

# Crisis in the Middle East: How would global gas markets cope if Iran closes the Strait of Hormuz?

November 2023



# Agenda

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<b>I. Executive summary</b>	<b>3</b>
<b>II. Background</b>	<b>4</b>
<b>III. Key assumptions</b>	<b>8</b>
<b>IV. Market impact</b>	<b>10</b>
1. Global supply response	
2. Global demand response	
3. European gas storage response	
<b>V. Key Takeaways</b>	<b>13</b>

# Executive Summary

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This strategic insight report investigates the global gas market consequences of a temporary Iranian blockade of the Strait of Hormuz, halting shipments of all LNG out of the Persian Gulf.

## Background

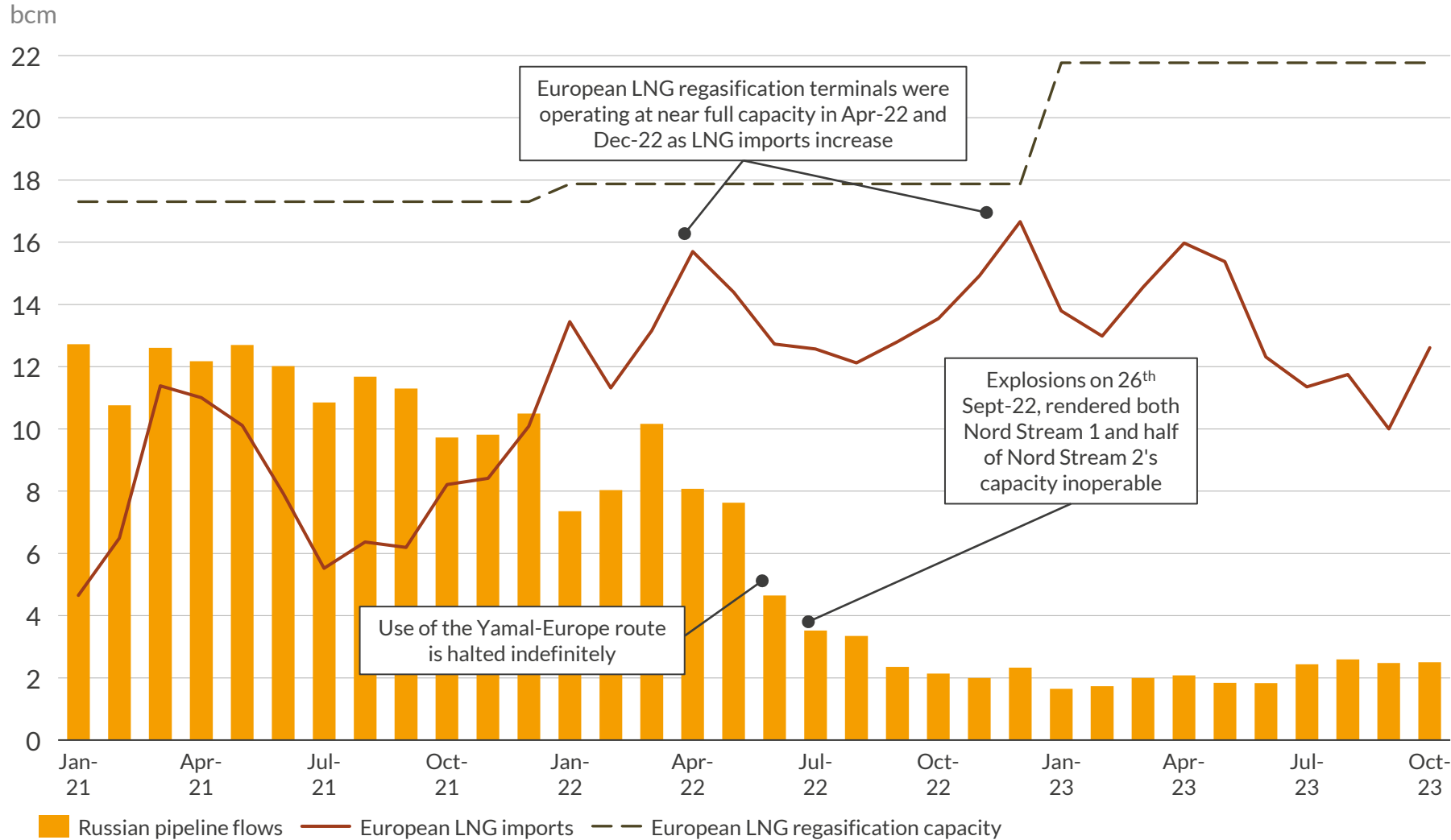
- Russia's invasion of Ukraine and subsequent cuts to natural gas flows from Russia to Europe have increased Europe's reliance on a shared global pool of LNG and removed a significant volume of gas from global markets.
- Likewise, EU sanctions and retaliatory regulations have cut Europe's direct reliance on Russian crude oil and refined oil products, shifting trade flows and straining oil supply chains.
- As a result, while global markets have mostly managed to avoid significant gas shortages, it has become increasingly difficult to replace additional supply. This has increased vulnerability to supply-side shocks and required more flexibility from historically less price-sensitive demand.
- Supply-side disruptions, such as strikes at Australian LNG export facilities earlier this year or unplanned extensions to Norwegian maintenance, have had an outsized impact on prices, driving gas prices in Europe higher in order to attract cargoes away from other destinations.
- Very little new gas production or LNG export capacity is expected to come online in the next year, meaning that cuts to a significant share of global supply would require demand to fall, either in reaction to a price increase or because of a lack of sufficient fuel.

## Strait of Hormuz Blockade

- The start of the Israeli-Palestinian conflict in October resulted in cuts to Israeli gas production but these cuts have already ended, and the war has otherwise not affected oil and gas flows significantly. However, an escalation of the conflict throughout the region could put a significant share of the world's global hydrocarbon supply at risk of disruption.
- This escalation could manifest in several different ways, but one of the most extreme would be an Iranian blockade of the Strait of Hormuz – an action which has been threatened in the past. While this scenario is highly unlikely to occur, it would cut world markets off from all Qatari and Emirati LNG, which together account for 22% of all LNG.
- This insight report investigates the risks and consequences of such an extreme scenario and its impact on natural gas flows and demand in the coming months.

