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War in Ukraine: The options for Europe's energy supply

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Abstract

Europe is likely to remain reliant on Russian gas in the short term. In the absence of this gas supply, the continent is likely to experience shortages and associated inflation. Immediate solutions include diversification of Europe's natural gas supply and the use of alternative fossil fuels, such as coal, but the latter would come with significant climate costs. Over a longer period, there is more scope for reshaping Europe's energy policy and diversifying its energy supply, but these would come at a cost. Expanding renewable energy capacity within Europe is critical. Fine-tuning policy to balance climate objectives against the security of the energy supply will be difficult. To ensure energy security and emerge from this conflict greener, the answer may be renewable energy produced in Europe. Investment in renewables in developing countries, particularly in the continent's trading partners, also holds promise, as it would allow more natural gas imports into Europe while contributing to Europe's climate commitments.

KEYWORDS

energy, energy trade, natural gas, natural gas trade, Ukraine conflict

1 | INTRODUCTION

Through swift action, sanctions and relaxation of immigration rules, European countries have made it clear that they stand with Ukraine in the conflict with Russia. The recent United Nations (UN)

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General Assembly vote highlighted that this support extends beyond Europe: 141 of the Assembly's 193 members supported the UN resolution demanding Russia end military operations in Ukraine, with just five countries voting against it.

Sanctions have had pronounced effects on the already struggling Russian economy. The rouble tumbled before making an apparent recovery following efforts by the Russian government, including higher interest rates and requiring exporters to sell 80% of their foreign currency revenue (Reuters, 2022b). However, rating agencies have downgraded Russia to 'junk' which will make any investor think twice about their Russian assets (Reuters, 2022a). As a result, Russia's only remaining income stream is its fossil fuel exports, especially natural gas exports to Europe. The idea that European countries are effectively financing a war they condemn is anathema to the public and politicians alike.

This study attempts to answer the question of whether Europe could realistically meet its energy requirements without Russia. To preview our conclusion, we argue that substituting away from gas imports from Russia is feasible in the medium to long term, but it is unlikely in the immediate future.

2 | THE IMPORTANCE OF RUSSIAN GAS IN THE EUROPEAN ENERGY SYSTEM

Natural gas has become increasingly important in Europe's energy mix over the last few decades. Ignoring temporary dips, European natural gas demand has been on the rise since at least 1965 – when data were first comprehensively collected. In 2020, it accounted for approximately 25% of European primary energy consumption (Figure 1).

This upward trend is partly due to Europeans' desire to substitute away from coal, which releases much more carbon dioxide per unit of energy than natural gas. Europe has managed slowly to reduce coal's share in its energy mix from around 19% in 2000 to less than 12% in 2020, while also reducing oil's share from 38% to 34% over the same period. With nuclear and hydropower's contributions remaining relatively constant, natural gas and renewables have gained importance (Figure 1). This has made natural gas a key fuel in meeting Europe's energy demand.

