

The promise of 'green' hydrogen



By Thomas Koch Blank/ Stockholm

While we already have mature technologies that can replace fossil fuels in many parts of our economy, there are areas where eliminating carbon pollution will be much more difficult. Steel, shipping, aviation, and trucking, for example, account for a combined 40% of our global carbon footprint and are on track to consume two times the remaining carbon budget for staying below 1.5C of warming.

Fortunately, “green” hydrogen – H₂ produced through electrolysis using renewable energy – holds enormous promise for these sectors. Through various applications, this tiny molecule can provide the heat, reduction properties, fuel, and other services needed to replace fossil fuels. In fact, given the technical challenge of getting these “hard-to-abate” sectors to a state of carbon neutrality, hitting 2050 net-zero targets without it would be virtually impossible.

H₂ uptake can serve other objectives beyond decarbonisation. For example, hydrogen’s ability to substitute for natural gas

in many applications allows for a degree of energy independence and reduced reliance on liquefied natural gas or pipeline imports from Russia. And while renewables like solar and wind are limited by the extent of electrical grids, hydrogen can be transported by pipeline or potentially by ship. That means it could become an exportable renewable-energy source, eventually replacing petroleum as the main global energy commodity.

H2 uptake is starting from vastly differing points, depending on the market. In Europe and Southeast Asia, political and market incentives are already fully aligned for the deployment of H2 infrastructure. But in large oil- and gas-exporting economies, the incentives are often conflicting. Notably, there is significant misalignment in the United States, where natural gas fulfils all the political priorities that hydrogen can provide for other markets.

As a crucial element in achieving 2050 net-zero targets, hydrogen production, storage, and transport represents a multi-trillion-dollar opportunity, not only for energy incumbents but also for investors. While hydrogen is currently more expensive (per unit of energy delivered) than competing options such as fossil fuels, the scaling up of electrolyser production is driving down costs. Within the next decade, we can expect H2 to reach break-even points with fossil fuels across different applications, after which hydrogen uptake will bring cost savings.

Green hydrogen is particularly attractive for developing economies. There is a strong geographical overlap between countries and regions with the lowest production cost for renewable energy and those with lower per capita GDP. These countries thus could secure a global competitive advantage by becoming hydrogen producers and exporters. Doing so would also help them attract zero-carbon heavy industry, such as fertiliser manufacturing or hydrogen-based direct reduction steelmaking. And, of course, the development of these sectors would lead to significant job creation.

H2 is also attractive for wealthy industrialised countries,

which currently lead the world in the manufacture of hydrogen electrolysers. However, if the recent history of the photovoltaic (solar panel) industry is any guide, wealthy countries may need stronger industrial policies to ensure that production does not migrate to China and other regions.

There is more work to do before hydrogen can realise its full decarbonisation potential. As matters stand, green hydrogen represents a very small portion of existing hydrogen production. Instead, most hydrogen is “gray,” because it is made using fossil fuels through a steam methane reforming (SMR) process. Though there is potential to capture and store some of the associated carbon dioxide emissions to make a slightly cleaner fossil-based “blue” hydrogen, this option would not be emissions-free. H₂ therefore has a complex CO₂ footprint, for now.

Furthermore, for hydrogen to deliver on its promise, the decarbonisation of electric grids must happen in parallel. But as with electric vehicles (EVs), we cannot wait for a 100% clean grid to begin deploying electrolysers; we must start now.

This is not as financially risky as it sounds. There will undeniably be a threshold where green hydrogen becomes the lowest-cost source of hydrogen generally. Notably, the US Department of Energy’s recently announced goal of reducing the cost of “clean hydrogen” to \$1 per kilogram is nearly impossible to achieve with hydrogen produced through the SMR process at sustainable price levels for natural gas. That means US policy is already aligned behind green hydrogen.

Nonetheless, using green hydrogen to decarbonise heavy industry will demand a truly awesome amount of electricity. Producing the necessary volume of hydrogen would almost double total current global electricity generation. The only way to meet this demand is to build renewable energy even faster.

That, in turn, will lead to critical infrastructure-design questions, such as whether to prioritise H₂ pipelines or power lines. And the growth of this sector will have many regulatory implications. To ensure a rapid build-out of hydrogen

infrastructure, it will be important to enable monetisation, create rate structures to encourage capital-expenditure deferral, and provide system-wide planning across infrastructure types.

Equally, a move to H2 will accelerate the obsolescence of many fossil fuel-based assets. For these large volumes of stranded assets not to produce negative side effects, they will need to be repurposed or helped into early retirement with various financial incentives.

One high-potential area for repurposing infrastructure is in natural-gas pipeline networks, which, in some cases, can be retrofitted to allow for hydrogen transport. Some thermal power plants can also potentially be repurposed; but, here, the end-to-end efficiency of power-to-hydrogen-to-power is low, so the profitable use cases are limited. For the steel industry, the picture is grimmer, as existing blast furnace capacity may need to be replaced with direct reduction. Similarly, gasoline and diesel fuelling infrastructure will need to be replaced. But the future of such infrastructure is already in doubt, owing to the growing market for battery EVs. Hydrogen brings enormous opportunities but also a daunting scaling challenge. Globally, the industry currently has the capacity to produce only around one gigawatt of hydrogen electrolysers each year, whereas, according to the International Energy Agency's analysis on what a 1.5C pathway requires, green hydrogen production will need to grow 1,000-fold from today to 2030.

There are actions that can and must be taken to meet this challenge. First, we need policies to ensure stable demand at scale, so that electrolysis makers can leap-frog into industrialised manufacturing. Second, governments must provide subsidies to cover the initial "green premium" until learning-curve effects take over. And, finally, we must address the tension between current asset locations and the places with the lowest-cost clean-sheet footprint for decarbonised industries.

Backed by direct and indirect political priorities, hydrogen

markets have already gained momentum and crossed the point of no return. As such, they are quickly bringing cleaner industry and a decarbonised economy within striking distance. – Project Syndicate

- Thomas Koch Blank is Senior Principal of Breakthrough Technologies at RMI.

Column: Europe's rising energy prices will force factory closures: Kemp



LONDON, Oct 1 (Reuters) – Europe's increasingly expensive gas and electricity prices are sending a strong signal to manufacturers to consider temporary plant closures and to home and office owners to turn down thermostats to conserve fuel

this winter.

