China And America's Trade War on Clean Energy Revolution: Taking Electric Vehicle Industry as An Example

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Abstract. This paper is based on several backgrounds. The first one is the increasingly severe global climate crisis and the imperative global green energy revolution. The second one is China's ambitious Belt and Road Initiative which has been put into efforts since 2013 in order to "create more opportunities for common development on the principle of extensive consultation and joint contribution and for the commonwealth of the world" (proposed by Xi Jinping, on a meeting with Emmanuel Macron and Angela Merkel on July 15, 2021) and America's countermeasures against China's economic movement. The research focuses on the electric vehicle industry area that clearly shows the tendency of global green energy revolution, the innovations and the complex geopolitical situation and conflicts of countries on this rising industry. To get into the topic, 2 specific examples: The cobalt (a vital resource in the EV industry) mining industry in the Democratic Republic of Congo (DRC), and Tesla's global strategy and its factory in Shanghai. This research will also talk about the orientation of the new technologies in the electric vehicle industry and how it is going to reshape the industry and their geopolitical impact on the world. This research mainly uses the method of literature research. The paper focuses on collecting and analyzing the facts and data of the industry, different perspectives and viewpoints from different stakeholders (mainly the US and China) and the developing situation of the geopolitical environment in the nowadays world.

Keywords: Electric vehicle; stakeholders; revolution.

1. Introduction

This research discusses a war between China and America on the global clean energy revolution. One of the central areas of this war is the Electric Vehicle industry. To gain more raw materials to the supply chain and expand the production, a war between policies and political countermeasures of the 2 nations is raging. One focusing point of this research is Cobalt resources--- a key raw material in the EV battery industry as well as China's important strategic resource in its Belt and Road Initiative. It plays a very important role to regulate the heat and volatility of an EV, permitting the lithium battery to work in long distance without recharging or exploding. According to Natural Resources Canada, the cobalt belt in the Democratic Republic of the Congo (DRC) and Zambia yields most of the global cobalt production and DRC alone accounted for more than 50% of the global production of the cobalt in 2016. [1] Another fact is that 15 of 19 Congo's biggest cobalt mines is purchased by China companies in China's great investment movements led by the Belt and Road Initiative, which is an ambitious and vital economic strategy that China has been putting into efforts for 10 years to build "a road for peace, prosperity, opening-up, and innovation, connecting different civilizations" according China's national leader Xi Jinping.[2] At the same time, it is a economic initiative that has long been objected by the United States in the name of issues with "human rights violations and environmental impact, as well as concerns of debt-trap diplomacy resulting in neocolonialism and economic imperialism".[2][3] Meanwhile, the United States is also making incentive policies for large firms to seek for cobalt and other crucial resources for the newly-developed high tech green industries overseas and put into investment, competing with China both politically and economically. The innovations of the EV industry is another great part of this global energy revolution competition. This research focuses the famous EV innovative company-Tesla as well as its Gigafactory in Shanghai-the largest production center of Tesla in the world. [4]Under the complex situation of Sino-US economic and political confrontation and the wave of foreign capital withdrawing from China, Elon Musk's visit in this factory and his meeting with Ding Xuexiang, the

Chinese Vice Premier of the State Council in June, 2023 showed the world Chinese government's strong willingness for foreign capitals to interact with China's markets and technology innovation transitions that are greatly needed in the background of China's economic model transformation and economic downward pressure. The research will analyse the positive impact Tesla made on China's economy and technology innovations and the benefit Tesla could gain from keeping investing production in China, as well as will Tesla withdraw from China in the foreseeable future due to the politic tension and the firm's transformation in the global strategy. The research also discusses the key potential innovations that can create a revolution in EV battery industry and Chinese companies' efforts and investments in this. Researching on the following aspects is important for several reasons. Firstly, the Belt and Road Initiative is a significant policy in China's global economy strategy and a major point of confrontation between China and the United States in terms of national interests and political systems. By examining China's investment and control over the Democratic Republic of Congo's (DRC) cobalt industry and America's countermeasures, readers can gain a comprehensive understanding of this important topic. Secondly, the EV battery industry plays a crucial role in the global competition for renewable technology and has a substantial economic influence on the global economy. Investigating the real industry situations of both countries in terms of manufacturing and production, global market share, technology innovations, and future tendencies is necessary to provide accurate measurements and comparisons. Emphasizing facts in this area is essential. Furthermore, the EV battery industry serves as an entry point for the world's green technology revolution during the global climate crisis and the competition among countries for renewable energy. This industry's development and advancements have far-reaching implications for sustainable energy solutions and environmental preservation. Additionally, it is important to highlight the role of underdeveloped countries in the global energy revolution and the unfair treatment they often face. These countries are sometimes used as tools in global power struggles, both politically and economically. By emphasizing this aspect, the aim is to promote global justice and work towards a better future for the global green resource revolution. The situation unfolding in Congo, with its significant cobalt reserves, serves as a significant example in this context. In conclusion, researching and examining these aspects provides a comprehensive understanding of the Belt and Road Initiative, the EV battery industry's global competition, the real industry situations in different countries, the potential of the EV battery industry in the green technology revolution, and the importance of addressing the challenges faced by underdeveloped countries. By delving into these topics, we can gain insights into key global dynamics and work towards a more equitable and sustainable future.

