

EFFECTS OF THE ENERGY CRISIS ON ELECTRICITY MARKETS¹

Gökseil TOPAL¹

Abstract

Due to the drought affecting the whole world and our country, the reservoirs of hydroelectric power plants have not reached the desired occupancy levels and have not been able to produce at the required capacity. The electricity production of renewable energy sources such as Wind, Solar and Geothermal remained well below the expected amounts. It has commissioned base load power plants (which come into operation in a short time at the time of demand and meet the demand) that use fossil fuels such as natural gas and coal to meet the energy supply in other countries, especially in European countries. With the increasing demand for coal for electricity generation in thermal power plants, countries have started to look for coal [9] [12]

The use of coal in power plants has led to an increase in countries' carbon footprints, carbon tax and emission values. In order for this situation not to cause a possible climate crisis, European countries have taken different policy steps. In October, in addition to the increase in coal demand, the reserves of natural gas in Europe have fallen to the lowest levels in the last three years [19] With the increase in natural gas demand in Europe to meet the electricity needs and the heating needs in winter, natural gas prices have risen to high levels. With the approach of winter months, it is expected that natural gas prices will increase in the coming periods

Keywords: Energy Crisis, Electricity Markets, Natural Gas

Introduction

In September 2021, the global energy crisis began due to the consequences of the natural gas and coal crisis in the United States, China and Russia. The effects of this energy crisis have not decreased, but with the start of the Russia -Ukraine war in February 2022, the effects of the energy crisis have increased and affected the whole world. In this study, the causes of the global energy crisis were mentioned and their effects in our country and in Europe were examined. The steps taken by Europe and our country as a solution to these effects were mentioned.

A significant part of European countries such as Bulgaria, North Macedonia, Estonia and Finland are 100% dependent on Russian Natural Gas. The natural gas demand of these countries is provided only from Russia. When we compare with other European countries, the amount of gas imported by these countries from Russia is quite low. According to the possible consequences of the Russian – Ukrainian war, we can say that Russia will not be much affected by the interruption of gas flow by Russia, but some European countries will be seriously affected due to the fact that Russia is the only supplier. We can state that Germany and Italy will be greatly affected by the imposition of sanctions on the Russian state or an interruption by Russia. Western European countries such as Germany, the Czech Republic, Poland and Italy use natural gas in the process of converting from fossil fuels to clean and renewable energy sources[1].

Europe's Natural Gas Supply

Lithuania received most of its natural gas supplies from Russia until 2015, but this percentage has now fallen to 69%. Despite the fact that Poland is gradually trying to reduce its dependence on Russian gas after the fall of the Soviet Union, the percentage remains above 80%. France meets 10% of its natural gas needs from Russia. The Netherlands imports close to 5% of its own needs from Russia, where it imported no natural gas until 2005. Although Italy plans to reduce the import rate of natural gas, in recent years this rate has again reached the level of 33%.

¹ TESPAM Markets Coordinator

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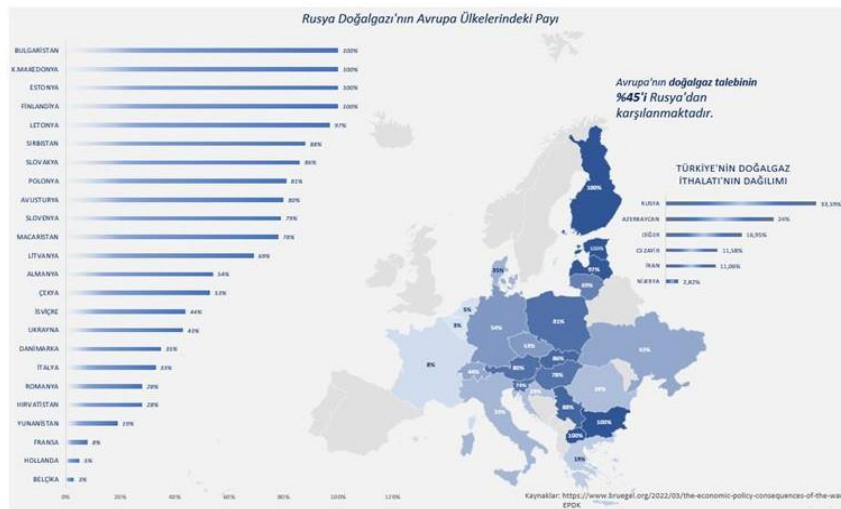


Figure 1: The Share of Russian Natural Gas in European Countries [9].