# Global gas markets are already tight following the Russia-Ukraine war and Europe's increased reliance on global LNG cargos

Sources of European gas supply<sup>1</sup>



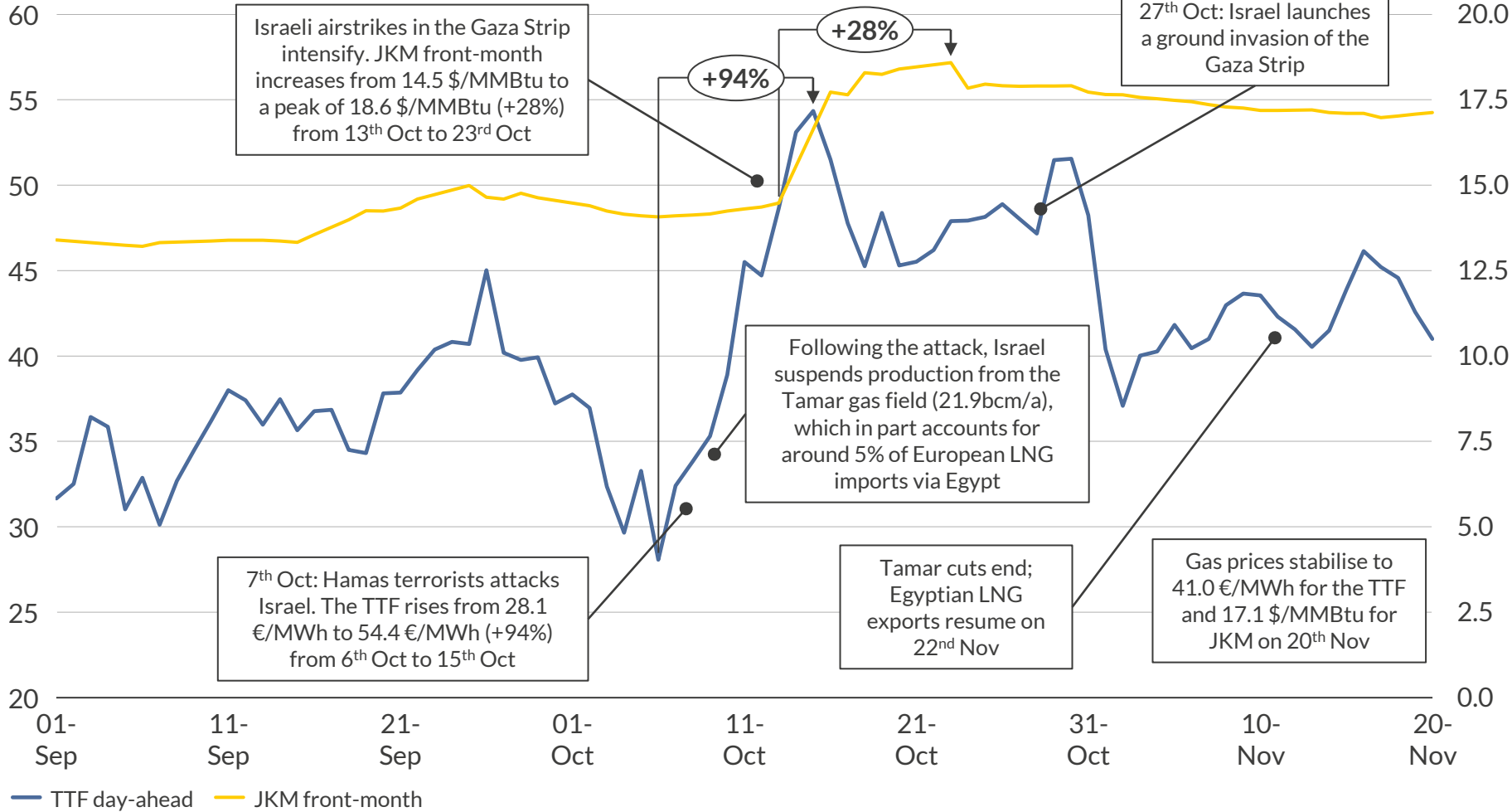
1) Includes EU-27, the UK, and Switzerland.

- Following the loss of Yamal-Europe route in May-22 and Nord Stream 1 and 2 pipelines in Sept-22, Europe lost around 120bcm/a in Russian pipeline gas, increasing European reliance on global LNG cargos from 20% of supply in Sept-21 to 35% in Sept-23.
- Europe has successfully replaced some of this Russian gas with increased pipeline gas imports from other sources and LNG, but this has also reduced the availability of LNG cargos for other markets.
- Little new liquefaction capacity has come online to meet this rise in demand, increasing competition for the same pool of LNG cargos.
- This has made global gas markets more vulnerable to supply-side shocks, and global gas prices have climbed as a result.

# European and Asian gas prices jumped sharply following the Hamas attack and Israeli retaliation but have now stabilised

Traded TTF day-ahead  
€/MWh nominal

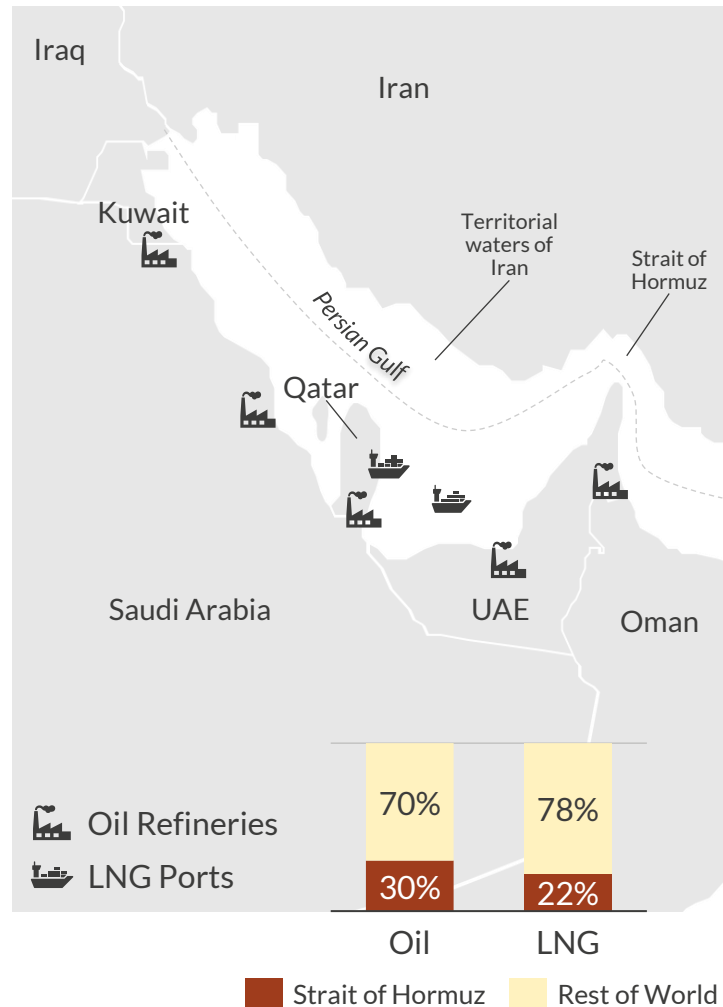
Traded JKM front-month  
\$/MMBtu nominal



