

SINO-RUSSIAN "ENERGY MARRIAGE": EVIDENCE OF COOPERATION FROM THE BELT AND ROAD INITIATIVE

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Abstract: Energy plays a vital role as the lifeblood of economic development, and China's rapid economic growth necessitates a stable and secure energy supply. In this context, energy trade between China and Russia, under the framework of the of the *One Belt One Road* initiative, becomes a crucial element of China's energy strategies. This paper employs a combination of quantitative and qualitative methods to comprehensively analyze the historical, current, and future aspects of energy cooperation between the two nations. Amidst the current international landscape, the energy cooperation structures of China and Russia exhibit complementarity, rendering the energy collaboration between both countries mutually beneficial. Hence, it is essential for China and Russia to reinforce their energy cooperation further, paving the way for a prosperous and symbiotic relationship in the energy sector.

Keywords: Sino-Russian Energy, the Belt and Road Initiative, Oil, Natural Gas

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Received March 15, 2023

Accepted May 9, 2023

Conflict of interests: The authors declare the absence of conflict of interests.

The relationship between China and Russia in terms of energy cooperation has gained significance, particularly with the implementation of *China's Belt and Road Initiative (BRI)*. China, being the world's largest energy importer, requires a substantial amount of energy to fuel its national development. However, its domestic energy production falls short of meeting this demand, necessitating significant energy imports.

China's proposal of the Silk Road Economic Belt in 2013 aimed to promote international cooperation, including in the energy sector. As the world's largest energy exporter, Russia's energy resources align with China's energy demand, making it an attractive partner for Russia's energy supply, and creating mutual interests between the two countries for energy cooperation. Sino-Russian relations have become increasingly important since the collapse of the Soviet Union, and they currently enjoy a period of strong bilateral ties. The rising energy security risks faced by China, especially concerning transportation routes through the Straits of Hormuz and the Straits of Malacca, further emphasize the need for energy cooperation with Russia to mitigate geopolitical risks.

While China imports a significant amount of energy from the Middle East, the tensions between China and the United States contribute to energy security concerns. Additionally, Russia, facing sanctions from Europe, the United States, and its allies, has been seeking new energy markets. The energy cooperation between China and Russia within the Belt and Road Initiative holds substantial potential, but the energy infrastructure in both countries is currently insufficient to meet their respective demands. Challenges and problems still exist in the energy cooperation between the two nations, necessitating the development of advanced energy technologies and further collaboration (Sun).

The Belt and Road Initiative aims to create a "community of interests" and establish win-win situations through cooperation with partner countries. As the largest country within the initiative and a neighbor to China, Russia is undoubtedly one of China's most important partners. The initiative further promotes energy cooperation between the two countries, ensuring China's energy security and resolving Russia's energy export dilemmas while fostering stability and development in both economies (Liu & Tang, 2017).

The COVID-19 pandemic, along with international capital flow fluctuations and exchange rate fluctuations, has led to a decrease in global aggregated energy demand. This situation has prompted Russia to "turn to the East" and strengthen regional cooperation with China. Governments are actively working towards bilateral cooperation, with China's rapidly growing economy set to increase its demand for imported energy. Research on Sino-Russian trade related to the Belt and Road strategy is still limited, highlighting the need to analyze energy cooperation between the two countries within the context of the Belt and Road Initiative (Li, 2016).

To address this research gap, scholars have focused on the necessity and current development status of energy cooperation between China and Russia. This study aims to analyze the energy trade patterns and prospects between

the two countries under *the Belt and Road Initiative* based on relevant data. The hypothesis suggests that energy trade between China and Russia will continue to grow in the future. The study adopts a mixed-method approach, combining qualitative and quantitative analyses to systematically examine the foundation of energy cooperation between China and Russia. Mathematical models inspired by the prediction models used in the BP Statistical Review of World Energy are applied to evaluate indicators such as Gross Domestic Product (GDP), Total Energy Consumption (TEC), Natural Gas Import (NGI), and Oil Import (OI) to assess the current cooperation and predict future energy trends (Jiang).