Türkiye's Natural Gas Supply

When we examine the BOTAS data, Türkiye has the capacity to receive 19.1 million m3 of gas daily from Azerbaijan, 17.3 million m3 from TANAP, 28.5 million m3 from Iran, 47.3 million m3 from MAVI Stream (Russia), 46.9 million m3 from TurkStream (RUSSIA). In addition, BOTAS Marmara LNG terminal has a daily capacity of 37 million m3, Silivri natural gas underground storage facility has a capacity of 28 million m3, EGEgaz terminal has a capacity of 40 million m3, IMPACT Port FRSU facility has a capacity of 28 million m3 [20]

When we examine the annual natural gas import data published by the EPDK, the distribution of imports in terms of source countries is; Russia 33.59%, Azerbaijan 24%, Iran 11.06%, Algeria 11.58%, Nigeria 2.82% and other countries account for 16.95%. Russia ranks first in the supply of natural gas to our country. Due to the long-term Commercial Natural Gas Agreements concluded with Russia, gas interruptions are not foreseen in our country in the coming days [5] ,[10].

From the use of natural gas imported by our country, electricity production is in the first place. When we examine the 2021 data, 26.64% of natural gas is used in combined cycle power plants, 23.10% in the industrial sector, 10.97% in commercial and official offices, 36.3% in residential buildings, 2.53% in oil refineries.



Figure 2: Turkish Gas and Oil Lines [20]

Causes of the Energy Crisis

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American oil companies have stopped new investments in accordance with the energy and environmental policies of the European Union. Since September, Brent oil prices have increased. Europe's faster-than-expected transition to renewable energy sources has reduced its investment in fossil fuel power plants. Thus, it has reduced the diversity of sources in electricity production. Sudden increases in natural gas and oil prices due to political reasons caused by Russia's undoubtedly being a major energy supplier for Europe and its invasion of Ukraine. Russia has reduced the capacity of the Nord Stream 1 pipeline, where gas trade with Europe continues, by 70% on maintenance grounds [11]

The demand of European countries to increase their natural gas reserves for the winter months Russia is the regional power in energy by meeting 25% of the oil needs in Europe, 46% of the coal needs and 40% of the gas needs [6], [8]

The sanctionist policy of the countries of the European Union against the Russian economy Energy production in our country; approximately 35% of natural gas and 18% of imported coal are foreign dependent sources such as:

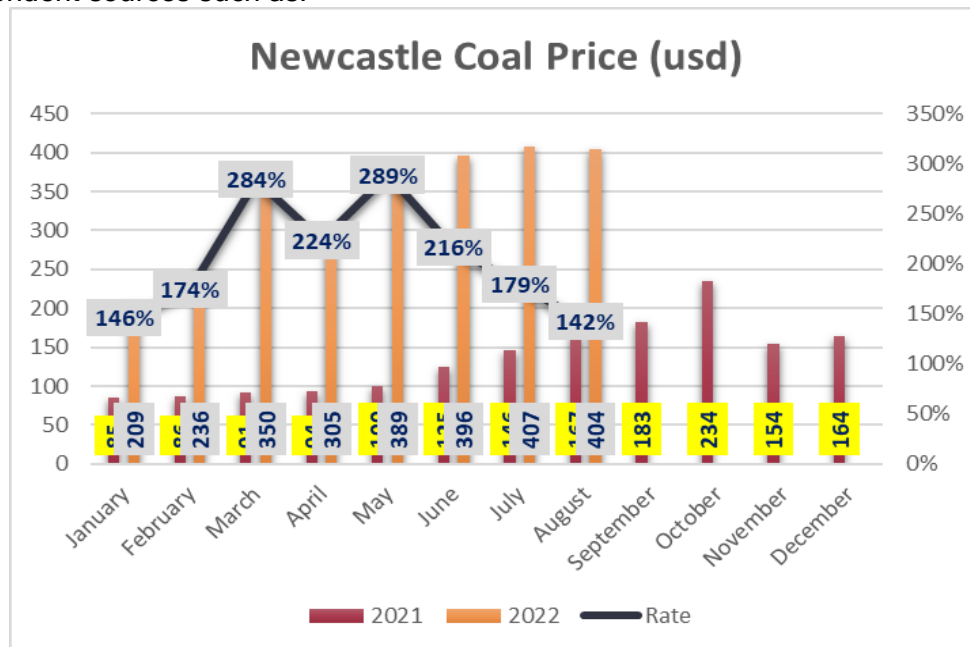


Figure 3: Comparison of coal prices compared to the previous year[21]

