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Kontakt/Contact

ZBW – Leibniz-Informationszentrum Wirtschaft/Leibniz Information Centre for Economics
Düsternbrooker Weg 120
24105 Kiel (Germany)
E-Mail: [rights\[at\]zbw.eu](mailto:rights[at]zbw.eu)
<https://www.zbw.eu/econis-archiv/>

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Russian Energy Strategies in the Natural Gas Market for Energy Security

Zhe Geng*

Postgraduate Student of International Institute of Energy Policy and Diplomacy, MGIMO University, 119454, Prospect Vernadskogo 76, Moscow, Russia. *Email: gengzhe@mail.ru

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ABSTRACT

The global natural gas market is one of the fastest growing energy markets. Russia is the second largest natural gas producer, and natural gas is its important strategic resource. As one of the main sectors of the Russian economy, natural gas plays a key role in the country's financial revenue and trade balance. In addition, it is also an important part of Russia's foreign policy. The structure and system of Russia's natural gas industry are inconsistent with its future development. We assess the natural gas security risks facing Russia by using HHI index, which takes into account the concentration of Russian natural gas exports. By calculating the HHI index, we found that Russia's natural gas export risk level differs considerably over different years. Russia is making efforts to promote the reform of the industry, and the government has constantly revised the draft energy strategy, to propose the latest direction for the long-term development of the natural gas industry. Russian gas strategy is to diversify the ways, directions and conditions of supplies to the world's major energy markets. Russia's layout of LNG export can help boost trade growth, and promote the diversification of its natural gas exports.

Keywords: Russia, Natural Gas, Energy Strategy, Energy Security

JEL Classifications: Q4, Q40, Q48, C8

1. INTRODUCTION

Russia has almost 20% of the world's proven reserves of natural gas and produces about 17% of world's overall output (BP, 2019). For more than half a century, Russia's natural gas industry has been developing, with its enormous domestic market and natural gas output playing an important role in the international market (Sinelnikov-Mourylev et al., 2014). Russia's natural gas industry is one foundation of the Russian economy and the most important source of its financial revenue (Ahrend and Tompson, 2010).

Russia's oil and gas products accounted for more than 65% of its exports before the collapse in resource prices in 2015, and more than half of its exports in 2017-2018 (Balashova and Serletis, 2020). Crude oil, oil products, and natural gas accounted for over 50% of the Federal budget revenue in 2014 and more than 46%

in 2018 (Sergi and Berezin, 2018). In 2018, natural gas accounts for 52% of Russia's primary energy consumption, and plays an important role in many fields of Russia, such as electricity, agricultural chemistry, metallurgy, transportation, and residential life (Mitrova et al., 2019).

As the world's largest exporter of oil and gas, Russia recognizes the value of using its oil and gas resources. Despite Russia's commitment to diversifying and promoting the reform of the natural gas industry, it still takes a lot of time due to the influence of socio-economic discontent (Overland and Kutschera, 2011). The oil and gas industry will, therefore remain crucial to Russia in the foreseeable future. Whenever a global financial or economic crisis occurs, it will have a considerable impact on the Russian oil and gas industry, such as the United States subprime mortgage crisis in 2008 and the Coronavirus economic shock in early 2020.

The decline in global energy prices and the sharp drop in global oil and gas demand, especially in Europe, have led to a decline in profits in the oil and gas industry and financial difficulties for energy companies (Aslund et al., 2011).

Under these circumstances, the main principles of the Russian gas strategy are to diversify the ways, directions and conditions of supplies to the world's major energy markets; expand Russia's influence in the LNG market, taking advantage of existing opportunity; strengthen positions in traditional markets (primarily in Europe), increase the price competitiveness of Russian gas in Europe and ensure reliability and uninterrupted supply; minimize transport risks during gas exports to Europe; actively entry into the natural gas markets of Asia-Pacific countries (Vatansver, 2017; Orttung and Overland, 2011).

In October 2019, the Russian government proposed the latest long-term development guidelines for the natural gas industry. According to the "Russian Energy Strategy Draft Before 2035" (Revised on October 21, 2019) (Hereinafter referred to as "2035 Energy Strategy Draft"), the Russian natural gas industry is currently facing four major tasks, including improving Russia's domestic natural gas market and effectively meeting domestic demands. Demand on the natural gas market, adapting to changes in the global natural gas market, developing the production of LNG and CNG (Compressed natural gas) for vehicles, as well as expanding its consumption (The Ministry of Energy of the Russian Federation, 2019). The "2035 Energy Strategy Draft" states that to complete the above tasks, Russia's natural gas production needs to be maintained within 850-924 billion cubic meters by 2035, that is, it needs to be 27% to 38% higher than the output in 2018. In Russia, the government plans to increase the gas production rate from 68.6% in 2018 to 82.9% in 2035 and vigorously promote natural gas vehicle fuels. By 2035, natural gas consumption in Russia will have growth potential of 2.2% to 5.2%. The specific situation depends on different forecast scenarios. Nevertheless, in the "2035 Energy strategy Draft," the development prospects of the Russian natural gas industry are mainly related to Russia's natural gas supply to foreign markets.

