ENERGY INVESTMENT BANKING

MUSINGS FROM THE OIL PATCH

December 13, 2019

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Note: *Musings from the Oil Patch reflects an eclectic collection of stories and analyses dealing with issues and developments within the energy industry that I feel have potentially significant implications for executives operating and planning for the future. The newsletter is published every two weeks, but periodically events and travel may alter that schedule. As always, I welcome your comments and observations.* Allen Brooks

Summary:

The Rhyme Of Oil History Should Be Heard And Studied – Part 5

In the early 1980s, the wheels began to come off the oil industry's boom begun in the early 1970s, as global supplies began outstripping demand. We follow the early downturn's impacts on the industry and consider the damage done to the banking industry, which may be materially different than in the current downturn.

READ MORE

U.S. LNG Altered Gas Market; China-Russia Pipeline, Also?

The global natural gas market continues to grow and mature. Its evolution has been shaped by the growth of LNG and especially the emergence of U.S. LNG as a new and rapidly growing supply source. What will happen to the global gas market, and especially the global LNG sector, with the new Russia-China pipelines.

READ MORE

Can Anything Help Lift Natural Gas Prices?

Natural gas prices are at very low levels. That is due to the rapid and substantial growth of gas production. From extremely low levels of storage after last winter, gas supply is now about at the 5-year level. That performance came even with growing gas exports and more gas used to create electricity. Will this change?

READ MORE

Exxon Wins! – That's Not A 'Dewey Beats Truman' Headline

No Exxon executive is holding aloft the excoriating decision of the judge in the NY AG "climate change" lawsuit over the company misleading investors about its use of different measures of carbon's impact on its business. Instead, Exxon executives are moving on to defend against the next climate change lawsuit. The harassment continues despite multiple court victories by the oil & gas industry.

Happy Holidays

We will be traveling and celebrating for the balance of 2019. We will return in January 2020.

The Rhyme Of Oil History Should Be Heard And Studied – Part 5

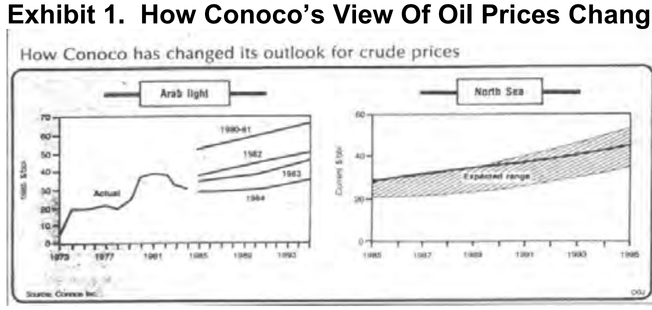
The speed with which the oil glut arrived in 1981 shocked oil and oilfield service industry participants. We often hear the expression: "turning on a dime." That is certainly what happened to the global energy business, although many people failed to see it happening until it was too late, and they were caught up in its vortex and pulled under. Those who did see the turn happening found there wasn't much they could do about it other than to hold on and try to ride its currents. We believe most of these participants failed to grasp that the road ahead, which we call "wandering in the wilderness," would take so long and be so devastating for the industry. What seemed to be only an oil industry phenomenon, however, turned out to deliver devastating blows to other industries, local economies and the social fabric of a large swath of America.

Those who did see the turn happening found there wasn't much they could do about it other than to hold on and try to ride its currents

Following the fly-up in oil prices after the 1979 Iranian government overthrow and the new government's decision to temporary remove the nation's oil output from the global pool, fear of supply disruptions became the driving force behind exploration and production activity. What was subsequently ignored, or at least minimized with respect to seriously harming the industry's upward trajectory was the problem over OPEC oil pricing that emerged in 1980. That problem seemed to be resolved with the OPEC organization targeting $36 per barrel while Saudi Arabia settled on $32. The friction between the main OPEC group of countries and Saudi Arabia, however, became more intense as 1980 transitioned into 1981. With Saudi Arabia seeing its fellow OPEC members cheating on their agreed-to production quotas and the kingdom having to cut its output to keep oil prices from collapsing, the tensions grew. Finally, Saudi Arabia had had enough and began lifting its output in order to gain back market share it had lost to other OPEC countries. It was also trying to teach its fellow OPEC members a lesson about the dangers of cheating. Most importantly, Saudi Arabia was trying to forestall a total oil price collapse. The view was that if the global oil price could be reduced, it would undercut drilling activity in regions with higher-cost oil, thereby slowing the arrival of new supplies. A chart accompanying an *Oil & Gas Journal* article shows how Conoco's oil price outlook had changed since 1980.

