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Institute of Economics and Administration	Department of Economic Theory and International Relations
Field of study	38.04.01 Economics
Master's degree programme	International Economics

GRADUATION THESIS

on

International energy trade of China: current state and development prospects

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Penza, 2021

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Institute of Economics and Administration
Department of Economic Theory and International Relations
Field of study 38.04.01 Economics,
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ASSIGNMENT
FOR THE GRADUATION THESIS OF

Master's degree student Kou Jingwen, group 19ЭЭм(а)2, full-time mode of study

1 The topic of the graduation thesis: «International energy trade: current state and development prospects»
was approved by the university order
dated «___»_____20__ no. _____
2 The deadline for the Master's degree student to complete the graduation thesis is 11.06.2021.
3 The input data for the graduation thesis is the regulatory and legal framework, scientific literature and reference books, and Internet data.
4 The list of issues to be studied includes current state of domestic economy and energy structure in China, analysis of the current state of China's energy trade, further development of China's energy trade.
5 The list of visuals contains tables and figures.
6 The date of setting the assignment is 29.11.2019.

Academic adviser _____/ Vlazneva S. A. /
(signature) (full name)

The assignment was accepted by Master's degree student_____/ Kou Jingwen /
(signature) (full name)

Schedule for completing the graduation thesis

No.	Content of the thesis	Deadline for completion	Due date, signature of the academic adviser
First year of study			
1	Analysis of scientific literature, choice and updating of the research topic	01.09.2019 – 28.11.2019	
2	Framing the scientific concept of research	29.11.2019 – 12.01.2020	
3	Devising the detailed plan of the first chapter and draft of the thesis	13.01.2020 – 23.02.2020	
4	Conducting theoretical research within the first chapter of the thesis	24.02.2020– 30.04.2020	
5	Preparing the first chapter of the thesis	1.05.2020– 30.06.2020	
Second year of study			
6	Collection of statistical data and material for the thesis	01.09.2020 – 30.09.2020	
7	Studying new literature sources within the topic of the thesis	01.10.2020 – 31.10.2020	
8	Conducting research within the first and the second chapters of the thesis	01.11.2020 – 31.12.2020	
9	Preparing the second chapter of the thesis	1.01.2021 – 1.03.2021	
10	Preparing the third chapter of the thesis	2.03.2021 – 2.05.2021	
11	Preparing the introduction and conclusion	3.05.2021 – 16.05.2021	
12	Completing the graduation thesis	17.05.2021 – 30.05.2021	
13	Handing in the thesis for compliance control and antiplagiat	31.05.2021 – 9.06.2021	
14	Getting acquainted with the feedback and review	10.06.2021	
15	Presenting the written thesis	11.06.2021	

Academic adviser _____ / Vlazneva S. A. /
(signature) (full name)

The assignment was accepted by Master's degree student _____ / Kou Jingwen /
(signature) (full name)

Summary

The graduation thesis comprises 79 pages, 3 chapters, 13 figures, 5 tables, 62 sources.

INTERNATIONAL TRADE, ENERGY TRADE, EXPORT, IMPORT, CHINA, OIL, GAS, COAL

The object of this research is international energy markets.

The research purpose is to analyze the current state and development prospects of China's international energy trade.

The methodological framework of the paper is formed by system approach, analysis and synthesis, statistical and comparative methods. To display identified economic dependencies graphical method was applied.

The results of work include: the importance of energy trade to China's economy was studied; primary energy production in China and the energy demand structure of China was identified; current state of China's energy trade was analyzed; the impact of the «One Belt and One Road» on China's current energy trade and obstacles of Chinese energy trade development were examined; prospects and countermeasures for the transformation of domestic energy consumption structure in the future were studied; strategies to strengthen China's relationship with energy trading partners were identified.

The novelty of the work is trends and prospects for the development of energy trade cooperation of China are revealed by using the combination of quantitative and qualitative methods.

The results of the research can be used in the teaching of educational disciplines «World Economy», «International Economic Relations», «International Trade».

The theoretical relevance of the research is that the conclusions made in the thesis form the basis for further research of the energy trade cooperation of China.

Content

Introduction…… 7

Chapter 1 Current state of domestic economy and energy structure in China…… 7

1.1 The importance of energy trade to China's economy…… 7

1.2 The current state of energy in China…… 14

Chapter 2 Analysis of the current state of China's energy trade…….. 31

2.1 Current state of China's energy trade…….. 31

2.2 Problems existing in the development of China's energy trade……. 39

Chapter 3 Further development of China's energy trade…….. 51

3.1 China's energy trade development prospects……. 51

3.2 Deepening energy system reform and improvement energy efficiency…… 55

3.3 Strengthen new energy development, look for new development opportunities…….. 58

Conclusion…… 70

References List……. 73

Introduction

No matter in the past or now, energy has always been an important topic of progress and development in an era. Energy involves every aspect of our life. It is a resource that can provide us with energy and support the production and life of our society. The history of human society development is also the history of energy evolution. Since the beginning of the 20th century, energy has become an important part of the foreign political, economic, military and diplomatic work of various countries, as well as the focus of contention of various countries. As a strategic resource, it not only plays a guarantee and promotion role in the national economy and society, but also restricts the development of economy and society. At present, China is entering the Fourteenth Five-Year Plan period, while facing the challenge of economic revitalization after the epidemic. It is urgent to relieve the downward pressure through sustained and stable economic growth, which requires energy to promote the positive development of the economy.

The relevance of this research is the following five aspects. Firstly, China is the second largest energy consumer in the world, and the proven reserves of some energy resources (such as oil, uranium and natural gas) are relatively insufficient. Moreover, the domestic energy demand gap is large, so we need to improve the problem of insufficient domestic energy demand through energy trade. Secondly, international energy trade is crucial to China's economy. Thirdly, China's per capita share of energy resources is relatively low, far lower than the world average. Fourthly, China's energy resources are widely but unevenly distributed. Fifthly, the shutdown during the epidemic poses a great threat to China's economic security, which serves as a warning to China's future energy

trade. China needs to seek more partners and develop new energy, and recover economic losses through international energy trade, so as to provide impetus for China's economic development and secure the future of international energy trade.

The object of this research is China's international energy markets. The subject of this thesis is current state and prospects of international energy trade of China.

The research purpose is to analyze the current state and development prospects of China's international energy trade. In order to achieve it we need to complete the following tasks:

– introduce the importance of energy trade to China's economy and the current situation of energy production and consumption in China;

– overview the current state of China's energy trade;

– analyze of the factors affecting the development of China's energy trade;

– analyze the impact of the epidemic on China's current energy trade;

– discuss the prospects and countermeasures for the transformation of domestic energy consumption structure in the future.

The main research methods used are literature research, qualitative analysis and quantitative analysis. Through reading, learning and sorting out relevant literature, and combination of qualitative and quantitative analysis, this master thesis draws on the effective research results of experts and scholars at home and abroad, preliminarily constructs the analytical framework for the development of China's international energy trade, understands the current situation of China's international energy trade, and lays a good foundation for the follow-up research.

This study is based on data and information collected from a variety of sources. CNKI was used for literature resources, China Statistical Yearbook website was used for data resources. The main source of data is from trade statistics for international business in Trade Map. In order to compare and analyze the dependence of energy trade between China and the world's energy exporting countries, the value of China's annual energy imports is measured in units of dollars. Through data description and analysis of the current situation, the influencing factors are sorted out to provide countermeasures for the future development of China's international energy trade.

The novelty of the work is trends and prospects for the development of energy trade cooperation of China are revealed by using the combination of quantitative and qualitative methods.

The theoretical and practical significance of the research is that the conclusions made in the thesis form the basis for China's energy trade development and the search for trading partners. By looking forward to the development prospect of China's international energy trade, and putting forward the countermeasures to promote the development of China's international energy trade, it provides theoretical guidance and practical reference for teaching of educational disciplines «World Economy», «International Economic Relations», «International Trade».

The work structure is determined by the purpose and tasks decided in the work. The first chapter introduces the current situation of China's domestic economy, reveals the positive effect of energy trade on economic development in industrial economy, and analyzes the important role of energy trade in economy, as well as describes the primary energy production and energy consumption. The second chapter analyzes the current

situation of China's energy trade, based on oil, coal, natural gas and other major energy commodities, and analyzes the influencing factors of China's international energy market, and explores the existing problems, including some obstacles, difficulties and challenges that may be encountered in the future, especially during the epidemic. The third chapter mainly predicts the future development of China's energy trade and puts forward some suggestions.

Chapter 1 Current state of domestic economy and energy structure in China

1.1 The importance of energy trade to China's economy

China is the second largest economy in the world. From the point of view of economic quantity, goods and services are the foundation. In 2020, total imports and exports of goods amounted to 3.21557 trillion yuan, an increase of 1.9 % over the previous year. Among them, exports amounted to 17,932 billion yuan, up by 4.0%; Imports amounted to 14.2231 trillion yuan, down 0.7 %. The surplus in imports and exports of goods was 3.709.6 billion yuan, an increase of 797.6 billion yuan over the previous year. The total volume of imports and exports to the «One Belt And One Road» countries reached 9,369.6 billion yuan, an increase of 1.0 % over the previous year. Among them, exports amounted to 5426.3 billion yuan, up 3.2%; Imports were 3.943 trillion yuan, down 1.8 % [42, p. 55] (Figure 1.1).

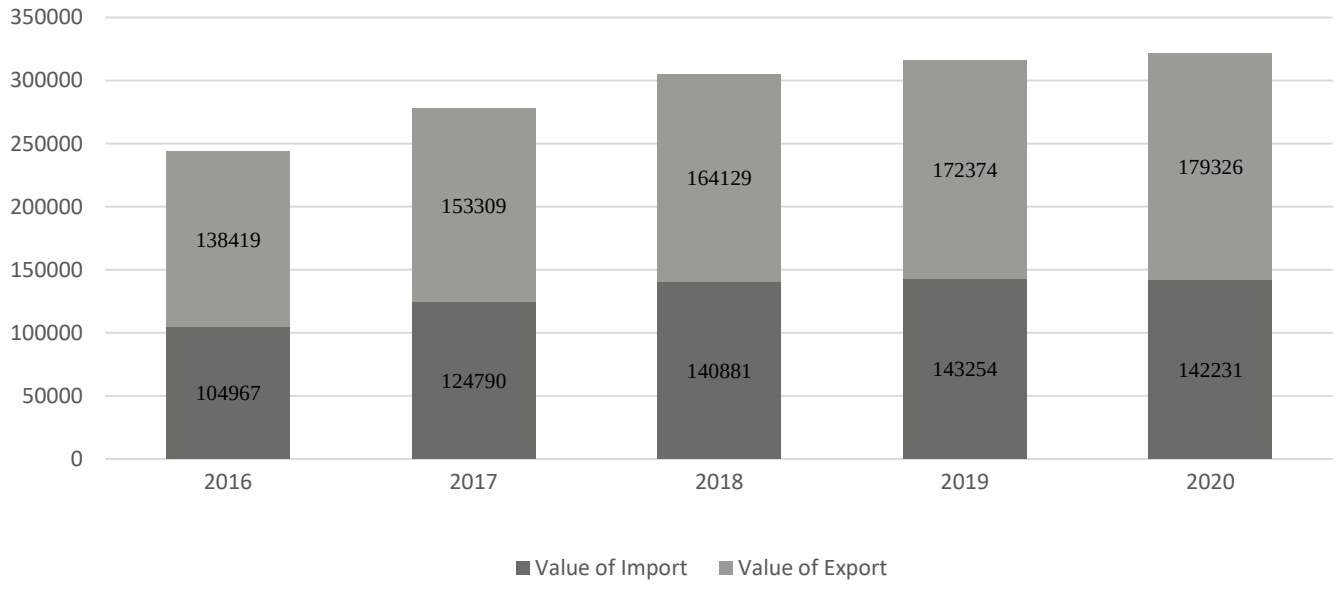

Figure 1.1 – Import and export of goods [51, p. 1]

Due to the impact of COVID-19 in 2020, the economy declined, but in the end, China still achieved growth. In the import quantity of major commodities, the demand for energy is greater. In 2020, coal imports reached 303.99 million tons, an increase of 1.5 % over the previous year. The value of imports amounted to 141.1 billion yuan, an increase of -12.1 % over the previous year. The import of crude oil was 542.39 million tons, an increase of 7.3 % over the previous year. The value of imports amounted to 1221.8 billion yuan, an increase of 26.8 % over the previous year. The import of refined oil products was 28.35 million tons, up by 7.2 %. The value of imports was 81.8 billion yuan, an increase of 30.4 % over the previous year. The import of natural gas was 101.66 million tons, an increase of 5.3 % over the previous year. The value of imports amounted to 231.5 billion yuan, an increase of 19.4 % over the previous year. It can be seen that in 2020, there was a large demand for primary energy and a large domestic gap. Although the growth rate of import has slowed down, it still relies on import [45, p. 12].

From the perspective of economic structure, China's economic growth has slowed down in recent years, but it still maintains a relatively high growth rate. Economic performance was stable on the whole. In 2020, China's GDP reached 10,1598.6 trillion yuan, an increase of 2.3 % over the previous year. Of which, the added value of the primary industry was 7,775.4 billion yuan, up by 3.0 %. The added value of the secondary industry was 38,425.5 billion yuan, up 2.6 %. The added value of the tertiary industry was 553,397.7 billion yuan, up 2.1 %.The added value of the primary industry accounted for 7.7 % of the GDP, the added value of the secondary industry 37.8 %, and the added value of the tertiary industry 54.5 %. The economic structure and regional distribution continued

to improve. Advanced manufacturing and modern service industries grew rapidly. Industry and services still dominate the industry [23, p. 344] (Figure 1.2).

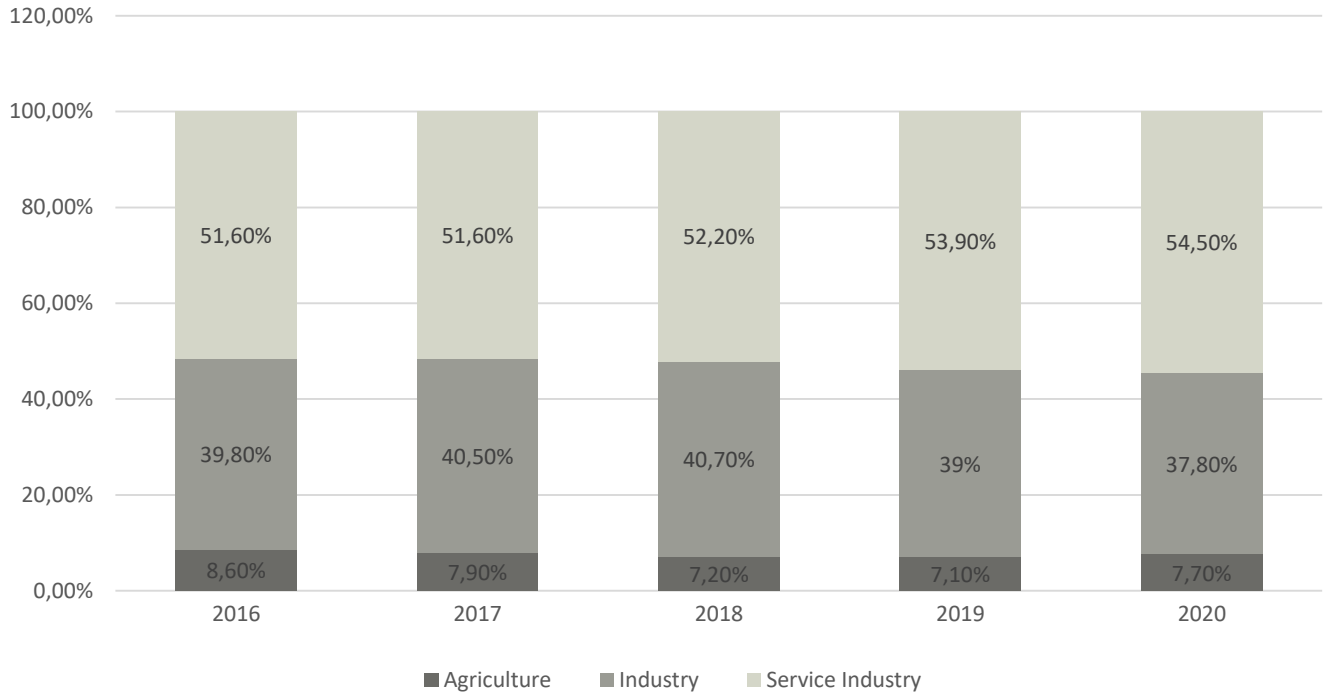

Figure 1.2 – The transformation of China's economic structure [23, p. 345]

Compared with the previous year, the proportion of added value of industry in 2020 has decreased. However, it is not difficult to see that the implementation of a series of policies has made China's economic structure more coordinated and developed towards the direction of optimization and upgrading. The proportion relationship between and within various industries in China has been significantly improved, with the proportion of the primary industry decreasing while that of the secondary and tertiary industries increasing. The growth of the total national economy is mainly driven by the primary and secondary industries to the secondary and tertiary industries, the growth of the secondary industry constitutes the main driving force of China's rapid economic development. While the overall industrial structure changes, the internal structure of each industry has also changed greatly. After three times of economic restructuring in China, industry is still playing a very important role in economic development. Industry still accounts for a large proportion [31, p. 35] (Figure 1.3).