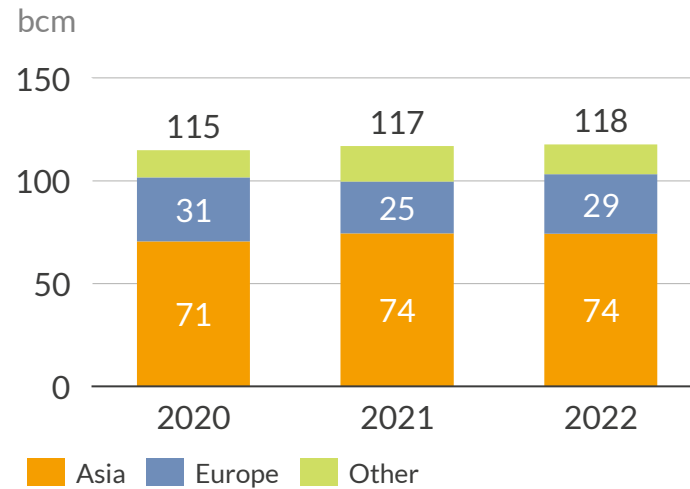
- Gas prices reacted strongly to the Hamas attack, on concerns over the loss of Egyptian LNG exports to Europe and the risks posed by a wider conflict in the Middle East.
- Political analysts have warned of the potential escalation of conflict across the region, including the involvement of Iranian proxy groups, such as Hezbollah in Lebanon and the Houthi movement in Yemen, and the US.
- Gas prices have largely stabilised in Nov-23 but remain elevated since the start of the conflict (+12% for the TTF on 20th Nov and +23% for JKM compared to average prices in Sept-23), as uncertainty remains over the potential supply risk that would be introduced with a wider war in the Middle East.

# The Strait of Hormuz is a critical route for oil and LNG shipping, through which a large share of the world's oil and gas passes

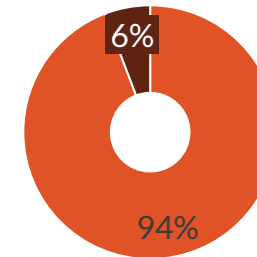
Map of the Strait of Hormuz



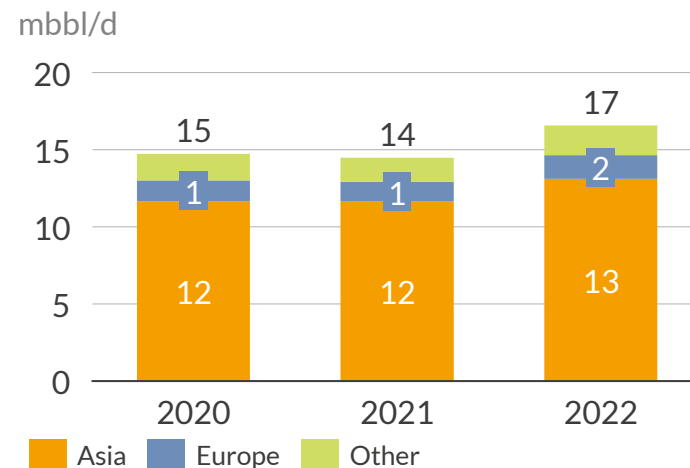
LNG destinations from the Strait of Hormuz



