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## The impact of LNG shipping market from China new emission policy

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**World Maritime University**

Malmo, Sweden

**The Impact of LNG Shipping Market from China  
New Emission Policy**

By

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A dissertation submitted to the World Maritime University in partial  
Fulfillment of the requirements for the award of the degree of

**MASTER OF SCIENCE**

**In**

**INTERNATIONAL TRANSPORT AND LOGISTICS**

2019

## **Declaration**

I certify that all the material in this research paper that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this research paper reflect my own personal views, and are not necessarily endorsed by the University.

(Signature):

(Date):

**Supervised by: Professor Gu Weihong**

**Shanghai Maritime University**

## **Abstract**

At present, China is vigorously promoting green development, and formulated and implemented the policy of China New Emission Policy. After a period of implementation, the impact of China New Emission Policy on LNG shipping market has been increasing. In order to have significant development in China Shipping Industry, I decided to study and analyze the influence of China New Emission Policy on China's LNG shipping market. This paper uses data to support and icon analysis to explain the impact of this policy. In my thesis, I choose to firstly analyze the LNG market like the LNG supply in China, showing the influencing factors of LNG demand in China. And then, I introduce the supply of LNG transportation market from import receiving stations and global LNG fleet. And I analyze the impact of the China New Emission Policy on LNG market. At last, to have significant development in China shipping industry, I will give some relevant suggestions.

**Key Words:** LNG Shipping, Market Analysis, China New Emission Policy, China shipping Company

## Content

Declaration .....	i
Abstract .....	ii
Content .....	iii
List of Tables.....	iv
List of Figures .....	v
1 Introduction .....	1
1.1 Preface .....	1
1.2 Research Background .....	1
1.3 Research Objectives.....	2
1.4 Dissertation Structure .....	2
2 Literature Review .....	3
2.1 Research Topic .....	3
2.2 Relevant Researches .....	3
2.3 Research Method .....	7
3 LNG Market Analysis .....	8
3.1 Analysis of World LNG Market .....	8
3.2 Analysis of China's Natural Gas Market .....	17
4 LNG Shipping Market Analysis .....	22
4.1 World LNG Shipping Market .....	22
4.2 China LNG shipping market.....	25
4.3 Impact of China New Emission Policy on LNG Shipping Market .....	31
4.4 Trends of China's Import LNG Maritime Market in the Next few Years .....	39
5 Responses of Chinese shipping company .....	42
5.1 Increase the ability to pick up goods .....	42
5.2 Optimizing Ship Configuration .....	42
5.3 Implementing an incentive mechanism for LNG ocean-going crew .....	44
5.4 Pay attention to the production safety of LNG routes .....	44
5.5 Improve the internal management level of LNG Shipping Company and follow the principle of "cost leadership" .....	45
6 Conclusion.....	47
Reference .....	49

## List of Tables

Table 3-1 World's Major Natural Gas Exploratory Reserve Countries	9
Table 3-1 World's Major Natural Gas Exploratory Reserve Countries	9
Table 3-2 Major Natural Gas Consumption Countries in the World	12
Table 3-3 Global Import and Export Situation	13
Table 3-4 Statistics of China LNG Supply	18
Table 3-5 China Total Gas Supply and Gas Consumption Population	19
Table 3-6 Energy Consumption of LNG in China	20
Table 4-1 The Top Ten LNG Shipyards	23
Table 4-2 The Top Ten LNG Shipowners	24
Table 4-3 Global LNG Trade Volume and LNG Ship	25
Table 4-4 Chinese Total LNG fleets	26
Table 4-5 Distribution of LNG Import Sources in China from January to November 2017	29
Table 4-6 Receiving Stations for LNG Import in China	30
Table 4-7 Natural Gas Production and Marketing Data in China	35
Table 4-8 Imports of LNG by Provinces and Municipalities from January to November 2017	36
Table 4-9 Daily Rent of LNG Ships between 2016 and 2017	38

## **List of Figures**

Figure 3-1 Distribution Map of Natural Gas Resources in the World	9
Figure 3-2 Distribution of Natural Gas Consumption in the World	11
Figure 4-1 Trend Chart of China's LNG Imports from 2008 to 2017	37
Figure 4-2 Trends of LNG Spot Rent from 2005 to 2017	39

# **1 Introduction**

## **1.1 Preface**

As a new industry, LNG transportation has more room for development because of the increasing attention going towards the environment around the world. According to the relevant literature I researched, there isn't much research and analysis of the LNG shipping market. Therefore, I hope to analyze the current situation of it, especially the impact of China's New Emission Policy on the LNG shipping market and put forward relevant suggestions for Chinese shipping enterprises.

## **1.2 Research Background**

With the development of economy, the Earth's environment has been seriously damaged. Global warming, ozone layer destruction, acid rain spread, air pollution, and water pollution are all the results of human destruction of the environment. The most serious environmental pollution in China is air pollution, which belongs to soot pollution. Dust and acid rain are the most harmful, and the degree of pollution is increasing. Therefore, people began to attach importance to the protection of the environment. As a developing country, China also has a responsibility to protect the environment. Therefore, China has introduced its New Emission Policy to promote the use of green and clean energy, especially LNG.



### **1.3 Research Objectives**

Since the policy was introduced, China's demand for LNG has been increasing, which has led to the rise of LNG shipping markets. Faced with the government's green energy policy, how should Chinese shipping enterprises seize the opportunity and vigorously promote the development of LNG shipping markets? This is the purpose of this study.

### **1.4 Dissertation Structure**

This paper is mainly divided into three parts. The first part is the study of the LNG market, mainly analyzing the demand and supply of LNG in the world and China, and analyzing the main factors affecting the supply and demand of LNG. The second part is the study of LNG shipping markets. It mainly analyses the current situation these markets in the world, the major shipyards and shipping enterprises, the current situation of the market in China, the main import sources and receiving stations of LNG, and the impact of the China New Emission Policy on the market. Finally, combined with the analysis of the first two parts, in order to strengthen the LNG shipping market in China, some suggestions are put forward to the Ministry of Communications and LNG shipping enterprises.

## **2 Literature Review**

### **2.1 Research Topic**

I want to mention the impact of LNG Shipping Markets from China's New Emission Policy. In recent years, China has paid more and more attention to environmental protection and wants to become a country with green development. The use of coal will cause environmental pollution such as acid rain, and the reserves of coal resources are decreasing day by day. Of course, some of them cannot be fully burned which are wasted. Natural gas is a clean and environmentally friendly energy source, which contains almost no sulfur, dust, and other harmful substances. It produces less carbon dioxide when burning than other fossil fuels, resulting in a lower greenhouse effect, and thus can fundamentally improve environmental quality. So, this new policy was introduced to use LNG instead of coal. The policy has a great influence on the LNG shipping industry which has very important research value.

### **2.2 Relevant Researches**

Low oil prices have led to a decline in oil-indexed gas prices and have contributed to the recovery of global gas demand over the past few years, which led to the rise of gas trade, especially LNG trade, and will result in dramatic changes in the world's LNG market landscape. Through the comparative analysis of global and Asia-Pacific natural gas consumption and growth, Shanweigu, Feng Chenyue, Wang Xinzhe, and Baihua discussed and analyzed the impact of low oil prices on global and Asian natural gas markets, and explained the characteristics of LNG market in the period of low oil

prices. Then the global and Asian natural gas supply and demand before 2030 have prospected. Finally, combined with the market situation and future forecast, some suggestions are put forward for LNG market participants.<sup>[1]</sup>

Lu Yuhan and Cai Zheliang first used statistical analysis to analyze the current situation of natural gas supply and demand in China, and predicted the future supply and demand situation, that LNG supply and demand would be further increased in the future. Through the analysis of regional LNG demand and supply, it is concluded that some regions still have gaps in LNG. On this basis, the paper analyses whether the built, built and planned coastal LNG receiving stations can meet the import demand of LNG, and puts forward suggestions for adding new LNG receiving stations or reserve sites in coastal areas such as Shandong, Jiangsu, Zhejiang, Fujian and Guangxi.<sup>[2]</sup>

Wu Gangqiang uses statistical analysis to analyze the development status of upstream LNG supply and downstream gas market demand in China, analyzes the contradiction between supply and demand. It also proposes the countermeasures of increasing the supply-side participants, constructing LNG storage facilities, exploring the new gas market and researching on matching the LNG supply and demand, which makes the LNG supply and demand achieving balance, stabilizes the gas market price and promotes the orderly development of the gas market in China.<sup>[3]</sup>

Cui Junchao first used qualitative analysis to analyze the supply and demand situation of LNG at home and abroad. According to the current situation, the development prospects of LNG supply and demand at home and abroad are forecasted, and relevant suggestions are put forward. He suggested that China should take the best technological measures to extract as much natural gas as possible in light of the current situation of gas field production, and build natural gas field treatment equipment to

improve the liquefaction rate of natural gas.<sup>[4]</sup>

He Tao and Guo Zhou-ming wrote the article that Research on the Supply and Demand Trend and Import Promotion Strategy of Natural Gas in China. In this article, they forecasted the trend of LNG supply and demand based on previous data. The demand for LNG is greater than the supply in China, so we must import the LNG from other countries. The writer studied the strategy of import promotion.<sup>[5]</sup>

