and the US have tax relief policies for new energy vehicles The

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FCVT program focuses on hydrogen fuel cell technology and PHEV technology, including tax breaks for consumers buying hybrid vehicles and financial support for automakers. Article 30D of the Energy Improvement and Extension Act of 2008 expressly creates a unique tax benefit for New Qualified Plug-in Electric Drive motor vehicles. This provision has been amended by The American Recovery and Reinvestment Act of 2009 and The American Taxpayer Relief Act of 2013. Under the bill, taxpayers will receive tax rebates for eligible plug-in hybrids and all-electric vehicles purchased after December 31, 2009. The following is the particular procedure for calculating the refund amount: Starting with a 5kwh vehicle power battery capacity, the equivalent fee is $2,500; for parts bigger than 5kwh, the amount is $417 / KWH, with a maximum of $7,500.The Renewable Energy Growth Act (GREEN Act), a draft of new tax subsidy regulations proposed in 2019, proposes to relax the total sales limit of subsidies and for the first time to subsidize used EVs and PHEVs. Encourage the electrification of heavy vehicles weighing up to 14,000 pounds. Subsidies will be provided for charging pile infrastructure construction and operation loans and tax deduction for employees. New energy cars exempt from vehicle purchase tax in China includes vehicles that are all electric, plug-in hybrid electric vehicles (including those with longer ranges, or so called extended-ranges), and fuel cell vehicles, to increase the scope of the tax exemption. The Energy Conservation and New Energy Vehicle Industry Development Plan (2012-2020) and its supporting measures released in June 2012 have helped China maintain its position as the largest market for new energy vehicles according to national statistics for many consecutive years. On November 2, 2020, the State Council issued and announced the Development Plan for The New Energy Vehicle Industry (2021-2035), clarifying the development plan and goals for the next 15 years.

Planning points include:

1. By 2025, new pure electric passenger vehicles will have an average power usage of 12.0 KWH/100km, the sales volume of new energy vehicles will be approximately 20% of total new vehicle volume of sales, and fully autonomous vehicles will be sold in limited regions and certain settings.

2. Electric vehicles (pure) will be responsible for the bulk of new vehicle sales by 2035, while vehicles used by the government will be fully electrified, meanwhile the fuel cell vehicles will be commercialized, made marketable, and highly autonomous vehicles will be widely used, adequately promoting conservation of energy and reduction of emissions while elaborating as well as improving social operation productivity.

3. Identify the three development trends of electrification, intelligence and Internet connection.

4. The whole automotive technology innovation chain is organized around three verticals: pure electric automobiles, pure electric cars, plug-in hybrid electric cars (with extended range), and pure electric cars.

5. Build the technology supply system of important parts using the "three horizontals" of power battery and management system, which can drive motor and power electronics, network connection, and intelligent technology.

6. Encourage the development of new energy vehicles in collaboration with the information, industries of transportation, energy, and communication.

7. Infrastructure like as power charging and replacement networks, smart road networks, and hydrogen fuel delivery systems should be improved.

8. Relax market access and improve the method of simultaneous management of enterprise average fuel consumption and acknowledgements for new energy vehicles.

The above two policies are to promote the sales of new energy vehicles. Traffic restrictions have been imposed around the world due to COVID-19 a global disaster that broke out in late 2019. Traffic control has negatively hit the market of new energy vehicles.

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2.2. Supply Chain

2.2.1. The Supply Chain Structure of Electric Vehicles

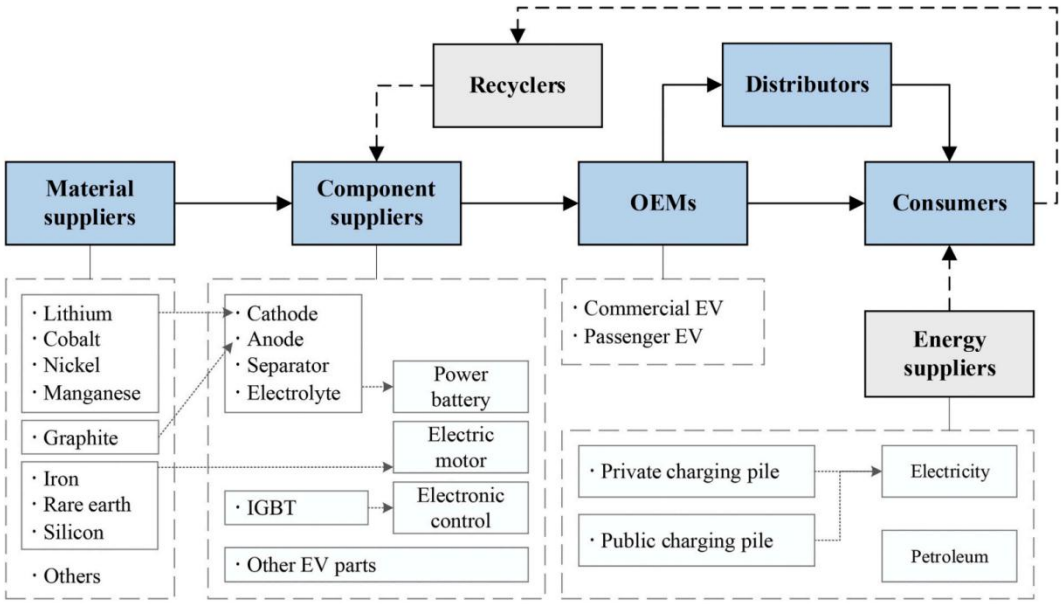

Figure 2: EV Supply Chain Structure with Key Players.[6]

Figure 2 shows that the supply chain of electric vehicles is very complex, including many parts and each part has interactions with others. Among all the components, there are three key components of EVs, respectively power battery, electric motor and electric control. As a result, the suppliers of these three parts and their raw materials play important roles in the supply chain of new-energy vehicle.