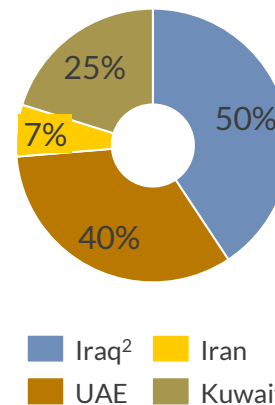
Suppliers in 2022



Oil destinations from the Strait of Hormuz<sup>1</sup>



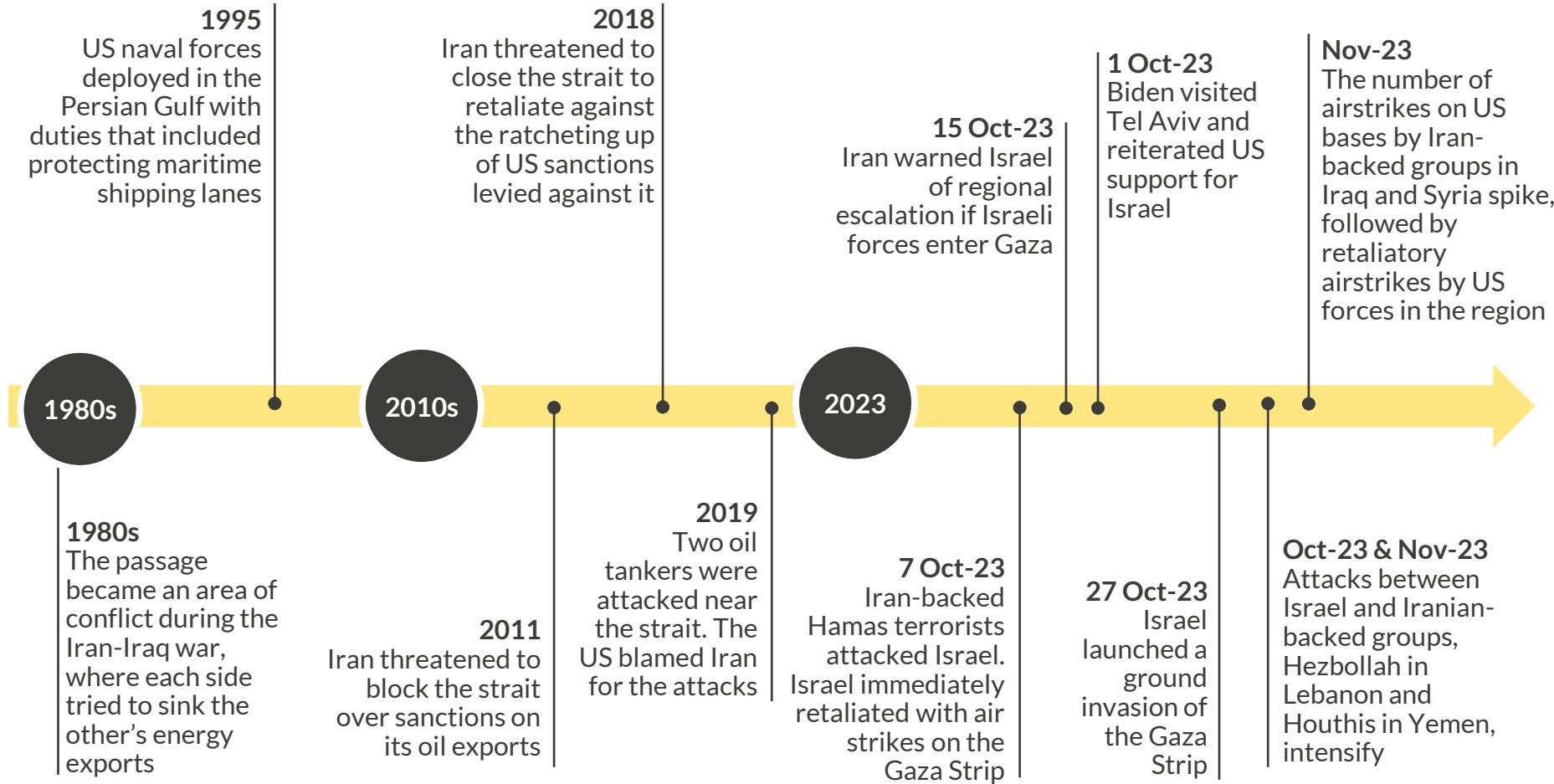
Suppliers in 2022



- The Strait of Hormuz provides the only sea passage from the Persian Gulf to the Indian Ocean. The route is critical to global energy security, with 30% of all crude oil and 22% of all LNG passing through the strait. Many other goods are traded via this route, making it one of the world's busiest shipping lanes.
- The 33km-wide passage is split between the territorial waters of Oman and Iran.
- Iran has threatened to block access through the strait in the past during periods of high regional tension and conflict.
- Only the UAE and Saudi Arabia have access to the oil pipelines that can circumvent the strait, but these pipelines have limited capacity of 6.8mbbl/d.
- Therefore, the water way is one of the top vulnerabilities within the global energy supply chain.

1) Includes crude oil pipeline flows from UAE and Saudi Arabia. 2) Includes Kirkuk.

# Iran's threats to close the strait remain key leverage against international rivals, but a blockade would lead to global backlash



- The Strait of Hormuz is governed by international maritime law, which guarantees right-of-transit passage for all vessels. However, its unlawful closure by Iran is possible via naval guerrilla warfare.
- Any attempt by Iran to blockade the strait would likely elicit a military response from the US and its allies, which would lift such a blockade over time.
- Moreover, a blockade would harm Iranian-Chinese relations, which are currently cooperative and of strategic importance, as China is reliant on Persian Gulf oil and LNG.
- However, impeding shipping in the strait would give Iran leverage against more powerful military powers, such as the US, and regional rivals. The threats are used as a form of deterrence against Israeli or US strikes and US sanctions.

# Aurora has modelled a scenario in which the Strait of Hormuz is closed from Dec-23, blocking all LNG exports from the Persian Gulf

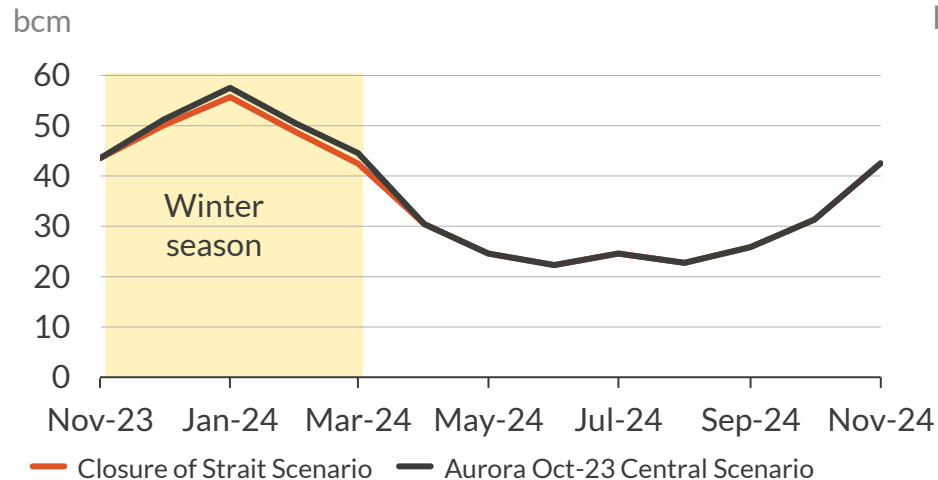
Assumptions	Description
The Strait of Hormuz is closed in Dec-23 by Iran	<ul style="list-style-type: none"> <li>Most assumptions are maintained from <a href="#">Aurora's Oct-23 Central scenario</a>, with minor updates to the timeline of LNG liquification terminal buildout, which is the reference case for this insight report.</li> <li>The Strait of Hormuz is closed from Dec-23 for 12 months, blocking all Qatari and UAE LNG exports. Although the strait would not likely be blocked this long, the assumption allows the scenario to depict the limiting case over an extended period.</li> </ul>
