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Investment Institute Macroeconomics

The economic impact of a Russian gas cut-off

Potential short and longer-term impacts of the Russian energy shock

AXA IM Macro Research Team,
David Page, Hugo Le Damany, François Cabau, Irina Topa-Serry and Modupe Adegbembo,
Macro Research – Core Investments

Key points

- Russia's invasion of Ukraine sparked a global energy shock. Russia's ability to cut off European gas supply has made it worse, but Russia will be more vulnerable to oil embargoes. Europe will suffer the most from the energy crisis, but Russia will be more vulnerable to oil embargoes
- Energy prices have risen and inflation looks set to induce a cost-of-living recession. This is exacerbated by expectations of gas rationing in Germany and some Central and Eastern Europe countries this winter. More could be impacted, including Italy and the UK, in the event of a severe winter
- We expect a European recession as a consequence of this shock, with a deep contraction in Q4 this year and Q1 2023. Activity should rebound in Q2, but its strength will depend on the technicalities of gas supply and the severity of winter
- The US appears well placed to be able to produce and export more natural gas to Europe and the rest of the world. However, this will take several years and could be impeded by concerns about longer-term demand for fossil fuels
- The restructuring of the global energy supply system is likely to take several years. However, a swift response from the European authorities may limit gas rationing to this winter alone.

A restructuring of global energy supply

The Russian invasion of Ukraine has prompted a period of global realignment – and it is hard to gauge the extent of this even seven months into the invasion. A swift and laudable unification of Western democracies in the face of the invasion resulted in a material range of sanctions against Russia, as well as considerable military support for Ukraine – which initially helped it fend off the advance of Russian troops, and then allowed it to recapture lost territory in some areas of the country. However, the lack of a swift victory and the formidable response of Western democracies has led to Russia falling back on its trump card – energy supplies to Europe.

Before the war, Russia provided 70% of Europe's coal, one quarter of its oil and around half of its natural gas imports at around 50 billion cubic metres (bcm). Coal is now a smaller part of the overall European energy mix, at 13%, and a globally traded commodity, and oil is also traded in international markets. This led the European Union (EU) to announce plans to end Russian imports of both hydrocarbons by the end of this year, although each will present its own challenges. Given Europe's dependence on gas – and the relative difficulty of international gas trade – the EU did not dare sanction Russian gas. Russia, though, has recently taken the initiative and stopped gas supply to the important Nord Stream 1 gas pipeline to Germany – claiming technical difficulties and maintenance issues. Only smaller supplies to Italy through Ukraine persist at present and we are doubtful that these will continue for much longer.

These combined actions have led to a global energy shock and something closer to an energy crisis for Europe. In June, we assessed some of the immediate implications following the war with a focus on the impact for greenhouse gas (GHG) emissions[1]. Here, we consider the implications of the energy shock for Europe and the impact on the outlook for economic activity, for the coming winter and next year.

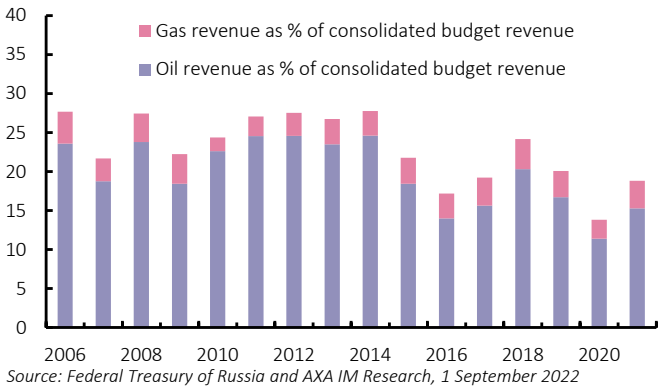
Even then, we barely scratch the surface of the longer-term implications for the world's changing energy supply complex. As we alluded to in June, over the longer term we expect a global merry-go-round of gas supply, with Russia increasingly supplying piped and shipped hydrocarbons to Asia. A shortfall to Europe is likely to be (partially) made up in the short term by increased supply from the United States (US) – something that could materially bolster growth and income in the US over the coming decade – before increased renewables capacity allows for more domestic and sustainable energy supply for Europe and the rest of the world. But this period of transition, particularly the coming winters, will challenge the global economy by restricting the unfettered access to energy that has underpinned global development since World War II, with the costly exception of the 1970s energy crisis. Moreover, these energy uncertainties overlay a deeper question over the stability of broader geopolitical relations.

Russia can afford to cut European gas supply, oil is more painful

Europe is Russia's biggest customer for gas, buying more than three-quarters of its volumes. The vast majority – around 90% – was delivered through pipelines, meaning it is difficult for Russia to quickly divert supplies to other countries. Russia will redirect some liquefied natural gas (LNG) supply to Asia, but more fundamentally this implies years of building new pipeline infrastructure, a process which has been underway for some time to China and will continue.

From a Russian standpoint, cutting off gas supplies has obvious advantages and initially only relatively limited costs. First and foremost, Russia is not as reliant on gas revenues as oil. Gas provided Russia with $23bn of revenues in 2021, small compared to the $100bn receipts from oil sales. Gas accounted for an average of 3.2% of federal government revenues over the past 16 years and 3.5% last year, compared to 15.3% for oil (Exhibit 1). Moreover, the energy price spike seen since the invasion has cushioned the impact on revenues of falling volumes. From January through July, oil and gas revenues rose 50% compared to the same period last year, accounting now for close to 80% of total federal oil and gas revenues in 2021. The immediate costs of putting Europe in a painful economic situation thus appear bearable for Moscow, particularly if this is a powerful tool to negotiate a scaling back of oil sanctions.

Exhibit 1: Gas accounts for some 3% of Russian public revenues



Source: Federal Treasury of Russia and AXA IM Research, 1 September 2022

Russia, however, faces much bigger issues over the longer term. Europe's planned ban on most Russian oil imports could prove much more costly to the Russian state. Again, Russia has the ability to redirect some oil supply from Europe to Asia. This is already happening, with sales to India, Turkey and China rising, but these are unlikely to fully compensate for the more than 3m barrels per day that Europe currently consumes. Moreover, diverted oil sales to date appear to have been at a discount to market prices.

