

Analyze Energy Price Movements Through Supply and Demand and Propose Recommendations for Governments to Address Energy Security - Taking the Gas Situation in Europe as an Example

Licheng Yuan^{*,†}, Keran Wang[†]

Sun Wah International Business School, Liaoning university, Shenyang, 111000, China

*Corresponding author: yuanlicheng0418@163.com

[†] These authors contributed equally

Abstract. Energy has always been the cornerstone of the development of the world and even human society. Energy affects mankind in economy, life, culture and other aspects. Therefore, energy has always been one of the most important things in human society. As the world changes, energy security is always on the minds of world leaders. At the same time, as a very important investment product in the world, the price trend of energy has been affecting the attention of investors around the world. Therefore, this paper will take the European natural gas price as an analysis case, and help analyze the possible trend of the European natural gas price by analyzing the demand and supply and detailing the supply situation. In addition, this paper will analyze European energy supply sources in detail, and put forward constructive suggestions for European leaders to solve energy security problems with the goal of helping Europe achieve energy self-sufficiency.

Keywords: Gas prices; European energy security; gas demand; gas supply.

1. Introduction

Natural gas has always been one of the most important energy sources, especially in the 21st century, natural gas is indispensable energy. As human society attaches more and more importance to environmental problems, the importance of natural gas is gradually known to the public. Kamal researched that natural gas is a very important energy source. It is abundant and cheap. It is also the most environmentally friendly of all fossil fuels, called 21st century fuels [1]. Just because of its importance, the investment value of natural gas appears. Moreover, with the change of the world situation, energy security has gradually become a problem that all countries need to think about. At this time, natural gas as an indispensable energy in the 21st century, its security value is constantly emerging. This paper will analyze the supply and demand of natural gas in Europe and summarize the price trend of natural gas futures, so as to help investors invest in natural gas. In addition, this paper will carefully analyze the supply sources of European natural gas, and put forward constructive suggestions for European natural gas security and even energy security.

2. Literature Review

Kamal researched that natural gas is a very important energy source. It is abundant and cheap. It is also the most environmentally friendly of all fossil fuels, called 21st century fuels [1].

Moravcsik found that in spite of ideological and cultural rivalries, gas trade between Russia and Europe is hard to block [2].

Kjærstad and Johnsson found that European gas is mainly used in power generation [3].

Frankel researched that excess money will lead to higher commodity prices [4].

Mackey found Supply and demand is a very important factor affecting commodity prices [5].

Noor and Siddiqi found that Energy shortages could hamper regional economic growth and recovery [6].

Schneider found that businesses will be hurt by higher energy prices [7].

Blumer et al. researched the issue of energy security is important to every country in the world [8].

Mukhopadhyay and Mukhopadhyay found the Strategic Importance of Energy Security[9]

Was and Allen researched that nuclear power plays an indispensable role in modern times and has great development potential in the future. It has the potential to meet human energy needs [10]

3. Analysis of European natural gas demand and supply

Mackey found Supply and demand is a very important factor affecting commodity prices [5] Therefore, this paper will first analyze the supply and demand of natural gas in Europe.

3.1 Total production and use of natural gas in Europe

Kja'rstad and Johnsson found that European gas is mainly used in power generation [3]. Through further research, it is found that European natural gas is not only used for power generation business, but also for chemical industry, gas industry and gas vehicle energy. It can be seen that European natural gas is widely used and plays a pivotal role in the operation of European society. Next, this paper will analyze European gas production and demand to determine how large the gas gap is in Europe.

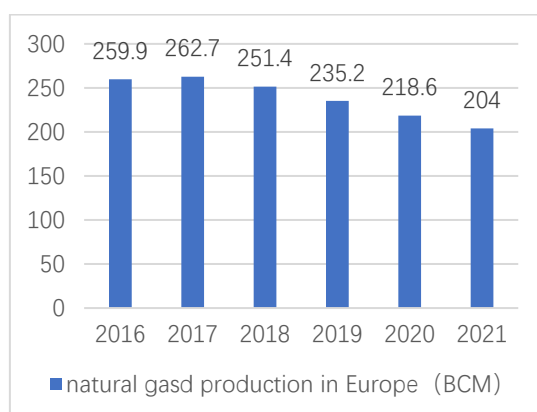


Figure 1. Natural gas production in Europe (unit: BCM)

As can be seen from the figure above, Europe's natural gas output has declined in recent years. Due to the impact of the epidemic and the changing international situation, Europe's natural gas output is likely to remain stable with a slight decline in the foreseeable future. Therefore, the change in demand is particularly important. Next, this paper will analyze the change in demand for Natural gas in Europe.