Front-month gas futures are now more than six times more expensive than at this point last year, as the region struggles to import enough gas to refill its depleted storage ahead of the winter peak heating season.

Regional storage sites are still only 74.7% full, the lowest for more than a decade, and compared with a pre-pandemic five-year seasonal average of 87.4%, according to Gas Infrastructure Europe.

In the short term, Europe is unlikely to attract significantly more gas because production is fixed and there is already a worldwide shortage, which is also pushing up prices in Northeast Asia and North America.

Escalating futures prices signal traders think lower consumption will be necessary to prevent stocks eroding to critically low levels and risking fuel supplies running out this winter (<https://tmsnrt.rs/2YkKwPc>).

Rising prices will find the path of least-resistance to cut consumption – with the most price-sensitive and least politically sensitive customers forced to reduce gas and electricity use first and most deeply.

In theory, the crisis could be resolved easily by homes, offices, schools and factories turning down thermostats by 0.5-1.0 degrees this winter; the result would be an enormous fuel saving with only a minimal impact on comfort.

In practice, policymakers will be reluctant to call for thermostat reductions since it implies a policy failure and has unpopular associations with one-term U.S. President Jimmy Carter.

European governments are instead trying to shield residential and small business customers from the full force of increasing energy prices on utility bills through price caps, rebates and

tax cuts.

But if the crisis continues to worsen, and especially if the winter proves colder than normal, shielding residential customers could prove unsustainable and calls for energy conservation may become inevitable.

In the meantime, policymakers are likely to explore other fuel saving measures, including reduced street-lighting and extended closures of government buildings, offices and schools over the mid-winter holiday period.

More significant savings could be made if manufacturers close their operations temporarily, cutting consumption and potentially reselling energy into the spot market if they have already contracted to buy it.

Steeply rising energy costs will force many manufacturers to reassess their production plans this winter, especially those with energy-intensive processes and/or limited ability to raise the price of their own products.

For manufacturers, short closures have the double benefit of cutting energy costs and also driving up the price of their products, helping protect margins against rising power and gas prices.

Once enough credible plant closures and other energy-saving measures are announced futures prices are likely to moderate.

Plant closures would, however, worsen problems throughout the supply chain and intensify the upward pressure on inflation, as well as disrupting long-standing customer relationships.

But unless the winter proves mild, price rises and physical shortages of gas, coal and electricity are unlikely to remain confined to energy markets, rippling out to the rest of the economy as is already happening in China.

How to Avert a Global Climate Catastrophe



Sep 23, 2021 10MAR RAZZAZ

Current global efforts to raise awareness and nudge and shame policymakers are necessary but not sufficient to prevent an existential climate crisis. Addressing the problem more effectively requires international governance arrangements that amount to a new social contract on global public goods.

AMMAN – The hottest day on record in Jordan since 1960 was a staggering 49.3° Celsius, (120.7° Fahrenheit) in July 2018, one month after I became prime minister. Jordan is not unique: heat waves have been causing record-high temperatures in countries from Canada to Australia in recent years. The effects of climate change (including increased frequency and severity of floods, hurricanes, and droughts), while felt locally, demand a global response, which should set binding targets that take into account countries' contributions to the

problem and to the solution.

Jordan has been actively pursuing policies and programs to reduce carbon-dioxide emissions. Over the past 15 years, Jordan's annual emissions per capita fell from 3.5 tons to 2.5 tons. But Jordan, like the vast majority of countries, accounts for a negligible share of global CO₂ emissions – just 0.04% annually. So even if Jordan was to turn its whole economy green overnight, it would hardly make a dent. This does not absolve us of responsibility, but we cannot overlook the fact that emissions are concentrated: the top 20 emitters account for almost 80% of the annual total, with the United States and China alone accounting for 38%.

In many countries, the ramifications of climate change for water supply have been staggering. In the case of Jordan, it made an already tight constraint much more acute. Rainfall was previously the savior for rural communities that engaged in seasonal rainfed agriculture and herding on semi-arid land. Over the last decade, however, a steady decline in average annual rainfall and an increase in the frequency and severity of droughts have undermined these modes of agriculture, deepening the socioeconomic divide between rural and urban areas.

Jordan is by no means unique: the World Health Organization estimates that half of the world's population will be living in water-stressed areas by 2025. In essence, what was previously a regional challenge has now become a serious global governance issue with environmental, political, and economic ramifications.

More broadly, other manifestations of climate change, and the lack of an internationally coordinated response to them – not to mention to additional threats such as the COVID-19 pandemic – suggest that something is seriously wrong at the global level. According to the recent sober assessment by the United Nations Intergovernmental Panel on Climate Change, the world

will not meet the 2015 Paris climate agreement goal of limiting global warming to well below 2°C unless it makes huge additional cuts in CO₂ emissions.

Quite simply, the results of the world's climate efforts are dangerously inadequate. According to the Climate Action Tracker, current policies put the world on course to be an alarming 2.7-3.1°C warmer by 2100, relative to pre-industrial levels. Yes, many emerging green technologies are promising and should be supported. But in the absence of a global approach, these innovations risk merely redistributing the impact of climate change among countries and regions.

Raising awareness and nudging (and shaming) policymakers is necessary, but not sufficient to avert what UN Secretary-General António Guterres has referred to as a "climate catastrophe." Climate-change mitigation must be pursued as a global public good. The problem is that such goods are plagued by collective-action problems, because the costs tend to be spatially and temporally concentrated while the benefits are diffuse. These difficulties can be tackled only by global governance structures that reduce the cost of collective action, internalize externalities, and counter short-term biases in decision-making.

To address climate change more effectively, we need global governance arrangements that amount to a new global social contract. Existing international governance structures can serve as a foundation for these new institutions, but will need to be amended and supplemented to address specific problems related to public goods and collective action.

For starters, we need a governance structure whose jurisdiction is limited to global public goods that cannot be provided adequately at the national level. Nation-states would be free to opt in and opt out, with the benefits of opting in outweighing those of opting out. Decisions would be taken on a majoritarian basis, with no single country having veto power.

There would also be an appeals and adjudication process that allows decisions to be challenged.

Second, a custodial entity would keep track of global natural wealth accounts to address intergenerational equity issues. This entity should be able to place items on the global governance institution's agenda and to appeal decisions.

Lastly, a regime of incentives and disincentives would aim to preserve nature and biodiversity and tax those who consume it, taking wealth and income disparities across countries into account.