Yang Guofeng analyzed Russia's LNG export policy, using qualitative analysis to analyze the current situation of Russia's LNG export under the background of the current era and the sanctions imposed by Europe and the United States. Finally, the future LNG export market in Russia is forecasted, and the LNG market supply situation is closely related to national policy and international situation.<sup>[6]</sup>

Huang Xianzhi and Du Shucheng use statistical analysis to analyze the status and prospect of global natural gas and LNG supply and demand, and summarize the development direction of the global natural gas market. Then, combined with the development status of the domestic natural gas industry, the basic idea that China shall speed up the overall market development and the related industry construction was put forward to provide the long-term mechanism for national energy supply security.<sup>[7]</sup>

Nie Xiliang, Liu Qiang, Li Guoshuai and Dai Ran used data analysis methods and literature research methods to analyze the historical safety accidents of LNG ships, and finally put forward relevant suggestions.<sup>[8]</sup>

Luo Qiaoyun and Shou Jianmin wrote the article that Economic and Prospective Analysis of LNG Transportation in Northeast Arctic Channel. Based on the analysis of

resources in the Arctic regions, the economy of LNG transportation through the Arctic Northeast passage was compared with that of the traditional route according to natural gas supply and demand, import conditions and navigation environment of the Arctic routes. The economy of LNG transportation through the Arctic Northeast passage was discussed in consideration of routes, voyage or flight number, and transport cost. By using the sensitivity analysis method, the influences of shipping environment change on the cost of the Arctic Northeast passage were discussed, as well as the prospects. The result shows that the Northeast passage distance shortens obviously, but the year voyage increase is not obvious, and the transportation costs reduce no largely.<sup>[9]</sup>

Zhang Li focused on the general situation of supply and demand of China's LNG import by sea, and used statistical analysis to analyze the rising factors of China's LNG import price from the supply of shipping capacity and national macro-demand respectively. The research shows that the import price of LNG in China has been rising steadily due to the rise of the green industry in recent years, the rapid increase of residential gas demand, the inelastic exploitation and supply of domestic LNG, and the small increase in the number of LNG carriers in China. LNG import tariffs are expected to remain at a high level in the second half of 2017 and may continue to grow next year, but there is little possibility of significant changes.<sup>[10]</sup>

With the continuous improvement of China's environmental governance requirements, the application and development of LNG have gradually attracted the attention of all parties. But until 2016, the LNG market was unsatisfactory, prices continued to decline, import LNG prices compared with long-term contract prices have been at a low level. In this regard, Zhao Zhiyong used qualitative analysis to analyze the current situation of LNG market, and put forward the need to open infrastructure, improve the industrial structure, broaden the mode of transport, and increase market development

efforts.<sup>[11]</sup>

LNG is prone to danger in storage and transportation. The emergency rescue must follow the principle of quick decision and safety first. Xu Yannan used qualitative analysis to analyze the causes of the accident and formulated corresponding emergency rescue measures to prevent such accidents from happening again.<sup>[12]</sup>

### **2.3 Research Method**

I find that there is little information about the impact of LNG shipping market from China New Emission Policy. Therefore, I think it has the value of further research. This paper uses data to support and icon analysis to analyze the impact of this policy.

### **3 LNG Market Analysis**

#### **3.1 Analysis of World LNG Market**

##### **3.1.1 Production of Natural Gas in the World**

According to BP's World Energy Statistics Review Report 2018, the world's natural gas production has not changed much. Natural gas production of North America and S. & Cent. America has declined slightly, while CIS, Middle East, and the Asia Pacific have increased slightly. The fastest growth rate is in the Asia Pacific, with a growth rate of 0.52%. In 2017, the world's total natural gas production reached 193.5 trillion cubic metres. Compared with 2016, it has a slight increase and the growth rate is 0.2%.

The world is rich in natural gas resources. Total proved reserves of natural gas were 128.1 trillion cubic metres in 1997, 163.5 trillion cubic metres in 2007 and 193.5 trillion cubic metres in 2017. In the past 20 years, total proved reserves of natural gas have increased by an average of about 2% annually, which shows that they are very rich in reserves and have very optimistic prospects.

Natural gas resources in the world are unevenly distributed across continents. At present, 40.9% of the world's proven natural gas reserves are located in the Middle East, 30.6% in CIS, 10% in the Asia Pacific, 7.1% in Africa and the rest in the Americas and Europe. See figure 3-1 for details.

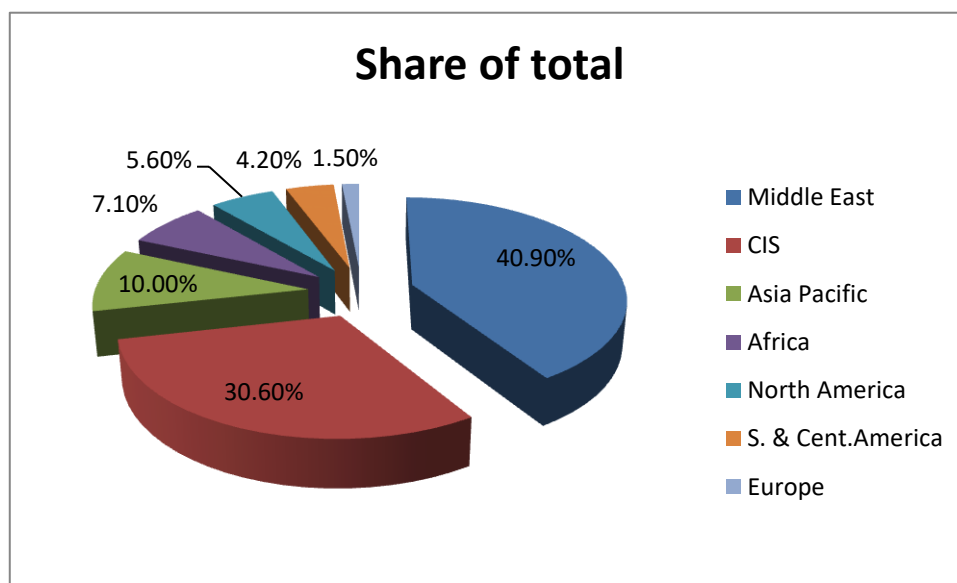


Figure 3-1 Distribution Map of Natural Gas Resources in the World

Source: BP Statistical Review of World Energy 2018

The distribution of natural gas in different countries is uneven. In 2017, the proven reserves of natural gas in the top ten major countries in the world were 152.3 trillion cubic metres, accounting for 78.9% of the total reserves of natural gas in the world. The Russian Federation has 18.1% of the world's proven natural gas reserves and is the world's largest natural gas country. In the top ten of having the highest proven reserves, there are four countries from the Middle East. The world's major proven natural gas reserves are shown in Table 3-1.

Table 3-1 World's Major Natural Gas Exploratory Reserve Countries Unit: trillion cubic metres

Country	1997	2007	2016	2017	Share of total
Russian Federation	33.6	33.9	34.8	35	18.10%
Iran	22.7	27.7	33.2	33.2	17.20%
Qatar	8.8	26.4	24.9	24.9	12.90%



Turkmenistan	2.6	2.6	19.5	19.5	10.10%
US	4.5	6.4	8.7	8.7	4.50%
Saudi Arabia	5.6	6.9	8	8	4.20%
Venezuela	4.6	5.4	6.4	6.4	3.30%
United Arab Emirates	5.9	6.3	5.9	5.9	3.10%
China	1.2	2.3	5.5	5.5	2.80%
Nigeria	3.3	5	5.2	5.2	2.70%
total	92.8	122.9	152.1	152.3	78.90%

Source: BP Statistical Review of World Energy 2018

### 3.1.2 Natural Gas Demand in the World

According to the world energy statistics review report of BP in 2018, the total global natural gas consumption reached 3670.4 billion cubic metres in 2017, a slight increase compared with 2016, with a growth rate of 2.69%. Except for the Americas, consumption in other regions is on the rise. Among them, Africa grew the fastest, at 6.46%, and Asia ranked second, at 5.86%.

Over the past decade, global consumption of natural gas has been increasing. Total consumption was 2958 billion cubic metres in 2007, 3327.1 billion cubic metres in 2012 and 3670.4 billion cubic metres in 2017. That is to say, total consumption rates have increased by about 2% annually in the past 10 years, which shows that its consumption is huge and the prospect of the natural gas market is very optimistic. In addition, its growth rate is similar to that of global natural gas production, and supply and demand remain relatively stable.