3.2 Gas demand in Europe

After analyzing the output of Natural gas in Europe, this paper will start to analyze the demand for natural gas in Europe. First of all, this paper makes statistics of European natural gas demand in recent five years.

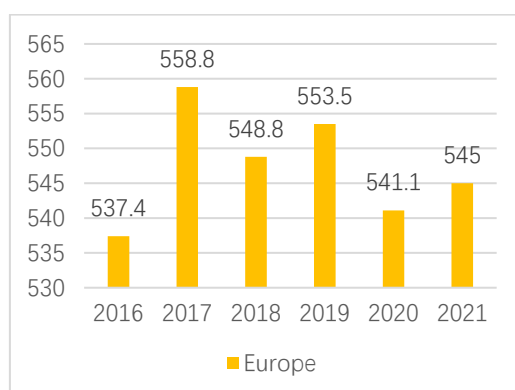


Figure 2. Natural gas demand from 2016 to 2021 (unit: BCM)

As can be seen from the figure above, the demand for natural gas in Europe is around 550BCM and keeps a relatively stable trend. Moreover, since there are few projects in recent years that require significant use of natural gas, this paper can predict that European gas demand will remain around 550BCM for the foreseeable future and will fluctuate with years. In late 2021 and early 2022, for example, demand for natural gas rose because of cold weather. However, because of the hot summer, there was not much change in overall gas use in 2021. What follows is a chart of the net difference between Europe's gas demand and production, which helps to know how much gas Europe needs from outside each year

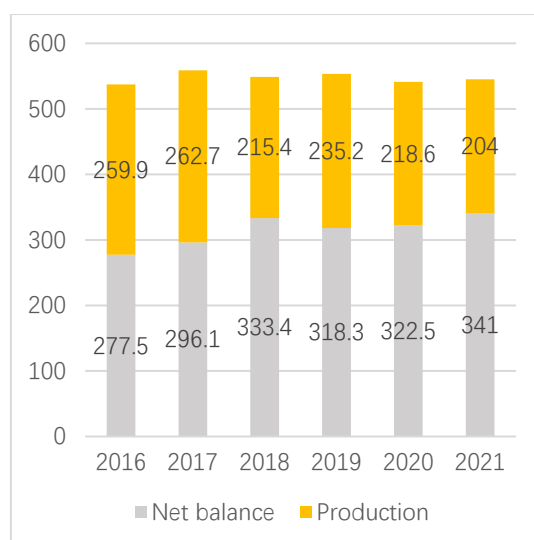


Figure 3. Natural gas demand from 2016 to 2021(unit: BCM)

As can be seen from the chart above, Europe needs to import a large amount of natural gas from outside every year to meet its internal demand, and the import volume has increased year by year in the past three years. Because of environmental constraints, this paper can predict that Europe will need to import more natural gas in the future to meet its domestic demand. Moreover, due to the recent changes in the international situation and the deterioration of the energy situation in Europe, many European countries began to restart fossil energy and suspend the development of new energy. As a result, Europe's demand for natural gas will continue to increase in the future.

3.3 Composition of Europe's imported energy sources

Through the above analysis, it is found that Europe's energy demand is far greater than its own output, that is to say, Europe has a big energy gap. So how can these energy gaps be filled? The answer is to import energy from outside.

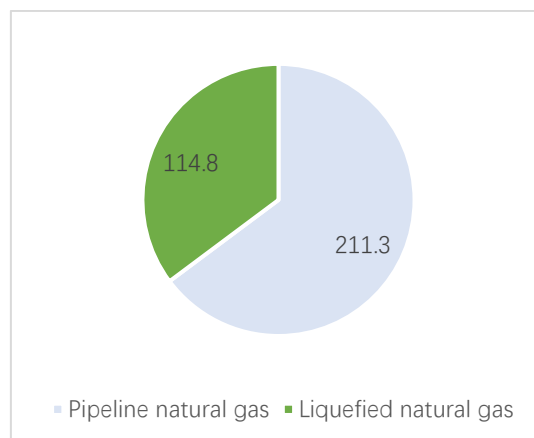


Figure 4. Natural gas import of Europe in 2020

The figure above shows Europe's natural gas imports. It can be seen that most of Europe's natural gas comes from pipelines. Then, where does the gas come from?

