

Energy Production, Energy Consumption and Energy Governance of the Belt and Road Regions

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Abstract: Energy is the strategic resource for the economic and social development of countries along the Belt and Road. The outbreak of COVID-19 and the geopolitical conflict between Russia and Ukraine have created important impacts on the energy supply chain and energy governance. The Belt and Road regions covers the Asian, European and African continents, including not only countries and regions rich in oil and gas resources, such as Russia, West Asia and Central Asia, but also involving important global energy consumption areas, such as China and India. The paper analyzed the energy production and energy consumption structure of Belt and Road regions. Following that, the paper analyzed the development of energy governance of Belt and Road regions, and stated the new challenges in terms of the geopolitical risks, increasing energy market competition, and common energy market for the countries along the Belt and Road. Finally, the paper put forward countermeasures and suggestions to improve the energy governance of the Belt and Road regions which include strengthening energy cooperation mechanism, building energy resilient supply network, accelerating the development of a common regional energy market, improving clean energy cooperation. All these strategies will help to improve energy security of countries along “Belt and Road”, and sustain healthy and stable development of the national economy.

Keywords: Energy Production, Energy Consumption, Energy Governance, Belt and Road

1. Introduction

Energy is the strategic resource for the global economic and social development [1-7]. In 2015, the 193 member states of the United Nations adopted the Sustainable Development Goals, which set out to ensure access to affordable, reliable and sustainable modern energy for all by 2030. The Belt and Road regions covers the Asian, European and African continents, including not only countries and regions rich in oil and gas resources, such as Russia, West Asia and Central Asia, but also involving important global energy consumption areas, such as China and India. According to BP World Energy Statistics 2021 [8], oil reserves in the Belt and Road region in 2020 were 138.9 billion tons, accounting for 59.2% of global oil reserves. Natural gas reserves reached 147.9 trillion cubic meters, accounting for 78.6% of global natural gas reserves. However, the distribution of energy resources under BRI is uneven, with oil and gas resources mainly concentrates in the

Middle East and the CIS region. In 2020, the oil reserves of the Middle East and the CIS region reached 133.1 billion tons, and the natural gas reserves of the two regions had 132.4 trillion cubic meters [8].

Due to the strategic nature of energy resources, the large number of participating countries, the prominent problem of ecological destruction and geopolitics, the energy security problem of the countries along the belt and Road also exists and becomes increasingly important. Especially the outbreak of COVID-19 has triggered a deep adjustment in the global energy market, which has disturbed the supply chains of energy producing countries [9]. In the February 2022, the geopolitical conflict between Russia and Ukraine has led to a complete ban on Russian oil in the European region at the end of 2022, resulting in the disruption and adjustment of the supply chain of oil and gas resources in the Belt and Road regions. This paper analyzed the current situation of energy production and consumption in the Belt and Road regions. Following that, the paper analyzed the development of energy

governance of Belt and Road regions, and stated the new challenges in terms of the geopolitical risks, increasing energy market volatility, and common energy market for the countries along the Belt and Road. Finally, the paper put forward countermeasures and suggestions to improve the energy governance of the Belt and Road regions.

2. Energy Production and Consumption of the Belt and Road Regions

2.1. Energy Production of the Belt and Road Regions

The countries along the “Belt and Road” have abundant reserves of oil, natural gas and coal resources. Table 1 shows the energy production of the Belt and Road regions from 2015-2021. In 2015, the oil production of countries along the “Belt and Road” was 51.54 million barrels per day, accounting for 54.7 percent of total global oil production. The natural gas output of countries along the Belt and Road was 1829.8 billion cubic meters, accounting for 52.9 percent of the world’s total natural gas output. The coal output of the Belt and Road regions was 124.8 EJ, accounting for 71.4 percent of the

world’s total coal output. The COVID-19 pandemic had a dramatic impact on energy markets with primary energy falling at their fastest rates since the Second World War. In 2020, the oil production of the Belt and Road regions was 47.85 million barrels per day, a decrease of 7.4 percent compared with that of 2019. The natural gas output of the Belt and Road regions was 2108.8 billion cubic meters, with a slight decrease compared to 2019. The coal output of the Belt and Road regions was 130.86 EJ and achieved a decrease of 1.5 percent compared to 2019.

