



U.S. Natural Gas Meets the Global LNG Market – A Potential to Reshape the NYMEX Natural Gas Term Structure

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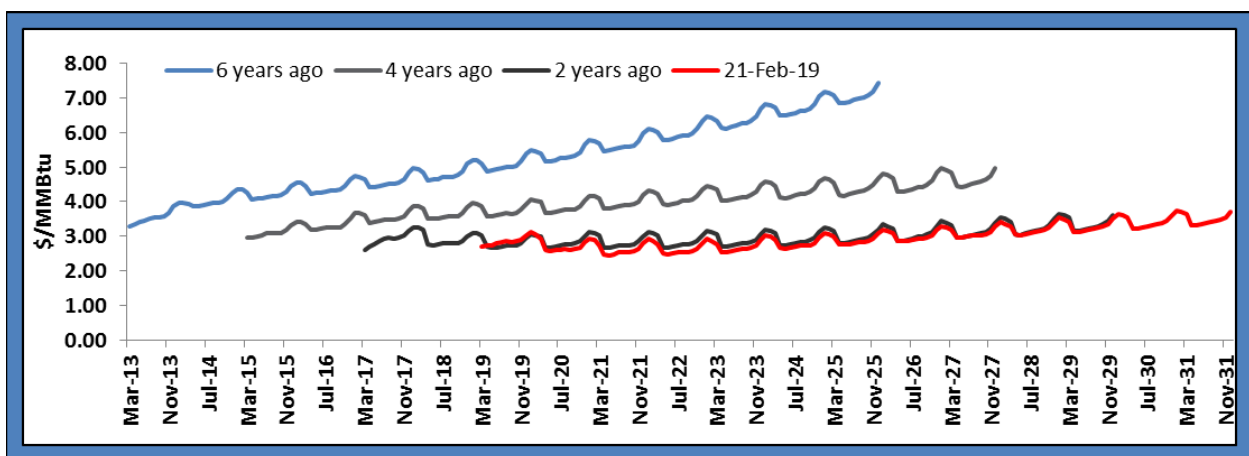
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Over the past decade, it is unmistakable that the dominant narrative for the U.S. natural gas market has been the shale gas renaissance and the subsequent abundance of production growth. Rampant production growth has redefined the very characteristics that once were the U.S. natural gas market: volatility, seasonality, and an overall higher range of price – to name a few. As a result of this nearly decade-long production growth story, the average annual price for U.S. natural gas has fallen dramatically, eroding along with it all those familiar characteristics.

Market participant behavior evolved as production overwhelmed the balance, changing the very shape of the New York Mercantile Exchange (NYMEX) natural gas forward curve. While historically producer hedging was balanced by consumer hedging and investor interest in deferred-tenor length, the constant roll down of price appeared to dissuade consumer hedging. As supply sources became plentiful, consumers reduced hedging tenors, at times eliminating entire hedge programs as natural gas price volatility to the upside nearly disappeared. At the same time, the upstream community – overwhelmed with molecules – found itself hedging further and further along the forward curve to capture higher prices as increased technological drilling efficiencies reduced production costs.

An extremely lopsided flow dynamic in the contracts traded within the U.S. natural gas market began to emerge – with incredible selling pressure exerted on the deferred portion of the forward curve from producer hedging. As a result, the contango of the NYMEX forward curve that once highlighted upside price risk for the U.S. natural gas market nearly disappeared; please see Figure 1.

Figure 1
NYMEX Natural Gas Forward Curve Over Time



Sources: NYMEX, Bloomberg, JPMorgan Commodities Research



Never more has this supply-side narrative been supported than during 2018 when annual production growth averaged ~8.5 Bcf/day over 2017 levels. And while we could review the technological advances and efficiency gains impacting the supply-side of the balance *ad nauseam*, what we found the most intriguing about 2018 was the ability for the U.S. natural gas market to find some semblance of balance not only through weather, but more importantly through organic growth in demand – primarily in the exports market.

The evolution of the price decline that persisted for the better part of the past decade clearly led to opportunities to find new demand outlets for U.S. natural gas molecules – be it through the shift in the domestic power generation sector from coal-to-natural gas as a primary fuel source, an increase in industrial demand given the economic advantage and stability of U.S. natural gas prices, or piquing the interest of gas-consuming countries abroad that rely on imports to satiate demand.