The structure of the electric car supply chain is similar to that of conventional vehicles. However, unlike traditional cars, electric vehicles compete on batteries rather than engines and transmissions. The amount of energy stored in the battery influences the range of electric cars and is regarded as the primary limiting factor in the sales of new energy vehicles. As a result, this article examines the supply chain of new energy vehicles beginning with battery manufacture.

The battery supply chain is very complex, consisting of a variety of key minerals, materials, and components, many of which come from relatively new companies in the automotive industry. First of all, from the perspective of raw materials, lithium, cobalt, nickel, graphite and manganese ore are the five critical mineral resources for the production of lithium-ion batteries.

2.2.2. Location of Suppliers

Because China is world leader in the production and construction of automobile vehicle parts, the majority of traditional vehicle components may be sourced locally. Moreover, from the perspective of the automotive industry chain, R&D, manufacturing, procurement and sales are all capital-intensive, thus, the cost pressure of the automotive industry has accelerated the process of international transfer of the industry.

When it comes to the production of electric batteries, China is one of the world leaders in lithium-ion battery production. For example, the figure in 2019 shows that there were 71 GWh power batteries manufactured in 2019 in China, accounting for 55.47 percent of the worldwide market. As a result,

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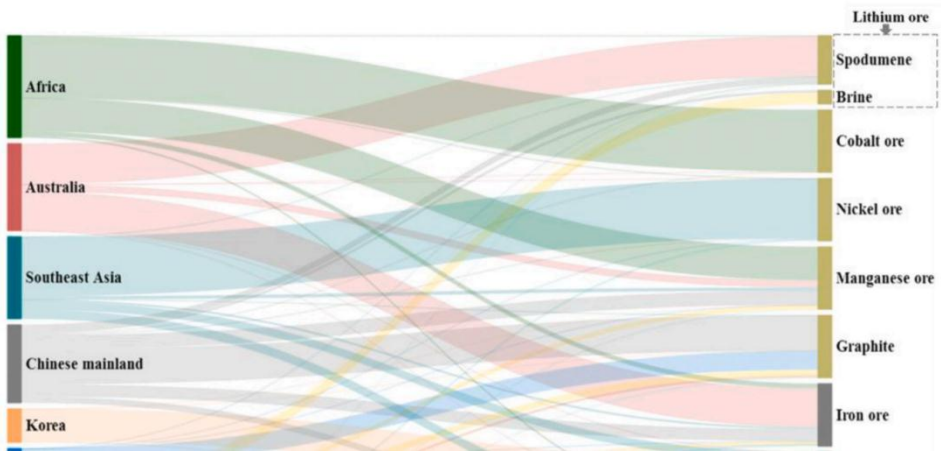

Figure 3: Supply Structure of Key Materials and Parts for EV Production in China. [6]

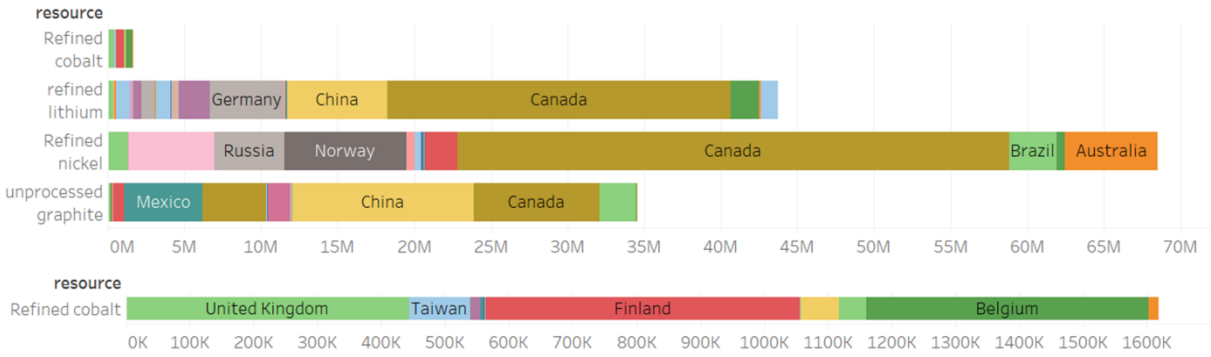

Figure 4: Suppliers of Key Materials EV Production in the U.S.

domestic enterprises in China such as CATL are able to provide China's electric batteries [7]. Although China has took an important part in the manufacture process of batteries, several important resources like raw materials for power battery manufacture were largely reliant on imports (see figure 3), thus causing risk on the supply chain [7].

Unprocessed and processed products are exported either from Chile into South Korea and Japan or exported from Australia to China for processing, refinement, and battery manufacturing. China controls most of the global processing for lithium that is used in LIBs. China heavily imports unprocessed lithium and exports refined lithium [9]. China dominates global processing and as a leader, in manufacturing LIBs, it consumes most of its refined products. The United States has relatively low production levels of unrefined lithium (HS 2805.19, 2827.39, and 2826.90) and import most of its refined lithium from China and Canada.

Figure 4 shows that the United States was the largest exporter of unprocessed artificial graphite and China was the largest exporter of unprocessed natural graphite (HS 2504.10). DRC accounted for almost all global unrefined cobalt exports. Almost all the cobalt in China is imported from DRC. The United States imports most of its refined cobalt (HS 2822.00) from UK and Finland.

China imports about twenty-two times more nickel than it exports. The RCA shows that China imports large amounts of both unprocessed and refined nickel (HS 7502.10, 7502.20, and 7504.00) for domestic use; this corresponds with China’s position as the world leader in the production of both LIBs and stainless steel.

According to the above facts, political stability, transportation distance, the exporting country's import and export trade policies, and other considerations will be taken into account when picking

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the source region. For example, most of the resources in the United States originate from Canada, whereas cobalt in China comes from the DRC.