Facing the economic recession caused by the COVID-19 pandemic, major economies in the world have launched economic revitalization plans. As the global economy recovers from the recession, the demand for energy in transportation and other industries around the world has soared. In 2021, the oil production of countries along the Belt and Road reached 48.65 million barrels per day. The natural gas output of countries along the Belt and Road was 2108.8 billion cubic meters, with an increase of 6.2 percent compared that of 2020. The coal output of countries along the Belt and Road was 130.86 EJ and achieved an increase of 6.0 percent compared to 2020.

Table 1. Energy Production of the Belt and Road regions.

Year	Oil/thousands of barrels per day	Natural gas / billion cubic metres	Coal / Exajoules
2015	51543	1829.8	115.63
2016	53225	1852.7	110.36
2017	52736	1922.3	113.61
2018	53180	1993.3	121.37
2019	51672	2031.9	125.31
2020	47845	1985.8	123.42
2021	48650	2108.8	130.86

Source: Calculated from BP Statistical Review of World Energy 2022 [10].

2.2. Energy Consumption of the Belt and Road Regions

The energy consumption of the Belt and Road regions played an important role in the global energy consumption market. Table 2 shows the energy consumption of the Belt and Road regions from 2015-2021. In 2015, the oil consumption of the Belt and Road regions was 38.43 million barrels per day, accounting for 40.8 percent of total global oil consumption. The natural gas consumption of the Belt and Road regions was 1618.5 billion cubic meters, accounting for 46.6 percent of total global natural gas consumption. The coal consumption of the Belt and Road regions reached 115.08 EJ, accounting for 72.6 percent of the world’s total coal consumption. However, in 2020, the COVID-19 severely impacted the global economy, leading to a sharp decline in demand for crude oil, natural gas and other energy sources. The primary energy demand in 2020 was 4.5% lower than that in 2019, reaching 556.63 EJ. In 2020, the oil consumption of countries along the Belt and Road was 47.85 million barrels per day, a decrease of 7.4 percent compared with that of 2019. The natural gas consumption of

countries along the Belt and Road was 2108.8 billion cubic meters, with a slight decrease compared to 2019. The coal consumption of countries along the Belt and Road was 130.86 EJ and achieved a decrease of 1.5 percent compared to 2019.

In 2021, the oil consumption of the Belt and Road regions reached 42.91 million barrels per day, achieving an increase of 5.0 percent compared to that of 2020. The natural gas consumption of the Belt and Road regions was 2108.8 billion cubic meters, with an increase of 7.5 percent compared that of 2020. The coal consumption of the Belt and Road regions was 126.16 EJ and achieved an increase of 5.8 percent compared to 2020. From the perspective of total energy consumption, China is the main driving factor for the growth of energy demand in the regions along the “Belt and Road”. From 2005 to 2021, the average annual increase in energy consumption in China accounted for 56.23% of total regional consumption. Even when the global economy downturn in 2020, China’s total energy consumption was also increased and reached 145.46 EJ.

Table 2. Energy Consumption of the Belt and Road regions.

Year	Oil/thousands of barrels per day	Natural gas / billion cubic metres	Coal / Exajoules
2015	38434.8	1618.5	115.08
2016	39950.8	1667.9	115.13
2017	41366.9	1740.1	116.22
2018	42552.9	1832.5	118.48
2019	43302.9	1866.5	120.68
2020	40862.9	1869.7	119.23
2021	42908.9	2010.6	126.16

Source: Calculated from BP Statistical Review of World Energy 2022 [10].

3. Current Situation and Main Challenges of Energy Governance in the Belt and Road Regions

3.1. Current Situation of Energy Governance in the Belt and Road Regions

By following the principle of joint discussion, joint building and shared benefits, the “Belt and Road Initiative (BRI)” energy cooperation takes into account interests and cooperation intentions of all parties and is committed to promoting practical international energy cooperation, which reflects new concepts and practices.