LNG flows do not fall below their 'no closure' value until Mar-24	<ul style="list-style-type: none"> <li>LNG flows from one country to another do not fall below Central volumes initially to simulate the likely response of governments to hold onto existing LNG cargoes in the event of a crisis. In reality, a crisis would induce producers to breach flexible off-take contracts and some shippers to redirect their LNG cargoes to send supply towards the most profitable markets, similar to actions taken during the peak of the energy crisis in late 2022. However, this would take several months to translate to a significant change in physical flows.</li> </ul>
Demand destruction in response to the supply shock until Mar-24	<ul style="list-style-type: none"> <li><b>Power and industrial demand elasticity:</b> A demand elasticity was introduced based on behaviour observed during the Russia-Ukraine war to simulate the crisis response of governments and other market players to the supply shock. This response varies by region, to reflect the difference observed during the Russia-Ukraine war, with some regions more likely to absorb shortages in supply or respond more quickly to price changes.           <ul style="list-style-type: none"> <li>No elasticity was introduced to household and small business demand, in order to reflect a delayed response to price spikes and the potential introduction of regulatory measures designed to protect small consumers.</li> <li>Demand response is assumed to be stronger in Pakistan and India compared to Europe and NE Asia, as the willingness to pay is lower. <b>Pakistan and India:</b> power and industrial demand fall 15% compared to Aurora's Oct-23 Central scenario from Dec-23 to Mar-24. <b>Europe<sup>1</sup> and NE Asia<sup>2</sup>:</b> power and industrial demand fall 5% compared to Aurora's Oct-23 Central scenario from Dec-23 to Mar-24. This response includes the impact of a nationwide policy for electricity conservation, such as Japan's "Setsuden" ("save electricity") policy, implemented during the 2011 Fukushima nuclear incident, which reduced electricity demand by 5% y-o-y.</li> <li><b>Japan and Germany gas-to-coal switching:</b> High gas prices during to the closure would encouraging gas-to-coal switching, where possible. This scenario assumes coal power generation is fully utilised in Germany and Japan. Available coal-fired generation capacity is based on maximum historical monthly power generation from coal since Jan-22, to account for grid constraints and disused facilities. The equivalent reduction in gas feedstock to a CCGT is calculated assuming a thermal efficiency of 51%.</li> </ul> </li> </ul>