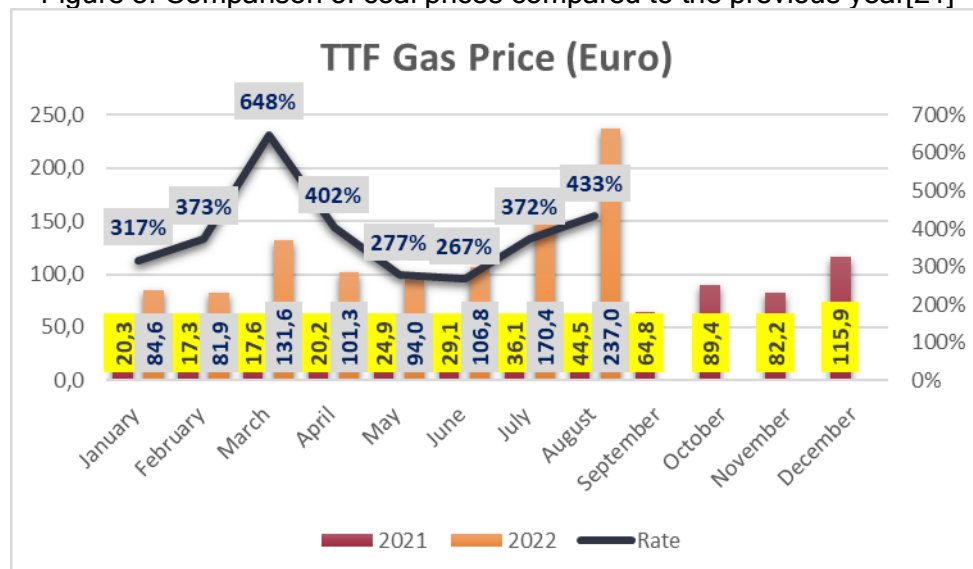


Figure 4: Comparison of TTF Gas prices compared to the previous Year[21]

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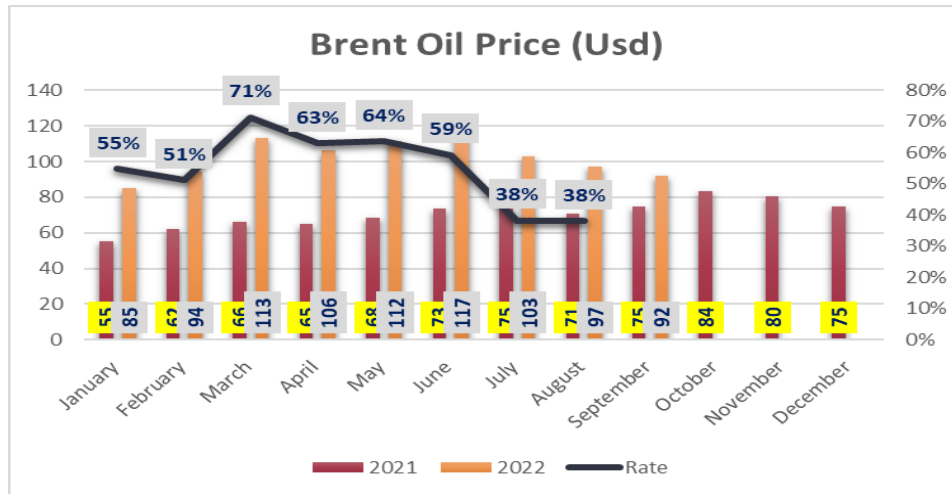


Figure 5: Comparison of Brent oil prices compared to the previous year[21]

Global Effects of the Energy Crisis

Approximately 70% of the electricity production in Europe and 53% of the electricity production in our country are provided from fossil sources. Due to the drought, renewable energy plants have been below the expected level in energy production in Europe and in our country, which has increased electricity prices to record levels since September of last year. In addition, the policy of closing coal and nuclear power plants in Europe has led to an increase in electricity prices, as it has also reduced the diversity of sources [17], [18]. The increases in exchange rates experienced in our country have increased the unit production costs of natural gas and coal power plants. As a result, it has caused electricity prices to rise [4].

