German Energy Dependence: Understanding Nord Stream 2

By Paul Weston

Background

In the weeks leading up to the Russian invasion of Ukraine, Germany received criticism for equivocation and a general lack of support for Ukraine. It was often posited that the reason for this weak support was Germany's energy dependence on Russia -- specifically, Germany's dependence on Russian natural gas. The embodiment of which was the Nord Stream 2 gas pipeline between Ust-Luga, Russia and Lubmin, Germany, which was to begin operation in 2022.

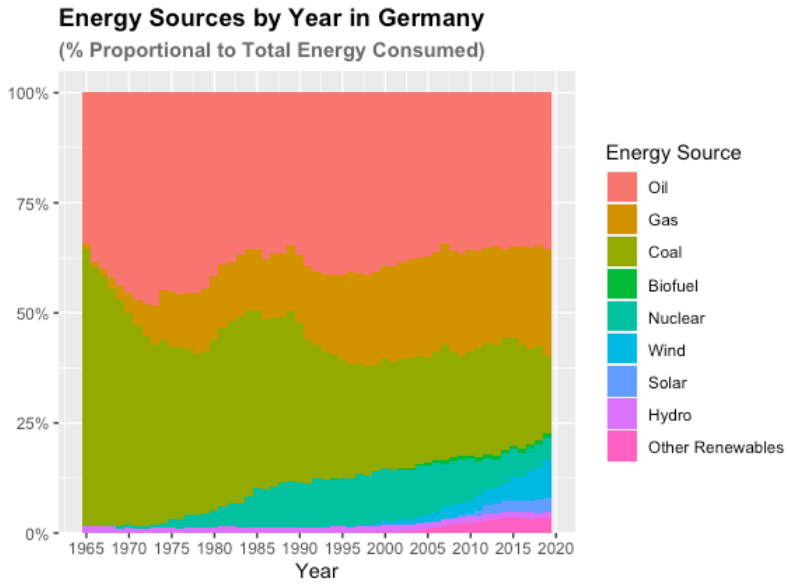
Nord Stream pipeline paths: credit Al Jazeera

The goal of this analysis is to answer the following questions using only the Complete Energy Dataset by Our World in Data and basic facts about the Nord Stream 2 pipeline. The analysis and data visualizations below were made using RStudio.

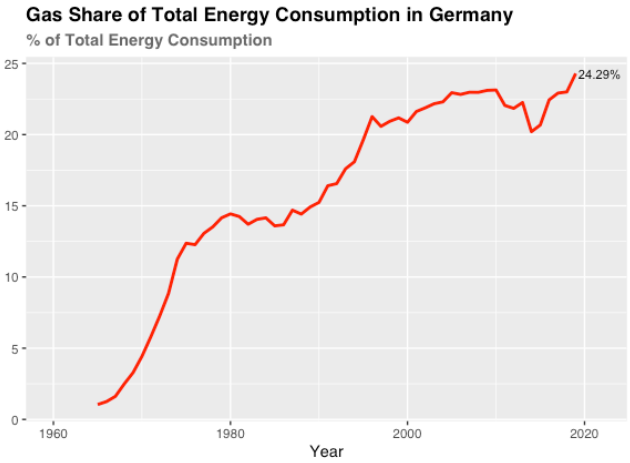
Motivating Questions:

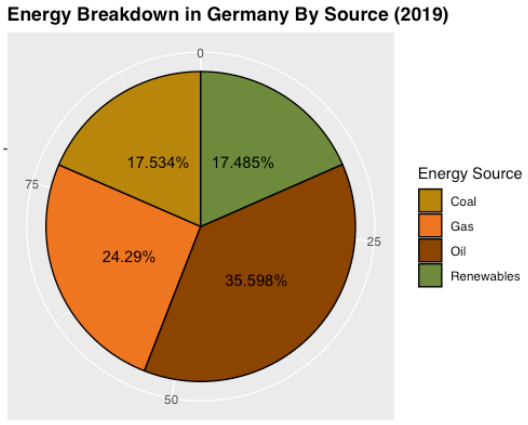
- **What is the energy composition of Germany?**
- **How energy dependent is Germany on Russia?**
- **What is the significance of the Nord Stream 2 pipeline for Germany?**

German Energy Composition



Viewing our data, we see that over the past 50 years, coal has been steadily replaced by natural gas and renewable energies like nuclear, wind, and solar.