The “BRI” energy cooperation promotes the establishment of regional energy cooperation mechanism and strengthens regional energy planning and coordination. In 2019, the “BRI” Energy Cooperation Partnership Relationship was officially established, the Cooperative Principles and Practical Actions of the “BRI” Energy Cooperation Partnership were issued, and the biennial “BRI” Energy Ministerial Conference was established. At the conference in 2021, the Charter of the “BRI” Energy Cooperation Partnership, the Qingdao Initiative of “BRI” Green Energy Cooperation, and the Best Practice Cases for “BRI” Energy Cooperation were adopted, and the “BRI” Energy Cooperation Partnership Network was established.

The “BRI” energy cooperation promotes the coordinated development of regional energy infrastructure, energy industry chain and energy financial system [7]. China has strengthened major cooperation projects with key countries such as Russia, Saudi Arabia, and Kazakhstan in fields like energy infrastructure, oil refining and chemical industry and energy equipment manufacturing. In terms of transnational and trans-regional energy infrastructure, a number of large projects such as the central Asia energy pipelines, and China-Russia oil and gas pipelines have been put into operation successively. Seven countries, including China, Russia, and Mongolia, have been interconnected through power grids. Twelve energy projects of China-Pakistan Economic Corridor (CPEC) are in operation or under construction, which promotes the optimal allocation of regional energy more widely. In terms of energy finance, Asian Infrastructure Investment Bank (AIIB) approved twenty-nine energy projects with a total investment of US \$5.6 billion from 2016 to 2021, covering fifteen countries in Southeast Asia, South Asia, Central Asia, and West Asia.

With profound changes in the global energy supply and consumption pattern, emerging economies, represented by China, India, have become an important force in promoting the transformation of global energy governance to low-carbon and clean energy. In 2020, China, India and Pakistan invested \$153.4 billion in wind power, solar photovoltaic and other new energy, surpassing developed countries for the first time since 2014. In 2020, the COVID-19 pandemic and the economic downturn made the global energy consumption decrease by 4.5%, and the global carbon emissions decrease by 6.0% [8]. The clean energy production of the Belt and Road regions was 1,226.8GW, with an increase of 15.6% compared with that of 2019, accounting for 39.0% of the world’s clean energy production. From 2011 to 2021, the world’s clean energy production increased from 908.3GW to 3657.2GW [10], with an increase of 3.0 times; at the same time, the clean energy production of the Belt and Road regions increased from 198.8GW to 1652.9GW, with an increase of 7.3 times. The growth rate of the Belt and Road regions was much higher than that of the world. According to the production of clean energy in the “BRI” countries and carbon emissions data of BP World Energy Statistics, among “BRI” countries, only China and India were included in the world’s top ten clean energy producing countries in 2021, with the production of 1323.9 GW, accounting for 36.2% of the world’s clean energy production.

3.2. Main Challenges of Energy Governance in the Belt and Road Regions

The core goal of energy governance is a diversified system, which mainly covers the security of energy supply and demand, international security, environmental sustainability, climate change and domestic governance [11-16]. In the 21st century, energy governance faces challenges from geopolitics, dysfunctional energy policies, fragmented mechanisms, climate change, governance objectives, participating countries and resource markets [17-21].

Global energy governance aims at the international community to manage and allocate energy resources, formulate and implement relevant rules to meet energy challenges, and build a secure and stable global energy system to ensure sustainable economic and social development. In the 21st century, the global energy governance system dominated by western developed countries and a few countries with oil and gas resources has gradually fallen into a dilemma due to multiple challenges

such as climate change, geopolitics and energy market volatility. The outbreak of COVID-19 caused severe shocks in the global energy market, and the global energy market continued to rise sharply in 2021, reversing the collapse of the decline. Enter in September 2021, energy prices continue to rise, causing European gas shortages, the oil shortage, European electricity and gasoline prices in the United States, emerging economies such as China and Brazil in electricity, India present coal shortage, the resulting energy crisis looming in the global scope, severe disability highlights existing global energy governance system.

In recent years, oil and natural gas production in the United States has continued to increase, driven by the shale gas revolution. The United States, Russia and Saudi Arabia have become the leading forces in global energy supply. In 2021, the three countries accounted for 41.8 percent and percent of global oil production and exports, and 43.4 percent and 27.6 percent of global natural gas production and exports, respectively. The alliance and fierce competition for global energy dominance are intensifying. Saudi Arabia and Russia have seen their oil and gas exports decreased as U.S. crude oil and natural gas exports has increased and reached record levels since 2020. In particular, in the context of the Russia-Ukraine conflict, Russia's Nord Stream 2 project has been suspended; the EU has imposed eight rounds of sanctions on Russia, and completely banned the import of Russian oil by the end of 2022. The influence and discourse of the US in the global energy market will be greatly enhanced.

