

Can Europe Survive Without Russian Gas? – Part 2

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Introduction

In the autumn of last year, SGI published a paper analysing whether Europe could survive without Russian gas. The conclusion was probably yes, but subject to a very wide range of uncertainty which could tip Europe into a gas supply crisis or even into a period of gas oversupply. With the critical winter heating season finishing, it is an opportunity to revisit this analysis and see which of these uncertainties have been answered and which new ones have arisen. New work has been done analysing in detail how domestic heating demand responded to higher prices – one of the key unknowns when our last report was written. With this new data, we will again assess whether Europe can survive the next two winters with greatly reduced supplies from Russia.

The Size of the Problem

Russia has not cut off flows to Europe entirely and continues to flow small volumes via the Ukrainian and Turkstream routes to the few remaining European countries it wishes to maintain good political relations with. The volume of residual flows was one of the uncertainties of our last report, but over the past 3 months it appears that Russia has been supplying around 5bcm per quarter or 20bcm p.a.

Continuing our analysis of last year, we will again compare Europe's current situation to that of 2021, the last year in which it received significant Russian supply (139bcm). If residual Russian gas flow remains at 20bcmpa, **Europe needs to replace around 120 bcm of Russian gas with alternative sources or reduced gas demand**. This remains a huge volume of gas, equivalent to 25% of European (EU27+UK) 2021 demand. Some help is provided by the gas held in storage in Europe, but in the long-term Europe needs supply or demand responses to make up for this volume. The stakes are high. If Europe fails, it risks ruinous shortages with gas and power rationing. If it succeeds, it deals a humiliating blow to Russia, which will lose a major revenue source.

Analysis of the past 6 months suggests that Europe can survive – but as before, subject to a high degree of uncertainty. Supply and demand responses to the crisis are analysed in the following sections.

Supply Responses

Europe derives its gas supply from Russia, domestic production, LNG imports, Norway, North Africa and Azerbaijan. SGI's estimate of the extra volumes available from each of these sources is shown in the table below and, except for LNG, is unchanged since our previous report¹. By far the most significant source of extra volume, but also the most uncertain and complex, is LNG, which is discussed in detail.

Source	Supply in 2021, bcm	Possible Additional Supply, bcmpa	Comments
Domestic Production	84	-5	Production had been slowly declining as fields mature and some governments discouraged new investment. It will take time to turn this around. Compared to 2021, Groningen production will be 5bcm lower.
Norway (pipeline)	113	5	
North Africa	34	0	2021 production was already a big increase on previous years; unlikely that Algeria has the potential to produce more.
Azerbaijan	7	8	Announced an increase in supply to 15bcm pa in early 2022.
LNG	94	60	Discussed in detail below
Total		~ 70 bcm	

¹ Source: SGI Analysis, Eurostat, ENTSOG

The LNG Component of the Supply Response

LNG is a global market, in which producers in the US, Middle East, West Africa and Southeast Asia/Australia supply customers in South Asia, East Asia, Latin America, the Middle East and Europe. Most LNG sales are on long term contracts between producers and large (mostly Asian) utilities, but in recent years a significant spot market has arisen, whose volumes are routed to whichever country is able to pay the highest price. Historically, Asian and other non-European customers could offer suppliers better prices for spot volumes than those available on the European gas markets, and most spot volumes went to Asia. Growth in Asia – in particular South Asia and China – drove growth in LNG sales. This traditional market structure changed when Covid-related demand reductions in Asia coincided with a wave of new LNG investment in 2020 and large volumes of unsold LNG were routed to Europe. In early 2021, growth returned to Asia and pulled some volumes out of Europe, but at the end of 2021 and in 2022, prices in Europe finally rose to a level at which Europe outcompeted the rest of the world. As a result of high prices (and for China, its zero covid policy), demand growth in South and Southeast Asia stalled, whilst Chinese LNG imports declined for only the second time in history. As prices rose, the LNG market price at which Asian demand began to fall was around 25\$/MMbtu (85 €/MWh or 220p/Therm). The increase in LNG flow to Europe resulting from these changes was around 60bcm increased supply in 2022 – this number is slightly higher than SGI has previously estimated, due to stronger than expected global LNG production and weaker Asian demand.