Saudi Arabia was trying to forestall a total oil price collapse

Exhibit 1. How Conoco's View Of Oil Prices Changed



Source: ***Oil & Gas Journal***

In the early 1980s forecasts were not routinely challenged

We often joke about how lousy oil companies and oil industry experts are at forecasting future oil prices, but in the early 1980s, forecasts were not routinely challenged. There hadn't been a long history of forecasts, let alone inaccurate ones. What the chart shows is that the expectations for oil prices in 1985-1995 had been consistently lowered. Remember, though, that these higher oil price expectations were baked into the thinking, planning and capital spending of the industry in the earlier years. As a result, industry spending was cranked up during the latter half of the 1970s, only to bring on more supplies in the 1980s when demand was falling. Oil industry participants missed the significant energy demand reductions driven by consumers adjusting to high prices.

Issues of oil service industry publications routinely reported on how participating companies were growing. Especially noteworthy were those companies adding new drilling and well servicing rigs to their fleets. The additions were coming in response to higher levels of demand, which was reflected in higher prices for equipment in short supply. The August 1st issue of *The Land Rig Newsletter* reported:

> "Day rates continue strong with no let-up in sight. Most contractors maintain rate gains will be in the 25 percent range for '81, likely a modest estimate."

It went on to comment:

> "Fabrication yards are reported 'a year behind' for deep rigs (below 15,000 ft). One major contractor reports an operator 'scrounging hard' for two 30,000 ft rigs for first-quarter '82 Anadarko drilling. The rigs are not to be found."

But the newsletter also pointed out some unsettling factors that should have caused more concern within the industry:

> "On the negative side of new rig construction are money sources, debt sources. Reports one contractor: 'Money is tight. Bankers and other finance people are goosy.' Another negative: A soft spot in rig demand appears to be in the making in Texas RRC District 6 (East Texas). Operators report getting a significant number of calls from contractors with rigs to be available a few weeks from now."

It cited a contractor who calculated that rig fabrication costs were rising at a 2% per month rate

The Land Rig Newsletter commented that one reason for the dramatic increase in day rates was the rapidly rising costs of equipment and labor. It cited a contractor who calculated that rig fabrication costs were rising at a 2% per month rate. Additionally, to attract and keep labor in the tight oilfield market, contractors were granting across-the-board wage increases. Tool pushers were routinely being paid $3,750 to $4,200 per month plus $300 to $500 in expenses. To keep these valued employees, contractors were looking at "perks" that could be offered as inducements.

The newsletter was reporting the growing conviction that a land rig oversupply was developing and would become evident in 1982

One month later, however, the newsletter was reporting the growing conviction that a land rig oversupply was developing and would become evident in 1982. The market was turning on that proverbial dime. As more and more analysts were reaching that conclusion, they were also cautioning that the imbalance would be supply, and not demand, driven. The oversupply was supposedly only going to impact the shallow-rig market. As the newsletter wrote:

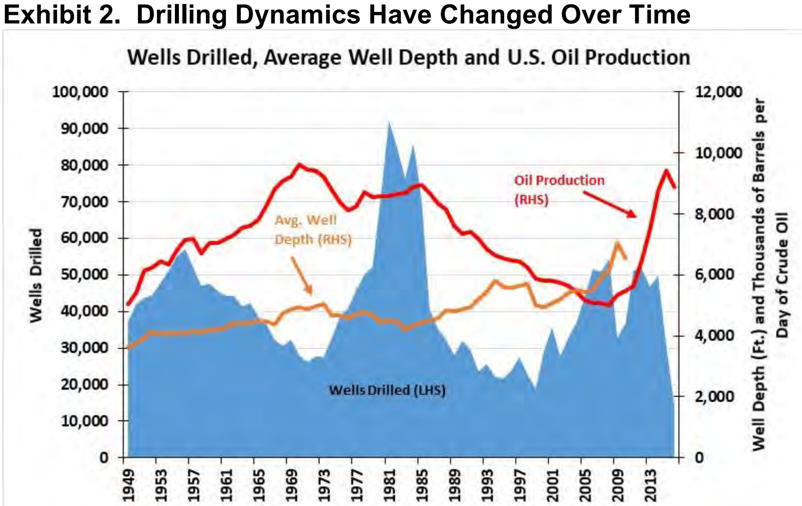
> "Demand for deep rigs continues to gain, no real let-up seen. Rig count, we think, may average 4,600/4,700 next year. Rigs in the fleet will total more than 6,000. Our forecast of 79,000-plus wells drilled in '81, made last March, remains unchanged."