The impact of the embargo on Russian oil will depend on its duration – the longer it stays in place, the higher the long-term costs will be as the prospect looms of closing oil wells. It will also depend on the response from Organization of the Petroleum Exporting Countries (OPEC) in terms of supply adjustments. The G7 countries are also attempting to cap Russian oil prices globally, to coincide with the EU embargo. We are sceptical about whether such a proposal can work to limit Russia's financial capacity. Beyond the difficulties that such a cap would entail in terms of enforcement, it would need to be adopted more widely than the G7 to have a significant effect. The Kremlin's threat to withhold oil from any country joining the cap should also be considered. There is a risk that such a price cap would result in tighter global supply and higher prices of non-Russian oil.

More broadly, Russia is being hurt by sanctions despite having already adapted to a series of sanctions first introduced in 2014 following the invasion of Crimea. Russia has reduced the role of the US dollar in its trade flows, financing and savings, while its banks and corporates have been deleveraging and the macroeconomic framework became more flexible through its fiscal rule. However, quite apart from the near-term difficulties Russia faces, over the longer term the significant impact on Russian capital accumulation and technological transfers will lead to a large-scale cumulative output loss. These suggest a dire direction for the country's future, of which the recently reported fall in imports and the beginning of what may become a serious 'brain drain' are just the first symptoms.

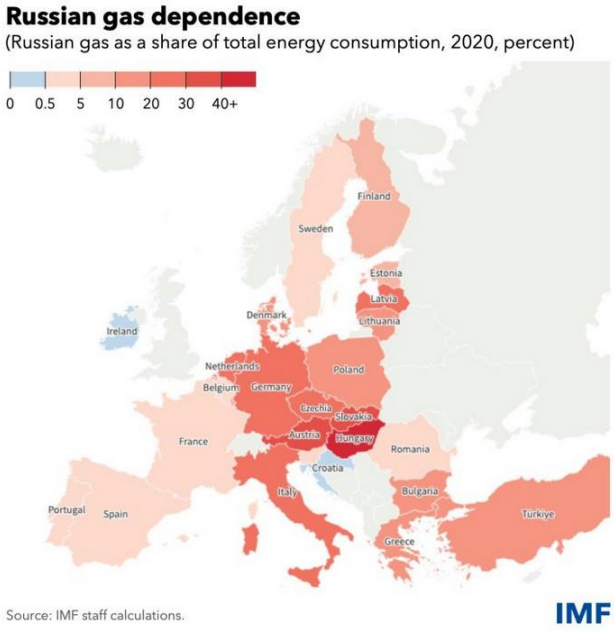
[1] Page, D. and Eugène, O., "The impact of the Ukraine crisis on climate change", AXA IM Investment Institute Sustainability, 9 June 2022

Beyond the economic outlook, this asks broader questions of geopolitical alignment and stability over the significant Eurasian landmass. Hence, we argue that these sanctions work in the medium-term, but provide little short-term relief.

Eurozone: Rationing leading to recession

Long before the Russian invasion of Ukraine, Europe had planned to adjust its energy supply mix, for reasons of sustainability and security. In the event, these plans were not fast enough and varied greatly between countries. If some countries such as Poland quickly understood the cost of Russian energy dependence, others focused on the shorter-term benefits of cheap and easily accessible energy. Germany, Europe's largest economy, built its economic success on such access, its dependence increasing with its decision to end nuclear power in the wake of Japan's Fukushima disaster. It is now the most exposed Eurozone economy, with Russian gas imports accounting for around 35-40% of consumption.

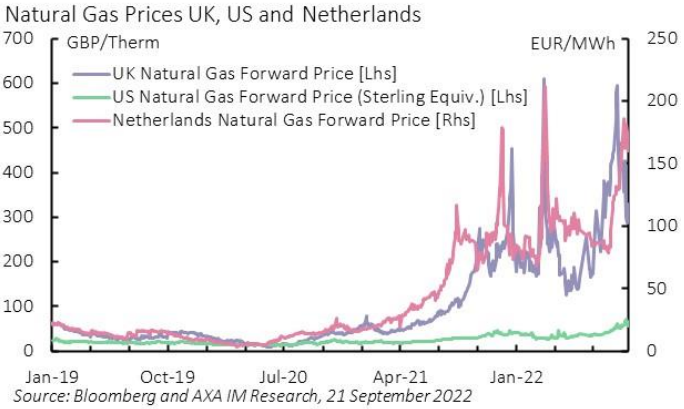
Exhibit 2: Energy dependence in Europe



The situation has changed with the invasion of Ukraine. Russian gas deliveries to Europe have shrunk in tandem with increasing Western sanctions. Despite an important reshuffling to non-Russian pipeline gas supplies from Norway, Algeria, Azerbaijan, Libya and the United Kingdom (UK), and rising imports of LNG, the total volume of European gas imports had declined by around 9% year-on-year in August. However, storage levels have still risen to year-ago levels, meaning that gas consumption has already declined.

The price of gas in Europe has soared (Exhibit 3). This will have a material and much discussed impact on European activity and has already exacerbated a cost-of-living crisis across the continent. As well as considering how the market may adjust consumption through price, we must also consider whether Europe will have sufficient gas to get through this winter. As Exhibit 2 suggests, such an assessment is a highly complex calculation, with several unknown variables. Below, we describe a scenario that we think contains plausible assumptions. We conclude that Germany is likely to have to ration gas – curtail consumption over and above the expected demand reduction from higher prices. Italy is likely to come close to this as well. We believe the outlook for France and Spain is more secure.

Exhibit 3: Gas prices surge, but Europe bears most of the cost



Source: Bloomberg and AXA IM Research, 21 September 2022

Which countries could run short of gas?