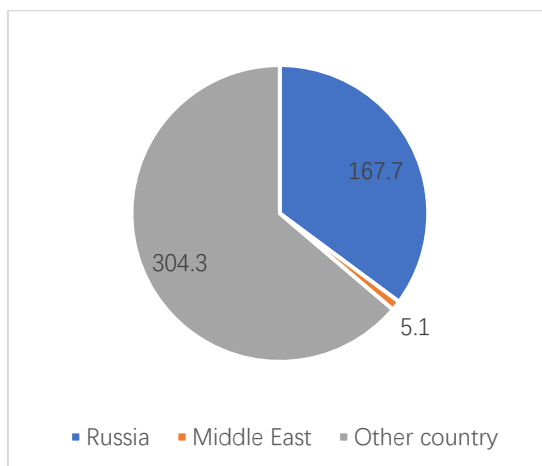


Figure 5. Import from pipeline natural gas in 2020 (unit: BCM)

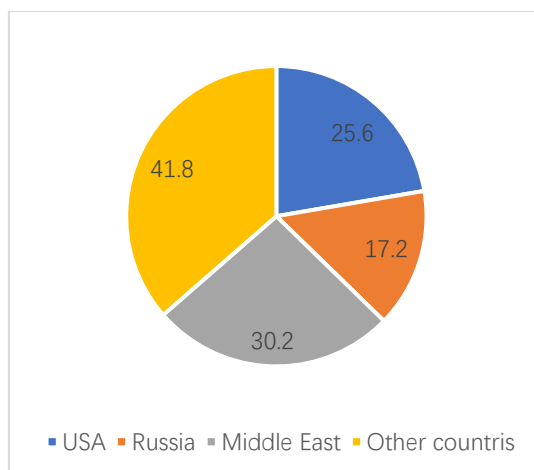


Figure 6. Import on liquefied natural gas in 2020 (unit: BCM)

According to statistics, it can be found that most of Europe's natural gas imports come from Russia. Although many countries in the world export natural gas to Europe, Russia has the greatest influence among them.

Next, look at Russian gas exports.

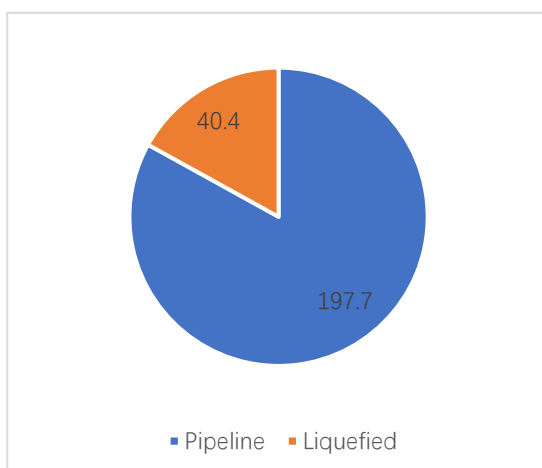


Figure 7. Import on liquefied natural gas in 2020 (unit: BCM)

It can be seen that most of the gas that Russia exports is used by Europe, so Europe and Russia have a very, very close relationship on gas. Moravcsik found that in spite of ideological and cultural rivalries, gas trade between Russia and Europe is hard to block [2] As a result, for now, European gas and even energy security are inextricably linked to Russia. Furthermore, European gas prices are heavily influenced by external factors, especially Russian supplies. Next, this paper will analyze the price trend of European natural gas through the supply situation.

4. Analysis of European natural gas prices

4.1 Gas prices in Europe

From the above analysis, it can be seen that the natural gas price in Europe is greatly affected by external factors. Then, this paper will analyze the actual natural gas price changes, give explanations and infer the possible results in the future.