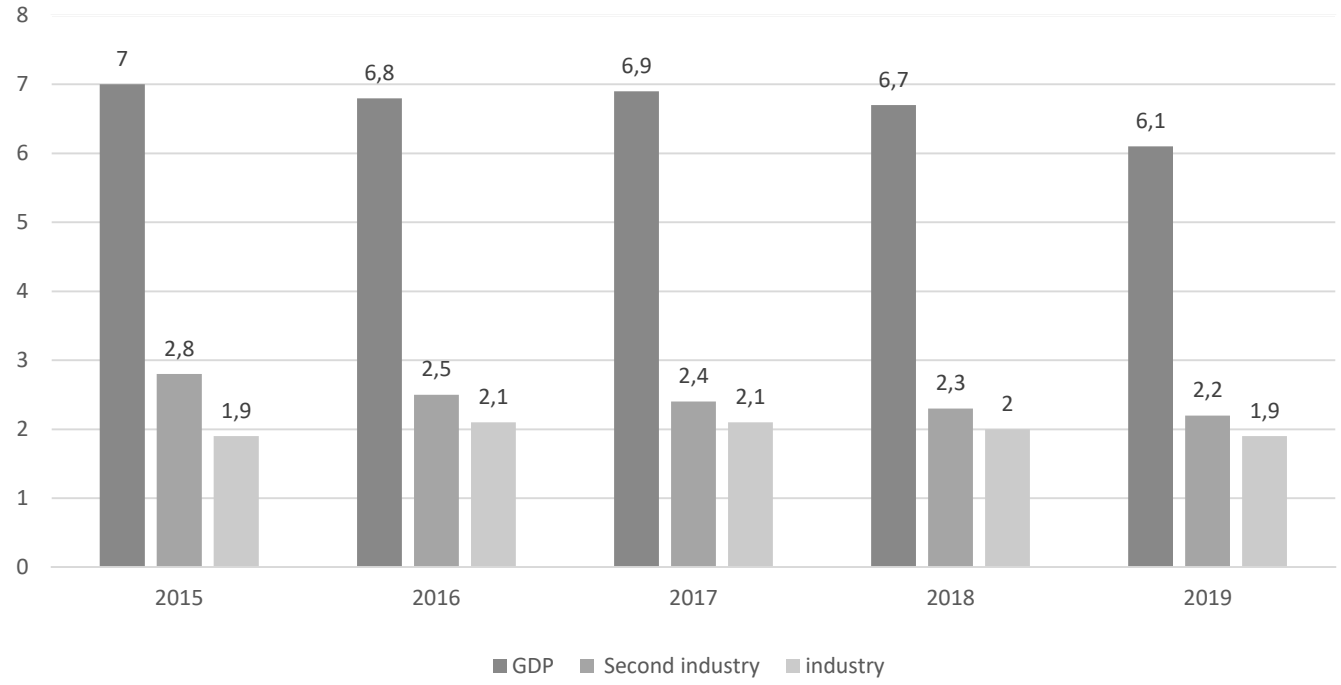

Figure 1.3 – The pull of industry on GDP growth (%) [31, p. 36]

According to the data over the years, industry accounts for a large proportion in the secondary industry, and its driving effect on the GDP is between 1.9 % and 2.1 %. This shows that no matter in the past or now, the pull effect of industry on economy has been positive and sustainable. This promotion is also due to the adjustment of industrial structure, so that industry has been the driving force of economic development. Although the adjustment of industrial structure promotes the development of economy, it also leads to the problem of overcapacity. Among them, the unreasonable way of economic growth is an important cause of overcapacity. Wen Qian believes that one of the deeper causes of overcapacity is the slow transformation of the economic growth pattern. He pointed out that the level of economic growth rate is to a large extent restricted by the extensive or intensive economic growth mode, and the improvement of China's economic growth rate generally depends on the increase of investment and other extensive growth mode, the

transformation of economic growth mode has not really started. Wang Xiaoguang also believes that the main cause of overcapacity is the unreasonable way of economic growth, which is manifested by the excessive intervention of local governments in investment and economic growth, forming vicious investment competition between each other, and the expansion of capacity is difficult to contain. For enterprises, due to their own low level of technology and weak independent innovation ability, the competition between them mainly focuses on resource input, output quantity and price competition. It can be seen that the economic development model has caused overcapacity, which also affects the development of the industry.

In the new era, China's economic aggregate and economic structure are changing, which requires the transformation of economic development model. On October 18, 2017, in report to the 19th CPC National Congress, Xi Jinping stated for the first time that «China's economy has shifted from a stage of high-speed growth to a stage of high-quality development» [32, p. 3]. This shows that the continued extensive speed development is no longer suitable for the current stage of economic development, and it is necessary to break the low-quality development and turn to the pursuit of high-quality development. At present, we enter the 14th Five-Year Plan period, we must follow the following principles for economic and social development: We must enhance our capability to implement the new vision of development and establish a new pattern of development, so as to provide fundamental guarantee for high-quality development [37, p. 9].

In the long term, China's development model has relied to a large extent on the industrial sector, and energy-intensive industries have provided support for domestic infru-

cture construction, heavy industry and export–oriented consumer goods manufacturing. Throughout, the development of industry, especially the energy trade in coal and oil, has provided a strong impetus for economic growth and a strong support for economic development. And in the 14th Five-Year Plan in 2021, our country emphasizes: We will advance the energy revolution and improve the system for energy production, supply, storage and marketing; improve domestic oil and gas exploration and development, speed up the construction of oil and gas storage facilities, accelerate the construction of major national oil and gas pipelines; develop smart energy systems and optimize the layout of electricity production and transmission channels, increase the consumption and storage capacity of new energy, and increase the capacity of power transmission and distribution to remote areas. It can be seen that the industrial industry, especially energy, plays an important role in China's economy and provides a driving force for the development of China's economy [44, p. 86].

This is not just speculation. Through quantitative and qualitative analysis and model establishment, domestic and foreign researchers have given their unified answers:Energy has a positive effect on the economy. In the process of social development, energy plays an important role in economic development. In classical economics, the British economist Adam Smith was the first to study the relationship between international trade and economic growth. In response, the theory of dynamic productivity and the model of «Vent for Surplus Export» were proposed. In the theory of «Vent for Surplus Export», Adam Smith wrote that foreign trade could «open up a relatively large market for the fruits of labor that could not be consumed domestically. This will encourage them to improve the productivity of their labour, to increase their annual output, and thus to increase the real

wealth and income of the society» [41, p.19]. Adam Smith believed that international trade has a driving effect on economic growth. D. H. Robertson puts forward the important proposition that foreign trade is «the engine of economic growth».

In recent years, some scholars, through econometric models, have concluded that in the period of rapid economic development, the rapid development of industrial economy can be attributed to the role of energy consumption. Zhao Lixia and Wei Weixian introduced energy as a new variable into the Cobb-Douglas production function, established a vector autoregressive model, and conducted an empirical study on the relationship between China's economic growth and energy. The research of modern economic growth theory finds that in the long run, the economic growth of most countries has the characteristic of steady state, thus constructing the Lucas R. E. economic growth model under energy constraint. It is concluded that in order to realize economic growth, human capital and consumption are positive growth in the long-term development, and economic growth needs the growth of energy input to support.

The theoretical achievements of many scholars have laid the foundation for my thesis research. In the process of economic development, energy creates new growth opportunities for the economy, dominates the progress and development of the economy and provides power support. Social and economic growth needs to be supported by energy consumption, so energy can drive economic growth. Energy supply can be increased only when the social economy reaches certain conditions, so economic growth can also promote energy development. On the one hand, economic growth increases the demand for energy. On the other hand, the role of energy in economic growth is to energize input, promote production development and economic scale expansion, promote the birth and

development of new industries, and promote technological progress [39, p. 854]. At the same time, energy is the core of social productivity and power source, is the material basis of China's sustainable development, energy development and economic growth is reflected in the relationship of mutual influence, energy development can promote economic growth, and in turn, economic growth provides an economic basis for energy development.

1.2 The current state of energy in China

China, located in East Asia, is a unified multi-ethnic country with the Chinese culture as the main body and the Han nationality as the main ethnic group. Its total area is 10.45 million km^2, ranking the third in the world. At the same time, China is by far the largest energy driver with its large share of energy reserves, accounting for more than three quarters of the world's net growth. China is also the largest contributor to China's renewable energy growth. In this section, I will introduce China's energy reserves and distribution, production and consumption from two dimensions.

According to BP's statistics, China's proven coal reserves in 2019 were 141,595 million tons, it accounted for 13.2 % of the world's total proven coal, and the reserves-production ratio was 37 %.Compared with the previous period, the proportion of proved coal reserves has increased. China's coal resources are distributed in a wide area. Except Shanghai, other provinces, municipalities and autonomous regions all have different amounts of coal resources. In North and Northwest, coal carbon reserves are the most abundant, accounting for nearly 80 % of the national reserves, of which Shanxi Province, known as the «coal sea», accounts for 30.39 % of the national reserves. The distribution of coal resources in other regions is as follows: Southwest China accounts for

8.64 % of the national coal reserves, 67 % of which is concentrated in Guizhou; East China accounts for 5.7 % of China's coal reserves, of which 87 % are concentrated in Anhui and Shandong provinces. The central and southern region accounts for 3.06 % of the country's coal reserves, of which 72 % is concentrated in Henan. Northeast China accounts for 2.97 % of the country's coal reserves, 52 % of which is concentrated in northern Heilongjiang [46, p. 310].

In 2019, China's proven oil reserves stood at 26.2 thousands million barrels, it accounted for 1.5 % of the world's total proven oil, and the reserves-production ratio was 18.7 %.The share of proven oil reserves was unchanged compared to 2018. Compared with 2009, proved oil reserves increased significantly by 21.3 %. China's oil resources are mainly distributed in the eastern region, and the cumulative proven oil reserves account for nearly 3/4 of the country's total. The oil reserves in the east are mainly concentrated in the Songliao and Bohai Bay basins, accounting for 70.53 % of the national reserves. At present, the oil reserves in Xinjiang are mainly distributed in the Junggar Basin (8.28 %), Tarim Basin (6.28 %) and Turpan-Hami Basin (1.55 %). The oil reserves in the sea are mainly concentrated in the Bohai Bay and Pearl River Mouth Basin [39, p. 856].

China's proven reserves of natural gas in 2019 were 8.4 trillion cubic meters. It accounted for 4.2 % of the world's total proved natural gas, and the reserves-production ratio is 47.3 %. Compared with 2018, the proportion of proved natural gas reserves increased by 31.25 %. Proven reserves of natural gas increased significantly by 189.65 % compared to 2009. Natural gas distribution in China is relatively concentrated. Central and Northwest and offshore natural gas resources account for about 80 % of the country's total. The central region mainly includes Sichuan Basin and Ordos Basin, with natural gas

resources account for 31.12 % of the country's total. The northwest region mainly includes the Tarim Basin, Junggar Basin, Turpan-Hami Basin and Qaidam Basin, and the natural gas resources account for 22.05 % of the national total. The sea areas mainly include Bohai Bay Basin (offshore), South Yellow Sea Basin, East China Sea Basin, Pearl River Estuaries, Beibu Gulf Basin and Yingqiong Basin, and the natural gas resources account for 27.37 % of the national total. There are also natural gas resources in the eastern part of China, including Songliao Basin and Bohai Bay Basin, which account for 12.98 % of the national total. In the south, natural gas resources mainly include the middle, lower Yangtze and Yunnan, Guizhou and Guangxi regions, accounting for 6.49 % of the national total. In addition, natural gas resources in Tibet have yet to be confirmed. Due to the greenhouse effect, the deterioration of the earth's environment, and the implementation of China's new development concept, people are paying more and more attention to the protection of the environment. Therefore, as a clean energy, natural gas can reduce SO_2 and dust emissions by nearly 100 %, reduce CO_2 emissions by 60 % and nitrogen oxides by 50 %, and help to reduce acid rain formation, relieve the earth's greenhouse effect, and fundamentally improve the quality of the environment [13, p. 208].

China is a country not rich in uranium mineral resources. The fuel that nuclear power plants use to generate electricity is uranium. According to the calculation of the reserves of a batch of uranium ore fields provided by China to the International Atomic Energy Agency, the proven reserves of uranium mineral in China rank after the 10th in the world, which cannot meet the long-term needs of developing nuclear power. Mineral deposits have been found in 23 provinces, among which Jiangxi, Hunan, Guangdong and Guangxi have the most uranium resources, accounting for 74 % of the proved reserves.

The scale of deposits is mainly small and medium-sized (accounting for more than 60 % of the total reserves).Through searching relevant information, it is found that the average level of nuclear power generation in the world is low. At present our country the proportion of nuclear power is too small, countries should from the strategic level to further make clear the pillar position of nuclear power in the optimization of energy structure, to develop large-scale nuclear power as an important choice of alternatives to fossil fuels, make it occupy a considerable proportion in the power supply, can effectively support to 2030 non-fossil energy consumption accounts for 20 % increase than to this goal. To our delight, the largest in-situ leachable sandstone-type uranium deposit has been discovered in Inner Mongolia. The discovery of this large uranium resource provides a guarantee for the development of nuclear power in China [15, p. 26].

However, under the dual pressure of the shortage of conventional energy and the deterioration of global ecological environment, new energy has appeared in our field of vision. These energy sources, such as wind energy and hydro energy, are pollution-free and renewable. They have huge development potential and are undoubtedly the direction which we need to move forward in the future. According to statistics, more and more electricity is generated by wind power around the world, which supplies more than 2 % of the world's electricity consumption. Inner Mongolia, Qinghai, Heilongjiang, Gansu and other provinces have the highest wind energy reserves in China, and the annual average wind speed is greater than 3m/s for more than 200 days. Wind energy density of 300 watts/m, 2,3 ~ 20 m/s over the southeast coast of China and nearby islands accumulates to more than 6,000 hours a year. Inner Mongolia to Xinjiang is the region with the best inland wind energy resources, with wind energy density of 200 ~ 300 watts/m, 2,3 ~ 20

m/s and wind speed of 5000 ~ 6000 hours per year. In Xinjiang Daban town, Wind Power Plant is the largest wind power plant in China, with an annual wind energy storage of 25 billion kilowatts per hour and a total installed capacity of 125 million kilowatts [19, p. 178].