2. LITERATURE REVIEW

During the Second World War, oil was already an important strategic resource. But early theoretical research on energy security dates back to the 1960s, and the focus started growing because of the outbreak of the oil crisis in the 1970s.

Morgenthau said in the book "Politics between Nations: The Struggle for Power and Peace" that oil under modern conditions is an important factor in enhancing national power (Morgenthau, 1973).

After the first oil crisis, Western countries realized that energy security had a significant impact on the national economy and security. To prevent energy from affecting national security, the United States has strengthened its military power in the Gulf region. Besides the US, Western European countries have also stepped up their market interference (Strange, 1988).

Although there are various interpretations of the concept of "energy security," no specific definition has yet been recognized worldwide. In the 1970s in the West, energy security was generally considered to be "security of energy supply." Energy security has both an external and an internal dimension. External dimension rely on ensuring energy imports at reasonable and affordable prices, in particular oil and natural gas. Daniel Yergin, a well-known American oil expert, describes energy security as follows: "The aim of energy security is to provide adequate and reliable energy supplies at a fair cost, without compromising national values and purpose." (Yergin, 2006) The internal dimension of the concept of "security of energy supply" is reduced to the development of the national infrastructure in the field of energy.

Mason Willrich divided energy security into the energy security of the importing country and the energy security of the exporting country (Willrich, 1978). The energy security of the importing country is associated with ensuring the rational supply of energy and the normal functioning of the national economy. For example, energy security for net importing countries (such as China and India), means the ability to solve the problem of rapidly increasing dependence on oil and gas imports because of national development. The energy security of an exporting country means that the country has sovereignty in natural resources and can ensure the security of demand (access to foreign markets) and the financial security of oil revenues.

The International Energy Agency (IEA) believes that "energy security means Reliable, affordable access to all fuels and energy sources." At the 2005 Davos Forum, the President of OPEC noted that, for consumers, security of supply is important, while security of demand is a key concern for producers.

In energy security, Researchers and practitioners from various countries have different opinions, depending on whether the research is conducted from the viewpoint of the consumer or the producer country.

The definition of energy security is the basis and premise for identifying energy security, and the method of assessing energy security is an important tool and means of identifying the state of energy security. The quantitative evaluation carried out on the basis of energy security theory research, on the one hand, is the verification of theoretical research, on the other hand, it is helpful to grasp the evolution of energy security and provide a scientific basis for the formulation of energy-related policies. At this stage, the energy security model is built on the energy security diversity index Shannon-Wiener Index (SWI) and the Herfindahl-Hirschman Index (HHI).

In the case of limited or even unknown knowledge of the long-term development of the future social economy, the diversification strategy is considered to be the best choice to ensure the long-term security of energy supply (Stirling, 1994a), and SWI is the most attractive diversity index (Stirling, 1999b). Based on Stirling's work, Jansen and others use the Shannon index, focusing on the long-term energy supply safety. In their research, several important factors were introduced, including diversification of the supply of energy resources and imported energy sources, long-term political stability of importing countries or regions, and background of local resources in regions of origin.

Shannon-Wiener index gives more weight to energy suppliers with a smaller market share, while the Herfindahl-Hirschman Index only gives more weight to suppliers with a larger market share. The range of the Shannon-Wiener index is expanding with an increase in the number of market participants (Frondele and Schmidt, 2008), which reduces comparability between markets and between countries. HHI is the easiest and most accurate way of measuring market concentration (McFalls, 1998).

Blyth and Lefevre used HHI to study the energy supply security of energy suppliers. They combined the Herfindahl-Hirschman index (based on the calculation of the market share of each supplier in each fuel market) with the level of the supplier country's related political risk and the evaluation of market liquidity (Blyth and Lefevre, 2004).

Gupta analyzes the relative oil vulnerability of 26 net oil-importing countries for the year 2004 on the basis of the modified Herfindahl-Hirschman index, focusing on the risks associated with external oil supply. Gupta's approach is based on several indicators, such as the ratio of oil imports to GDP, the consumption of oil per unit of GDP, the share of oil in total energy supply, the political risk of the oil-supplying country, the diversification of imports, market liquidity and so on. These indicators are combined into a composite indicator to measure the country's oil vulnerability (Gupta, 2008).