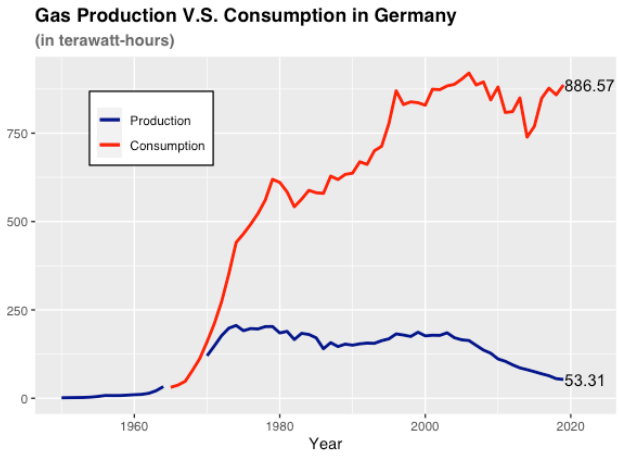


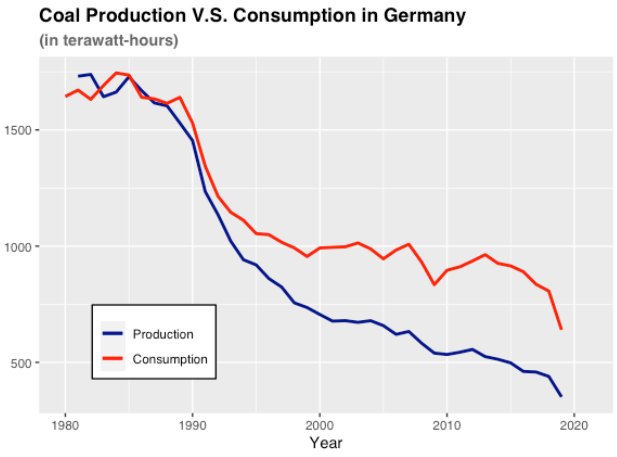
As of our most recent data, in 2019, natural gas made up 24.29% of German energy and is likely to increase in the coming years.

Key Takeaways:

- **Gas and renewable energies have replaced coal as German energy sources**
- **Gas has had the most substantial rise of any energy source over the past 55 years**
- **Gas now makes up nearly ¼ of the German energy supply as of 2019**

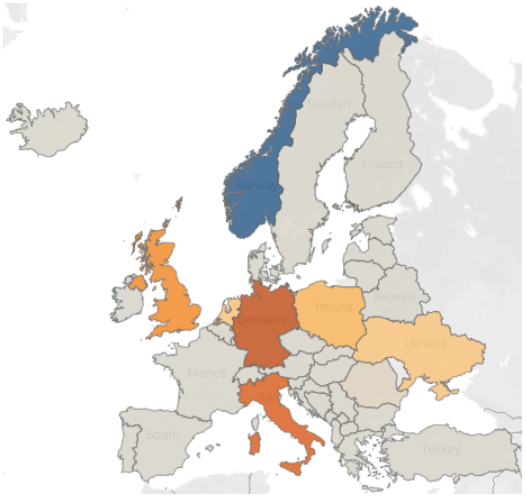
German Energy Dependence





We see that in 2019, while Germany produced 53.31 terawatt-hours of gas it consumed nearly 886.57 terawatt-hours. In turn, 94% of German gas was imported in 2019 and that percentage was posed to increase as consumption rises and production continues to fall.

Just accounting for gas, Germany imported 22.8% of its annual energy supply. When we also consider coal, Germany imported a staggering 30.7% of its total annual energy in 2019.



Net gas production, that is gas production minus the gas consumption, of Europe in 2019. See the full interactive map here.

Unfortunately, our data is incomplete, but we see that Germany is joined by the United Kingdom, Italy, Poland, the Netherlands, and Ukraine in similar natural gas shortages.

Key Takeaways:

- **Germany imports 94% of its gas**
- **Accounting for only gas and coal, Germany imported 30.7% of its total annual energy in 2019**

The Importance of Nord Stream 2

Nord Stream 2, the 1230km gas pipeline running through the Baltic Sea, was expected to have a capacity of 27.5 billion cubic meters of gas per year.

In turn, it would produce roughly 284.62 terawatt-hours of energy a year which would cover 32.1% of Germany's annual gas consumption and could provide up to 7.82% of Germany's annual energy need.

Nord Stream 2 Pipeline: credit BBC

Conclusion

Key Takeaways:

- **Gas has been the fastest growing energy source in Germany over the past 50 years and now accounts for almost ¼ of its annual energy**
- **Germany imports 94% of its gas and accounting for both gas and coal imports 30% of its annual energy- 22% of which is imported gas.**
- **Nord Stream 2 would provide almost 1/3 of Germany's annual gas consumption and 8% of Germany's annual energy.**

Limitations of the analysis:

- Our analysis is severely limited by the breadth of our data.
- We have no way of determining the source of any of Germany's imported energy.
- Our dataset only contains data up until 2019. We would need to use regression or other predictive models to understand Germany's current energy demands.