Energy plays a crucial role in a country's national economic development, and for China, as the world's largest industrial nation, meeting its substantial energy demands is a challenge due to limited domestic production. As a result, China heavily relies on energy imports.

In 2013, China introduced the *Silk Road Economic Belt*, which facilitated international cooperation in its energy sector. Given China's position as the world's largest energy importer and Russia as the leading energy exporter, their geographic proximity aligns their energy needs and supplies. China's vast market and financial capabilities make it an attractive partner for Russia's energy supply, creating mutual interests in energy cooperation. Since the collapse of the Soviet Union, Sino-Russian relations have grown in importance, and they currently enjoy a strong bilateral bond. To mitigate energy security risks due to geopolitics, strengthening energy cooperation with Russia becomes imperative for China.

While China imports a significant amount of energy from the Middle East, the transportation routes through the Straits of Hormuz and Malacca pose risks to its energy security, particularly given tensions with the United States. Additionally, Russia, facing sanctions from Europe and its allies, has been exploring new energy markets. Although the *Belt and Road Initiative*-based energy cooperation between China and Russia holds great potential, their current energy infrastructure falls short of meeting the demand, and challenges persist in their cooperation. Developing advanced energy technology is vital for their future collaboration (Sun, 2013). Furthermore, some regions pose challenges in energy extraction and transportation (Liu, Tang, 2017).

The *Belt and Road Initiative* aims to create a "community of interests" by fostering cooperation with partner countries, and Russia, as China's neighbor and the largest country within the initiative, is a crucial partner. This initiative promotes energy cooperation between the two nations, ensuring China's energy security and addressing Russia's energy export dilemmas, thereby fostering stability and development in both economies (Liu & Tang, 2017).

The global COVID-19 pandemic, along with fluctuations in international capital flow and exchange rates, resulted in a decrease in the aggregated global energy demand. As a response to this situation, Russia has been increasingly turning its focus to the East and strengthening regional cooperation with China (Li, 2016). Governments have been actively engaging in bilateral efforts to foster cooperation. Qing (Jiang, 2017) highlighted the rapid growth of China's economy

and the consequent increase in its demand for imported energy. In this context, the relationship between China and Russia regarding energy cooperation has achieved significant progress in areas like oil, coal, and natural gas. However, research on Sino-Russian trade within the *Belt and Road* strategy remains limited, making it crucial to analyze energy cooperation between the two countries under the framework of the *Belt and Road Initiative*.

Existing research primarily focuses on the necessity and development status of energy cooperation between China and Russia. Scholars recognize that Russia possesses abundant energy resources, such as oil, coal, and natural gas, and is willing to export them in substantial quantities. This study aims to explore the energy trade patterns between the two countries and analyze their prospects for energy trade under the *Belt and Road Initiative*, using relevant data. The hypothesis posits that energy trade between China and Russia will continue to grow in the future. The research adopts a mixed-method approach, combining qualitative and quantitative analyses to systematically examine the foundation of energy cooperation between the two nations. Mathematical models, inspired by the prediction models of the BP Statistical Review of World Energy, are applied to evaluate indicators like Gross Domestic Product (GDP), Total Energy Consumption (TEC), Natural Gas Import (NGI), and Oil Import (OI) to assess the current cooperation and predict future energy trends. GDP serves as a significant indicator to reflect future energy status.

In 2020, global energy consumption experienced a significant decline of 4.5% due to the COVID-19 pandemic, resulting in substantial decreases in petroleum, natural gas, and coal demand. Specifically, oil demand dropped by 9.3%, while natural gas demand decreased by 2.3%, and coal consumption declined by 4.2%¹. Notably, China emerged as the only country with a positive growth in oil demand, experiencing an increase of 220,000 barrels per day².