Natural gas consumption varies from region to region. North America and the Asia Pacific rank first and second in the world, accounting for 25.7% and 21% of global natural gas consumption respectively. CIS, the Middle East, and Europe accounted for 15.7%, 14.6% and 14.5% of global natural gas consumption, respectively. Although Africa's natural gas consumption growth rate is the first in the world, its consumption share is only 4.7%. S. & Cent. America consumed the lowest amount of natural gas, accounting for 3.9% of the world's total gas consumption. See figure 3-2 for details.

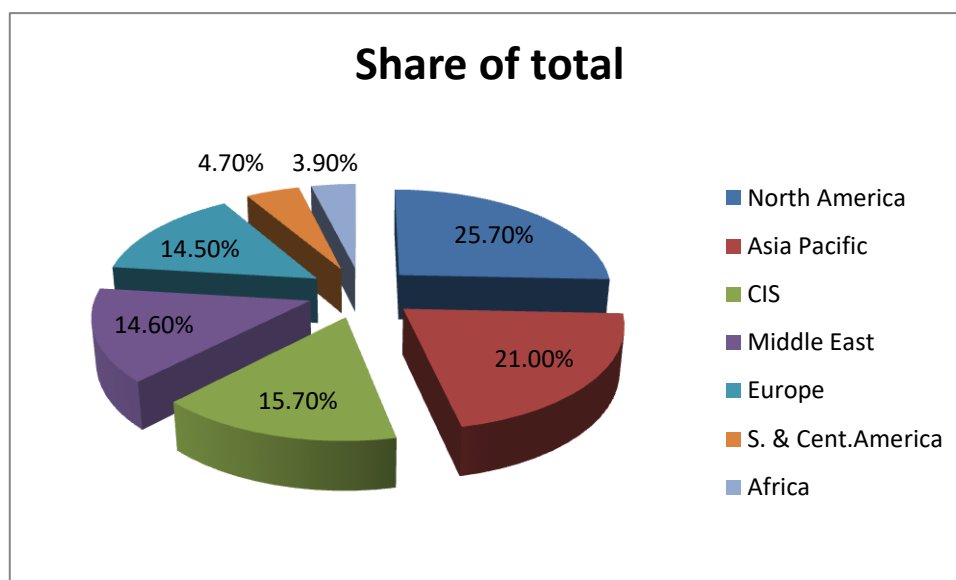


Figure 3-2 Distribution of Natural Gas Consumption in the World

Source: BP Statistical Review of World Energy 2018

The demand for natural gas in the world varies greatly from country to country. In 2017, the consumption of natural gas in the top ten major countries in the world was 3670.4 billion cubic metres, accounting for 60.5% of the world's total natural gas consumption. US gas consumption accounts for 20.1% of the world's total consumption, ranking first in the world. The second is the Russian Federation, which is 424.8 billion cubic metres, accounting for 11.6%. The third is China, which

consumes 240.4% of natural gas, accounting for 6.6%. Most of the other top ten countries account for about 2% to 3% of the world's total natural gas consumption. The world's major natural gas consumers are listed in Table 3-2.

Table 3-2 Major Natural Gas Consumption Countries in the World      Unit: billion cubic metres

Country	2014	2015	2016	2017	Share of total
US	722.3	743.6	750.3	739.5	20.10%
Russian Federation	423.6	409.6	420.2	424.8	11.60%
China	188.4	194.7	209.4	240.4	6.60%
Iran	180.9	191.9	201.4	214.4	5.80%
Japan	120.5	118.7	116.4	117.1	3.20%
Canada	103.2	102.9	109.5	115.7	3.20%
Saudi Arabia	97.3	99.2	105.3	111.4	3.00%
Germany	73.9	77	84.9	90.2	2.50%
Mexico	80.1	78	91.8	87.6	2.40%
United Kingdom	70.1	71.8	81	78.8	2.10%
total	3398.7	3474.2	3574.2	3670.4	60.50%

Source: BP Statistical Review of World Energy 2018

### 3.1.3 World LNG Import and Export Analysis

Global LNG import and export volume is 393.4 billion cubic metres. North America, Middle East and Africa are LNG export continents, and the export volume is much larger than the import volume. The Asia Pacific and Europe are LNG import continents, and import volume is much larger than export volume. S. & Cent.

America's LNG imports and exports are basically the same. CIS only exports, not LNG imports. Among them, the import and export volume of Asia Pacific ranks first in the world. See Table 3-3 for details.

Table 3-3 Global Import and Export Situation Unit: billion cubic metres

	import	export
North America	9.2	17.4
S. & Cent.America	13.8	19.2
Europe	65.7	8.2
CIS		15.5
Middle East	13	122.5
Africa	8.2	55.5
Asia Pacific	283.5	154.9
Total	393.4	393.4

Source: BP Statistical Review of World Energy 2018

LNG has a high concentration of supply and demand. Japan, China and South Korea are the top three countries in LNG demand. In 2017, these three countries imported LNG 113.9 billion cubic metres, 52.6 billion cubic metres and 51.3 billion cubic metres, accounting for 55.36% of the world's total LNG imports. Among LNG exporting countries, Qatar is an enormous export volume of LNG, with an export volume of 103.4 billion cubic metres. The second is Australia, with exports of 75.9 billion cubic metres.

#### 3.1.4 Main factors affecting LNG supply and demand

First, Macroeconomics. Like other energy products, the primary factor affecting the supply and demand of LNG is the economic growth rate, because economic growth is directly related to the energy demand. As an important part of the energy, the supply and demand of LNG are closely related to the world economic growth. According to the analysis of historical data, the world's demand for energy is also higher in years with high global economic growth rates and vice versa. The global financial crisis in 2008 resulted in slow global economic growth, greater impact on chemical fertilizer, chemical industries, building materials, and metallurgical enterprises, lower price affordability of natural gas users, and slower growth of natural gas market demand.

Second, the cost of LNG. In the past 10 years, the cost of liquefied natural gas (LNG) has dropped dramatically, both in production, transportation, and re-gasification. This is mainly due to the development of liquefaction modes, transportation routes, and the re-vaporization technology of LNG. Because of the application of new technology in the natural gas liquefaction process, the operation cost of liquefaction plants has been greatly reduced. So the production cost of LNG has been reduced. At present, LNG transportation is mainly completed by sea transportation. With the development of shipbuilding technology, the cost of shipbuilding has been reduced. At the same time, due to the good management of shipping companies, the cost of ship management has also been reduced. Finally, these two factors lead to a decrease in the overall transportation cost. It is precise because of the cost reduction of each link in the LNG supply chain that the current end-to-end cost reduction of LNG is finally formed.

Third, Oil Prices. As a substitute for oil, soaring oil prices have created opportunities for the development of the LNG market. High and volatile oil prices have increasingly become one of the biggest uncertainties in world economic development. The oil crisis has always stimulated innovation in the energy market. The price hikes of OPEC in

1973-1974 and 1979-1980 brought an end to the era of cheap oil. Great progress has been made in the development of alternative energy and energy-saving technologies, such as water power, nuclear power, and coal. The coal liquefaction technology developed by Germany in World War II and the ethanol-fueled automobile plan of Brazil also shined brilliantly. On the one hand, the demand for natural gas as an alternative product of oil is rising rapidly. On the other hand, the new round of oil crisis also makes the field of natural gas production and transportation burst out with innovative sparks. So LNG has obtained technical support and capital support for long-term development.

Fourth, the Impact of Natural Gas Producing Area Distribution. The distribution of natural gas has created conditions for the development of liquefied natural gas markets. Compared with the concentration of oil distribution, natural gas is a more widely distributed energy source. As a supplementary transportation mode of pipeline natural gas, liquefied natural gas (LNG) links the natural gas market globally, making it easy for consumers to buy natural gas from all sources wherever they are. This decentralized supply mode avoids the "malicious collusion" of natural gas producers, weakens the monopoly and control of the whole market of a single producing area, and minimizes the possibility of "OPEC" of natural gas. Because LNG makes the market more competitive and the price formation more reasonable, it is more and more favored by the market.

Fifth, the Promotion of Environmental Policy. In 2018, natural disasters occurred frequently all over the world, such as the torrential fires in Paradise Town, California, the endless lethality of typhoon "mangosteen" and "flying swallow", as well as the erupting volcanoes and the rampant snowstorms, which caused millions of people to lose their homes and become displaced. In view of the precarious natural environment,

countries around the world have taken active measures to establish emergency preparedness measures. In response to the pace of the times, as well as the call of the tide, the "low-carbon economy" swept in. Under the guidance of this concept of sustainable development, aimed at reducing greenhouse gas emissions, we should build an economic development system based on low energy consumption and low pollution. By means of technological innovation, institutional innovation, industrial transformation, and new energy development, we can achieve a win-win situation in social development and ecological environment protection to a certain extent, as well as a priority for many countries to step into a "low-carbon economy" one after another. All countries in the world advocate saving resources, protecting the environment, building a conservation-oriented society and implementing sustainable development. Natural gas is a clean and environmentally friendly energy source, which contains almost no sulfur, dust, and other harmful substances. When burning, it produces less carbon dioxide than other fossil fuels, resulting in a lower greenhouse effect and can fundamentally improve environmental quality. Therefore, natural gas has been favored by all countries in the world.

