

Chemical Energy Security in China and Kazakhstan Based on Central Asian Cooperation

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Abstract—In order to promote China-Kazakhstan energy cooperation, this paper mainly focused on the Sino-Kazakhstan petroleum and gas energy security cooperation under the Silk Road Economic Belt. This paper analyzes the energy status of China and Kazakhstan and then analyzes the basis and cooperation of China-Kazakhstan energy cooperation. This paper also explains the cooperation involved three aspects: the development of petroleum and gas resources, the construction of crude petroleum pipelines, and cooperation in petroleum and gas development and processing technologies. The paper aims to analyze the challenges faced by China-Kazakhstan cooperation and put forward appropriate countermeasures. The results show that the cooperation between China and Kazakhstan not only can achieve the development of petroleum and gas resources, but also have rich natural resources, strong domestic support, and broad prospects for cooperation in the field of new energy; in terms of energy technologies, China and Kazakhstan have their own expertise in energy extraction and processing, and can achieve complementary strengths.

Keywords—Chemical Energy Security; Central Asian Cooperation; Kazakhstan

I. INTRODUCTION

Energy is an important production resource for human social development and national progress, and its importance is becoming more and more prominent along with the development of national economy. China, as a country with a large population and high energy consumption, has always been in high demand for energy. Although in recent years, it has been proposed that economic development should be "new normal", and the transformation and upgrading have been carried out gradually, at present, China's demand for traditional fossil energy is still rising, and the importance of developing and utilizing foreign energy resources will be further improved (Karrar, 2017). Especially in the framework of the "The Belt and Road" strategy construction, the energy problem is particularly important, including the full supply of energy, strategic transportation channel for energy and rational allocation of energy and mining issues, which all require the close cooperation of diplomacy means. Therefore, effective external energy cooperation is of great significance to the development of China (Ho, 2017).

As the largest and most abundant petroleum and gas resource in Central Asia, Kazakhstan has a unique advantage in developing energy cooperation with China. Northwest China borders Kazakhstan, and the two countries have nearly 2000 kilometres of border line. China is one of the largest economies

on the border with Kazakhstan. The economic cooperation between China and Kazakhstan has been extensive and far-reaching. After the establishment of diplomatic relations in 1992, the economic cooperation of the two countries has been warming up rapidly and has made remarkable achievements in many aspects. First of all, Kazakhstan has developed into a country with the largest trade volume in the five Central Asian countries. Secondly, China has made extensive investment in Kazakhstan with its advantages of capital, technology and other advantages. It has gradually become the top five investors in Kazakhstan, and the two countries' cooperation is comprehensive and closely related. Therefore, in general, Chinese cooperation with Kazakhstan plays an important role in bilateral economic development. In the future, to carry out "The Belt and Road" strategic cooperation, the two countries also have a broader prospect for development.

II. LITERATURE REVIEW

In the study, Karatayev and others showed that China would be more active in promoting energy diplomacy in order to achieve sustainable development, and China might take some measures to reduce energy vulnerability, such as improving energy utilization efficiency, diversifying energy types, upgrading energy infrastructure construction, and reducing the impact of American factors (Karatayev, et al, 2016). Amineh and Driel believed that hydroelectric power and wind power were the two most potential low carbon generation modes. In contrast, the probability of nuclear energy and solar energy was the lowest (Amineh and Driel, 2018). Miglio held that China's economy was in the phase of energy transformation, China would have huge demand for petroleum and coal, and China must improve the efficiency of energy utilization (Miglio, et al, 2014). Rakhimov thought that China's investment in Kazakhstan was due to its foreign exchange security. Under the impact of the financial crisis, China's huge single foreign exchange reserves are in a state of constant depreciation, so China will turn its own economic risk by investing in Kazakhstan. At the same time, for Kazakhstan, China's investment can effectively solve the problem of insufficient construction funds, so the two coincide with each other. However, the Kazakhstan government was warned that China's investment was not a good thing. The continuing fiscal deficit in Kazakhstan will lead to a stronger reliance on China's investment, while China controls more petroleum and gas resources and equipment in Kazakhstan through investment, so it poses a threat for the independence of Kazakhstan's country (Rakhimov, 2014). Based on the above research status, this

paper mainly focuses on chemical energy security in China and Kazakhstan based on Central Asian cooperation.

III. METHOD

A. Data analysis method

The data analysis method is mainly used for analysis. There are a large number of relevant data in the energy cooperation between China and Kazakhstan, which needs to collect and collate the data. Through the arrangement of energy output and export volume, Kazakhstan's rich energy is obtained. By collating data on China's energy output, consumption, import and external dependence, it is concluded that China's import of foreign petroleum and natural gas is increasing year by year because the economy has developed rapidly, the population base is large and there is a shortage of domestic petroleum and gas resources. After analyzing the data and making relevant charts, we can clearly express the current petroleum situation between the two countries. Through the quantitative analysis

and after analysis and study, the petroleum data of China and Kazakhstan will continue to be exported, the import of China's petroleum will continue to expand, and the geographical proximity of China and Kazakhstan will be further similar, which will further deepen the cooperation.

