



The Future of Gas in the EU's Energy Security



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INTRODUCTION

The European Union is currently seeing gas shortages and high prices, with declining domestic production and concerns over its relationship with Russia. Gas is also required as coal is being phased down. European countries vary in their attitudes to gas depending on domestic politics, resource position and energy mix.

How does the EU balance the role of gas in its energy security? How does gas improve energy security, and where are there vulnerabilities?

ENERGY REPORT

This research paper is part of a 12-month series published by The Al-Attiyah Foundation every year. Each in-depth research paper focuses on a prevalent energy topic that is of interest to The Foundation's members and partners. The 12 technical papers are distributed in hard copy to members, partners, and universities, as well as made available online to all Foundation members.



- Economic recovery, a decline in gas supplies from Russia, and increasing competition with Asian consumers for LNG supplies has led to low gas storage levels across Europe, prompting traders to speculate on a supply shock, thus pushing gas prices up.
- EU policymakers are concerned that Russia has used the gas crisis to lobby for the commissioning of the Nord Stream II Pipeline. The crisis has also underscored the diverging energy policies of EU member states.
- There are two opposing views on the EU's dependence on Russian energy supplies. The European Commission and member states such as Poland and Lithuania believe that Russia intends to use gas exports as a foreign policy and pressure tool, and the EU needs to explore alternatives to diminish the risk of gas restrictions, cut-offs, and / or unexpected price increases. Others such as Germany, Austria, and Hungary believe that dependence on Russian supplies does not pose a security risk to the EU.
- EU member countries will not overcome their dependence on Russian energy supplies in the short-term. There are three fundamental challenges for the EU 1) Gazprom's monopolistic position on pipeline supplies to the EU, despite prohibitions of EU law 2) The high share (44-47%) of Russian gas, and to a lesser but important extent oil, in EU imports, with no viable near-term alternatives, 3) Russia's ability to use different pipelines to pressure transit countries and endmarkets.

- The EU has introduced various liberalisation measures under the Third Energy Package, which has been relatively successful in reducing Gazprom's influence.
- The European Green Deal may result in fossil fuels, notably gas, being progressively phased-out from the energy mix and replaced with greener sources such as renewables, which could dimmish the role of gas in the bloc's future energy mix. The European Commission estimates that ~US\$ 80bn will be required to upgrade existing and develop new gas infrastructure that enhances connectivity.
- The EU has limited options in the shortterm to reduce its reliance on Russian gas supplies. However, in the long-term the bloc could invest in improving its energy efficiency; expand domestic supply of gas (including shale) and renewables (and potentially nuclear); increase LNG imports; accelerate efforts to expand the pipeline infrastructure from the Southern Gas Corridor, including possible future supplies from the Eastern Mediterranean; and scale up the import and use of hydrogen.
- This also presents an opportunity for EU member states not only to resolve their differences on energy policy, but also to work bilaterally with the US to coordinate on better managing their energy dependency on Russia.

BACKGROUND

Europe is facing a record-breaking surge in gas prices that threatens to derail its economic recovery following the COVID-19 pandemic. European Union (EU) member states are facing a severe energy crisis, and potentially a cold, dark and expensive winter.

Gas prices are currently six times higher than last year and four times higher than the recent spring season. The increase in global prices is mainly attributed to an increase in demand for energy following the economic rebound from the COVID-19 pandemic-induced downturn. At the same time, competition has also contributed to higher prices, with the EU having to pay higher prices to attract supplies from large demand centres, especially the high-priced East Asian markets (Japan, South Korea, Taiwan and China).

Figure 1. Gas Prices in Europe (Dutch TTF)



Slower wind speeds during 2021 (leading to less wind generation) combined with unanticipated demand in China, and the EU's own energy transition and climate-related policies have resulted in low gas storage across Europe. Usually, storage utilisation rates in the beginning of winter across the EU usually average ~95%, but this year they were at 77%. Low storage levels prompted gas traders and marketers to speculate on a gas supply shock, which has also pushed prices up.



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Nonetheless, the current gas supply shock has forced electricity generators in Europe and Asia to switch to coal and in some rare, but isolated cases, to fuel oil¹. The high prices have not only signalled a supply shortage, but have also led to demand destruction, where the market is reserving supplies for residential customers for colder days ahead, and industries cut back their operations.





Most of the EU's gas is imported through piped supplies from Russia, Norway and Algeria, and LNG supplies particularly from the US, Qatar, Nigeria and Algeria. Piped imports account for 80% of its total gas imports, whereas LNG imports account for 20%". Russian gas imports by pipeline to Europe (including Turkey) stood at 168 BCM in 2020 and account for 40% of the bloc's total gas imports; another 17 BCM came as Russian LNGⁱⁱⁱ. Russian piped imports are backed by long-term contracts; Russia typically supplies additional spot gas via the St Petersburg exchange, over and above its contractual commitments, but it has repeatedly not done so during the current winter.