2. Industry Size

2.1. China's EV Industry

When it comes to the industry size and the development situation of the EV industry, such research can help to break people's common stereotypes and help people to have a clearer view on this important industry. About the electric vehicle industry, people tend to think the United States as a country with more advanced technologies, and EV battery as a newly developing high-tech industry, the US is supposed to take the dominance in EV battery industry. The US is also famous for its car culture based on the fact that every 1000 American individuals own 868 cars, ranking at number 7 in the world by vehicles per capita (Hart, 2021), [5] which might be a factor that Americans are willing to buy more EVs. However, according to Global EV Outlook 2022 published by International Energy Association,"the increase in EV sales in 2021 was primarily led by the People's Republic of China, which accounted for half of the growth. More vehicles were sold in China in 2021 (3.3 million) than in the entire world in 2020." (2022, IEA) [6]. While the total EV possession of US is 2.5 million, compared to 3.3 million EVs were sold in China in one year [7].

2.2. America's Technological Advantage

However, such data is also easy to cause another stereotype in people's mind which is that China is the complete winner in this industry and completely overcome the United States. And that is not the fact, either. One important point needed to be realized is that manufacturing does not equal to the technology innovation. According to Barry Van Wyk's research in China now has a lot more batteries than electric vehicles (2023), overcapacity now becomes a great threat to China's battery industry. Due to the economic downturn after 3 years' Covid-19 locking down and much too rapid expansion of battery manufacturing "China is still producing the world's most batteries, but a glut of low-quality EV batteries is crowding out more advanced tech." [8]According to his data, "China's sales of new energy passenger vehicles (NEVs) in May rose 10.5% from April, but NEV sales have slowed overall in recent months, leaving domestic battery makers with a stockpile of batteries and no vehicles to put them in.As impressive as China's EV sales growth has been, passenger EV sales in January and April declined month-on-month by 48% and 3.6%, respectively, while battery production capacity has continued to expand prodigiously."(2023)As China's EV battery industry has reached and surpassed self-sufficiency, it is now entering a period of fierce competition. With the battery glut in China, some companies are choosing to expand overseas.[9] However, due to multiple factors, including stricter emission standards in the U.S. and Europe, politic factors and low brand awareness, Chinese battery companies find their hard situation in taking their products overseas especially to the western countries. Chinese EV battery makers now face having to distinguish themselves with technological innovation, developing the most advanced batteries such as solid-state and sodium-ion, [10] which is not a mature and low-cost technology yet for these companies. Take the Tesla Shanghai Gigafactory as an example, up to January 2021, the annual production capacity of the plant is 250,000 vehicles, and it is planned to increase to 450,000 vehicles. In 2021, the production of Shanghai Gigafactory holds about 27% of Tesla's global production. [10] As a leading EV company in the world, Tesla's huge production proportion in China indicates the strong manufacturing ability and vast market China holds. However, the core steps of research development and innovations are basically finished in Tesla's labs in the United States. Unstable political situation in the future might also affect the production capacity and economic effects of Shanghai gigafactory.