Establishing global governance mechanisms that focus on the public-goods and collective-action challenges of climate change will not be easy. Concerns and fears related to a "democratic deficit" and the need to protect national sovereignty are legitimate, and cannot simply be brushed aside.

Nevertheless, we are not starting from scratch. The World Trade Organization provides an example of a strong and successful global governance structure with binding rules. It is thus both ironic and sad that the WTO has failed to incorporate trade-related environmental and human-rights issues into its regulations in order to ensure a level international playing field. After all, with its sanctioning authority, the WTO is best positioned to link issues such as greenhouse-gas emissions and labor rights to trade rules.

Jordan cannot successfully tackle today's global climate challenges on its own. Nor can the Middle East, owing to regional conflicts and rivalries. Now that the world has become a village, the task facing the region is instead to agree with other countries – our fellow villagers – on how to mitigate our own excesses and avert an existential threat. This can be achieved only by finding suitable ways to hold ourselves and each other accountable. The solution lies in

establishing a global governance system that is based on the nation-state but has the capacity to sanction harmful behavior.

Some might regard the idea of creating such a structure as far-fetched. But unless we do, there is scant hope of preventing the climate crisis – already apparent in Jordan and around the world – from continuing to destroy countless lives and livelihoods.



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1 Commentary

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**China's power crunch spreads,
shutting plants, dimming
growth outlook**



BEIJING: Widening power shortages in China have halted production at numerous factories including many supplying Apple and Tesla, while some shops in the northeast operated by candlelight and malls shut early as the economic toll of the squeeze mounted.

China is in the grip of a power crunch as a shortage of coal supplies, toughening emissions standards and strong demand from manufacturers and industry have pushed coal prices to record highs and triggered widespread curbs on usage.

Rationing has been implemented during peak hours in many parts of northeastern China since last week, and residents of cities including Changchun said cuts were occurring sooner and lasting for longer, state media reported.

On Monday, State Grid Corp pledged to ensure basic power supply and avoid electricity cuts.

The power crunch has hurt production in industries across several regions of China and is dragging on the country's economic growth outlook, analysts said.

The impact on homes and non-industrial users comes as night-

time temperatures slip to near-freezing in China's northernmost cities. The National Energy Administration (NEA) has told coal and natural gas firms to ensure sufficient energy supplies to keep homes warm during winter.

Liaoning province said power generation had declined significantly since July, and the supply gap widened to a "severe level" last week. It expanded power cuts from industrial firms to residential areas last week.

The city of Huludao told residents not to use high energy-consuming electronics like water heaters and microwave ovens during peak periods, and a resident of Harbin city in Heilongjiang province told Reuters that many shopping malls were closing earlier than usual at 4pm (0800 GMT).

Given the current power situation "the orderly use of electricity in Heilongjiang will continue for a period of time," CCTV quoted the provincial economic planner as saying.

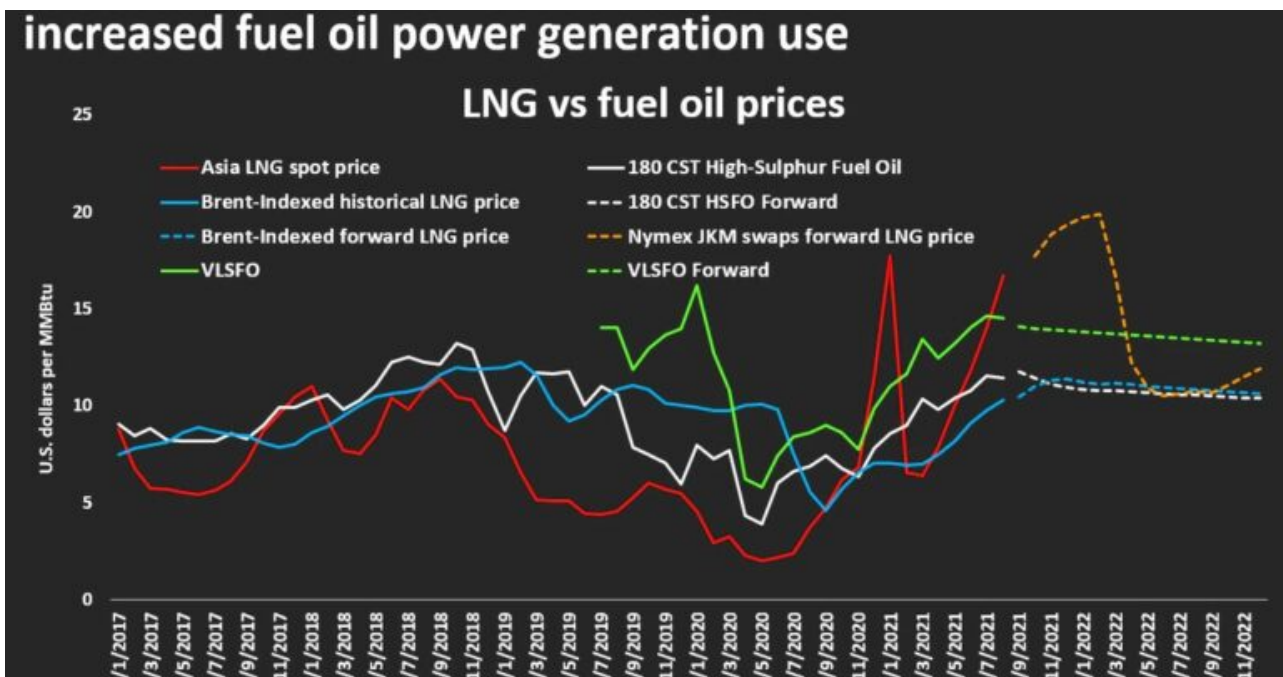
The power squeeze is unnerving Chinese stock markets at a time when the world's second-largest economy is already showing signs of slowing. China's economy is grappling with curbs on the property and tech sectors and concerns around the future of cash-strapped real estate giant China Evergrande.

Tight coal supplies, due in part to a pickup in industrial activity as the economy recovered from the pandemic, and toughening emission standards have driven the power shortages across the country.

China has vowed to cut energy intensity – the amount of energy consumed per unit of economic growth – by around 3% in 2021 to meet its climate goals. Provincial authorities have also stepped up the enforcement of emissions curbs in recent months after only 10 of 30 mainland regions managed to achieve their energy goals in the first half of the year.