The impact of the current crisis is such that, last November, Moldova declared a state of emergency after its contract with Gazprom expired in September. This led to a ~33% decline in Russian supplies to Moldova until Figure 3. Gas Supply to the European Union From Russian Routes, January 2022 $^{\rm iv}$



a new contract and debt arrears arrangement could be reached^{vi}. Despite not being a member of the EU, Moldova appealed to the union for emergency aid and received a US\$ 68M financial package^{vii}. EU member states such as Poland, and neighbouring Ukraine, which is not a member of the EU, rushed to Moldova's assistance by selling additional volumes. Eventually, Moldova concluded a new five-year supply contract with Russia that reinforced its energy dependence on and political relationship with Russia^{viii}.





Figure 4. Gas Supply to the European Union From Norway and Algeria, January 2022^v

In October, the EU energy ministers called an emergency meeting on how to protect their consumers and companies from soaring power and gas prices^{ix}. The summit underscored the divergent energy interests between EU member states. Over the last decade, some EU member states such as Poland have sought to diversify from long-term gas contracts with Russia, whilst others such as Germany and Hungary have tried to expand energy ties. Germany has also supported by Nord Stream I and II pipelines, built by Gazprom with participation of European companies, intended to reduce and eventually eliminate the need for transit through Ukraine. These divergent positions have had a profound impact on the bloc's energy security.

A fundamental component of European energy security is its structural interdependence with Russia, where Gazprom supplies 42% of the EU's gas consumption^x. Conversely, despite more recent efforts to develop exports on the longer route to China, and to build up Arctic LNG exports, this has also made the EU the most profitable market for the Russians. EU policymakers are concerned that Russia has lobbied for the newly completed Nord Stream II Pipeline to be approved by limiting supplies for Europe's gas storage. The International Energy Agency (IEA) has also suggested that Russia could do more to increase the availability of gas to the EU and ensure storage is filled at adequate levels for the winter heating season^{xi}. Forty members of the European Parliament have recently called on the European Commission to launch an investigation into Gazprom's withholding of gas^{xii}.



Some experts estimate that if Russia increased its gas exports to the EU by 20%, it could lead to a 50% decline in market prices across Western Europe^{xiv}. Yet, Gazprom has found a careful balance by exporting just the right amount, without lowering the market price. Gazprom's strategy of pushing for higher gas prices in the short-term could prove to be a double-edged sword, in terms of its future market.

From an energy security perspective, the current crisis has highlighted the fundamental EU energy security challenge: if the EU's diverging energy policies diminish the bloc's bargaining power and render the union less secure.

A secure and uninterrupted supply of energy is vital for the political stability of the EU, its economy, and the functioning of the North Atlantic Treaty Organisation (NATO). The EU has found itself in a position where there is no easy path to energy security, and short-term solutions to the energy crisis may undermine its longer-term goals.



SOURCES OF GAS AND LNG SUPPLY FOR THE EUROPEAN UNION



In 2020 the EU consumed 388 BCM of gas, which decreased by 1% / year over the last decade. Germany and Italy are the largest consumers in the bloc, collectively accounting for 40% of total gas demand for the EU. In same year, gas accounted for 24% of the EU's primary energy consumption increasing from 22% in 2019^{xvi}. The EU's peak demand for gas is in the winter when gas is used heavily for heating. Occasionally demand increases in the summer months, mainly as a result of spikes in electricity demand for cooling, a factor mostly in southern European markets. In the medium-term, the EU will continue to rely on gas as a fuel source as it strives to achieve its climate targets of reducing CO_2 and GHG emissions. Some energy outlooks forecast that gas will account for 35% of the EU's primary energy mix by 2035, whereas others see it declining under an ambitious energy transition scenario, where gas becomes less competitive with other sources such as renewables and possibly nuclear^{xvii}.

Despite the increasing reliance on gas imports in the medium-term, the EU's options have limited flexibility in terms of diversifying gas suppliers, supplies, and routes in the shortterm. In part, this reliance will be driven by policy developments in countries such as Germany, which intends to phase-out coal use in electricity generation by 2038 and nuclear by 2022^{*viii}.

The EU's gas production currently stands at 160 BCM and has declined by 4% / year over last decade. In 2020, the Netherlands and the UK produced the largest amount of gas, with the former producing 40 BCM and the latter 20 BCM. The North Sea, despite being a mature basin, is a major source of indigenous supply for countries such as the UK1, Netherlands, Germany and Denmark. With the exception of Norway, supplies from North Sea fields have been on a decline over the last decade.

Norway has the largest proven reserves of gas in Europe with 1.4 TCM^{xix}. Despite the country not being an EU member, it maintains a close relationship with the union. Almost all of Norway's gas exports go to the EU and UK through pipelines and LNG.

However, European and international fossil fuel producers are divesting their operations across various North Sea fields as they forecast a long-term decline in production and an eventual decline in Norwegian production over the medium-term. For example, in 2019, ConocoPhillips sold its assets in the British North Sea to the UK-based independent oil & gas company, Harbour Energy, for US\$ 3bn**. Others such as Chevron and Marathon have also divested their assets in the North Sea given their concerns about the remaining reserves. Moreover, since 2013, supplies from the Groningen Field, the largest gas field in Europe², has been on the decline. In 2021, Dutch regulators announced they will end regular production from the field in 2022, following increasing concerns by the public and government officials that drilling activities across the field has led to a series of earth tremors^{xxi}. The shutdown of production will reduce supplies for countries such as Belgium, Germany, and France. Even more importantly, it removes Europe's largest indigenous source of swing supply, which was vital for balancing higher winter demand.