2.2.3. Impacts on EV Productions

1) China

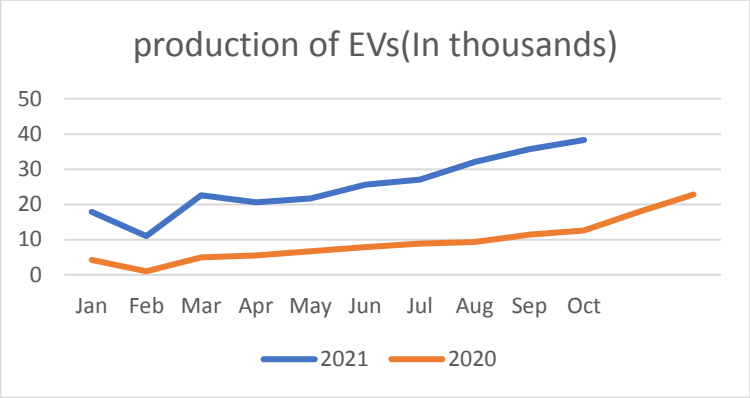

Figure 5: Production of EVs in China.

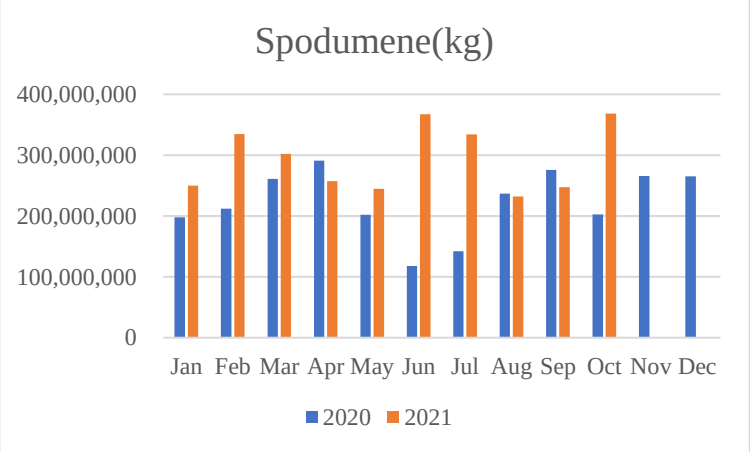

Figure 6: Comparisons of Monthly Spodumene Imports to China.

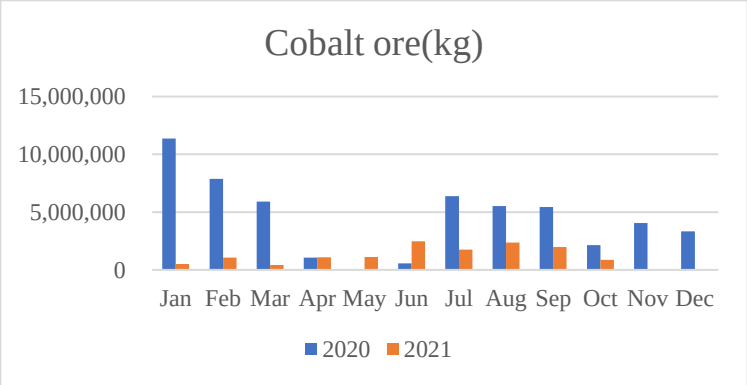

Figure 7: Comparisons of Monthly Cobalt Imports to China.

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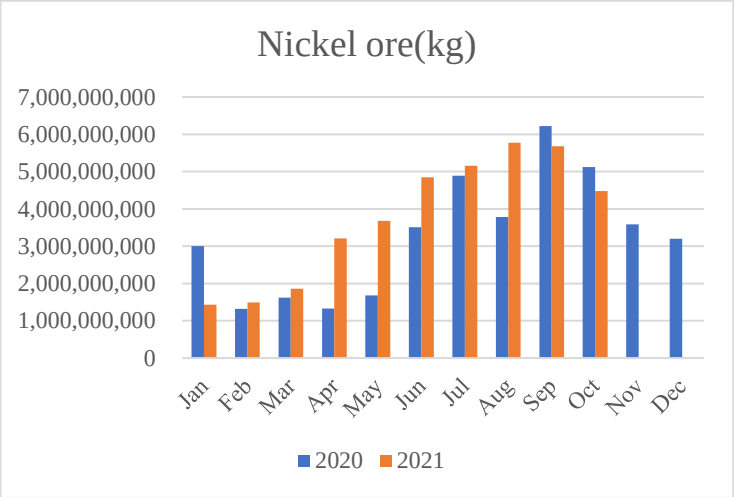

Figure 8: Comparisons of Monthly Nickel Imports to China.

From Figure 5, we can find that sales of new energy cars fell in both February 2020 and February 2021. This is primarily due to the Chinese New Year, which occurs in February and causes the factory to halt work and consumers to stop shopping. Furthermore, the erupted of covid-19 in February, 2020 had a negative influence on productivity. Following the emergence of the covid-19 pandemic, China implemented strict policies, causing factories to shut down and people to travel less. However, the lock-down did not last for a long time. Most manufacturing companies start their production in 3 or 4 weeks after the lockdown. Therefore, the temporary production interruption did not play a major part on the sales of new energy automotive vehicles.

At the beginning of 2020, the outbreak of covid-19 has affected countries that provide these materials to varying degrees. These countries had enacted various actions and policies in reaction to the outbreak, affecting the availability of these resources. For example, as shown in Figure 6, during the outbreak of COVID-19 in Australia in June and July 2020, the number of spodumene imports fell dramatically. Despite this, China has not experienced a lithium supply shortage due to excess inventories and prompt replenishment from a variety of sources.

Because of export restrictions in the Democratic Republic of Congo (DRC) and the April closure of South African ports, the monthly import of cobalt ore in May 2020 has been reduced to nearly nothing (see Figure 7). Although it began to improve in July, cobalt supplies remained below average in the second half of 2020. Cobalt's primary application is in superalloys. As a result, even if the volume of imports declines, new energy cars will continue to be produced. The industry has remained unaffected.

