

The Impact of the Russia-Ukraine Conflict on the German Energy Industry

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Abstract. This passage will mainly focus on the effect that Russia-Ukraine War had on the German energy industry in 2022 and the time after. However, the paper will also focus on the German economy and political and social development during this war. This paper's assumptions on the influence of war that impacted Germany are primarily supported by the German government's statistical data about gas and electricity, the newspaper, the institutional statistics, and the data from other academic papers. The results shown in the documents indicate that the German economy and energy industry has suffered much damage in the past few months. Especially the collapse of one of the biggest energy companies in Germany called Uniper, and the government's enormous subsidy amount given out on the power market for more than 660 billion Euros. Although this war has impacted Germany significantly, also it may change the future German energy market to a more renewable and cleaner one. Moreover, the German political structure may change by the Green Party, which may support by more Germans.

Keywords: energy industry. statistical data, subsidy, natural gas.

1. Introduction

1.1. Literature Review

At the beginning of the Russian-Ukraine war, the European Union and NATO already started to impose economic sanctions on Russia, especially on the exporting of natural resources like oil, coal, and natural gas, which are essential exporting goods for Russia since they can bring an enormous amount of cashback to Russia and fulfill its foreign exchange reserve. Iikka Korhonen and Heli Simola say in their article that the exporting amount of Russian merchandise has accounted for about 540 billion dollars which can take over 35% of its GDP in the year 2021 [1]. Moreover, traditional resources like crude oil, petroleum, and natural gas have taken about half of Russian exporting values. Moreover, the European Union, United Kingdom, and United States counted 50% of Russia's total exporting amount in 2021. Nevertheless, the European Union has remained the biggest consumer of Russia's exporting market, which has taken about 38% of Russia's exports. The ban on the resources imported from Russia has caused economic damage to Russia and the European Union, especially Germany. Since Berger says in his article that, generally, the economic effect of the sudden stop of the energy supply from Russia has caused extensive damage to Germany, which may be like the global economic depression brought about by the coronavirus [2]. It shows that the banning of Russian exports can have a significant effect on Germany's national economy. Julian's passage shows the national statistics of Germany's energy mix about the power market [3]. In another paper, the government statistics conclude Germany's energy market in recent years and mostly its current situation [4]. These data clearly show that the war has caused massive damage to the energy market, which continually radiated the whole state. Hutter's passage has stated that the energy problem has caused substantial economic damage to German manufacturers' production in a relatively short time [5]. Because according to macro-econometric studies, as Kilian published, the effect of GDP will magnify a lot after a substantial impact [6]. By this condition, a warning has appeared. However, the energy industries continued producing their product although the war had already started. As a result, the sudden decreases in their output can amplify the harm for an extended period. After all, the impact of the Russian-Ukraine war has warned the German government about the risk of using non-renewable energy as their primary energy resource. In the future, more eco-friendly policies and

changes will appear as an academic paper state that the Russian-Ukraine war and the current situation of empty export of natural gas caused by the war will all play an essential role in the European Union's future developments, which may help to the reshaping of the European energy market. For prospection, the future European energy may mostly change to the supply from renewable energy [7].

Furthermore, the German green party's existence will also help push these policies. As the paper states, the greens have become more and more well-supported. They became one of the new three-party united governments. Greens' appearance in the government has pushed forward the transition from a traditional power market to a renewable energy market [8]. The current situation in Germany is that the government has given enormous subsidies to control energy prices. Seifert and Dennis's paper has identified that the phase-out of fossil fuel subsidies, investments in renewables, and complementary policies are crucial to facilitate the decarbonization of Germany's energy sector [9]. So, Germany may have imposed no subsidy on the non-renewable energy era. Since the government will focus more on the renewable energy era, the focus of which kind of renewable energy will be the new focal point. The well-known renewable energies are solar and wind. However, hydrogen energy may become a new rising star. It states that the carrier will play an important role despite the variations [10]. While their deployment is expected to have only started by 2030 with a mean demand of 91 TWh/a (4% of the final energy demand) in Germany, they will be an essential part by 2050 with a mean order of 480 TWh/a (24%). Therefore, in the future, Germany's energy market may consist of more than 90% of renewable energies. From all these documents, the effect of the Russian-Ukraine war on Germany's economy and energy market is vast and continuous.