With only a small number of gas suppliers in the EU, the last decade has seen a significant increase in LNG supplies to the EU from the US, Qatar, Russia, and Nigeria. The EU has a total LNG import capacity of 150 BCM^{xxii}. And given its strategic importance, additional capacities are being developed in Poland and in Greece, which could allow for a significant increase in LNG imports to the EU.

The EU's LNG imports currently stand at 81 BCM / year and have increased by 3.5% between 2010 – 2020^{xxiii}. In 2020, the US and Qatar were the largest exporters of LNG to the EU with 18 BCM, followed by supplies from Russia at 14 BCM, and Nigeria at 12 BCM. However, the EU is the country of last resort for most LNG suppliers, which is typically sold to the highest bidder in the market, which in most cases are Asian buyers in China, South Asia, and Southeast Asia.

- 1- The UK is not a member of the European Union, but maintains close relations with EU member states and has similar energy security challenges.
- 2 Groningen is also larger than any fields in non-EU UK and Norway

The reliance on Russian gas imports for various EU member states will be dependent in part on the future role of gas in their respective energy mix, and in part on the role of imported gas in their total energy imports. Countries such as Belgium, Austria, Latvia, Slovakia, and Hungary are highly dependent on Russian imports, with Russian supplies accounting for 20% – 35% of their respective primary energy consumption. Whereas Germany, Lithuania, Czech Republic, Italy, and Bulgaria rely on 10% – 20% of their primary energy consumption from Russia. The remaining EU member countries depend on Russian imports for less than 10% their overall consumption.

Conversely, the EU is the largest energy trading partner for Russia. In 2020, Russia exported 237 BCM of gas, of which 70% was exported to the EU^{xxiv}. Germany continues to be largest buyer of Russian supplies at 56 BCM, which is 23% of Russia's total gas exports.

Since the "Russia – Ukraine Dispute" of 2006 and 2009, the EU has intensified its efforts to enhance its gas supply security. In 2006,

Figure 5. Share of Russian Gas Imports in the EU Energy Mix, 2020

Source: BP Statistical Review of World Energy Units: percentage, %





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Russia temporarily cut-off supplies through the Bratstvo Pipeline (also known as the Brotherhood Pipeline) to Ukraine due to disagreements on contracted supplies, prices, and debts. In part the crisis was due to Russia's disagreements with the pro-EU government of Viktor Yushchenko in Ukraine, which came into power after the Orange Revolution of 2005. As result of the cutoff, Hungary reported a 40% decline in gas supply, France reported a 25% – 30% drop, Poland experienced a 14% drop; and Austria, Slovakia, and Romania suffered a 33% decline^{xxy}.

Three years later, Russia once again temporarily halted supplies to Ukraine when Gazprom refused to enter into a new supply contract unless Ukrainian state gas company Naftogaz settled its accumulated debts for previous supplies. Ukraine took transit gas from the pipelines, resulting in shortages in downstream countries such as Slovakia and Bulgaria. The dispute was resolved when Russian Prime Minister Vladimir Putin and his Ukrainian counterpart Yulia Tymoshenko negotiated a new ten-year supply contract.

Experts believe that both crises had a negative and an irreversible impact on the bilateral relations between Russia and Ukraine, the reputation of Russia as a dependable gas supplier to the EU, and the reputation of Ukraine as a transit country for supplies into the EU^{xxvi}.

There are two opposing views on the EU's dependence on Russian gas supplies. The European Commission and some member states such as Poland and Lithuania believe that Russia intends to use gas exports as a foreign policy and pressure tool, and the EU needs to explore other alternatives to diminish the risk of gas restrictions, cut-offs, and / or unexpected price increases. In order to mitigate the risk of such events, the EU introduced the Security of Supply Regulation in 2017, which aimed to prevent supply crises by cooperate in regional groupings to develop joint Preventive Action Plans and Emergency Plans, and facilitate gas sharing during crises.

Some EU member states, such as Germany, Austria, and Hungary believe that dependence on Russian gas supplies does not pose an unacceptable security risk to the EU. Despite the often-adversarial relations with Russia, these administrations view Russian gas to be the most cost-competitive option. They also advocate that the risks to the EU's gas security lie in unstable transit routes such as Ukraine, which projects such as the Nord Stream II pipeline could help mitigate.



Russian influence in the European energy sector extends beyond its supply of gas to the EU. Russian companies and their subsidiaries own significant equity stakes in various European pipelines, distribution, and storage infrastructure. At the same time, some Russianbacked media groups have been involved in spreading propaganda regarding environmental concerns about unconventional shale gas production in Europe.

Currently, there are five major routes for Russian supplies to Europe: direct piped exports to Finland and Baltic states; the Brotherhood pipeline (Yamal system) via Belarus and Poland; the Northern Lights system via Ukraine to Slovakia, Hungary and Romania and on to central Europe; Nord Stream I to Germany; and TurkStream under the Black Sea to Turkey, from where connections are being developed into south-east Europe. In additional LNG from the Yamal project also reaches Europe and other markets and will be supplemented by other new LNG projects in the coming years.

