



# LNG – Headed for an Uncertain Future

By Deepika Lal

The year 2022 changed the global gas and LNG markets in many ways. The trigger point was Russia’s invasion of Ukraine in February 2022 following which Russia, which hitherto supplied 40 percent of Europe’s LNG demand, slashed its pipeline gas shipments to the European Union. This dropped to around 17% by August 2022. As a result, EU buyers panicked and purchased record volumes of LNG from elsewhere to replace lost Russian supplies; LNG imports by European countries were up by 60% in 2022. The sudden threat to global energy security led the world to respond in different ways and

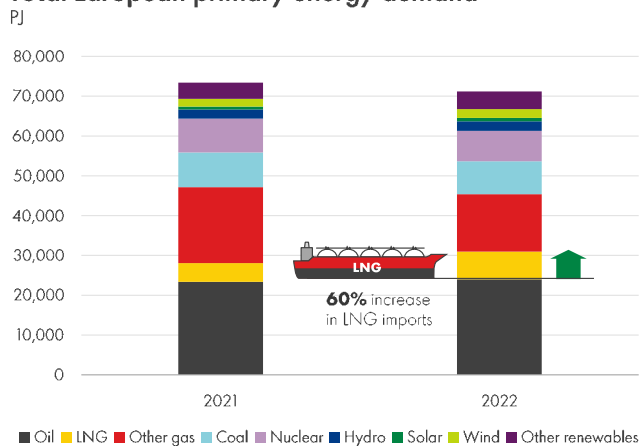
initiated many different trends in the global LNG markets.

## *LNG - From an economic option to a costly affair*

In response to Europe’s red-hot demand, global gas and LNG spot prices shot to record levels and squeezed the volumes available to developing economies.

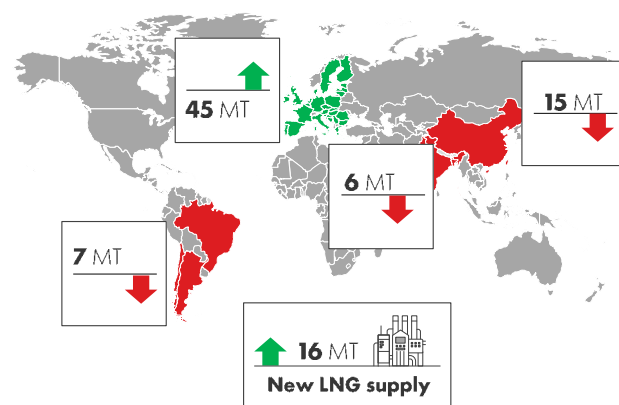
Of course, high prices and supply disruptions have consequences. Accordingly, in many Asian nations, LNG has now acquired a reputation as a costly and unreliable fuel. South Asia, including

**Total European primary energy demand**



Source: Shell interpretation of Kpler, Wood Mackenzie 2022 data  
Europe – EU 35 (includes Turkey & UK) \* YoY year on year

**Changes in global LNG trade 2022\***

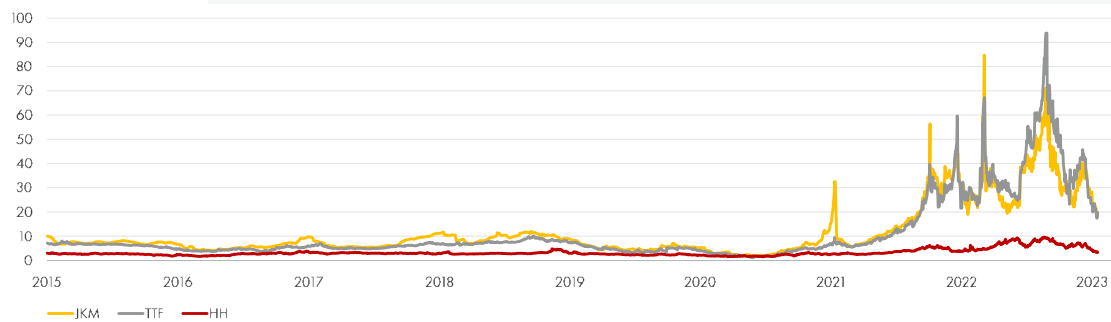


## Global gas prices \$/MMBtu

JKM, the premium gas marker, prices seasonally increase through winter but do not exceed \$12/MMBtu. TTF provides a floor.