The "Belt and Road" region plays an important role in the world in terms of energy production and consumption, but the prices of Western trading platforms represented by Europe and the United States have been taken as the pricing benchmark in energy trading. In terms of oil, the New York Mercantile Exchange (NYMEX), the International Petroleum Exchange of London (IPE) and the Dubai Mercantile Exchange (DME) have formed three major international crude oil futures exchanges. The international crude oil pricing mechanism is determined by market supply and demand, and the price of Brent oil and American oil has become the dominant price of international oil. Taking the natural gas market as an example, the price of natural gas in the Asian market is mainly based on the long-term agreement price linked to oil, so the price cannot reflect the relationship between the supply and demand of natural gas in the region.

In the absence of a mutual-interest oil futures market such as the New York Mercantile Exchange and the International Petroleum Exchange in London, countries have long paid more to import oil from the Middle East than the United States and Europe. Without energy pricing power, it can only passively accept international energy price fluctuations, and it is difficult to resist market risks. To build a regional energy trading market, a large number of producing country, transit countries and consumption country will gather on the same platform for public trading, so as to realize the optimal and efficient allocation of regional resources, form a market price reflecting the supply and demand relationship and scarcity of regional energy, and finally form its own pricing benchmark.

4. Strategies of Improving Energy Governance of the Belt and Road Regions

Facing the complex global energy market, impact of COVID-19 and geopolitical shock, energy governance of the Belt and Road regions should strengthen energy cooperation mechanism, improve energy supply network, and speed up the establishment of a regional energy market. All these strategies will help to improve energy security of countries along "Belt and Road", and sustain healthy and stable development of the national economy.

4.1. Strengthen Energy Cooperation Mechanism

The Belt and Road energy cooperation will help build a new global energy governance order. In the current international energy order, the status and power of developing countries and developed countries are unbalanced. With the acceleration of world multi-polarization, the international community calls strongly for the establishment of a new international energy order. The cooperation mechanism of the "Belt and Road" Energy Partnership can provide countries along the Belt and Road with energy security public goods in the form of international mechanisms, enhance the position of developing countries along the Belt and Road in global energy governance, and adjust the asymmetric and unbalanced relationship in energy cooperation. Through consultation and joint efforts with international organizations such as the International Energy Agency, OPEC and the Natural Gas Exporting Countries Forum, as well as regional cooperation platforms such as ASEAN and the Shanghai Cooperation Organization, the countries along the "Belt and Road" will continue to innovate ways of energy cooperation and upgrade energy cooperation.

Through the cooperation mechanism of the "Belt and Road" Energy Cooperation Partnership, the countries along the "Belt and Road" will further deepen mutually beneficial and win-win energy cooperation, and build a new energy cooperation network with closer ties and more effective cooperation. The countries along the "Belt and Road" should establish and improve the Belt and Road energy financial regulatory cooperation mechanism. The countries along the "Belt and Road" should build a mechanism for balancing energy supply and demand, promote the formation of a coordination mechanism between oil and gas importers and exporters, and establish a unified energy trading market, so as to foster a new pattern of an open, stable and balanced energy market. To increase financial support for energy infrastructure and clean energy of countries along the "Belt and Road", the neighborhood currency swap needs to expand, and the investment bank and multilateral financial institutions such as the Silk Road Fund, needs to give full play to realize their function.

4.2. Build Energy Resilient Supply Network

The countries along the "Belt and Road" need to strengthen

the Belt and Road energy production network. Regarding the characteristics of the complexity and diversity of energy demand, it should continue to push forward China and Saudi Arabia, Russia, the United Arab Emirates, Kazakhstan and other countries in the development of oil and gas, refining, chemical, petroleum equipment manufacturing in the field of major cooperation projects. The countries along the “Belt and Road” should explore new cooperation pattern and strengthen energy operating capacity. It also need to integrated the exploration and development of oil and gas resources, pipeline transportation, crude oil processing, engineering technical services into energy supply chain.