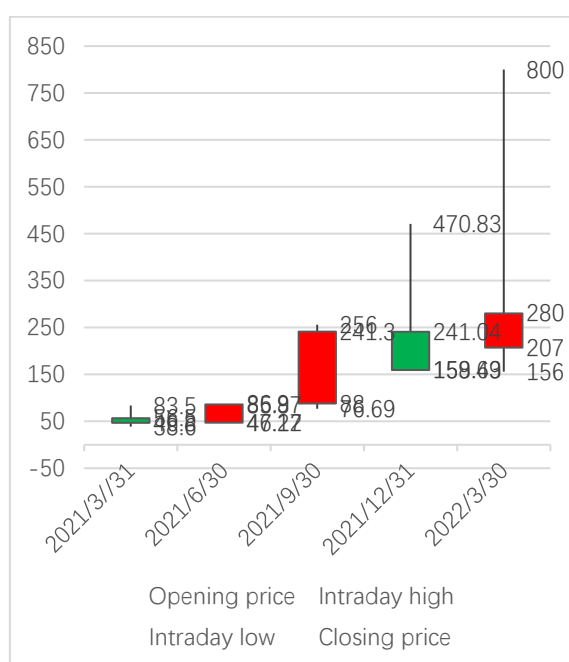


Figure 8. Season K line

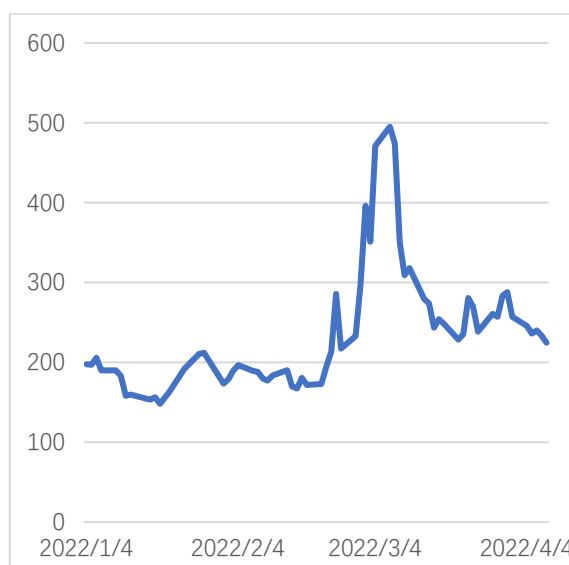


Figure 9. Daily K line from 2022/1/4 to 2022/4/5

From the chart above, it can be seen that European gas prices have been rising since 2021, with very large fluctuations in the first quarter of 2022. Especially around March 2022, gas prices soared and fell quickly. This situation raises a question. What is causing such a big fluctuation in natural gas prices?

4.2 European gas prices change reasons

There are many reasons for the change in European gas prices. First of all, the epidemic has led to global currency overflows. Frankel researched that excess money will lead to higher commodity prices [4] As a result, European gas prices continued to rise in the first three quarters of 2021.

In addition, cold weather in Europe at the end of 2021 and early 2022 has continued to increase demand for natural gas, which is also driving up prices. But none of this explains the unusual volatility in European gas prices in March 2022. The unusual volatility in European gas prices in March 2022 came from the prospect of a sharp drop in European gas imports due to geopolitical conflicts. As the standoff between Russia and Europe continues, Europe could be cut off from its main external source of gas, creating a huge shortfall that has quickly pushed up gas prices. In this context, the short-term trend of European gas prices can be expected.

4.3 What's next for European gas prices

Europe's gas supply gap will be difficult to meet in the short term, as the conflict between Russia and Ukraine may prove difficult to solve in the short term. America promised to supply Europe with gas, but the pipeline took long enough to be built and shipped to send European prices soaring during the gap. Second, natural gas prices will rise further due to rising world inflation and interest rate hikes in the United States. However, the demand side of natural gas may fall back as summer approaches. Therefore, it is expected that the price trend of natural gas will remain stable and rising. However, if the geopolitical conflict remains unresolved into the autumn, European gas prices could reach very high levels in the third and fourth quarters of 2022 and stabilize at high levels. Therefore, the most important thing for policymakers in European governments is to tackle European energy security so that gas prices can be controlled by governments.

5. Energy security in Europe

5.1 The possible harm caused by energy shortages

Noor and Siddiqi found that Energy shortages could hamper regional economic growth and recovery [6] In other words, energy shortages weigh on economic growth and recovery. At the same time, short-term energy price inflation due to the imbalance between supply and demand will hit manufacturing, people's livelihood and the economy. Just like what Schneider found, businesses will be hurt by higher energy prices [7] Therefore, energy shortage can cause great harm to the country, so energy security is very important.

5.2 Importance of energy security

From the above, the importance of energy security can be found. Blumer et al. researched the issue of energy security is important to every country in the world [8] Mukhopadhyay and Mukhopadhyay found the Strategic Importance of Energy Security [9]. Moreover, energy security is not only related to national development, but also related to national stability, national economic development and national strategic intention. To sum up, energy security is a top priority for a country. Therefore, it is scary that Europe is too dependent on the outside for its energy security. The consequences of this lack of independence are on clear display in this geopolitical conflict. For Europe, how to solve its energy security problem should be a question that European leaders need to think about together.