If 2018 is defined by exorbitant production growth, we would deem 2019 a year recognized for a meaningful step-change higher in U.S. liquefied natural gas (LNG) export capacity. The introduction of this chunky demand source to combat the overwhelming amount of production growth in the U.S. natural gas balance may be a start in the restoration of those long-lost characteristics.

A severely flattened forward curve, with near- to intermediate-term backwardation, has led to a series of shifts in the U.S. natural gas market. From a dearth of new storage capacity to a slowing of producer hedging, the current fundamental environment is primed for a structural shift in the forward curve as a new type of consumer participant is introduced to the U.S. natural gas balance – U.S. LNG consumers.

Lack of Increased Storage Capacity to Support Seasonal Volatility

With these substantial changes in supply and demand, a clear laggard in growth has been storage capacity. Since 2008, working gas storage capacity has grown ~572 Bcf through 2017 as reported by the U.S. Energy Information Administration (EIA), with only ~66 Bcf of that growth occurring from 2014 to 2017. It may appear odd that amid the substantial growth in supply, demand, gas processing plants, and natural gas pipelines over the past several years that storage growth has been stunted. However, it is the very shape of the forward curve which is the most likely cause for this slowdown in working gas storage capacity growth. The economic incentive to store has been stripped away from storage operators with the disappearance of the contango and seasonality in the NYMEX forward curve.

As a result, the extensive amount of gas production from Northeast wells, as well as from oil plays and the Haynesville Shale play will serve as a proxy for storage capacity.

The primary repercussion of a natural gas system becoming more reliant on a production site to meet demand is increased price volatility. The call on that production will likely manifest through regional pricing (rising to redirect flows to the necessary region and falling to push gas to other regions) with the NYMEX futures price also likely to participate.

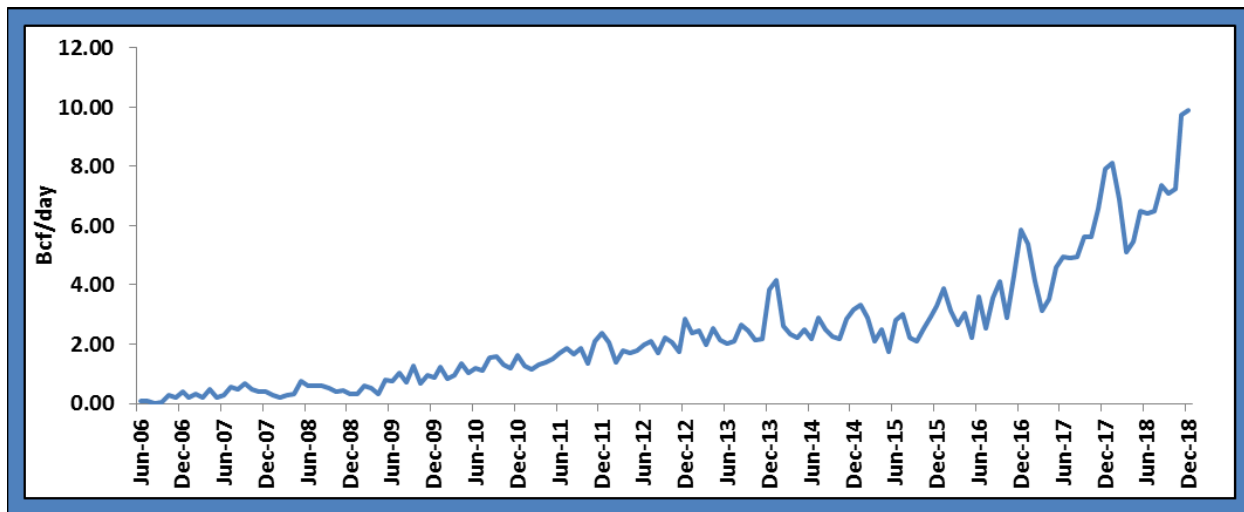
One only has to look at the U.K. National Balancing Point (NBP) market for the implications of relying on imports from another region to meet demand, especially during the winter withdrawal season. With the



decommissioning of the Rough storage facility, the main source to meet winter-related demand in England, volatility in the U.K. NBP price has been prevalent. During the summer period, NBP prices tend to dive lower, signaling there is too much gas on the grid with the inability to store the excess gas in this storage facility. However during the winter withdrawal period, the U.K. NBP price now rallies more significantly in order to meet additional demand through LNG imports. Essentially, Rough storage served as a price volatility dampener and with that dampener removed, the U.K. natural gas market is exposed to global pricing.