1.2. Background Information

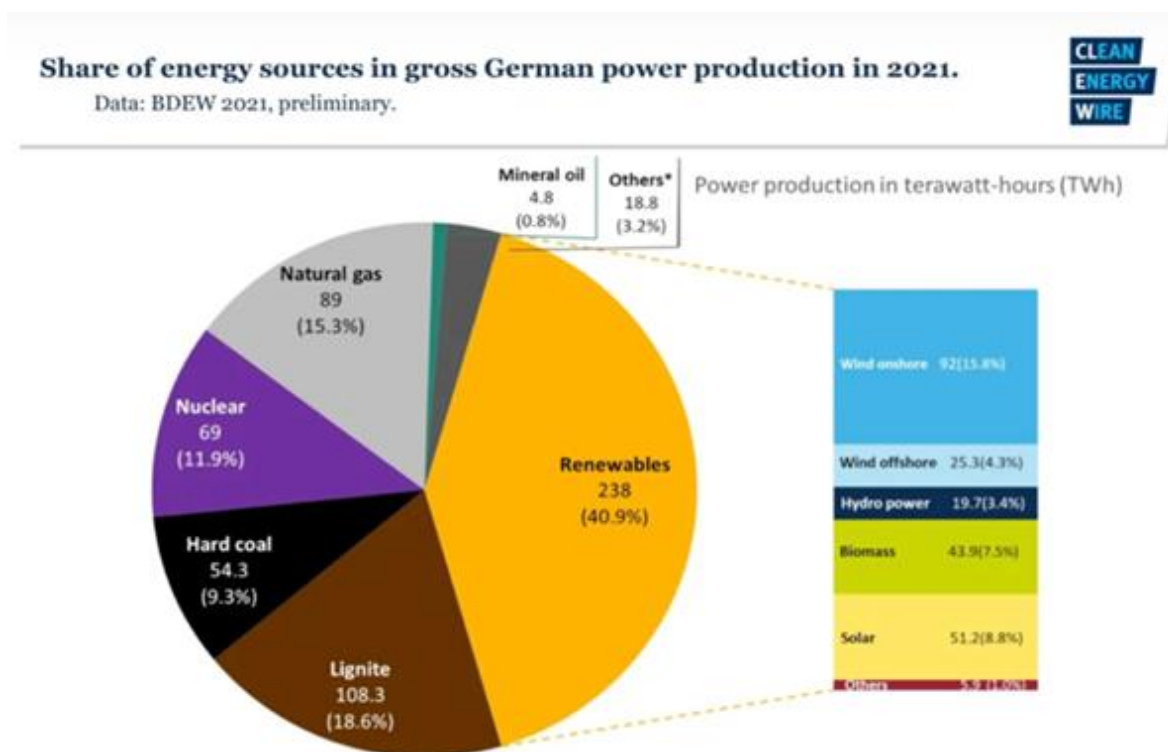


Fig. 1 Share of energy sources in gross German power production in 2021 about the current situation of the German energy industry

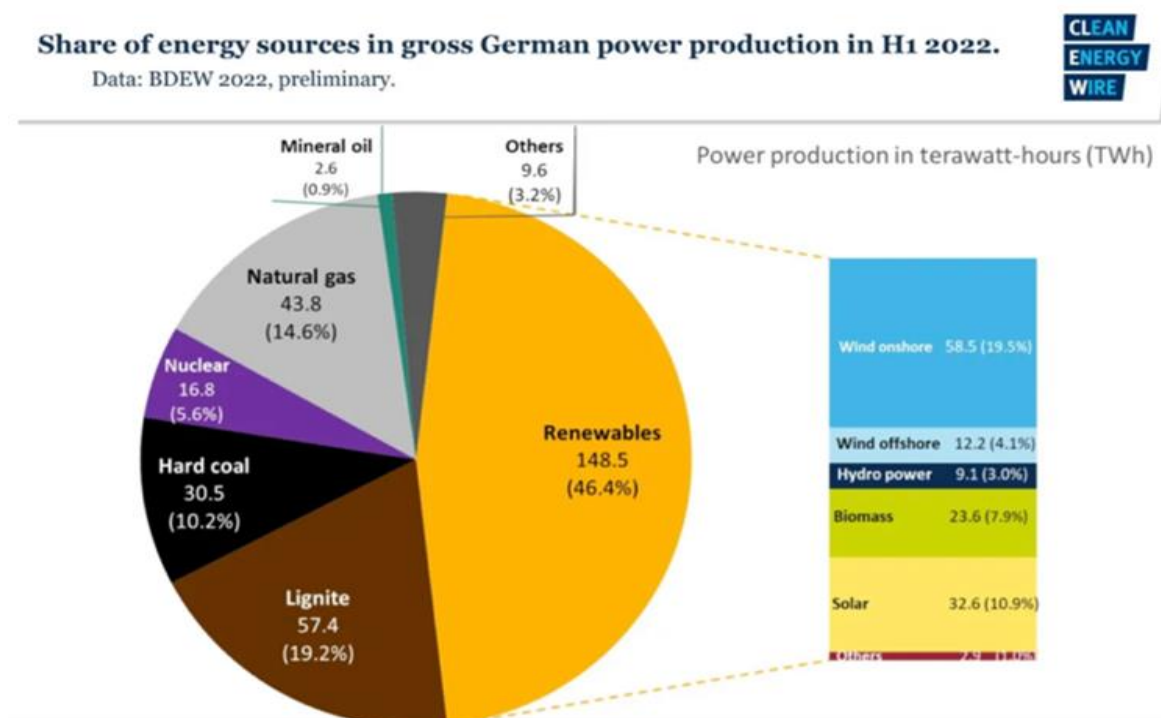


Fig. 2 Share of energy sources in gross German power production in H1 2022

Although in recent years, the German government has pushed forward the use of clean energy as a significant part of the German energy industry. But traditional electric power still consists of about 50 percent of the total percentage of power production in Germany. However, more than 63% of electric power in Germany needs to import, which mainly consists of natural resources that are used to generate traditional electric power generation. But more than 50% of these imports came from Russia.