Mr. Peacock's forecast of 79,000-plus wells for 1981 was blown away by the industry's 92,090 wells drilled!

Darnell Peacock, the owner and editor of *The Land Rig Newsletter*, was good at digging out industry data and facts, but not particularly good at financial analysis or forecasting (our personal view based on helping him with projects). In 1979, the domestic drilling industry punched slightly over 52,000 holes in the ground. But it really revved up its effort the next year with 71,205 wells drilled. Mr. Peacock's forecast of 79,000-plus wells for 1981 was blown away by the industry's 92,090 wells drilled! However, the following year, 8% fewer wells were drilled, which was followed in 1983 with 10% fewer wells. The good times came to an abrupt end. In 1989, the industry just barely missed reaching 28,000 wells drilled, and a decade later it was struggling to drill 19,000 wells.

Exhibit 2, although not completely up to date, shows the history of wells drilled, average well depth and U.S. oil production from 1949 through 2015. The standout feature of the chart is the spike in wells drilled, which reflected the spike in active drilling rigs working during the 1970s. While average well depth actually declined during the

Exhibit 2. Drilling Dynamics Have Changed Over Time



Source: EIA, PPHB

Once drilling headed south, so too did U.S. oil production

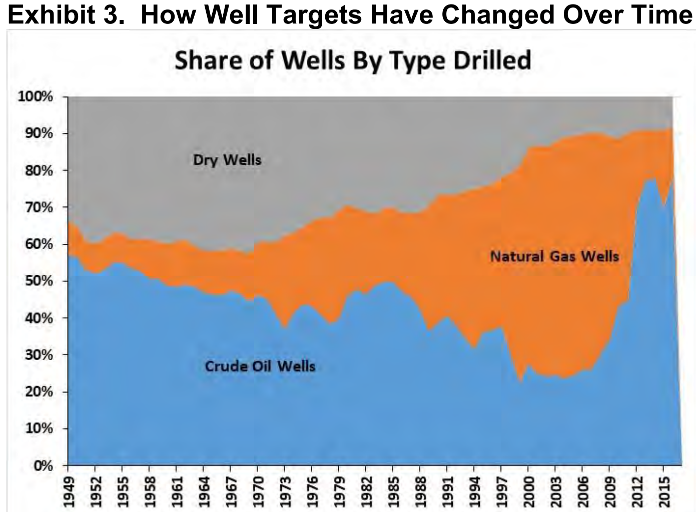
1970s, it began to increase in the 1980s and continued rising into the 1990s. The herculean drilling effort of the 1970s was needed to reverse the decline in oil output and actually recover about one-third of its decline from the end of the 1960s. Once drilling headed south, so too did U.S. oil production until the commencement of the shale drilling boom.

Other aspects of drilling activity that began to change as the 1970s oil boom ended were the growth in natural gas drilling, largely spurred by the decontrol of gas prices, and the improvement in drilling success rates. Fewer dry holes was the result of improvements in seismic technology and better directional drilling tools and techniques.

The shift in drilling targets was dramatic with respect to the speed and magnitude of the reorientation

Exhibit 3 shows clearly when natural gas became a focus of drilling in the U.S. due to the gas shale boom, only to be superseded by the oil shale boom. The shift in drilling targets was dramatic with respect to the speed and magnitude of the reorientation. An overarching drilling trend was the dramatic improvement in well success. A key factor was the shale revolution, which helped to reduce dry hole wells, as shale formations are clearly defined and require little or no exploration or delineation drilling, such as needed with conventional oil and gas prospects.

Exhibit 3. How Well Targets Have Changed Over Time



Source: EIA, PPHB

When the rig count rolled over at the start of 1982, the change in industry conditions was swift and brutal

When the rig count rolled over at the start of 1982, the change in industry conditions was swift and brutal. In June 1982, *The Rig Land Newsletter* reported that rig utilization had fallen to 66%, with 1,800 available rigs out of work. The newsletter said, "the downturn is not only pronounced, it is widespread." The newsletter reported on the auction of new drilling rigs and equipment by a fabricator in Midland, Texas. The company hoped to receive 80% of list price for the 19 new drilling rigs. Instead, it collected less than 50%.