Sixth, Implementation of the China New Emission Policy. With the rapid development of China's industry, coal has contributed a lot, but it has brought about serious environmental pollution, such as haze. The more developed regions, such as the Yangtze River Delta, North China, Pearl River Delta, and Bohai Rim, are, due to the rapid development of industry, the greater the use of coal. The more inhalable particulate matter they produce, the greater the degree of air pollution. In recent years, especially in Beijing, Tianjin and Hebei areas, people need to take appropriate protective measures to reduce the number of pollutants in the air. After the two sessions in 2013, the state promulgated the "National Air Pollution Prevention and Control Plan". In order to vigorously promote national policies, other regions have

formulated many relevant provisions according to their own regional development characteristics. On March 1, 2014, Beijing promulgated the Regulations on the Prevention and Control of Air Pollution, which established that the important task of China's energy industry is to actively seek clean energy. The natural gas reserves are large and easy to exploit, which makes China New Emission Policy an important energy structure adjustment strategy.

There are many factors affecting the supply of LNG in the world, such as macro-economy, cost of LNG, price of oil, the influence of the distribution of natural gas producing areas, promotion of environmental protection policy and implementation of "coal to gas" policy. As far as China is concerned, even though the global financial crisis in 2008 reduced LNG supply and the fluctuation of oil prices continued to make LNG supply unstable, according to the data of LNG supply and demand in China in recent years, the supply and demand of LNG in China continued to rise. The most important factor is the implementation of China's New Emission Policy because the government strongly advocates the use of LNG green energy, provinces and municipalities strictly enforce orders, making the Chinese LNG market gradually better.

### **3.2 Analysis of China's Natural Gas Market**

#### **3.2.1 Production of LNG in China**

China is the earliest country to utilize natural gas. The exploitation and utilization of Ziliujing gas field in Sichuan has a history of 2000 years. In recent years, China's natural gas production has increased year by year. The sources of domestic liquefied



gas supply can be divided into seven regions: Northeast China, North China, Shandong, East China, along the Yangtze River, South China and West China. From Table 3-4, it can be seen that the supply of liquefied gas fluctuated little in all regions except East China in November, December, 17 and January, 18. Compared with December 17, the areas where supply increased on January 18 were Northeast China, East China, and South China, of which East China was 13.05% higher than the previous month, and East China and South China had a similar growth rate of about 4%. However, the supply of North China, Shandong, along the Yangtze River and the western region has declined, with the western region falling by 6.95% from last month, the highest decline. But overall, the total supply of liquefied gas in January of 18 years increased by 1.34% compared with the previous month. In January of 18, the supply of liquefied gas in Shandong reached 540,100 tons, ranking the highest in the whole country, followed by Northeast China, which was 333,900 tons, and North China, which had the lowest supply of liquefied gas and was 176,500 tons.

Table 3-4 Statistics of China LNG Supply

Unit: 10000 tons

Region	2017.11	2017.12	2018.1	Compared with last month (%)
Northeast	32.31	32.03	33.39	4.25
North	17.56	18.48	17.65	-4.49
Shandong	48.42	54.14	54.01	-0.24
East	31.06	26.28	29.71	13.05
Along River	21.67	21.56	21.29	-1.25
South	29.41	28.31	29.60	4.56
West	31.05	29.37	27.33	-6.95
Total	211.48	210.17	212.98	1.34

Source: <http://gas.in-en.com/>

According to Table 3-5, the total natural gas supply increased year by year from 2013 to 2016, and the growth rate was relatively stable. The total gas supply in 2013 was 90 billion cubic meters, which increased to 117.272 billion cubic meters in 2016. In the past four years, the number of people using gas has also increased, from 23,783,444,000 in 2013 to 30,855,577,000 in 2016. China's natural gas supply is increasing, and its popularity is getting higher and higher.

Table 3-5 China Total Gas Supply and Gas Consumption Population

	Gas Supply/ Billion cubic meters	Gas Consumption Population /10000 person
2013	900.00	23783.44
2014	964.38	25973.94
2015	1040.79	28561.47
2016	1172.72	30855.57
2017	1429.35	32948.36

Source: <http://gas.in-en.com/>

### 3.2.2 Natural Gas Demand Analysis in China

With the rapid development of China's economy, China's environmental problems have become more and more serious. Therefore, the government pays more and more attention to environmental protection and has formulated many policies to protect the environment, such as advocating the use of green and clean energy. Over the past 20 years, China's energy consumption structure has constantly been changing, and LNG

consumption accounts for an increasing proportion. LNG consumption accounted for only 1.8% of total energy consumption in 1995 and increased to 6.2% in 2016. See Table 3-6 for details.

Table 3-6 Energy Consumption of LNG in China                      Unit: 10000 tons of standard coal

Year	Total Energy Consumption	Percentage of LNG
1995	131176	1.8
2000	146964	2.2
2005	261369	2.4
2010	360648	4
2011	387043	4.6
2012	402138	4.8
2013	416913	5.3
2014	425806	5.7
2015	429905	5.9
2016	435819	6.2

Source: China Energy Statistics Yearbook 2017

### 3.2.3 Conclusion

According to the analysis of the supply and demand market of LNG in China, it can be seen that the supply and demand of LNG in China are in short supply. It is estimated that the annual LNG supply in China is about 25 000 000 tons, but the annual LNG demand in China is about 40 000 000 000 tons. The domestic LNG production in China is difficult to meet the demand. In addition, the growth rate of LNG demand is

much faster than that of production, so China has a large LNG market with good market prospects.

## **4 LNG Shipping Market Analysis**

LNG development is project-based. On the one hand, LNG transportation needs a lot of financial support. On the other hand, it also requires negotiation with suppliers to sign project development and transport contracts to ensure sales channels. In addition, LNG ship also belongs to high-tech, difficult, high value-added products, with high cost. From this point of view, this is a relatively closed sub-market. In this sub-market, it can be further divided into smaller sub-areas based on projects. There is basically no so-called "market goods". Because of this, LNG transportation can still be a niche market. This feature, on the other hand, shows that there are thresholds and conditions for profit-making in the LNG transportation market.

### **4.1 World LNG Shipping Market**

#### **4.1.1 World LNG Shipyard and Shipping Enterprises**

The top ten LNG shipyards in the world are located in Asia and Europe, with eight in Asia and one in Europe and North America. Among them, South Korea has four shipyards in the top ten in the world, namely Daewoo (DSME), Samsung HI, Hyundai HI (Ulsan) and Hyundai Samho HI. There are three in Japan, namely MHI Nagasaki, Kawasaki HI Sakaide and Mitsui SB (Chiba). One is in China, which is Hudong Zhonghua. The largest LNG shipyard in Europe is Ch. de l'Atlantique in France and General Dynamics in North America. The shipyards of Daewoo (DSME) and Samsung HI have built more than 150 LNG ships with a total load of more than 10 million DWT.

Table 4-1 The Top Ten LNG Shipyards

Rank	Builder	Number	Total	Avg Size	Unit	Country/Region
1	Daewoo (DSME)	173	16,306,963	94,259	DWT	South Korea
2	Samsung HI	152	13,496,122	88,790	DWT	South Korea
3	Hyundai HI (Ulsan)	84	7,447,209	88,657	DWT	South Korea
4	MHI Nagasaki	57	4,556,544	79,939	DWT	Japan
5	Kawasaki HI Sakaide	38	2,693,447	70,880	DWT	Japan
6	Hyundai Samho HI	38	3,484,859	91,706	DWT	South Korea
7	Hudong Zhonghua	25	2,138,334	85,533	DWT	China P.R.
8	Mitsui SB (Chiba)	16	1,148,117	71,757	DWT	Japan
9	Ch. de l'Atlantique	10	722,026	72,202	DWT	France
10	General Dynamics	9	653,328	72,592	DWT	United States

Source: Clarkson

The top ten shipowners operating LNG ships in the world are scattered. Asia accounted for three seats, namely Mitsui OSK Lines of Japan, Nippon Yusen Kaisha and Petronas of Malaysia. Europe is mainly Greece's Angellicoussis Group, GasLog, and Dynacom Tankers Mgmt. North America includes Teekay Corporation of Canada and Golar LNG and BW Group of Bermuda. There is also Qatar Gas (Nakilat) of Qatar in the Middle East. The top ten LNG shipowners in the world have about 30 ships. LNG orders range from 0 to 10. The total load tonnage is above 1.5 million DWT. The largest LNG shipowner is Mitsui OSK Lines of Japan, which is 3.6 million DWT.