1.2.1 The current situation of the Russian-Ukraine War

The Russian-Ukraine conflict began on 2022/02/24 to now. It directly resulted from Ukraine's civil war between the Russian-supporting rebel forces in east Ukraine and the Ukraine government, supported by NATO. Until now, NATO supported Ukraine in both military and propaganda ways. By sending voluntary forces and supplying weapons. The conflicts now grew bigger and threatened the energy transportation channels to Europe.

1.2.2 The reasons for the less energy import in Germany

War's damage on the energy transportation

The war has caused damage to the significant pipelines from Russia to Germany, and Europe, especially Nord Streams 1 and 2, has been shut down and damaged. Nord Stream 1 is a pipeline that starts from Russia's northwest region and passes through the Baltic Sea to Germany's north region. And in 2022/09/26, two leakage points were discovered around Denmark and Sweden's sea area. Because of the damage, it has been shut down. And some media guess that the United States is responsible for it. And Nord Stream 2 is a parallel pipeline that passes the same road as Nord Stream 1 pass. And has been damaged for unknown reasons, but it has two channels: A and B. The B pipeline can still work. However, it has been shut down by the German government since it has not qualified to operate by German law.

The Russian's attitude on the energy resources transportation to Europe and Germany

Since NATO and European Union has supported a lot to Ukraine, Russia has shut down its energy export to Europe. The Russian government turned its natural resources into a chip against its opponents.