Published in Dawn, September 28th, 2021

GLOBAL LNG-LNG prices continue to soar as buying ahead of winter starts



- * Bangladesh pays nearly \$30/mmBtu for prompt cargo – sources
- * China and Turkey seek cargoes for winter
- * Cameron LNG says Louisiana plant unit to return online this week

SINGAPORE, Sept 24 (Reuters) – Asian liquefied natural gas (LNG) prices surged by about 10% this week as demand continues to rise in the region despite higher prices and amid a supply crunch.

The average LNG price for November delivery into Northeast Asia LNG-AS was estimated at about \$26.50 to \$27 per metric million British thermal units (mmBtu), up at least \$2 from the previous week, industry sources said.

“The post-COVID recovery in some places has been fast, which is pushing up demand, while there are some supply issues in several places, which is causing a crunch,” a Singapore-based trader said, adding that prices are expected to rise even higher during winter when demand for heating peaks.

Bangladesh, for instance, bought a cargo for delivery in late September from Vitol at \$29.89 per mmBtu, the highest the country has paid for the super-chilled fuel, three industry sources said.

It did not award a separate tender seeking a cargo for October delivery as the offer was at around \$35, two other sources said. Instead, it will issue two tenders next week to buy two cargoes for delivery in October, a third source said.

Demand from China was also firm with Unipecc Singapore, the trading arm of Sinopec, seeking 11 cargoes for delivery in winter while Beijing Gas and Guangzhou gas also sought a cargo each for delivery in October and November, traders said.

Turkish state energy company Botas is also seeking 20 cargoes for delivery in winter, while Thailand’s Egat was seeking two cargoes for delivery in October, they added.

Some spot cargoes were offered in the market from Angola, Australia, Russia and Indonesia from October to January, but lower shipments from Egypt and Malaysia were supporting prices, traders said.

Cameron LNG in the U.S. said on Wednesday the liquefaction train shut for maintenance at its Louisiana export plant was expected to return later this week, which could add some supply. (Reporting by Jessica Jaganathan. Editing by David Evans)

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Another headwind?: global gas price spike worries energy execs



DUBAI/LONDON, Sept 21 (Reuters) – Energy executives gathered in Dubai on Tuesday for the first time since the COVID-19 pandemic started, but despite being upbeat on economic recovery, they were concerned about another headwind: a global gas price spike.

Natural gas prices have soared by around 280% in Europe this year and by more than 100% in the United States, pushing up winter fuel bills, and exacerbating a near-term spike in inflation in another blow to a world economy as it recovers from the coronavirus crisis.

Low storage inventories, high demand for gas in Asia, less Russian and liquefied natural gas (LNG) supply to Europe than usual, high carbon prices and outages have led to the spike and analysts expect prices to remain elevated until 2022 or even 2023. [read more](#)

At the Gastech industry conference, energy executives were concerned about the “sweet spot” of prices acceptable for customers and still high enough to incentivise investments,

while others warned of shortfalls in the event of a severe upcoming winter.

The chief executive of Malaysia's state energy firm Petronas (PETRA.UL) said that a gas price of \$7-\$8/mmBtu could be a "sweet spot" for customers and allow infrastructure investments to continue.

"Natural gas needs to be embraced as a transition fuel. A decarbonised future does not mean a hydrocarbon-free future," Tengku Muhammad Taufik said.

Meanwhile, OPEC Secretary General Mohammed Barkindo blamed high prices on the shift to renewable energy sources.

The average LNG price for November delivery into Northeast Asia was estimated at about \$24-\$25 per metric million British thermal units (mmBtu) last week, while benchmark European natural gas prices have surged to around \$25/mmBtu from around \$6-7/mmBtu at the start of the year.

BURDEN BUT 'NOT A CRISIS'

Qatar's energy minister said he believes high gas prices reflect a lack of investment, as well as a shortage of supply, but stopped short of calling the situation a crisis.

"I don't think it is a crisis (yet). Unfortunately, in my view, this (price spike) is due to the market not investing enough in the industry," said Saad al-Kaabi, Qatar's energy minister and the CEO of state-owned Qatar Petroleum (QATPE.UL), the world's top liquefied natural gas (LNG) supplier.

"We don't want these high prices: we don't think it is good for consumers. We don't want \$2 and we don't want \$20, we want to have a reasonable price that is sustainable."

United Arab Emirates energy minister, Suhail al-Mazrouei, said current prices could be a burden on many countries.

He too blamed the spike on a slowed pace of investments in gas, adding that gas prices were not sustainable at a level of \$2 or \$3 either.

“New investments need to be there, we are talking about investments to the north of a trillion dollars to satisfy (demand) requirements for the years to come,” Mazrouei said.

“I am afraid it is not going to be magical...we will go through ups and downs until the market realises the right price,” he added.

Some countries have agreed to reduce emissions to net zero by 2050 or earlier, meaning a shift away from fossil fuels, but many energy officials said consumers will pay the price.

The Qatari energy minister said the “euphoria around energy transition” was pressuring companies not to invest in gas or oil projects, while his Emirate counterpart called for honest, practical plans.

“There is a drive for being emotional about net-zero carbon emissions, but I think we need to be honest with the consumers and tell them what is going to be the cost associated with net zero,” UAE’s Mazrouie said.

Analysts at WoodMackenzie said separately on Tuesday that the economics of existing gas operators are difficult and new-build can present a substantial and unattractive risk, particularly in climate-wary Europe.

For French energy group Engie (ENGIE.PA), the price spike was “not good news” and the company’s deputy chief executive, Didier Holleaux, said he was worried that current gas prices may continue for foreseeable future with gas storage levels not as high as usual for this time of year.

“Hopefully the start of the winter will not be so cold in the north hemisphere. If not, we are in trouble. Forecasts for

temperatures in three months' time are just the worst.”

(This story was refiled to remove reference to event being held in hotel in lede)

Additional reporting by Yousef Saba in Dubai, writing by Marwa Rashad and Nina Chestney in London; editing by Jason Neely and Barbara Lewis

How the US and Iran compete to fuel Lebanon



Hezbollah has imported fuel from Iran to supply Lebanon, while the US wants to power Lebanon with Egyptian gas and Jordanian electricity. The energy race between the geopolitical rivals has implications for the region.

Lebanon has been mired in economic crisis since 2019. Recently, a severe fuel crisis has gripped the country and has exacerbated the situation considerably.