Hydro energy is also a clean source of energy. Its most notable feature is that it is renewable and no-pollution. The development of water energy plays a positive role in the comprehensive treatment and utilization of rivers, and is of great significance to the promotion of national economic development, the improvement of energy consumption structure, and the alleviation of environmental pollution caused by the consumption of coal and oil resources. Therefore, the development of water energy has been placed in the priority position of energy development strategies in all countries in the world. China is extremely rich in hydro energy resources, with a theoretical reserve of 680 million kilowatts, among which about 380 million kilowatts can be developed, but the distribution is uneven. China's hydro energy resources are more in the west and less in the east, mostly concentrated in the west and central part. Of the potential hydro energy resources in China, only 6.8 % are in the eastern regions of East China, Northeast China and North China about 15.5 % in the central and southern regions, 9.9 % in the northwest region and 67.8 % in the southwest region, of which 50.7 % are in the provinces of Sichuan, Yunnan and Guizhou. Hydroelectric power generation brings new life to our energy development. In 2019, hydroelectric power generation was 1296.7 terawatt-hours, with a growth rate of 5.9 %, accounting for 30.1 %.That is an increase of 106.25 % from 2009. It can be seen that under the new situation, we need more new energy to support the development of economy. In addition, China is rich in geothermal, solar and biomass energy resources,

which still have great potential for development and utilization. These resources are our future development direction [9, p. 4].

Compared with other countries, China's proven reserves of some energy resources (such as oil, uranium and natural gas) are relatively small, and the domestic energy demand gap is large; China's per capita share of energy resources is low, far lower than the world average; China's energy resources are widely but unevenly distributed. The main areas of energy consumption in China are concentrated in the economically developed southeast coastal areas, and there are obvious differences between resource occurrence and energy consumption region. Although there are a variety of new energy, but the proportion is still very low. Therefore, we need to explore the specific situation of energy production and consumption.

In the total energy production, raw coal accounts for the largest proportion. It is China's huge coal production that makes it the world's largest producer of fossil fuels. In 2019, China's total energy output reached 3.97 billion tons of standard coal, and only coal production reached 272.34 million tons of standard coal. In 2019, it accounted for 68.6 %, 4.99 % less than in 2015. There are probably two reasons for this. The first is that there are few proven reserves of coal. Secondly, the new era requires us to develop green, shifting from traditional energy industries to new energy industries. The proportion of crude oil is the second, decreasing year by year. In 2019, it accounted for 6.9 %, 18.82 % less than in 2015, with the largest decline. However, the proportion of natural gas increased year by year, accounting for 5.7% in 2019, an increase of 18.75% compared with 2015, showing the largest increase. This also proves that our country is developing towards the direction of new energy [46, p. 311] (Table 1.1).

Table 1.1 –Total energy production and composition [46, p. 312]

Years	Total energy production (10,000 tons of standard coal)	Proportion of energy production (%)			
		raw coal	crude	natural gas	Primary electricity and other energy
2015	362193	72.2	8.5	4.8	14.5
2016	345954	69.8	8.3	5.2	16.7
2017	358867	69.6	7.6	5.4	17.4
2018	378859	69.2	7.2	5.4	18.2
2019	397000	68.6	6.9	5.7	18.8

China's total energy consumption has increased year by year from 2015 to 2019. In 2019, the total energy consumption was 4.87 billion tons of standard coal, with an average annual growth rate of 2.33%. And production is similar, China's largest consumption of energy is still raw coal. In recent years, with the increase of people's awareness of environmental protection and the emergence of various new energy sources, the consumption of raw coal has been decreasing year by year. In 2019, the consumption accounted for 57.7 % of the total energy consumption, and the total coal consumption showed a downward trend. That was 9.56 % less than in 2015. Total oil consumption has barely budged, standing at 18.9 % for the past three years. Natural gas does have new opportunities for development. The country advocates the use of new energy and the emergence of various new energy products give new opportunities for development of new energy. In 2019, natural gas accounted for 8.1 % of total consumption. From 2015 to 2019, it showed an obvious upward trend, increasing by 39.66 % compared with 2015, with an average annual growth rate of 6.91 %. In 2019, China's total production and consumption were 397 million tons and 487 million tons respectively, with a domestic consumption gap

of 90 million tons. These data show that energy production is far lower than consumption, China's energy is facing the problem of insufficient domestic demand, heavily dependent on imports. Both total energy production and consumption are increasing, but consumption is increasing faster. According to relevant statistics, three kinds of fossil energy have appeared domestic demand gap. Among them, the domestic production of oil was the first to fail to meet the consumption demand, and the domestic production of natural gas and coal was also insufficient after 2000.Today, the situation is more serious, with the gap increasing year by year. Therefore, under the requirements of the goals of the 14th Five-Year Plan, China will pay more attention to the development of new energy, committed to increase the proportion of new energy consumption, and replace the traditional energy with the development of new energy. In the new era, with the progress of economy and the development of science and technology, there are many new things that release the potential of consumption and drive the positive development of economy. Hind this, there is a heavy price to be paid: greenhouse effect, global warming and serious environmental pollution. We have only one earth, people all over the world breathe the same fate, so we try our best to develop pollution-free, sustainable new energy, to improve our environment, to protect the earth we live on (Table 1.2).

Coal accounts for the vast majority of both production and consumption. According to China Statistical Yearbook, China's total coal production in 2018 was 2.62 billion tons of standard coal, accounting for 69.2 % of the total energy production. In 2018, the amount of imported coal was 0.28 billion tons of standard coal, and the amount of exported coal was 0.0049 billion tons of standard coal. The amount of imported coal was more than 57 times that of exported coal. This statistic surprised me. China is the largest

consumer of fossil fuels, of which coal accounts for the majority, and can be said to be a big importer of coal. In 2019, coal production was 2.72 billion tons of standard coal, it accounted for 68.6 % of the total energy production [47, p. 4].

Table 1.2 – Total energy consumption and composition [47, p. 5]

Years	Total energy consumption (10,000 tons of standard coal)	Proportion of energy consumption (%)			
		raw coal	crude	natural gas	Primary electricity and other energy
2015	434113	63.8	18.4	5.8	12.0
2016	441492	62.2	18.7	6.1	13.0
2017	455827	60.6	18.9	6.9	13.6
2018	471925	59.0	18.9	7.6	14.5
2019	487000	57.7	18.9	8.1	15.3

The consumption of coal was 2.81 billion tons of standard coal, accounting for 57.7 % of the total energy production. Production of coal is less than consumption, with a consumption gap of 0.09 billion tons of standard coal. Therefore, it is not difficult to see that at present, coal is the main energy source in China, it has the largest consumption gap in 2016, and the gap has narrowed from 2017 to 2019, but it still has to rely heavily on imports and the international energy market (Figure 1.4).

Oil, known as the «blood of industry». Since the outbreak of energy crisis in 1973 and 1979, countries began to pay attention to energy security, and the media began to pay attention to the extent of oil supply reports [49, p. 9]. It also led to the realization that oil was a finite resource that would eventually run out.

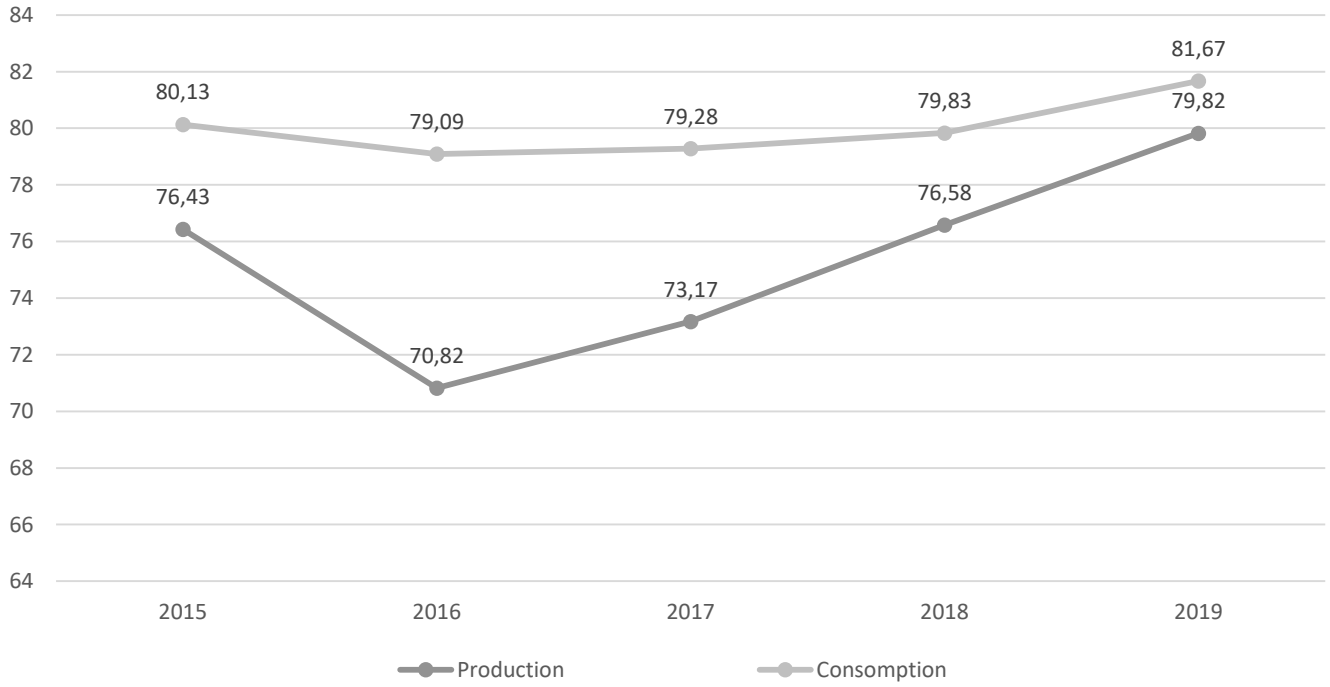

Figure 1.4 – Production and consumption of coal (Unit: EJ) [50, p. 82]

But all attempts to predict that oil will run out have so far failed to materialize, so some dismiss the discussion. China is also one of the first countries in the world to discover and utilize oil. As an important source of energy, it has made great contributions to the development of our economy and industry. Today, 90 % of transportation energy is derived from oil. Oil is the most important transport-driven energy source because of its ease of transportation and high energy density. In addition, it is the raw material of many industrial chemicals, so it is one of the most important commodities in the world today. In 2019, oil production was 0.274 billion tons of standard coal, it accounted for 6.9 % of the total energy production. Oil consumption was 0.92 billion tons of standard coal, accounting for 18.9 % of the total energy consumption. Like coal, oil is produced less than it is consumed, and the domestic oil consumption gap has been increasing from 2015 to 2019. In 2019, the largest consumption gap was 0.646 billion tons of standard coal. China's energy imports are mainly oil and natural gas. According to the data of BP

Statistical Yearbook of World Energy (2020), China's oil imports accounted for a large proportion in the international energy market, so it still has to rely heavily on imports and the international energy market. China's oil supply is under the greatest pressure compared with other energy sources as demand for oil is growing and the country's domestic oil resources and existing technology are causing a widening demand gap (Figure 1.5).

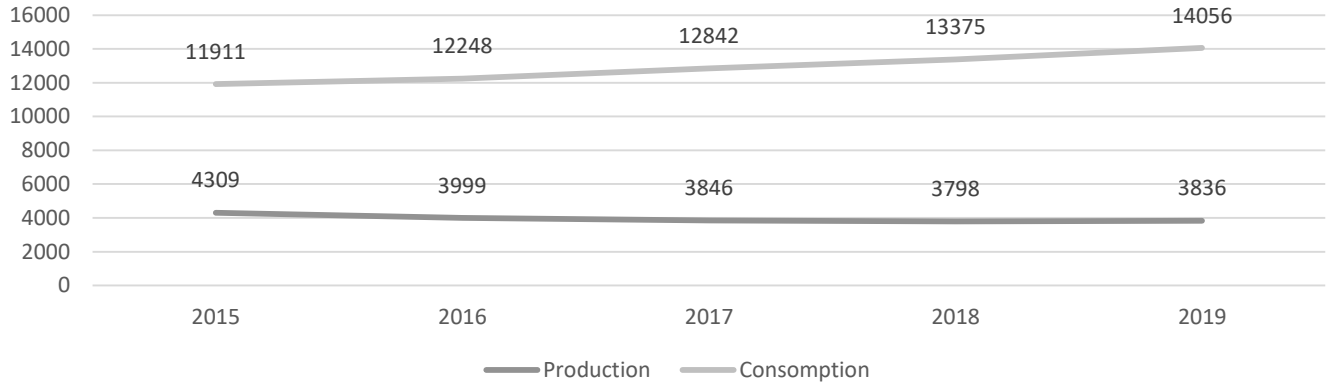

Figure 1.5 – Production and consumption of oil (Unit: Thousand barrels daily) [50, p. 86]

Natural gas is an up-and-comer in China's energy market. The use of natural gas as an energy source can reduce the use of coal and oil, thus greatly improving the problem of environmental pollution. As a kind of clean energy, natural gas helps to reduce acid rain formation, relieve the global greenhouse effect, and fundamentally improve the environmental quality. Although the current share is still small, natural gas has the most development prospect in terms of the growth ratio of production to consumption and the requirements of environmental constraints on energy development. Due to the limitations of domestic natural gas resources, the dependence of China's natural gas on foreign countries will be increased in the future. In 2019, natural gas production was 0.226 billion tons of standard coal, it accounted for 5.7% of the total energy production. The consumption of natural gas was 0.394 billion tons of standard coal, accounting for 8.1% of

the total energy consumption. Like coal and oil, the production of natural gas is smaller than the consumption. From 2015 to 2019, the domestic consumption gap of oil is increasing year by year. In 2019, the consumption gap was the largest, with a consumption gap of 0.168 billion tons of standard coal. As people's awareness of environmental protection increases, the demand for clean energy around the world increases, and governments around the world communicate this trend through the legislative process, natural gas has been regarded as one of the cleanest energy sources, so the demand for natural gas will naturally increase.

According to relevant policies, natural gas is expected to become the same as coal and oil in primary energy consumption by 2030. The share of natural gas will equal that of oil by 2040, and world energy demand will increase by 60 % by 2050, but coal and oil consumption will be on a gradual decline. The peak period of natural gas lasts for a long time. The emergence and great development of unconventional natural gas will definitely support the rapid development of natural gas and eventually surpass oil to become the largest energy consumption in the world (Figure 1.6).

