

Power Rivalry and Energy Transition: A Comparative Analysis from the Perspectives of China and the United States

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Abstract. This paper examines the energy transition and rivalry between China and the United States. Following the commitment made in the Paris Agreement, both countries face challenges and opportunities in energy transition. The research applied a comparative analysis of motivations, strategies, and actions. China, heavily reliant on imported fossil fuels, seeks energy security and economic growth through clean energy. By leveraging multiple Five-Year Plans, they achieved remarkable results in renewable energy distribution. The US, a major energy exporter, wishes to keep its dominance. However, the different political views of their parties hindered the implementation of energy transition policies. China positions itself as a global climate leader. Trade tensions arose as China's solar panels crowded out US products. China's control over critical minerals for renewable energy infrastructure poses a potential pressure on the US. To address these conflicts, the paper calls for a global recognition of climate change, actively engaging in sincere talks and collaboration between governments. By doing this, both nations can promote energy transition while effectively addressing the climate crisis.

Keywords: Great power rivalry; energy transition; climate actions; comparative analysis.

1. Introduction

On December 12th, 2015, COP 21 adopted The Paris Agreement, requiring all signatories to keep the global temperature below 2 °C above pre-industrial level [1]. In this context of the climate crisis, the richness and diversity of renewable energies make them an ideal substitute for fossil fuels, especially for those depending on imported energies. More than a hundred proposing supporting policies, 118 countries set goals for renewable energy until 2012 [2].

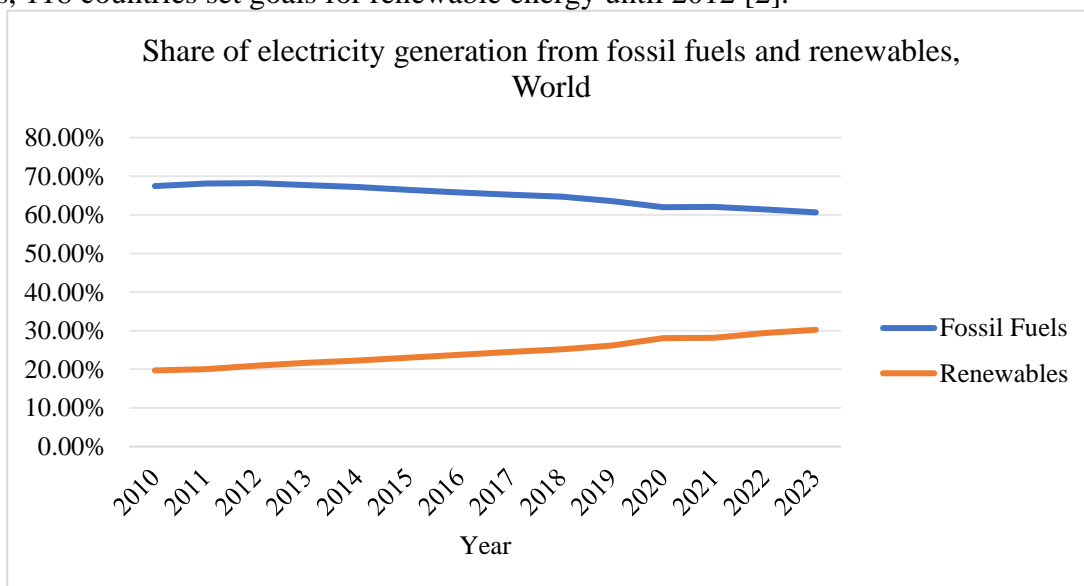


Fig. 1 Share of electricity generation from fossil fuels and renewables, world [3]

From 2010 to 2023, the share of electricity generated from renewables increased by about 10%, while electricity generated from fossil fuels decreased by about the same percentage, as shown in figure 1. However, it is obvious that the transition comes at a considerable cost. In 2020, fossil fuels still generated more than 80% of the world's energy [4]. Using renewable energies means giving up

80% of energy that is cheaper and more effective and might lead to increasing production costs and instability in the economy. This conflict weakens the activeness of global climate action and prompts countries to pass the buck on environmental protection.

China and the United States are the two largest economies in the world, being responsible for a huge percentage of global carbon emissions. China is in a golden age of rapid development, which is accompanied by a huge demand for energy, whereas the US is a highly industrialized energy-exporting country. Therefore, both countries require cheap and accessible energy resources to sustain economic growth, and undoubtedly unwilling to give up carbon emission rights. In the meantime, it is worth noting that China depends heavily on imported energies, which provide internal incentives for energy transition to increase energy security. The US is also making efforts to take the lead in the global renewable energy market and maintain its hegemony. Although collaboration between the two exists, rivalry pervades.

This paper seeks to explore the complicated game and rivalry between nations on energy transition, taking examples from China and the US. It first briefly reviews the strategies and actions of energy transition in China and the US. It then analyzes the rivalry between China and the US on energy transition and tries to provide suggestions to promote climate action.