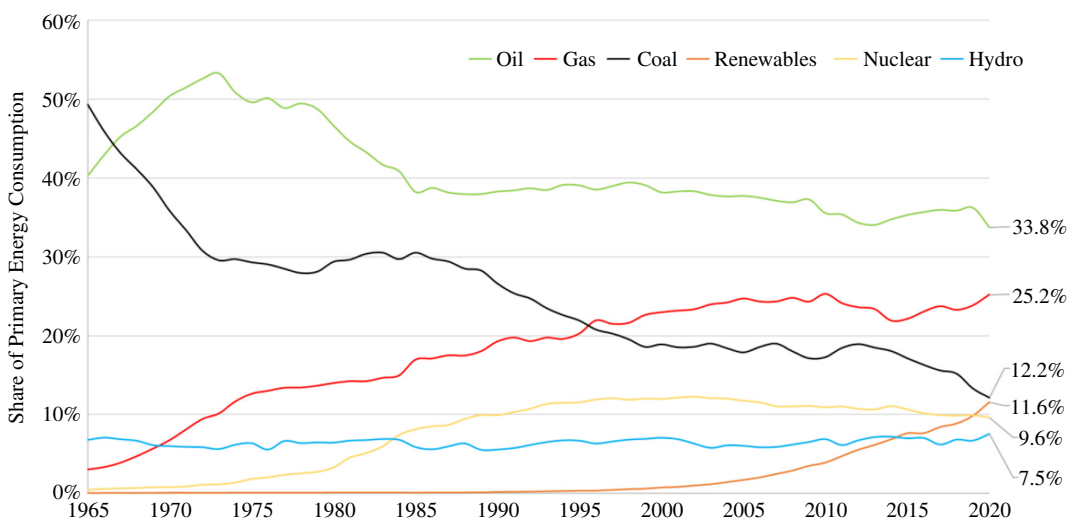


FIGURE 1 European energy mix. Source: Authors' calculations based on BP Statistical Review of World Energy (BP, 2021).

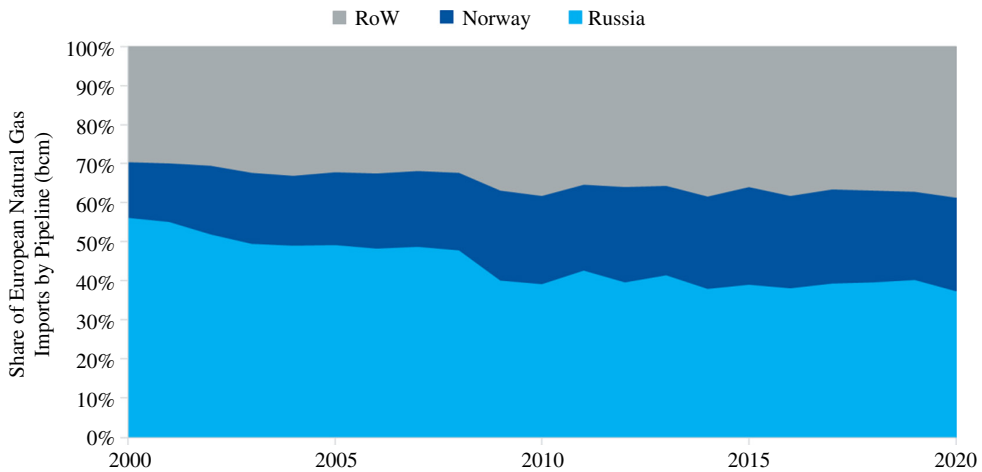


FIGURE 2 Share of European natural gas imports by pipeline (calculated from figures in billion cubic metres). Source: Authors' calculations based on BP Statistical Review of World Energy (BP, 2021). RoW, Rest of the World

This natural gas comes from many countries. Approximately 40% is produced in Europe. The rest is imported from other countries, particularly Russia. Europe's dependence on Russian gas has diminished over the last 20 years: in 2000, over 56% of natural gas imported to Europe by pipeline came from Russia. By 2020, this figure had fallen to 38% (Figure 2).

In this sense, Europe's dependence on Russian gas has diminished over the last 20 years. But Europe has not been importing less gas from Russia. In fact, the volume of gas imported from Russia via pipelines has been relatively stable since 2000. Russian gas accounts for a smaller proportion of Europe's total imports because its demand for gas produced elsewhere has been increasing over the years. This reflects declines in European production and increases in demand overall and has made imports from Russia a smaller share of the larger whole.

The other key supplier of European natural gas is Norway. Norwegian pipeline exports to Europe more than doubled between 2000 and 2020, now accounting for around 24% of total pipeline imports (Figure 2).

Compared with the rest of Europe, the UK is less exposed. In 2020, pipeline imports from Russia accounted for less than 16% of the UK's total pipeline imports, and most of the UK's pipeline imports come from Norway. Overall, there is no denying that pipeline imports from Russia are critical for Europe. Could Europe realistically move away from Russian gas? Could it do so quickly?