The fuel shortages hit so hard that a fuel crisis soon became a humanitarian crisis. Lebanese citizens found themselves lining up for hours at petrol stations to receive limited rations of fuel, the price of which has skyrocketed.

Generators, starved of diesel, provided fewer hours of electricity to houses and businesses. Even hospitals were deprived of power.

With the government struggling to manage the crisis, Hassan Nasrallah, the political leader of the Iran-backed Shiite militant group Hezbollah, announced in August that Iranian fuel would be brought into Lebanon.

The first two shipments arrived via Syria on September 16 and 17. Several videos and pictures posted on social media showed people celebrating the arrival of the fuel convoys. A third shipment is expected to arrive this week.

The delivery was not officially approved by the government. The trucks entered via an illegal crossing which violates US sanctions against Iran. So far, the US has not tried to block the shipments.

US counterproposal to contain Iran's influence

The US didn't sit back. Following Nasrallah's announcement, the US ambassador to Lebanon, Dorothy Shea, revealed that the United States was working closely with the governments of Egypt, Jordan and Lebanon, along with the World Bank, to find sustainable solutions for Lebanon's fuel and energy needs.

On September 8, the US-backed effort to satisfy Lebanon's energy needs took place in Amman, Jordan, where ministries from Egypt, Jordan, Lebanon and Syria outlined a road map to pipe Egyptian natural gas to Lebanon via Jordan and Syria

through the Arab Gas Pipeline (AGP). Another part of the plan involves providing electric power to Lebanon from the Jordanian grid.

Although the US proposals would not alone be enough to satisfy market demand, Roudi Baroudi, chief executive of the consultancy Energy and Environment Holding, told DW that the proposals were good ideas as they could increase the supply of electricity to the country.

He explained that, though the AGP is ready for use, the electric cables passing through Damascus were heavily damaged during the Syrian civil war and needed to be repaired. "The gas from Egypt will be sufficient for 8-10 hours per day. Electricity from Jordan and Syria would add 2-3 hours," he said.

Iran's new foreign affairs policy and Syria's comeback

Technical issues apart, the competition between the US and Iran to help Lebanon in the energy sector has wider implications for the region.

In Lebanon, the Iranian fuel shipment cemented Hezbollah's powerful image. The new Lebanese Prime Minister Najib Mikati said Iranian fuel imports constituted a breach of Lebanon's sovereignty, but he didn't follow with any actions.

For Iran, shipping fuel to Lebanon is a sign of a new vision of its foreign policy, according to Sina Toossi, a senior research analyst at the National Iranian American Council (NIAC). He told DW that Iran wanted to become a regional power and neutralize the effects of imposed sanctions by increasing trades with its neighbors.

"New Iranian President Ebrahim Raisi's foreign policy strategy focuses on the region and increasing regional economic

interconnectivity and interdependence. However, if the US doesn't enforce sanctions, it may be a sign that Biden has a good intention to get the nuclear deal talks with Iran back on track," he said.

Conversely, the United States is trying to contain Iran's influence in the region by backing the proposals to provide natural gas and electricity to Lebanon. However, it found itself in an awkward situation. By involving Syria in the plan, which already expressed its availability, the US would break its own sanctions imposed on Bashar Assad's government through the 2019 Caesar Syria Civilian Protection Act.

Chris Abi-Nassif, Lebanon program director at the Middle East Institute, told DW that the involvement of Assad's government in the plan might be perceived as the US reaching out to Syria.

"Syria, which had effectively been taken out of the Arab world equation, has been suddenly put back in the picture," he said. Furthermore, Syria may take not only a political advantage by letting gas and electricity pass through its territory but also profits, according to Abi-Nassif.

Fueling Lebanon doesn't solve the crisis

Lebanon has had an issue in the energy sector since the end of the civil war in 1990. For decades, the political class has developed no long-term plans in the energy sector to satisfy market demand.

The Iran-Hezbollah initiative to supply fuel won't be enough to satisfy the country's demand for a long time, although Lebanese may breathe a sigh of relief in the immediate term.

Meanwhile, the US proposals are still being negotiated. It may take several months before they make any difference.

Those proposals may relieve the crisis, but it won't resolve the issue of paying for gas and electricity, according to Abi-Nassif.

“The fundamental question is how Lebanon will pay for natural gas and electricity, ” he said. “To answer this question, Lebanon should focus on how to settle the debt crisis, restructure the banking system, and how to distribute losses. This is the key to unlock the long-term prospect not only for the energy sector but for any other single sector in Lebanon as well.”

**لو استفاد لبنان من خط الغاز
العربي لوفّر 5 مليارات دولار...
بارودي لـ "النهار": إبعاد
السياسة عن قطاع الطاقة مفتاح
الحلول**



طرأت في الأيام الأخيرة معطيات إيجابية تعطي ال#لبنانيين بارقة أمل بالنسبة إلى التخفيف من ساعات التقنين الكهربائي القياسي، مع وصول الفيول #العراقي إلى لبنان والذي قد يساهم في تأمين حتى 6 ساعات من التغذية على الشبكة، لتبقى الأنظار إلى مسار استرجار الغاز المصري إلى معمل دير عمار وكذلك استرجار الكهرباء الأردنية.

حصول لبنان على الطاقة الكهربائية من مصادر متعددة وتأمينها على نحو مستدام هو خطوة أولى من أجل وضع البلاد على طريق النهوض وتأمين الاستقرار نظرا إلى أهمية الطاقة في تشغيل العديد من المرافق والقطاعات الحيوية، فيما التدخل السياسي في هذا القطاع هو الذي أدى إلى ما وصلت إليه الأمور. اليوم، تبذل الجهود من أجل استرجار الغاز من مصر والكهرباء من الأردن، ما يحتم على الجهات والدول المعنية تسهيل هذه العملية التي ستعطي لبنان دفعا قويا في ظل الظروف الصعبة التي يمر بها، وما يعيد إلى الواجهة أهمية خط #الغاز العربي الذي انكبت الدول المعنية على إعادة إصلاحه وتعزيز بنيته التحتية لاستخدامه في استرجار الغاز المصري عبر الاردن و#سوريا وصولا إلى شمال لبنان.