Consumption of gas can fall because of efficiency savings, price-driven voluntary reductions and involuntary rationing. Each has distinct implications for GDP, including beneficial savings through energy efficiency or lowering heating temperatures. Involuntary rationing implies an output cut on production – although lower energy production and consumption mechanically dampen GDP. It is difficult to know the tipping point at which savings become rationing, but overall we assume rationing is unavoidable in Germany, as has been the case in previous months (Exhibit 4). It may also be necessary in Italy if consumption reduction does not reach 10% as targeted. Rationing will primarily be borne by the most energy intensive producers, including chemical, steel, glass, cement and metal, both for technical reasons, including gas grid maintenance, and political.

Exhibit 4: German gas consumption already down markedly

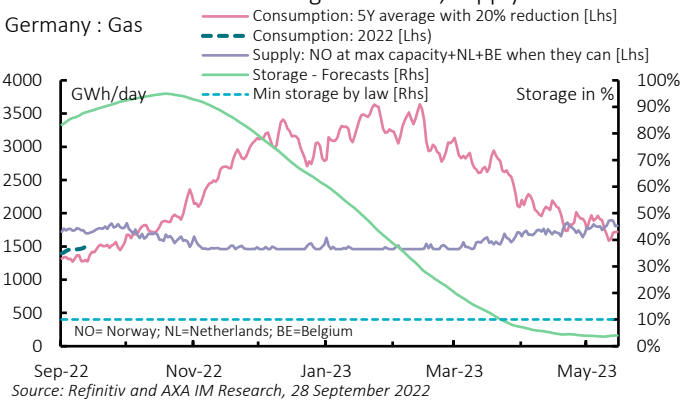
Current German gas consumption trends			
Germany vs average 2021-2018	Total	LDZ*	Non-LDZ*
May	-18%	-30%	-12%
Jun	-12%	1%	-15%
Jul	-19%	-6%	-21%
Aug	-22%	-25%	-22%
17-Sep	-23%	-23%	-24%

**LDZ=heating and SMES / Non-LDZ: power generation and most intensive industries*

Source: Refinitiv and AXA IM Research, 17 September 2022

To assess the outlook for European countries we consider individual countries' gas demand and supply profiles (Exhibit 5). Appendix A contains a detailed summary of the assumptions that we make over ongoing supply for piped gas and LNG supply for the largest European countries. On the demand side, comparing current usage to the last five years shows demand is already lower (Exhibit 4), likely reflecting a combination of all three elements. Looking ahead we reduce recent years' consumption by 20% for Germany and 10% for Italy – in line with the most recent European Commission non-mandatory targets.

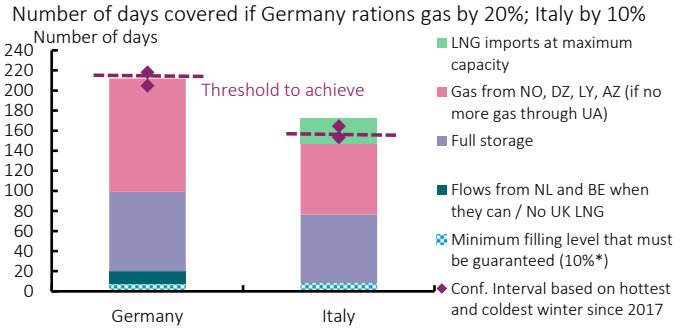
Exhibit 5: Estimated German gas demand, supply and reserves



Source: Refinitiv and AXA IM Research, 28 September 2022

Comparing estimated supply with these reduced demand forecasts shows when countries should start to use gas reserves. In Germany, we estimate that consumption will exceed supply for 215 days (from mid-October until the beginning of May). For Italy, it would start at the beginning of November until mid-April, lasting 160 days.

Exhibit 6: Germany likely to face biting gas constraints



Source: Refinitiv,Eurostat and AXA IM Research, 11 September 2022

This then provides a framework to assess if countries will run short of gas – that is when the cumulative demand for gas exceeds the cumulative supply plus gas reserves – and for how long. We show the number of average winter days' consumption covered by average supply and reserves, dividing total gas supply and storage by average daily consumption. We also include a confidence interval, varying consumption by looking at the coldest and mildest winters in the last five years. Exhibit 6 illustrates the number of average days of supply available in Germany and Italy, compared to the estimated total demand.

Our calculations suggest that Germany should get through approximately 200 days (until end-March) of an average winter without reducing consumption by more than the assumed 20%. This would be around 20 days short of the typical period. In reality, this could be more if Germany allows storage to fall below the current legal minimum of 10% (to ensure supply to hospitals or other vital services), manages to get floating LNG terminals operational by year-end or benefits from additional UK exports via Netherlands and Belgium – something most likely in a milder winter[2]. Alternatively, a colder winter would shorten the number of days covered for Germany and require additional measures sooner. Finally, a further highly political uncertainty is that Russian state-owned energy company Gazprom owns major storage facilities in Germany and Austria, accounting for 7% of EU storage capacity (assuming full storage). Those facilities come under domestic law, but Gazprom might be able to delay or inhibit its use.

Italy would also be at risk in the event of a severe winter, and/or if it does not succeed in reducing its consumption by 10% as assumed. Indeed, Italy has only reduced gas consumption by 8% versus the average of last year up to August. That said, Italy has also not been running LNG imports at maximum capacity to date, providing some scope for more. In part this may be because it is currently still receiving gas from Russia through its Ukraine pipeline (approximately 10% in September), although we doubt that this will last.