Table 4-2 The Top Ten LNG Shipowners

Rank	Owner Group	Fleet No	OB No	Total Number	Total	Unit	Country/Region
1	Mitsui OSK Lines	32	12	44	3,603,777	DWT	Japan
2	Nippon Yusen Kaisha	29	13	42	3,503,525	DWT	Japan
3	Angelicooussis Group	29	13	42	3,821,221	DWT	Greece
4	Teekay Corporation	39	0	39	3,279,064	DWT	Canada
5	GasLog	26	8	34	2,943,670	DWT	Greece
6	Petronas	31	0	31	2,217,603	DWT	Malaysia
7	Qatar Gas (Nakilat)	29	0	29	3,609,718	DWT	Qatar
8	BW Group	20	5	25	2,173,784	DWT	Bermuda
9	Golar LNG	19	0	19	1,550,030	DWT	Bermuda
10	Dynacom Tankers Mgmt	15	2	17	1,522,604	DWT	Greece

Source: Clarkson

#### 4.1.2 World LNG Maritime Market Supply

Since 2013, the global trade volume of LNG has increased year by year, from 236.9 MT in 2013 to 263.6 MT in 2016. However, long-term trade volume declined slightly in 2014, short-term and spot volume declined in 2015, while the overall trade volume of LNG increased. In the past four years, the number of LNG carriers in service has also risen, and the rising speed is relatively stable, from 378 in 2013 to 454 in 2016. In recent years, FSRU has been gradually valued by shipping companies, from one in 2011 to 24 in 2016. The total carrying capacity of LNG vessels in service increased from 28.93 million tons in 2013 to 37.34 million tons in

2016. Among the active vessels, the largest number of LNG vessels is Marshall who is 84, the Bahamas is 78. And Bermuda is 58, Panama is 50, Japan is 30, Malaysia is 28, Greece is 26, Malta is 24, Hong Kong is 18 and China is 2.

Table 4-3 Global LNG Trade Volume and LNG Ship

	LNG Trade Volume /MT			LNG vessels		
	Long-term	Short-term	Total	LNG	FSRU	Total
2013	171.9	65.0	236.9	378	15	393
2014	169.6	69.6	239.2	416	5	421
2015	176.8	68.4	245.2	426	23	449
2016	189.0	74.6	263.6	454	24	478

Source: <http://gas.in-en.com/>

In recent years, the number of LNG ships in the world has been increasing but compared with 2016, the growth rate in 2017 has decreased slightly. By December 2017, the number of LNG vessels in the world had risen to 502, with a total of 39.98 million tons. However, compared with the global demand for LNG transportation, transportation capacity cannot fully meet the demand. There is a significant imbalance between supply and demand for LNG transportation.

## 4.2 China LNG shipping market

### 4.2.1 LNG Fleet

China National Offshore Oil Corporation (CNOOC) and China National Petroleum Corporation (CNPC) are the main importers of LNG in China, accounting for about



70% and 26% respectively. CLNG and China COSCO Shipping are China's major shipping companies responsible for LNG transportation.

China LNG Shipping (Holdings) Limited is jointly invested by Dalian Ocean Shipping Company and China Merchant Shipping LNG Transport Investment Co., Ltd. approved by the Ministry of Commerce on March 15, 2004, and registered in Hong Kong. It is the first shipping enterprise to enter the field of LNG transportation. Its main business is to invest in LNG transportation-related business, develop and manage LNG transportation project investment, invest in LNG ships, invest in LNG transportation management company, invest in an LNG transportation company, provide LNG transportation management, technology and financing consulting services. As a professional company of COSCO and China Merchants Bureau Group in LNG transportation investment and management, CLNG has led the investment of six LNG shipping vessels in Guangdong and Fujian LNG import projects which have been completed and put into operation in China. It is currently preparing for the investment of LNG shipping in Shanghai and will continue to develop the investment of LNG import follow-up projects in China. CLNG currently operates six LNG carriers, a total of 450,000 DWT. The average age of the fleet is 9.8 years. The mode of operation is to sign long-term contracts. China COSCO Shipping is a combination of China Shipping and COSCO in 2016. There are seven LNG vessels under the flag, totaling 660,000 DWT. The average age of the fleet is 2.3 years. They are mainly used for long-term transportation projects. See Table 4-4 for details.

Table 4-4 Chinese Total LNG fleets

Name	Dwt	GT	Built	Builder	Owner Group
CESI	95,641	113,397	2017	Hudong	China COSCO Shipping

Qingdao				Zhonghua	
CESI				Hudong	
Gladstone	95,638	113,397	2016	Zhonghua	China COSCO Shipping
CESI				Hudong	
Lianyungang	95,638	113,397	2018	Zhonghua	China COSCO Shipping
CESI				Hudong	
Tianjin	95,628	113,397	2017	Zhonghua	China COSCO Shipping
				Hudong	
CESI Beihai	95,599	113,397	2017	Zhonghua	China COSCO Shipping
CESI				Hudong	
Wenzhou	95,530	113,397	2018	Zhonghua	China COSCO Shipping
Golar				Samsung	
Crystal	82,058	102,100	2014	HI	China COSCO Shipping
				Hudong	
Shen Hai	82,625	98,068	2012	Zhonghua	CLNG
				Hudong	
Dapeng Sun	73,275	97,871	2008	Zhonghua	CLNG
Dapeng				Hudong	
Moon	73,275	97,871	2008	Zhonghua	CLNG
				Hudong	
Min Lu	73,230	97,871	2009	Zhonghua	CLNG
				Hudong	
Dapeng Star	73,058	97,871	2009	Zhonghua	CLNG
				Hudong	
Min Rong	72,989	97,871	2009	Zhonghua	CLNG
Hai Yang	16,250	25,309	2015	Jiangnan	CNOOC

Shi You 301				SY Group	
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Source: Clarkson

#### 4.2.2 LNG Import

From January to November 2017, China's LNG imports originated from 20 countries, an increase of 7 over the same period last year. The top five LNG imports originated from Australia, Qatar, Malaysia, Indonesia and Papua New Guinea, accounting for 90.6% of China's total imports. From January to November, the quantity of LNG imported by Australia totaled 15.222 million tons, which increased by 45.3% year-on-year, accounting for 46% of China's total import share. It slightly decreased by 0.9 percentage points compared with the same period last year. It is still the largest source of LNG imports in China. LNG imports from Qatar totaled 6.459 million tons, up 61.7% year-on-year, accounting for 19.5% of China's total imports, up 1.6 percentage points over the same period last year. The number of LNG imports from Malaysia was 3892,000 tons, up 60.3% year-on-year, accounting for 11.7% of China's total imports, a slight increase of 0.8 percentage points over the same period last year. The quantity of LNG imported from Indonesia was 2.630 million tons, up 3.8% year on year, accounting for 7.9% of China's total import share, down 3.4 percentage points from the previous year. LNG imports from Papua New Guinea totaled 1.89 million tons, down 4.5% year-on-year, accounting for 5.5% of China's total import share, down three percentage points from the previous year. In addition to the above five places, the number of LNG imports from the United States has increased dramatically, becoming the sixth-largest source of LNG imports in China. From January to November 2017, the total amount of LNG imported from the United States was 1.261 million tons, an increase of 1.22 million tons over the same period last year, accounting for 3.8% of China's total import share.

Table 4-5 Distribution of LNG Import Sources in China from January to November 2017                      Unit: 10000 tons

Country	import	Year-on-year	Proportion
Australia	1522.2	45.3%	46.0%
Qatar	645.9	61.7%	19.5%
Malaysia	389.2	60.3%	11.7%
Indonesia	263.0	3.8%	7.9%
Papua New Guinea	180.9	-4.5%	5.5%
U.S.A	126.1	2008.0%	3.8%

Source: Customs Statistics

#### 4.2.3 LNG Import Receiving Stations

There are 24 LNG receiving stations in China, of which 15 have been operated, one has been operated in the first phase, five are under construction, one has been put into operation and two have been approved. According to Table 4-6, the main receiving areas of LNG in China are the Pearl River Delta and East China. The number of receiving stations in East China is the largest in the country, mainly distributed in Shanghaishan, Shanghai Midwest Gateway, Jiangsu Rudong, Zhejiang Ningbo, Fujian Putian, and other places. The Pearl River Delta region mainly has Dapeng, Zhuhai and other receiving stations, although the number of LNG receiving stations in the Pearl River Delta is not large, the receiving stations have a large acceptance. Guangdong Dapeng Receiver Station is the largest in China. Its first-stage capacity is 5.11 billion cubic meters per year, and its total capacity ranks first in the country, with 9.25 billion cubic meters per year. The second is the Rudong Receiver Station in Jiangsu Province, which is 8.97 billion cubic meters per

year. The total capacity of Shanghai, Liaoning, and Tianjin is about 3-4 billion cubic meters per year.