As Indonesia's nickel export limits increased in the second half of 2020, it was unable to deliver enough nickel. In this situation, the Philippines took over as China's primary nickel ore supplier from Indonesia. Nickel imports have plummeted in the first half of 2020 and 2021 (see Figure 8). Furthermore, demand was down due to the domestic Spring Festival vacation. Due to delayed constraints, the number of shipments in the main nickel-producing areas of the local nickel mines is still low. In the second quarter, laterite nickel ore supply increased seasonally (see Figure 8).

The main impact on the traditional vehicle manufacturing industry, in comparison to the production interruption and increased transportation challenges caused by the outbreak, is the chip shortage. Because many prominent new energy vehicle firms have survived the chip crisis through independent research and development, the chip scarcity has not had the same impact on sales of EV vehicles as it has on traditional automobiles. BYD has already entered the semiconductor industry and has started self-research, mass production, and self-supply to deal with the chip problem.

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2) United States

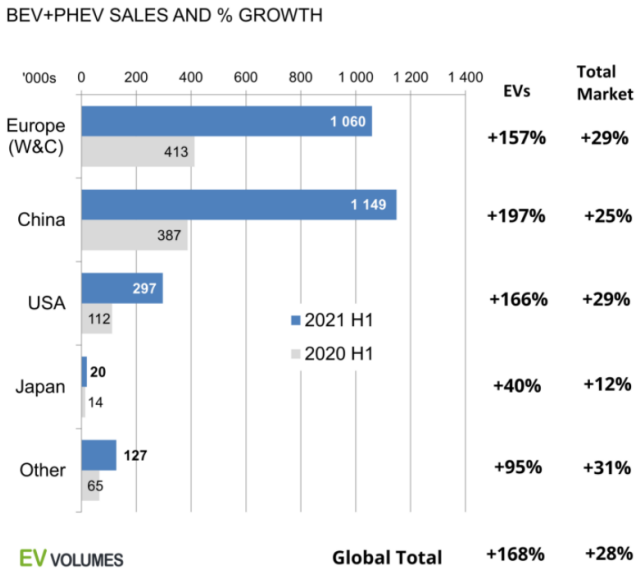

Figure 9: BEV+PHEV Sales and Growth in the U.S.

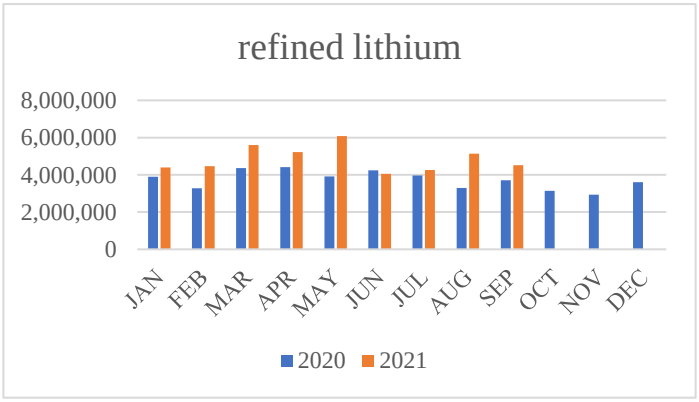

Figure 10: Comparisons of Monthly Lithium Imports to the U.S.

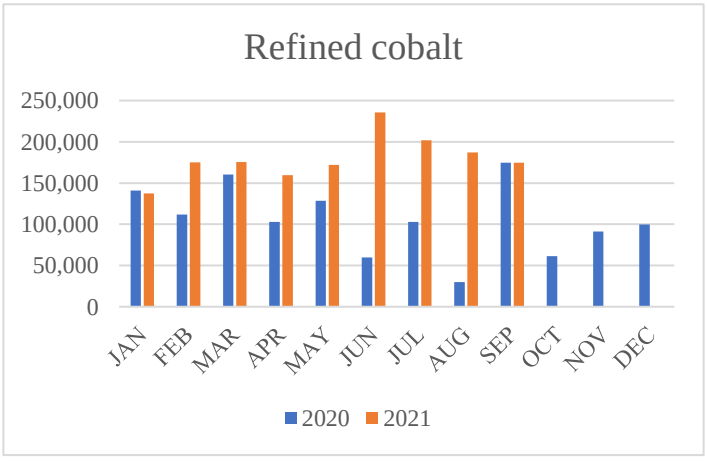

Figure 11: Comparisons of Monthly Cobalt Imports to the U.S

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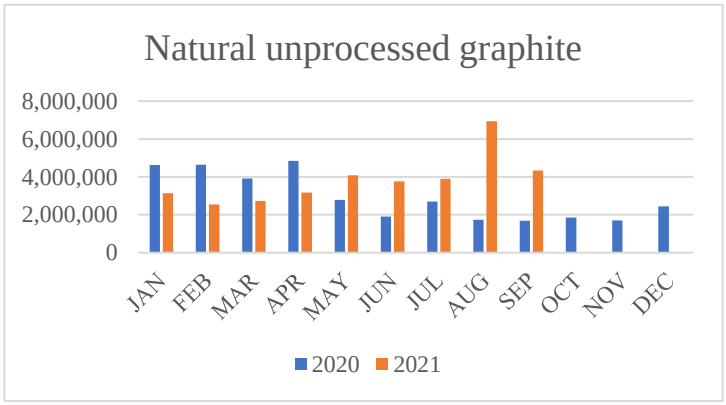

Figure 12: Comparisons of Monthly Graphite Imports to the U.S.

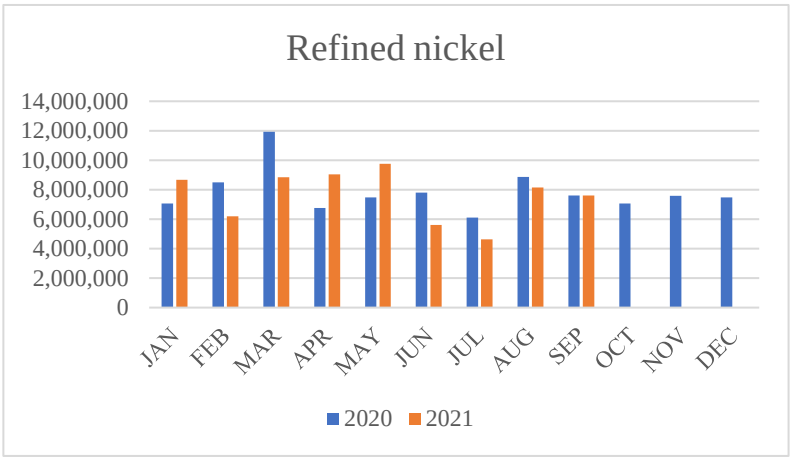

Figure 13: Comparisons of Monthly Nickel Imports to the U.S.