Le Coq and other scholars believe that Herfindahl-Hirschman index is better suited to measure the risks caused by a single energy structure, and energy import diversification, political risks of the supplying country, the risk associated with energy transit are the most important factors affecting energy security. As a result, they developed separate indicators for oil, gas, and coal, introducing an index designed to assess short-term risks associated with external energy supplies to EU Member States (Le Coq and Paltseva, 2009).

3. DATA AND METHODS

As mentioned before, researches about energy security more emphasis on the energy security of energy importing countries. In this paper, we measure the energy security of Russia in the natural gas sector using the HHI Index.

The standard HHI index, which is the sum of the squares of each participant's market share, is often used to assess market concentration in the literature. We use the revised "HHI market concentration index" to measure the diversity of foreign gas consumers by summing the squares of each consumers' share in Russia's total gas export. We believe that, under other conditions being equal, a large proportion of the country's energy exports, which are concentrated on several consumers, may pose more risks to energy security.

The HHI index is used to measure the concentration of Russian natural gas exports, defined as the following equation:

$$HHI = \sum_{j=1}^n W_{ij}^2$$

where j represents the country and region, n is the total number of import countries or regions; W_{ij} is the natural gas volume that the country i exports to the country j accounts for the proportion of country i 's total gas exports.

The HHI index is calculated by adding the square of each importing country's share of imported Russian gas in total Russian gas exports. For example, a share of 20% of the total will be squared in the index calculation. The higher the HHI, the more concentrated the Russian natural gas export market and the weaker the energy security.

The distribution of Russian natural gas export countries or regions and the corresponding natural gas export volume comes from the "BP Statistical Review of World Energy 2002-2019" and the website of Gazprom. The consumption of natural gas and total primary energy consumption of the importing countries is taken from the "BP Statistical Review of World Energy 2002-2019" and the IEA database.

4. RESULTS

Generally, the more variety of energy export targets it has, the smaller the corresponding HHI index, the lower the risk of energy exports, and the higher the security of energy trade it will be. Over the past decade, Russia's HHI index has shown a downward trend on the whole. From 2001 to 2008, Russia's HHI index was relatively high. In 2009, HHI index had a sharp decline compared with that of 2008, and then it gets a small upward trend in fluctuations since 2010 (Figure 1).

Through the observation on the targets of Russian gas exports, it shows that the number of Russian gas export countries and regions was comparatively small between 2001 and 2008, which was only 18, and its natural gas export market concentration was high, it focused on European countries. Of these, Russian gas exported to Germany accounts for more than 23% of total volume, the proportion of natural gas exported to Italy remains above 14%, and the proportion exported to Turkey rose from 8.6% in 2001 to 15.2% in 2008. More than 50% of Russian gas exported to these three countries, the concentration of exports led to a higher risk index for Russian gas exports during this period.

Figure 1: The trend of HHI index of Russian natural gas from 2001 to 2018

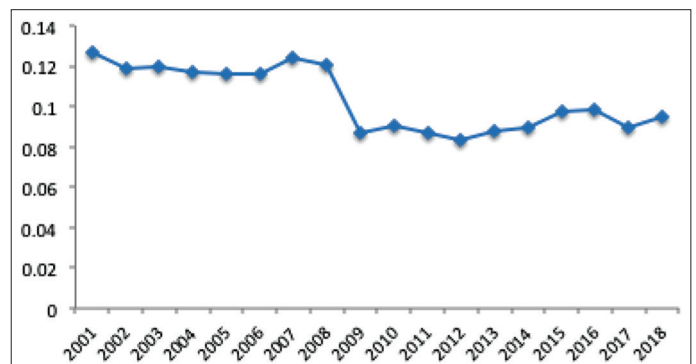


Table 1: Natural gas exports from the Russian Federation to Asia Pacific countries

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
China	0.25	0.51	0.33	0.5	-	0.2	0.2	0.3	0.6	1.3
India	0.67	-	-	-	-	-	-	-	-	0.5
Japan	3.69	8.23	9.76	11.3	11.6	11.5	10.5	9.5	9.9	9.4
South Korea	1.35	3.90	3.88	3.0	2.5	2.6	3.5	2.4	2.6	2.6
Taiwan	0.24	0.67	0.25	-	0.1	0.1	0.3	1.7	2.3	3.2
Thailand	-	-	0.16	-	-	0.1	-	-	-	0.1

Source: BP Statistical Review of World Energy 2010-2019

In 2009, The HHI index of Russian gas plummeted, it was mainly because of the following reasons. In this year, the number of Russian gas export countries and regions jumped to 35, while the proportion of natural gas exports to Germany, Italy and Turkey fell to 17.2%, 11.3% and 9.4%, respectively. Besides, Russia has opened up an Asian market and increased LNG exports, changing the export structure of a single supply of pipelines (Visenescu, 2018). In 2010, Russian gas exports to Asia surged to 13.3 billion cubic meters, up 60 percent from 2009 (Table 1). Diversification of natural gas export targets and export forms has contributed to a sharp drop in the risk index of Russian natural gas exports and an increase in export security.