2. Data Comparison and Analysis

1. Gas flows

1.1 Gas imports (GWh/day)

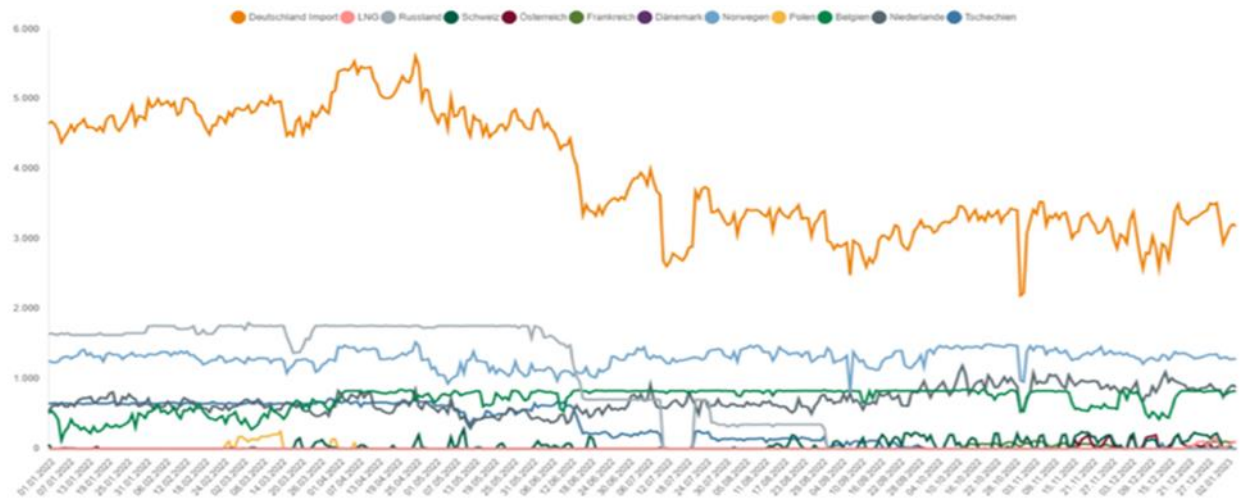


Fig. 3 Gas imports in German

1.3 Gas production in Germany (GWh/day)

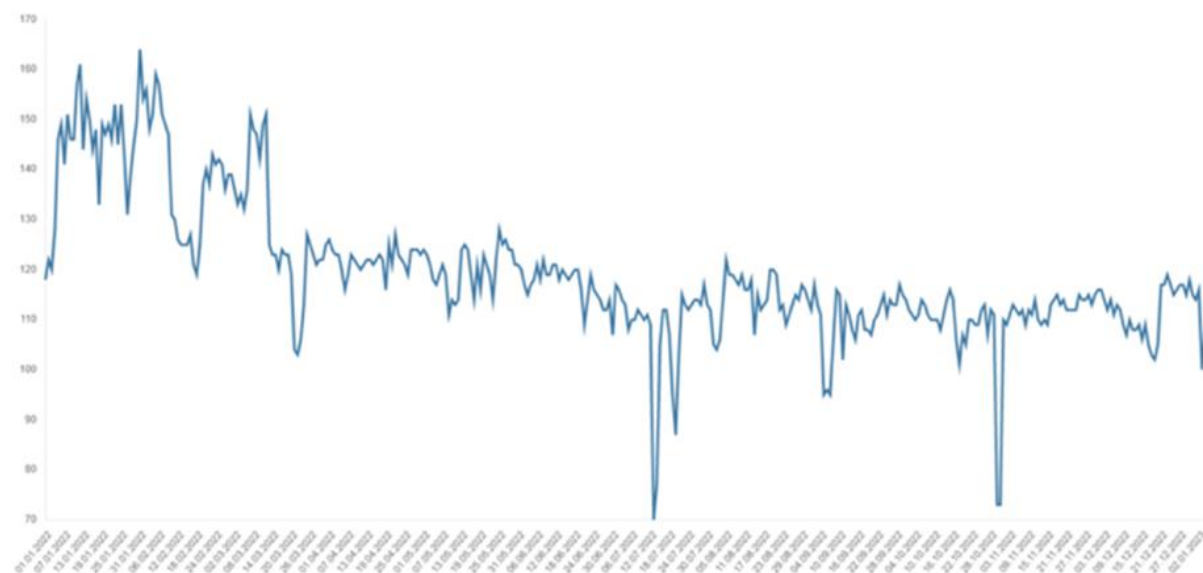


Fig. 4 German's domestic gas production

The first graph is the gas imports in Germany, the orange line represents Germany. And the second graph shows the domestic production of gas in Germany. As you can see in the first graph, from January 2022 to April 2022, the gas import quantity has risen from about 4500 GWh per day to about 5500 GWh per day. However, after the growing scale of war, the amount of imported gas has dramatically decreased from 5500 GWh per day to about 2500 GWh per day, the lowest point of the year in November. Nevertheless, the domestic production of gas's highest point in 2022 is 160 GWh per day. The difference between domestic production and import is more than ten times.