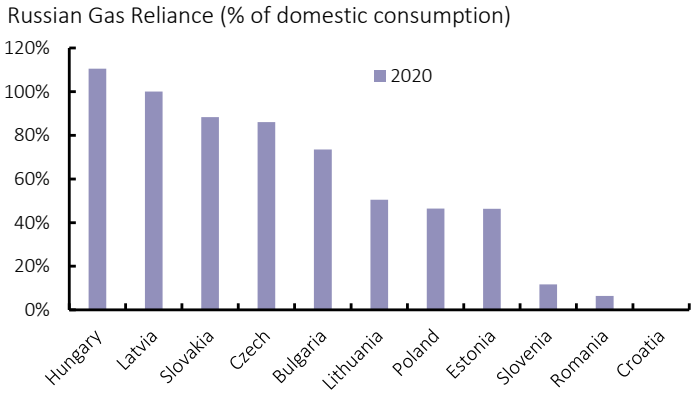
We do not think either France or Spain will run short of gas. Gas supply is more diversified in France which has four LNG import terminals and receives piped gas from Norway. Additionally, storage capacity is elevated (82 days). France's nuclear capacity poses some concern. More than half of France's reactors are currently shut down, through a combination of low water levels and micro-fissures in pipes. The French government has stated that all reactors should be working normally by February. However, if this is delayed again it may require the continued use of gas-fired electricity generators to fill the gap, which would increase consumption, exacerbating volume constraints and price reactions. Spain's gas supply is supported by six LNG import terminals – totalling 35% of the Eurozone's total LNG import capacity – and a limited capacity (10% of its imports) to export any excess to the rest of Europe. Spain looks set to be well supplied for gas.

[2] France has pipeline connections with Germany, but it is not able to reverse the usual flow into, rather than out of Germany.

Central Europe vulnerable – supply-chain risk

Gas supplies from Russia also play an essential role in power generation and home heating in Central Europe and few topics are more political and sensitive in the region than energy security these days. The region as a whole will experience a sharp output contraction following the Russian gas shutdown. Landlocked Hungary, Slovakia and the Czech Republic purchase most of their gas and oil from Russia (Exhibit 7). The main alternative supply routes go through countries also facing supply constraints, such as Germany, Austria or Italy. These Central and Eastern Europe (CEE) countries will be directly affected by Russian supply shortages – as well as second-round effects from weakening economic activity in Germany, their largest trading partner. The cumulative impact of output loss in these countries could be as much as 4 percentage points (ppt) of GDP.

Exhibit 7: Central Europe relies massively on Russian gas



Source: International Energy Agency (IAE) and AXA IM Research, September 2022

Other countries in the region either have access to alternative supply routes or are already less dependent on Russian gas.

- **Bulgaria** has a still high reliance on Russian supply, but gas plays a limited role in its overall energy mix; furthermore, the country has access to alternative supply routes through Greece or Turkey
- **Romania** is self-sufficient as its domestic gas production covers most of its consumption needs
- **Slovenia** has limited dependence on Russian gas and has a pipeline via Italy
- **Estonia**, despite sharing a border with Russia, is becoming one of the European countries the least dependent on Russian gas – relying on domestically-produced shale gas
- The **other Baltic countries** appear very much reliant on Russian gas. Lithuania was nonetheless the first European country to turn away from Russian supply as they have access to alternative imports – Lithuania has an LNG terminal on the Baltic Sea and a brand-new operating pipe connection to Poland offering an entry point, albeit limited in capacity, for Europe overall.

No CEE nation will be unscathed by the current European gas crisis and will bear its indirect costs. We generally lower our growth expectations into this winter by close to 1ppt of GDP cumulative.

Poland, the biggest country in the region, imported around half of natural gas, 76% of its oil, and 15% of its coal from Russia in 2020, according to the International Energy Agency (IEA). Despite this, Poland has been one of the loudest voices demanding that all EU countries stop buying Russian oil, gas and coal in response to the invasion of Ukraine. It is also the country hosting most war refugees from Ukraine. However, the Polish economy is not particularly gas intensive, with a greater reliance on coal, and will be connected to a new gas pipeline from Norway as well as being able to import LNG from Lithuania. We have cut our Polish GDP outlook by 1.4ppt.

Economic impact – Germany most affected

Having considered how the energy shock will affect different countries within Europe, we now turn to the expected economic impact. Following the pandemic-related supply shocks of recent years, the energy price shock is now creating a new energy quantity constraint for some economies, implying further supply challenges for the Eurozone economy.

As suggested above, Germany is likely to be the most affected in terms of gas supply of the big four Eurozone countries. Germany's economic composition also makes it likely to be the most affected economically given the significant weight of its industry in GDP (around 25% in 2019, 8.4ppt above the average of the large three other countries), for which natural gas is a prime input.

To consider the economic impact of this energy shock, we first assess a GDP output approach – gross value added (GVA), differentiating between sectors depending on their reliance on gas consumption and relative weight in the economy.

Exhibit 8: German chemicals and public administration sectors key gas users

German industrial usage of natural gas	Total manuf.	Chemicals & pharma.	Public admin.	Metals	Food & bev. manuf
Share in total natural gas usage (%)	70	25	11	11	8
Share in total German GVA (%)	23	3	18	3	2

Source: Eurostat and AXA IM Research, 28 September 2022

According to the German Federal Statistical Office, natural gas is the most used energy source accounting for 31% of total industrial energy use. According to the internationally comparable Eurostat database, manufacturing sectors in Germany account for 70% of natural gas usage, dominated by chemical and pharmaceutical products (around 25%), which in turn represents 3% of total GVA. Public administration and basic/fabricated metals' share in gas usage is very similar, though their relative weight in total GVA is smaller (Exhibit 8).

Pencilling in a 20% voluntary rationing in gas use (as above) across these selected industries would reduce German GVA by 2.2%, everything else being equal. With our assumption that industry will bear the brunt of the reduction (at approximately -30%, vs services and construction at -2%), consistent with a 20% reduction for the entire economy, this would suggest a 4% drop in German growth relative to a "no rationing" scenario.

However, this simple approach does not allow for the complexity of reaction that might follow the removal of a readily available supply of energy to a modern industrial economy. A comprehensive literature review discussed in an International Monetary Fund (IMF) paper explains how different modelling techniques can yield different results[3], with estimates ranging from -0.2% to -5.0% of GDP loss. We identify three main areas to watch; and the nature of policy coordination that follows in response.