Nord Stream I is a 1,222 km pipeline with an operational capacity of 55 BCM / year and is the largest gas pipeline from Russia to the EU. The pipeline is a joint project between Gazprom, which owns a 51% equity stake in the pipeline, and a consortium consisting of ENGIE, Wintershall, E.ON, and Gasunie, who collectively own a 49% equity stake^{xxvii}.

Nord Stream II is awaiting approval to begin operations and runs mostly parallel to Nord Stream I. The pipeline also has a planned capacity of 55 BCM / year and will double the pipeline system's total capacity upon





commercial operation. Unlike Nord Stream I, the additional capacity on pipeline system will be fully owned by Gazprom and will be financed by a consortium of ENGIE, OMV, Shell, Uniper, and Wintershall***

Supporters of Nord Stream II such as Germany and Austria believe that the pipeline could enhance the EU's energy supply and overall energy security by increasing direct supplies into the bloc at a time of rising demand, and by bypassing the unreliable Ukrainian route. However, opponents of Nord Stream II such as the US and Poland have argued that Nord Stream II could give Russia greater political, economic, and energy leverage over Germany, and ultimately over other EU members.

Another concern of the opponents of Nord Stream II is that the new pipeline may diminish Ukraine's significance as a transit country for Russian supplies to the EU. This would deprive Ukraine of much needed revenues and threaten its national security. It could increase Ukraine's strategic vulnerability it would reduce the risk to Russia that its gas exports would be interrupted by any conflict in Ukraine.

Similarly to Nord Stream II, the new TurkStream Pipeline (started operations 1st January 2020) also erodes the role of Ukraine as a transit country by replacing use of the Trans-Balkan pipeline. It could also expand Russian gas supplies across southern European states. The Russians view the TurkStream Pipeline as a counterbalance to the Southern Gas Corridor Project, which intends to export gas from Azerbaijan and possibly Central Asia and the Middle East into the EU. The TurkStream Pipeline system consists of two parallel pipelines each 930 km long with an operational capacity of 16 BCM / year. An extension of the TurkStream Pipeline, also known as TurkStream II or Balkan Stream is currently under construction and will supply gas to south-eastern and central European states.

Some experts believe that the current supply shock has exposed a weakness in the EU's gas storage. The European Commission is considering a number of options, including a joint initiative to procure emergency supplies and a creation of a strategic gas reserve. Some member states such as Slovakia have suggested that additional storage capacity in Ukraine could play an important role in providing supply security for the EU^{xxix}. Ukraine does have large existing storage capacity, but the use of this could be threatened by Russia's operations.

Gazprom is the largest storage operator in Russia and a major one in the EU. The company operates on an obligation to fill domestic storage capacities by early November. Currently, Gazprom operates a total storage capacity of 9 BCM across Europe and a strategic reserve of 3 BCM in Austria, Hungary, and Slovakia^{xxx}, out of total EU storage capacity of 117 BCM. The company is also the only foreign company that operates gas storage facilities in the EU. Gazprom typically uses its inventories for smoothing supply shocks and ease trading.

One of the biggest concerns for the gas markets in the EU is that the level of storage is much lower than usual for this time of the year. Gas storages levels in the EU currently stand at 74% compared to 94% last year^{xxxi}, and most of this underfill relates to the Gazprom-owned facilities (Figure 7). Figure 7. Fill Level of Gas Storage in the European Union, January 2022 versus 2015-20 average^{xiii}



It is unlikely that EU member countries that rely on gas from Russia will overcome their dependence in the short-term. These countries have long-term contractual agreements to import Russian supplies. For example, Germany has entered into five contractual agreements with Gazprom on gas supplies that mature between 2031 – 2035.

Europe's reliance on gas supplies from Russia will continue to present three fundamental challenges for the EU. Firstly, Gazprom operates a full monopoly on Russian pipeline exports, even preventing other Russian companies such as Rosneft and Novatek to enter the EU market (other companies can export LNG). Secondly, EU law discourages the monopolistic power held by Gazprom. The company continues to invest in additional production capacity, which allows it to use its spare capacity to influence supplydemand balances. And thirdly, Gazprom is one of the main instruments of achieving geopolitical objectives for Russian President Vladimir Putin, particularly towards countries such as Germany, France, and Italy; and also neighbourhood countries such as Ukraine, Moldova, and Serbia.



15 DEVELOPMENTS IN THE EUROPEAN UNION'S ENERGY POLICY



Energy policies are managed by the respective government of each EU member state, and each government makes their own decisions on their national energy mix. However, over the last decade, the European Commission has increasingly taken an active role in energy policy, specifically on elements that relate to energy security, consumer protection, and climate change. At the same time, EU treaties also provide provision on the general scope of the Union's energy policy, mainly relating to functioning markets, supply security, promoting energy efficiency, and facilitating interconnectivity. The Energy Charter Treaty, which is not an EU treaty and to which Russia, amongst many others, is a signatory, further governs international trade and transit of energy. The European gas regulatory structure is a complex system consisting of the Gas Coordination Group (GCG), European Network of Transmission System Operators for Gas (ENTSOG), and Agency for the Cooperation of Energy Regulators (ACER), along with government of the Title Transfer Facility (TTF) in the Netherlands and other important continental gas hubs, that governs energy security and the smooth functioning of the European gas market.