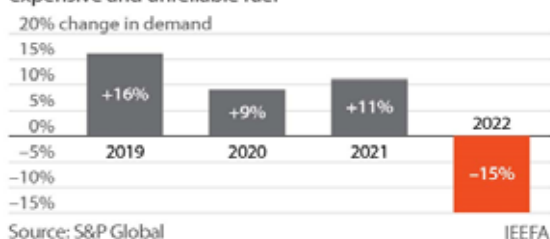
Gas demand declines sharply during pandemic resulting in global prices converging with both TTF and JKM dipping below HH.

Global gas prices rise to record levels through H2 2021; extreme volatility remains through 2022 as Russia curtails pipeline gas supplies.



Source: Shell interpretation of ICC, CMC, S&P Global Commodity Insights 2022 & 2023 data  
TTF: Transfer Title Facility; HH: Henry Hub; JKM: Japan Korea Marker; NBP: National Balancing Point

## Emerging Asia's LNG Demand Fell 15% in 2022 In key growth markets, LNG has earned a reputation as an expensive and unreliable fuel



India, Pakistan and Bangladesh, slashed LNG purchases by 16% last year. Many buyers in the region withdrew from spot markets altogether, and suppliers under long-term contracts often defaulted on cargo deliveries to obtain higher profits in other markets. Proposed LNG import projects in the region now face increased delay and cancellation risks.

China too cut its purchases of LNG by 20% last year, due to a combination of high prices, COVID-19 shutdowns, and slower economic growth. Prolonged high LNG prices have encouraged the country to rely more heavily on lower-cost Russian pipeline imports and domestic gas production, putting downward pressure on the country's LNG demand growth. Rising concerns over fuel supply security and affordability of LNG have downgraded the prospects for LNG demand growth in the region.

### *New US LNG supply saves Europe*

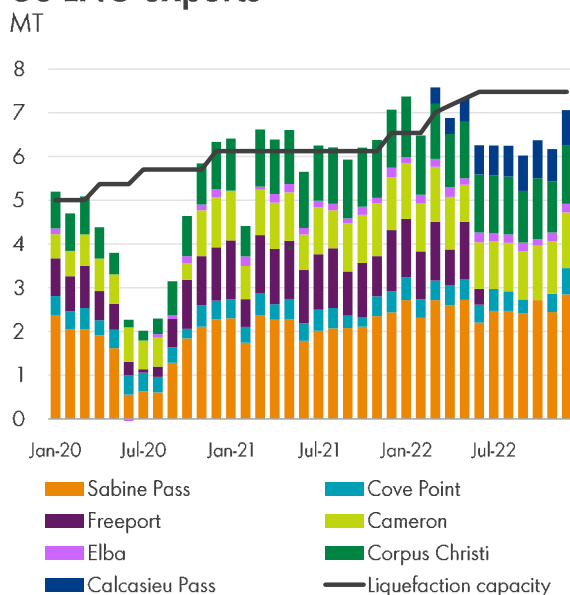
New US LNG supply supported Europe's need for LNG. LNG imports increased in Europe in 2022 and the gas inventories reached an all-time high in December driven by more US LNG inflows helped by its increased liquefaction capacity and

Though Asian LNG prices have significantly fallen from record highs; average LNG price for May 2023 delivery into northeast Asia was \$12.50 per mmBtu and for June delivery was \$11.5 per mmBtu as against peak of \$70.50/mmBtu in August 2022. Prices below \$13/mmBtu continue to deter China, which remains quiet and on the sidelines with opportunistic bids, while healthy storage in Japan and Korea continue to keep that all important end-user demand at bay. Europe is still a favourable destination for cargoes, despite a series of strikes in France that have reduced the country's LNG imports by around one million tonnes in March, as cargoes have been diverted to neighbouring terminals.

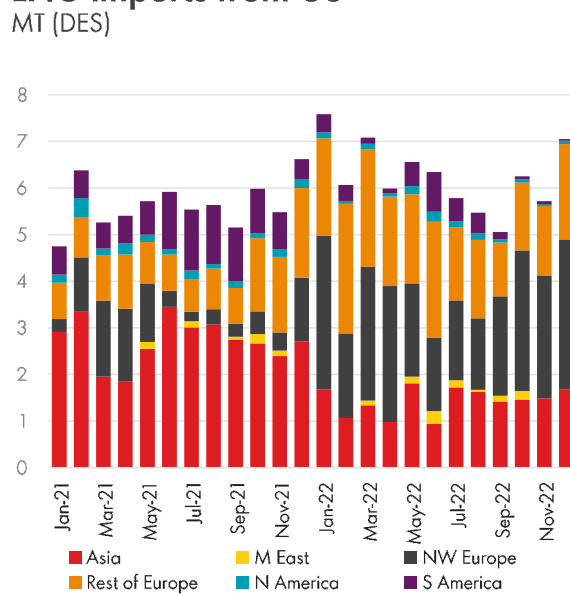
### LNG Output as Share of Rated Capacity, Selected Projects