The degree of spill over offers the most prominent uncertainty. Such spill overs can be supply related, including the ability for sectors to substitute energy or downstream linkages and/or demand related, for example weaker German output impacting other countries. According to IMF analysis[4], these are likely to be much larger than direct impacts (e.g., three times as large for Germany). We should also bear in mind that models tend to focus on prices **or** quantity adjustments. Given the observed volatility in energy markets and expected rationing, both may be in play which may imply downside risks to models' assessments.

Uncertainty effects are also likely to be high[3]. The impact of questioning the energy complex, at the core of our modern economies, may be underestimated by measures of uncertainty drawn from past events, as may be the tectonic scale of geopolitical shifts, unseen since World War II. Furthermore, with historic supply shocks coming hand-in-hand with unprecedented, dynamic moves to tighten financing conditions this may add further downside to estimates. These uncertainties are difficult to quantify but suggest a balance of risks to the downside of such estimates.

The wild card: Enhanced policy coordination

Third, the ongoing nature of the shock makes it difficult to adequately account for the fiscal (demand-oriented) policy responses taking place at both national and EU level. These should help shore up confidence but are only a partial offset to demand, not least as they threaten persistent inflation and could drive interest rates higher. We note the strong call for enhanced coordination across European policymakers, with Eurogroup President Paschal Donohoe explicitly mentioning the need to avoid additional inflationary pressures that the European Central Bank (ECB) would have to react against by ensuring, first, that fiscal policy should focus on exceptional income transfers, preferably targeted, and second, that it avoids a wage-price spiral.

All in all, we expect a cumulative 1.6% GDP contraction in the Eurozone to take place in Q4 2022 to Q1 2023, led by Germany (2.4%). Given the risks to supply mentioned above, we suggest that a Q2 GDP rebound is likely to be mild, but Q3 should benefit from a stronger reopening effect. Similar to COVID-19 –a similar supply shock in some ways – we think a strong rebound during one quarter is likely, although the timing and magnitude are uncertain. We think that Q3 is most likely.

The outlook for Q4 2023 will depend on ongoing responses to the energy situation. Germany has embarked on a rapid response to the energy crisis and is in the process of securing floating LNG terminals that can be installed relatively quickly. Optimistically, it hopes to have the first operational by end-2022, but even with some delay there is the prospect for some relief before winter 2023. However, with LNG demand likely to remain high, gas prices should remain elevated which is likely to continue to dampen activity going into next winter.

Beyond 2023, given our ECB rate expectation of the deposit rate at 2%, headline inflation likely remaining above the bank's target, and a neutral-to-slightly tightening fiscal stance, Eurozone growth is expected to remain below potential. ECB President Lagarde repeated again in a recent speech[5] that the ECB Governing Council would consider a persistent energy shortage as a permanent negative supply shock implying more, not fewer hikes, so that "demand remains aligned with supply".

UK gas sufficient barring severe winter

The UK faces a similar issue to the Eurozone, though on a different scale. A cut-off of Russian oil will inflict less direct pain on the economy, but the impacts will still be felt through global prices. The UK is also not as directly exposed to Russian gas as the rest of Europe as there are no physical pipelines connecting the UK and Russia. As shown in Exhibit 9, UK imports from Russia have formed a small part of total gas imports, totalling just 6% in 2021. More recently, the UK has been able to replace Russian LNG with supplies primarily from the US and Qatar.

In the UK, 40% of total domestic gas demand is met by domestic production in the North Sea, with the remainder from imports via pipeline and LNG, comprising 30% piped gas from Norway and 30% from a combination of LNG and gas from the European hub. In the winter, the UK has historically imported cheaper gas from Europe, rather than relatively expensive LNG, the price of which rises with Asian demand. Net imports from Belgium and the Netherlands have historically totalled 5bcm over the last and first quarter of the year (10% of total demand in that period).

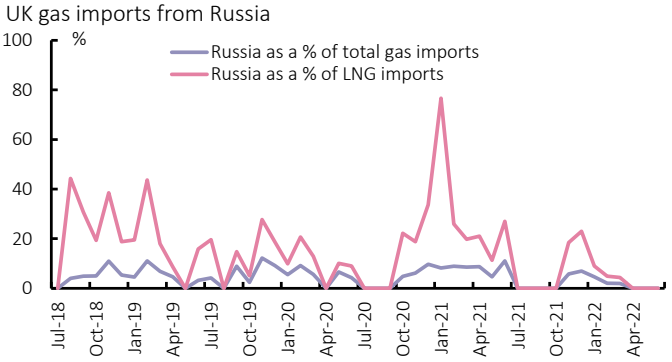
[3] The Economic Impacts on Germany of a Potential Russian Gas Shutoff, IMF, July 2022

[4] Natural Gas in Europe: The Potential Impact of Disruptions to Supply (imf.org)

[5] "Monetary policy in the euro area", ECB, Lagarde, C., 20 Sept 2022

UK consumers have still been exposed to fallout from the crisis given the integration of the UK and European gas networks and similar price movements. Prices in UK and European National Balancing Points (NBP) follow each other closely and both have soared. In August, NBP prices hit 595 pence per therm, around 10 times higher than the 2012-2018 average. So, despite being shielded from direct gas supply interruption, the importance of natural gas for UK energy consumption and production adds to the risks facing the economy. Natural gas and crude oil are important for energy production in the UK with 85% of homes using gas boilers to provide heat[6] and in 2021 around one-third of all electricity generation came from gas[7].