1.2 Gas exports (GWh/day)

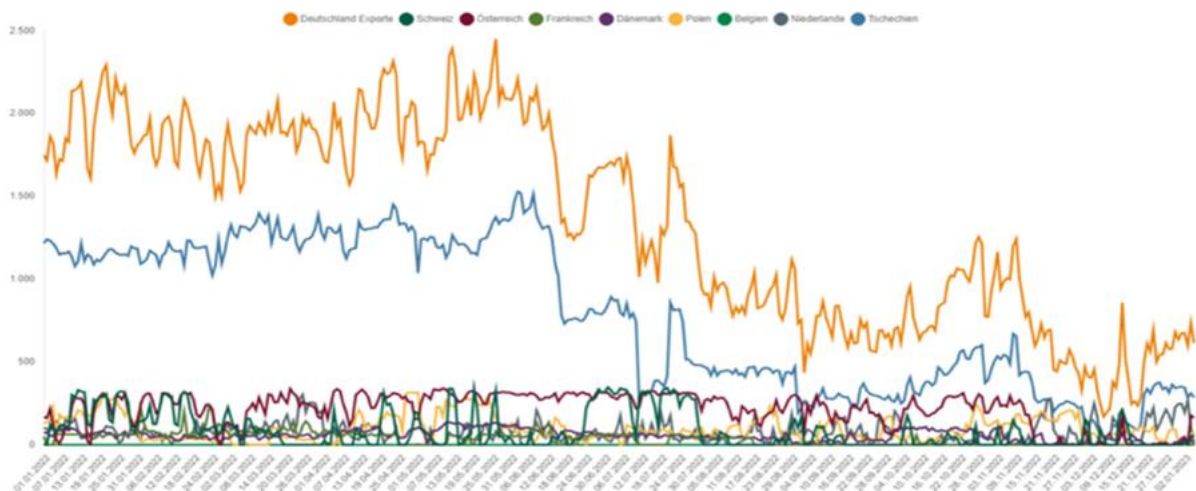


Fig. 5 German's gas export

3.3 Gas consumption in Germany (weekly average) (GWh/day)

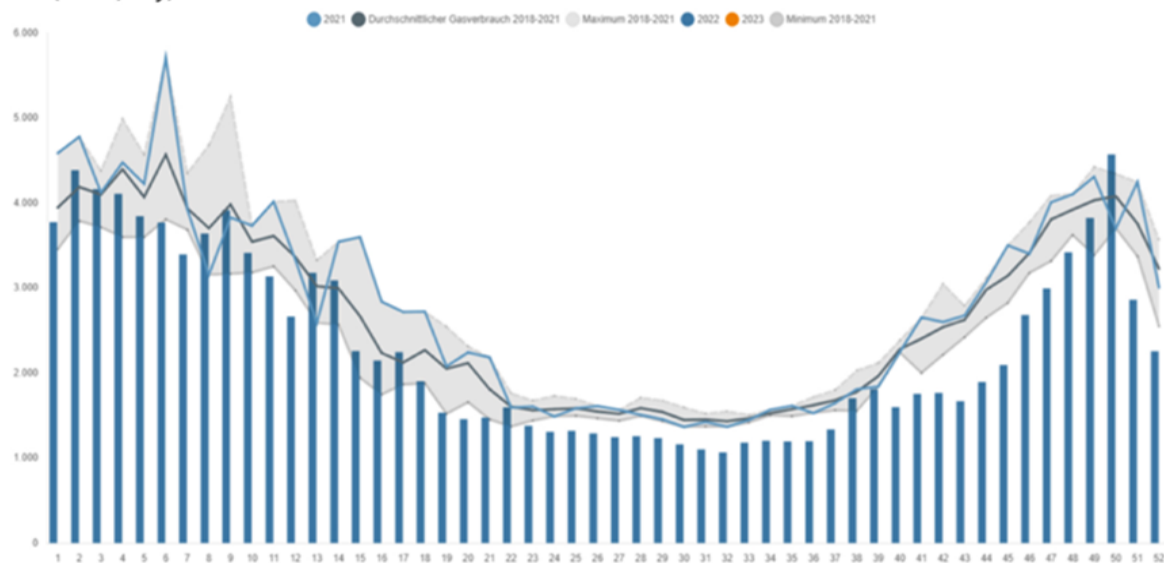


Fig. 6 Gas consumption in Germany (weekly average)

However, Germany has not only imported gas but also exported its redundant gas to other European countries. But like imports, its exporting quantity has decreased dramatically after the beginning of the Russian-Ukraine war from about 2500 GWh per day at the highest point to about 250 GWh per day at the lowest point at the end of the year. Because at the beginning of the war, the natural gas supply was stable as usual. However, after May, the war's scale has risen since NATO officially supported the Ukraine government. So as you can see the export quantity has vastly decreased. And another reason for the lowest export quantity at the end of the year is the need for central heating for the citizens' homes and public spaces. Since Germany is a country in Northern Europe near the cold area like Norway and Sweden. And the average temperature in Germany's winter is about 0-5 degree celsius which is more challenging than the southern European countries. So in the winter, Germany's consumption of natural gas is enormous, as another graph shows its consumption in 2022. As the dark blue bars show, the highest consumption quantity is about 5000 GWh per day in the 50th week of 2022, which is in December, the coldest month in Germany. And most of the weeks

in 2022 have a much lower consumption quantity than the 2021 and the previous years' quantity because of the decreasing import quantity and the rising price of natural gas.

4.1 Wholesale gas prices (€/MWh)



Fig. 7 Wholesale gas price in Germany

This graph shows the wholesale price of Euro per MWH in Germany, as the orange line shows. And in this graph, the exchange unit for MWH is 1 GWH equals 1000 milliwatt hours which is the MWH. The wholesale gas price rises from the start of more brutal combat. The price rose from 80 Euros per MWH to 320 Euros per MWH in April. Also, this rising price period parallels Nord Stream pipelines' destruction and shutdown. However, the price has fallen highly at the end of the year. It is because of the government subsidy on the gas price, which has spent about 200 billion Euros on the national market price control. And the German government has planned to spend more than 660 billion on future gas, electricity, and heat subsidy.

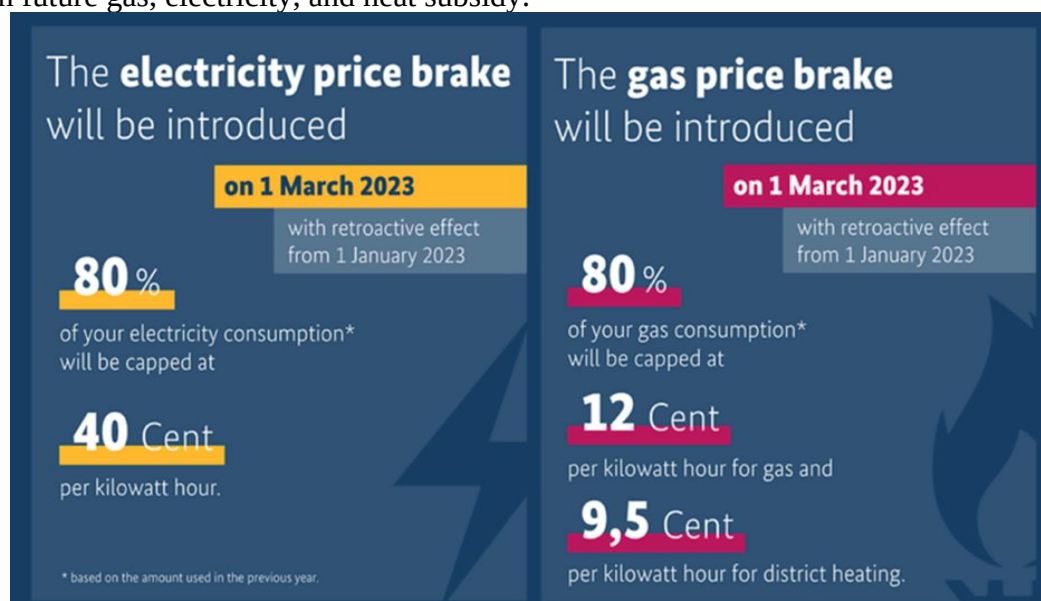


Fig. 8 The brief situation about German's current gas and electricity prices from the German government website

The graph from the German government website shows that gas and electricity prices have become very low because of the vast amount of government subsidy, which has set up a price ceiling in the market.