	2020	2021	2022
Prelude FLNG (Australia)	6%	59%	36%
Darwin LNG (Australia)	84%	87%	39%
Egyptian LNG	22%	55%	42%
Arzew-Skikda (Algeria)	44%	49%	42%
Freeport LNG (U.S.)	69%	93%	43%
Kribi FLNG (Cameroon)	54%	50%	55%
Stavanger LNG (Norway)	93%	61%	66%
Hammerfest LNG (Norway)	71%	0%	67%
Brunei LNG	84%	77%	68%
Angola LNG	95%	77%	68%
Nigeria LNG	97%	80%	68%
Atlantic LNG	89%	56%	68%
Gladstone LNG (Australia)	70%	73%	71%
Peru LNG	90%	59%	79%
Bontang LNG (Indonesia)	80%	84%	82%
Ichthys LNG (Australia)	96%	91%	86%
Malaysia LNG	83%	81%	87%

### US LNG exports



### LNG imports from US



adding up of extra regasification capacity in Europe to handle additional LNG. As a result, LNG trade flows reversed in 2022 with the largest import growth seen in Europe and the biggest drop in Asia and South America.

#### *LNG supply projects face reliability and feedstock challenges*

Predictable LNG supplies rely on existing projects operating predictably. Yet in recent years, the global LNG industry has had a checkered track record in keeping plants operating and LNG flowing. Even though the red-hot prices in 2022 made LNG production more lucrative than ever, global LNG capacity utilisation — actual LNG output as a share of total production capacity — barely budged compared to prior years.

While some LNG plants met or even exceeded output targets last year, a number of high-profile LNG projects around the world saw production plummet. The 15 mtpa Freeport LNG project in the U.S. was one of the highest profile underperformers, after a June explosion spurred regulators to shut the plant until significant safety concerns could be addressed. Shell’s floating Prelude LNG plant off the Australian coast also underperformed. Prelude’s disappointing track record raises the possibility that the project may never produce as much LNG as designed. Norway’s 4.3 mtpa Hammerfest project was also offline during 2022

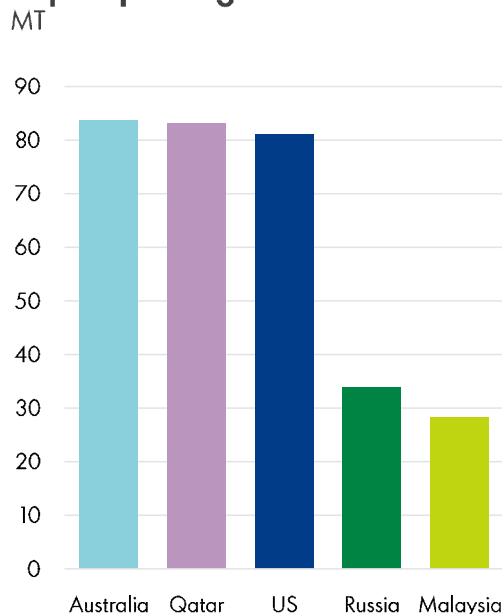
for some time, after a fire. Apart from these, over a dozen projects struggled in 2022, with LNG production falling far short of nameplate capacity. Maintenance problems, performance issues, and declining yields from the gas fields feeding LNG plants have all played a role in keeping LNG production low at the plants.

In addition to reliability challenges, many LNG projects are struggling with declining production from the gas projects that feed them. This problem is particularly acute in Australia as the massive 16.9 mtpa NW Shelf project is in decline as the gas fields that supply it deplete. Same is the case with other projects such as Santos’ Gladstone LNG (GLNG) plant and Darwin LNG plant that face gas supply challenges.

#### *Slower short term supply growth backed by little new LNG supplies*

Australia continued to lead the world in LNG exports in 2022 with almost 84 million metric tonnes (mt) shipped from 10 projects. However, going forward, the country is expected to see muted supply growth for the next several years. That is because it has only one major LNG supply project, the 5 mtpa expansion of Pluto LNG, scheduled to come online in 2026 and which is currently under construction. The existing NW Shelf gas project and Darwin LNG face feedstock declines unless they can secure additional supplies. Qatar, the top

## Top exporting countries



second global LNG exporter, also exported 83 mt of LNG last year. But in terms of additional supplies, its ongoing Northfield East LNG project, consisting of four massive trains with a combined 32 mtpa of liquefaction capacity, can enter service not before 2026. However, once this project comes onstream, it is projected to have the lowest costs which could turn the country into globe’s lowest-cost LNG producer.