Table 4-6 Receiving Stations for LNG Import in China Unit: Billion cubic meters/Year

Receiving station	Region	Operator	Condition	Commissioning time	First stage productivity	Full capacity
Da Peng	Guangdong	CNOOC	Already run	2006	51.1	92.5
Pu Tian	Fujian	CNOOC	Already run	2009	35.9	69
Yang Shan	Shanghai	CEEC	Already run	2009	41.4	41.4
Zhong Xi Men Tang	Shanghai	CNOOC	Already run	2009	41.4	41.4
Ru Dong	Jiangsu	CNPC	One-stage operation	2011	48.3	89.7
Da Lian	Liaoning	CNPC	Already run	2011	41.4	41.4
Ning Bo	Zhejiang	CNOOC	Already run	2012	41.4	82.8
Tian Jin	Tianjin	CNOOC	Already run	2013	30.4	30.4
Zhu Hai	Guangdong	CNOOC 、 Guangdong Energy	Already run	2013	48.3	48.3
Cao Fei Dian	Hebei	CNPC 、 Kunlun Energy	Already run	2013	48.3	48.3
Hai Nan	Hainan	CNOOC	Already run	2014	41.4	41.4
Qing Dao	Shandong	Sinopec	Already run	2014	41.4	41.4

		Group				
Die Fu	Guangdong	CNOOC 、 Shenzhen Energy 、 CNPC	Be under construction	2015	55.2	55.2

Source: <http://gas.in-en.com/>

#### 4.2.4 Major Routes of LNG Transport Imported by China

China's LNG importers mainly include Australia, Qatar, Malaysia, Indonesia, Papua New Guinea and the U.S.A. Therefore, most LNG is transported to China via the South China Sea. There are three main routes for LNG imports from China: the first is LNG imported from Australia, Indonesia, and Papua New Guinea through the Karimata Strait and the South China Sea; the second is LNG imported from Qatar through the Arabian Sea, the Bay of Bengal, the Malacca Strait and the South China Sea. The third is LNG imported from the United States via the Pacific Ocean.

### 4.3 Impact of China New Emission Policy on LNG Shipping Market

#### 4.3.1 China New Emission Policy

##### 4.3.1.1 Three stages of China New Emission Policy

Since the reform and opening up to the beginning of the 21st century, China has carried out the urban "coal gasification project". Due to the limitation of the national economic level, gas resources are scarce, and the use of gas water heaters is limited, which cannot be popularized. Therefore, this stage of "coal gasification project" is

mainly to improve the use rate of residents coal-fired stove cooking. This is the first stage of the China New Emission Policy.

The second stage is from the beginning of the 21st century to 2013, which mainly solves the problem of gas stoves. Beijing won the right to host the 2008 Olympic Games on July 13, 2001. In order to create a good international image of China, it is necessary to improve the air quality of Beijing. Since then, Beijing has become the first city in China to introduce large quantities of natural gas. Not only have coal-fired heating boilers and power generation coal-fired boilers been gradually transformed, but gas-fired household heating has also been opened in stages and batches from Beijing and other gas-rich areas.

Since Beijing, Tianjin, and Hebei took the lead in implementing the China New Emission Policy in 2013, it is the third stage of the China New Emission Policy in China. Due to the serious air pollution and haze in many areas of China, the China New Emission Policy has been implemented in Beijing, Hebei, Tianjin, Shandong, Shanxi, Shaanxi and Henan.

#### 4.3.1.2 Current Situation of China New Emission Policy Implementation

Several relevant departments of the Beijing Municipal Government jointly formulated the Guidelines for Promoting the Work of "Clean Energy for Coal Reform and Coal Reduction for Coal Change" in villages in rural areas of Beijing in 2016. Its main purpose is to reduce energy consumption and the user's use cost as much as possible. Its main content is to advocate the green energy system with the characteristics of "multi-heat combination, multi-energy linkage, and multi-source integration". Unification. Because of the large amount of electricity used in direct heating and a large amount of money spent, users are required not to use direct

heating. In addition, various regions should vigorously promote "multi-energy linkage" equipment and heat pump, the amount of use should be higher than 80% of the number of heating equipment.

Beijing Environmental Protection and Finance Bureau want to increase its efforts to promote and develop clean energy conversion and transformation of coal-fired boilers, so the subsidy standard of coal-fired boilers has been greatly improved. "Beijing Boiler Reform Subsidy Fund Management Measures" was issued in 2002. It specifies that if coal-fired boilers with less than 20 steam tons are used, they can be subsidized by 55,000 yuan per steam ton. If coal-fired boilers with more than 20 steam tons are used, they can be subsidized by 100,000 yuan per steam ton. As a result of the implementation of the China New Emission Policy in 2014, the subsidy amount for each steam ton has been increased - if suburban counties use coal-fired boilers, they will receive a subsidy of 130,000 yuan per steam ton. In addition, the Municipal Development and Reform Commission promulgated the Notice on Adjusting the Investment Policy of Fixed Assets of the Municipal Government for Clean Energy Renovation of Coal-fired Boiler House.

In addition, "Beijing Electric Heating Low Valley Electricity Preferential Measures" is also jointly formulated by relevant departments. The Measures stipulate that families using electric heating enjoy preferential policies for low-valley electricity consumption. During the period, the preferential period is from November 1 to March 31 of the next year, from 11 p.m. to 7 a.m. of the next day. During this period, the charging price does not divide the different prices by using the type of people and the way of using electricity. It is two corners per kilowatt-hour. Because of the cold night time stipulated in the Measures and a large number of people heating during this period, this policy has much promoted the implementation of the China New



Emission Policy.

In order to implement the China New Emission Policy and realize the green development of Shandong Province, the Shandong government formulated the related goals of reducing the annual total coal consumption in 2015. Compared with the total coal consumption in 2012, the Shandong government endeavored to reduce the total coal consumption by 10 million tons in 2016 and 20 million tons in 2017.

In addition to reducing the total coal consumption, Shandong Province has also actively promoted the development of green and clean energy, such as geothermal energy, solar energy, biomass energy and wind power. Especially, relevant energy enterprises such as electric power and oil and gas need to strive to change the energy structure, advocate the use of green energy, and promote supporting projects such as "coal substituted by electricity" and "coal substituted by gas".

4.3.2 The demand for LNG has increased dramatically, increasing the transportation requirements for LNG.

With the increasing emphasis on environmental protection and the introduction of the China New Emission Policy, China's energy consumption structure is changing. Coal consumption has gradually declined, and LNG demand has increased substantially. According to the data released by the National Development and Reform Commission, China's LNG production is increasing year by year from 2011 to 2016, from 103.06 billion cubic meters in 2011 to 137.1 billion cubic meters in 2016. Over the past five years, China's LNG production increased by 33% and continued to grow at a relatively stable rate every year. However, China's LNG imports are growing rapidly. In 2011, China's LNG imports were only 31 billion cubic meters, reaching

72.1 billion cubic meters by 2016. Compared with LNG imports in 2011, imports increased by 133% in 2016. However, from 2011 to 2016, China's LNG export volume did not fluctuate significantly, so it seems that China's LNG demand is rising continuously. According to the data from January to November 2017, the demand for LNG in China is on the rise in 2017. Compared with 2016, the demand for LNG in 2017 has increased significantly.

Table 4-7 Natural Gas Production and Marketing Data in China Unit: Billion cubic meters

	2011	2012	2013	2014	2015	2016	2017年1-11月
Production	1030.6	1100	1178	1280	1298	1371	1338
import	310	385	530	595	621	721	812
export	32	29	32	59	79	34	72
Apparent Consumption	1308.6	1456	1676	1803	1840	2058	2078

Source: National Development and Reform Commission

In the case of a greater increase in natural gas demand, the release of domestic natural gas production capacity is relatively limited, especially in the second half of the year when the pressure of environmental protection increases sharply, the import volume of LNG increased significantly in 2017. According to the General Administration of Customs, the import volume of LNG in China from January to November 2017 was about 33.127 million tons, an increase of 48.3% over the same period last year. There were 11 import provinces in Guangdong, Shandong, Jiangsu, Hebei, Zhejiang, Fujian, Shanghai, Liaoning, Tianjin, Guangxi, and Hainan.