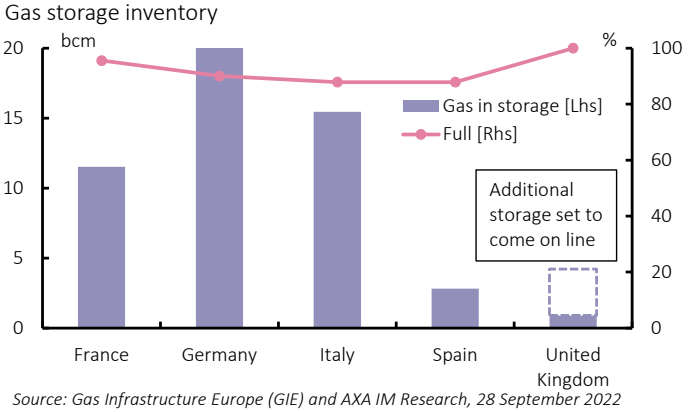
Exhibit 9: Russian gas a small part of UK imports



Source: Department for Business, Energy and Industrial Strategy (BEIS) and AXA IM Research, 28 September 2022

At present, the UK's gas storage capacity is limited to around 3 days' worth although plans have been announced to reopen the rough storage facility by winter, which should increase capacity by around 5bcm, to around 20 days. The decision to hold relatively small reserves reflects significant LNG import facilities – similar to Spain (Exhibit 10). The UK has Europe's second-largest regasification infrastructure, with capacity to convert LNG back to natural gas at a rate of 36bcm per year. As the crisis has intensified, the UK has increased its LNG re-exports to Europe to help fill European storage before the winter.

Exhibit 10: UK storage capacity low, reflecting LNG capacity

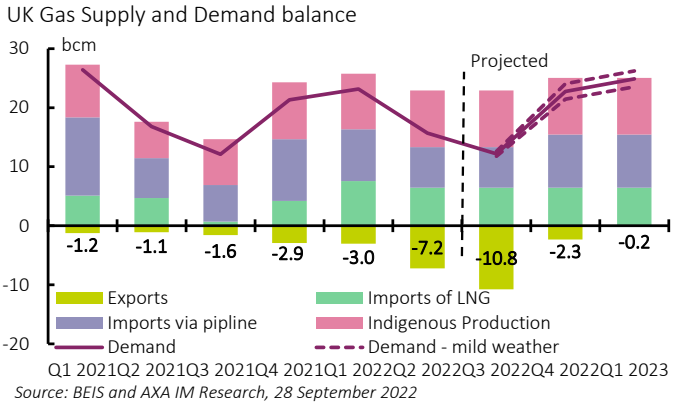


Source: Gas Infrastructure Europe (GIE) and AXA IM Research, 28 September 2022

This process of re-exporting should continue over the warmer months. However, as winter takes hold and domestic demand for gas rises, the UK's regasification infrastructure will be needed to meet domestic demand. Furthermore, government interventions to cap household per unit costs for two years and business costs for at least six months at an equivalent per unit cost will have a material impact on our inflation outlook, but will also dampen demand reduction from higher prices.

Looking at historic gas consumption and assuming the UK can maintain current levels of supply, we estimate UK consumption will soon rise to around the level of supply, all but ending re-exports until next spring (Exhibit 11). Additionally, the severity of the winter will also be important. Historically, when temperatures have been one degree lower than average, gas consumption has averaged 0.5bcm higher per quarter. Our estimates suggest that a cold winter could yet see the UK face a deficit between gas demand and supply, making the reintroduction of UK gas storage even more important.

Exhibit 11: UK gas demand and supply projections



Source: BEIS and AXA IM Research, 28 September 2022

US scope to fill the gap in the medium-term

Amid the risks of European gas supply shortages, the US is the most obvious candidate to step up its natural gas supply to Europe through increased LNG exports. In the immediate aftermath of the Russian invasion, President Joe Biden announced the US would export an additional 15bcm of LNG to Europe this year, increasing this to at least 50bcm by the end of the decade. Exhibit 12 shows that the US has already shipped 20bcm more LNG exports to Europe (the EU and UK) in the first six months of this year. This increase in part reflects lower exports elsewhere, primarily to Asia.

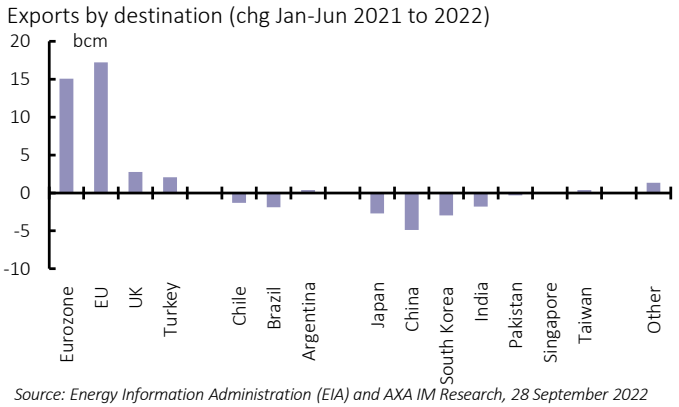
This partial substitution of LNG exports reflects a combination of weaker activity in Asia, coming from higher LNG prices and greater fuel substitution, including increased coal generation in Asia. Looking to the coming years, Asian LNG demand may well

[6] English Housing Survey, Energy_report.pdf (publishing.service.gov.uk) (2014)

[7] UK Energy Brief UK Energy in Brief 2021 (publishing.service.gov.uk) (2021)

revive, not least as the region refocuses on greenhouse gas commitments and other pollutants. The price of LNG will thus in part depend on the US ability to supply additional exports as well as those to Europe. For now, this looks encouraging, at least over the medium term.

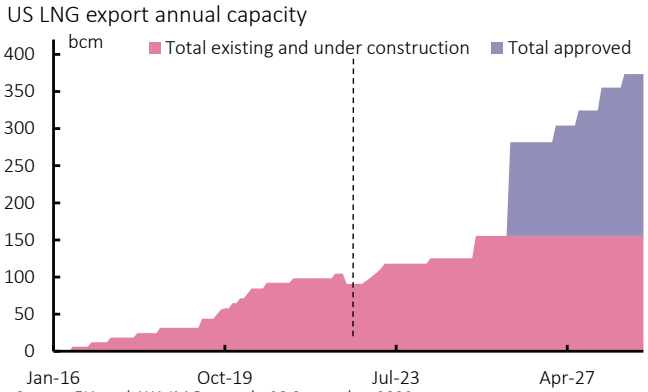
Exhibit 12: Exports to Europe rise as Asian demand softens



Source: Energy Information Administration (EIA) and AXA IM Research, 28 September 2022

Exhibit 13 shows planned US LNG export terminal capacity. This includes existing capacity and that under construction using official estimated completion dates. It also includes additional capacity with planning approval, although this is not yet under construction and so the timing of eventual commissioning is uncertain. Actual export capacity has fallen after an explosion at the Freeport terminal in June. This is expected to resume exports from November and return to full capacity in March 2023, likely limiting US exports over the remainder of this year. The US exported an additional 8.2bcm in the first six months of 2022 compared to 2021. If it continued at this pace, it would have increased exports by some 16bcm for the year as a whole, but this now looks a stretch.