The Dutch TTF is the largest gas market clearing system in the EU, where most traders and buyers purchase supplies. Other pricing hubs, including the UK's NBP, now display a close correlation with TTF. This gas can come from producers through pipelines and LNG imports or storage across the EU. These reserves are filled approximately four times per year, mainly during non-peak times in spring and summer.

The GCG is chaired by the European Commission and meets regularly to discuss issues relating to gas supply security. In the context of the current shock, the CGC meets on a monthly basis to assess the unfolding situation. The GCG will be publishing its conclusions on the ongoing crisis in the next couple of months.

The ENTSOG assess the upcoming winter demand and supply for the season and publishes its findings on the "Winter Supply Outlook" publication. And ACER is the EU governing body that has a legal duty to monitor the market functioning and ensure there is no price manipulation.

EU regulations prescribe three different mechanisms for each member state to prepare for and to follow during times of a supply / price shock. Firstly, is the N-1 Rule, which ensures that each member state has sufficient alternative delivery routes in the event its main import infrastructure or supply is disrupted. Secondly, is the "Toolbox for Action and Support" under the EU Commission's "Tackling Rising Energy Prices Guidelines," which outlines national measures to be taken in order to support the most vulnerable consumer.

And thirdly, at the EU-level, the European Commission investigates any possible anticompetitive behaviour in the energy market and asks the European Securities and Markets Authority (ESMA) to intervene as required.

In recent times and particularly in the context of the ongoing gas supply shock, some EU member states have advocated the establishment of a European Central Gas Purchasing Agency (ECGPA) that would administer and explore the potential benefits and design of voluntary joint gas reserves and strategic stocks. In 2015, a feasibility study on establishing the ECGPA failed to outline positive conclusions.

Concerns related to Russia's reliability and Gazprom's dominance as a major energy supplier to the EU led to various liberalisation initiatives under the Third Energy Package, which was introduced by the European Commission in 2009. A central component of the package was to unbundle the gas market in Europe by separating ownership and control of supplies and production, transportation, and storage in order to prevent individual companies from dominating gas markets, which could lead to price shocks / hikes for the end-users^{xxxii}.



In 2014, Russia challenged the European Commission on the Third Energy Package before the World Trade Organisation (WTO) where it claimed that the rules unfairly discriminated against Gazprom by design and through selective exemption of non-Russian projects from some requirements. Russia argued that the EU unfairly discriminated in favour of European LNG and pipeline operators by exempting them from unbundling requirements.

In 2018, despite the WTO presenting a final resolution on the case in favour of the EU, the WTO panel also concluded that Croatia, Hungary, and Lithuania had discriminated against Russia by requiring a "security of energy supply assessment for foreign operators", and not for domestic pipeline operators^{xxxiii}.

The EU's market liberalisation and integration efforts under the Third Energy Package have been relatively successful in reducing Gazprom's influence across the bloc. The EU also improved its resilience with interconnectors and implementing pipeline reversibility, particularly in eastern Europe, so that countries could not be cut off selectively. This included the ability to reverse-flow into Ukraine from Slovakia. Lithuania and Croatia constructed LNG terminals to give them and neighbouring countries access to alternative supplies.

Member states' direct dependence on Russian gas varies widely (Figure 8), with those neighbouring Russia, not surprisingly, generally having higher shares. But given the interconnectedness of the European market, this does not give a full picture of their relative vulnerability. Also, for some countries with high dependence on Russia, such as Finland, gas is not a large share of their overall energy mix, and a country such as Germany is therefore more at risk from any cut-offs or price spikes.

However, over the last two decades, Russia has taken advantage of bilateral contracts by extracting major concessions from weaker, energy-poor states in the EU that do not have access to alternative supplies such as LNG ports or nuclear energy.

In addition to these energy-poor states, Gazprom has also improved its energy relationship with Germany, its most profitable consumer, whose demand continues to increase.

It remains to be seen to what extent the EU is willing to pressure further Russia and Gazprom to adopt EU principles of competition. Various EU institutions have addressed concerns about Gazprom as an energy market manipulator across several legal cases. An example of such a case is the South Stream Pipeline under the Black Sea to Bulgaria, construction of which was abandoned by Gazprom in 2014 after the European Commission concluded that intergovernmental agreements between Russia and selected EU transit countries did not comply with some EU anti-competition rules^{xxxv}.





The project was eventually re-engineered as the TurkStream pipeline, which goes directly to Turkey, a non-EU member.

The European Green Deal will result in fossil fuels being progressively phased-out from the energy mix and replaced with greener sources such as renewables. Gas has appeared relatively less vulnerable than coal and oil given its lower carbon content; nevertheless, gas is seen in European plans are only a medium-term transition fuel. The deal has led to international and European energy companies such as Total, Shell, BP, and Equinor to switch part of their capital expenditure plans from fossil fuel projects to hydrogen, electricity storage, and renewable energy projects across the EU.

As the region's energy mix progresses towards cleaner sources, it may lead to frequent and major supply-demand balancing problems in the short-term such as the ongoing gas supply shock across the region. At the same time, the deal faces some resistance from countries such as Poland, which is heavily reliant on coal for its energy needs.