In terms of natural gas demand, Russia and the United States witnessed the largest decreases of 33 billion cubic meters and 17 billion cubic meters, respectively. Conversely, China and Iran demonstrated the most significant increases in natural gas demand, with growths of 22 billion cubic meters and 10 billion cubic meters, respectively³. Coal consumption experienced a decline of 6.2 exajoules (EJ) or 4.2%, with the United States and India accounting for the largest decreases of 2.1 EJ and 1.1 EJ, respectively⁴. On the other hand, China and Malaysia registered the most substantial increases in coal demand, with growths of 0.5 EJ and 0.2 EJ, respectively⁵. Despite an overall decrease of 0.9%⁶ in global power gener-

¹ Statistical Review of World Energy, 70th edition (2021) BP. Available at: <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2021-full-report.pdf> (accessed 20 June 2023).

² Ibid.

³ Ibid.

⁴ Ibid.

⁵ Ibid.

⁶ Ibid.

ation, the demand for renewable energy witnessed significant growth, particularly in solar energy generation. The proportion of renewable energy in the global power generation reached an all-time high, resulting in a decline in the global demand for coal in the electricity sector. China and the United States emerged as the leading countries with the largest growth in renewable energy demand, with increases of 1.0 EJ and 0.4 EJ, respectively.

The United States, India, and Russia experienced the largest declines in energy consumption, whereas China demonstrated a growth rate of 2.1%, making it one of the few countries with increasing energy demand in 2020. Overall, the global energy structure is undergoing diversification, with renewable energy market shares witnessing significant growth⁷.

China's Energy Situation

China's energy demand has been witnessing strong growth in traditional fossil energy sources, particularly coal and oil. As of 2018, coal consumption accounted for 58.25% of China's primary energy consumption (Gu, 2021). In 2020, approximately 55.4% of China's oil demand and 41.6% of its natural gas demand were dependent on imports. While the proportion of raw coal consumption in China decreased by nearly 12% from 2018 to 2018, the overall coal consumption remained relatively stable from 2016 to 2020 (Gu, 2021). Over the past decade, China's oil consumption has experienced an average growth rate of 5.3%, making natural gas the third most consumed traditional energy source. Although natural gas does not hold a prominent position in China's primary energy consumption, its demand has been rapidly growing, with an average annual growth rate of 13.1% from 2010 to 2020⁸. Amid China's ongoing energy transformation and revolution, the renewable energy sector has shown remarkable progress. China ranks first globally in hydropower and wind power generation. By the end of 2020, China's renewable energy power generation capacity reached 2,082.8 billion kWh, accounting for 27.32% of the country's total power generation (Gu, 2021). Additionally, 70% of China's new power generation in 2020 was sourced from renewable energy (Gu, 2021).

Russia's Energy Situation

As one of the major energy-exporting countries globally, Russia holds the highest export volume of natural gas and relies significantly on the energy industry as a primary economic sector. Russia's proven natural gas reserves consistently rank first in the world. Natural gas is the primary energy source in Russia, followed by oil and coal. Russia's natural gas consumption constitutes more than half of its total energy consumption, with nuclear and hydropower accounting for approximately 5% of the country's overall consumption. Crude oil and natural gas

⁷ Ibid.

⁸ National Statistics Bureau (n.d.) Available at: <https://data.stats.gov.cn/> (accessed 20 June 2023).

production contribute to approximately 80% of Russia's total energy production. Due to its abundant oil and gas resources, Russia heavily depends on energy exports, enjoying a significant resource endowment advantage in this regard. While Russia primarily focuses on traditional energy sources such as oil and natural gas, its renewable energy industry remains relatively underdeveloped.

Foundation of Sino-Russian Energy Cooperation under the Belt and Road Initiative

Foundation of Political Cooperation

Sino-Russian energy cooperation is built upon a strong basis of mutual dependence and political alignment. Russia was among the earliest supporters of China's *Belt and Road Initiative*, aiming to foster regional economic growth, mutually beneficial economic cooperation, and ensure peace and stability in the vast Eurasian region. By combining the *Belt and Road Initiative* with the Eurasian Economic Union, deeper cooperation between China and Russia becomes feasible in energy and other industries. Currently, Sino-Russian relations have reached an unprecedented level of strength. Both countries are facing increasing pressures from the Western world, yet they share no fundamental conflicts of interest at this stage. Given the global situation, it becomes crucial for China and Russia to strengthen economic, cultural, and political cooperation. On one hand, as the Sino-US trade war commenced on March 22, 2018, tensions between China and the United States escalated, posing heightened energy security risks for China. On the other hand, Russia's special military operations in Ukraine since 2022 have further strained its relations with Western countries, leading to increased economic sanctions against Russia and international isolation. Therefore, promoting energy and other forms of cooperation within the framework of the *Belt and Road Initiative* serves as an effective countermeasure for Russia to improve its ties with China and mitigate the impact of international isolation. For China, such cooperation helps reduce its dependence on sea routes for energy imports and minimizes energy security risks.