نشأت فكرة الخط كنتيجة لتوسيع التعاون الثنائي بين الدول العربية في شرق البحر المتوسط وشمال افريقيا، وذلك منذ اواخر تسعينات القرن الماضي. ففي حين كان لبنان وسوريا يحضّران لمشروع خط الغاز الطبيعي الذي يربط البلدين، كانت الاردن ومصر في طور البدء بتنفيذ الخط المصري - الاردني مرورا بخليج العقبة، وتزامن ذلك مع

الاستعداد لاطلاق المشروع الاورو- متوسطي لربط دول حوض المتوسط بشبكة غاز طبيعي تمتد لاحقا إلى اوروبا. وفي عام 2001، شارك لبنان في الاجتماعات التمهيدية لمشروع نقل الغاز الطبيعي وتسويقه وتصديره إلى دول الحوض الشرقي للمتوسط، وكانت مشاركة لبنان في العديد من الاجتماعات على مستوى تمثيل رئاسة الحكومة والتمثيل الوزاري والتقني. وقد سعت الاجتماعات المتلاحقة إلى التحضير لاتفاق انشاء الهيئة العربية للغاز وتأسيس الشركة العربية لنقل الغاز الطبيعي وتسويقه. وبعدها أقر مشروع إنشاء الشركة تمت المصادقة عليه في كل من الاردن ومصر وسوريا ولبنان حيث اقره المجلس النيابي في العام 2005 بموجب القانون 683.

لقد منعت المناكفات السياسية وعدم اجراء الانتخابات الرئاسية في مواعيدها الدستورية كما الفراغ الحكومي في السنوات الماضية اللبنانيين من الاستفادة من خط الغاز العربي الذي كان يمكن ان يحلّ معظم مشاكل انتاج الكهرباء بحسب الخبير في شؤون الطاقة رودي بارودي، لو تمّ وصل خط الغاز العربي بمعامل انتاج الطاقة الاخرى في الزهراني والجية الجديد والزوق الجديد وصور وبعلبك، خصوصا ان هذه المعامل يمكنها انتاج الطاقة الكهربائية بواسطة الغاز. فلو استفاد لبنان من خط الغاز العربي منذ 18 عاما، لكان وفرّ على خزينته حوالي 5 مليارات دولار، في ما لو فرضنا ان سعر برميل النفط يراوح ما بين 50 و60 دولارا اميركيا، ولكان لبنان نعِم بوقود صديق للبيئة طوال السنوات الماضية، ما يؤدي حتماً إلى انخفاض التكاليف المالية للتشغيل والصيانة. وأكد بارودي انه "لو استفاد لبنان يومها من تلك الشراكة ومن خيارات الانبوب العربي لكانت معظم مشاكله الكهربائية حُلّت، اذ انه كان سيستفيد طوال تلك السنوات سواء من اسعار الغاز المصري التنافسية او من ارباح الشركة العربية لنقل الغاز وتسويقه بصفته شريكا اساسيا تصل نسبة ارباحه إلى 25% من الارباح العامة. كذلك، كان ليستفيد من رسم الترانزيت".

خط الغاز السوري - اللبناني

بدأ تنفيذ هذا المشروع خلال شهر آذار 2003، وهو عبارة عن انبوب للغاز قياس 24 انش يمتد من سوريا إلى محطة البداوي وينقل الغاز السوري إلى المحطة المذكورة (راجع الخريطة المرفقة). وبحسب بارودي يشمل المشروع صيانة وتشغيل وادارة هذا الخط، في حين ان

اهميته تكمن في انه كان معدا يومها لينقل الغاز السوري بسعر مشجع حدده القانون الرقم 509 الذي اقره البرلمان اللبناني في العام 2003 (الاجازة للحكومة ابرام اتفاقية بيع الغاز من الشركة السورية للنفط). وبالفعل، استفاد معمل دير عمار عبر هذا الخط من الغاز المصري والسوري وانما لفترات متقطعة، وتوقف لاسباب عديدة. ويعتبر بارودي ان سعر الغاز أصبح منافسا جدا مما يؤمن للخزينة وفرا ماليا كبيرا يمكن الحصول عليه في ما لو تم تحويل معامل انتاج الطاقة في دير عمار، الزهراني، الجية، والزوق للعمل على الغاز الطبيعي كما يظهر الجدول التالي، وذلك بحسب الاسعار المختلفة لبرميل النفط. ولا بد من التذكير بأن الكميات المتفق عليها والعائدة لمعمل دير عمار والزهراني تراوح ما بين مليون ومليون ونصف مليون يوميا .

سعر برميل البرنت (دولار اميركي)	كلفة كهرباء لبنان من الفيول اويل والغاز اويل* (بملايين الدولارات الاميركية)	كلفة الغاز الطبيعي (بملايين الدولارات الاميركية)	الوفر المتوقع سنويا (بملايين الدولارات الاميركية)
50\$	770\$	542\$	228\$

*استنادا إلى استهلاك معامل الطاقة وفقا لتقرير الانتاج الصادر عن مؤسسة كهرباء لبنان

هذا الجدول يشمل الوفر الناتج عن تحويل العمل من الغاز اويل والفيول اويل إلى الغاز الطبيعي في البداوي، الزوق، الجية، والزهراني. أما سعر الغاز المستعمل في هذا النموذج فهو وفقا للقانون الرقم 509 الموقع بين لبنان والشركة السورية للنفط وسعر الغاز اويل المتبع هو 136% من سعر برميل النفط بينما سعر الفيول اويل المتبع هو 88% من سعر برميل النفط. وفي حال أضيفت قيمة الفوائد من الوفر البيئي واطالة حياة المعامل والتوفير في صيانة وعمل المعامل قد تتخطى حدود التوفير الـ 250 مليون دولار سنويا. ولا بد من الاشارة إلى ان معدل عدد ساعات العمل للمعامل وفقا لتقرير الانتاج لمؤسسة كهرباء لبنان يقدر بـ 55%. وإذا ما تحسن اداء العمل فيها (خصوصا في الزهراني ودير عمار) إلى 75% سيرتفع

الوفر إلى أكثر من 350 مليون دولار سنويا.