As part of the European Green Deal, the EU aims to achieve net-zero emissions by 2050 by curbing emissions across all sectors, with a strong focus on the energy sector, which accounts for ~75% of the EU's overall GHG emissions^{xxxvi}. However, in the short to mediumterm, the European Green Deal envisions gas to play an important transitional role. The European Commission estimates that ~US\$ 80bn will be required to upgrade the current gas infrastructure and develop new infrastructure that enhances Europe's gas connectivity, including making it ready for renewable gas (biogas / biomethane) and hydrogen^{xxxvii}.



Figure 9. Evolution of the European Union's Energy Mix

Nonetheless, the EU's environmental policy, and the need to enhance current gas infrastructure and expand its connectivity across member countries; and ultimately to achieve a higher degree of energy security are intertwined. Despite the growing pressure from the general public to tackle climate change, rising energy prices, shortages and political vulnerability cannot be ignored.

The extent to which new regulatory interventions by the European Commission mitigate the risk of future supply-demand imbalances across Europe remains to be seen. However, the region's short-term options are limited and inflexible. In case of the current energy crisis, requesting additional gas from Russia to avoid an economic downturn would be a major strategic defeat for European policymakers.

Therefore, the EU must develop alternative supply options in order to diversify gas imports from Russia. In doing so, the EU may introduce additional regulation in the short-term, which accelerates the phase-out of fossil fuels and the ongoing energy transition. 18

The EU's options to diversify gas supplies from Russia are limited in the short-term. Primarily, these options involve:

- sourcing more LNG from countries such as the US and Qatar, but these have very little spare capacity and cargoes are already dedicated to other buyers on long-term contracts, mostly in East Asia. A largescale replacement of Russian gas would also use most of Europe's spare LNG regasification capacity, much of it located in Spain with limited connections to the rest of Europe
- sourcing more European gas including a temporary restart of the Netherlands' Groningen field
- burning oil or coal for power and heat, with associated envirOnmental damage and high carbon costs
- rationing to ensure supplies to vulnerable consumers, forcing industries to shut down and causing job losses, economic damage and knock-on shortages in related businesses

However, in the long-term the EU could:

- enhance energy efficiency expand domestic energy supply by tapping into indigenous shale gas, although this would be environmentally controversial
- further improve intra-European connectivity, notably increasing pipeline capacity between Spain and France
- expand LNG imports from Qatar, United States, and North African countries such as Algeria, Egypt, Mauritania, Senegal and perhaps Libya, although this is also dependent on sufficient upstream investment

- accelerate efforts to expand pipeline infrastructure from the Southern Gas Corridor and Central Asia, also potentially carrying gas from the Middle East such as Iraq's Kurdistan region
- explore possible future supplies of LNG or (unlikely) pipeline gas from the Eastern Mediterranean
- accelerate even further the deployment of renewable energy, including electricity interconnections
- create hydrogen domestically and import hydrogen from the Middle East and Africa to replace gas in industry and long-term storage and possibly heating

Currently, investments in energy efficiency and renewable energy projects across the EU are too slow in mitigating the future risk of a gas supply shock, let alone replacing gas from Russia. The residential and commercial sectors are where renewables should be increasingly deployed in order to efficiently consume electricity for heating and cooling. As only about 30% of European gas is used for electricity, the residential (~40%) and industrial (~30%) sectors are even more important to tackle but have fewer alternatives.

At the same time, the EU should continue to aggressively pursue its gas-to-renewables switch in the power sector as per the European Green Deal. Currently, renewables use in the electricity mix varies considerably across each EU member state. At one extreme, Poland like most Eastern European countries still uses coal for 70% of its electricity generation, whereas in France nuclear accounts for 70% of its electricity mix, while in Germany coal is 24% of generation^{xxxviii}.



Figure 10. Electricity Mix for Selected European Union States, 2020

The EU does not have the same kind of fossil fuel resources that the US or Russia has, yet some member states such as Poland, France and the Netherlands, and non-EU UK, hold substantial shale resources that could be developed. It is estimated that the EU member countries jointly possess 12 TCM of unproven technically recoverable wet shale gas resource^{xxxix}.

However, fossil fuel companies that seek to develop these resources incur substantial pressure from environmental activism and political opposition to hydraulic fracturing. Political parties and opposition such as the Alliance 90 / The Greens in Germany and the Democrats 66 in Netherlands have deeprooted and long-standing environmental concerns. Some experts believe that Russia may have provided financing to opposition and environmental activists in Bulgaria and Romania, in hopes of discouraging local shale gas production^{x1}.



Some governments such as those in Ireland, France, and Germany have banned hydraulic fracturing. Other EU member states do not have laws that prevent hydraulic fracturing, but the overall consensus within the bloc is that hydraulic fracturing is not feasible due to its overwhelming political disapproval.

Conventional gas can also be further developed, notably in the North Sea (Netherlands, and the non-EU UK and Norway). However Denmark has announced an end to new exploration licensing, and new field developments in the UK also face environmentalist and legal challenges.