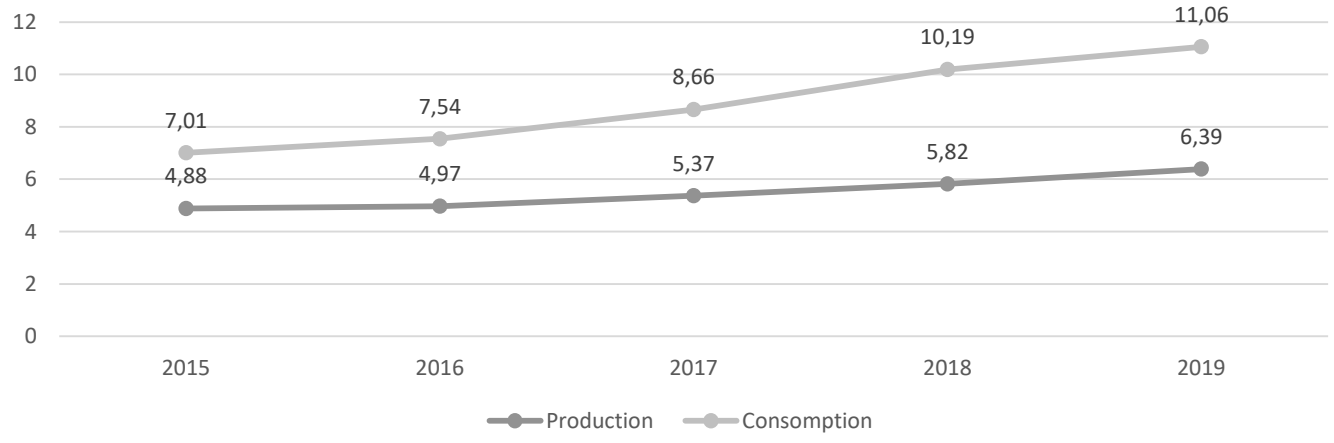

Figure 1.6 – Production and consumption of natural gas (Unit: EJ) [49, p. 4]

Electric power is the power of energy, widely used in our life. Electric power was invented in the 1870s. The invention and application of electric power triggered the second upsurge of industrialization and became one of the three scientific and technological revolutions in the world since the 18th century. Since then, science and technology have changed people's lives. We still have a growing need for electricity in the age of the Internet, as we invent computers, home appliances and other products that use more electricity. There is no denying that the continuous emergence of new technology makes electricity a necessity for people. The large-scale power system in the 20th century is one of the most important achievements in the history of human engineering science. It is a power production and consumption system composed of power generation, transmission, power transformation, distribution and electricity consumption.

Today, electricity touches every aspect of our lives. From 2014 to 2018, electricity production and consumption were roughly flat. Production and consumption are increasing year by year. In 2018, production was 7,166.7 billion kilowatt-hours and consumption was 7,150.8 billion kilowatt-hours. Imports were only 5.7 billion kilowatt-hours and exports 20.9 billion kilowatt-hours. This data shows that electricity is basically self-sufficient. The reason for this is that the relevant policies introduced by our country encourage the development of new energy and make more use of wind energy, hydro energy and geothermal energy to generate electricity, so as to meet the domestic demand for electricity. Figure 1.7 shows production and consumption of electric power.

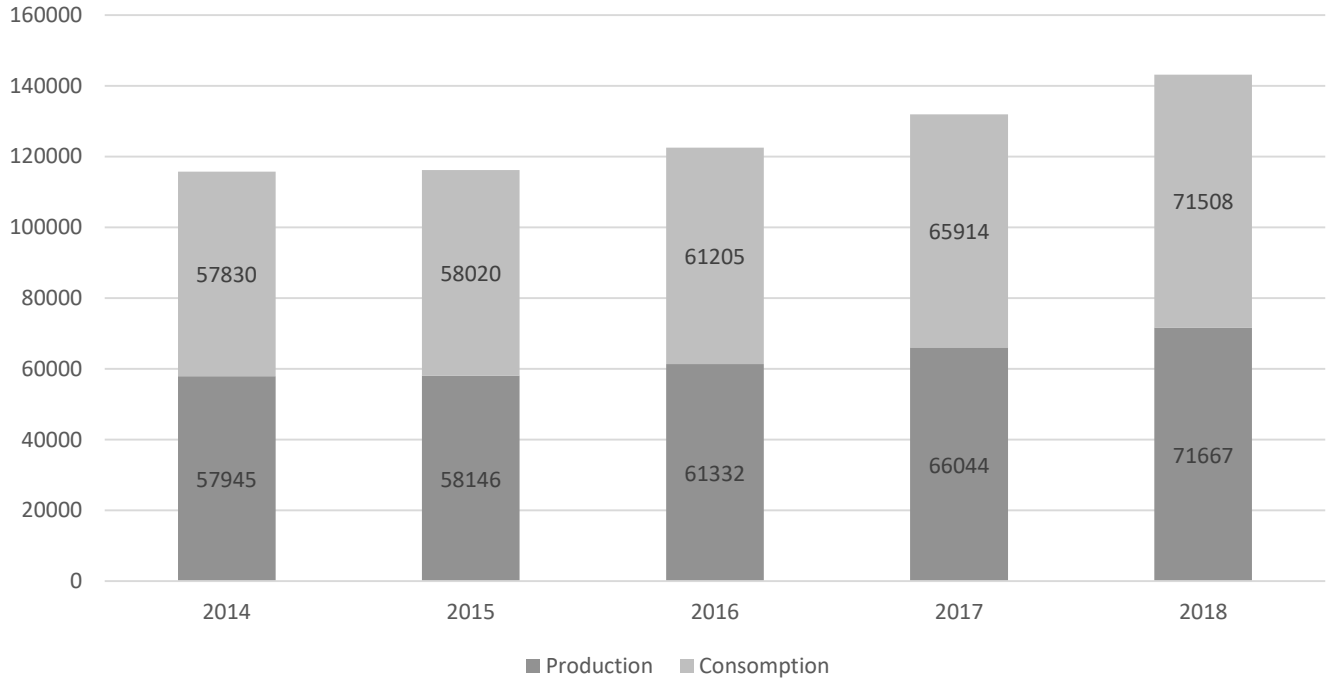

Figure 1.7 – Production and consumption of electric power [52, p. 84]

The main ways of electric energy generation are: thermal power generation (coal and other combustible material), solar power generation, large capacity wind power generation technology, nuclear power generation, hydrogen power generation, water conservancy power generation, etc. In China, the electricity supply mainly comes from the following four aspects: wind power, water power, thermal power and nuclear power. As can be seen from the figure below, from 2014 to 2018, it mainly relied on thermal power generation (combustible materials such as coal). In 2018, thermal power generation amounted to 5,096.3 billion kilowatt-hours, far exceeding the other three categories. That's an increase of 15.82 % compared to 2014 (Figure 1. 8) [52, p. 85]. Thermal power accounted for 71.11 %, well over half of the total, with hydropower at 5.11 % and nuclear at 4.11 %. (Figure 1. 9) In the time of thermal power generation, although it has facilitated

our life, led to the development of the economy. But it will not only pollute our air, releasing acidic gases and leading to an increase in acid rain [52, p. 87].

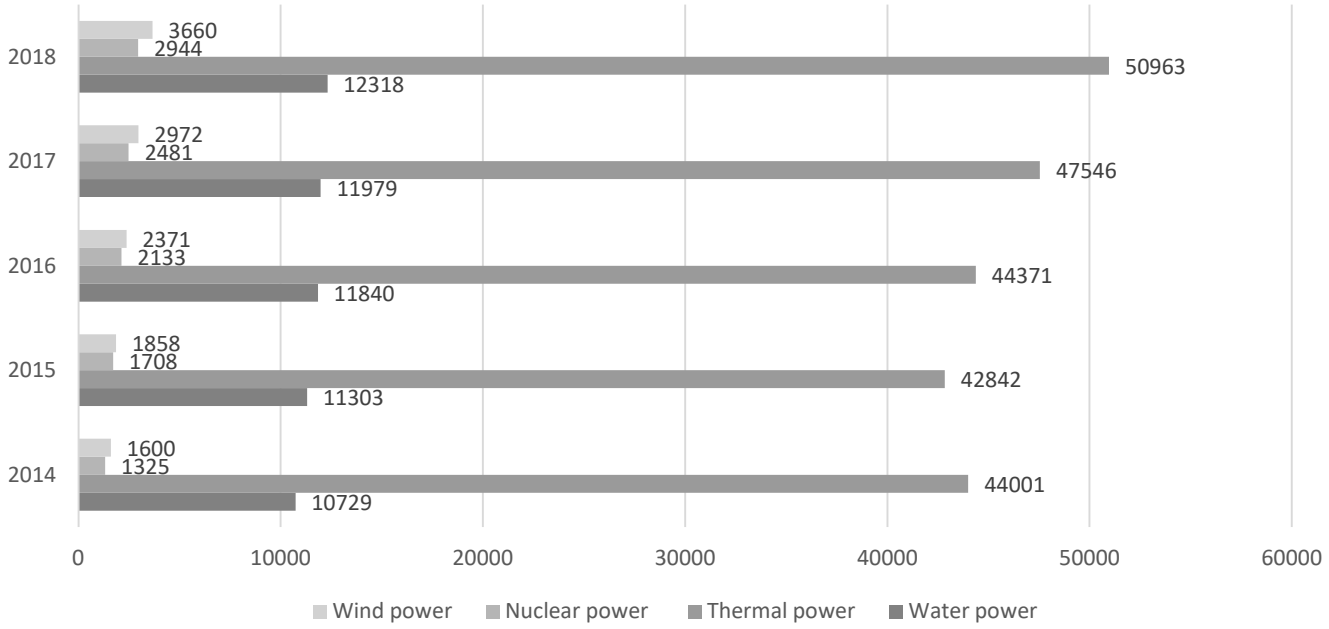

Figure 1.8 – Production and consumption of electric power [52, p. 85]

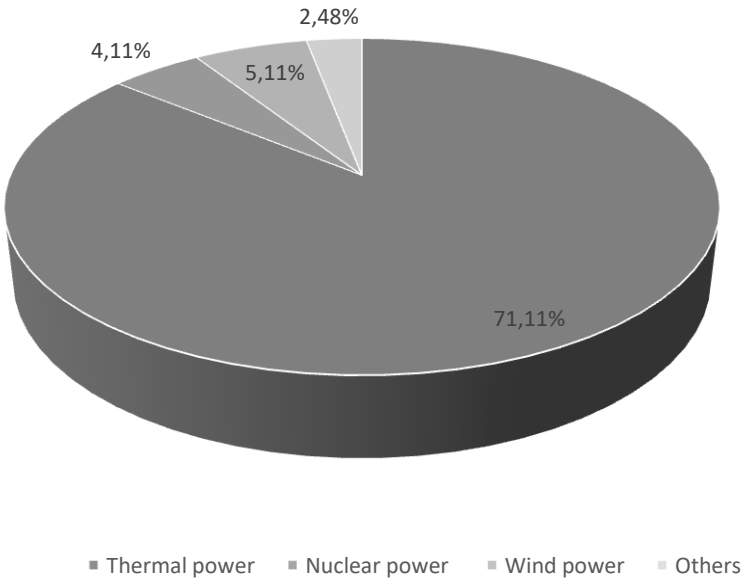

Figure 1.9 – The proportion of power generation in 2019 [52, p. 87]

Moreover, it will cause dust pollution and have a bad effect on people's life and the growth of plants. At the same time, it will cause a waste of resources. According to relevant statistics, the daily water consumption of a 1 million kilowatt thermal power plant is about 100,000 tons. The country consumes 50 million tons of standard coal every year [54, p. 1093]. This kind of bad phenomenon has a lag effect, so that by the time we realize this kind of problem, our environment has been polluted, and we must do our best to improve this kind of problem. In recent years, the relevant policies of the state for environmental protection, we can see that the state is studying more new energy to serve our production and life.

Through the above brief introduction, although affected by the epidemic, the economy still achieved positive growth, and the domestic economy is slowly developing in a good direction. Among them, the support of industrial economy is indispensable. And the development of industry, it is necessary to rely on energy to provide power. From the combing of the current situation, I find the following three problems:

(1) The total proved reserves of energy in China increased somewhat compared with that in 2018, among which the proved reserves of natural gas increased the most, but the distribution was unbalanced.

(2) Production and consumption increase year by year, and production is less than consumption, and there is a big gap in domestic demand, among which, oil gap is the largest, and it is heavily dependent on imports and the international energy market.

(3) In recent years, the market for new energy development has been improving and development opportunities have increased, but the proportion of new energy is still

relatively low. This requires us to continue to explore China's energy import and export situation, as well as the obstacles to China's energy development.

Chapter 2 Analysis of the current state of China's energy trade

2.1 Current state of China's energy trade

2019 has been a turbulent year for both developed and developing countries, with the global economy growing at 3.7 % in 2018. Economic growth slowed by 0.8 % in 2019, with declines in both developed and emerging economies. Growth in global primary energy consumption slowed to 1.3 % in 2019, less than half the 2.8 % growth in the previous year. Due to the COVID-19 epidemic, the total global primary energy consumption demand decreased by about 5 % in 2020.The international pattern of the world energy market shows the following characteristics: firstly, the global primary energy consumption will shift from the overall shortage to oversupply, and the growth rate of consumption will gradually slow down. Secondly, the overall adjustment of the energy supply side structure has been accelerated and deepened. Thirdly, the overall price of oil will be lower in the shock, and the oil settlement system will undergo major changes. Fourthly, China, the United States and India will become important drivers of global energy consumption patterns. Fifthly, reducing carbon emissions and paying attention to climate change will become the theme of future energy pattern development [7, p. 230].

In the face of such a situation, it is particularly important to study energy trade. Energy trade is the sum total of energy exchange and circulation. The exchange and circulation of energy and general Commodity Exchange and circulation are subject to the regulation of economic laws. In international energy trade, there are two major types of trade: firstly, trade in energy commodities, including oil, petroleum products, natural gas and coal, etc. Secondly, trade in energy technology, including talent, know-how and

machinery and equipment. In this master thesis, the scope of energy trade is defined in energy commodity trade. This chapter introduces coal, oil, natural gas and electricity respectively.

In 2019, the world coal market continued its cyclical recovery and upward trend and coal production and consumption increased. Coal prices have fallen slightly, and international coal import and export trade is still active. However, the upward growth momentum has weakened slightly, and the downward adjustment momentum has become stronger. The demand for coal is basically stable in the short term. According to the International Energy Agency, global coal demand will remain generally stable until 2024. The European and US markets are consuming less coal, but this share will be offset by increased coal demand in China, India and other Asian countries, with India's coal power generation demand expected to grow at an annual rate of 4.6 % in 2024 and Southeast Asia's coal demand to grow by more than 5.0 %. Coal's contribution to the global energy mix will fall from 27 % to 25 %, with the main alternatives coming from renewables and natural gas [1, p. 846]. In 2019, world coal prices began to fall as mining and exports from emerging countries such as Indonesia and Australia increased. However, coal demand growth has slowed because of the global economic slowdown and overall lower energy demand, as well as climate, energy policy and power industry developments affecting coal production, including a shrinking coal market in Europe and coal control policies in China [3].

According to statistics, China's coal consumption in 2019 was 2.81 billion tons of standard coal, accounting for 57.7 % of the total energy production. Consumption has not changed much in recent years. In the short term, coal and fossil energy will still take a

high proportion in the global energy production and consumption structure, but with the growth of renewable energy and natural gas, the proportion of coal in the global primary energy production and consumption will continue to decline. In terms of coal import and export data, the global coal import volume in 2019 was 35.28 EJ, and China's coal import volume was 6.4 EJ, accounted for 18.1 %, an increase of 4.3 % over 2018. The global coal export volume was 35.28 EJ, and China's coal export volume was 0.34 EJ, accounted for 1 %, 18 % lower than that of 2018 (Figure 2.1).