Spot LNG prices are now falling, along with TTF, and **the key question for 2023 and beyond will be whether the fall in LNG prices stimulates extra Asian demand to reduce the flows to Europe**. So far, the demand response in Asia to lower prices has been rather muted; some opportunistic buyers have emerged in South Asia and China but not enough to reduce LNG flows to Europe – yet.

The flow of LNG to Europe is highly uncertain and variable, since it is the difference between two large numbers – total LNG production and demand in non-EU markets, especially Asia. Small changes in either number can have a disproportionate effect on Europe's LNG supply. The fragility of the flow of LNG to Europe is shown by the impact of the accident at the Freeport export facility in the USA in June 2022. This removed just over 1mt per month of LNG from the market, and European imports in July and August fell by almost exactly the same amount. These volumes are only now just starting to return to the market.

Demand Responses

European gas demand can be split into:

Residential – space heating for homes. Demand can be saved by reducing heating temperatures or by improved insulation.

Commercial – Usage by small businesses. Some of this is for space heating, and some is consumed in processes like cooking.

Industrial – use of gas by large customers in industrial processes (e.g. the chemicals, fertiliser or metals industries).

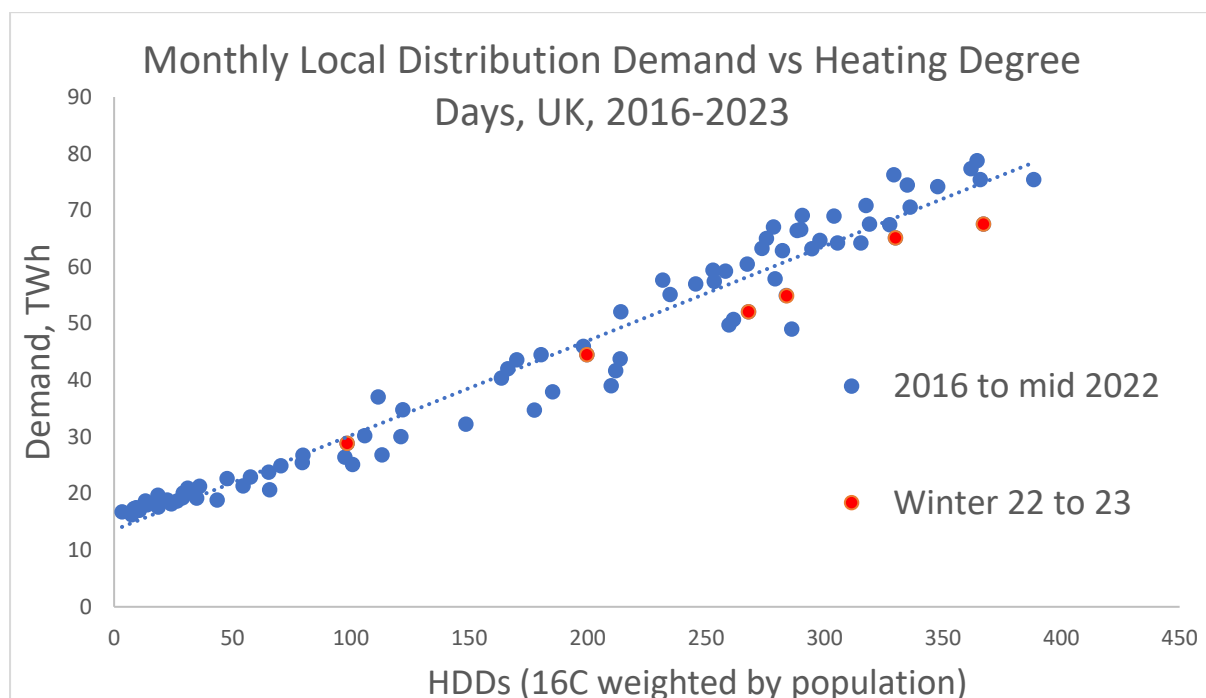
Power Generation – Use of gas for production of electricity in competition with other fuels.

SGI has analysed gas consumption in 2022 to see how demand has changed in each of these sectors – as a response to high prices, the weather, or changes in the power industry.

Residential (space heating)

The residential sector is one of the largest consumers of gas, and demand is highly seasonal and strongly dependent upon winter temperatures. By analysing historically how demand in this segment has varied with temperature, SGI calculates that a 1°C reduction in winter temperatures leads to a 10bcm increase in gas demand and vice versa². Demand would also be expected to respond to the historically high prices European households have had to pay.