Figure 9 show that new energy vehicle sales in the United States are continuing to rise and will increase significantly in 2021. In the United States, the volume of lithium imports is largely consistent, and the supply situation is relatively stable (see Figure 10). The Figure 11 and Figure 12 shows that the availability of cobalt and graphite reduced dramatically in the second half of 2020, but this had little effect on production. In 2021 and 2020, the volume of nickel imports changes in the same way (see Figure 13). More and more manufacturers are seeking for battery methods that are diverse. For instance, Tesla are taking attempts to obtain more control and vertically integrate additional components of battery production, such as battery manufacture and essential material mining and processing. Other OEMs are also deliberating on the best strategy that can largely reduce risk for them .

Although the Covid-19 had little effect on the supply of these sorts of resources, the future shortage of resources remains a critical issue. New energy automotive producers are taking steps to increase raw material recycling and design new kinds of batteries to avoid future resource shortages. At the upstream layer, many industrial firms are taking the necessary steps to prepare for future resource shortages, including speeding the development of nickel- and cobalt-free power batteries and technology of battery recycling. When it comes to the chip crisis in the United States, leading companies like Tesla were able to overcome the chip crisis by redesigning microcontroller-based components, adjusting MCU suppliers, and rewriting software code.

On one hand, extreme weather, political considerations, and epidemics all have an influence on the supply chain. New energy vehicle manufacturers in the United States and China, on the other

DOI: 10.54254/2754-1169/3/2022814

hand, have responded to the crisis by developing excellent supply chain strategies and initiating independent research and development on time, ensuring that the supply chain is not disrupted and new energy vehicle manufacturing is not harmed.

2.3. Marketing

2.3.1. Global Market

The rise of new energy vehicles has triggered a technological revolution in the automotive industry. Automobile companies are innovative and aggressive, new car-making forces are dynamic, and various joint ventures in the world are gaining momentum and will soon be in full force. Therefore, the market will grow at a high rate in the future and competition will continue to be fierce. From an overall perspective, global sales of new energy vehicles have grown tremendously in 2020 despite the shadow of the Covid-19 epidemic hanging over the world. As for electric vehicles-volumes estimates, global deliveries of pure electric vehicles/battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs) were 3.24 million units in 2020, compared to 2.26 million units in the same period in 2019, there is an increase of 43 percent, which is a large improvement. The worldwide light vehicle market declined by 14 percent during the same period, allowing the global market share of EVs to grow from 2.5 percent in 2019 to 4.2 percent in 2020 (see figure 14).

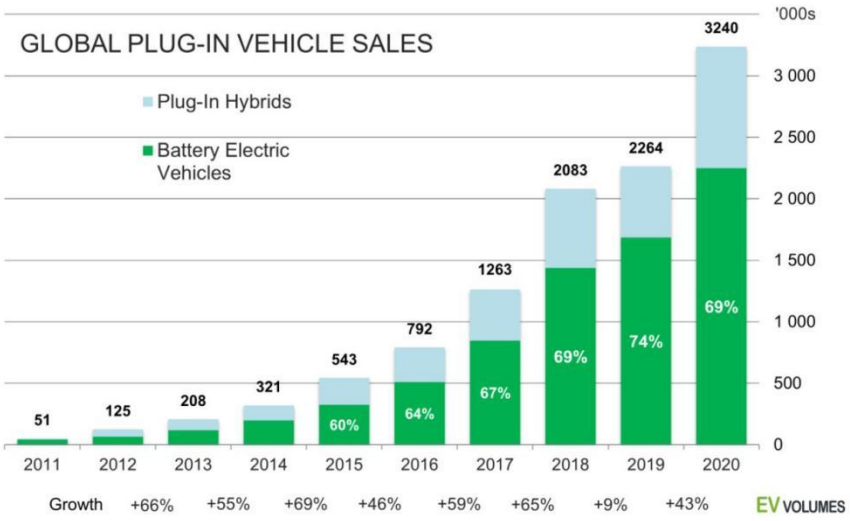

Figure 14: Global New Energy Vehicles Sales in the Past Ten Years (Source: EV Volumes) [12]

2.3.2. China

As we all know, China's new energy vehicle sector got its start early because of factors like lowering foreign dependence on crude oil, reaching carbon neutrality targets, and rolling out high-tech businesses. According to the information issued by the Ministry of Industry and Information Technology in October, 2020, China has invested more than 2 trillion yuan in the entire industry chain of new energy vehicles. By the end of 2020, there will be 4.92 million new energy vehicles on the road, accounting for 1.75 percent of all vehicles and more than 40% of global new energy vehicle ownership. Pure electric vehicles make for a bigger share of the holdings due to China's insistence on a pure electric drive strategy orientation, with 4 million pure electric vehicles accounting for 81.32 percent of the total number of new energy vehicles in 2020. New energy automobiles have formed the backbone of the revolution and upgrade of the automobile and auto-related industry as a result of

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technological and industrial changes, and the incremental volume of new energy vehicles has exceeded 1 million for three years in a row, indicating a consistent trend of rapid growth.