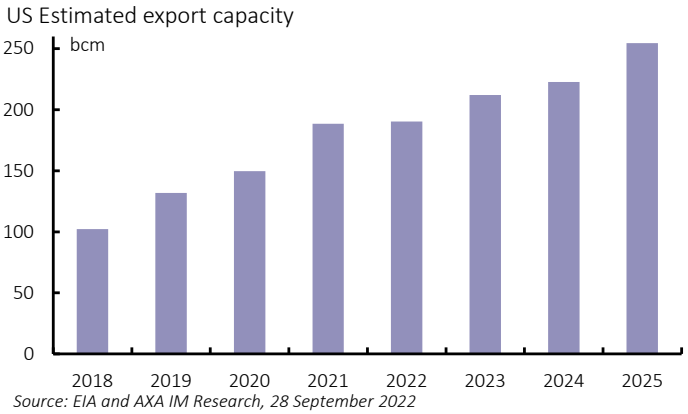
Exhibit 13: Planned US LNG export capacity



Source: EIA and AXA IM Research, 28 September 2022

Exhibit 14 shows estimated total export capacity. Allowing for the Freeport explosion, export capacity is basically unchanged this year. Assuming Freeport returns fully online in 2023, capacity should rise steadily by about 20bcm a year over the coming three years given terminals already under construction. This would provide ongoing scope for US export growth.

Exhibit 14: US export capacity set to steadily rise



Source: EIA and AXA IM Research, 28 September 2022

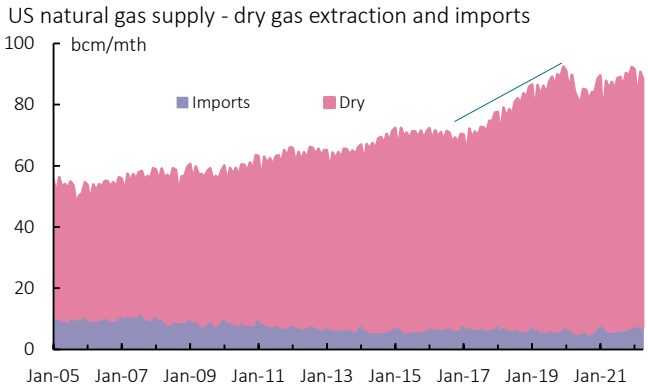
The broader question is whether the US can produce sufficient gas to meet growing export capacity and its domestic energy consumption needs. US domestic natural gas use has been stable in recent years, facilitating export growth. However, over the period 2005 to 2021, gas consumption rose by an average 1.8% per annum. If this continued over the coming years, it would add around 9bcm to US gas demand per annum. However, exports have squeezed domestic natural gas prices so that they have been as high as $9/MMbtu, around the highest levels seen since 2008. Prices at these levels have already led some politicians to call for export bans. Looking ahead, US greenhouse gas (GHG) emission commitments are only likely to add to domestic consumption, contributing to faster growth than since 2005 and increasing competition for exports.

Exhibit 15 illustrates US production of natural gas. Production dipped during the pandemic and is only now broadly back to pre-pandemic levels. Production rose materially between 2017 and 2019. If output could match this pace, average annual gas output could rise by around 130bcm over the coming three years. However, matching that growth rate would likely prove challenging. In the short term, material and labour shortages have limited output increases – something that should ease over the coming years. More uncertainly, political appetite for interstate pipelines has restricted further output, particularly from the established gas fields in the Appalachian basin, including the large Marcellus field. This suggests most production will be focused in the Southeast. However, even here equity investors have been resistant to chase further production growth following the volatility of the past decade.

We do expect gas production to rise over the coming years. The pace of growth looks unlikely to match the peak rate between 2017 and 2019. Nevertheless, even production at one-third of that pace would still produce in the region of an additional 40bcm per year. This would allow for domestic consumption to

increase at double the pace of the previous 17 years and provide nearly 20bcm additional per annum export volumes.

Exhibit 15: US natural gas production



Source: EIA and AXA IM Research, 28 September 2022

While not without uncertainty, the US looks well placed to provide material additional gas exports to Europe and beyond in the medium term and could potentially deliver a more significant increase over the longer term. This would have distinct implications for US productivity and potential growth, while should also have a material impact in boosting export revenues, shrinking the US's current account deficit. We consider this to be a driver of current dollar strength.

Restructuring the global energy complex implies material geopolitical shifts

Russia's invasion of Ukraine provided an immense shock to the global energy market. While the European authorities have acted swiftly to access alternate supplies, both from temporary fossil fuels and longer-term renewable sources, the impact on Europe is going to be large. In part, this will come though eye-wateringly high gas prices which have driven inflation to elevated levels. However, in some instances industry may face quantity constraints as gas is rationed – we have highlighted here how this could affect Germany and some CEE countries in the event of a normal winter and other economies, including Italy and possibly the UK in the event of a more severe winter.

We estimate that the immediate impact of this energy shock is likely to be recession in the Eurozone and the UK, reflecting the combination of gas shortages and the cost-of-living crisis. Energy prices are likely to indirectly contribute to recession in the US, having further elevated inflation and requiring the Federal Reserve to tighten financial conditions aggressively.