Foundation of Economic Cooperation

China's continuous economic growth has led to a surge in its energy demand, making it the world's largest energy importer. In 2020, over half of China's oil demand (55.4%) and a significant portion of its natural gas demand (41.6%) relied on imports. China's appetite for natural gas is also rapidly expanding. As Russia stands as the world's largest energy and natural gas exporter, expanding its energy exports to China not only boosts Russia's energy revenue but also supports the sustainable development of its economy. Considering China's role as the "world's factory" for the foreseeable future, its strong and sustained energy demand presents a promising market for Russia for decades to come. For Russia, further energy cooperation with China helps alleviate its dependence on the EU market and offsets the impact of sanctions. As Russia's energy export share

dwindles, finding new energy export destinations is crucial to avoid an economic downturn in the energy industry. China serves as an ideal market for Russia in this regard. Moreover, Russia possesses vast untapped energy resources, but limited opportunities for development within its domestic economic structure. In contrast, China exhibits the willingness and ample capital to invest in the exploitation of these resources, providing substantial output for energy projects in Russia.

Analysis of Sino-Russian Energy Cooperation based on the Belt and Road Initiative

The Development of Sino-Russian Energy Cooperation

The cooperation between China and Russia in the field of oil can be divided into five distinct stages. The first stage, from 1991 to 2000, saw the beginning of energy cooperation when China became an oil importer in 1993. During this period, China mainly imported refined oil from Russia. However, the scale of cooperation remained relatively small, with China's total oil imports reaching 200,000 tons in 1999.

The second stage, spanning from 2000 to 2004, witnessed further advancements in energy cooperation due to China's expanding economy and increasing energy demand. However, issues related to oil transportation pipelines between the two countries limited the progress of cooperation during this period.

In the third stage, from 2004 to 2009, China and Russia achieved significant breakthroughs in energy collaboration. The total volume of Sino-Russian oil trade surpassed 10 million tons in 2004, and both countries jointly established an oil company to explore Russia's domestic energy resources.

The fourth stage, occurring from 2009 to 2013, marked a new phase in Sino-Russian energy cooperation with the official deployment of the Sino-Russian oil transportation pipeline. During this period, the two countries also initiated a cooperation model involving "repaying loans with oil."

The fifth stage, beginning in 2013 and continuing to the present, represents a new era in China-Russia energy cooperation, driven by the *Belt and Road Initiative*. In this stage, Russia began providing China with 15 million tons of oil annually through the oil transportation pipelines. By 2016, Russia became China's largest source of oil imports, exporting 52.5 million tons of oil to China, marking a 24% increase. Additionally, a new oil pipeline from Russia to China began operations in 2018.

Regarding natural gas cooperation, it commenced in the 1990s but faced challenges due to disagreements between the two countries over natural gas pricing. However, in 2007, two natural gas transportation lines were established between China and Russia. In 2013, Gazprom and CNPC signed a framework agreement on Russia's supply of natural gas to China via the Eastern Route. Subsequently, China purchased nearly 20% of shares in the Yamal LNG project. The initiation of the "Belt and Road Initiative" accelerated natural gas cooperation between China and Russia. In 2014, CNPC and Russia's Gazprom signed the "Si-

no-Russian East Route Gas Supply Contract. The “Power of Siberia” began connecting the eastern route of the China-Russia natural gas pipeline in 2015. Furthermore, on December 8, 2017, the first production line of the Yamal LNG Project, an energy cooperation project between China and Russia, was officially put into use.