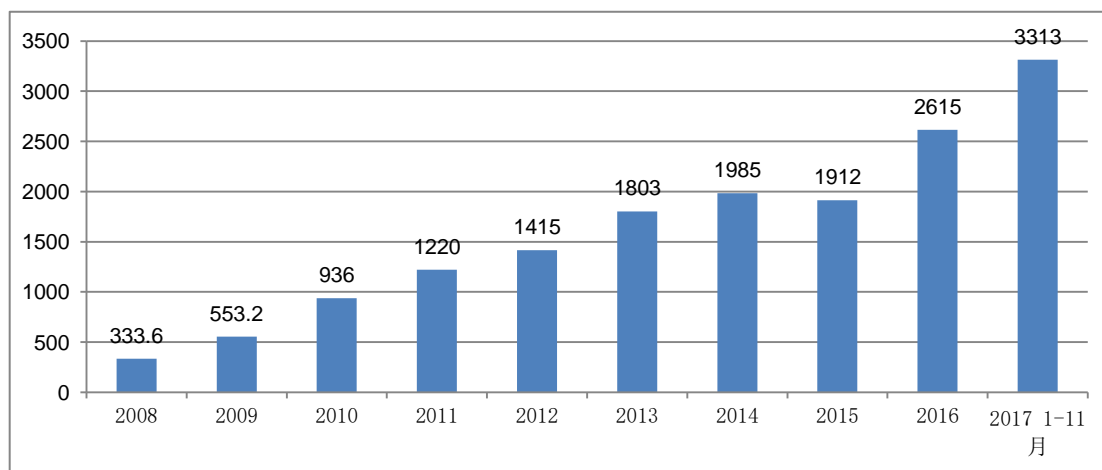
According to the top five provinces and cities in terms of import volume, the total import volume of LNG in Guangdong Province is 7.912 million tons, up 4.7% from the same period last year, accounting for 23.9% of the total import volume in China. Shandong Province imported 4.065 million tons of LNG, a significant increase of 83.6% over the same period last year, accounting for 12.3% of the country's total imports. Jiangsu Province imported 4.016 million tons of LNG, a sharp increase of 148.2% over the same period last year, accounting for 12.1% of the country's total imports. The total import of LNG in Hebei Province is 33.955 million tons, up by 177% from the same period last year, accounting for 10.2% of the total import in China. The total import of LNG in Zhejiang Province is 3084,000 tons, a significant increase of 71.5% over the same period last year, accounting for 9.3% of the total import in China.

Table 4-8 Imports of LNG by Provinces and Municipalities from January to November 2017  
Unit: 10000 tons

Region	Import	Year-on-year	Proportion
Guangdong	791.2	4.7%	23.9%
Shandong	406.5	83.6%	12.3%
Jiangsu	401.6	148.2%	12.1%
Hebei	339.5	177.0%	10.2%
Zhejiang	308.4	71.5%	9.3%
Fujian	290.2	9.1%	8.8%
Shanghai	270.1	13.1%	8.2%
Liaoning	188.3	66.0%	5.7%
Tianjin	164.2	99.8%	5.0%
Guangxi	110.0	52.2%	3.3%

Hainan	42.6	118.8%	1.3%
Total	3312.7	48.3%	

Source: Customs Statistics



Source: Customs Statistics

Figure 4-1 Trend Chart of China's LNG Imports from 2008 to 2017 Unit: 10000 tons

#### 4.3.3 China's imports of LNG have increased

Compared with 2016, China's imports of LNG from all over the world changed in 2017. Although LNG imports from distant Papua New Guinea have declined slightly, the volume of LNG imports from other countries has increased. The trade volume of LNG from Malaysia, the southeast coast of the United States, Qatar, and Australia has increased significantly, especially the import volume of LNG. The import of LNG from Indonesia, which has a shorter voyage, also shows an upward trend, but the growth rate has declined. From this point of view, the shipping voyage of LNG imported by China in 2017 is still showing an upward trend.

#### 4.3.4 The price of LNG and transportation increased significantly.

In recent years, with the introduction and vigorous promotion of the China New Emission Policy, the energy structure of winter heating in northern China has been greatly adjusted, and LNG, as the primary clean energy in China, is becoming more and more important. However, there are few LNG regions in China, and the LNG quantity is seriously insufficient. The technology of LNG mining in China is not mature enough and the equipment is not advanced enough to meet the existing demand. Therefore, since November 2017, there has been a shortage of LNG in northern China. In this case, the LNG market has formed a state of a shortage of supply and demand, making LNG prices continue to rise.

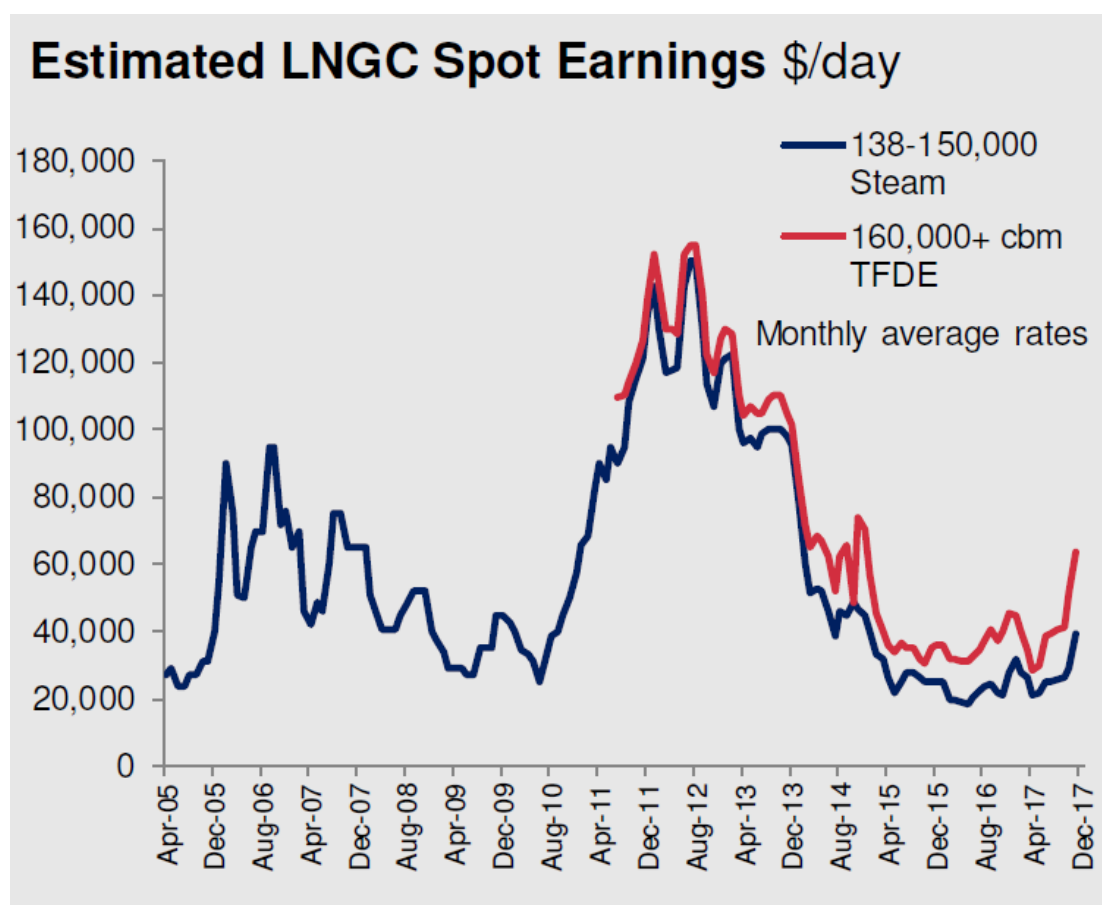
While China's international status is constantly improving, its international influence is also constantly strengthening. After the implementation of the China New Emission Policy in China, the impact on the global LNG transport market cannot be underestimated. Although the number of LNG vessels in the world has risen in recent years, and the capacity of LNG vessels has also increased at a relatively high level, the global LNG freight rate has risen due to the large increase of LNG demand in China in the second half of 2017. Looking at the trend of LNG freight rate in 2017, it shows that the freight rate is higher at the beginning of the year and at the end of the year. According to the data found, the daily rent of 140,000 CBM or 160,000 CBM LNG vessels in 2017 has increased by about 30% compared with that in 2016.

Table 4-9 Daily Rent of LNG Ships between 2016 and 2017      Unit: USD/Day

	145,000m <sup>3</sup> (ST)	160,000m <sup>3</sup> (TFDE)
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2016	20151	33528
2017（1-11）	26991	42836
Growth Rate	33.94%	27.76%

Source: SIMPSON SPENCE YOUNG



Source: SIMPSON SPENCE YOUNG

Figure 4-2 Trends of LNG Spot Rent from 2005 to 2017

#### 4.4 Trends of China's Import LNG Maritime Market in the Next few Years

##### 4.4.1 China's LNG import will further increase

Air pollution is becoming more and more serious in China, and the environmental protection pressure of various government departments is tremendous. In order to improve the environmental quality of our country, we need to promote the China New Emission Policy vigorously. Therefore, China's LNG imports will continue to grow substantially. China needs more LNG receivers, and the operational efficiency of LNG receivers will be further improved. Although China needs more receivers, due to various factors, the number of LNG receivers in China in 2017 did not increase as much as expected. Generally speaking, the overall construction process of LNG receiving station in 2017 in China has not made a great leap. As more and more regions in China begin to implement the China New Emission Policy in 2018, China's LNG shipping volume is still growing, and the growth rate is faster. In 2017, there are three projects newly built and put into operation in China, namely, Qidong Project in Jiangsu, Tianjin Project, and East Guangdong Project. By December 31, 2017, 18 LNG receiving stations have been built and put into use in China. In addition, the Western Guangdong Project, Lianyungang Project in Jiangsu Province and Zhoushan Project in Zhejiang Province have been approved. The project is planned to be completed and put into operation in 2018. According to the relevant statistics, the three new LNG receivers can increase the LNG acceptance by 9.11 billion cubic meters per year. If the LNG receiving station plan can be completed as scheduled in 2018, there will be 21 LNG receiving stations in China by December 2018, with a total receiving capacity of 101.3 billion cubic meters per year. According to the data obtained, the growth rate of LNG imports in China in 2019 will be lower than that in 2018, but the imports are still expected to exceed 45 million tons.