In 2019, Total and China National Offshore Oil Corporation (CNOOC) announced the highpressure, high-temperature Glengorm discovery, which holds ~1.4 Tcf of reserves in the North Sea along the coast of Scotland^{*II}. This was the largest discovery in the North Sea since 2008. Although the discovery is not that far from existing infrastructure, it requires further understanding of the resource in order to produce a reliable timeline for developing it. Further gas developments are underway in the West of Shetland area, which requires more infrastructure and faces challenging weather conditions. Recent gas discoveries and potential developments in the Black Sea off Romania, Bulgaria and Turkey are another promising area for additional European supply.

Moreover, some EU policymakers are suspicious of the US' opposition to the Nord Stream II Pipeline, which has expressed its desire to increase LNG exports to Europe. The US not only aims to prioritise the export of its energy resources to Europe, but also intends to help its allies and partners in the region, in an effort to strengthen its foreign policy^{xlii}. The US has an operational LNG export capacity of 75 BCM,



with an additional 83 BCM currently under construction in states such as Alaska, Louisiana, and Texas. However, LNG supplies from the US are more expensive than pipeline supplies from Russia and cannot replace all of the imports.





Qatar is another option for the EU to increase and diversify its LNG supplies. The country has been exporting LNG to the EU since 1997 with Spain as its first customer. Qatar is usually the world's largest exporter of LNG and one of the largest sellers to the EU, along with the US. The country has also signed new LNG import contracts with France, the Netherlands, Poland, and the UK. Its major expansion from 77 million tonnes per year (Mtpa) of capacity to 126 Mtpa will only be complete by 2027. though, so does not provide short-term relief. Its plants are operating near-maximum capacity currently, and most of its exports are tied up under long-term contracts (particularly to Japan, South Korea, China and other Asian countries), so there is limited flexibility to reroute to Europe.

Supply disruptions and security concerns are a major hindrance to gas exports from North Africa. The three main producers in the region are Algeria, Egypt, and Libya. Each country has its own LNG export infrastructure, with Libya having direct access to the EU through the Greenstream Pipeline, and Algeria to Spain and Italy through the Pedro Duran Farell (Maghreb-Europe), Medgaz, and the Trans-Mediterranean Pipeline. However, supplies through Maghreb-Europe have stopped due to a dispute with Morocco, through whose territory the pipeline passes, and this cannot be entirely made up by boosting amounts through Medgaz. Also, Algeria's gas exports appear to be in long-term decline because of rising domestic demand and stagnant production.

The Southern Gas Corridor is an initiative of the European Commission for the supply of gas from Azerbaijan to Europe. The development of the corridor is an important priority for the EU, with plans to extend supplies from Central Asian countries provided the gas pipelines do not pass through Russia or Iran, or lead to situation where Europe is dependent on Russian or Iranian supplies through the route. Currently, the corridor consists of three main pipelines, the South Caucasus Pipeline (SCP), the Trans-Anatolian Pipeline (TANAP), and the Trans-Adriatic Pipeline (TAP).

Despite the construction of the TANAP and TAP pipeline offering an alternative route and source of gas to the EU, the current supply of 10 BCM / year to Italy (through Turkey) is unlikely to change the EU dependency on Russian supplies. Azerbaijan produces 26 BCM / year of gas, and the Shah Deniz Field could boost its production by additional 16 BCM / year*^{IIII}.



Figure 12. Map of Gas Pipelines in the Southern Gas Corridor

BP owns the largest share in the joint venture that operates on the Shah Deniz Field with an equity stake of 29%^{xliv}. TAP could be expanded to 20 BCM capacity, and additional supplies could come from Iraq's Kurdistan region if commercial and technical challenges can be overcome.

In addition to supplies from Azerbaijan, many experts have suggested that the Southern Gas Corridor could be expanded into Central Asia, with supplies from Kazakhstan, Uzbekistan, and Turkmenistan. The three countries produce in total 116 BCM / year^{xIv}. At present, most of Kazakhstan's gas exports go to Russia, and Turkmenistan and Uzbekistan mainly export to China.

However, expanding the corridor into Central Asia could expose the EU to the Russian sphere of political influence. In 2018, at the Fifth Caspian Summit, Iran, Azerbaijan, Kazakhstan, Russia, and Turkmenistan ratified the "Convention on the Legal Status of the Caspian Sea", that aims to regulate legal issues relating to the Caspian Sea. The agreement specified sovereign waters from each bordering country and banned the Caspian nations from allowing any foreign military presence in the Caspian Sea^{xIvi}.

Recent large discoveries of gas across the Eastern Mediterranean region along the coast of Egypt, Israel, and Cyprus could be utilised by the EU in the future. In 2020, the governments of Cyprus, Greece, and Israel agreed to build the Eastern Mediterranean (EastMed) Pipeline, which will supply gas from the Leviathan Field in Israel and the Aphrodite Field in Cyprus to Greece. The EastMed Pipeline was hoped to be commission in late 2025. But given the high cost, long distance, political complexities and doubts in Europe about financing new fossil fuel infrastructure, it looks very unlikely to be built. New LNG capacity or exports as electricity or hydrogen may be more realistic. There is not much the EU can do in the short-term to change its heavy reliance on Russian supplies. But in the long-term, the EU must enhance its efforts to develop new domestic energy sources, such as shale gas and renewables, whilst at the same time improve its energy efficiency levels. The Union could also boost LNG imports from North Africa, the Arabian Gulf, and the US; and accelerate efforts to expand pipeline systems from the Southern Gas Corridor or the Eastern Mediterranean.