3 | PIPELINE GAS VERSUS LIQUEFIED NATURAL GAS (LNG)

Pipelines are politically contentious. They often span multiple countries, are expensive and take years to construct. Yet once in place, gas can flow freely within certain engineering limits. The alternative is to transport natural gas in a liquefied form. We have the technology to do this – LNG is loaded onto specialised vessels that can handle the low temperatures and high pressures involved. Once the vessel arrives at its destination, sophisticated LNG terminals are required for regasification. This infrastructure is also costly, so LNG trade is not a cheap alternative to building pipelines.

European gas supply relies on both technologies. Europe's main LNG trading partners have changed over the years. Back in 2000, Algeria dominated, with some contributions from Nigeria. But

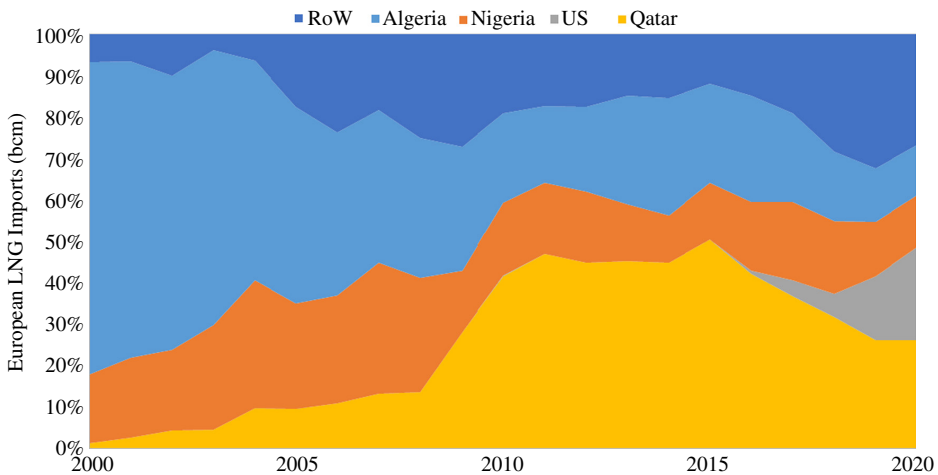


FIGURE 3 Share of European LNG imports (calculated from figures in billion cubic metres). Source: Authors' calculations based on BP Statistical Review of World Energy (BP, 2021). RoW, Rest of the World

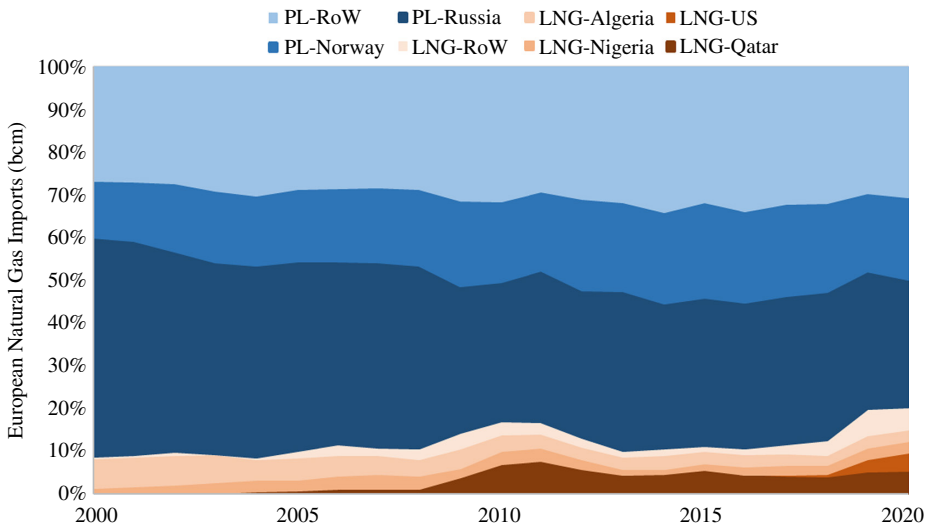


FIGURE 4 Share of European natural gas imports by type and origin (calculated from figures in billion cubic metres). Source: Authors' calculations based on BP Statistical Review of World Energy (BP, 2021). RoW, Rest of the World

by early 2010, Qatar had become the largest player, supplying just over 50% of Europe's LNG imports. Following the rapid growth in US natural gas production in 2018 and 2019, Europe's LNG imports from the United States expanded very quickly. In 2020, Europe imported over 22% of its LNG from the United States, compared with just 4% in 2017 and 6% in 2018 (Figure 3).