2.3. Belt and Road Initiative

One important fact that is found in the paper is that China's great success in the EV industry does not come out from nowhere. One vital reason that contributes to China's great success in this area is its Belt and Road Initiative. Through the economic cooperation with other nations, China expands markets for its products, more importantly, opens an approach for China to obtain vital resources in this industry to keep the industry growing. One of them is the cobalt, one ore that used to only be used in dyeing, now plays a vital part in the EV battery. Cobalt can help solve the 2 most important disadvantages that most electric vehicles face: not enough endurance distance and not short enough charging time. It can also help guarantee the safe operation of the battery. According to the New York Times, the Democratic Republic of Congo (DRC) produces more than two-thirds of the cobalt in the world every year. This country is now taking the center stage for major automakers and superpowers to compete for leadership in the coming global clean tech revolution. Nowadays, 15 of the 19 DRC's biggest cobalt mining facilities are in the hand of Chinese firms, that largely invests overseas in response to the government's Belt and Road Initiative. About the cobalt mining industry, nowadays, a great competition happening in the Democratic Republic of Congo is worth people's great attention on "with more than two-thirds of the world's cobalt production coming from Congo, the country is once again taking center stage as major automakers commit to battling climate change by transitioning from gasoline-burning vehicles to battery-powered ones." "China's Luoyang Molybdenum, the new owner of the Kisanfu site since late last year, bought it from Freeport-McMoRan, an American mining giant with a checkered history that five years ago was one of the largest producers of cobalt in Congo — and now has left the country entirely." [2] Without doubt, a

raging competition between China and the United States of this important resource on the market share and control of the materials will heavily shape the global cobalt industry.

3. Market Demands

According to the data analysis provided by IEA, "Demand for electric cars is fast increasing, with sales expected to leap 35% this year after a record-breaking 2022." "The new edition of the IEA's annual Global Electric Vehicle Outlook shows that more than 10 million electric cars were sold worldwide in 2022 and that sales are expected to grow by another 35% this year to reach 14 million. This explosive growth means electric cars' share of the overall car market has risen from around 4% in 2020 to 14% in 2022 and is set to increase further to 18% this year, based on the latest IEA projections."[3] Without doubt, the global market demand of electric vehicles is on a significant increasing tendency, the increasing is mainly contributed by 3 major markets---China, Europe and the United States. China takes the lead in the proportion. In 2022, 60% of the world's EV sales take place in China and China has 50% of the world's whole electric vehicles. However, on the other hand, another fact is that China is actually facing the overcapacity in this industry, especially in the EV battery industry. This is due to multiple reasons. One side is the huge production ability and over enthusiasm of the investors and market. China's EV factory produces a great amount of the EVs in the world, but domestic market usually doesn't have the ability to completely digest the capacity. To make up for this gap, Chinese companies have to focus on the international market and export. However, Chinese EV brands usually do not have a well-known market awareness in the western countries and some of them are not able to match the emission standards of the western states. Another big factor is politic reason. In the context of the U.S. government's sanctions against Chinese high-tech companies and the economic relationship between the two states gradually drifting away, it is hard for Chinese EV brands to hold a leading character in the western market. The total withdraws of Huawei from western countries and the banning Tik Tok faced show Chinese EV companies a sign of risk. While in non-western countries where there are only small EV sales, those Chinese companies are not able to find a big-enough demand to make up for the gap, thus the overcapacity problem becomes very hard for companies to solve. Another fact is that China holds a great lithium reserve, which is the main material to make EV batteries and it is much cheaper for Chinese producers to access lithium. Though labor price has been increasing for recent years in China, China is still able to hold a labor price advantage compared to the developed states. These 2 factors make China have a natural advantage in the production cost of EV and that explains why China can easily build up such a great capacity and its relatively cheap price in EVs. This further increases the gap between the country's market demand and production capacity. As for United States, compared to Chinese consumers, Americans seem to show a lower willingness to replace petroleum vehicles into EVs. However, data by IEA shows that a strong growth with sales increasing 55% has occurred in the United States, 2022. The ambitious Inflation Reduction Act in the United States is expected to further increase market share for electric vehicles this decade and beyond.