Figure 13. Map of the Eastern Mediterranean Pipeline





The US has long wanted the EU to lessen its dependency on Russian energy. In August 2021, US Secretary of State Anthony Blinken appointed Amos Hochstein as the Senior Advisor for Energy Security. His appointment enforces the US commitment to reduce the risks posed by the Nord Stream II Pipeline, support Ukraine as a transit hub for gas supplies into the EU and enhance European energy security and climate goals^{xIvii}.

Given the disunity among EU member states on energy issues, in the short-term the US will continue to work bilaterally with European states such as Ukraine, Moldova, Bulgaria, and North Macedonia that are the most vulnerable to Russian coercion on energy issues. In trying to achieve its bilateral objectives, the US will have to address one of the biggest obstacles towards energy independency, which is ending energy corruption.

Over the last decade, the US's focus on energyrelated issues in the EU is primarily focused on two main elements: the expansion of LNG exports into the EU and opposing the commissioning of the Nord Stream II Pipeline. The US' efforts to block the Nord Stream II Pipeline have resulted in three rounds of stringent sanctions over the last five years.

The "Countering Russian Influence in Europe and Eurasia Act (CRIEEA) of 2017" clearly states the US' policy position on the opposition to the Nord Stream II Pipeline given its detrimental impacts on the EU's energy security, gas markets in Central and Eastern Europe, and ongoing energy reforms in Ukraine^{xIviii}.

In 2017, the legislation led to the US' House of Representatives passing a resolution that called for the imposition of sanctions on the project^{xlix}. Sanctions were imposed on those that invested US\$ 1M – US\$ 5M over a twelve-month period or provided goods, services, or material support valued at the same amount for the construction of the pipeline.

At the beginning of 2021, the US imposed sanctions on the Russian vessel Fortuna and its owner KVT-RUS^I. Gazprom was using the ship to complete the remaining undersea construction of the pipeline.

Although the US has not imposed sanction under the Protecting Europe's Energy Security (PEESA) Act of 2019 sanctions, the threat of these sanctions appears to have encouraged some companies to withdraw from the Nord Stream II project^{II}. These sanctions could be enforced on entities that the US understands to have provided or facilitated in the provisioning of vessels for the purpose of undersea construction activities on Nord Stream II Pipeline.

Despite the sanctions on Fortuna, it has been reported that similar vessels continue to work on the pipeline. In 2021, the local of government of Lubmin near Greifswald in Germany, where the Nord Stream II Pipeline will end, established an economic freezone, which shields companies involved in the project from sanctions.

However, the ongoing energy crisis across Europe presents an opportunity for EU member states not only to resolve their differences on energy policy, but also work bilaterally with the US to coordinate on how to further manage their energy dependency with Russia. If the EU member states and the US fail to coordinate effectively on energy security, it is likely the EU will be even more vulnerable to Russian pressure.

CONCLUSIONS

The greatest beneficiary of the ongoing energy crisis in the EU is Russia, which has watched with great pleasure how the bloc has consistently failed to reach a consensus on the ongoing energy crisis. Member states such as Poland, Hungary, and Czechia have called for revisions on the EU's climate plans^{lii}. These member states view the EU's current climate plans as a major contributor to the ongoing energy crisis.

Such policy differences between EU member states have not only limited their cooperation but also resulted in a handicapped Russian policy, which has encouraged or at least not discouraged continued aggression by the Russians towards Ukraine.

Given that the EU will likely remain in a mutually dependent relationship with Russia in the medium-term, there are several policy options and alternative gas suppliers, supplies, and routes it must consider. At times, these options may clash with the EU's climate goals. But to ensure the energy security of its member states, it may choose to modify or suspend some of its ambitious climate policy goals.

The ongoing tensions on the Russian – Ukrainian border exemplify this hard choice. Like the rest of the EU, Ukraine also faces severe energy shortages this winter^{liii}.

Poland, the biggest coal consumer in the EU after Germany, may push back on its coal phase-out plans. In order to maintain an energy buffer against Russia, the country could continue to use coal for another decade. These short-term initiatives will reduce Ukrainian and Polish dependency on Russian supplies but will come at the cost of offsetting the EU's climate initiatives. In the long-term, the EU will have to confront its profound disagreement on nuclear energy, which could reduce its reliance on future Russian energy supplies and help the bloc meet its climate initiatives. Nuclear power (and gas) have been included in the EU's 'Green Taxonomy' of sustainable investments, albeit under stringent conditions. Yet this has attracted great controversy already.

European success requires balancing four great tensions:

- the environmental-security-economic contradictions
- the internal divisions between member states and with close neighbours, notably the UK
- the disagreements over strategy and tactics with the US, particularly on sanctions and on suspicions of the US's pursuing its own commercial agenda relating to LNG
- the nature of the relationship with Russia, whether a mutually-beneficial economic partnership or a one-sided trade marred by suspicion, unreliability and coercion.



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