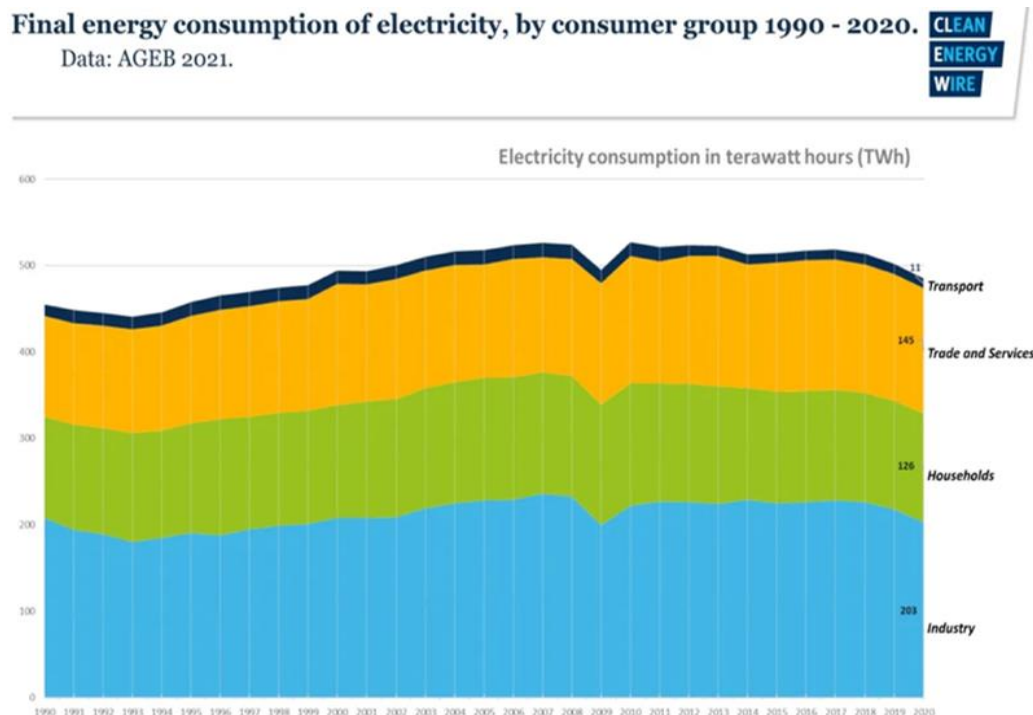


Fig. 9 German's electricity consumption from 1990-2020

Also, the industries in Germany have been hugely impacted because gas, electricity, coal, and oil are the necessary resources for the operation of heavy industries, especially the manufacturing of cars, aluminum, steel, and other heavy materials as the graph shows that the total amount of electricity consumption in Germany from 1990 to 2020. The industry's consumption has taken over one-third of the total electricity consumption, about 203 TWh. And one Tera Watt hour equals about 1000 gigawatt-hours which is the GWh. The generation of electricity in Germany consists of more than 50% of traditional resources like gas, coal, and oil. More than 50% of these are imported from Russia. So the shutdown of resources and transportation roads has brought substantial financial problems to many German businesses. Although the government has imposed subsidies on gas and electricity prices, many companies have already become bankrupt or got huge losses.

Financial and Non-Financial Indicators for the Uniper Group

January 1–September 30	Unit	2022	2021	2020	2019	2018
Sales	€ in millions	213,303	78,498	30,825	46,852	53,059
Adjusted EBIT ¹	€ in millions	-4,755	614	405	203	386
For informational purposes:						
Adjusted EBITDA ¹	€ in millions	-4,139	1,100	891	720	891
Net income/loss	€ in millions	-40,374	-4,768	446	981	-521
Earnings per share ^{2 3}	€	-110.14	-13.20	1.06	2.55	-1.50
Cash provided by operating activities (operating cash flow)	€ in millions	-10,877	2,244	833	-277	89
Adjusted net income ⁴	€ in millions	-3,220	487	308	82	N/A
Investments	€ in millions	392	523	491	401	387
Growth	€ in millions	103	262	283	223	230
Maintenance and replacement	€ in millions	289	260	208	178	157
Economic net debt ⁵	€ in millions	10,906	324	3,050	2,650	2,509
Employees as of the reporting date ⁵		11,209	11,494	11,751	11,532	11,780

¹Adjusted for non-operating effects.

