Environment

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Physical and Financial Hedging of Natural Gas

The prices of natural gas and liquefied natural gas (LNG) has increased since the COVID-19 lockdowns began in early 2020. Global natural gas prices are now relatively high ranging between $5.60 per million British Thermal Units (MMBtu) in the US and $33/MMBtu in Europe and Asia, compared to $3.00/MMBtu since just before COVID lockdowns.

The current high natural gas prices are more likely the result of failing to implement timely hedging strategies which are to manage supply and prices risks. It's as if market participants in the EU and Asia, and to a lesser degree in the US, were caught in a green vortex.[1] It didn't have to be this way. This article examines what could have been done and why natural gas utilities, power producers, fertilizer, petrochemical plants, and governments have not used traditional physical and financial hedges to secure supplies and manage price risk.

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The US and world markets had gone from a supply glut when natural gas was trading well below $3/MMBtu at the Henry Hub in the US. LNG importers were canceling cargo shipments agreed to under long-term sales and purchase agreements as prices in Asia and Europe converged with Henry Hub prices (**Figure 1**). Instead, importers were buying LNG cargos far below $3/MMBtu in the spot market due to excess supplies. With numerous LNG regasification terminals, buyers in the European Union (EU) could have bought and stored gas in existing underground storage facilities and LNG storage tanks. They could have also secured more supplies from Norway, Algeria, and Russia, as needed.

On October 12, 2021, global natural gas prices broke records, and natural gas utilities and power generators in the US, European Union, China, and other parts of Asia were scrambling for supplies in anticipation of winter heating needs (**Table 1**).

[1] Meyer, R. (2021, June). How the U.S. made progress on climate change without ever passing a bill. *The Atlantic.* https://bit.ly/3p7Mgq6.

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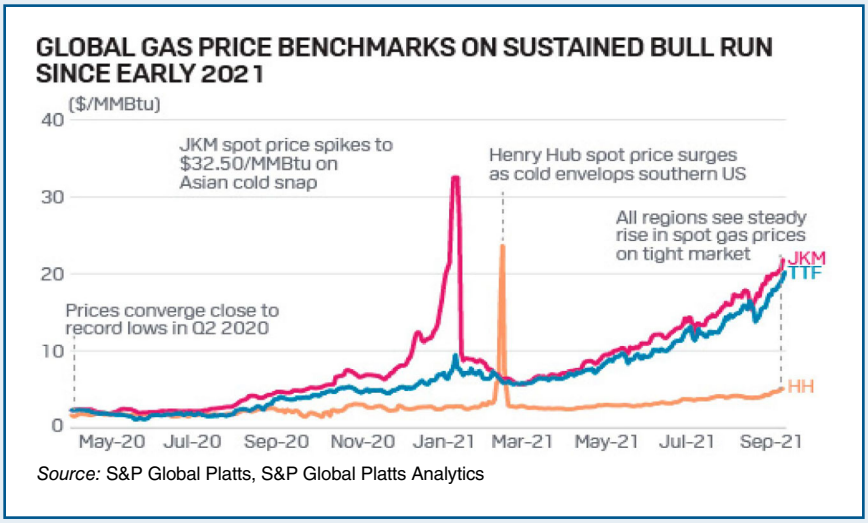
Figure 1. Global Prices of Natural Gas Since May 2020



Source: S&P Global Platts, S&P Global Platts Analytics

According to industry experts familiar with the matter, China's central government officials ordered the country's top state-owned energy companies—from coal to electricity and oil—to secure supplies for this coming winter at all costs.[2] In the UK[3] and EU,[4] offshore wind farms are producing electricity well below what these countries are accustomed to, displaying once again the intermittent nature of renewables and benefit of requiring no fuel other than wind to generate. Hydropower, often not thought of in the same way because of its ability to store water for use as energy, has demonstrated the significant impact climate change can have on our communities. Severe droughts continue to plague California and the Pacific Northwest, the Nordic countries, and central Europe.[5] Germany still plans to close 4 gigawatts (GW) of their nuclear capacity and 1.6 GW of their lignite and coal plants by the end of 2021.[6] If natural gas prices continue to remain high, coal power plants will likely produce a significant amount of electricity to keep the lights on in many countries, as coal generation relative to natural gas becomes more competitive.

TO HEDGE OR NOT TO HEDGE

Hedging supply and price risks are not novel for natural gas utilities and natural gas-fired power generators. There are numerous ways to physically hedge (**Table 2**). Filling underground natural gas storage facilities and purchasing pipeline transportation on pipelines are standard hedging practices in the EU and the US, primarily where heating customers compete with power generators for scarce supplies during winter months. Small LNG peak shaving plants are also popular in the northeastern and midwestern US, where the geology of a region or population density prevents the construction of underground natural gas storage facilities.

[2] Cang, A. (2021, September 30). China orders top energy firms to secure supplies at all costs. *Bloomberg.* https://bloom.bg/30ekk9B.

[3] Mellor, S. (2021, September 16). The U.K. went all-in on wind power. Here's what happens when it stops blowing. *Fortune.* https://bit.ly/3lE2dSX.