However, this may be followed by the largest supply additions in the history of the LNG industry, driven primarily by new projects in the U.S and Qatar thereafter, according to experts, because so many governments want to have their own facilities to ensure they have security of supply. This could create the potential for an extended supply glut and a return to the low global prices. There are seven industrial-scale LNG plants already operating in the US with capacity totalling more than 92 mtpa and two multi-billion dollar final investment decisions announced on major US LNG export projects in March 2023 alone. As new supply floods the market, today’s tight markets may give

Five new export-scale LNG projects are expected to come online over the next two years, adding a scant 5.8 million metric tons per annum (mtpa) of liquefaction capacity in 2023 and 9.1 mtpa in 2024:

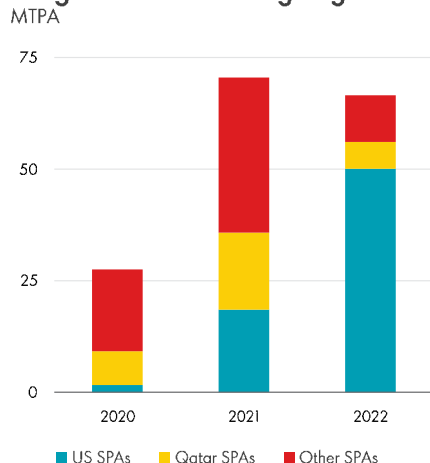
- Train 3 of BP’s Tangguh LNG project in Indonesia is expected to be online in November 2023, adding 3.8 mtpa of liquefaction capacity.
- Eni expects its 0.6 mtpa Tango LNG terminal to enter service in late 2023.
- New Fortress Energy has told investors that its Altamira “Fast LNG” project in Mexico could begin operating in 2023, adding 1.4 mtpa of capacity.
- The 2.5 mtpa Greater Tortue Ahmeyim (GTA) LNG project off the coast of Mauritania and Senegal was previously slated to enter service in 2023 but has been delayed until 2024.
- Russia’s Arctic LNG 2 project may be able to bring one 6.6 mtpa train online over the next two years, but the fleet of specialized ice-class LNG carriers being built for the project will not be delivered until 2024 at the earliest.

The five projects will boost global LNG production capacity by just 3% over two years, from roughly 456 mtpa to 471 mtpa—the slowest pace of global LNG supply growth since 2014. The projects span the globe, including the U.S. Gulf Coast, Qatar, Australia, Canada, Nigeria, Mexico, Mozambique, and Russia.

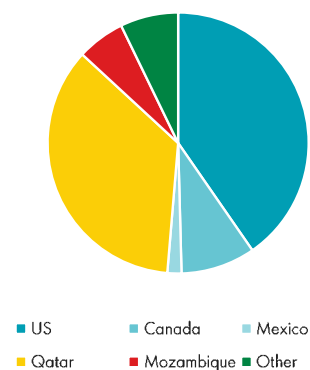
way to a supply glut, with lower-than-anticipated prices, smaller netbacks, tighter margins, and lower profits for LNG exporters.

However, since US LNG projects draw from

## Long-term LNG SPA signings



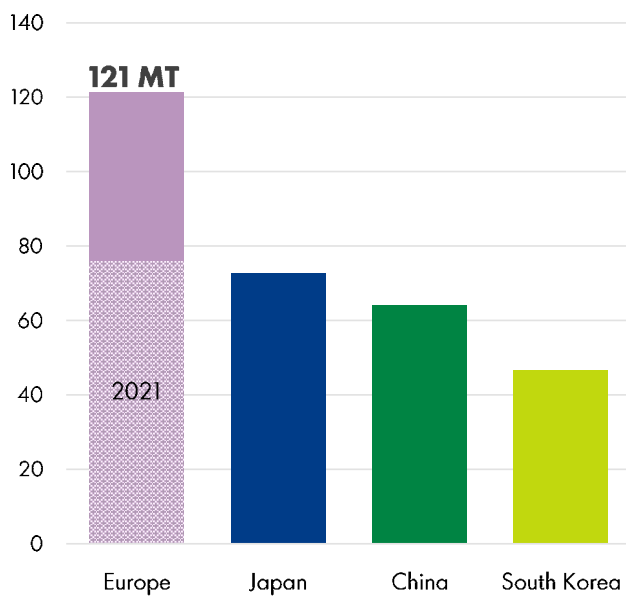
## LNG supply growth 2025 - 2030



Source: Shell interpretation of Wood Mackenzie and S&P Global Commodity Insights 2022 data  
SPA: Sales and Purchase Agreement, does not include Heads of Agreement or Memoranda of Understanding

the same gas pipeline and supply network that supplies the majority of domestic gas buyers, the rapid growth of US gas exports during 2022 tightened domestic natural gas markets, pushing US benchmark gas prices to their highest levels in more than a decade and creating financial hardships for household gas consumers and gas-dependent industries.