LNG trade is critical in situations where pipelines are not viable. Currently, pipeline trade represents approximately 60% of global trade in natural gas. The situation in Europe is quite different because of the extensive pipeline network that has developed across the continent (Entsog, 2021). Currently, European pipeline imports significantly exceed LNG imports. To get a sense of the scale, Figure 4 plots shares of imports from Europe's top natural gas trading partners. Pipeline imports (shown in shades of blue) are much larger than LNG imports (shown in shades of orange).



But LNG is growing. In 2016, nearly 90% of European imports were via a pipeline; by 2020, this number had shrunk to 80%. This is encouraging and signals that European countries may be able to expand LNG capabilities in an effort to reduce imports from Russia.

4 | IS RUSSIAN NATURAL GAS UNAVOIDABLE IN EUROPE?

There are two overarching solutions. The first option is to reduce gas consumption, either by substituting towards a different source of energy or by reducing overall energy consumption. The second is to move away from Russian imports but retain gas in the energy mix at its current level. We could think of the former as a diversification of the energy mix and the latter as a diversification of the natural gas supply. Because of the region's existing dependence on gas, there are no easy options in the short term. But over the longer term, diversification of supply and the energy mix is possible, and the latter is likely to have the largest effect in shoring up Europe's energy security.

Reducing gas imports from Russia in the short term would be difficult. In 2020, Europe imported 185 billion cubic metres (Bcm) of gas from Russia (BP, 2021). According to the International Energy Agency (IEA), Europe could realistically import an additional 10 Bcm of natural gas via pipeline from Norway¹ and Azerbaijan, plus 20 Bcm of LNG from other exporters around the world, such as Qatar (IEA, 2022). Constraining factors include tight limits on the export capacity of major producers (Reuters, 2022e), international competition for the existing supply of the fuel – particularly from Asia – and limits on the continent's regasification capacity which are both geographical and technical in nature (IEA, 2022; Rystad Energy, 2022).

The IEA also recommends a raft of further measures for lowering Russian imports, including mandatory minimum levels of gas in storage across Europe – to smooth peaks in demand, particularly next winter – accelerated development of new renewables capacity and the rapid replacement of domestic gas boilers with heat pumps. They estimate that if all the measures were implemented effectively, with considerable financial and political support from governments and institutions, Europe could reduce its imports from Russia by around 50 Bcm.

However, mustering this effort, political willpower and investment would be to cut just over a quarter of yearly pipeline imports from Russia. To make matters worse, Europe currently has enough gas in storage to cover only 2 months of demand at average winter levels (Rystad Energy, 2022). Therefore, Europe is likely to remain reliant on Russia, at least in the short term.

5 | OPTIONS IN THE LONGER TERM

Over the medium to long term, there is more scope for reshaping Europe's energy policy. Germany, for example, has already announced that it plans to accelerate the construction of its first LNG import terminals (S&P Global, 2022). One of these was previously planned as a floating terminal – a design that is typically more cost-effective and takes less time to develop.

Refitting an existing vessel as a floating storage and regasification unit (FSRU) can be achieved within 18 months, while onshore terminals take much longer. FSRUs can also be redeployed in other locations when capacity requirements shift, reducing the likelihood that they become stranded assets. Where feasible, this would be a sensible way of rapidly building more LNG import capacity across the

¹Equinor and its partners are planning to increase gas exports from the Norwegian continental shelf (Equinor, 2022).

continent, giving the bloc more control over the diversity of its gas supply, and consequently, reducing its dependence on Russia.

In addition to expanding flexible import capacity, Europe also needs new contracts with other LNG exporters. As Figure 4 shows, at present, pipeline imports from Russia dominate LNG imports. These contracted volumes will therefore need to be substantial if they are to make a serious dent in Europe's gas dependency problem. Consequently, they need to be sought from exporters with the requisite production capacity and industry maturity.