The following month, July 1981, the newsletter did a quick rundown of regional rig markets, showing how widely the downturn was being felt. The editor said that "drilling contractors now making long-term plans usually see mid-1983 or later as the soonest any significant upturn can come in drilling." That outlook turned out to be optimistic.

Contractors were cutting costs wherever they could

Contractors were cutting costs wherever they could, but as the newsletter pointed out, there was "no norm, no standard." Some contractors had frozen wages, while others cut them. Crew sizes were being reduced, with the result that higher skilled workers were being kept by allowing them to bump lower-skilled workers from their jobs. Thus, tool pushers were now working as drillers. Per diem payments, as well as virtually all other perks, were being eliminated.

Rig auctions were showing sale values at roughly 60-cents on the dollar

Rig auctions were showing sale values at roughly 60-cents on the dollar in what were described as "distress cases," but those eventually became liquidations. Buyers were reportedly only interested in rig purchases if they could be bought for under 50-cents on the dollar.

The general economic contraction caused by lower oil prices helped to destroy the region's savings and loan industry that was based on the real estate market, another victim of the downturn

Another observation made by *The Land Rig Newsletter* was that: "Banks no longer want to look at a rig for collateral in flanging up a loan. They say they're more interested in contractor cash flow, and the backlog of work." As hard as they tried, banks that had loaned against "iron" were shackled with it. As they watched the collateral value evaporate, they were pulled down by the weight of the debt load. (Sounds familiar in today's energy world.) As global crude oil prices were falling, with the ultimate collapse a few years hence, not only was the oil and oilfield service industry impacted, but the banking sector was also damaged, especially the banks in the Southwest region of the country, home to the oil and gas industry. As energy companies were fighting with the rapidly deteriorating oil market, the commercial banking industry also struggled with the fallout on workers and local economies. The general economic contraction caused by lower oil prices helped to destroy the region's savings and loan industry that was based on the real estate market, another victim of the downturn.

"Oil was both the foundation of the region's economy and the primary force behind the Region's banking crisis"

In the book, An Examination of the Banking Crises of the 1980s and Early 1990s, there is a chapter dealing with the "Banking Problems in the Southwest." A seminal point was made that "Oil was both the foundation of the region's economy and the primary force behind the Region's banking crisis." For those involved in the petroleum industry, this is an absolutely true statement. The oil and gas business, while a critical and substantial industry in the nation and globally, was built by gamblers and speculators. Those images were created by high profile characters, whose lifestyles often were the story of books, movies, and certainly society columns. But their successes led to the creation of businesses much larger than any one, or even a handful of them, could ever have imagined. Hundreds of thousands of workers were dependent on the oil and

Billions of people were the beneficiaries of the good that oil and gas delivered

gas business, while billions of people were the beneficiaries of the good that oil and gas delivered via growing economies, improved living standards, and longer life spans. What made much of this possible was a vibrant financial community. When things in the oil patch turned down, the ramifications were widespread.

As was pointed out in the book:

> "The banking collapse in the Southwest was especially devastating to the Texas banking industry. From 1980 through 1989, 425 Texas commercial banks failed, including 9 of the state's 10 largest bank holding companies. In 1988, 175 Texas banks failed with assets of $47.3 billion - 25 percent of the state's 1987 year-end banking assets. The following year 134 Texas banks failed with assets of $23.2 billion - 13.6 percent of the state's banking assets."

While Penn Square Bank in Oklahoma may be the most well-known of the oil price banking casualties, Continental Illinois, Seattle-First and Chase Manhattan Bank, among others, were also victims

The devastation of the oil and gas business in the 1980s brought dramatic changes to the nation's banking system. The Texas banking scene may have been ground zero for the devastation of the regional finance system, but other regions were also hurt. While Penn Square Bank in Oklahoma may be the most well-known of the oil price banking casualties, Continental Illinois, Seattle-First and Chase Manhattan Bank, among others, were also victims. The degree of damage varied, but was largely tied directly to the commitment the respective banks made to energy lending relative to the rest of their book of loans. Banks were critical to the boom and bust of the oil industry in the 1970s to 1990s. They have been less critical to the industry's success in this downturn, partly due to changes in the banking laws as a result of the 1980s oil bust, but also the greater sophistication of today's energy company borrowers. Now we must look to the public equity and debt markets to see whether the nature of energy financing has helped to create another industry boom and bust. This may yet prove to be the most critical difference between the last and current boom-bust cycle. It may alter the industry's journey and whether it will follow the same road endured during the recovery period we call "wandering through the wilderness."