## Top LNG importers in 2022 (MT)

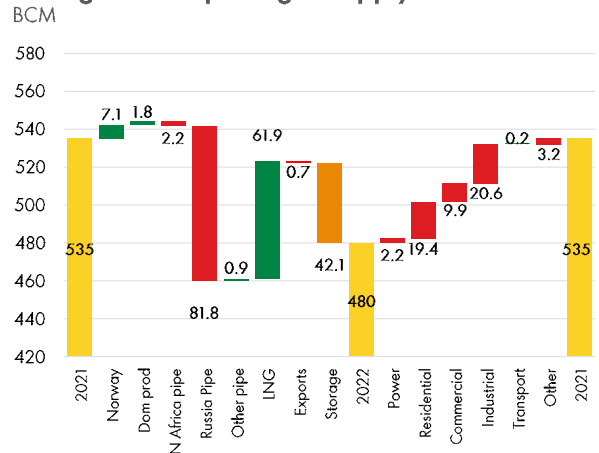


### *Increased gas demand in Europe – a combination of various factors*

To ensure energy security, governments across the world intervened with policies to protect consumers from high energy prices. European policy makers prioritised LNG imports, resulting in quick build out of import infrastructure. Other levers that helped support Europe’s energy balance were fuel switching and gas demand destruction, choices which come with tough mid and long term consequences, particularly on emissions such as Germany fired up its coal plants to meet the energy gap.

Weather played an important role in Europe’s energy supply in 2022. In the first six months of 2022, hydroelectric generation was down almost 30% in France, and down more than one-third in Italy and the Iberian Peninsula. During the summer months, France was forced to reduce output of its nuclear power stations on the Rhône and Garonne

## Change in European gas supply & demand



ivers as hot weather raised temperatures in the river waters which was used to cool reactors. These events may have increased Europe’s reliance on gas-fired power. Yet particularly mild weather had also reduced gas demand for heating in buildings and homes in late 2022.

Other factors have affected gas consumption, as well. Along with water temperature concerns, France experienced extended nuclear outages due to maintenance issues, forcing the continent to rely more heavily on alternative power sources, including gas-fired generation. Meanwhile, a price cap that applies exclusively to gas for power generation in Spain and Portugal — the so-called “Iberian exception” — contributed to increase in gas-to-power generation.

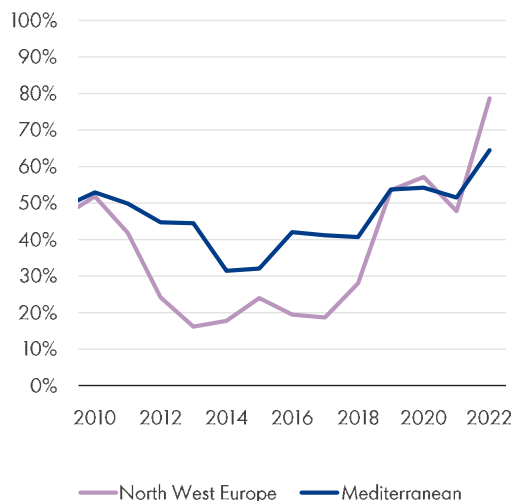
### *Europe’s regasification capacity to increase*

But at the same time, the continent’s regasification capacity is set to increase, with much of the new capacity coming from newly-chartered floating storage and regasification terminals. There are 32 LNG projects that are either under construction or in the planning stage around Europe (with certain facilities claiming they will be able to transport hydrogen by the end of the decade). These facilities are set to be added to the 31 operational LNG import terminals that currently exist in Europe. However, total import capacity may not be an accurate proxy for LNG demand since gas transmission system operators (TSOs) in Europe are incentivised to overbuild infrastructure and expand their regulated



## LNG capacity utilisation in Europe

Terminal use



## New European regasification capacity

MT



Source: Shell interpretation of Wood Mackenzie 2022 data  
Picture courtesy EemsEnergy Terminal