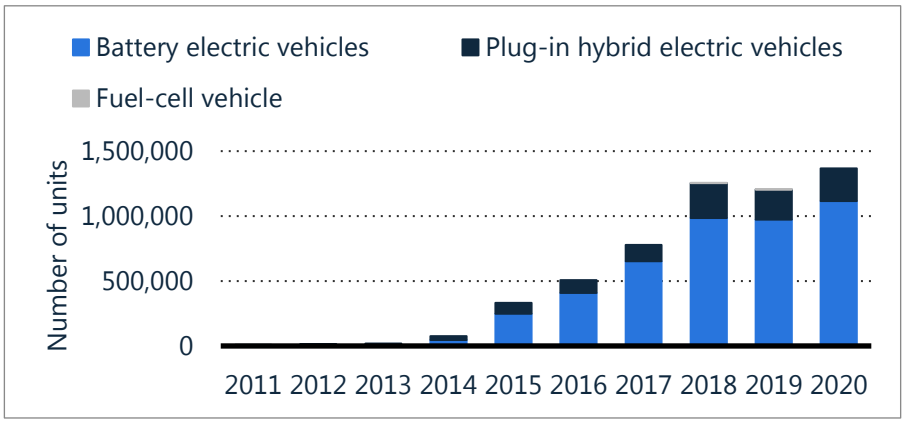

Figure 15: Annual Sales of New Energy Vehicles in China 2011-2020, by type (Source: statista.com) [13]

The figure 15 above depicts annual sales of new energy vehicles in China by type from 2011 to 2020. In China, around 0.25 million plug-in hybrid automobiles were sold in 2020, up from less than 0.1 million just a few years ago, which indicates a significant growth.

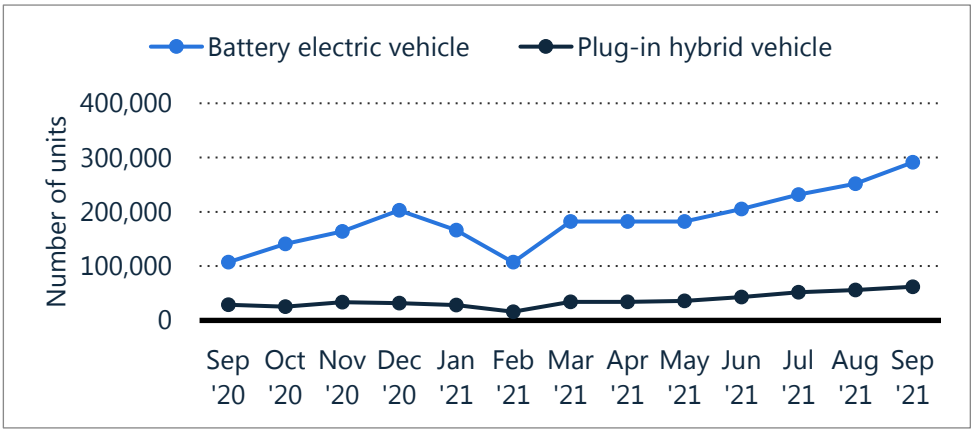

Figure 16: New Energy Vehicle Production in China 2020-2021 (Source: statista.com) [14]

China's overall automotive sales fell slightly in 2020, and new vehicle sales and production fell precipitously during the first six months of the year, but started to rebound rapidly in March, with the first positive year-over-year growth in July, and began hitting new monthly high sales rates in the second half of the year. Judging from the whole year of 2020, new energy vehicle production and sales increased significantly, with an increase rate of roughly 9.98 percent in production and 13.35 percent in sales, reversing the decreasing trend in 2019 (see figure 16).

In particular, Pure electric car production and sales totaled 1.105 million and 1.115 million units, respectively, up 5.4 percent and 11.6 percent; plug-in hybrid vehicle sales totaled 260,000 and 251,000 units, respectively, up 18.5 percent and 8.4 percent. It is undoubtedly that under the circumstance which is rich and diversified with new energy vehicle products and positive policies that can achieve the requirements or needs of various levels of the market, this kind of new environmentally products will be recognized by more and more consumers.

The Ministry of Industry and Information Technology of People's Republic of China had launched a guidance called Technology Roadmap 2.0 for Energy-Saving and New Energy Vehicles (2021-

DOI: 10.54254/2754-1169/3/2022814

2035) on October 27, 2020, proposing the targets that Energy-saving automobiles and new energy vehicles will account for half of China's yearly vehicle sales, and the automotive industry should make a fully transition from conventional energy to new energy in 2035.

According to the new energy vehicle production and sales data since this year and the latest release, China's new energy vehicle penetration rate doubled again from July to September compared with the first half year of 2021. With the current development trend, there is an optimistic forecast that China's new energy vehicle sales plan of 2035, including the sales scale and penetration rate, will be completed in the next few years, which is ahead of schedule.

2.3.3. United States

The U.S. government attaches great importance to the application of new EVs, while in recent years, the U.S. government has gradually adopted promotional policies such as trade-in to effectively stimulate public demand. Meanwhile, in the actual promotion process, for those customers who use new energy vehicles will also be given a certain tax incentives subsidies.

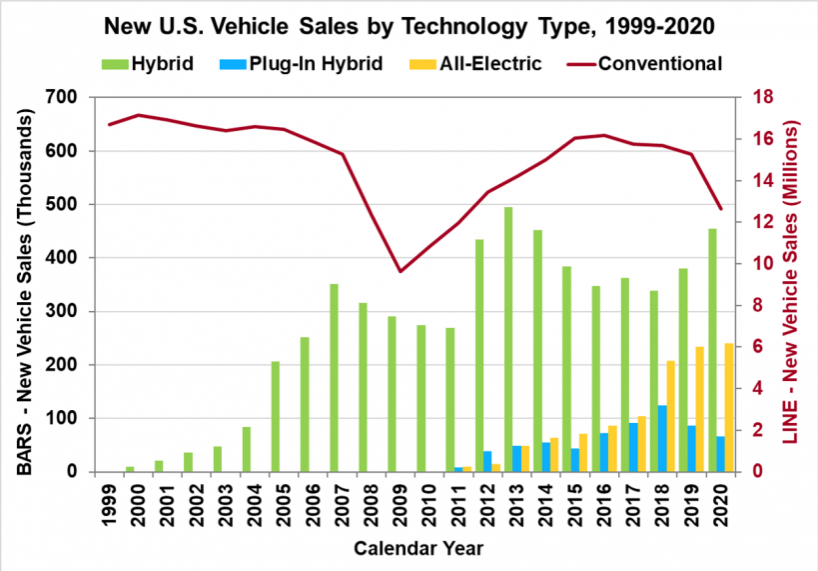

Figure 17: New U.S. Vehicle Sales by Technology Type, 1999-2020 (Source: energy.gov) [15]