Current Situation and Prospect for Sino-Russian Energy Trade

China and Russia, being neighboring countries, possess a unique geographical strategic advantage that facilitates energy trade between them, particularly through land pipeline transportation, which reduces transportation costs and risks. Leveraging the strong political and economic foundation of energy cooperation and the *Belt and Road Initiative*, the mutual energy trade between China and Russia is expected to continue its growth trajectory. China’s industrial development and increasing energy consumption demands will be a crucial driver for its reliance on Russian energy imports, while Russia seeks stable energy revenue to safeguard its national economy.

To forecast China’s future energy demand, we have employed mathematical models analyzing Energy Consumption (TEC), Natural Gas Import (NGI), Oil Import (OI), and Gross Domestic Product (GDP) with lags. The data utilized in these models is sourced from the National Statistics Bureau of the People’s Republic of China. By considering GDP as the independent variable, we estimate its relationship with other indicators. The lag is set at 6 or 7 to predict future data over the next few years. We present three models for predicting China’s future energy demand, taking into account these key factors.:

$$\text{TEC}_t = \beta_4 + \beta_1 \text{GDP}_{t-7} \quad (1)$$

$$\text{NGI}_t = \beta_2 \text{GDP}_{t-6} \quad (2)$$

$$\text{OI}_t = \beta_5 + \beta_3 \text{GDP}_{t-6} \quad (3)$$

Table 1. Estimation Result

	Variables	Abbr.	Coefficient	Intercept	R2	Observation
Model 1	Total Energy Consumption	TEC				44
	Gross Domestic Product	GDP	β_1 0.595*** (0.07)	β_4 2296*** (0.0002)	0.741	
Model 2 (No Intercept Model)	Natural Gas Import (100 billion cubic meter)	NGI				30
	Gross Domestic Product	GDP	B_2 0.0023*** (0.0003)	-	0.761	

	Variables	Abbr.	Coefficient	Intercept	R2	Observation
Model 3	Oil Import (10000 tons)	OI				42
	Gross Domestic Product	GDP	β_3 0.075*** (0.014)	β_5 1103*** (338.7)	0.570	

All coefficients are positive, which represents the positive correlation between energy growth and economic development. If China's economy continues to grow in the future, energy imports will continue to increase. The predicted results are as follows:

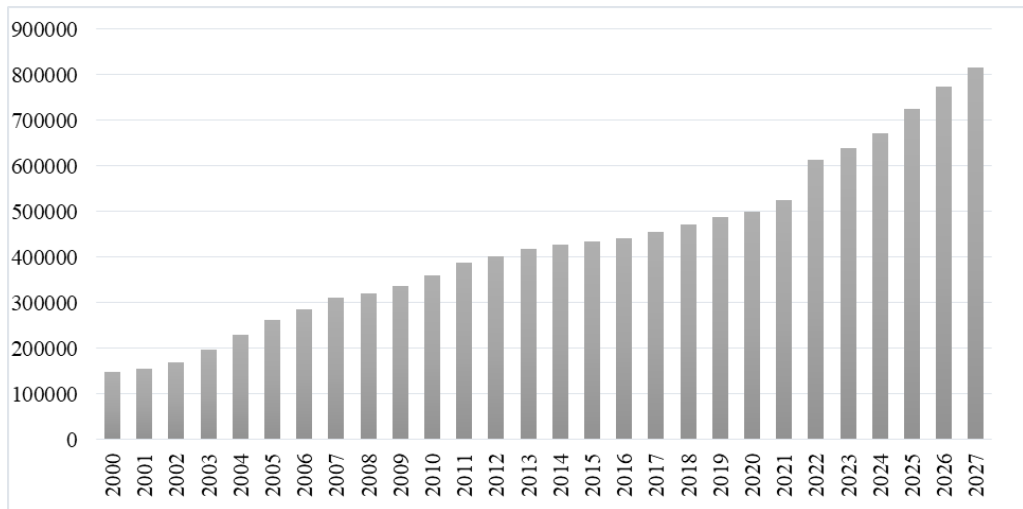


Figure 1. Total Energy Consumption (10000 tons)⁹

Note: the total energy consumption from 2002 to 2019 was the actual data, and the data from 2022 to 2027 was the estimated consumption based on our model.