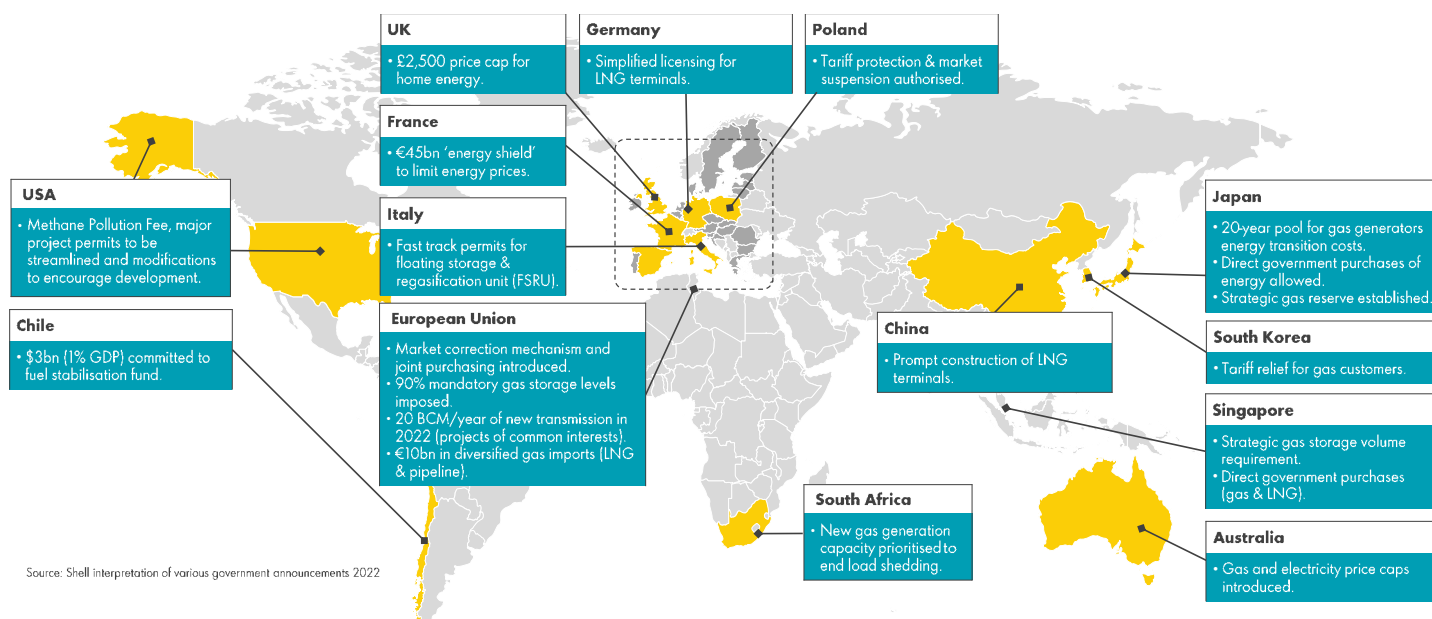
asset base to increase shareholder returns, even if they remain unused.

### Energy transition - Structural shift in the European gas market

Though Europe's LNG buying frenzy to replace lost pipeline imports from Russia is likely to continue in short term, there is a structural shift in the European energy market arising from legally binding emissions reduction targets, policy

measures to ensure energy security and gas demand destruction stemming from high prices. This shift has triggered the momentum of Europe's energy transition, dramatically increasing the penetration of technologies that displace gas and LNG, such as heat pumps, solar thermal, renewable power, battery storage, demand response, buildings insulation, and other energy efficiency upgrades. National and regional plans could bring cost reductions and economies of scale to alternative

## Immediate policy actions in 2022 to manage energy security and high energy prices



Source: Shell interpretation of various government announcements 2022



technologies faster than expected. All these could translate into a sizeable decrease in gas demand in the long term. The cues can be felt in policy strategies being adopted by the continent.

For example, the European Union’s RePowerEU plan, brought out in May 2022, encouraged EU member states to increase energy savings and clean energy with more aggressive targets, access to funding, streamlined permitting for renewables, and other new regulations. Since then, multiple announcements could lead to reduced demand for gas and LNG in the long term, including:

- **Bans of gas boilers:** At least 11 countries have already announced bans or restrictions for fossil heating that will take full effect before 2027.
- **Growth of heat pumps:** Preliminary figures suggest 3 million heat pumps (replacing LNG) were sold in Europe in 2022, double the number sold in 2019.
- **Growth of solar power:** In the EU, 41.4 gigawatts (GW) of new solar PV capacity was connected to electricity grids in 2022, a 47% increase from 2021. The industry expects the growth to continue, breaking 50 GW this year and reaching 85 GW in 2026.
- **Growth of demand response:** In the UK, the National Grid successfully activated its demand flexibility service, which pays residential customers to cut electricity consumption during peak hours.