In the longer term, the severity of the energy shortage should ease. In the very long term, current elevated energy prices and insecurity are likely to accelerate shifts to renewable forms of energy, delivering sustainable and increasingly secure domestic energy supply to Europe, with, hopefully, additional unanticipated technological advances along the way. Before that, we still expect a merry-go-round of energy supply that will see Russia increasing supply to Asian economies, including China and India, with the US increasing its own natural gas output to increase LNG shipments to Europe. However, this will still likely leave Europe facing higher gas prices over the medium term from the pre-invasion status quo, and higher emissions than otherwise. A debated on the contribution of nuclear power to the EU energy mix needs to open quickly.

In the shorter term, the question is how many tough winters Europe will face. Our estimates suggest that this winter will be one of the toughest in recent decades. An assumed ongoing cessation of Russian gas supply over next year will make it difficult for European countries to go into the following winter with similar levels of gas reserves, making it harder to get through next winter. That said, the rapid reaction from European governments, particularly Germany's swift move to secure LNG import terminals provides some hopes of additional supply over the next year to address this issue and boost supply throughout next winter. Gas prices will remain higher than before the war going into next winter, but it will be a close call as to whether this will be Europe's only year of gas rationing. Next year will also see challenges in terms of oil supply.

Finally, we stress the significant uncertainty in assessing the medium-term outlook. This reflects both the fast pace of structural change targeted by many countries to perform this energy supply transformation, and the underlying geopolitical fragility of the current global environment. The Russian economy looks increasingly vulnerable to the impact of oil embargoes or price caps and the longer-term effect of sanctions. Yet as an expected key energy supplier to Asia, and particularly China, Russia may require increasing support from these economies. The outlook for economic growth over the rest of this decade is likely to rest almost as uncertainly on the shifting tectonic plates of international geopolitical relations as on the restructuring of the global energy supply complex.

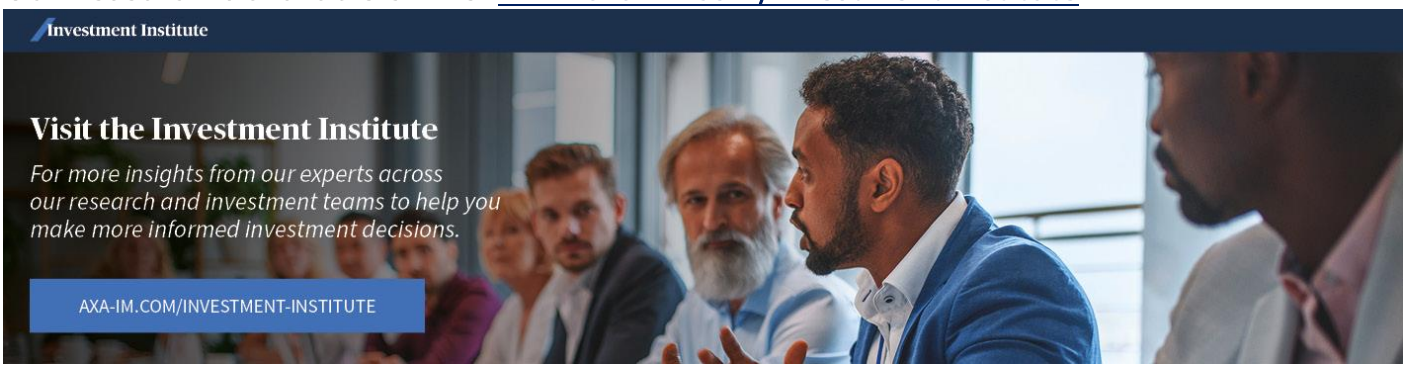
Appendix A

In considering the impact of the energy crisis on European activity we have built a forecast of European gas supply. This is based on the following assumptions:

- Nord Stream 1 will not restart at all. Italy continues to receive gas from Russia through the Ukrainian pipeline, but we assume that these flows can be shut down at any time.
- Non-Russian pipeline gas would continue to run at current (and very close to maximum) capacity. Norway – which now provides something close to 90%-95% of German gas needs – has already said it cannot deliver more gas. Onward gas transfers of Norwegian supply through Belgium and the Netherlands might be possible if those countries have sufficient to send excess to Germany. Assuming some saving in Belgium and the Netherlands, we add incremental supply to Germany.
- The UK is usually a net importer of gas during winter but contributes to fill storage during warmer periods. We assume the UK would be autonomous this winter but send no gas to Belgium nor the Netherlands.
- Algeria has materially reduced gas supply to Spain – a geopolitical response to Spain's support for Morocco's plan for the autonomy of Western Sahara. Algeria has increased its supply to Italy, providing around 40% of its winter needs. Azerbaijan also supplies 20% of Italian volumes. It should also expand, but only from 2027 as it signed a deal with the European Commission (EC) to double imports of natural gas.
- LNG flows have never been so high. However, European LNG imports are constrained by a lack of infrastructure – import terminals in the right place. Germany does not currently have a single LNG import terminal. Spain holds 35% of the Eurozone's import capacity but can only export 10% of its import capacity to the rest of the Eurozone due to pipeline capacity (but this does mean that Spain is not at risk of rationing). As of end of August, France was close to its maximum import capacity while Italy still has some leeway.
- We do not believe rising demand in Asia this winter should limit European import volumes. First, because total LNG export capacity has increased substantially and second, because Asia and in particular China are struggling with weak economic activity, lowering demand for gas. Moreover, LNG is expensive and several countries have already restarted alternative ways of producing electricity, including coal-fired plant.
- European countries have achieved higher levels of gas storage before the winter (86% as of 18 September), above the EC's targets. Although the Nord Stream 1 shutdown complicates the situation for Germany, we believe storage is likely to be close to full before winter. As of 11 September, German gas storage had reached 88% and we pencil in 96% as restrictions allow more storage over the coming weeks. Italy's storage is lower, but gas consumption only usually accelerates here from mid-October.

30 September 2022

Our Research is available online: www.axa-im.com/investment-institute



AXA Investment Managers SA
Tour Majunga – La Défense 9 – 6 place de la Pyramide 92800 Puteaux – France
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