The heating season 2022/3 is now almost over, and overall, there was a substantial reduction in gas demand in this sector. Now that temperature data for Q1 has been published, SGI has analysed how much of this demand reduction was driven by milder than normal temperatures and how much by other factors (presumably, price) in most of Europe's largest gas markets. The graph below shows the results for the UK as a plot of gas demand via local distribution networks (which corresponds to demand in the residential and commercial sectors) and temperature.



The winter of 2022/3 was slightly milder than average (a milder Q4 2022 and average Q1 2023), but gas demand was greatly reduced. The results are striking; even after correcting for temperature, local distribution demand was around 10% down in all the markets analysed (UK, France, Netherlands, Italy). Some of this demand was from reduced consumption in the commercial sector; after factoring this in, **SGI calculates that temperature-adjusted residential demand decreased by around 8%**. Extrapolating this across the entire European market would result in a decrease of 10bcm, similar to the number assumed in our earlier paper.

The key question going forward is whether European consumers will continue to cut back on gas consumption for heating even after their domestic prices have decreased.

² The IEA has quoted a similar number

Industry and Commercial

SGI sees no reason to update its earlier analysis suggesting that industrial gas demand would drop by around 12%, resulting in a 25 bcmpa reduction in demand compared to 2021 due to high gas prices.

A key question going forward is whether industrial gas demand will recover as wholesale gas prices fall; SGI assumed that most of this reduction will be permanent as gas intensive industries have closed or found energy efficiency measures.

Power

This sector has the biggest potential for changes in gas demand but is also the most complex. Fossil fuel generation is used to balance the market after generation from nuclear and renewables have been despatched. Gas and coal then compete for the share of the market available to fossil fuels. This competition used to be a key factor helping to balance the European gas market, but this “coal to gas switching” has become much less important in recent years as much coal capacity in western Europe has been phased out. Much of the remaining coal capacity is in areas where competition with gas is limited – like eastern Europe.

The above means that the demand for gas-fired generation is set by the total demand for power, minus generation from other power sources. Changes in any of these other parameters affects the demand for gas. In 2022, these changes have meant that despite the high cost of gas, usage of gas in the power sector even increased in some countries due to high total power generation (extreme heat in Southern Europe), low generation from hydro (drought) and nuclear power outages (technical problems and scheduled decommissioning).

In future years, gas demand will be determined by a complex interplay of the same factors. The table³ below shows SGI’s forecast for each of them.

Source	Possible Change TWh pa	Impact on Gas fired power Demand TWh	Comments (Differences Relative to 2021)
Total Power Demand drop due to price	-80 (2%)	-80	Power demand dropped around 3% over 2022 as compared to 2021, with a particularly large drop in Q4 (8%), some of which was weather related.
Wind + Solar capacity additions	+110 (p.a. cumulative)	-110 (p.a. cumulative)	Assumes capacity additions continue at same average rate as 2012-2021; Cumulative impact from 2021, 2023 impact is 2x110 = 220TWh
Nuclear	-120	+120	Balance of changes in French, German and Belgian nuclear generation.
Decreased used of coal fired capacity	+20	-20	Analysis by SGI of current increase in major markets
Total Change in Gas Generation		-200 TWh (for 2023 vs 2021)	Equivalent to 20bcm of gas, this number increases by 10bcm p.a. as more renewable capacity is built

³ SGI analysis based on data from ENTSOe and Ember

Supply and Demand Responses Combined

The combination of supply and demand responses results in around 70 bcm of additional supply and 50bcm of reduced demand, roughly equal to the reduction in Russian gas flow. In future years, gas demand will continue to decline by around 10bcm every year, as additional renewable power capacity is added. **The biggest contributions to securing energy supply come from increased LNG supply, and energy conservation (both of gas and electricity). However, since these are both price-dependent, there is great uncertainty around them as gas prices fall.**

Item		Increase in Supply or Decrease in Demand 2023 vs 2021, bcm p.a.	Comments
Supply	Non-LNG Supply	8	Norway, Azerbaijan
	LNG	60	Assumes European prices continue to outcompete Asian marginal demand
Demand	Residential	10	Reduced Heating/energy saving, assuming average temperatures
	Industry/Commercial	20	Demand Destruction
	Power Gen.	20	See table above
Total		~120	