⁹ Source: National Statistics Bureau of People's Republic of China and Estimation Result of the model.

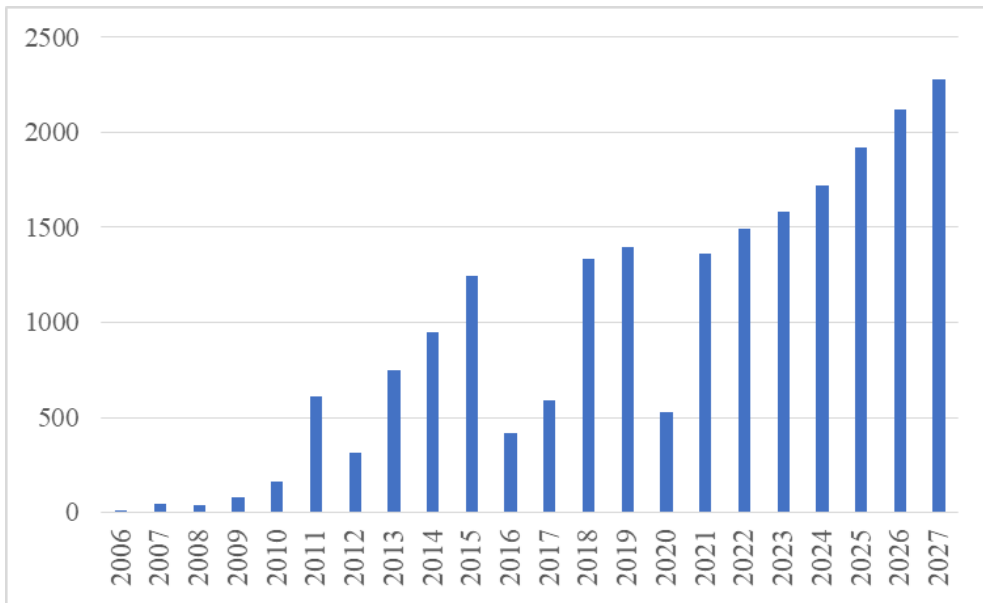


Figure 2. Natural Gas Import (100 billion cubic meter)¹⁰

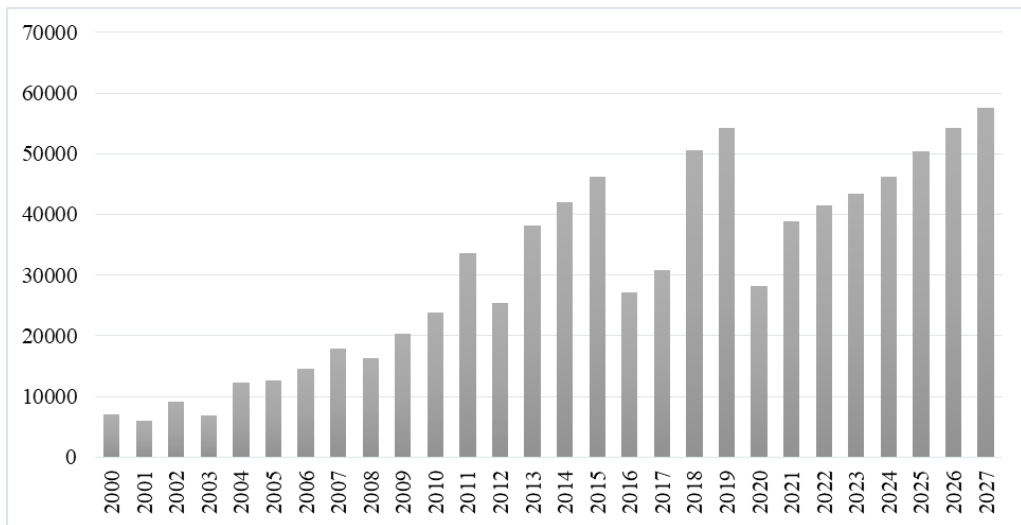


Figure 3. Oil Import (10000 tons)¹¹

¹⁰ Source: National Statistics Bureau of People’s Republic of China and Estimation Result of the model.