U.S. LNG Altered Gas Market; China-Russia Pipeline, Also?

The emergence of LNG from new supply sources has forced the dominant LNG suppliers to compete more aggressively to sustain their market shares

In February 2016, the world's natural gas market was altered when the Sabine Pass gas liquefaction plant shipped its first cargo of liquefied natural gas (LNG). That shipment marked the start of a dynamic change for the global natural gas market, driven by the latest chapter in the growth of the U.S. gas market, and which continues today. The emergence of LNG from new supply sources has forced the dominant LNG suppliers to compete more aggressively to sustain their market shares. Because cheaper natural gas supplies are feeding the U.S. LNG plants, the global market price for this fuel has been falling. There are other forces at work on LNG pricing, especially in Asia. The restart of Japanese nuclear power plants that had been shut down in a precautionary response to the 2011 Great East Japan Earthquake and associated tsunami, which caused the Fukushima nuclear plant accident, is shrinking the country's need for LNG supplies.

That development is last week's startup of the Power of Siberia pipeline connecting Russia's huge Siberian gas supplies to China's energy markets

As the global LNG market adjusts to reduced Japanese demand, concern over the security of European gas supply from Russia, coupled with an increase in continental gas demand due to various countries shutting down their nuclear power plants in fear of experiencing a Fukushima-type accident has boosted demand, and shifted the demand pattern. Against these shifting demand patterns comes a new gas market development that has the potential for significantly disrupting the future global gas market, and especially its LNG sector. That development is last week's startup of the Power of Siberia pipeline connecting Russia's huge Siberian gas supplies to China's energy markets. This is the first of two major gas pipelines, with potentially a third pipeline to be constructed, that will lead to Russia supplying a meaningful amount of China's growing natural gas needs. Importantly, this Russian pipeline gas may back out some of the LNG currently targeted for China.

China is now emerging as the major LNG demand driver in Asia

Traditionally, the Asian LNG market has been dominated by Japan and South Korea, two countries that have limited or non-existent fossil fuel resources. Therefore, other than building nuclear power plants, these two economies have depended on the importation of fossil fuels, primarily LNG. China is now emerging as the major LNG demand driver in Asia. Renewables will not solve the future energy needs of these countries.

Exhibit 4. How Asian Countries Compare On Fuel Use

Million tonnes oil equivalent	Oil	Natural Gas	Coal	Nuclear energy	Hydro electric	Renew-ables	2018 Total
Japan	182.4	99.5	117.5	11.1	18.3	25.4	**454.1**
	40%	22%	26%	2%	4%	6%	100%
South Korea	128.9	48.1	88.2	30.2	0.7	5.0	**301.0**
	43%	16%	29%	10%	0%	2%	100%
China	641.2	243.3	1906.7	66.6	272.1	143.5	**3273.5**
	20%	7%	58%	2%	8%	4%	100%

Source: BP Statistics, PPHB

The two countries have 26% to 29% of their energy needs satisfied by coal

To better appreciate the natural gas market dynamics in Asia, it helps to see the energy consumption by fuel for each of Japan, South Korea and China. In the case of Japan and South Korea, both rely on 40% to 43% of their total energy supply coming from petroleum, with natural gas accounting for 16% in South Korea and 22% in Japan. The two countries have 26% to 29% of their energy needs satisfied by coal. For both countries, 10% of total energy used in 2018 came from nuclear, hydroelectric and renewables, but the reliance on nuclear was vastly different for the respective countries (2% for Japan compared to 10% for South Korea) due to legacy actions related to the 2011 Fukushima nuclear accident in Japan.

The energy fuel mix for Japan and South Korea contrasts sharply with that of China

The energy fuel mix for Japan and South Korea contrasts sharply with that of China. There, coal satisfies almost 60% of the nation's energy consumption, while petroleum accounts for only half the usage of Japan and South Korea. Hydroelectric power is a much greater energy contributor in China due to its major rivers, compared to the amount supplied in either Japan or South Korea.

China pumps more CO_2 than the United States and the European Union combined

China has agreed to comply with the Paris Accord for reducing its greenhouse gas emissions, but its current plan is only to stop them from rising by 2030. China pumps more CO_2 than the United States and the European Union combined. While the COP25 environmental conference is underway in Madrid, China has 148 gigawatts of coal power generation "either under active construction or under suspension and likely to be revived" according to the nonprofit *Global Energy Monitor*.