مميزات هذه الطاقة النظيفة

بالانتقال إلى الموضوع البيئي، فالمحافظة على البيئة في لبنان لم تعد ترفا. لذلك لا بد من التوقف عند الوفر البيئي المتوقع من استعمال الغاز الطبيعي، خصوصا ان معامل انتاج الطاقة الحالية تنبعث منها كميات كبيرة من الغازات الملوثة، وهي بمعظمها ناتجة عن عمليات حرق الفيول وغيره من المحروقات الاحفورية لتوليد الطاقة الكهربائية. ويؤكد بارودي ان اهمية استعمال الغاز الطبيعي في معامل الانتاج تتعدى الوفر المباشر لتشمل حوافز اخرى تساعد في التخلص من أعباء مالية كبيرة ناتجة عن استعمال وقود غير نظيف، اضافة إلى كلفة النقل والتوزيع والخسائر التقنية ومشاكل الصيانة وعمل الوحدات. لذلك ثمة حاجة حقيقية للتحويل إلى استعمال الغاز الطبيعي في معظم معامل الانتاج في لبنان، لأنه يؤدي إلى خفض المشاكل التقنية والحد من أعبائها المالية، ونذكر من المشاكل ما يتعلق بموضوع صيانة المعامل والاساخ والضرر البيئي الناتج عن احتراق الفيول. من هنا، يمكن القول ان الفترة التي تفصل مراحل الصيانة للعديد من المعدات والآلات تكون أطول، وبالتالي فان ذلك يطيل عمر المعمل لجهة استعماله لتوليد الكهرباء بما لا يقل عن 5 إلى 7 سنوات. ويساهم استعمال الغاز الطبيعي في الحد من هذه الملوثات بشكل كبير مما يؤدي إلى تخفيف الضرر على البيئة وعلى الصحة العامة، ويكون هذا القطاع قد ثبت دوره الريادي في المحافظة على مصادر البيئة اللبنانية. وسوف يشجع التحويل إلى الغاز الطبيعي على انخفاض الانبعاثات الآتية:

100% 1. من انبعاثات الكربون.

60 % 2. من انبعاثات ثاني أوكسيد الكربون.

70 % 3. من انبعاثات أوكسيد النيتروجين.

منعت الحكومات السابقة لبنان من الاستفادة من خط الربط الكهربائي السداسي (مصر، الاردن، العراق، سوريا، لبنان وليبيا) وبالتالي

توفير سنوي قدره 250 مليون دولار طوال السنوات الماضية، علماً أن محطة مجدل عنجر قد انجزت الاعمال فيها عام 2006 وتستطيع أن تستوعب 400 ميغاواط يمكن ربطها بالشبكة اللبنانية. ويعتبر بارودي ان المطلوب من الحكومة الجديدة هو "عدم تضييع الفرصة من جديد والاستفادة من كل الفرص والامكانيات لتحسين وزيادة انتاج الطاقة الكهربائية سواء عبر خط الغاز العربي والانتهاء من تنفيذ وصلة جنوب دمشق إلى الزهراني بأسرع وقت ممكن، كما هو ممكن في الخريطة المرفقة او عبر البدء بتطوير انتاج الطاقات المتجددة، خصوصا بواسطة الشمس، نظراً إلى طبيعة لبنان ومناخه الذي يمكن ان يعطي نحو 2000 ميغاواط، وما يؤمن انتاجاً نظيفاً ومستداماً ويوفر على الخزينة الكثير من الاموال لبنان بحاجة اليها سواء في بناء معامل جديدة وفي تطوير شبكتي النقل والتوزيع".

Why an Electric Car Battery Is So Expensive, For Now



At Tesla Inc.'s ballyhooed Battery Day event last year, CEO

Elon Musk set himself an ambitious target: to produce a \$25,000 electric vehicle by 2023. Hitting that sticker price – about \$15,000 cheaper than the company’s least expensive model today – is seen as critical to deliver a true, mass-market product. Getting there means finding new savings on technology – most critically the batteries that can make up a third of an EV’s cost – without compromising safety. Alongside Musk, traditional automaking giants including Toyota Motor Co. and Volkswagen AG are pouring tens of billions of dollars into the race.

1. Why are EV batteries so expensive?

Largely because of what goes in them. An EV uses the same rechargeable lithium-ion batteries that are in your laptop or mobile phone, they’re just much bigger – cells grouped in packs resembling big suitcases – to enable them to deliver far more energy. The priciest component in each battery cell is the cathode, one of the two electrodes that store and release electricity. The materials needed in cathodes to pack in more energy are often expensive: metals like cobalt, nickel, lithium and manganese. They need to be mined, processed and converted into high-purity chemical compounds.

2. How much are we talking?

At current rates and pack sizes, the average battery cost for a typical EV works out to about \$6,300. Battery pack prices have come down a lot – 89% over the past decade, according to BloombergNEF. But the industry average price of \$137 per kilowatt hour (from about \$1,191 in 2010) is still above the \$100 threshold at which the cost should match a car with an internal-combustion engine. Costs aren’t expected to keep falling as quickly, and rising raw materials prices haven’t helped. Still, lithium-ion packs are on track to drop to \$92 per kWh by 2024, according to BNEF forecasts, and \$58 per kWh by 2030.

Greedy for Gigawatts

EVs are going to be the driving force for lithium-ion battery demand

Source: BloombergNEF Long-Term Electric Vehicle Outlook, June 2021

3. How will the batteries get cheaper?

A major focus for manufacturers is on the priciest commodities, and particularly cobalt. One option is to substitute the metal with nickel, which is cheaper and holds more energy. Doing so requires safety adjustments, however, as cobalt's advantage is that it doesn't overheat or catch fire easily. Another move has been to use alternatives that don't contain cobalt at all, like low-cost lithium iron phosphate cells, once derided for poorer performance but winning a revival as design changes deliver improvements. Simplifying battery pack design, and using a standard product for a range of vehicles – rather than a pack tailored to each model – will deliver additional savings.

4. What about fire risks?

Lithium-ion batteries, whether used in grid-sized storage facilities, cars or devices like smartphones, can catch fire if they've been manufactured poorly, damaged in an accident, or the software that runs them hasn't been designed properly. Incidents remain rare, but garner huge scrutiny in what remains a developing sector. A decision in August by General Motors Co. to carry out a \$1.8 billion recall of more than 100,000 Chevrolet Bolt models as a result of battery defects underscored the seriousness. Blazes or overheating incidents this year also impacted major energy storage projects in Australia and California. And the fires aren't easy to

extinguish; it took firefighters four hours and took more than 30,000 gallons (113,560 liters) of water to douse a Tesla Model S after a fatal crash in Texas. Tesla insists that incidents involving electric models garner undue attention. According to its 2020 Impact Report, cars with internal-combustion engines (ICE) catch fire at a “vastly” higher rate. From 2012 to 2020 there was about one Tesla fire for every 205 million miles (330 million kilometers) traveled, compared to a fire every 19 million miles for ICE vehicles, the EV pioneer said.