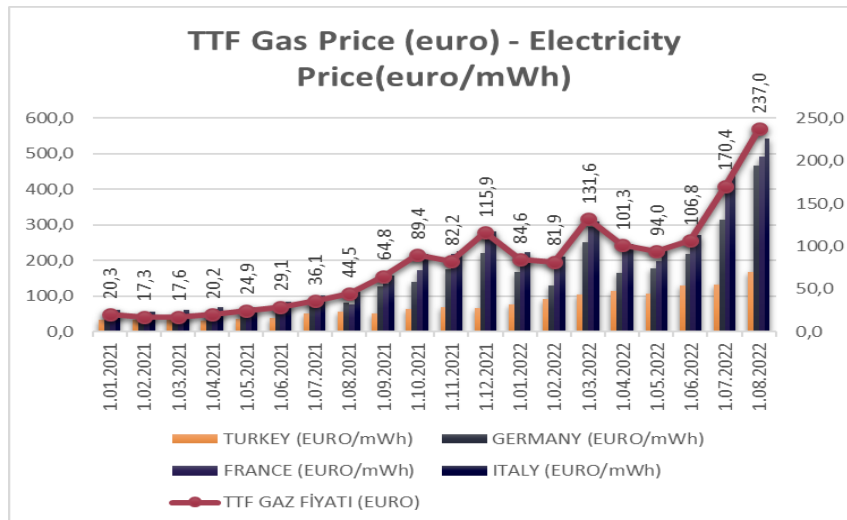


Figure 6: TTF Gas Price - Electricity Price Comparison[21]

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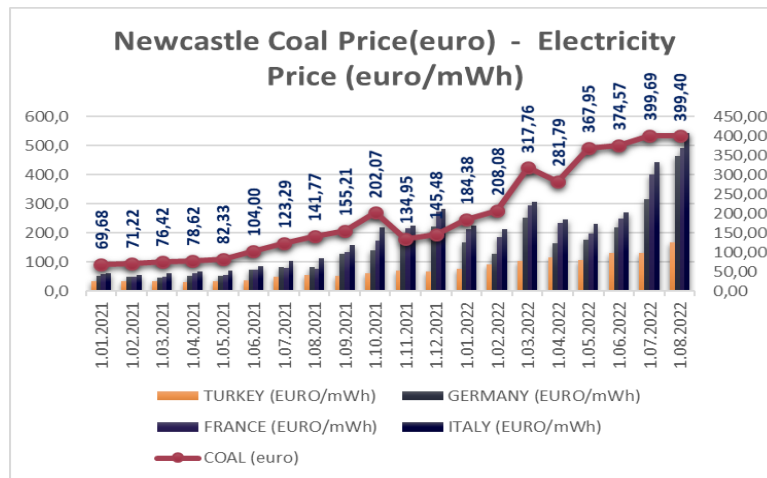


Figure 7: Newcastle Coal Price - Electricity Price Comparison[21]

In addition, in October 2021, in addition to the effect of coal and natural gas prices, the increase in the dollar exchange rate caused the increase in market clearing prices.

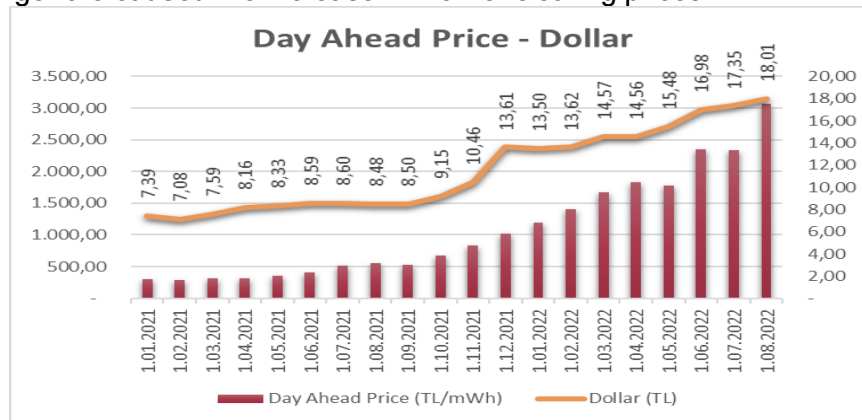


Figure 8: Day Ahead Electricity Price in Türkiye - Dollar Comparison[21]