The expectation is that China will become a much more significant consumer of LNG

It has been the conflict between the Paris Accord commitment and the reality that coal is a much cheaper and consistent power source than renewables that has China considering the use of greater amounts of natural gas and LNG. The expectation is that China will become a much more significant consumer of LNG. China is building new LNG receiving terminals along its coast, which is where a substantial portion of the nation's population is clustered. However, its industry, in many cases, has been shifted inland closer to where the coal power plants are being built. But, this move, as well as the rapid growth of cities and their vehicle fleets, has still left many locales with extremely dirty air. Increased use of cleaner natural gas is an obvious solution.

This growing realization was behind the agreements between China and Russia to build large pipelines to bring Siberian, and now European and Central Asian gas supplies, to China

One of China's major problems is that it has not been able to develop shale gas deposits on the scale it originally envisioned. Early in its shale development efforts, the thought was that the failures were more tied to the lack of knowledge of how to drill and complete the wells. With the help of western oil companies and modern equipment, the disappointing outcomes reflect issues with the quality of much of China's shale deposits. This growing realization was behind the agreements between China and Russia to build large pipelines to bring Siberian, and now European and Central Asian gas supplies, to China.

In May 2014, China signed an agreement to connect with an extension of the Power of Siberia pipeline to bring natural gas from Russia to the northeastern region of China. Gazprom, the Russian oil and gas company and the only Russian company allowed to export gas, signed a 30-year supply contract with the China National

Petroleum Company (CNPC) to deliver 38 billion cubic meters (Bcm) of gas annually. This pipeline began delivering its first natural gas to China last week, but will not reach maximum capacity until 2024.

This pipeline provides a hedge for Russia should its markets in Europe stagnate or decline

In November 2014, Russia and China agreed to a second deal that will bring 30 Bcm of gas annually through the Altai Gas Pipeline that enters China in the western region of the country. This pipeline will be able to haul gas destined for Europe markets and supplies from the central region of Russia. This pipeline provides a hedge for Russia should its markets in Europe stagnate or decline. Exhibit 5 shows the two pipelines – Power of Siberia in red and the Altai pipeline in blue. Each pipeline taps different gas deposits in Russia, with the eastern most pipeline able to also receive natural gas from Central Asian suppliers besides Russia.

Exhibit 5. New Russia To China Gas Pipelines

Source: ***PeakOil.com***

It is unknown exactly what price China will be paying for its gas from Russia

When the contract was signed in 2014, China was reportedly asking for a gas price of $350 per thousand cubic meters, which, at the time, was about $30 less than European gas customers of Russia were paying for their supplies. It is unknown exactly what price China will be paying for its gas from Russia. Analysts will be able to gain insight into the price eventually from the Chinese customs data and the revenues and earnings reported by Gazprom. It is likely that the earliest we will be able to see some data is the first quarter of 2020, but because the gas volumes will be so small, it is likely that a true understanding of the gas price and the pipeline's economics will not become clear until later in 2020.

Also, in 2014, there were articles written about the pipeline deals that addressed the economics, given that it was going to require an estimated $100 billion to finish constructing them. Since that time, there has been a devaluation of the Russian ruble, which has reduced the real economic cost of constructing the pipelines. Again, we have little information upon which to base any conclusions about the pipeline's economics – assuming they are relevant given the geopolitical implications of these pipelines to the global energy market and the health of the Russian economy, which depends heavily on petroleum product exports.

In 2018, the United States was the fourth largest LNG exporter in the world

In 2018, the United States was the fourth largest LNG exporter in the world. Through nine months of this year, the U.S. has moved into third place with 24.4 million tons (mmt) of LNG exported. It trails Qatar, who shipped 59.6 mmt, and Australia, with 57 mmt of LNG shipped. These three LNG exporters will be battling it out for supremacy in the global gas market, which has implications for each country's gas market, as well as the global marketplace and prices.

The United States is projected to be the leader in building new LNG export capacity between 2019 and 2023

According to *Global Data*, the United States is projected to be the leader in building new LNG export capacity between 2019 and 2023. *Global Data* projects the U.S. will add 157 mmt/y of new capacity, or roughly 70% of additional global supply during this period. Canada is projected to build the second most LNG capacity at 19 mmt/y, and Russia will be third with 15 mmt/y.