1) Include EU-27, the UK, and Switzerland. 2) Includes Japan, Taiwan, China, and South Korea.

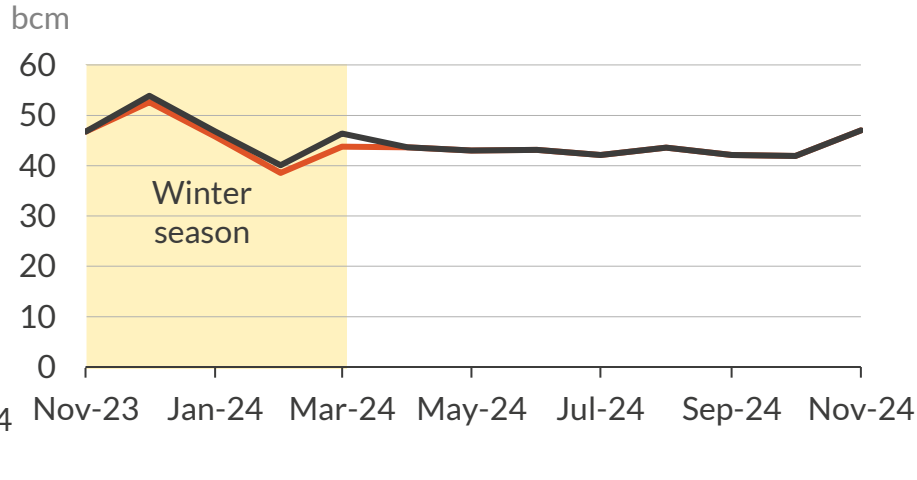


# Key assumptions deep-dive: demand reduction measures

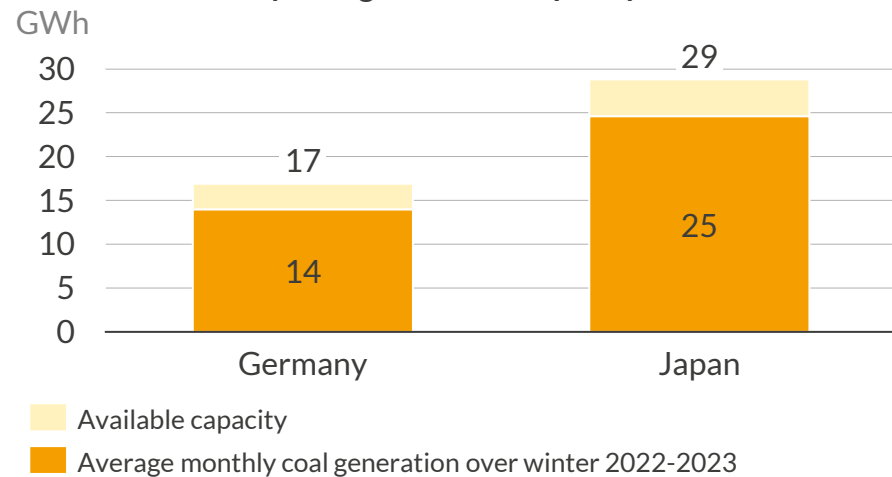
Gas demand in Europe<sup>1</sup>



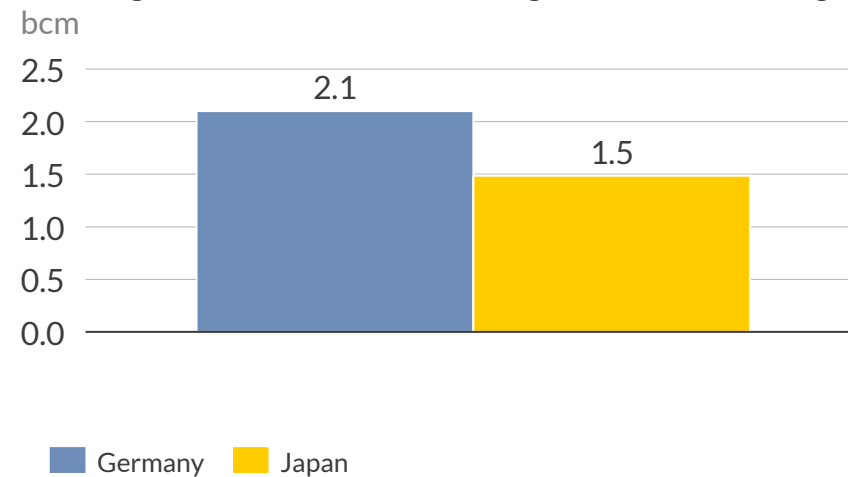
Gas demand in NE Asia<sup>2</sup>



Maximum monthly coal generation capacity<sup>3</sup>



Winter gas demand reduction from gas-to-coal switching<sup>4</sup>

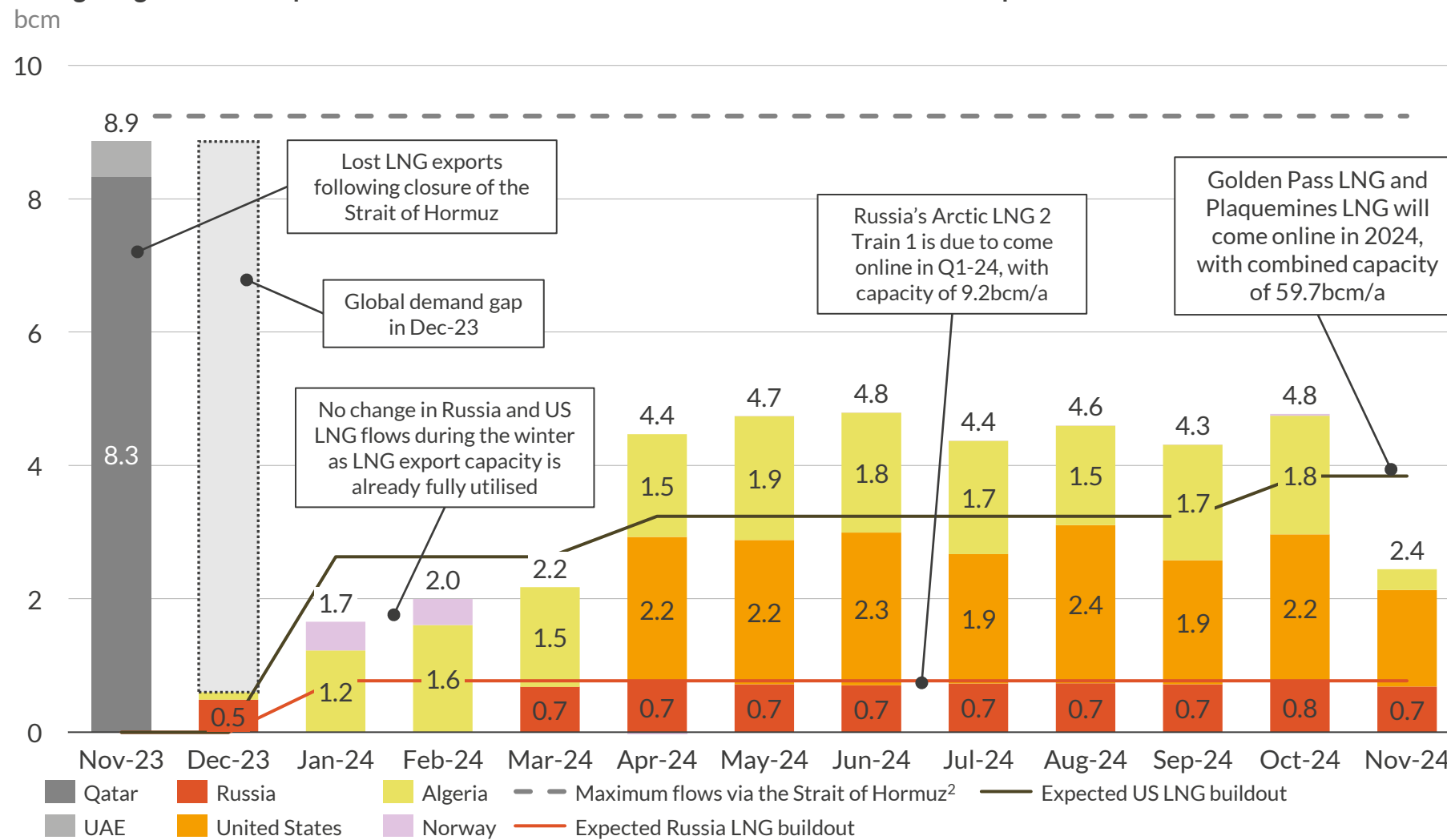


- Gas demand in both markets are of similar magnitude in winter. Demand destruction accounts for 6.4bcm of gas for Europe and 6.4bcm for NE Asia.
- Germany's capacity for gas-to-coal switching is the focus of this scenario, as it is the largest in Europe, although other European countries also have additional capacity.
- Japan's coal generation capacity is double the size of Germany's but, due to higher utilisation of coal-fired power stations in Japan, there is less unused capacity to switch to from gas. Switching to coal would result in maximum power-sector gas demand savings of 1.5bcm for Japan in Dec-23 to Mar-24, and 2.1bcm for Germany.
- There is nuclear capacity buildout of 1.6GW in Japan over 2024 which would ease pressure on gas generation, although the effect is limited.

1) Include EU-27, the UK, and Switzerland. 2) Includes Japan, Taiwan, China, and South Korea. 3) Taken as the maximum historical power generation from coal from Jan-22. 4) Calculated as the reduction in gas feedstock to a CCGT with a thermal efficiency of 51% if available coal generation capacity is fully utilised, reported as total volume from Dec-23 to Mar-24.

# Supply increases from Russia, the US, and Algeria would help offset the loss of Qatari LNG, but significant demand cuts are still needed