[4] Wallace, J. (2021, September 13). Energy prices in Europe hit records after wind stops blowing. *The Wall Street Journal.* https://on.wsj.com/3aAG15H.

[5] Mendes, L. (2021). Winter 2020–2021 overview of Europe. *Independent Commodity Information Service.* https://bit.ly/3mLQwZI.

[6] Ibid.

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Table 1. Global Natural Gas Prices Settlement Prices on October 12, 2021

NATURAL GAS **October 12, 2021**

Henry Hub -United States
Day change: $0.160 up 3.0% | Settle: $5.505 | November 2021

TTF -Title Transfer Facility in Netherlands
Day change: $0.107, up 0.4% | Settle: $29.031 | November 2021

JKM -Japan-Korea Marker
Day change: $0.180, down 0.5% | Settle: $32.900 | November 2021

- High natural gas and coal prices are flowing into Japan's power markets as electricity prices in the country reached a 9-month high this week at ~$0.45/kwh...
- ...meanwhile, elsewhere in Asia, China is rethinking its approach to the energy "transition" amid its widening power shortage, which is slowing economic growth...
- ...Premier Li Keqiang stated in a release yesterday that China's path to a greener economy needs to be underpinned by a 'stable supply of energy'...
- ...he called for an in-depth assessment of how the recent power crunch was handled before establishing a timetable of 2030 for peak carbon emissions
- Gazprom began withdrawing gas from storage this week to dampen soaring gas prices according to Russia's Deputy Foreign Minister Sergei Ryabkov...
- ...Ryabkov stated that "we want to work collaboratively with countries in Europe", following President Vladimir Putin's offering to help stabilize gas markets last week

Source: Tellurian Inc.

Russia's Power of Siberia pipeline is transporting natural gas to China, while China is developing its shale gas reserves. Also, China, Japan, and South Korea have built LNG Storage and regasification plants to ensure there are adequate heating and power generation supplies.

Many natural gas utilities and power generators are aware of the opportunities to hedge price risks with natural gas futures, options, and swaps.

There is adequate natural gas infrastructure in most of the EU, Asia and the US to ensure energy security. The problem appears to be a reluctance of market participants to hedge natural gas when prices were lower physically, and a global supply glut characterized the market in 2020. Physically hedging natural gas is not complicated when a country has the necessary infrastructure in place. Injecting natural gas into storage and other physical hedging measures are well known (Table 2). They can effectively manage the supply and price risks when done promptly before winter.

Many natural gas utilities and power generators are aware of the opportunities to hedge price risks with natural gas futures, options, and swaps. These energy derivatives don't increase supplies but can reduce the cost of gas procurement if physical gas prices increase. The NYMEX Natural Gas Futures Henry Hub Contract (NYMEX HH) and similar futures contracts at the Title Transfer Facility (TTF) in Europe and the National Balancing Point (NBP) in the UK offer liquid markets to market participants to hedge their price risks. In Asia, where pipelines are fewer in number, market participants can hedge natural gas and LNG price risks with Japanese-Korea Marker Swaps (JKM).

This author believes that some market participants have simply waited too long to implement physical and hedging strategies. The inability to ensure adequate natural gas supplies and manage price risk begs the question, "What is different now, and why was action not taken sooner?"

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Table 2. Common Approaches to Physically Hedge Natural Gas

1. Store natural gas underground in gas storage facilities or in LNG storage tanks,
2. Build LNG Peak Shaving Facilities or Propane Air Plants to meet winter peak demand,
3. Buy liquid (LNG) or vapor gas in low use months when prices are low,
4. Purchase Firm Pipeline Transportation,
5. Enter into Take or Release contracts,
6. Buy Physical Call Options,
7. Buy equity in natural gas production in a shale basin, and
8. Run oil-fired power generating units when natural gas prices spike.

Source: Russo on Energy LLC

LESSON LEARNED FROM HEAT WAVES AND FRIGID WEATHER

The severe heatwave and drought in California and the Pacific Northwest in 2020 and 2021 and the lack of crucial hydropower sent power demand to record levels as customers turned on air conditioners. This extreme weather alone should have prompted natural gas and electric utility regulators to encourage physical hedging in the US, EU, and Asia, and where legally permitted, financial hedging.

Winter Storm Uri should have also warned natural gas utilities and power generators in the US, EU, and Asia of the importance of filling their underground natural gas storage reservoirs and implementing other physical and financing hedging practices. However, natural gas storage levels in the EU fell in 2021 (**Figure 2**), which this author finds inexplicable.