Since 2017, the quarterly volumes of LNG shipped have increased from roughly 3 mmt per quarter to nearly 8 mmt/qtr

The battle for LNG export supremacy will be intense. It will spill over into delivered LNG prices, which will play a role in the cost of natural gas at the wellhead. *Global Data* prepared a chart showing both the growth of LNG export volumes from the United States and the regions where the fuel was delivered. Since 2017, the quarterly volumes of LNG shipped have increased from roughly 3 mmt per quarter to nearly 8 mmt/qtr.

Through the first quarter of 2019, Asia received the bulk of U.S. LNG exports. The second quarter of 2019 saw almost a balance between Asia, the Americas and Europe for LNG deliveries. In the third quarter, Europe dominated U.S. LNG exports. Much of that gas wound up in storage tanks in Europe, which are now reportedly full. That has put downward pressure on gas prices on the continent, which may force more U.S. LNG to head to the Americas.

Exhibit 6. Where U.S. LNG Shipments Have Gone

Source: *Global Data*

Adding to the LNG challenge is the evolving gas market in Europe

Adding to the LNG challenge is the evolving gas market in Europe. The liberalization of the gas market has led to lower gas costs for consumers. That has also been helped by improved network interconnections. With gas being able to flow throughout the continent more easily than in the past, the entire gas network becomes more resilient. A problem is that lower natural gas prices has led to a shrinking of the price spread between winter and summer gas. A decade ago, the spread averaged €10 to €12 ($11.18-$13.42) per megawatt-hour (MWh), but now it has fallen closer to €2 ($2.24). At the same time, the cost of gas storage has remained unchanged at around €5 to €6 ($5.59-$6.71)/MWh.

Over the past two years about 4% of gas storage capacity has been closed due to falling gas prices

This means that there are fewer incentives for buyers to store gas during the summer. According to Gas Infrastructure Europe, a trade association, over the past two years about 4% of gas storage capacity has been closed due to falling gas prices. This has the tendency to raise the risk of demand load curtailments when gas storage shrinks by 10%. The resultant impact on electric power availability and costs is significant.

This shows how the value of gas storage has been diminished, which will probably continue to create problems for gas customers whenever bitter cold temperatures descend on the region

Two years ago, polar air from Siberia, dubbed "the Beast from the East," hit the U.K. and Ireland. When the cold weather hit, gas demand soared to multi-decade highs and energy operators were forced to curtail demand, import LNG from Qatar and the United States, and restart all the available coal-fired power plants previously idled for environmental reasons, in order to avoid burning gas to generate electricity. The situation was exacerbated by the closure of British Gas' largest gas storage facility, citing economic and safety reasons, the year before. This shows how the value of gas storage has been diminished, which will probably continue to create problems for gas customers whenever bitter cold temperatures descend on the region. It will open up opportunities for LNG shippers, but without the assurance gas suppliers would like to have with their customers.

At a very high level, the addition of the two pipelines will increase Russia's share of gas supply to China to 17% by 2030. While that may not appear to be significant, remember that commodity prices and supplies are usually impacted by marginal changes and not necessarily massive shifts. There are other dynamics at work in the Chinese gas market that will also impact the global LNG business.

All gas supplies - LNG, domestic production and piped imports - grew in China during 2015 to 2018

Between 2016 and 2018, global LNG supply increased by 28%, with China absorbing half the new supply. China's LNG imports almost tripled between 2015 and 2018. All gas supplies - LNG, domestic production and piped imports - grew in China during 2015 to 2018. In fact, local gas production grew more than imports (88 Bcm versus 62 Bcm). Through the first nine months of 2019, pipeline imports have not grown at all, while domestic production is up 10%. This is an explanation for the decline in Chinese LNG imports, although the tariff war with the U.S. is also a factor.

Between 2015 and 2018, 80% of Chinese gas demand growth was due to fuel switching

Despite the emphasis on building new coal-fired power generating plants, between 2015 and 2018, 80% of Chinese gas demand growth was due to fuel switching. This switching is driven by policy, but also because cleaner natural gas is partly subsidized. PetroChina reports losses for its pipeline and LNG import businesses, as imported gas prices remain high. Through September 2019, the average price of LNG was $9.80 per million British thermal unit and $7.30 for pipeline gas. Will Russian gas be priced at this level, or has China negotiated a better deal due to the geopolitical and economic needs of Russia? Time will tell.