Meanwhile, it reveals from figure 17 that In 2020, new light-duty vehicle sales in the United States decreased significantly, while sales of all-electric vehicles (EVs) surged over the previous year. Despite being a small fraction of overall sales, electric car sales climbed from 1.4 percent in 2019 to 1.7 percent in 2020. Hybrid car sales increased as well, although plug-in hybrid vehicle sales declined from their 2018 high (0.7 percent market share). New light-duty vehicle sales in the United States fell to 12.7 million in 2020, down from 15.3 million in 2019.

From the latest data of 2021 and the figure of EV Sales Share of New Vehicle Sales, the penetration rates in 2021 in U.S. also starting to move closer to 10% before its government adjusts its tax policy.

In more detail, during the year of 2018, driven by the listing of Tesla Model 3, the annual electric vehicle sales grew 83% compared to 2017, including 125% year-on-year growth in sales of pure electric models(battery electric models). However, after Trump took the white house, he did not give any substantial subsidy support policy for new energy vehicles, which led to three consecutive years of electric vehicle sales fluctuating in the range of 300k-400k, with a penetration rate of only 2.2% in 2020. Thus, the sales of America’s new energy vehicles were at a standstill in year 2018 and 2020, then returned to high growth in year 2021 eventually (see figure 18).

DOI: 10.54254/2754-1169/3/2022814

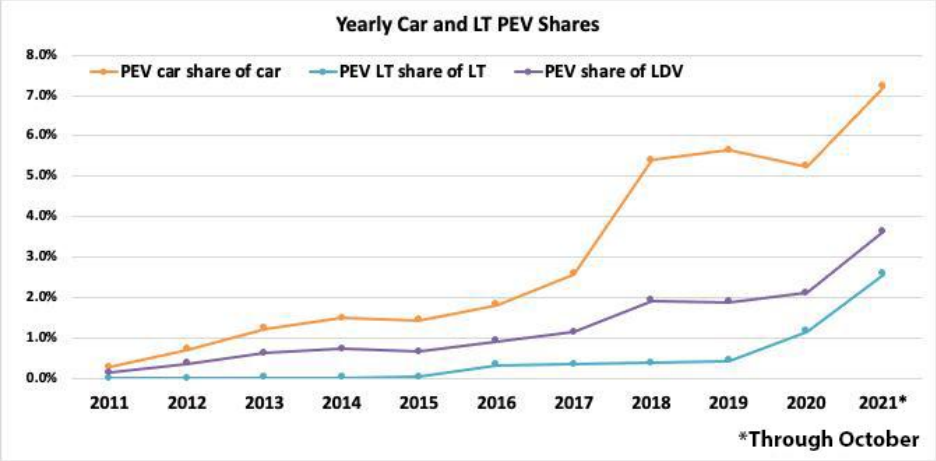

Figure 18: EV Sales Share of New Vehicle Sales (Source: anl.gov) [16]

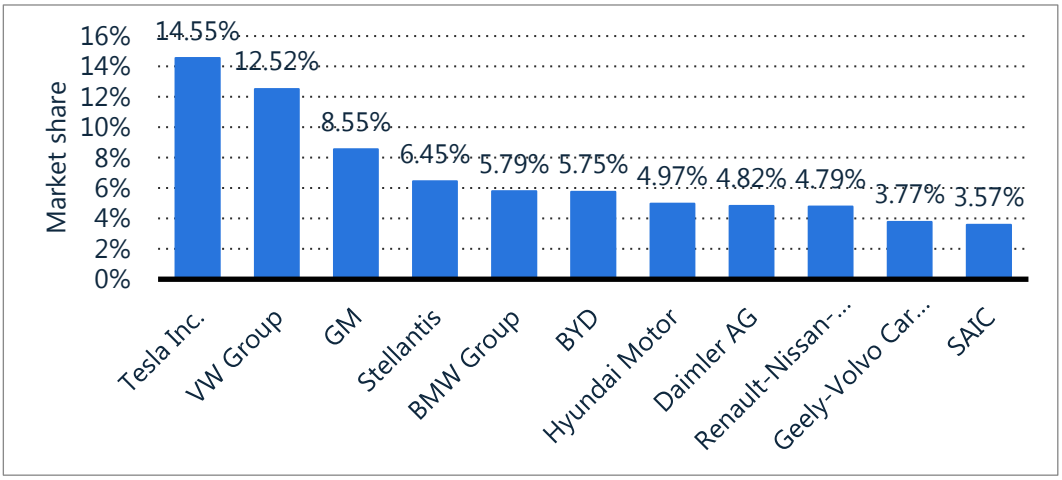

Figure 19: Electric Vehicle Sales Market Share by Producer 2021 (Source: energy.gov) [17]

From the market share and the comparison data of pure electric and plug-in hybrid models (see figure 19), the current U.S. market for pure electric vehicles, the Model Y is a standout, and in second place is the Model 3. The U.S. market is indeed a relatively small number of models placed in the pure electric sector. With the increase in certainty, there will be a further growth in the U.S. pure electric market. Imagine that if Tesla gets a $7,500 tax rebate, plus the impact of the standard renewal version based on lithium batteries, the incremental volume of it would be very considerable.

Nevertheless, although the electric vehicle market in the United States has grown rapidly nowadays, it still trails behind economies such as Europe and China, with the United States accounting for just around 17% of the world's complete stock of 10.2 million new energy vehicles, compared to 44% for China.