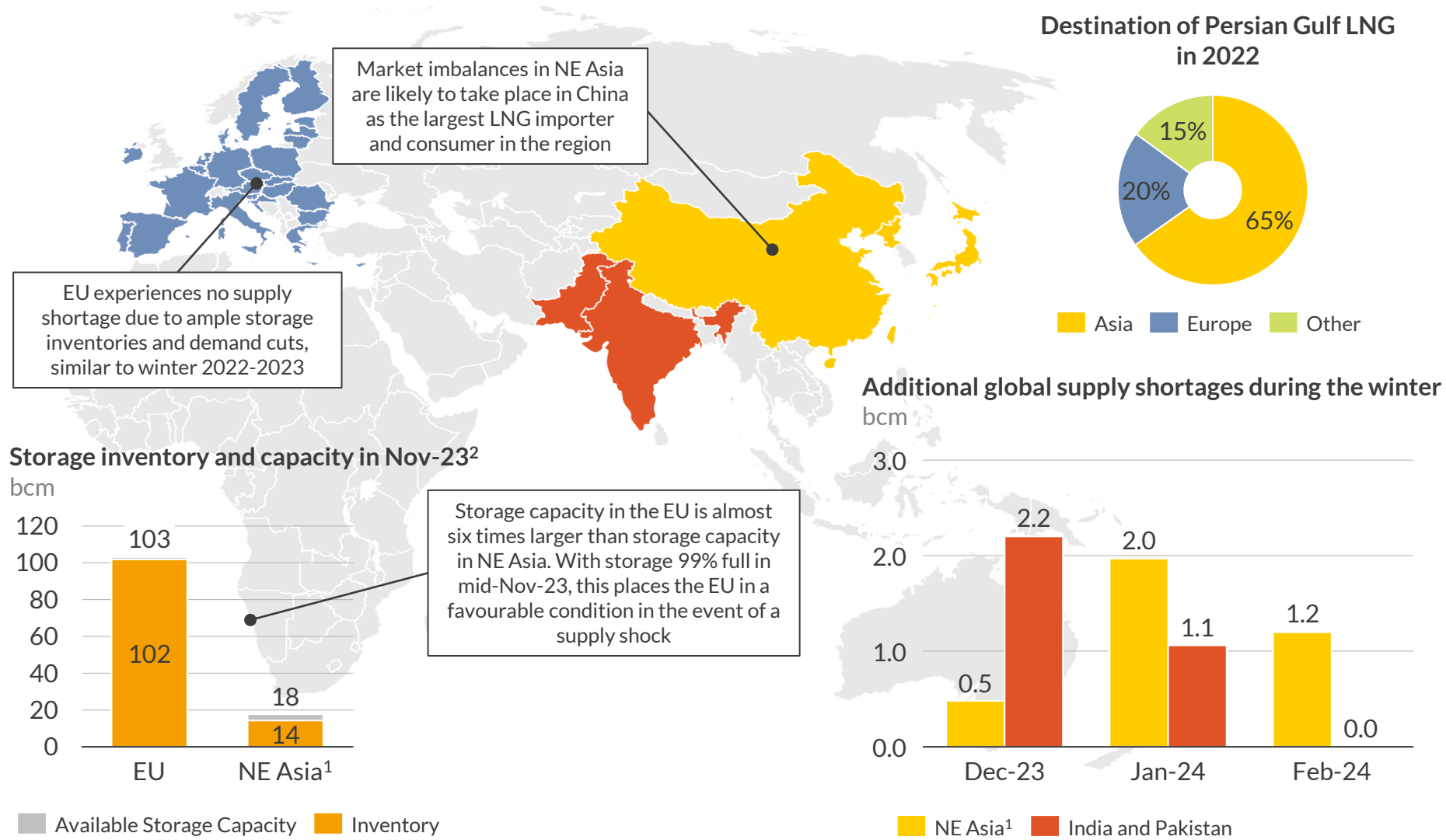
Change of global LNG exports relative to a scenario where the Strait of Hormuz is left open<sup>1</sup>



- Closure of the strait would cost Qatar and the UAE a loss of up to \$55.4bn<sup>3</sup> in gas revenue over the year.
- Full utilisation of unused capacity at existing and new US and Russian LNG terminals would bring additional supply to market during the summer compared with a 'no closure' scenario.
- The high gas price environment would make Algerian and Norwegian LNG more price competitive, encouraging higher LNG exports from these regions in 2024.
- However, there is limited global supply capacity available to compensate for the loss of Qatari LNG, and a significant supply shortage would still take place, resulting in a need for gas demand cuts globally.

1) US and Russian LNG buildout reflects currently expected start-up dates. 2) Taken from monthly historical data within 2023. 3) Reported in base year 2023, using Aurora Central forecasts for average TTF and JKM over 2024.

# Despite demand reduction measures, some regions still experience global supply shortages, especially in South Asia

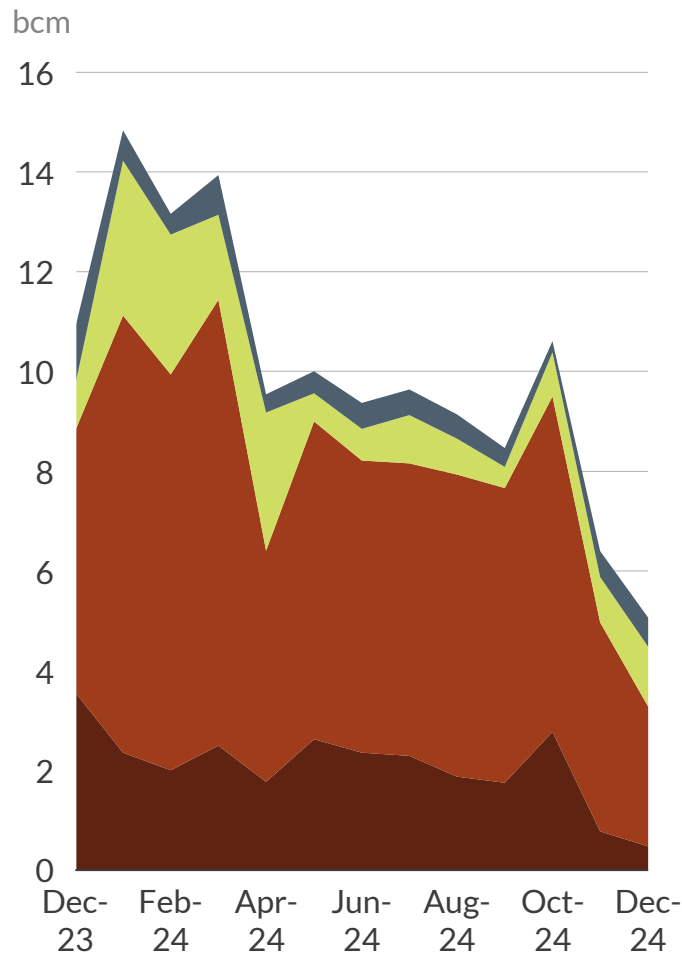


- Emerging economies India and Pakistan disproportionately experience the consequences of a global gas shortage, as LNG shipments are diverted those willing to pay more, such as European markets.
- More than a quarter of Pakistan’s gas demand is supplied by LNG. Pakistan could face nation-wide blackouts, like in 2022-2023, when the TTF reached 305 €/MWh. India’s power market is mostly reliant on domestic coal production, but other sectors still experience gas shortfalls.
- In addition to demand reduction measures already taken, market imbalances still occur in NE Asia due to its significant reliance on Qatari LNG (37%), unless more extreme energy-restriction policies are taken.