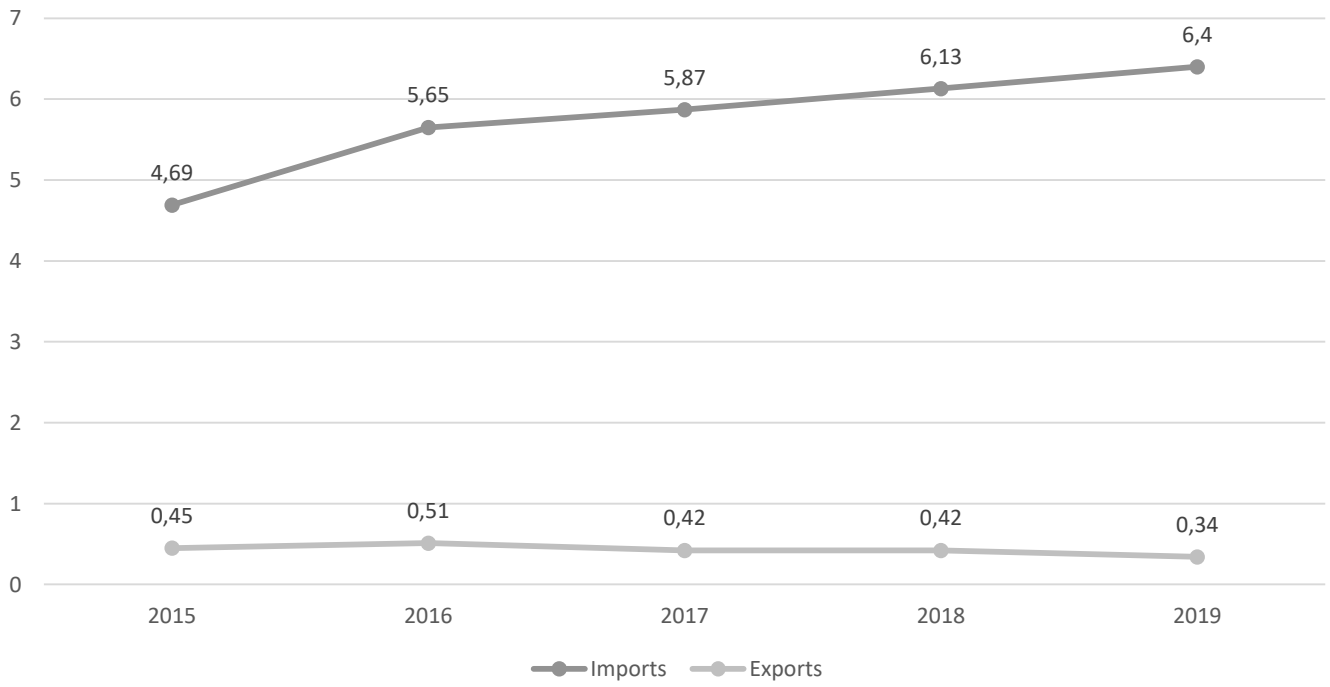

Figure 2.1 – The imports and exports of coal [62]

In recent years, China's domestic coal energy demand gap continues to expand, the substantial increase of domestic consumption makes China need to obtain energy from outside to make up for the lack of domestic production, so China's coal energy imports continue to increase. According to BP's statistics, China's total coal import in 2019 is 6.4 EJ. Among them, the main imports are from Russia, Australia, Indonesia and Mongolia,

accounting for 12.81 %, 32.19 %, 34.22 % and 15.94 % respectively. Indonesia has large coal resources, and China is the main export target. In terms of export, the coal export quantity in 2019 is only 0.34 EJ, and the main export region is the Asia-Pacific region, accounting for 41.18 %. Exports are small compared with coal imports (Table 2.1).

Table 2.1 – Sources of import and export of coal [46, p. 313]

Energy		Source									
Coal (Unit: EJ)	China's imports	Cana-da	US	Colum-bia	Russia	Austr-alia	Indone-sia	Mongol-ia	Other Asia Pacific	–	–
	6.4	0.1	0.03	0.05	0.82	2.06	2.19	1.02	0.13	–	–
	China's exports	Source (+:Less than0.005)									
		Cana-da	Mex-ico	US	Euro-pe	Middl-e East	Africa	India	Japan	South Korea	Other Asia Pacific
	0.34	+	+	+	0.02	0.01	0.01	0.03	0.07	0.06	0.14

At present, domestic industrial coal consumption accounts for 90 % of the total coal consumption. Electric power, metallurgy, building materials and chemical industries are the major industrial coal consuming industries, coal consumption can account for about 70 % of the industrial coal consumption, of which the power industry consumes more than 40 % of the coal. With the implementation of the policy, coal consumption decreased in 2019, and the carbon emissions caused by energy consumption should not be taken lightly. Growth of 0.5 % in 2019 moderated slightly from an unusually large 2.1 % in 2018. The average annual growth rate of carbon emissions in 2018 and 2019 is higher

than the average growth rate of the past decade. This has caused serious pollution to our environment. However, with the advent of clean energy, coal's share is expected to decline. As an indispensable energy source, oil plays an important role in our economic development. The slowdown in global economic growth and trade frictions between China and the United States have reduced global demand for oil, adding to the downward pressure on oil prices. International crude oil prices in 2019 out of the first rise and then fall. Energy security has once again become a global concern. In recent years, with the development of economy, our country is faced with the problem of heavy dependence on imports for oil. Oil occupies the second place in China's energy production and consumption. In 2019, the oil consumption was 0.92 billion tons of standard coal, accounted for 18.9 % of the total energy consumption. In 2019, the largest consumption gap was 0.646 billion tons of standard coal. The amount of oil imported in 2019 was 1,825.00 thousand barrels daily, an increase of 7.3 % over the previous year, accounting for 16.7 % of the world's total oil imports (Figure 2.2).

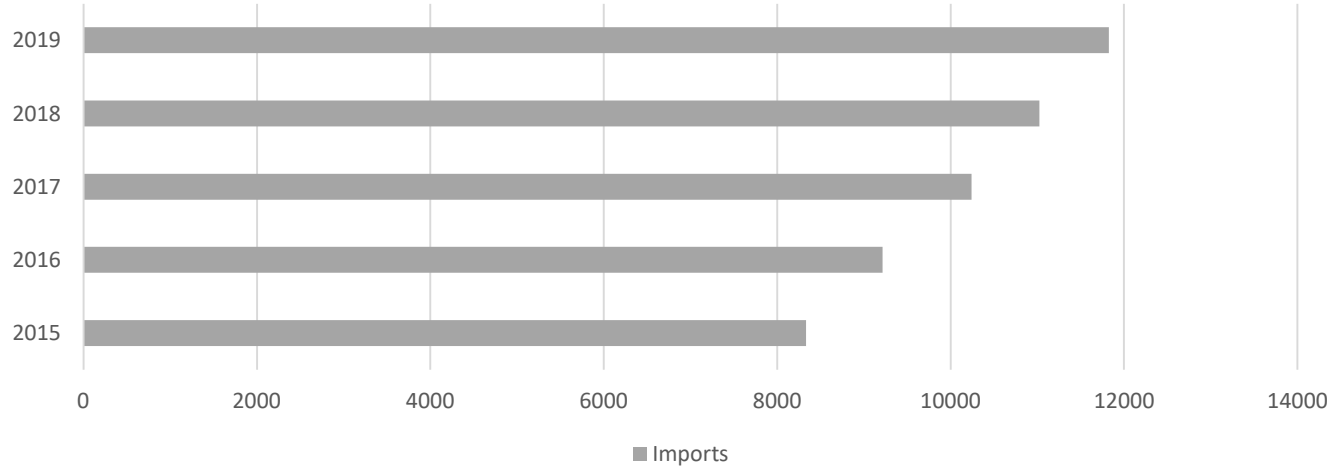

Figure 2.2 – The imports of oil [60]

In terms of exports, crude oil exports totaled 66.9million tonnes and petroleum products exports totaled 0.4 million tonnes. The major crude oil exporters were the Asia-Pacific region, accounting for 50.97 %, and Singapore accounted for 22.42 %. Petroleum products are mainly exported to the Asia - Pacific region. It can be seen that the Asia-Pacific region plays an important role in the development of China's oil trade (Table 2.2).

Table 2.2 – Sources of import and export of oil [39, p. 858]

<table>
<tr><td>Energy</td><td rowspan="2">Product exports</td><td colspan="9">Source</td></tr>
<tr><td rowspan="5">Oil (Unit: Million tonnes)</td><td>Canada</td><td>US</td><td>Mexico</td><td>Europe</td><td>Australia</td><td>Africa</td><td>Singapore</td><td>Other Asia Pacific</td><td>other regions</td></tr>
<tr><td>66.9</td><td>0.3</td><td>0.5</td><td>1.3</td><td>2.5</td><td>3.4</td><td>2.8</td><td>15</td><td>34.1</td><td>7</td></tr>
<tr><td rowspan="2">Crude exports</td><td colspan="9">Source</td></tr>
<tr><td colspan="9">Other Asia Pacific</td></tr>
<tr><td>0.4</td><td colspan="9">0.4</td></tr>
</table>

Relative to the shock of the oil market, the performance of the global natural gas market is relatively stable, North America and Asia market consumption growth slowed down, the European market consumption growth from negative to positive, Eurasia production slightly increased compared with the same period. Natural gas prices fell in major markets, with prices in Europe and Asia falling sharply to 10-year lows. In 2020, the market environment became more complex and demand side factors increased. As a relatively clean energy, natural gas is widely used in our life. In 2019, the consumption of

natural gas was 0.394 billion tons of standard coal, accounted for 8.1 % of the total energy consumption. In 2009, the import of pipeline natural gas was 47.7billion cubic yard, an increase of 4.8 % over the previous year. The import volume of liquid natural gas was 84.8 billion cubic yard, an increase of 15.4 % over the previous year (Figure 2.3).

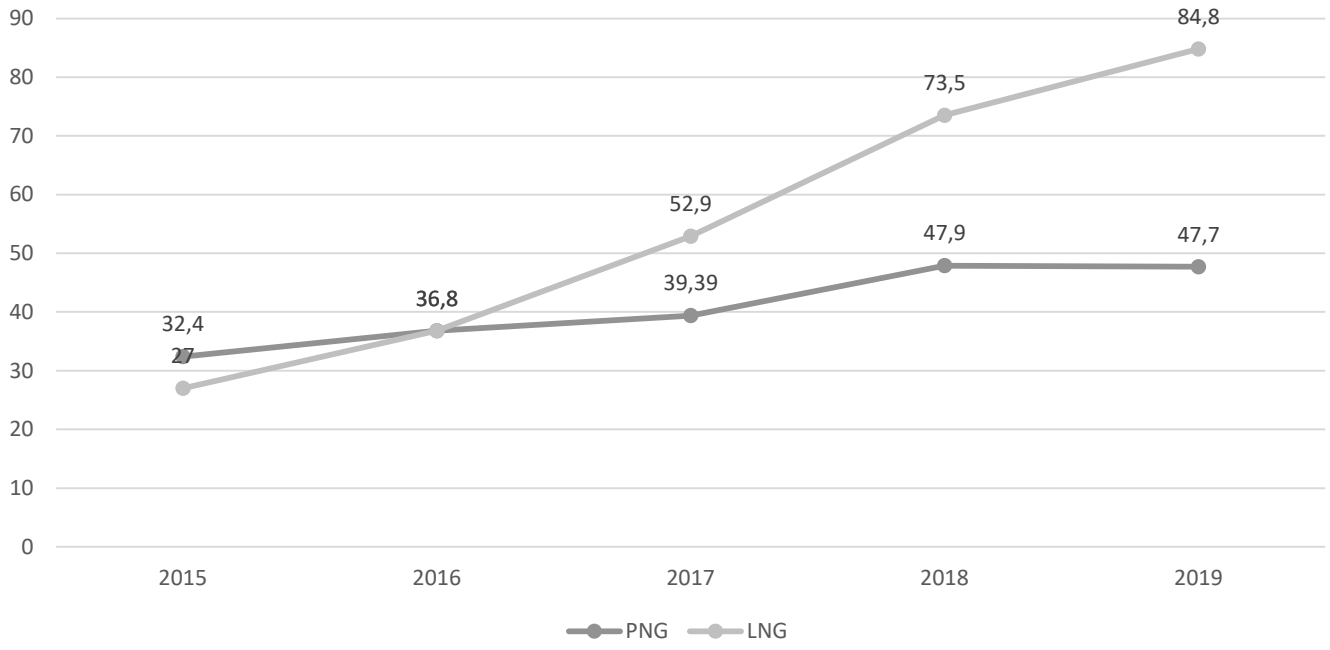

Figure 2.3 – The imports of LNG and PNG [4]

The main importers of pipeline natural gas are Australia, Qatar and Indonesia, accounted for 46.93 %, 13.44 % and 7.3 % respectively. The main importers of liquefied natural gas are Turkmenistan, Kazakhstan, Uzbekistan and Myanmar, accounted for 66.23 %, 13.63 %, 10.27 % and 9.22 %, respectively.

According to the above statistics, China's natural gas is in the stage of development. In the relevant policy also shows: 14th Five-Year period, China's natural gas consumption will still maintain rapid growth. Natural gas consumption in 2025 is expected to be 482.7 billion cubic meters, which is 1.59 times that of 2019. The compound growth rate of natural gas consumption in 2025 is 8.4 %. The imports of LNG and PNG are in Table 2.3.

Table 2.3 – The imports of LNG and PNG [4]

LNG	Source							
	Qatar	Oman	Russia	Nigeria	Australia	Indonesia	Malaysia	Other regions
84.8	11.4	1.5	3.4	2.6	39.8	6.2	10	9.9
PNG	Source							
	Kazakhstan	Russia	Turkmenistan	Uzbekistan	Myanmar	–	–	–
47.7	6.5	0.3	31.6	4.9	4.4	–	–	–

It is estimated that China's dependence on natural gas will exceed 50 % by 2025. On the one hand, the increase of China's natural gas production cannot meet the increase of consumption. On the other hand, the production of the eastern line between China and Russia and the intensive investment and construction of coastal LNG receiving stations will also drive the rapid growth of natural gas imports [45, p. 14].

In recent years, the power industry, which is closely related to coal, has been reformed around the world. Its growth is mainly from developing countries, with Asia-Pacific countries still taking the first place in the world share, while the Middle East and Africa have great potential for growth. Coal is the main source of thermal power generation in China. However, in 2019, the growth of renewable energy reached a record high (3.2 EJ), accounting for more than 40 % of the global growth in primary energy, higher than that of all other fuels. Renewables surpassed nuclear for the first time as a share of electricity generation (10.4 %). The main sources of electricity are wind power and solar power. The amount of electricity generated by renewable energy in 2019 was 732.3 terawatt-hours, an increase of 15.1 % over the previous year. Among them, wind power generated 405.7 terawatt-hours, an increase of 10.9 % over the previous year. Solar

power generation was 223.8 terawatt-hours, an increase of 26.5 % over the previous year. Thus, the proportion of renewable energy is slowly increasing (Figure 2.4).