Effects on the Production Sector

The effects of the global energy crisis on electricity markets have also been felt in our country, including Europe, Asia, China, America and the United Kingdom. As a solution to the supply shortage caused by rising coal prices in China, intermittent power outages have been experienced in 31 provinces of China, 20 factories and homes in the region [2]. Because of the power outages, small, medium and large-sized enterprises in the global manufacturing sector have stopped their production. Factories in the Netherlands temporarily stopped their production due to rising energy cost [14], [15]. Aluminum manufacturing companies in Germany announced that they will reduce their production by 50%. Similarly, various production factories in France have stated that they will stop their production due to rising energy costs. Large-scale production factories in Switzerland and Romania have also stopped production due to increases in energy costs [13], [16], [23]

In our country, there were 3-day natural gas and electricity restrictions in January, especially in the organized industrial zones in our major cities, and many factories gradually reduced their production [5], [7], [15]

Measures Taken Against the Energy Crisis

Action Plan of the International Energy Agency

The International Energy Agency has presented a 10-point plan to reduce the European Union's dependence on Russian Natural Gas by 35% and to support the European Green Deal.

1. By not renewing gas supply contracts with Russia.

Effect: Provides greater diversification of supply this year and in the coming periods.

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2. By replacing Russian supplies with gas from alternative sources.

Effect: Russia increases its non-sourced gas supply by about 30 billion cubic meters in a year.

3. By fulfilling the minimum gas storage obligations.

Effect: Increases the continuity of the gas system until next winter.

4. By accelerating the processes of new wind and solar projects.

Effect: Reduces gas use by 6 billion cubic meters in a year.

5. By maximizing energy production from bioenergy and nuclear energy.

Effect: Reduces gas use by 13 billion cubic meters in a year.

6. By taking short-term tax measures to protect electricity consumers from high prices [3]

Effect: Even when gas prices remain high, there are no sudden changes in energy bills.

7. By accelerating the process of replacing gas boilers with heat pumps.

Effect: Reduces gas use by October by an additional 2 billion cubic meters per year.

8. By increasing energy efficiency improvements in buildings and industry.

Effect: Reduces gas use by close to 2 billion cubic meters per year.

9. By encouraging consumers to lower the thermostat values by 1 °C.

Effect: Reduces gas use by about 10 billion cubic meters per year.

10. By accelerating the processes of diversifying production sources and decarbonization.

Effect: Reduces fuel costs used in power plants [22].

Conclusion and Measures Taken by Different Countries against the Energy Crisis

The European Union has prepared an emergency plan in case of a possible interruption of the flow of natural gas from Russia. It has been decided that the member states of the European Union will reduce their gas consumption by 15%. In addition, it is aimed that the EU countries will fill their gas reserves by 80% by the winter months. For the countries of the European Union, it was demanded to save energy. The budget was allocated for the energy efficiency of buildings. The operating periods of some coal and nuclear power plants have been extended. It was announced that rock gas studies will be supported. Supports were provided for renewable energy plant investments.

Spain

-The heating temperature was limited to 19°C.

-VAT on natural gas will be reduced from 21% to 5%.

Belgium

-VAT on electricity and natural gas is 6%.

-Public buildings will not be illuminated between 19:00 and 06:00 Dec.

Italy

-Fuel taxes have been reduced.

-A subsistence allowance of 200 euros will be provided.

Poland

-Households will be paid a one-time 650 euro.

Greece

-Public buildings will be heated to 19°C.

Germany

-Billing support will be provided to citizens

-Unlimited ticket application in public transportation,

-Public buildings will be heated to 19°C.

Bulgaria

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- Electricity and natural gas taxes have been abolished
- Electricity price increase was limited to 3.4%.

England

- Those who received public assistance were paid £ 650.
- 300 Euros will be provided to pensioners October.
- The total of households' energy bills has been fixed at £2,500 per year [21].

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