3. Conclusion

Taken these two countries together, we believe that the new energy vehicles in China and the United States are now at the start of a fresh rising trend, and that The outbreak is merely a temporary blip on the radar that will have no effect on the cycle's operation, and this type of automotive industry will continue to benefit fully in the medium to long term in the industry chain of the times. People are increasingly concerned about the environment and sustainable economy.

DOI: 10.54254/2754-1169/3/2022814

Extreme weather, political considerations, and epidemics all have an influence on the supply chain. New energy vehicle manufacturers in China and the United States, on the other hand, have responded to the crisis by developing excellent supply chain strategies and initiating independent research and development on time, ensuring that the supply chain is not disrupted and new energy vehicle manufacturing is not harmed. At the same time, incentives and subsidies were actively introduced to restore the economy to pre-epidemic levels.

Although the research and the development of innovative vehicles in the United States is earlier than that in China. From a short-time perspective, because the epidemic in the US remains strong uncertainty, China's domestic car market may recover first. But if we look at the long term, the recovery of the car sales market in both countries will converge to the same, and the markets can even expect new energy vehicles to make up a larger proportion of the automotive industry.

Although the Covid-19 had little effect on the supply of these sorts of resources, the future shortage of resources remains a critical issue. New energy automotive producers should increase raw material recycling to avoid future resource shortages. The government can also introduce relevant policies to avoid resource shortages in the future.

In conclusion, consumer sentiments toward new energy vehicles are favorably connected with government industrial policies. The term industrial policy refers to a group of government policies that intervene in the establishment and development of industries in order to achieve certain economic and social objectives or goals, as well as all the industrial policies, would be driven by the country's and society's overall interests. The government backs the new energy vehicle industry not just because of its enormous financial value, but also because of the social and environmental benefits of encouraging long-term social development. At this moment, due to the uneven level of development of the new energy vehicle industry around the world, the consumption of new energy vehicles is still hampered to a certain extent. In the future, with the continuous improvement of policies and other aspects, the current development obstacles will gradually disappear. Due to the increasing growth of new energy vehicles industry, and the changing of advanced technologies, the global traditional car companies are under increasing pressure. As a matter of fact, the transformation opportunities of the automotive industry have been presented in front of the global car companies, and once the transformation is successful, it will have a significant impact, or great changes on the global automobile industry.

References

[1] *Kendall, M. (2018). Fuel cell development for New Energy Vehicles (NEVs) and clean air in China. Progress in Natural Science: Materials International, 28(2), 113-120.*

[2] *Zou, B., You, J., Lin, Y., Duan, X., Zhao, X., Fang, X., ... & Li, S. (2019). Air pollution intervention and life-saving effect in China. Environment international, 125, 529-541.*

[3] *Khan, M. A. (1997). The role of government in the economy. American Journal of Islam and Society, 14(2), 155-171.*

[4] *China Association of Automobile Manufacturers. (2021). Retrieved 1 December 2021, from http://www.caam.org.cn/*

[5] *Bedsworth, L. W., & Taylor, M. R. (2007). Learning from California's zero-emission vehicle program. California Economic Policy, 3(4).*

[6] *Xie, Y., Wu, D., & Zhu, S. (2021). Can new energy vehicles subsidy curb the urban air pollution? Empirical evidence from pilot cities in China. Science of The Total Environment, 754, 142232.*

[7] *Wen, W., Yang, S., Zhou, P., & Gao, S. (2021). Impacts of COVID-19 on the electric vehicle industry: Evidence from China. Renewable And Sustainable Energy Reviews, 144, 111024.*

[8] *Coffin, D., & Horowitz, J. (2018). The Supply Chain for Electric Vehicle Batteries. Retrieved 1 December 2021, from https://www.usitc.gov/publications/332/journals/the_supply_chain_for_electric_vehicle_batteries.pdf*

[9] *Scott, S., & Ireland, R. (2020). lithium-ion battery materials for electric vehicles and their global value chains. Retrieved 1 June 2020, from https://www.usitc.gov/publications/332/working_papers/gvc_overview_scott_ireland_508_final_061120.pdf*

DOI: 10.54254/2754-1169/3/2022814

[10] DataWeb. (2021). Retrieved 1 December 2021, from https://dataweb.usitc.gov/

[11] Harrison, D. (2021). Electric vehicle battery supply chain analysis 2021: How lithium-ion battery demand and production are reshaping the automotive industry. Retrieved 1 December 2021, from https://www.automotivelogistics.media/electric-vehicles/electric-vehicle-battery-supply-chain-analysis-2021-how-lithium-ion-battery-demand-and-production-are-reshaping-the-automotive-industry/41924.articlew

[12] EV-Volumes - The Electric Vehicle World Sales Database. (2021). Retrieved 1 December 2021, from https://www.ev-volumes.com/

[13] Statista research department. (n.d.). Annual Sales Volume of New Energy Vehicles in China from 2011 to 2020, by Type. Statista.Com, from https://www.statista.com/statistics/425466/china-annual-new-energy-vehicle-sales-by-type/

[14] Statista research department. (n.d.). Monthly New Energy Vehicle Production in China from January 2021 to January 2020, by Type. Statista.Com, from https://www.statista.com/statistics/425421/china-monthly-new-energy-vehicle-production-by-type/

[15] Vehicle technologies office. (2021, August 23). Sales of New Electric Vehicles in the U.S. Were Up for 2020 While Conventional New Light-Duty Vehicle Sales Were Down. Office of Energy Efficiency & Renewable Energy, from https://www.energy.gov/eere/vehicles/articles/fotw-1200-august-23-2021-sales-new-electric-vehicles-us-were-2020-while

[16] D. Gohlke and Y. Zhou, "Assessment of Light-Duty Plug-in Electric Vehicles in the United States, 2010 – 2020, Argonne National Laboratory, Lemont, IL USA, ANL/ESD-21/2, 2021.

[17] Global EV Sales for 2021. (n.d.). EVVolumes.Com, from https://www.ev-volumes.com/country/total-world-plug-in-vehicle-volumes/