Secondly, countries along the “Belt and Road” should emphasize on the construction of energy infrastructure network. It should be speed up the construction of major energy infrastructure such as the Central Asia Energy Pipeline, the Maritime Silk Road energy hub, the China-Russia oil and gas pipeline, and the China-Pakistan Energy Corridor to enhance energy infrastructure connectivity. Countries along the “Belt and Road” also need to strengthen energy infrastructure connectivity, jointly promote the building of international backbone corridors, and gradually form an infrastructure network connecting sub-regions in Asia and between Asia, Africa and Europe.

Thirdly, the countries along the “Belt and Road” need to promote the building of an energy emergency management network. The mechanism of sharing energy production and consumption should be established with countries along the Belt and Road in case of energy supply crisis, so as to facilitate the formulation and evaluation of emergency plans and the coordination of emergency support. A regional strategic oil and gas reserve system should be established to release a certain amount of reserves into the market in case of energy crisis to mitigate the adverse impact of crude oil price shocks and other external supply disruptions.

4.3. Accelerate the Development of Common Regional Energy Market

The construction of the "Belt and Road" regional common energy market is an important measure to ensure regional energy supply, maintain regional energy security and promote the sustainable development of regional economy. In the process of promoting the construction, the first step is to build consensus among countries along the Belt and Road, actively strengthen communication on energy policies, improve the transparency of energy policies, and strengthen the sharing mechanism of energy data and cooperation in financial regulation.

The second is to build a regional energy futures trading center. Regarding the China and countries with high energy production and the huge consumer demand, the oil and natural gas futures has obvious geographical advantages. The countries along the Belt and Road should establish a regional oil and gas futures exchange, and form oil and gas pricing center in Asia to have the oil and gas resources pricing power.

Third, the countries along the Belt and Road should explore and promote the construction of regional trading platforms. It

needs to strengthen dialogue and cooperation to leverage all the countries' respective strengths. China should discuss regional energy security and market stability, as well as RMB settlement and offshore RMB market construction within the framework of the SCO, Central Asia Regional Economic Cooperation. Under such multilateral mechanisms as the China-Arab States Cooperation Forum and the China-Gulf Cooperation Council Strategic Dialogue, China will promote the development of energy relations between China and the Middle East, formulate effective strategies for comprehensively addressing energy supply risks, and carry out cooperation in oil futures.

4.4. Improve Clean Energy Cooperation

Energy cooperation under the BRI has formed a new pattern of green and low-carbon governance. Based on the Belt and Road Energy Cooperation Partnership, China will work with international organizations such as the Global Energy Internet Cooperation Organization and the International Renewable Energy Agency to strengthen the promotion of green and low-carbon energy, cooperate in technological innovation and investment of green energy, and guide the transformation of global energy governance to clean energy production, consumption and trading.

As for regional cooperation on clean energy area, it needs to strengthen the Shanghai Cooperation Organization Summit, Asean+3 energy ministers mechanism and the East Asia Summit mechanism, and promote the cooperation of clean energy standard, clean energy investment, and the supply of public green goods. The countries along the Belt and Road should improve cooperation on the clean energy technology transfer, joint research and industrialization development. The countries along the Belt and Road should build common data platform to provide service on green development and ecological environment protection, and further form the joint construction and sharing of relevant information, knowledge and technology. By building a green Belt and Road, countries will achieve benefits to lay the foundation of ecological civilization and pursuing green development for the whole world.

5. Conclusions

The strategic support and institutional guarantee provided by the Belt and Road Initiative have not only strengthened the foundation of the energy cooperation community, but also facilitated energy trade, provided energy financial support, promoted the development of energy and resources industries in countries along the Belt and Road, and promoted all-round cooperation among them. Energy and resources development under the Belt and Road regions provide a huge market for production capacity cooperation and a key area for international manufacturing cooperation. The energy governance of Belt and Road regions are facing main challenges from geopolitical risks, increasing energy market competition, and common energy market. To improve the energy governance, the paper provides several measurements

and suggestions, which include strengthening energy cooperation mechanism, building energy resilient supply network, accelerating the development of a common regional energy market, improving clean energy cooperation.

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