The United States is the world's largest gas producer and a natural partner to seek out. In 2020, it produced 915 Bcm of natural gas but also consumed 90% of it domestically. By comparison, Russia produced around 640 Bcm, and exported nearly 240 Bcm. As such, the United States cannot currently meet Europe's demand but has the capacity to do so in the future. It has reportedly granted construction and export permits for LNG terminals that would have a combined annual liquefaction capacity of around 220 Bcm (Wood Mackenzie, 2022). By 2025, half of these could be online and furnishing Europe with significant flows of gas.

It would be prudent to seek additional contracts with suppliers in other countries. Qatar and Australia are among the obvious choices. In 2020, they exported around 106 Bcm of LNG each (BP, 2021). In Qatar, work is already underway to increase the country's production and LNG export capacity within the next 5 years (Reuters, 2022c, 2022d).

Importing LNG is not the only option. At the end of 2020, the long-awaited Southern Gas Corridor became operational, linking Greece, Bulgaria and Italy with gas production facilities in Azerbaijan via Turkey (TAP, 2022). The pipeline is now expected to deliver 10 Bcm to the continent each year, helping to diversify supply away from Russia. Crucially, this was designed with expansion in mind: with further investment, it could support a further 10 Bcm of imports per year. An additional proposal to link Eastern Mediterranean producers with Italy and Greece could bring in a further 10 Bcm each year from 2025 (European Commission, 2021).

These options come with some strings attached. If Europe were to pursue them, it would need to commit to fixed long-term contracts (Wood Mackenzie, 2022), which are potentially costly due to the uncertainty surrounding gas demand. On the one hand, as Europe transitions away from coal, gas demand is likely to rise, which is reinforced by the fact that gas is a key complement to renewables, compensating for the intermittency and inflexibility of the latter (United Nations, 2019). On the other hand, gas demand must fall if Europe is to meet its emissions targets.

Should countries develop new infrastructure and negotiate these fixed contracts to ensure that their current needs are met, recognising that they may not need the same gas volumes in the future? Or should they under-commit assuming future targets will be met?

In the longer run, ensuring energy security will require investing heavily in new renewables capacity. This expansion of capacity will need to accelerate rapidly. In the meantime, exploiting existing nuclear and hydroelectricity generation capacity should be a priority. From a climate perspective, carbon capture, use and storage can help to mitigate some of the effects of any fossil fuels that we rely on during the transition. The transport sector is key, so it is critical for Europe to support the rollout of the infrastructure required for electric vehicles (Ersoy & Forshaw, 2022). It is equally important to be uncompromising in the pursuit of energy efficiency improvements to bring overall energy demand down.

A by-product of the recent discussions between Italy and Algeria also holds promise (Financial Times, 2022b). As part of negotiations over gas trade, Italian investment in renewables in Algeria is being considered. This is aimed at freeing up more gas for export by reducing domestic consumption of gas in Algeria. Perhaps this has wider applications. If the planned East Mediterranean pipeline is built swiftly, it would not only link gas reserves in the region with the EU but may also allow further



gas to flow from the Eastern Mediterranean and Northern African countries, especially if European countries invest in the region's renewables capacity – particularly solar. This solution may be especially attractive because it would count towards Europe's climate commitments to help developing countries wean themselves off of fossil fuels. These green investments may also lead to financial returns for the investors, making it an appealing solution for both parties.

6 | OPTIONS IN THE SHORT TERM

Short-term emergency solutions available to Europe are costly. Due to logistical and technical difficulties, we believe it would be challenging to achieve the proposals put forward thus far. For example, the most significant element in the EU Commission's REPowerEU report hopes to procure 50 Bcm of additional LNG imports next year (European Commission, 2022a). This volume is 2.5 times more than the IEA (2022) estimated would be available, and the Commission did not specify where such volumes could originate from. Given the current tightness of the market, this is optimistic. Furthermore, many of the planned measures have a long time horizon and would not address immediate concerns.