5.3 Solutions to energy security problems in Europe

From the previous analysis, it can be found that Europe is excessively dependent on external sources of energy. In this case, Europe has not been vigorously developing nuclear power for political reasons. And for some reason, there has even been a dangerous moratorium in new energy in some parts of Europe. Europe's energy security needs to be taken seriously by all European leaders. Then, how to solve this problem? First, Europe will not be able to wean itself off external dependence any time soon, so Europe must strive for better relations with energy-supplying countries. And Europe needs to move slowly away from too much uniformity among energy suppliers. In particular, with Russia playing an extremely important role in Europe's energy security, Europe needs to think about how to balance its energy supplies so that it does not become overly dependent on one or two countries. Second, Europe needs to increase its energy reserves. Until new sources of energy cannot meet all of Europe's needs, fossil energy security will always be on Europe's mind. So, planning for a rainy day, reserving a lot of energy before a problem occurs, can be an effective response when a problem occurs. Then there is the need for a big push into nuclear technology in Europe. Nuclear power technology is the technology most likely to solve the energy problem of mankind. Was and Allen researched that nuclear power plays an indispensable role in modern times and has great development potential in the future. It has the potential to meet human energy needs [10] Finally, Europe needs to restart new energy projects and increase support for new energy, which is the future of humanity. In addition, with the development of new energy and nuclear energy, Europe's energy will gradually change from external dependence to self-sufficiency. When it really develops to this stage, the energy security problem of Europe will be easily solved. In other words, in the short term Europe needs good relations with all its energy suppliers. In the medium term, Europe should gradually balance the energy supply of all countries, get rid of the dependence of a single country and increase energy reserves. In the long-term, keep developing new energy and nuclear energy to achieve energy self-sufficiency.

6. Conclusion

To sum up, after studying the relationship between supply and demand, price trend and energy security of Natural gas in Europe, it can be concluded that the price of natural gas in Europe will still be dominated by supply and demand in the short term. Moreover, Europe's energy security problem is unlikely to be solved in the short term. It can be seen that European gas prices will maintain a steady upward trend. European gas prices could reach an incredible peak in the third and fourth quarters of 2022, with the likelihood of increased geopolitical conflict and cooler weather. Under these circumstances, Europe's leaders need to refocus on energy security. In the short term Europe needs good relations with all its energy suppliers. In the medium term, Europe should gradually balance the energy supply of all countries, get rid of the dependence of a single country and increase energy reserves. In the long-term, keep developing new energy and nuclear energy to achieve energy self-sufficiency.

References

- [1] W. A. Kamal, Global Warming and the Emerging Importance of Natural Gas, 1993. DOI: 10.2118/26175-MS
- [2] A. Moravcsik, Power of connection: why the russia-europe gas trade is strangely untouched by politics. *Nature*, vol.576, no.7785, 2019, pp.30-31. DOI: 10.1038/d41586-019-03694-y
- [3] J. Kjärstad, F. Johnsson, Prospects of the european gas market. *Energy Policy*, vol.35, no.2, 2007, pp.869-888. DOI: 10.1016/j.enpol.2006.01.013
- [4] J. A. Frankel, The effect of monetary policy on real commodity prices. *NBER Working Papers*, 2006.
- [5] M. C. Mackey, Commodity price fluctuations: price dependent delays and nonlinearities as explanatory factors. *Journal of Economic Theory*, vol.48, no.2, 1989, pp.497-509.

- [6] S. Noor, M. W. Siddiqi, Energy consumption and economic growth in south asian countries: a co-integrated panel analysis. *International Journal of Human & Social Sciences*, no.67, 2010, pp.251.
- [7] M. Schneider, The impact of oil price changes on growth and inflation. *Monetary Policy & the Economy*, no.2, 2004, pp.27-36.
- [8] Y. B. Blumer, R. Seidl, C. Moser, The precarious consensus on the importance of energy security, 2014.
- [9] B.K. Mukhopadhyay, B. R. Mukhopadhyay, The Strategic Importance of Energy Security, 2020.
- [10] G. S. Was, T. R. Allen, The importance of nuclear power in our energy mix. *New Labor Forum*, vol.29, no.3, 2020, pp.109579602094923.