2. Energy Transition in China

2.1. The Motives of Energy Transition in China

The Reform and Opening in 1978 energized the slumping economy in China. Productivity was greatly emancipated. Creativity was greatly inspired. The energy demand skyrocketed as aggregate supply expanded. Coal, cheap and abundant, gradually dominated the energy structure. Industrialization and urbanization also contributed to the growing demand for other fossil fuels like crude oil. In 2018, as the net importer of all fossil fuels, China consumed 21% of energy used worldwide. It imported 304 million tons of coal, 542 million tons of crude oil, and 102 million tons of natural gas, posing threats to energy security [5]. Carbon emissions and air pollution is inevitable under such intense consumption of fossil fuels. China emitted more CO₂ than the US and EU combined, being responsible for 28% of CO₂ emitted globally [6]. About 92% of the population was exposed to unhealthy air for more than 120 hours, causing 1.6 million deaths per year [7]. 133 million workdays that generate 1.34% of real GDP were lost because of air pollution [5]. By engaging in an energy transition, China can not only address its import reliance and environmental issues but also drive more sustainable economic growth, eventually securing a resilient future for its people.

2.2. The Strategies for Energy Transition in China

The Proposal of the Twelfth Five Year Plan (FYP) (2011-2015) symbolizes the official start of China's transition towards sustainability. By investing in strategic and emerging industries like new energy and materials, the Twelfth FYP aimed to cut energy intensity by 16% and increase the share of non-fossil fuel consumption to 11.4%. Despite setting new standards to continue the goals of reducing energy intensity and fossil fuel usage, the Thirteenth FYP (2016-2020) changed its policy from subsidy-oriented to market-oriented. The government leveled the benchmarks of the feed-in tariffs for renewable energy to create more competition among enterprises and encourage the grid parity of renewable electricity [8]. At the 75th United Nations General Assembly, China claims to reach the carbon emission peak in 2030 and carbon neutrality by 2060. Following the commitment, the Fourteenth FYP (2021-2025) aims to reduce carbon intensity by 18% and increase the share of non-fossil fuel consumption to 20%. However, to address energy security issues, the plan puts more attention on stabilizing coal production and increasing natural gas and oil production [9]. Overall, the government emphasizes the development of clean energy but still ensures the supply of fossil fuels to protect national energy security.

2.3. The Actions of Energy Transition in China

In 2012, only 2.1% of electricity was generated from renewable energies, with 61 GW and 3.4 GW of installed solar and wind power capacity. However, in 2017, the electricity generated from renewables doubled, reaching 5.3%. By the end of the Thirteenth FYP (2020), the installed capacity of solar energy was 186 GW, greatly exceeding the target of 110 GW [6]. Investments in green energy were expanding simultaneously. By 2014, China became the global leader in renewable investments, rising from 118 billion yuan in 2008 to 252 billion yuan [10]. The government was also collaborating with other countries to optimize energy structure and improve energy security. In 2014, China declared to import 38 billion m³ of natural gas from Russia annually, decreasing the use of coal by about 50 million tons, which might account for 46 million tons of CO₂ emission. Treaties are signed between Iran and China, stating that China will provide infrastructure for Iran, in exchange for continuous oil supply [5].

3. Energy Transition in the US

3.1. The Motives of Energy Transition in the US

The situation in the United States is more complicated compared to China, where arguments on energy transition pervasively exist. As the largest economy in the world and the second largest emitter, the US polluted 4.7 billion tons of CO₂ in 2020, undeniably causing serious trouble to the environment. More than 70% of the country's energy still relies on fossil fuels, with 38% of petroleum, 36% of natural gas and 9% of coal [11]. In addition, according to a survey conducted by Pew Research, about 70% of respondents wish to develop alternative clean energy and achieve carbon neutrality by 2050 [12]. This result infers that parties who act in energy transition might increase their competitiveness in the election. Nevertheless, renewable energy might be a threat to the US, especially the hegemony of the petrodollar. As an ideal substitute for petroleum, the usage of renewable energy will undeniably reduce the demand for crude oil. Without the liquidity provided by crude oil purchases, the US dollar will lose its value guarantee and thus lose its dominance in the global monetary market [13].

3.2. The Strategies of Energy Transition in the US

The strategies of energy of the US were influenced by the change in the ruling party. In 2009, President Obama took office and immediately prioritized climate actions. In the American Recovery and Reinvestment Act, he allocated more than \$90 billion in funds for renewable energy. Four years later, Obama's Climate Action Plan (CAP) included limits for greenhouse gas emissions and empowered the Environmental Protection Agency to regulate. Moreover, the CAP places attention on the energy efficiency of buildings and vehicles, further reducing CO₂ emissions. In 2015, showing the determination to combat climate change, the US joined the Paris Agreement. But the determination was soon ended by Trump, who believes emission restrictions will only limit economic growth. Most subsidies and policy supports were abolished. He declared to decrease the funds for renewable energy R&D, with some projects losing up to 91% of the budget [14]. The 2020 election was another turn. Democratic President Biden proposed, claimed by the White House, "the most ambitious agenda" and rejoined the Paris Agreement. The Chips and Science Act, the Infrastructure Investment and Jobs Act, and the Inflation Reduction Act, all newly issued, provided more than \$314 billion in subsidies for energy sectors and aimed to replace all fossil fuels by 2035 [15].