REASONS FOR LITTLE OR NO HEDGING

Despite severe global weather extremes, the US, EU, China, and other countries appeared to be dealing with the Covid-19 delta variant and lockdowns and debating their decarbonization strategies for the upcoming Conference of the Parties 16 from October 31 to November 12, 2021 in Glasgow, UK.[7]

The Intergovernmental Panel on Climate Change (IPCC) report[8] accelerated the debates and urgency for decarbonization. This author believes that the UK, EU, China, and to a lesser extent, the US relied on offshore and onshore wind and solar to replace dispatchable gas-fired power generating facilities and coal-fired plants. The author calls this the Green Vortex, whereby companies believe so deeply in renewables that they assume ideal conditions for wind, solar and hydropower production and don't hedge. Perhaps, in the face of such statements embracing decarbonization by the leaders of the US, EU, and China, natural gas utilities and power generators were dissuaded from implementing physical and financial hedging natural gas. The only problem with the policy statements is that no one thought there would be wind droughts that would significantly reduce offshore wind energy production needed by the UK and EU to meet loads[9] under ideal conditions.

While offshore and onshore wind's installed capacity increased in the EU, it does not necessarily mean that power will be available when needed. European wind capacity factors or the percentage of time that wind projects are operating were excellent. Capacity factors of the entire

[7] United Nations Climate Change. (2021). Glasgow Climate Change Conference. https://bit.ly/3lEVCHU.

[8] Intergovernmental Panel on Climate Change. (in press). *Climate change 2021: The physical sciencebasis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [Masson-Delmotte, V., et al. (eds.)]. Cambridge University Press. https://bit.ly/3BKVhJ9.

[9] See notes 2 and 3.

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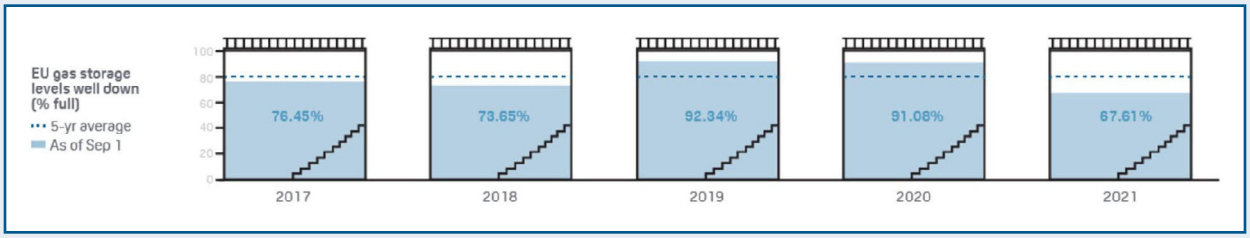
Figure 2. Underground Natural Gas Storage Levels in the European Union



wind fleet in the EU and UK were on average 27 percent, a 2 percent increase in 2019. Capacity factors for onshore were 25 percent, while for offshore fleet, they increased significantly from 38 percent to 42 percent during 2020.[10]

Extreme weather events such as prolonged droughts or low water years for production of hydroelectricity also affect availability in the western US, EU, and China. Finally, smoke and particulate matter from wildfires in California have reduced solar energy production in California.[11]

Until the world has increased its ability to store surplus renewable energy from solar and wind projects, natural gas utilities and power generators will still rely on dispatchable natural gas-fired power plants to meet electricity demand. However, if hedging strategies are not implemented quickly to ensure adequate natural gas supplies and manage price risks, the only alternatives left will be to rely on nuclear power or coal- and oil-fired resources.

Some have suggested that the EU and other countries need to set up a strategic natural gas reserve similar to the Strategic Petroleum Reserves in the US, EU countries, and China. For oil, the International Energy Agency (IEA) requires its members to hold a 90-day supply of oil in case of unexpected supply shocks. No policy exists for natural gas, although Italy and France do have regulations requiring minimum storage levels. However, the EU does not have a centralized approach for all member countries.[12] This author believes that a Strategic Gas Reserve may be warranted as a backstop to supplement the private sector's efforts to hedge price volatility, especially if governments continue to transition away from the use of coal power plants and continue to retire nuclear power plants.

CONCLUSION

Natural gas utilities and gas-fired power generators cannot afford to be caught in a green vortex and rely too much on intermittent renewable energy. Physical and financial hedging of natural gas continues to be important in managing risks and is required as countries continue to accelerate their decarbonization efforts. Such efforts are crucial to manage natural gas and price risks especially if prolonged water and wind droughts, colder winters, and hotter summers continue to limit renewable energy production in future years.

Decarbonization efforts should not only entail increasing the installed capacity of wind and solar, and battery storage. Decarbonization must also embrace carbon capture, storage, and utilization, blending hydrogen in natural gas grids. Also, the US, EU and China must accelerate efforts to reduce methane and carbon dioxide (CO_2) in their oil and natural gas supply chains and from landfills, livestock farms, and other methane sources. Finally, the role that nuclear power can play in the transition must be considered by each country.

[10] WindEurope. *Wind energy in Europe—2020 statistics and the outlook for 2021 to 2025.* https://bit.ly/3oZjW9q.

[11] US Energy Information Administration. (2020, September 30). *Smoke from California wildfires decreases solar generation in CAISO.* https://bit.ly/3AF2YiI.

[12] Critchlow, A. (2021, September 27). Time for Europe and the IEA to create a strategic gas reserve. *S&P Global Platts.* https://bit.ly/3mRbzKl.

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