It would seem more insignificant if the global LNG market was well supplied, which one could argue at the current time that it is. However, the recent environmental changes in China – forcing industrial consumers of coal to switch to natural gas during the winter season – suggest that a structural change in demand may be upon the global LNG balance. The 2017-2018 winter was one example of this increased demand that sent LNG imports into China soaring above 8 Bcf/day. With less weather-related demand, Chinese imports of LNG still remained above 9 Bcf/day during the last two months of 2018; please see Figure 2.

Figure 2
Chinese LNG Imports



Sources: CGA, Bloomberg, JPMorgan Commodities Research

Deferred Producer Hedging Begins to Slow

One ramification of the steady barrage of producer hedging that has hammered the natural gas NYMEX curve nearly flat over the past decade is the fall in the absolute level of price. This has clearly corresponded with sizeable declines in production costs. One example can be seen from the likes of the Haynesville Shale play. In 2011 and 2012 when production from the region was in vogue, production costs for the play were cited as high as \$3.75/MMBtu. A resurgence of drilling in the play since 2017 has some producers touting the cost of production as low as \$2.25/MMBtu, with anecdotal data pointing to even lower costs.



Yet, with the emergence of crude oil shale production in the U.S., competition for the same drilling and completion resources has become increasingly apparent. Correspondingly, the upstream community has reported increased drilling and completion costs, especially as efficiency gains continue to diminish.

With lower absolute prices across the forward curve – at the time of this publication both calendar strip 2021 and 2022 prices hovered around \$2.65/MMBtu, nearly 10¢ below the calendar 2020 strip price – there appears to be a slowing in producer hedging in the deferred tenors. The backwardation of the forward curve in the near- to intermediate-term optically makes it difficult to execute hedges when the curve implies a potential roll up in price should the current fundamental environment remain. Additionally, incorporating the regional basis to Henry Hub, regional fixed prices in Appalachia (the primary source of growth in U.S. natural gas production) have fallen closer to \$2/MMBtu – a price level which appears to hold some producers captive.

Barring another major technological advancement, cost inflation is likely to set a soft floor in price for U.S. natural gas. We believe that a NYMEX calendar strip price around the \$2.50/MMBtu level is likely to elicit a pause in hedging as the regional fixed price falls below \$2/MMBtu. This is especially true as primarily gassy producers will have further competition from oil producers and the associated natural gas coming from liquids-rich plays.

Enhanced Volatility and Seasonality Makes a Return

While the U.S. market becomes more reliant on production from the wellhead to meet demand and the upstream community has bumped up against less appealing hedge prices, structural changes on the demand side of the balance has opened the U.S. natural gas market to economies, politics, and fundamental balances abroad. During 2019, we expect more than 3 Bcf/day of LNG export capacity growth. This growth has and is likely to continue to contribute to increased price volatility and seasonality for the U.S. natural gas market.

U.S. LNG exports first became meaningful to the domestic gas balance during the winter 2017-2018 season. Only ~2.4 Bcf/day of export capacity was officially available during the early part of the winter season; however, at times nearly ~3.2 Bcf/day flowed as feedgas into the one functional LNG export facility, Sabine Pass. That feedgas is essentially a representation of demand.

The meaningful pull of U.S. natural gas into Sabine Pass was the result of several non-U.S. based factors. Sources of domestic natural gas in Europe are dwindling. Despite steady production levels from the North Sea, the aforementioned decommissioning of the Rough storage facility in the United Kingdom along with diminishing Dutch natural gas production has left Europe more heavily reliant on imports to meet weather-related demand. In Asia, China's stringent environmental policies, imposing winter bans on the use of coal-boilers by industrials, continue to support increased LNG demand.