One possibility would be to substitute away from gas towards coal or fuel oil. There are fewer issues with coal supply, and Europe still has a substantial fleet of coal-fired power plants. The IEA estimates that, if used, this alternative generation capacity could offset the requirement for around 22 Bcm of Russian gas imports (IEA, 2022). But the environmental impact would be substantial. Given the already enormous projected costs of climate change, as set out by the Intergovernmental Panel on Climate Change (IPCC, 2022), policymakers may be reticent to pursue this option.

Beyond that, governments could consider demand-oriented policies. These could include campaigns to turn off (or turn down) boilers in the winter and air conditioning units in the summer – perhaps with financial incentives provided for doing so – and usage monitored via smart meters (European Commission, 2022b).

Even then, we are likely to see severe shortages next winter. To highlight the magnitude of these shortages, we report on a thought exercise. Assuming gas demand stays at its 2020 levels, which is arguably unlikely given that gas consumption has been increasing steadily over the years, we estimate that Europe is over 100 Bcm per year short over the next few years. By 2025, there is still, approximately, a 50 Bcm shortage despite FSRUs coming online. Although this is bad news, some progress has been made. For example, the recent agreement between the US and EU is providing 15 Bcm. With some additional investment, the TAP pipeline may bring a further 10 Bcm, and discussions with Qatar and other LNG exporters may yield another 20 Bcm. Based on IEA estimates, if Europe takes the difficult decision of opting to bring coal back into electricity generation, it may offset a further 22 Bcm of gas requirement. Together, this is substantial progress, but it is simply not sufficient.

Aside from the immediate associated costs, governments will have to consider the wider effects, including the possible negative effect of a policy like this on productivity (Somanathan et al., 2021), which is already low and a cause for concern (European Central Bank, 2021). Indeed, the same applies to the use of coal as a stopgap, as the negative effects of pollution on productivity are well established (Zivin & Neidell, 2012).

Distributional considerations are also important. In the UK alone, more than 3 million households are estimated to be in fuel poverty (Department for Business Energy and Industrial Strategy, 2022), and many households are already bracing for a sharp rise in energy bills. Unfortunately, it looks like this is just the beginning.

Oil and gas prices are at historic highs and consumers are already feeling the effects (Financial Times, 2022a). With further sanctions on the way, shortages in the immediate future and accompanying price rises appear inevitable (Financial Times, 2022c). This will be costly for Europe and the rest

of the world, but we may need to ask ourselves if we are willing to come together and endure this given the atrocities committed in the conflict.

7 | CONCLUSION

The options available to Europe in the short run are limited, imperfect, and costly. They also require immediate upfront investment and commitment despite considerable uncertainty surrounding natural gas demand in the next decade. In the immediate future, alternative fossil fuels, such as coal, might have to be considered in spite of the costly implications for the climate. Even then, shortages and associated price rises appear inevitable. As a result, inflation in the wider economy seems unavoidable, especially considering that energy prices have multiple transmission channels to inflation: energy is used directly by consumers (e.g. heating by gas boilers in the winter) and it enters the firms' production function (e.g. as an input into manufacturing). The impact of this economic uncertainty and stress is exacerbated by the fact that world economies were already on a fragile road to recovery following the unprecedented disruption caused by the pandemic.

On the demand side, although the sharp rise in prices is likely to dampen natural gas consumption, further progress is required. To this end, it is important to be uncompromising in the pursuit of energy efficiency improvements. Public campaigns with information on energy efficiency can help, especially if they are coupled with policies and financial incentives.

In the longer term, European energy policy can aim to diversify the energy and natural gas supply. A two-pronged approach that involves developing renewable energy capacity while ensuring natural gas supply would be wise and would ensure that we emerge from this conflict greener. In addition to building renewables capacity within the continent, European investment in renewables capacity in Eastern Mediterranean and Northern African countries could provide an attractive solution. This type of investment would enable countries in these regions to export more gas to Europe by reducing their domestic consumption of fuel. It would also contribute to Europe's climate commitments.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available in BP Statistical Review of World Energy 2021 at <https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html>.

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