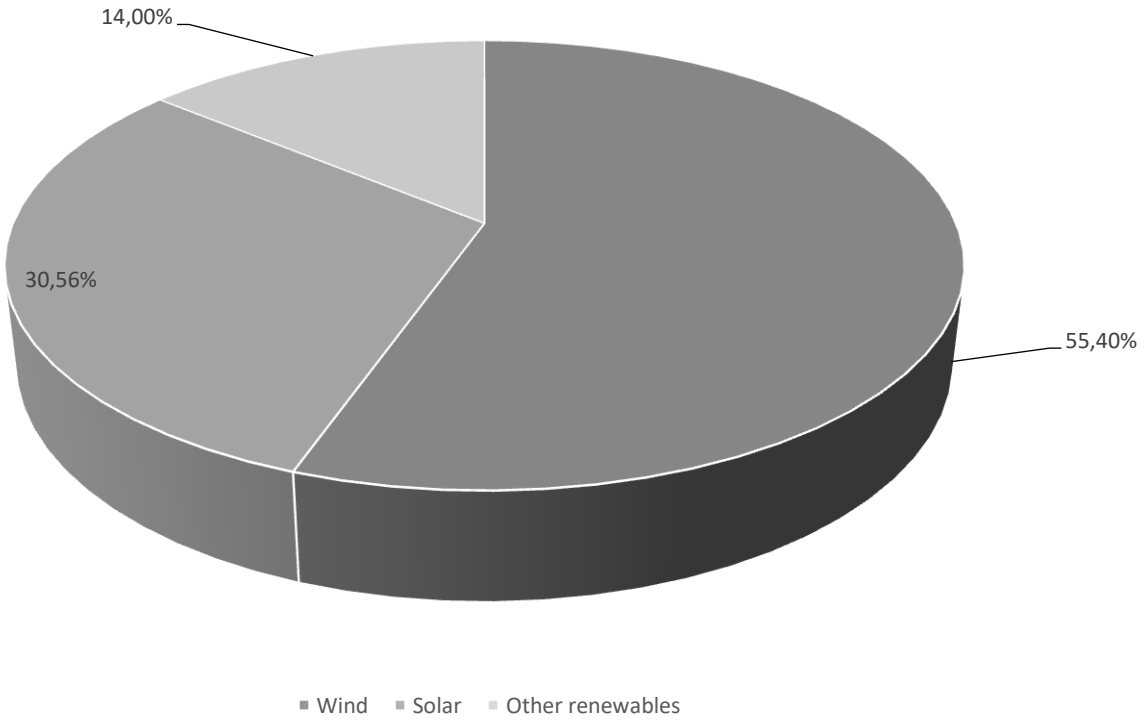

Figure 2.4 – Generation by source [14]

As a big developing country, China's fossil energy accounts for more than 85 % of its total energy consumption, and there are obstacles to the development of the system and mechanism to replace renewable energy. Therefore, in the medium and long term, China's energy development should give consideration to the clean and efficient use of coal and support the large-scale development of renewable energy.

2.2 Problems existing in the development of China's energy trade

Just a few years after massive production cuts in 2015 and 2016, investment in the oil and gas sector took an even bigger hit in 2020. Markets, companies and entire

economies are being affected by the COVID-19 pandemic, with impacts being felt throughout the global hydrocarbon supply chain. Oil prices have fallen sharply and investment has fallen. For example, Brazil's Petrobras and PetroChina both announced spending cuts of 30 %. The squeeze has been worse in some places, such as Sonatrach in Algeria, where investment has fallen by 50 %. At the same time, shrinking coal demand, low prices, environmental pressures and disruptions to supply chain and investment operations will lead to a significant drop in coal supply investment in 2020. There is a bad picture of global energy investment [7, p. 235].

China's energy investment has also been affected. However, with the continuous implementation of the «Belt and Road» construction and the gradual acceleration of the «going out» pace, the overseas investment of state-owned energy enterprises has been growing rapidly in recent years, and the selection of investment countries (regions) has gradually become wider [18, p. 190]. The overseas investment scale of state-owned energy enterprises shows the characteristics of rapid growth on the whole, but the volatility is also relatively large. According to the data collected by the Heritage Foundation of US, from 2015 to 2018, the investment amount of large-scale projects of state-owned energy enterprises showed a fluctuating trend. It peaked at US 37.01 billion in 2012 and US 24.2 billion in 2018, an increase of 280.5 % over 2005. (Figure 2.4) In recent years, the price of oil and gas has been falling, and the main investors are pessimistic about the energy market, and the profits of overseas investment of energy enterprises are reduced [11, p. 181]. Moreover, China's own problems also affect energy trade, mainly in the following five aspects.

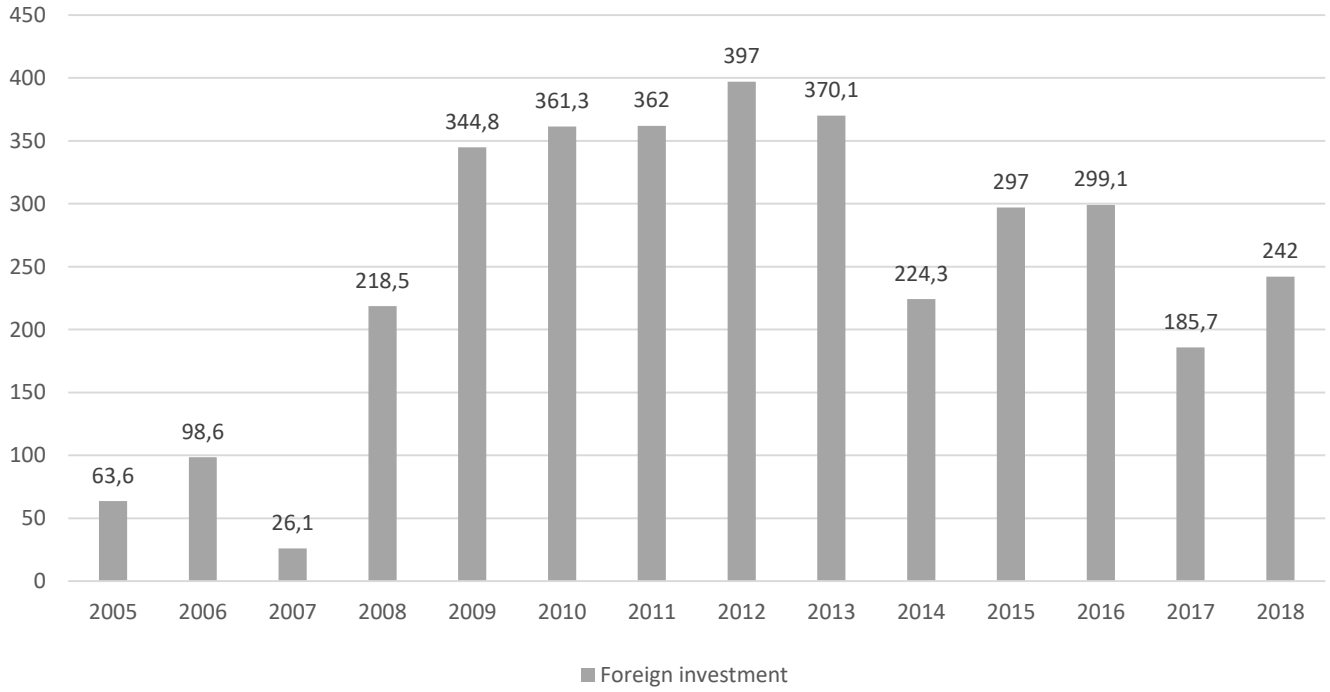

Figure 2.4 – Amount of outbound investment by state-owned energy enterprises [18, p. 192]

Firstly, we are less energy efficient. Energy efficiency was improved by only 2.6 % in 2019, short of the 3 % target set by Premier Li in 2019.China's proven energy reserves increased in 2019, but a large amount of oil in particular needs to be imported. Domestic production cannot keep up with consumption, and there is a big gap in consumption. This is because China's oil exploration technology is not yet mature and needs to be improved. A lot of unnecessary energy consumption has resulted in our country's heavy dependence on a single energy import and neglect of clean energy. This runs counter to the green development advocated by other countries. I think the problem of low utilization also affects the energy trade. I think the problem of low utilization also affects the energy trade.

Secondly, China's state-owned enterprises invest less. The investment of state-owned enterprises in China started late and the starting point is not high. Most of them are large projects with large amount of investment, high risk and long investment cycle. Investment means are relatively single and lack of flexibility. Transnational mergers and acquisitions have gradually become the main way for state-owned energy enterprises to invest abroad. State-owned enterprises' energy investment in foreign regions through mergers and acquisitions is bound to be reviewed by the host countries. Moreover, due to their inexperience and lack of flexibility, all these increase the risk of investment. Behind this, it not only brings economic loss for a company, but also discourages other companies that are ready to enter the energy investment industry, thus further hindering the development of China's energy trade.

Thirdly, energy exporters are far away from China and their supply channels are not stable. At present, China's oil imports are still relatively single–mode transportation, mainly relying on shipping and rail transport. The only form of transportation for oil imported into Middle East and Africa is sea transport, and each maritime route is highly dependent on the Cape of Good Hope and the Straits of Malacca. It requires a strong ocean shipping fleet and strong naval guards, and even has the necessary traffic arteries. Certain control and influence are necessary, and the Chinese Navy’s experience in this area is still lacking [34, p. 9].

From a specific point of view, there are many problems in the face of different oil exporting countries. The following will be specifically illustrated by several major energy trading partners in China [34, p. 12].

Russia is a friendly strategic partner of China. It has been over 70 years since the establishment of diplomatic relations with our country. On May 20, 2014, China and Russia signed the Joint Statement on the New Stage of China-Russia Comprehensive Strategic Partnership of Coordination, which aims to establish a comprehensive China-Russia energy cooperative partnership in the field of energy [6, p. 12]. China needs to import resources for its market, while Russia needs to find markets for its resources. In 2019, Russia's proven natural gas reserves accounted for 25 % of the world's proven reserves, ranking first in the world. Proven oil reserves account for 9 % of the world's proved reserves. The coal reserves rank fifth in the world. The reserves of iron, nickel and tin rank first in the world. Proven oil reserves account for 9 % of the world's proved reserves. The coal reserves rank fifth in the world. The reserves of iron, nickel and tin rank first in the world [6, p. 18]. And China and Russia have significant geographical advantages and strong energy complementarity. These advantages have increased energy trade between the two countries. However, through the course of energy trade between the two countries, the friction between the two sides continues and the progress is not smooth. So I'd like to start by talking about the constraints on energy trade between China and Russia [6, p. 28].

Firstly, in coal energy cooperation, there is the problem of high logistics costs. China has large lignite reserves, but relatively small amounts of anthracite and coking coal, mostly made up by imports from Russia. However, the main source of these two types of coal in Russia is Siberia, which is far away from the border between China and Russia and has a long distance from ports and the border. It takes a long time to reach the region by rail and sea transportation. In the current economic situation, the cost of railway

transportation is higher. Transport costs account for half the price of Russian exports, far more than the price of China's own coal [18, p. 201].

Secondly, in terms of natural gas energy cooperation, there is a lack of price mechanism. In 2019, the eastern route of the natural gas pipeline between China and Russia will be put into operation, which is of great significance for both China and Russia. But it is only about the project of the east line of the natural gas pipeline between China and Russia that the two countries have been talking about for nearly 10 years [6, p. 38]. Russia's price was much higher than China's expectation, while China's price did not meet Russia's demand. As a result, the two governments have been unable to reach an agreement on industrial cooperation. In the face of this situation, the Chinese government has been constantly exploring the import market of natural gas and has obtained natural gas purchase agreements with some Middle East and African countries through cooperation and exchanges with other countries in the world. Energy trade between Russia and China has been affected [6, p. 61].

Thirdly, in oil and energy cooperation, transportation and investment costs are too high. On the one hand, pipeline transportation infrastructure in Russia is not perfect [6, p. 70]. According to incomplete statistics, it would take 30 years and cost nearly 200 billion to build a pipeline to meet the full requirements of Russia's domestic exports. At present, Russia's financial constraints, investment is too large, infrastructure construction has been delayed, thus affecting the trade cooperation between the two countries. On the other hand, The high oil export tariff and land transportation cost of Russian oil to China also affect the enthusiasm of Russian oil enterprises to carry out oil trade in China. The Russian government keeps increasing export tariffs on China's oil trade, which also leads

to the lower income of Russia's domestic export than that of domestic sales. Therefore, enterprises have little enthusiasm in export trade [6, p. 92]

The ups and downs of the Sino-Russian oil pipeline issue and natural gas cooperation reflect Russia's national interests, complex political background, and future strategic choices. These are also the main factors affecting the route of the Sino-Russian oil pipeline. This is the main reason why Russia abandoned the «Angola-Dalian Line» and the «Anna Line» and adopted the «Tina Line». For China, in order to gain benefits in the energy game, it must adopt a diversified strategy of energy supply and import, convert the geographical advantage of energy into an economic advantage, and weaken the pressure of domestic oil supply [18, p. 202].

Fourthly, in the field of power and energy cooperation, the subsidy policy is imperfect, the investment is large, and the return rate is low. In recent years, with the attention to the environment, countries have begun to increase the proportion of renewable energy use. Russia also introduced the relevant preferential subsidy policy, but put forward the requirements of investment and production [27, p. 660]. For China, this is not consistent with the usual cooperation mode of contracting projects and exporting machinery and other equipment, which increases the corresponding cost for Chinese enterprises, but avoids the enjoyment of preferential policies. In addition, the relevant procedures of the government are relatively complex, which also reduces the willingness of some Chinese enterprises to cooperate, thus further affecting the energy trade between the two countries [27, p. 662].

The global economic and trade pattern is in a turbulent situation, and Sino-Russian energy and trade cooperation has therefore become more uncertain. The developed

countries have not given up the interference in Sino-Russian energy and trade cooperation, which has caused great obstacles to Sino-Russian energy and trade cooperation [6, p. 129]. In the face of these difficulties, Chinese energy companies must improve their market competitiveness as soon as possible, work hard to eliminate interference, actively meet challenges, and identify their position in a complex international energy trading environment. It is necessary to seize the opportunity of Russia to develop oil and natural gas in the eastern region and the Silia region, and to improve the independent research and development technology level of China's energy enterprises through cooperation and mergers and acquisitions, and continuously expand the scope of Sino–Russian energy trade cooperation [33, p. 67].

Since the «The Belt and Road» policy was put forward in 2013, China began to carry out energy cooperation with other countries. Among them, Central Asia is the region where China conducts extensive energy cooperation. Central Asia is the «heartland», the core of the Eurasian continent and the core of the construction of the Silk Road Economic Belt [36, p. 624]. At present, China's demand for energy is in the stage of rapid expansion, and its energy production has been unable to meet the growth of demand. The economic exchanges between China and Central Asian countries can effectively alleviate this dilemma, and Kazakhstan will play an important role in the future economic and trade between the two sides [36, p. 625]. China should also give full play to the advantages of China's northwest region and establish close energy trade links with the five Central Asian countries, which can relieve the pressure of China's energy demand far exceeding its production [36, p. 630].

Central Asia, known as «the energy base of the 21st century» [42, p. 55]. Among the five countries in 2019, Kazakhstan has proved the largest oil output, with 3.9 thousand million tons. Turkmenistan has proved the largest amount of natural gas, with 688.1 trillion cubic feet. Kazakhstan's coal output was the largest, with 25,605 million tons. Therefore, it can be seen that Central Asia has rich energy resources, advantageous geographical location, small distance and transportation cost, and great trade advantages [42, p. 56].Through searching relevant information, it is found that the GDP level of Central Asian countries is generally low, and it has become the consensus of Central Asian countries to rely on energy to develop their own economy. However, there are also problems with regard to energy trade.

Firstly, in the area of coal energy cooperation, the investment environment is not good. Most of the five Central Asian countries are in the period of economic transformation, and the market environment is changing rapidly and the investment environment is unstable, which is not conducive to transnational cooperation in large energy projects [42, p. 58]. In terms of government efficiency, the slow speed of administrative examination and approval and the complicated procedures increase a lot of activity costs for Chinese enterprises that want to invest and affect the project schedule [9, p. 7]. Moreover, the law in the five Central Asian states is not sound. Policies are often issued by presidential decree, which is highly arbitrary, and policies and regulations are easy to change with the change of government. Kazakhstan once abruptly raised export tax after signing contracts with Chinese enterprises, which caused losses to Chinese enterprises and made it difficult to guarantee the security of Chinese enterprises'

investment and reduce their enthusiasm for investment, which was not conducive to bilateral economic and trade exchanges and energy cooperation [42, p. 59].