5. Who are the biggest manufacturers?

Asia dominates manufacturing of lithium-ion cells, accounting for more than 80% of existing capacity. The Chinese company Contemporary Amperex Technology Co. Ltd. (CATL) shipped the highest volume in 2020, capturing almost a quarter of the market. By September this year it had extended its lead to 30%, followed by South Korea-based LG Energy Solution and Japan’s Panasonic Corp. Tesla and Panasonic’s joint venture is the biggest battery producer in the U.S. Emerging producers include Northvolt AB in Sweden, founded by former Tesla executives, and Gotion High-tech Co. in China.

6. Are the batteries all the same?

They have the same basic components: two electrodes – a cathode and an anode – and an electrolyte that helps shuttle the charge between them. But there are differences in the materials used, and that’s key to the amount of energy they hold. Grid-storage systems or vehicles traveling short distances can use cheaper and less powerful cathode chemistry that combines lithium, iron and phosphate. For higher-performance vehicles, automakers favor more energy-dense materials, such as lithium-nickel-manganese-cobalt oxide or lithium-nickel-cobalt-aluminum oxide. Further refinements are seeking to improve range – how far a vehicle can travel before

recharging – as well as charging speed.

7. So China's in pole position?

Yes, in almost every aspect. China is responsible for about 80% of the chemical refining that converts lithium, cobalt and other raw materials into battery ingredients, though the metals themselves are largely mined in Australia, the Democratic Republic of Congo and Chile. China also dominates processing capacity across four key battery components (cathodes, anodes, electrolyte solutions and separators), with more than half of the world's commissioned capacity for each, BNEF data shows. The nation faces a challenge when it comes to advanced semiconductor design and software, components that are increasingly important as cars become more intelligent. Less than 5% of automotive chips are made in China, according to the China Association of Automobile Manufacturers.

8. Is cost the only hurdle?

There's still an issue with driving range. While the most-expensive EVs can travel 400 miles or more before a top up, consumers considering mainstream models remain anxious about how often they'll need to recharge. Automakers and governments have become directly involved in the roll-out of public recharging infrastructure for drivers on the road. However, most recharging is expected to take place at home, and that means another cost for consumers. While the average price of a home-charging kit has fallen 18% since 2017 to about \$650, some top-of-the-line bi-directional chargers (which let you send energy from the vehicle to the home or grid), cost more than \$6,000. Installation costs in the U.S. can run from as little as \$400 to more than \$3,300.

9. What's around the corner?

Most keenly anticipated is the arrival of solid-state batteries, which promise a huge performance upgrade by

replacing the flammable liquids that enable charging and discharging with ceramic, glass or polymers. QuantumScape Corp. says it has innovations in that field to increase a car's range by as much as 50% and the technology could be deployed in vehicles at dealerships as soon as 2026. Another industry focus is modifying anodes – typically made using graphite – to add more silicon, or by using lithium metal. That would likely make it viable to power smaller aircraft. Storing renewable power with utility-scale batteries for days or weeks, rather than hours at present, is also a key challenge. Form Energy Inc. is developing iron-air batteries that it says could enable entirely carbon-free grids. CATL and others are also working on plans to substitute lithium, or combine it with, far cheaper sodium-ion technology for some niche applications.

The Reference Shelf

- Electric vehicle sales should increase sharply in the next few years and account for 16% of regular car sales by 2025, BNEF forecasts.
- These are the Nobel Prize winning scientists who pioneered the lithium-ion battery.
- Bloomberg News examines how the U.S. is falling behind as the EV battery soars.
- More QuickTakes on the road to driverless cars, the broader trend toward electrification, greener hydrogen and electric airplanes.
- Bloomberg Opinion's Anjani Trivedi explains how new power packs will require new supply chains.
- Bill Gates discusses the electrification of transportation in this blog post.
- A TOPLive Q&A with Carnegie Mellon University professor Venkat Viswanathan on the future of batteries.

– *With assistance by Chunying Zhang*

Energy crunch deepening as US warns Europe isn't doing enough



Europe's energy crunch is deepening, with gas and power prices hitting fresh records after the US warned the continent isn't doing enough to prepare for what could be potentially a dire winter.

With about a month to go before the start of the heating season, Europe doesn't have enough natural gas in storage sites and isn't building inventories fast enough either. Amos Hochstein, the US State Department's envoy for energy security, said on Friday he was worried about supplies this winter.

Energy demand is rebounding across the world as economies reopen and people return to the office. Gas stockpiles in Europe are already at the lowest level in more than a decade for this time of year, pushing up the cost of producing electricity. The rally in European energy prices is just a taste of what's to come for other commodities, Goldman Sachs Group Inc said in a report.

"European energy pricing dynamics offer a glimpse of what is in store for other commodity markets, with widening deficits and depleting inventories leading to elevated price volatility," said Goldman analysts including Jeff Currie. For

European gas, "demand destruction is the only option to rebalance markets," they said.

Europe is struggling to boost supplies, with flows from No 2 supplier Norway currently limited due to maintenance. Top seller Russia is "is coming off an extended period of inexplicably low supply" at a time when US deliveries of liquefied natural gas can't be increased further, Hochstein said.

"I worry because I don't think we should ever be in a position knowing that if it's a cold winter, there's not enough supply," he told reporters during a visit to Warsaw. Benchmark European gas futures traded in the Netherlands exceeded €60 a megawatt-hour, climbing as much as 4.6% to a new record. The UK contract for next-month surged as much as 4.3% to 151.79 pence a therm.

Soaring gas prices are fuelling a rally in electricity. German power futures for next year, a benchmark for Europe, surged to a record €99.25 a megawatt-hour, while the equivalent French contract reached an all-time high of €102.75 a megawatt-hour on the European Energy Exchange.

Short-term prices are also gaining, with low wind power across most of Europe boosting costs. A bigger requirement from more expensive fossil-fuelled plants to meet demand has lifted the German day-ahead contract to the highest since 2007 and the UK equivalent above 200 pounds for the fourth time in two weeks.

"If supply were to disappoint further and winter weather turns out colder than normal, European gas and power prices may have to rise further to ration demand and thus curb energy-intensive industrial production," Goldman said.