After 2010, the small rebound in the HHI index was mainly because of the increased concentration of the Russian export market. Although the number of export countries and regions is large, the proportion of natural gas exports to several major countries has rebounded. For instance, Russia's share of natural gas exports to Germany has rebounded to 23.6% of its total exports in 2018. The rising trend of the concentration of Russian gas exports has led to an increase in the risk index of Russian natural gas exports and a decline in export security.

Russia has long considered Europe as its most important gas export market. But since the 21st century, Russia has realized the potential of the Asian market led by China. The eastward strategy of Russia's energy policy was first proposed in "Energy strategy of Russia for the period up to 2020" and further deepened in "Energy strategy of Russia for the period up to 2035."

Russian natural gas resources are unique, having the potential to become one of the world's largest LNG producer. By 2035, Russian LNG production capacity of the total global proportion will increase significantly (Leonid, 2016). With the Russian government's support, Novatek Company has LNG as its core business and gradually establishes the value of LNG-related industries. Over the past 10 years, the amount of LNG exported to Asia has been steadily increasing. In 2018, LNG export volumes reached 17.2 billion cubic meters, accounting 69% of the total exports.

Russia exports much more natural gas by pipeline to Europe than it exports LNG to Asia because of the mature natural gas pipeline network between Russia and Europe. But the natural gas pipeline project between China and Russia will change this situation. The Russia-China East Route Natural Gas Project ("Power of Siberia") was formally launched into production on December 02, 2019. According to the plan, the project will eventually be able to export 38 billion cubic meters of natural gas to China each year (Orlov,

2016). In addition, Russia has set its sights on moving forward with the China-Russia western pipeline project ("Power of Siberia 2"), which would allow Yamal's gas to be sold not only to Europe but also to Asia.

Nord Stream II would transport natural gas from Russia directly to Germany across the Baltic Sea, with an annual production capacity of 55 billion cubic meters. The Nord Stream II and the existing Nord Stream pipeline are the best pipeline routes to transport Russian natural gas to Europe. This pipeline can change the situation that Russia is subject to transit countries, and can ensure the supply of natural gas to Germany and other European countries, and eliminate the risk of "supply interruption" caused by transit through Ukraine.

To reduce the above risks and threats, the energy cooperation between Russia and Turkey is a good example. Russian gas exports to Europe via TurkStream gas pipeline started in January 2020. TurkStream transports natural gas from Russia to Turkey across the Black Sea with an aggregate capacity of 31.5 billion cubic meters. One of the pipeline's two strings is used to supply gas to Turkey, and another is used to supply southern and southeastern Europe (Gazprom, 2019).

5. CONCLUSION

We assess the natural gas security risks facing Russia by using HHI index, which takes into account the concentration of Russian natural gas exports. By calculating the HHI index, we found that Russia's natural gas export risk level differs considerably over different years. Russian gas business has long been connected to the European market via pipelines. In recent years, the development of LNG has made the resource increasingly important in the Asian market, and Russia is shifting its cooperation strategy towards Asian countries, especially China. The strategy of developing LNG and exploring the Asian market has reduced the risk of Russian natural gas export.

There are enormous business opportunities behind accelerating the layout of LNG projects. From the perspective of the domestic market of Russia, the development of the LNG project can promote the development of natural gas resources in the Far East, transform the resource advantages into fiscal revenue, and bring multiple boosting effects to economic development. At present, Russia's LNG projects mainly rely on the import of liquefaction technology and equipment. By expanding the development of the LNG industry, Russia can promote the independent research and development capacity of liquefaction technology

and equipment, which would not only deal with the impact of potential sanctions but also become an exporter of technology. In addition, the development of LNG projects enables companies such as Novatek to take part in the domestic market, which will help break Gazprom's monopoly and improve the competitive efficiency of the domestic natural gas market (Tsygankova, 2012; Talipova et al., 2019).

From the perspective of the international market, the demand of natural gas in Europe is slowing down, and the demand for LNG in Asia and other regions is exploding. Russia's layout of LNG export can help boost trade growth and promote the diversification of its natural gas exports. The LNG trade is more global, so Russia can develop international relations with more countries through LNG export trade, and use its resource advantages to gain a greater voice in international negotiations.

LNG will become the key component of Russia's natural gas export growth potential, the current direction of LNG export growth is the Asian market. By establishing delivery with "Power of Siberia," "TurkStream," "Nord Stream II" and more pipeline projects, the Russian natural gas export growth capacity will be further guaranteed.

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