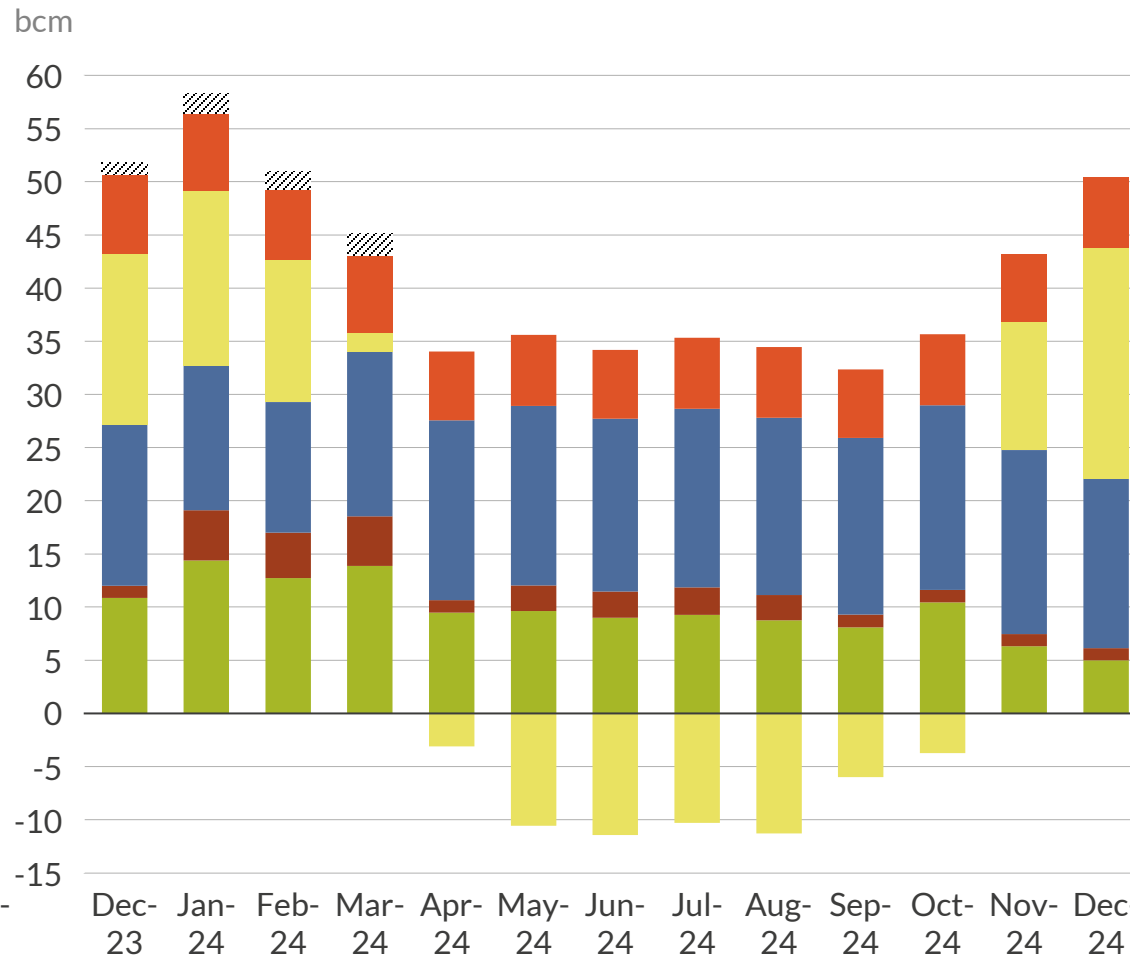
1) Includes Japan, Taiwan, China, and South Korea. 2) Underground gas storage capacity only, exclude LNG storage.

# Refilling gas storage will cost Europe €30bn-60bn in the event of a Hormuz closure, up to twice the cost compared to a 'no closure' world

LNG imports into Europe by source<sup>1</sup>



European balance<sup>1</sup>



Legend for LNG imports: Africa (dark brown), US (red), Russia (light green), Other (dark blue).

Legend for European balance: LNG imports (green), Pipeline imports (blue), Production (red), Russian Pipeline Imports (dark red), Storage (yellow), Demand reduction from Central (hatched).

1) Includes EU-27, the UK, and Switzerland. 2) High TTF price bound taken as the current EU natural gas price cap. Low TTF price bound taken as the exit price based on demand reduction measures. 3) High TTF price bound taken as the exit price based on demand reduction measures. Low TTF price taken from Aurora Central forecast, assuming the strait is reopened in summer.

- In 2022, 18% of European LNG imports came from the Strait of Hormuz, an average of 2.4bcm per month.
- As it would be unknown when the blockage ends, stocks are depleted to 50% by the end of the 2024 withdrawal season to conserve inventories for the following winter.
- Following the strait closure, TTF prices average about 95-180 €/MWh<sup>2</sup> over the rest of winter (Dec-23 to Mar-24).
- In the event of a prolonged strait closure, Europe would face a high cost to refill storages in summer 2024. Following the initial price shock, the TTF could rise as high as 95 €/MWh<sup>3</sup> in summer or be as low as 50 €/MWh if the strait were to reopen, costing €30bn-60bn to refill storage inventories, compared to €29bn in a 'no closure' scenario.

## Key takeaways



The Strait of Hormuz is a key transit route for oil and gas markets, through which flows 30% of the world's oil and 22% of its LNG. Although unlikely, Iran has threatened to block the Strait of Hormuz in the past during periods of high geopolitical tension. With the ongoing conflict between Israel and Iran-backed Hamas, further escalation could encourage Iran to blockade the strait.



Aurora's 'Closure of Strait' scenario investigates the behaviour of global LNG trade networks and key markets, specifically the EU and Asia, if the Strait of Hormuz were to close from Dec-23, removing 8.9bcm/month of LNG from global supply.



Closure of the Strait would cause significant economic harm to Qatar and the UAE due to the loss of \$55.4bn in gas revenues. Expected LNG liquification buildout in the US and Russia helps to compensate for the supply shock, as well as higher exports from Algeria and Norway over the winter. However, significant demand gaps still exist and most of the burden would fall on emerging economics, such as India and Pakistan, which are more exposed to LNG from the Persian Gulf and have lower willingness to pay for gas than Europe and Japan.



High storage capacity and inventories and lower direct exposure to Qatari LNG compared to northeast Asia means that Europe would have enough gas to pass through winter 2023-24, provided timely and coordinated demand reduction measures are taken. TTF prices would average 95-180 €/MWh during the rest of winter, and it could cost Europe €30bn-60bn to refill storage sites next summer, up to twice the cost compared to a 'no closure' world.

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## Details and disclaimer

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### Publication

How would global gas markets cope if Iran closes the Strait of Hormuz?

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