### *Other key growth markets trim LNG exposure*

Global inventories of LNG have increased in past few months of 2023 driven by weaker demand for LNG from the three biggest LNG importers in the world: China, Japan, and South Korea due to high LNG prices. Governments in these markets which were widely accepted as the key growth regions for LNG have announced new policies designed to limit dependence on global gas imports. Let’s look at them one by one.

Japan, South Korea, and Taiwan: The East Asian markets

of Japan, South Korea, and Taiwan have historically been among the largest LNG importers globally, with demand typically underpinned by long-term, oil-indexed contracts. All three countries have scarce domestic gas resources and together accounted for over 40% of global LNG traded from 2015 to 2022.

However, in both Japan and South Korea, high LNG prices have rekindled interest in restarting nuclear plants, trimming long-term LNG contract exposure, and shifting power targets away from LNG. They are also boosting wind and solar power generation to achieve energy security, economic growth and decarbonisation goals and their LNG purchases may reduce because of their changed emphasis.

**Japan** aims to reduce the share of LNG in the national electricity mix by 17% by 2030 while South Korea has announced plans to reduce LNG’s share in the power mix to just 9.3% by 2036, down from almost 30% in 2021. Long-term contracts have typically been the primary driver of demand in Northeast Asian markets, and the region’s increased exposure to volatile spot markets may cause LNG buyers to cut imports faster to avoid costly spot trades.

**Taiwan remains a wild card:** Government policy generally supports LNG imports, but state-owned utilities have absorbed huge losses due to high global LNG prices and import terminal projects have experienced repeated delays. Taiwan’s plans to increase LNG imports face capacity and pricing challenges, while demand in Japan and South Korea is widely expected to decline in the coming years due to various factors, including increasing nuclear power generation, expiring long-term gas contracts and reduced national energy mix targets.

**China:** China is widely expected to be the largest growth market for LNG demand globally over the next two decades. However, its LNG demand fell in 2022 due to high global prices, COVID-19-related lockdowns, and slow economic growth. There is likely to be little LNG demand growth going forward because of rising domestic gas production, increased pipeline gas imports (from China due to its huge network of pipelines and high LNG prices), increase in coal production, a resumption of coal imports from Australia, and rapid growth in low-cost renewables. Although China’s new long-term contracts may support additional term deliveries, China’s spot purchases are unlikely to recover until prices fall to more competitive levels.

**India, Pakistan, and Bangladesh:** Total LNG

consumption in India, Pakistan, and Bangladesh declined in 2022, primarily due to unaffordable spot prices, contractual disputes, and rapidly depleting foreign currency reserves. The region's LNG demand growth is likely to continue to face resistance over the medium term unless LNG prices settle to affordable and cost-competitive levels. High prices have eroded the competitive advantage of LNG over alternative fuels and are likely to continue to subdue

India was the world's fourth-largest LNG importer in 2021 even though gas provided just 6.1% of the country's energy mix. Imports have been declining due to high spot prices and a shortfall in supplies from long-term contracts. While the volume of LNG imports fell by 15.2% in 2022, the total cost increased by 44.5% due to expensive LNG prices. Meanwhile, domestic gas production increased 20% in 2021 and an additional 3% in 2022. The fertiliser sector consumes the largest share of LNG in India and receives significant subsidies from the government. The sector's LNG consumption increased from 8.3 mtpa in January 2022 to almost 10.31 mtpa in November, raising the subsidy burden to potentially US\$31 billion for the ongoing fiscal year due to high imported LNG prices. Exorbitant costs have pushed the government to encourage consumption of domestically produced gas instead of LNG. In December 2022, the government allowed fertilizer companies to procure 20% of their gas supplies from the domestic spot market to ease the public subsidy bill. The government has also put a cap of US\$6.5 per MMBtu on domestically produced gas prices, which are typically linked to international prices. LNG consumption by other sectors such as city gas and petrochemicals decreased as they pass through fuel costs to price-sensitive consumers while for power sector, this high priced gas was not at all the option. For long term, India has set green energy targets that could reduce its dependence on LNG imports. These include a goal of deploying 500 GW of renewable energy by 2030—up from 118 GW in 2022—as well as establishing a green hydrogen production hub, capable of developing 5 mt of green hydrogen per year. The country also aims to focus on natural farming and bio inputs announced in the budget FY2023-24.

LNG demand in South Asian countries. Bangladesh, Pakistan, and India are actively seeking new long-term LNG supply contracts from diverse suppliers though they will take few years to start supplying. Till then, supplies may have to come from volatile spot markets. Also, South Asian countries resorted to demand-side management and energy conservation measures, such as early store closures and increasing promotion of biofuels. For 2023, India plans to run 2.5 GW of peaking gas units under a special scheme where state-owned gas company GAIL will procure gas supplies in advance. Pakistan and Bangladesh may continue to undertake energy conservation measures such as scheduled load management and reduced commercial activity to avoid major disruptions. Governments are also examining plans to increase domestic renewable energy penetration in the long-term.