B. Energy status in China

China is in the high speed development stage. Because of the large population base, the demand for energy has been high, and it continues to grow at a high proportion every year (Karatayev, et al, 2017). China's energy structure is characterized by "rich coal and less petroleum". The consumption of coal accounts for a large proportion of total energy consumption. The consumption of coal in China is maintained at 35-40 million tons in a year, accounting for 50% of the world's coal consumption, mainly used for industrial power generation and civilian fuel. China's per capita share of resources is very low. Table 1 is China's primary energy consumption.

TABLE I CHINA'S PRIMARY ENERGY CONSUMPTION (UNIT: MILLION TONS OF STANDARD COAL)

Year	Coal	Petroleum	Natural gas	Hydropower	Nuclear energy	Alcohols gasoline	Biodiesel
2000	944	278	30	85	6	0	0
2005	1537	435	60	132	20	2	1
2010	2424	628	109	217	28	10	1
2020	2991	1096	271	294	30	22	3
2030	2932	1587	460	358	181	33	8
2040	3001	1710	532	380	380	36	9
2050	2925	1836	668	397	595	39	9

At present, China's petroleum import has become more diversified from its original relative simplicity. In 1995, the Middle East and the Asia Pacific region provided nearly 90% of China's petroleum imports, while Indonesia alone accounted for 31%. Half of China's one hundred million tonnes of crude petroleum imported from abroad in 2004 came from the Middle East. Today, only about half of China's crude petroleum is imported through the Middle East. Meanwhile, the growth of supply share from Africa and Russia has already offset the sharp decline in the composition of China's petroleum imports in the Asia Pacific region. The US Energy Information Administration (EIA) predicts that China's petroleum imports will rise from 66% in 2020 to 72% in 2040.

C. Energy status in Kazakhstan

Kazakhstan's current petroleum production capability ranks 10 in the world, and a large number of petroleum and gas reservoirs are being explored and developed. According to the 2010-2014 National Plan for Compulsory Industrial and Innovative Development in Kazakhstan, by 2020, the government expected production will increase to around 3.8 million barrels per day. In the future, the development of the domestic petroleum sector depends on the further development of crude petroleum resources in the Caspian Sea of Kazakhstan, which is expected to continue to be exploited for 50 to 60 years (Paulo and Gecian, 2017). It is estimated that by 2030, the output of crude petroleum in Kazakhstan will be doubled compared to that at present. In the 2005-2016 years, the chart of petroleum reserves in Kazakhstan is shown in Figure 1. In the 2005-2016 years, the petroleum production trend map of Kazakhstan is shown in Figure 2.

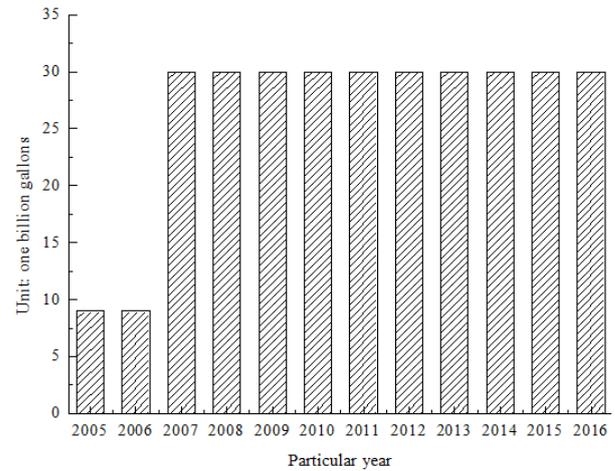


Fig. 1 Trend of petroleum reserves in Kazakhstan in the past 2005-2016 years

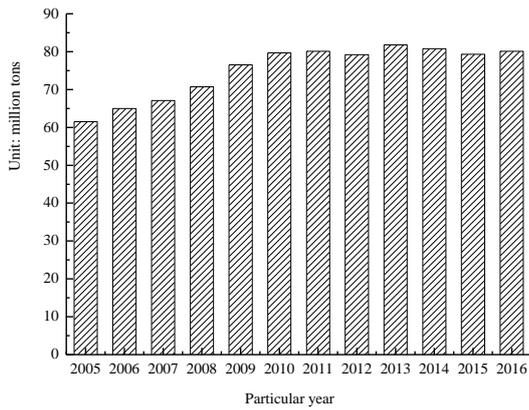


Fig. 2 Petroleum production trend in Kazakhstan in the past 2005-2016 years

D. Results and discussion

Cooperation in petroleum and gas resources between China and Kazakhstan

Kazakhstan has a wide variety of resources and rapid economic growth and the comprehensive national strength is the top in Central Asia. Kazakhstan has abundant petroleum and gas reserves, and the domestic market does not have high energy demand. Through the analysis of the petroleum and gas reserves and mining conditions in 2015 in China and Kazakhstan, as shown in Table 2, we can see that China and Kazakhstan have a strong complementarity in the production and consumption of petroleum and gas. Kazakhstan has higher reserves than China in terms of petroleum and natural gas, but China is obviously more than Kazakhstan from the perspective of petroleum production and consumption. China's petroleum and natural gas resources are in short supply, while Kazakhstan's petroleum and natural gas supply exceeds demand.