Uncertainties

The above estimates are subject to a great deal of uncertainty, since the European gas, European electricity and global LNG markets have all entered unfamiliar territory and no one can be certain how they will respond to the current market stresses. **In particular, it is not known how much gas and power demand in the industrial, commercial and residential sectors will recover as prices fall.**

These new uncertainties must be considered together with a traditional one – the weather. Cold weather in Europe increases gas demand for heating and in Asia increases demand for LNG. Wind speeds influence the power generation from wind, and rainfall that from hydro. The importance of weather is increasing as more and more of Europe’s power is generated by renewables. A table⁴ showing the key uncertainties that could affect Europe’s gas balance is shown below.

The uncertainty range is huge and easily sufficient to transform a forecast of adequate supply into a reality of either physical shortage or oversupply. Europe has survived its first winter without Russian gas in a good state but must still survive two more winters - 2023/4 and 2024/5 - of tight supply before a new wave of LNG investments rebalances the global gas market. It is quite possible that in at least one of these winters these uncertainties will evolve unfavourably, causing gas shortages.

⁴ Source: SGI Analysis based on data from ENTSOe, ENTSG, IGU inter al.

Analysis of Major Uncertainties Affecting European Gas Balances		
Uncertainty (and its Cause)	Potential Impact on p.a. Gas Demand (delta to base case)	Comments
Weather: Cold/Warm Winter in Europe	+/- 20bcm	Based on historical variability of heating demand
Weather: Variability of Renewable Energy Production due to wind, rain or sun	+/- 12bcm	Based on historical variability
Weather: Cold/warm Winter in Asia	+/- 10bcm	Based on historical variability, results in less LNG for Europe
Price: Domestic Gas for Heating	- 10bcm	Savings in domestic gas consumption might be reversed as prices fall
Price: Power demand	- 8bcm	Power demand returns to historical levels as prices fall
Price: Asian LNG demand growth resumes, despite high prices	-60 bcm	A key uncertainty – will Asian demand respond to falling prices?
Other: Russia completely stops gas supply to Europe	-20bcm	Russia may gamble on shutting off supply completely
Other: Average LNG plant operating factors fall 2%	-10 bcm	In 2022 and so far in 2023 existing LNG plants have, on average, been operating strongly. A fall to early 2021 rates would reduce global LNG output by around 2%.
Total Range: -150bcm to +40 bcm		

Europe's Limited Storage Capacity

As seen in the table above, many external factors can greatly influence gas balances on the European gas market. Ideally, Europe would be able to store any excess of gas supply arising from a favourable combination of these factors in one period in order to mitigate the impact of less favourable conditions in the future.

However, Europe's total storage capacity for gas of around 100bcm is insufficient for this purpose. Supply and demand for gas in Europe will become more volatile as Europe's dependence on LNG and renewable energy increases. At the same, two of the key factors that used to help balance European supply and demand – gas to coal switching in the power sector and variations in Russian gas flows – have now almost completely ceased to operate. Gas storage withdrawals/additions are left as the only major mechanism for balancing the gas market.

On SGI's base case assumptions, European gas capacity will completely fill in the summer of 2023; excess gas, which could have been used to meet future supply crises, cannot be stored. Europe will then have to survive the next two winters with only slightly more gas in storage than it had in the summer of 2022, leaving it vulnerable if the uncertainties described in the previous section turn out negatively.

Conclusions

At the end of the winter of 2022/3, Europe finds itself in a much better position than expected due to gas demand destruction, continuing high imports of LNG, and a mild Q4 2022.

Europe still needs to survive two more winters of reduced Russian gas supply before large new LNG projects rebalance the global gas market. Although on SGI's base case assumptions, supply and demand responses are sufficient to replace Russian gas supply, there is still considerable uncertainty:

- The demand destruction seen in Europe and the global LNG market may go into reverse as gas prices weaken.
- Many external factors such as the weather, Asian LNG demand and global LNG production rates influence the global gas balance. The cumulative impact of these factors is easily enough to cause gas shortages or oversupply.
- Europe's gas storage capacity is small compared to the swings in gas supply and demand that can be expected in the future. This means that possible excess supply in the summer of 2023 cannot be stored to reduce the risk of supply problems in future winters.