**Southeast Asia:** In 2022, Southeast Asia's (Thailand being the largest LNG importer in Southeast Asia and Vietnam and Philippines do not currently import LNG) LNG demand growth encountered stiff headwinds due to high prices and unreliable supplies. If global market conditions persist, key challenges related to pricing, procurement, and infrastructure development will continue to curb the region's LNG demand growth. Limited availability of long-term LNG supply contracts, economic and currency pressures for state-owned enterprises of these countries that develop new LNG projects and financing challenges for private projects are also expected to drive the demand away from LNG.

### *Developing on existing applications and newer lower emission LNG technologies*

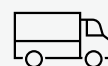
LNG for transport continued to be developed upon. The LNG shipping and bunkering industry got affected after the LNG prices touched record levels last year knocking out the use of the fuel to those with dual-fuelled tonnage. However, LNG as a marine fuel is starting to make more positive noises again after the prices have touched down

#### Europe heavy-duty road transport



**635**

LNG fuelling stations (some with bioLNG)



**39,600**

LNG & bioLNG fuelled vehicles



## Progress on developing lower emission LNG technologies

While adopting more transparency & accuracy in emissions reporting

### Progress on quantifying & compensating emissions

#### Progress on certified natural gas

17% of US natural gas supply in 2022, equivalent to around 1,000 US LNG cargoes certified using the MIQ methane emissions certification standard.

Chevron and Project Canary announced a pilot project to certify well-to-well gas production at five US sites using the TrustWell™ Certification programme.

Equitable Origin independently certified around 12% of North American gas production.



#### Using Artificial Intelligence to reduce emissions

Shell used AI to modify operations at an existing LNG plant to reduce annual emissions by ~ 130,000 tonnes for a single train of process units, when operating at full capacity.



#### First GIIGNL-aligned GHG-neutral LNG cargo

First delivery of a GHG-neutral LNG cargo aligned to GIIGNL's Monitoring, Reporting and Verification (MRV) and GHG Neutral Framework.



### Technologies developments in 2022

#### CCUS with LNG plants up by 28%

Carbon capture utilisation & storage (CCUS) projects adoption continued in 2022 with six LNG projects with a total LNG capacity for of 67.5 MTPA announcing plans.

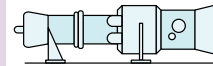


#### LNG/hydrogen hybrid engine

Hyundai Heavy Industries Group has successfully tested South Korea's first combined LNG/ hydrogen-powered engine.



#### Hydrogen-powered gas turbines



GE Gas Power and Shell Global Solutions are collaborating to develop 100% hydrogen powered gas turbine technology for LNG production, without the use of diluent.

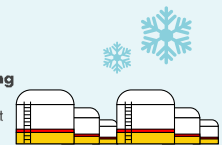
#### Recovering boil-off gas

Samsung Heavy Industries successfully tested a new system which enables LNG-powered ships to reliquefy and collect boil-off gas.



#### Harnessing cold energy

JGC Japan Corporation has begun technical development on capturing carbon through applying unused cold energy captured at an LNG liquefaction plant.



Source: Shell interpretation of various news announcements

again this year. The global LNG fleet of all sizes has grown by nine vessels so far this year to 672 vessels at end of February this year, following the 34 additions in 2022 and a record 60 in 2021.

LNG as road transport is also picking up momentum with European network of LNG fuelling stations for vehicles at 635 stations in January 2023, as it continued to grow despite high prices.

Though gas will be needed in the long term to balance energy systems as the world transitions to a lower emission future. But for that, gas needs to be decarbonised, especially for use in hard to electrify sectors like industry, transport and heating. Progress is being made world over to reduce emissions released from LNG so that it could be increasingly accepted as the fuel of the future.

### Threat from newer carbon-free alternatives

If hydrogen and electrification could match the economics of LNG, one would definitely prioritise them considering their climate advantage. Both the options are receiving good attention from governments around the world and LNG could face heat in long term from these carbon-free solutions.

Source: IEEFA Global LNG Outlook 2023-27, Shell's LNG Outlook 2023



The author of this article is Deepika Lal. She has been the lead content writer for GSR since 2015. An economics graduate and an MBA (Finance), she has over 22 years of experience in research and analysis and content writing in the energy sector. She has produced several industry reports and research papers and has profiled many leading names in the oil and gas domain in her professional career.