3.3. The Actions of Energy Transition in the US

The construction of clean energy facilities was increasing dramatically. The US installed a record 31 GW solar power capacity in 2023, which was 55% more than in 2022, reaching a total capacity of 161 GW. Wind energy reached 147 GW and was able to provide 11% of electricity supply. Renewable energies generated 1/4 of electricity in the US until mid-2023. The EV sales have been soaring after Biden's administration. By the end of 2023, both the number and the share of EV sales have broken

the record. The Bipartisan Infrastructure Law even specifically provided \$7.5 billion for EV charging stations [16]. The installation of renewable energy infrastructures, however, faced challenges. According to Susskind et al., there are seven main reasons for opposition, such as concerns for local wildlife, impacts on land value, and health issues. Over 80% of the cases include more than one concern. Thus, it is essential to fully consider the interests of all concerned before implementing renewable energy plans [17].

4. The Rivalry Between China and the US on Energy Transition

The anarchy of the international system makes rivalry inevitable. While each has its concerns, China and the US are competing fiercely on many different facets. On a political level, the US is struggling with internal partisan conflicts on energy transition. The nonacceptance of Trump towards climate change was hurting the US's influence and reputation. The withdrawal of several inter-government agreements during Trump's administration decreased the US's credits as a cooperative and responsible leader. On the contrary, China was gathering its partners through active collaboration and remarkable achievements. The commitment made to COP 21 energized the global climate action at a pivotal moment. The Belt and Road Initiative also provided a perfect opportunity for China to take the lead in energy supply by building solar panels in the Middle East, possibly keeping the 1.5 °C target [18]. Its centralized political system alleviated many policy uncertainties and provided a more focused target.

Another facet of their rivalry centered on trade, and to be specific, solar PV trade. Since 2000, China's PV industry has been expanding, soon taking over the international market. The cheap labor and more complete supply chain in China, added with intense government support, enable Chinese manufacturers to produce PV cells at a lower price. In 2011, US PV companies claimed that Chinese producers were dumping their products and receiving illegal subsidies from the government. Later, the Department of Commerce charged that Chinese products were hurting US producers. To protect domestic products from the onslaught of the Chinese, the US imposed unilateral tariffs ranging from 18.3% to the highest of 249.9% in 2011-12 and 2013-14. In response, China added 50% of preliminary anti-dumping on US producers to restrain its exports. The tariff gained US producers more market share. The imports of solar modules from China decreased by 92% first year after the sanction [19]. Although the sanctions worked, they didn't last long enough to break China's monopoly, which continued to take over most of the market share.

Historically, most crude oil supplies were controlled by the US because of the petrol dollar system. But nowadays, China mainly controls the critical materials required to construct renewable infrastructures, slightly shifting the international balance. Democratic Republic of Congo produces half of the cobalt (a mineral essential for producing batteries) worldwide. China sewed up 80% of its cobalt exports and related goods [6]. China is also the largest supplier of dysprosium, tellurium, gallium, neodymium, and indium, which are minerals used to manufacture solar panels and wind turbines. The Chinese government set export quotas to ensure its domestic supply, but this resulted in a continuous price increase. The price of neodymium rose from \$11/kg to \$286/kg in 2011 and the price of dysprosium rose from \$66/kg to \$2392/kg in the same year [20]. According to the Stanford Center on China's Economy and Institutions, China supplies 9 out of 13 minerals that the US relies on import the most. Whereas China only relies on beryllium imported from the US [21]. As the importance of renewable energy increases, the competition between states on vital minerals is destined to get more intense.

5. Conclusion

The energy transition presents both opportunities and challenges for China and the US. While both countries rely on fossil fuels and share the common goal of reducing carbon emissions, their motivations and approaches differ in many ways. China isn't benefiting a lot from its current energy

status, so it has a stronger will to engage in energy transition to extend economic growth and ensure energy security. The United States suffered from the consequent change of policy directions because of the shift in presidents. The US is also more market-oriented compared to China's government-oriented. This complex dynamic fosters rivalry between the two superpowers.

This rivalry manifests in several ways. Politically, China seeks to establish itself as a leader in global climate action, while the US struggles to maintain its international influence after the Trump administration retreats from environmental commitments. Economically, trade tensions pervade, where China's dominance in manufacturing clashes with US efforts to protect domestic industries. Protectionist tariffs stifle innovation and increase costs for consumers. On a resource dimension, China's control over critical minerals for renewable energy infrastructure presents a potential chokehold to the US's resource safety.

A delicate balance between competition and cooperation is necessary. First, both nations must fully recognize the urgency of the climate crisis and bridge the division. Second, instead of implementing protectionism tariffs, countries should understand that trade is a mutual win. Third, a multilateral platform should be established, responsible for controlling the prices of vital materials and distributing them effectively. Lastly, fostering joint research and development efforts can accelerate innovation in clean energy technologies.

By fostering open communication, establishing international platforms, and promoting responsible actions, nations can flourish in a new era of sustainable development that benefits all.

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