Secondly, in terms of natural gas energy cooperation, the infrastructure is not perfect. Relevant data show that the economic development level of the five Central Asian countries is not very high, and the domestic energy industry development level is relatively low [55, p. 154]. The energy investment is small and there is not a lot of money for later pipeline repairs. Kazakhstan has good infrastructure among the five Central Asian countries, but it is still insufficient in road, railway transportation and power system, so it is difficult for residents to have all-weather electricity supply for daily life. The inevitable work of Chinese enterprises in energy cooperation with the five Central Asian countries is to help build the infrastructure in the region so that the factories can operate [55, p. 155].

Thirdly, in terms of petroleum energy cooperation, transportation security is poor. In June 2018, the United States launched the toughest oil embargo policy in its history against Iran, requiring all countries to stop imports from Iran by November. China ignores this claim of inequality and continues to trade energy with Iran. But this has brought about a series of effects such as the US ban on ZTE's domestic sales [48, p. 56]. From this we can see that the oil under the influence of geopolitics and the control of the United States, China's oil imports to the Middle East countries cannot guarantee security. Although the Middle East is rich in oil reserves, China still needs to seek more and safer sources of oil [48, p. 58].

Fourthly, the energy trade structure between China and the five Central Asian countries are single. The energy distribution of the five countries in Central Asia is not too balanced. China can only trade with countries with certain resources, which leads to trade

of only one kind of energy for each country, resulting in the unitary trade structure. In the energy trade between China and the five Central Asian countries, the energy products traded between China and menistan mainly focus on natural gas, accounting for 99.54 % of the total energy trade between the two countries. The energy products traded between China and Kyrgyzstan mainly focus on petroleum, accounting for 86.48 % of the total energy trade between the two countries. The energy products traded between China and Uzbekistan are mainly concentrated in natural gas, accounting for 85.84 % of the energy trade between the two countries. The energy products traded between China and Kazakhstan are mainly concentrated in crude oil, accounting for 91.41 % of the energy trade between the two countries. It can be seen that the energy trade structure of Central Asian countries is too simple and their export products are too concentrated. In the long run, it is not conducive to the sustainable energy development of Central Asian countries. At the same time, for China, excessive dependence on the import of a certain energy product from the same country is not conducive to the realization of energy diversification and cannot effectively guarantee China's energy security [47, p. 18].

Fifthly, due to the different energy reserves, energy trade development and government support degree, the five Central Asian countries to China's energy. There are great differences in product trade. Kazakhstan's energy trade develops the most rapidly and has the closest connection with China's energy trade. By comparison, the other four Central Asian countries' energy trade with China is less developed. From the perspective of energy trade volume, the total energy trade volume between the other four countries and China is lower than that between Kazakhstan and China. From the perspective of energy policy development, due to the backward level of economic development, the

infrastructure of energy trade development of the four countries is not perfect, and the degree of trade development is not as good as Kazakhstan. The energy cooperation between the other four countries and China is limited, and there is still a need for further policy coordination to create better conditions for the trade of energy products [49, p. 5].

Chapter 3 Further development of China's energy trade

3.1 China's energy trade development prospects

In recent years, the Belt and Road Initiative has become the main topic of our country's foreign trade. The Belt and Road Initiative has promoted the relationship between our country and other countries, and at the same time has opened up an energy path for us. As of January 30, 2021, the «Belt and Road» circle of friends is getting bigger and bigger. China has signed 205 cooperation documents for the joint construction of the «Belt and Road» with 171 countries and international organizations. There was an epidemic in 2020 and work was suspended. The sudden new crown pneumonia epidemic has impacted the global economy, and various signs indicate that this will not be conducive to the stability of crude oil production capacity and the balance of global oil prices and supply and demand in the next year or even a few years. At the same time, it has exacerbated the weakness of the Asian natural gas market. In addition, due to factors such as European market inventories, the future global natural gas market is uncertain. The world coal market maintains a cyclical recovery and rising trend, and international coal trade is active. Electricity is also slowing down in development growth [7, p. 241]. Compared with traditional energy sources, solar and wind energy are more efficient and cost-effective. In 2020, the cost of renewable energy will continue to fall, and cross-market and cross-technology integration will accelerate. In this section, I will look into specific energy sources: oil, coal, natural gas, and new energy.

First of all, I want to talk about the prospects for the development of oil trade. The Covid-19 crisis has caused a historic decline in global oil demand in 2020, but it is not

necessarily lasting. Oil is a strategic resource that has always been obtained by various countries. The state controls the oil veins, because oil has too much influence on modern people. Although mankind has developed tidal energy, wind energy, solar energy, etc., it still cannot be used on a large scale, so the energy used now is still mainly oil. Without oil, a state machine would cease to function, and it would not be able to face any coming events. Studies have shown that it takes at least 2 million years to generate oil, and among the oil reservoirs discovered today, the oldest can reach 500 million years. There are 19 oilfields exploited in China, of which Daqing Oilfield produces the most, followed by Shengli Oilfield. However, from the perspective of mining time, my country's oilfield mining time is around 1995. And now the oil output has obviously declined greatly. China's oil chain is breaking, and we urgently need to develop other new energy sources [46, p. 312].

In terms of natural gas: As the dependence on imported natural gas continues to rise, my country's natural gas import pattern will also undergo tremendous changes. During the «13th Five-Year Plan» period, with the rapid development of the natural gas industry, my country's natural gas is also facing many challenges. For example, import prices and domestic prices cannot be smoothly transmitted, and imported natural gas resources cannot match changes in domestic natural gas supply and demand. Many problems related to imported natural gas have yet to be resolved during the «14th Five-Year Plan» period [46, p. 313] The core issue in the development of the natural gas industry is internationalization. How to effectively promote the internationalization of the natural gas market in the future, or ease or resolve industrial conflicts to a certain extent? The Chinese government has issued a number of policies in 2019 to encourage foreign companies to

participate in China's natural gas investment. Up to now, foreign-funded enterprises can carry out investment cooperation in the entire industrial chain in the natural gas industry. In addition, in 2018, the State Council issued the «Several Opinions on Promoting the Coordinated and Stable Development of Natural Gas». The opinions called for accelerating the promotion of importing countries (regions), transportation methods, import channels, contract models, and diversification of participating entities. The natural gas import trade adheres to both long-term contracts and spot resources. While ensuring long-term supply stability, it will give full play to the market regulation role of spot resources. Strengthen multilateral and bilateral cooperation with key natural gas exporting countries, and accelerate the promotion of key international cooperation projects. In terms of cooperation, although China and Russia have signed a natural gas «large order», this «38 billion» is not the initial supply of gas, but the ultimate goal is 38 billion cubic meters. Therefore, domestic natural gas extraction can't be relaxed. However, my country's natural gas exploration should not contain monopoly. It should increase fair and orderly competition among enterprises, lower the entry threshold, and increase the efficiency of natural gas exploration in the process of marketization. As an important organic part of the natural gas development strategy, my country should increase the development and utilization of coal gas formations, so as to increase the proportion of natural gas in oil and gas consumption and production at the source, and regard the construction of a domestic natural gas supply system as an important part of the country. In order to avoid random mining, «minimum access standards» can be set, including restrictions on some aspects of environmental protection. The reserve of natural gas is more difficult than that of petroleum, and there are seasonal differences in natural gas consumption. In order to

strengthen the effective supply of natural gas, our country should take into account the differences in the economic, geographical, and cultural environment of various regions, and rationally arrange multiple supply and transportation methods, such as various methods such as underground gas storage and pipeline transportation [45, p. 21].

In terms of coal and electricity, my country is actively responding to relevant international policies, striving to decarbonize development and reduce CO2 emissions. At the United Nations General Assembly in September 2020, the declaration of the People's Republic of China issued by President Xi aims to achieve the peak of CO 2 emissions by 2030 and achieve carbon neutrality by 2060, which is a pioneer for China. Sexual vision. The next four decades. China also announced in December 2020 that it will strengthen its Nationally Determined Contribution (NDC) under the Paris Agreement in 2030, including reducing its CO 2 unit GDP emission intensity by more than 65 % from 2005. Non-fossil energy. The proportion of primary energy consumption has increased to about 25 %, and the total installed capacity of wind and solar energy has expanded to more than 1200GW. The «14th Five-Year Plan» proposes to formulate an action plan for peak CO 2 emissions by 2030 and adopt more powerful policy measures to achieve carbon neutrality by 2060.The «World Energy Development Report (2020)» pointed out that the clean and efficient use of coal includes the cleanliness and efficiency improvement of the entire industrial chain. Subject to cost and carbon emissions constraints, the government needs to determine policy orientation from the perspective of technology and energy system security [13, p. 215]. At the same time, the effective complementarity of coal and other clean energy sources on a larger scale is also an aspect that needs to be considered in the clean development of coal. Due to the advanced technology and huge number of

large-scale thermal power plants in China, and the short operating time, thermal power plants have a strong lock-in effect. At the same time, the industrialization of CCUS (Carbon Capture, Utilization and Storage) technology also needs continuous policy support and promotion.

3.2 Deepening energy system reform and improvement energy efficiency

To ensure the sustainable development of energy, China should strengthen the reform of the energy management system and improve the national energy management system and regulatory mechanism [42, p. 63]. The state should centralize the energy management functions that are scattered among local government departments at all levels. At the same time, it must strengthen the overall planning and coordination capabilities between governments, strengthen the overall planning and macro-control of the country's energy development, and establish an integrated energy management system. In order to realize the transformation of government functions, it is necessary to focus on guiding energy management from decision-making, reducing the use of administrative methods, and attaching importance to information services. To deepen the reform of the energy investment system, to ensure the dominant position of enterprises in the investment field, the government needs to use economic and legal means to guide social investment and establish and improve an investment control system. Further form a management system with proper concentration, reasonable division of labor, scientific decision-making, smooth execution, and strong supervision.

The price mechanism is the core of the market mechanism. The State Council Information Office issued a white paper entitled «China's Energy Status and Policies» in 2007. It is stated that the Chinese government must actively and steadily advance energy price reforms while properly handling the relationship between different interest groups and fully considering the affordability of all aspects of society. Gradually establish a price formation mechanism that can reflect the scarcity of resources, market supply and demand, and environmental costs. The current international energy prices are unpredictable and have a knock-on effect on relevant economic sectors. There is an urgent need to deepen price reforms, fully realize marketization, and gradually make prices formed by market competition. At the same time, the government should also conduct supervision and price subsidies to gradually improve Pricing mechanisms for coal, oil, natural gas, etc., timely changes in international market prices and the relationship between supply and demand in the domestic market.

As the world's largest energy consumer, China's efforts to improve energy efficiency are critical to the global energy and climate pattern. In 2018, China alone accounted for 22 % of global energy consumption and 29% of total CO2 emissions from fuel combustion. According to relevant statistics, energy consumption may reach its peak by 2030, and compared with current trends, 16 EJ can be saved by 2040-equivalent to the energy use of France and Germany. These savings will come from the industry (41 %) and transportation (30 %) sectors. In recent years, China has made tremendous progress in technological energy efficiency, and most of the efficiency improvements have been achieved in the industrial sector. According to the Efficient World Scenario (EWS) of the International Energy Agency, China has huge potential for energy efficiency improvement. Ensuring

that China seizes all opportunities to improve efficiency in a cost-effective manner is essential for China and the world to transition to low-carbon energy [13, p. 215].

China must work hard to improve energy efficiency in order to relieve the pressure of China's excessive dependence on foreign energy. At present, China's economic development is increasingly affected by energy constraints, and it is extremely difficult to curb total energy demand in the short term. Therefore, improving energy efficiency is a necessary way to achieve the country's long-term development. Compared with developed countries, China's energy efficiency is still a long way away, and there is still huge room for improvement. Therefore, China should increase its investment in energy technology while economic growth, especially in areas where energy consumption is high, and continue to enrich the content of energy-saving legislation so that my country's energy-saving technology can exert the greatest effect. China should vigorously develop energy development technologies, optimize the energy structure, and narrow the gap in domestic energy demand [44, p. 87]. According to statistics from the World Bank, since 2002, China's energy production and consumption have both risen rapidly, while the increase in energy consumption has gradually exceeded energy production, and the domestic energy demand gap has continued to expand. In addition, China's domestic primary energy production and consumption are dominated by coal, and extensive consumption is more harmful to the environment. China has abundant unconventional energy resources, with shale oil geological resources ranking second in the world, total coal bed methane resources ranking third in the world, and shale gas resources equivalent to twice the amount of conventional natural gas resources [48, p. 56]. We should vigorously develop new energy development technologies, ease the pressure on energy

supply, increase the proportion of clean energy use, and achieve a balance between domestic energy supply and demand.

3.3 Strengthen new energy development, look for new development opportunities

Under the current international energy market structure and energy reform trend, China should further consolidate its energy trade partnership with other countries and continue to expand the scale of bilateral energy trade. At present, China's external dependence on energy continues to rise, and this situation will continue to exist for a long time in the future. China should work hard to find points where the interests of both parties meet. It must not only ensure its own interests, but also take into account the concerns of the partner countries, continuously improve the conditions of bilateral energy trade, expand the scale of energy trade, and maximize the interests of the two countries. At the same time, China should expand energy import channels and further increase the diversification level of energy imports. The current economic development model of China shows excessive dependence on energy, and the issue of energy security is highly valued [50, p. 89]. China should continue to deepen cooperation with other major energy suppliers, continue to expand the areas of cooperation, and seek new trading partners on the basis of consolidating existing energy supplies, and ensure the country's energy supply security by increasing the diversification of energy imports. In addition, in the current situation that both China and Russia lack international energy pricing power, China can increase its bargaining power in energy trade with Russia by increasing the diversification level of energy imports.

China's exchanges and cooperation with these major international oil companies not only learn advanced technologies from these large companies, but they can also jointly do some oil and gas projects and obtain a certain share of development and utilization. Secondly, we must do a good job in political diplomacy. Because energy is related to the safety of a country, exploration and development of foreign oil and gas are not only the development and utilization of energy, but also political negotiations. Under the complicated and changing world situation, diplomatic work has become a necessary condition for the cooperation of overseas oil and gas projects [50, p. 90].

Our country is a country in short supply of resources and energy, and economic development, especially extensive development, requires a large amount of energy consumption. In order to meet the increasing needs of mankind's material and spiritual civilization, the demand for energy is also increasing. Especially for a developing country like my country (with a large population, weak economic foundation, and continuous progress in society), the healthy development of the economy is to a great extent. It relies on the clean, safe and efficient use of energy, and this historical law will not change in the short term. Therefore, while pursuing social and economic development, neither the quality of life in the contemporary era nor the future can be damaged [51, p. 96].

At present, we promote the development and utilization of new energy and renewable energy, replace traditional energy with new energy, and strive to find new alternatives, reduce consumption, and thereby reduce the outflow of a large amount of economic benefits from the country, so that my country will not be too passive in the oil and gas trade. For traditional energy coal, not only clean coal technology can only reduce dust and sulfur dioxide emissions but cannot eliminate them, but more importantly,

excessive mining of coal will affect the ecological environment of the mining area. Unlike traditional energy sources, new energy sources are more evenly distributed and have a very large content. If the direction of my country's oil and gas development strategy is formulated as energy quality, then the focus of energy development should be the development of new energy. In addition, from the development experience of developed countries, the following new energy sources are clean, safe and efficient, such as: hydropower, nuclear power, wind power, solar energy, biomass energy, geothermal energy, ocean energy, etc. It have accounted for about 22 % of the world's energy consumption. Therefore, my country should take the development of new energy as the focus of consideration. Although most of the development and utilization of new energy in my country have relatively low economic benefits, my country can learn from the technology and experience of developed countries to encourage major energy companies across the country to increase investment. Give preferential policies and support to new energy so that new energy can be effectively developed and actively promote the localization of new energy production equipment [47, p. 21].