TABLE II PETROLEUM AND GAS RESOURCE EXPLORATION, PRODUCTION, RESERVE PRODUCTION RATIO AND CONSUMPTION IN CHINA AND KAZAKHSTAN IN 2016

Countries	Petroleum				Natural gas			
	Exploration (million tons)	Production (thousand tons)	Reserve production ratio (year)	Consumption (ten thousand tons)	Exploration (million metre)	Production (million cubic metre)	Reserve production ratio (year)	Consumption (million cubic metre)
China	25	21460	11.7	55970	3.8	1380	27.8	1973
Kazakhstan	39	7930	49.3	1270	0.9	124	75.7	86

Construction of crude petroleum pipeline

In 1997, China and Kazakhstan reached an agreement on common construction pipelines. The first batch of pipelines, from the petroleum fields in the optbee area to Atla, was completed in 2003, with a total length of 449 km and a design capacity of 120 thousand barrels per day (about 6 million tons / a year). The pipeline construction from Kazakhstan Atsu to the port of Alashan began in September 2004 and completed in December 2005. The total length of the pipeline was 987 km long, with a total investment of \$700 million, and the capacity of the pipeline was 200 thousand barrels per day (about 20 million tons / year). In May 2006, it formally shipped petroleum to China, and increased its capacity to 400 thousand barrels per day in 2011. In August 18, 2007, Kazakhstan and China reached the construction of part of Kenkyak - Kum Karl. It was completed in July 11, 2009, the length of the section is 792 kilometers, and tt present, the annual capacity is 14 million tons. The pipeline is expected to achieve an annual capacity of 20 million tons in 2017.

Technical cooperation of petroleum and gas development and processing

In the development of petroleum and gas, China is mature no matter in technology or equipment, and has a perfect petroleum and gas exploration, mining and processing technology. The technology of drilling well, petroleum and gas petroleum refining, transportation pipeline and so on are more advanced. In order to reduce wax content in crude petroleum, the pipeline heating device developed by Kazakhstan can also be used for energy development in Northwest China.

China and Kazakhstan also have broad cooperation space in the processing of petroleum and gas products. Although the production of petroleum and gas resources is very large in Kazakhstan, because of the limited technical level and the small number of domestic refineries, the petroleum and gas refining and chemical processing depth is insufficient and the quality is low, which is much lower than the world's major petroleum producing countries. The petroleum refining depth is lower than the world average level of 85%, as shown in Table 3. The high-end petroleum products with light refined petroleum represented are heavily dependent on imports.

TABLE III PETROLEUM REFINING DEPTH TABLE OF KAZAKHSTAN REFINERY

Petroleum refining depth table of Kazakhstan refinery	Average refining depth	European average refining depth	Average refining depth in the United States
Average	70%		
Atla petroleum refinery	59.8%	81%	85%
Ba Puda refinery	74.2%		
Kim Kent refinery	74.4%		

E. Challenge of China's energy cooperation with Kazakhstan

Chinese and Kazakhstan have made a lot of achievements in terms of energy cooperation, but due to the factors of international environment and area, the countries look at fiercely as a tiger does in the strategic position of Central Asia. In addition, due to some economic and cultural reasons for China and Kazakhstan, Kazakhstan will encounter various problems and challenges in the process of carrying out energy cooperation under the background of "The Belt and Road". In politics, it is mainly influenced by Russia, the United States and the European Union. In the economic aspect, it is mainly due to the transition period of the global energy pattern, the limited strength of Chinese enterprises, the quality of petroleum, the cost of transportation and the fluctuation of price. In terms of social environment, it is mainly the uncertainty of national culture and the change of regime.

Proposals for promoting energy cooperation between China and Kazakhstan

The suggestions in the concept and strategy level are mainly to carry out the "new energy security concept" and continue to promote the "going out" strategy of energy. In the level of national mechanism, there are information exchange mechanism, personnel training mechanism, macro guidance mechanism and energy emergency mechanism; in the enterprise cooperation level, it is to deepen the construction of petrochemical industry chain, cultivate corporate social responsibility consciousness and prevent vicious competition among Chinese enterprises.

IV. CONCLUSION

In this paper, through the data analysis method, the energy situation of Kazakhstan China is summarized. Combined with the "The Belt and Road" background, Chinese and Kazakhstan energy cooperation achievements and the existence of some problems and risks are analysed, levels are divided, and from the national strategic level, the government level and the enterprise mechanism, suggestions are proposed for further promotion of energy cooperation between China and Kazakhstan. The recommendations in the concept and strategy level are mainly to carry out the "new energy security concept" and continue to push forward the "going out" strategy of energy. In the level of the national mechanism, the proposals include information exchange mechanism, talent training mechanism, macro guidance mechanism and energy emergency mechanism; in the enterprise cooperation level, it is to deepen the construction of petrochemical industry chain, cultivate corporate social responsibility consciousness and prevent vicious competition among Chinese enterprises.

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In case of Acknowledgments, please add this paragraph after Conclusions and do not number it.
[Style: CET Acknowledgements]

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