Aside from the steady pull of U.S. natural gas into Mexico, this would be the first time that countries abroad had a direct impact on the U.S. gas balance in over a decade. Additionally, the pull of U.S. gas by these gas-consuming countries appeared somewhat impervious to price, as meeting weather-related demand was the priority. During that winter season, the day-ahead Henry Hub natural gas price rallied

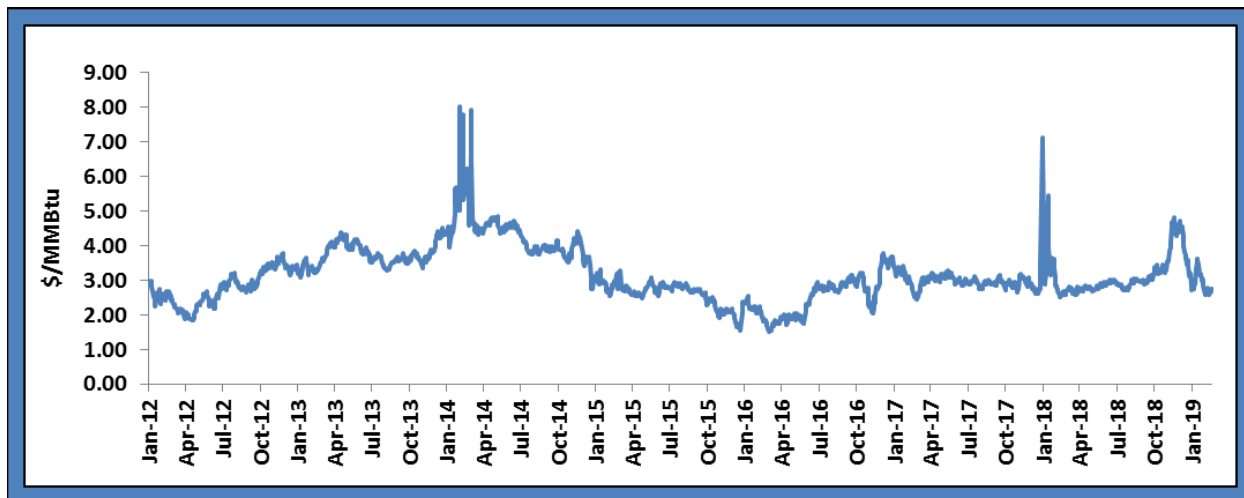


above \$5/MMBtu twice – the first time these price spikes were observed since the polar vortex winter season of 2013-2014.

With an increase in LNG capacity during 2018, feedgas flowing into U.S. LNG export facilities during this past winter season reached as high as 5.5 Bcf/day, exceeding pipeline exports to Mexico. The U.S. experienced an early cold start to this past winter season, highlighting significant regional tightness in the domestic gas balance amid a backdrop of historically low storage levels. U.S. LNG exports accounted for a sizeable and steady demand-side risk factor which at times contributed to an end-March storage trajectory of below 1.1 Tcf.

As a result, the day-ahead Henry Hub cash price found itself above \$4/MMBtu in a sustained manner near the start of the withdrawal season; please see Figure 3. This would represent the second consecutive withdrawal season in which the Henry Hub cash price signaled significant tightening of the balance since winter 2013-2014 – a trend we expect to continue over the next several years during the winter withdrawal season.

Figure 3
Day-Ahead Henry Hub Cash Price



Sources: NYMEX, Bloomberg, JPMorgan Commodities Research

Admittedly, the disappearance of winter-weather did in fact result in the ultimate decline in price during this past winter season. However, when weather-related demand is apparent, growth in organic baseload demand (including from LNG exports) in the U.S. natural gas balance has resulted in increased price volatility, even amid exorbitant production growth.

In fact, the seasonality apparent in LNG demand globally, a winter-driven market much like the U.S. natural gas market, has restored seasonal spreads. An amalgam of weather-related demand side risk factors during winter in the U.S. and abroad supports the natural gas price during the withdrawal season