Under the current international energy market pattern and energy reform trend, China should continue to strengthen clean energy and industrial development, accelerate the transition of energy to green and low-carbon; at the same time, it must clarify the priority direction and route of the energy technology development strategy, and fully grasp the green energy technology of the world. Low-carbon, smart, efficient, and diversified development direction; seize the trend of digital transformation in the source industry, and use digital and information technology to build a more efficient, cleaner, more economical, and safer modern energy system.

Strengthen China's cooperation between energy companies and the international market is the most important. All four major oil companies in China are strengthening the exploration and development of oil and gas, and the market has expanded from home to abroad.

Specifically, Russia, Central Asian countries, and Middle East countries are all countries with significant influence along the “One Belt and One Road” region. They have extensive interests in the region, while Central Asia and Middle East are regions where energy exporters are concentrated. In the era of globalization, China can only actively promote cooperation in the «One Belt and One Road» energy cooperation with the above–mentioned countries and regions, actively control and control these competitions and conflicts, and benefit from benign competition in order to further deepen trade relations with energy exporting countries. The following sections will analyze the specific situations of different countries.

Russia has taken a positive attitude toward China’s promotion of the «One Belt and One Road» initiative and related energy cooperation. China–Russia energy cooperation is of strategic significance to both parties. At present, the level of energy cooperation between China and Russia is continuously rising. The tremendous potential and complementarity of Sino–Russian energy cooperation is gradually being released, and both sides benefit from it. China can continue to deepen cooperation in the following areas in the future:

Firstly, fully implement existing agreements and continue to expand the scale of trade. In May 2014, China and Russia finally reached a 30–year long–term natural gas pipeline long–term gas supply agreement after more than 10 years of negotiations. The

volume reached 38 billion cubic meters, and the scale of energy trade between the two countries has achieved a qualitative leap. The two parties agreed to implement the solution to the pipeline construction and related financing and technical issues as soon as possible to ensure that the goal of starting gas supply in 2018 and gradually increasing the volume of gas supply. At the same time, the energy trade between China and Russia still has huge room for development. Through the energy talks under the regular consultation mechanism between the two countries' premiers, the companies of the two countries will increase the scale of oil and gas trade, increase the supply of oil and gas pipelines in the eastern section, and deepen the level of mutual dependence [30, p. 45].

Secondly, China must strengthen energy interconnection and construction. At present, the pipeline oil and gas transportation capacity between China and Russia is relatively limited, and it is difficult to meet the demand for energy cooperation between the two countries; the maritime transportation capacity has not been fully developed. China should promote energy infrastructure construction. China must expedite the implementation of pipeline construction in the western part of China and Russia and push for a new pipeline construction agreement between the two countries to achieve a significant increase in energy transportation capacity; conduct research on the construction of offshore oil and gas transportation corridors between the two countries, achieve diversification of energy transportation modes, and reduce pressure on pipeline transportation safety [6, p. 131].

The first step on promoting the development of China–Russia energy trade is to strengthen cooperation and mutual trust between the two governments. Political advantage is an important driving force for the development of energy trade between the two

countries. However, Russian domestic people are also dissatisfied with the reality of Sino–Russian energy trade. They believe that Russia has become China's raw material supply base, and the difficulties in laying oil pipelines and natural gas pipelines between the two countries have been it proves that the political mutual trust between the two countries has not reached the corresponding level. Therefore, although the energy trade between the two countries can bring trade benefits to both sides, if China wants to continue to develop, we must further strengthen political mutual trust between the two countries and strive to raise consensus. At the same time, it is necessary to strengthen and deepen exchanges and cooperation in the fields of culture, education, sports, media and tourism between the two countries, continuously consolidate the social foundation of bilateral relations, and enable the Russian people to regard China's traditional culture, basic national policies, and open strategies.

Accelerate the infrastructure construction in the border areas of the two countries, improve transportation capacity, accelerate the infrastructure construction in the border areas, improve the economic development level of the border areas and further develop Russia's abundant energy resources, and provide new capital for the development of border areas. In addition, it is also conducive to solving the problem of insufficient transportation capacity in Sino–Russian energy trade and promoting the development of Sino–Russian energy trade. China should actively participate in infrastructure construction in eastern Russia, including not only oil and gas resources transportation pipelines, refineries and other energy–related construction projects, but also transportation infrastructure and water supply and power supply facilities in the Sino–Russian border area. In this way, while improving the living conditions of local residents in Russia, it can

also solve the employment problems of local residents, thereby reducing the barriers for Russian residents to develop energy in China and Russia, combating the Chinese forces in Russia, and solving the healthy development of energy trade between the two countries. Actively build a national–level new district in China and Russia, and promote the construction of a free trade zone. The construction of Sino–Russian national new districts can focus on four aspects to actively explore: 1. explore effective mechanisms to play the role of market and government; 2. explore effective ways to promote deep integration of science and technology; 3. explore effective measures to stimulate the motivation and vitality of innovators; 4. explore an effective model for deepening open innovation. On this basis, all levels of government in China should pay full attention to the preferential policies in the «Opinions of the State Council on Supporting the Development and Opening of Several Policy Measures in Key Areas Along Border Areas», focusing on the construction of Manzhouli, Suifenhe and Heihe three open cities along the border with Russia. Based on this, we will actively explore and promote the construction of a Sino–Russian free trade zone, gradually increase the level and level of China's trade with Russia, and promote energy trade between the two countries [6, p. 151].

Increase direct investment in Russia and actively participate in the development of energy resources in the Russian Far East. The Russian Far East covers an area of 6.2 million square kilometers and has a population of only 6 million. The region is rich in resources, and timber, coal, oil and natural gas reserves account for a large proportion of Russia's energy reserves, but due to geographical and natural conditions, the degree of development is seriously inadequate.

In addition, China should improve the single issue of energy products in Central Asian countries. As the energy trade development process in China and Central Asia, the issue of energy product simplification emerged. In order to promote the sustainable development of energy trade between the two sides, both parties need to make breakthroughs in the development of energy products. On the one hand, China needs to diversify its energy trading needs and avoid over–reliance on the energy risks associated with certain types of products. At the same time, in the cooperation of energy products, we should actively cooperate with the five countries in Central Asia to develop new energy sources. China can make full use of its «One Belt and One Road» policy and vigorously build infrastructure for new energy trade in the five countries of Central Asia to provide more convenient conditions for China's energy imports. At the same time, the five Central Asian countries can rely on their rich energy advantages, continuously research and develop new energy products, strengthen the level of science and technology in energy products, achieve diversification of energy products, and ensure the sustainable development of energy product exports [36, p. 625].

China should accelerate the construction of land and sea transportation facilities in Middle East. First, shipping is the main transportation channel between China and Middle East. China can build a convenient, safe, and efficient transportation system through large customs clearance, and build a maritime interconnection network system with key coastal ports and important Middle East imports as nodes. Second, the land is interconnected. China should strengthen the infrastructure construction of roads, railways, and land bridges, and build a faster land bridge trade clearance system with Middle East, such as the promotion of land–to–rail projects such as China–Israel Railway International

Cooperation Construction Project. Third, air interconnection and intercommunication. China can deepen cooperation in airport positioning, airspace planning, customs supervision, security work, and flight rights policies by promoting the exchange and interoperability between the airports in the two airports, and accelerate the docking and co–construction of domestic airports and Middle East International Airport and expand trade with Asia Middle East Airways.

China also has opportunities faced in Africa's energy cooperation. First, the African oil industry has developed rapidly. With the exception of Nigeria, Algeria, and Libya, all other oil–producing countries in Africa are non–OPEC members. Their production is not limited by their peers, and their development potential and exploitation potential are huge. Oil exploration and development in Africa is entering a golden period of rapid development. A group of emerging oil–producing countries has rapidly emerged, providing a broad space for China–Africa energy cooperation.

Secondly, the oil producing countries in Africa seek to diversify their development partners. Western oil companies have monopolized the African oil market for a long time. They have firmly controlled the exploration and development rights and oil pricing power of African oil resources, which has seriously damaged the interests of oil–producing countries in Africa. In order to safeguard national sovereignty and legitimate oil rights and interests, some oil–producing countries are vigorously implementing the diversification strategy for the exploration and development of oil, and hope to develop oil cooperation with developing countries such as China on the basis of equality and mutual benefit, in order to break the Western oil companies' own oil industry. This provides a good external

environment for Chinese oil companies to enter the African oil field and strengthen China–Africa energy cooperation [34, p.20].

On this basis, it is also possible to expand markets abroad. For example, some countries in North Africa rely on the Mediterranean Sea. The coastline is very long and contains a lot of petroleum resources. Establishing oil cooperation with these countries requires multiple forms of cooperation to explore and develop the oceans of resource countries. Oil and gas resources are also a great complement to China's overseas markets. In terms of oil, it can be seen that the development and utilization of China's oil show a good development trend. It will be possible for China to increase its consumption of oil in the future and then increase the proportion of oil consumed in China's energy structure.

In addition, China's oil imports from Venezuela, Kazakhstan, Canada, and Mongolia also increased significantly. In recent years, the share of imports from Central and South America and Africa has increased due to the diversification strategy of energy imports. At present, the main problem of China's oil imports is that the concentration of oil imports is relatively high and it relies heavily on the Middle East. This is not conducive to the dispersion of risks. Once an unexpected event is encountered, the impact on China's energy security will be greater. In recent years, China has actively implemented a diversification strategy for energy imports. Through strengthening energy cooperation with Africa, Russia, Central Asia and other places, it has continuously explored new oil import channels to reduce its dependence on Middle East oil and achieved certain achievements. The proportion of imports from African countries has risen to 24.7 %. Breakthrough progress in energy cooperation with several countries [49, p. 8].

The two governments should increase policy support for energy cooperation enterprises between the two sides and create a favorable policy environment for Sino–Russian energy and trade cooperation. At present, both China and Russia, the concentration of domestic energy companies are relatively high, and active policies should be introduced to encourage these companies to introduce modern enterprise management models, go abroad and actively participate in global energy trade. In addition, Russia's energy exploration, production, processing, transportation and other aspects are strictly controlled by the government. This is basically consistent with the situation of China's three major state–owned oil companies controlling the domestic market. The two governments should strengthen coordination and communication at the government level according to this feature. To provide financial and policy support for energy companies that cooperate, and continuously expand the scale and scope of energy trade cooperation between the two sides. On the other hand, the two governments must strengthen the construction of infrastructure and technical equipment. Weak infrastructure and backward technology are important factors that restrict Sino–Russian energy and trade cooperation. For example, the differences in railway standards between the two countries have severely limited bilateral cargo turnover [6, p. 142].

China will improve the energy transportation channels between the two countries, and work hard to strengthen the construction of port stations and wharf infrastructure around energy transfer, and form a comprehensive transportation channel for roads, railways and pipelines. With energy mining technology innovation and cooperation as the focus of energy trade cooperation, through the joint research and sharing of technology,

the Sino–Russian energy trade cooperation will continue to promote sustainable and healthy development.

Conclusion

The research of this paper starts from the current situation of China's domestic energy. The first chapter introduces the current situation of China's economic development and sorts out the importance of energy to the economy. Then, it mainly introduces the current energy reserves and distribution in China. In 2020, the outbreak of the epidemic, the global economy was hit hard, but under the correct leadership of the Chinese government, China's economy finally achieved positive growth. At the same time, we also discovered the importance of energy trade to the economy. The energy picture, however, is grim. First of all, the proven reserves of some energy resources (such as oil, uranium and natural gas) are relatively insufficient, and the domestic energy demand gap is large. Therefore, we need to improve the problem of insufficient domestic energy demand through energy trade. Secondly, China's per capita share of energy resources is low, far lower than the world average. Thirdly, China's energy resources are widely but unevenly distributed. Through data analysis, it can be found that the total proved reserves of energy in China have increased compared with that in 2018, among which the proved reserves of natural gas have increased the most, but the distribution is unbalanced. Production and consumption increase year by year, and production is less than consumption, the gap of domestic demand is large, among which, oil gap is the largest, it needs to rely heavily on imports, heavily dependent on the international energy market; In recent years, the market for new energy development has been improving and development opportunities have increased, but the proportion of new energy is still relatively low. In the new era, all countries are actively responding to the relevant policies of IEA, and China, as an ally,

needs to make efforts to do so. At present, China has achieved initial results in the development of clean and new energy. However, compared with the sustained and rapid growth of China's energy demand, these new energy sources are far from replacing the position of traditional energy, so in the future. Over the past few decades, China's energy problems will continue to focus on traditional energy sources such as coal, oil and natural gas.

The second chapter mainly introduces the current situation of China's international energy trade and some factors affecting its development. With the change of international energy trade pattern, the focus of energy trade is gradually shifting from the Atlantic coast to the Asia-Pacific region. China has become a major energy trader in the world, and no one can replace it in the energy trading market. China relies on imports from the international market for all kinds of traditional energy. Section I focuses on trade in coal, oil, natural gas and electricity. From the perspective of the trade data of statistics, in recent years, China's coal consumption without too big change, coal and fossil energy in the short term will still occupy high proportion in the world energy production, consumption structure, but as the growth of the scale of renewable energy and natural gas, coal weight in the global primary energy production and consumption will continue to decline. Coal imports are mainly from Russia, Australia, Mongolia, Indonesia and other countries. In oil fields, China's main trading partners are Russia and Saudi Arabia. In recent years, Russia's trade ties with China have become increasingly close, overtaking the Middle East to become China's most important source of oil imports. In terms of natural gas, China's main partners are Turkmenistan, Kazakhstan, Uzbekistan and Myanmar. In terms of electric power, coal is the main source of thermal power generation in China. However, in 2019,

the growth of renewable energy reached a record high (3.2 EJ), accounting for more than 40 % of the global growth in primary energy, higher than that of all other fuels. Through sorting out the energy trade, I found that among the traditional energy sources, the import volume and consumption of coal decreased. Oil is still mainly imported to meet consumption; Natural gas, on the other hand, has come on the scene and increased its share. In addition, our country has begun to use new energy to replace traditional energy. Although the development is slow now, I believe the potential is unlimited. In the second section, I introduce some factors that affect China's energy trade. For example, China's energy efficiency is low and many energy waste rates are high, leading to the simplification of China's trade structure. Distance problem, supply channel is not safe. Foreign energy investment by Chinese state-owned enterprises is low. Based on some influencing factors in China, I will explain it from two aspects: Russia and five Central Asian countries. For Russia, the factors affecting trade include: imperfect subsidy policies, high investment and transportation costs, and lack of price mechanism; For the five Central Asian countries, the factors affecting trade are: poor investment climate, energy security issues, single trade structure, and poor infrastructure.

Finally, the third chapter predicts the future of China's energy trade and puts forward some countermeasures. The proportion of coal, oil and other energy sources in China will decrease, while new energy sources will have greater development potential. The development of energy will drive the development of our economy. To this end, we should start from our own, improve the efficiency of energy use, more funds for the development of new energy; Second, we need to improve the energy system and improve the energy management system and price mechanism. Third, we need to improve

the current situation of trade simplification with some countries, strive to develop more trade partners, and create more possibilities for our energy trade. Fourth, under the requirements of the new era, we should protect the earth on which we live, improve environmental quality, promote the sustainable development of energy, increase the development and investment of new energy, and lay a good foundation for our future energy trade development.

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