Several reasons can explain the relatively low holds of EVs in America. One important aspect is that America economy does not have a necessary reason to shift traditional vehicles to electric vehicles. The oil price in the U.S. is cheaper due to the petrodollar system and oil resources including shale oil are abundant for the United States. One reason for China's transition from traditional vehicles to EVs is to reduce reliance on oil sources with volatile supplies in a complex geopolitical situation, while this reason doesn't work for the United States. Most of the EV sales in the U.S. are Tesla Model Y and Model 3, which are more expensive products compared to Chinese consumers' various relatively cheaper choices in many brands. However, America's EV sales still hold a great increasing potential in the next decade due to its strong economy strength and confidence on the economy growth. Increasing global EV market promotes the Cobalt demands. The cobalt mines in DRC will face more investors from China and the United States.

4. Technology

Continuously advancing battery technology promotes EVs expanding into various areas, one example is the electric heavy-duty vehicles. In 2022, nearly 66 000 electric buses and 60 000 medium and heavy-duty trucks were sold worldwide, representing about 4.5% of all bus sales and 1.2% of truck sales worldwide. The advancement in battery technology can generate stronger driving power, hence spread the electric vehicle transition to the heavy-duty vehicle area. Several possible potential battery technologies have the power to change the industry. Carbon nanotube electrodes is one of them. According to The Future of the Electric Vehicles, "NAWA Technologies has designed and patented an Ultra-Fast Carbon Electrode that could change batteries as people know them. This utilizes a vertically aligned carbon nanotube that can boost battery power ten times over current battery packs. It can also increase energy storage by a factor of three and increase the lifecycle of a battery five times over. NAWA says that charging time will be just five minutes to get to an 80 percent charge".

5. Government Policies

According to the official website of THE STATE COUNCIL of PEOPLE'S REPUBLIC OF CHINA, The Silk Road Economic Belt and the 21st-century Maritime Silk Road (commonly known as Belt and Road Initiative or One Belt One Road), is a transnational economic belt initiated and led by the government of the People's Republic of China in 2013, investing in nearly 70 countries and international organizations. The Belt and Road Initiative is seen as a core component of China's nation leader Xi Jinping's "major power diplomacy" strategy, which seeks China to play a greater leadership role in global affairs in line with its rising strength and status. The Chinese government says the initiative is "aimed at strengthening regional connectivity and embracing a better future". However, criticism, mainly from United States and other western developed countries, argued that China's belt and road has issues with human rights violations and environmental impact, as well as concerns of debt-trap diplomacy resulting in neocolonialism and economic imperialism. Some observers and skeptics, mainly from non-participant countries, including the United States, interpret it as a plan for a sinocentric international trade network. In response the United States, Japan, and Australia had formed a counter initiative, the Blue Dot Network in 2019, followed by the G7's Build Back Better World initiative in 2021 to compete with China's ambitious plan. [7] The main opposite points by the western states on China's Belt and Road Initiative can be concluded into several aspects: Belt and Road damaged the international financial system. China's loans to other countries is unsustainable; China has taken control of infrastructures that are critical to Europe and the developing world, jeopardizing the national security of these countries; The initiative makes other countries more vulnerable to China's economic pressure meanwhile giving China a better ability to spread its power; Under this background, the conflict of China and America on the EV raw materials and supply chain distribution and their competition on the EV industry will lead the policy makers to promote more competitive policies. Belt and Road Initiative is without doubt significantly important for China's global economy strategy and its willingness to promote the transformation of its economy. The very significant example is Chinese government's foresight of investing on DRC's Cobalt mines.

6. Conclusion

It can be seen that both America and China are eager to hold their chances to become the leader of the global clean energy revolution. China's ambitious Belt and Road Initiative help this country to gain more economic opportunities to develop its clean energy industry. Due to its successful investment and reasonable planning, China is able to hold a stable and low-priced access to vital resources including Lithium and Cobalt. It ends up making Chinese Electric vehicles have a lower production cost on the quality and type thus gaining a market advantage. It can be concluded that China's success on the EV industry has a very significance relationship with its policies on the Belt

and Road Initiative. The U.S. has long been the biggest critic and opponent in China's project. It is true that many problems including workers' wages and treatment issues, debt issues, environmental issues can always be found during the China's economic activities, it is important to stress out that such problems are common in the international economic interactions. The situation happening in Congo, the remain large-scale challenges are not unique to DRC or China. It is a complex question about clean resource distribution, uneven development among countries and geopolitical confrontation.

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