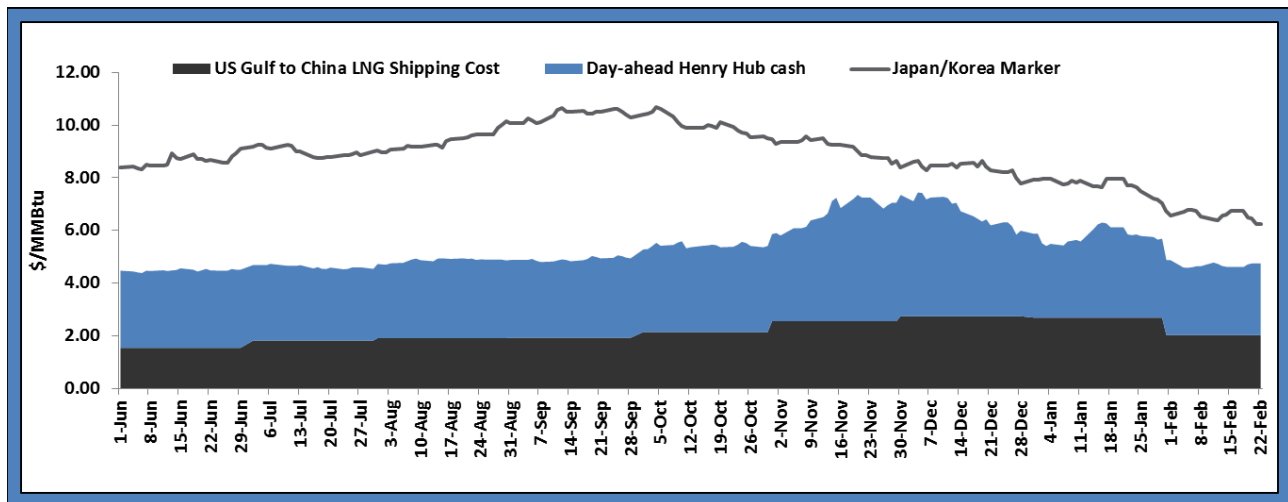


only for that price to fall under pressure in the injection season due to fairly steady production growth and in the absence of weather.

U.S. LNG Hedging Likely to Increase

The price volatility exhibited during this winter season not only caught the attention of gas analysts across the market, but it also drew the attention of natural gas consumers. While a visit above \$4.50/MMBtu for a period of time is likely to cause momentary pause for a domestic natural gas consumer, for U.S. LNG consumers abroad that price did diminish netbacks significantly; please see Figure 4. This stands to reason given the rise in LNG shipping costs during the second-half of last year, the precipitous slide in the Japan/Korea Marker as published by Platts, and Henry Hub cash prices rising above \$4/MMBtu for a sustained period of time near the start of the withdrawal season.

Figure 4
Diminishing LNG Netbacks



Sources: NYMEX, Bloomberg, JPMorgan Commodities Research

As the natural gas forward curve has shifted into backwardation over the first three calendar years, it has provided an opportunity for consumers to achieve historically low price hedges, especially amid an environment of increased near-term volatility. While calendar strip 2022 and beyond are positioned in an ever so slight contango, 1Q19 price has averaged at a level that is not observed on the NYMEX natural gas forward curve until the December 2027 futures contract. In fact given our assumptions of the current fundamentals for this year, we expect for calendar strip 2019 to average at, or within a few cents of, the current calendar 2026 average price.

Ultimately as summer/winter spreads widen amid growing seasonality, the current shape of the forward curve offers consumers – primarily LNG consumers – a reasonable opportunity to capitalize on a curve structure beneficial for price risk mitigation.



Conclusion

As rising production costs create a soft floor in price – reducing producer hedging activity relative to that seen over the past five years – the morphing of the near- to intermediate tenors of the NYMEX forward curve into backwardation has created opportunities for natural gas consumers to hedge. With U.S. LNG exports growing at a faster pace than any other demand side factor at the current time, it has introduced a new set of consumer participants to the U.S. natural gas market that did not exist before.

Admittedly, it took nearly a decade to destroy the contango that was once so prevalent in the U.S. natural gas forward curve, so the restoration of a contango is one that could take a significant amount of time. That said, the U.S. natural gas market appears to be reaching a stasis in terms of price – weather-adjusted – and we would expect for competitive length procurement to apply some upward pressure in price over the intermediate-term, especially amid upstream cost inflation.

Endnote

For further coverage of the natural gas markets, the reader is invited to read [past GCARD articles](#) on these markets.

Author Biography

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Ms. Shikha Chaturvedi, an Executive Director at J.P. Morgan, joined the Global Commodities Group in 2009 and is the Head of Natural Gas Strategy. She specializes in North America natural gas market fundamentals, representing the J.P. Morgan price view for this market. Ms. Chaturvedi joined J.P. Morgan in 2005 to work in the credit markets, specifically in Credit Hybrids. She graduated from the University of Virginia in 2005, earning a Bachelor's Degree in Commerce.