²Basis: outstanding shares as of reporting date.

³For the respective fiscal year.

⁴Adjusted net income is used as a management indicator for the entire Group for the first time beginning in 2020. The figure for 2019 is disclosed solely for informational purposes to provide year-over-year comparability.

⁵Figures as of September 30, 2022; comparative figures as of December 31 of each year.

Fig. 10 The financial report of Uniper from 2018 to 2022

The best example is Uniper, a gas company transforming Russian natural gas to standardize safe gas and generate electricity. Because of the suddenly decreasing import quantity, Uniper has applied to be bankrupt. Since it got a 40.374 billion Euros loss in 2022 for its net income, it has finally been takeover by the government and turned into a government enterprise. And it is a company with more than 11 thousand employees, so its shutdown means many people will lose their jobs.

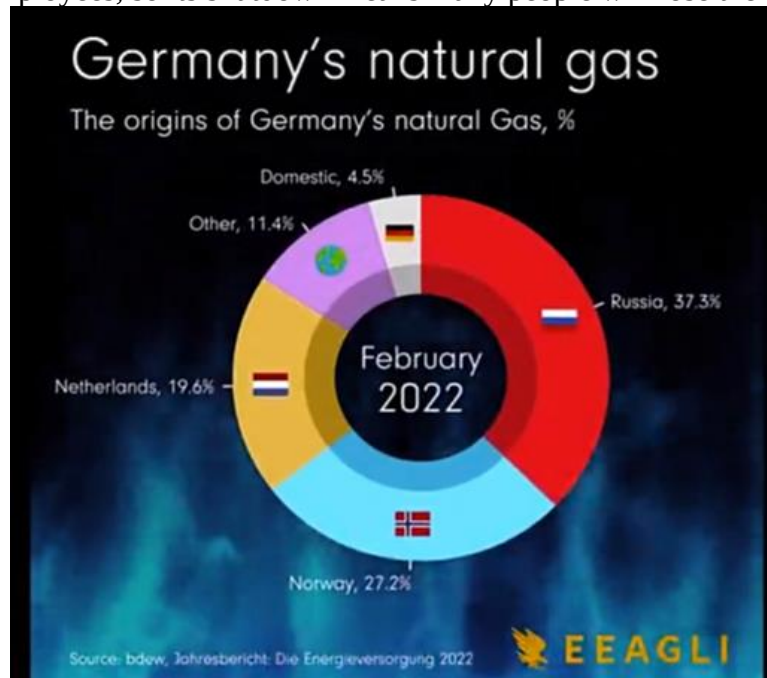


Fig. 11 The composition of German's natural gas sources in February 2022

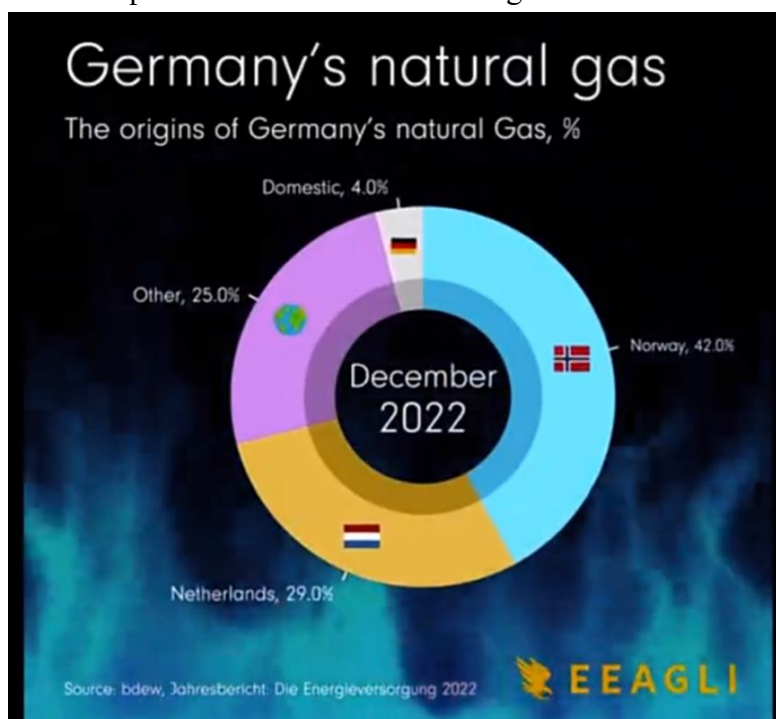


Fig. 12 The composition of German's natural gas sources in December 2022

The last pie chart shows the change in the percentage of gas suppliers from the beginning of the war in February 2022 to December 2022. We can see that the Russian part has been taken away mostly by Norway. However, Norway's gas selling price is much higher than before due to the change in the international gas market. The total quantity became smaller, and the need did not change, which meant the price would rise and giant bear for Germany's economy.