¹¹ Source: National Statistics Bureau of People’s Republic of China and Estimation Result of the model.

Potential Challenges to Sino-Russian Energy Cooperation

Energy infrastructure issues present potential challenges to the cooperation between China and Russia. Most Russian industrial regions are situated in the west, with supporting facilities for energy development also concentrated in this area. In contrast, the Russian Far East region faces economic recession and infrastructure deficiencies, resulting in significantly higher costs for energy development and utilization. Energy transportation in this region heavily relies on railways, yet the transportation capacity falls short of demand. However, the substantial investment required for infrastructure development in the region poses a challenge, compounded by relatively low returns on investment. Both China and Russia have shown limited enthusiasm for investing in energy infrastructure. Currently, traditional energy transportation facilities are utilized between the two countries, but they prove insufficient to support the growing energy transportation needs.

China's rapid development in clean energy and renewable technology further impacts Sino-Russian energy cooperation. China boasts abundant shale gas reserves, and as shale gas mining technology advances, China is poised to exploit this resource, potentially influencing Russia's natural gas export business to China. Moreover, China's domestic renewable energy technology has seen remarkable progress, with renewable energy power generation accounting for 27.32% of the country's total power generation (2,082.8 billion kilowatt-hours) by 2020. This significant increase from 17.42% (736.4 billion kWh) in 2010 indicates substantial growth in renewable energy generation, which may reduce the market share of traditional energy sources.

China's energy security concern poses another challenge to the energy cooperation with Russia. In 2020, China heavily relied on imports for 55.4% of petroleum, 42.6% of natural gas, and 7% of coal. China's low energy self-sufficiency rate raises serious energy security issues, considering its high dependence on imported energy. As imported energy lacks stability, any energy shortage could inflict significant damage on the Chinese economy. To address this, China has adopted countermeasures, including diversifying energy imports and advancing alternative energy technologies to mitigate overreliance on a single energy resource, as seen in some European countries. The Chinese government's support for new energy and renewable industries reflects its efforts to boost domestic energy production and enhance energy self-sufficiency. These measures are aimed at safeguarding China's energy security amidst the challenges of energy cooperation with Russia.

Conclusion

In this study, we utilized data obtained from the National Statistics Bureau of the People's Republic of China and employed mathematical models to examine the relationship between Gross Domestic Product (GDP) and key energy-related macro-factors, including Energy Consumption (TEC), Natural Gas Import (NGI), and Oil Import (OI). Our findings revealed a positive correlation between economic development and energy growth in China, suggesting that the continuous

expansion of the Chinese economy is likely to drive an increase in energy consumption. As China's energy needs rise, it becomes imperative for the country to adopt an energy diversification strategy encompassing multiple energy import channels, new energy development, and indigenous energy technology transformation.

Russia possesses vast and abundant energy reserves due to its extensive territory, making it a reliable energy supplier for China, creating a mutually beneficial partnership between the two nations. The energy cooperation structure between China and Russia is well-aligned and advantageous to both parties. The initiatives of China's *Belt and Road Initiative* and Russia's "Focusing on the East" strategy, along with the signing of the "Joint Statement on the Cooperation of Co-Construction of the Silk Road Economic Belt and the Eurasian Economic Union," have provided a stable political and economic framework for energy cooperation between the two countries.

While there may be uncertainties in the energy cooperation between China and Russia, both nations should capitalize on the opportunities presented by the "Belt and Road Initiative," enhance political trust, and prioritize further energy cooperation. For China, its reliance on fossil energy will persist until complete industrial transformation occurs, and despite efforts to diversify its energy sources, energy supply from Russia will remain crucial for sustaining its current level of industrial development. On the other hand, Russia's relations with Western economies, such as the European Union and the United States, have been precarious, with these economies employing political means to exert control over Russia's energy sector, impacting its energy exports. Accelerating the construction of energy infrastructure, such as gas pipelines between Russia and China, can ensure the security of energy exports and provide stability to Russia's domestic economy in the foreseeable future.

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