#### 4.4.2 LNG fleet capacity will increase slightly

According to Clarkson's data, the number of LNG ships worldwide is steadily increasing in recent years, and the number of LNG ship orders is increasing year by year, from 6 in 2016 to 19 in 2017. Obviously, the number of LNG ship orders in 2017 is significantly higher than that in 2016, and the increase is large. As far as I know, LNG's new shipbuilding price is not high, even at a low level. It can be inferred that the number of LNG ship orders will continue to grow in 2019, LNG capacity will be further enhanced, and the net increase capacity is expected to reach 3 million tons.

#### 4.4.3 The freight rate of LNG transport market is expected to increase further.

With more and more attention paid to environmental protection in the world, LNG has become the first choice of clean energy in the world. As a result, LNG's Global trade volume has increased year by year in recent years, up to 10% in 2017. According to the statistical analysis of global LNG trade volume data over the past few years, it should continue to grow in 2019, which is expected to reach a 13% growth rate, which will set a record high of LNG Global trade volume over the years. Around the world, LNG resources in Australia, Qatar, and the United States are abundant and their output is also rising. In addition, seasonal variations are the major factors affecting the LNG shipping market, and the demand for LNG has risen sharply in winter. Especially in recent years, after the China New Emission Policy was introduced in China, the demand for LNG transportation has become stronger, but the capacity of LNG transportation in China has not been able to catch up with the demand. Therefore, the LNG transport market is in good shape. The LNG freight rate will be further increased in 2019. Its trend is still high at the end of the year, and the rent level will be slightly increased.



## **5 Responses of Chinese shipping company**

### **5.1 Increase the ability to pick up goods**

After the implementation of the China New Emission Policy in China, the total demand for LNG has increased sharply. In this regard, LNG Shipping Company should pay attention to the management and assessment of its sales and operation department to improve its cargo handling capacity. The LNG shipping company should do a good job in the LNG demand statistical survey, and analysis and forecast the development trend of demand. In order to quickly grasp first-hand information of LNG demand market and make corresponding countermeasures, LNG shipping company should set up branches in regions where the demand is large when the cost is allowed. In addition, LNG Shipping Company should carry out corresponding professional knowledge training for salesmen, excavate and solicit sales elites from all over the country, formulate corresponding sales incentive policies, organize collective company activities to improve the sense of belonging of employees to the company. So as to improve the enthusiasm and initiative of salesmen to solicit goods, increase the ability of the company to solicit goods, and make the company occupy a larger market share.

### **5.2 Optimizing Ship Configuration**

#### **1. Making Full Use of Existing Ships**

China's LNG transport market is now a seller's market, and the number of domestic LNG ships is not enough to meet the total domestic demand for LNG. Therefore,

LNG shipping company should make full use of existing ships in order to obtain more profits. The operational dispatching department should keep a close eye on the ship's dynamics, arrange the berthing and unloading time in time, make a good connection between the last and the next voyages, reduce unnecessary stay time in port, and improve ship turnover rate. At the same time, regular inspection and maintenance of the ship will be carried out to extend the life of the ship and ensure that the ship is in good condition during the voyage.

## 2. Charter an appropriate number of ships

Faced with the huge demand for LNG, LNG shipping companies need to increase the capacity of their ships. Due to the shortage of LNG transport supply and demand, the price of second-hand vessels is much higher than that of new vessels. However, the construction time of the new vessels is too long. Therefore, renting an appropriate number of LNG vessels is the best way to increase transport capacity. The operation dispatching department of the company should closely communicate with the marketing center and the chartering department to consider both the cargo that may be obtained in the market and the ship that may be chartered. Every cargo and ship in the opponent should study the feasibility of the line-dividing operation and choose the best scheme according to the evaluation results. The focus of the chartering department should be shifted from "open capacity sales" to "providing a capacity guarantee for the expansion of the company's business scale". The marketing center can not only focus on the ship in hand to collect goods; similarly, the chartering department can not only focus on the ship in hand to arrange the capacity. Solving the problem of open capacity sales is only a part of the function of the chartering department. The most important task of the chartering department is to rent the required capacity according to the demand of the marketing center. Therefore, the

core work of the chartering department is to sell open surplus capacity and the capacity needed by the chartering company, which should be considered together. For this reason, the chartering department needs to update the chartering and sales plans of various types of ship capacity in time according to the market fluctuations, including the stage, region, and mode of chartering and sales capacity, so as to achieve the company's business objectives, reduce risks and operate steadily.

### **5.3 Implementing an incentive mechanism for LNG ocean-going crew**

In recent years, China has substantially increased the import of LNG from the southeast coast of the United States, making the United States the sixth-largest source of LNG imports. At the same time, imports from Qatar and Australia are also growing at high speed, which increases the LNG shipping company's ocean voyages. Therefore, in order to meet the demand of ocean-going LNG transportation, shipping companies should establish an incentive mechanism to encourage seafarers to run ocean-going routes.

### **5.4 Pay attention to the production safety of LNG routes**

The increase in ocean routes means the escalation of potential safety hazards. Therefore, shipping companies should pay more attention to the production safety of ocean routes, because safety is the lifeline of enterprises. Ocean voyage means the extension of voyage time, which increases the potential safety hazard of fatigue driving of crew. Liquefied natural gas (LNG) is dangerous to some extent, and

improper operation will threaten the safety of crew members. Therefore, attention should be paid to the standardized operation of the crew in their daily work. In addition, the new crew management system and the impending ship management system will inevitably bring some new situations, changes, and problems to the safety management of the LNG transportation company. The reform involves a large number of areas and personnel, and the situation is complex. It is easy to bring about the negative impact of employee ideological instability, and also easy to cause the process is not smooth, thus affecting the company's security situation. From this point of view, each shipping company not only needs to reform the ship management system according to the specific situation of the company but also needs to improve the safety management system and build a solid security and stability line of defense.

### **5.5 Improve the internal management level of LNG Shipping Company and follow the principle of "cost leadership"**

In order to enhance the competitiveness of enterprises and improve their profit opportunities, the most direct and effective way is to reduce costs and improve the operational efficiency of enterprises. Firstly, we should make it clear that the company should be in the position of internal management according to the principle of "cost-leading". For example, the company needs to implement intensive management to reduce costs. At the same time, we need to formulate the relevant operating process rules and norms within the company, clarify the rights and responsibilities of various departments, so as to lay a foundation for sustainable profits. Secondly, we should optimize the allocation of resources and enhance internal capital. Source elements are systematic, holistic and synergistic, which can improve the efficiency of resource utilization and greatly reduce the operation cost.

For example, after reorganization, COSCO Shipping will be divided into the marketing department, operation dispatching department, chartering department, shipping business department and so on according to its functions, so as to achieve unified and effective management. And the division of labor is clear and responsibility is certain to people.

## 6 Conclusion

With the promotion of green development in China, the market structure of LNG shipping is also changing slowly, which brings great opportunities and challenges to LNG shipping company. In the current shipping market depression, how LNG shipping company to open up the market and maximize profits is an important issue.

This article first divides the LNG market into two major markets: the world LNG market and China LNG market. The world LNG market is mainly analyzed from the distribution of natural gas resources, natural gas exploratory reserve countries, natural gas consumption countries, LNG import and export situation and factors affecting LNG supply and demand. The LNG market in China is mainly analyzed from three aspects: supply from different regions, gas consumption population and gas consumption. According to some relevant data of the world and China's LNG market, the demand for LNG is high, and the market prospects are bright. Then, the article analyses the LNG transportation market from the world LNG transportation market and China LNG transportation market. The LNG transportation market is mainly analyzed from the aspects of LNG shipyard, LNG shipping company, LNG fleet size and LNG receiving station in China. Because of the distance between LNG supply and demand, the demand for LNG transportation market is larger. In addition, the LNG transportation supply market is not perfect enough and has a larger development space. From the above two LNG market analysis, especially with the support of China New Emission Policy, LNG transportation market has great development potential, and Chinese LNG shipping enterprises should seize this opportunity. We can draw the following countermeasures: improving the cargo handling capacity and setting up key routes; making full use of existing ships and chartering an appropriate number of ships; formulating

the related system of ocean-going shipping; forming healthy competition among LNG shipping companies to maintain the rising trend of freight rates; improving the internal management level of LNG shipping companies and complying with it. Follow the principle of "cost leading".

However, there are still some imperfections in this study. Only the number of LNG vessels in the world reflects the supply of LNG vessels in China. In addition, the proposed qualitative evaluation index system of LNG shipping market is not comprehensive enough.

As the shipping market is changing rapidly, we should always pay attention to the LNG shipping market dynamics and make timely analysis and prediction so as to make the LNG shipping market more prosperous.

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