3. Future Prospection

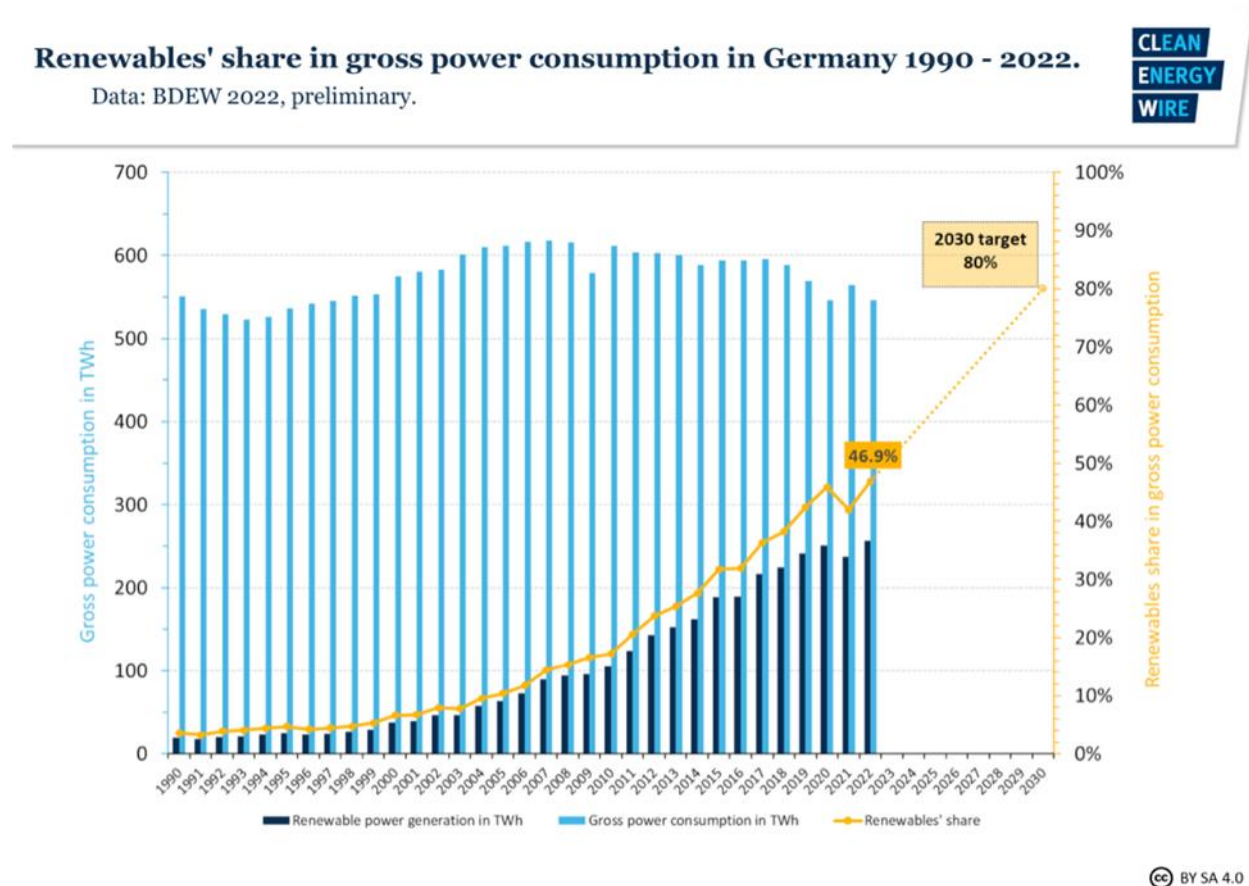


Fig. 13 The renewables' share in gross power consumption in Germany from 1990 to 2022

According to the chart, the German government plans for more clean energy. They want to reach about 80% of national power supplies with clean energy like wind and solar in 2030. Since the 2022 energy crisis has caused considerable losses to Germans, in the future, the German government may spend more on clean power development to remove their dependencies on other countries' natural resources for their traditional power generation. Also, the development of the Green party in Germany has pushed faster on their plan. Since then, the Green party has significantly influenced civil society and the political system. And they have taken a big part in combining the federal government of many parties.

4. Conclusion

The Russian-Ukraine conflict has caused significant damage to Germany's energy industry since the lower import quantity of natural resources means the cost of generating electricity and operating industry become super high than before, especially for those resources imported from other countries that give dramatic high prices like America and Norway. The rising energy prices also significantly impact the German economy since the living cost of electricity and gas has risen from hundreds of Euros to thousands of Euros per month. Moreover, lower productivity and higher costs for industries will push them to fire their workers and increase unemployment. However, since the beginning of 2023, this damaging effect has been weakened by the new policies and the change of suppliers made by the German government. This energy crisis brought about by the Russian-Ukraine war has caused a significant impact not only on the energy industry but also on the whole country. Many industries have gained enormous losses for the national economy and pushed the increasing unemployment rate. Also, investment in Germany decreased, and the national economy's development slowed.

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