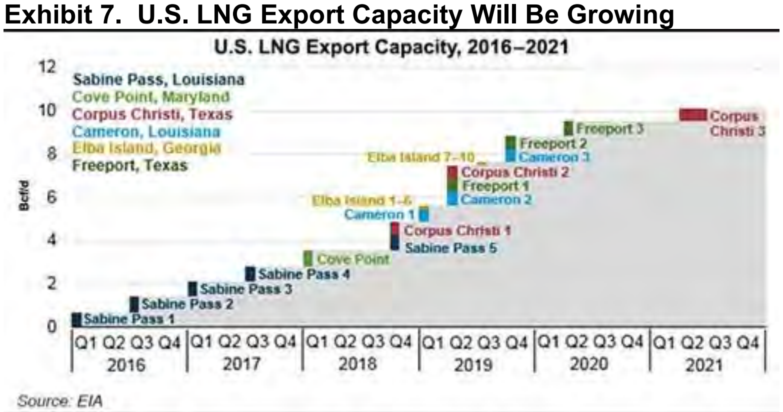
ExxonMobil Corp. announced it was abandoning a plan to build an LNG import terminal in Australia

For the global LNG market, we thought it was interesting that almost at the same time Russia was starting to ship gas to China on the Power of Siberia pipeline, ExxonMobil Corp. (XOM-NYSE) announced it was abandoning a plan to build an LNG import terminal in Australia. The country has experienced a natural gas shortage on its eastern side where coal-seam gas supplies have all been committed to Asian LNG exporters. With declining supplies from its central region basins, the thought has been that gas would need to be imported to ease the crisis. It seems, according to ExxonMobil, that it is impossible to secure any long-term supply contracts, at least at economic prices for the oil company. Is this a sign Australian energy companies foresee a change in the region's gas market that will make supply more readily available and at more reasonable prices, as well as requiring less-onerous contracting terms?

One begins to wonder who will build the first "white elephant" LNG export terminal?

With LNG export capacity continuing to grow in the U.S. – from under 8 Bcf/d in 3Q19 to close to almost 9 Bcf/d in 4Q19, and further increasing to 10 Bcf/d in early 2021 – and more proposed terminals are receiving approvals from regulators, one begins to wonder who will build the first "white elephant" LNG export terminal?

Exhibit 7. U.S. LNG Export Capacity Will Be Growing



Source: EIA

LNG terminals planned for the West Coast of Canada may also be at risk, as they would be starting to ship their first volumes about the

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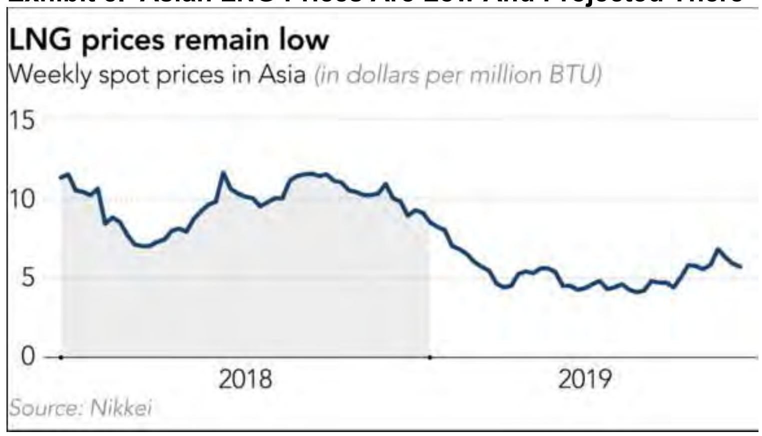
time the two new Russian pipelines, not even counting the possibility of a third pipeline, would be reaching their peak shipping volumes.

Exhibit 8. Asian LNG Prices Are Low And Projected There



Source: ***Nikkei Asia News***

Is the United States exporting its low natural gas pricing environment globally?

As we look at what has happened to Asian LNG prices – they are below $6 per million BTU versus over $10 a year earlier – we are left wondering if low natural gas prices will prevail globally in the future? In other words, is the United States exporting its low natural gas pricing environment globally? If so, then the world's gas industry should be bracing for changes it has yet to consider.

Can Anything Help Lift Natural Gas Prices?

They were pushing "natural gas is the bridge fuel to a cleaner environment" mantra because high gas prices provided a price-umbrella over expensive renewables

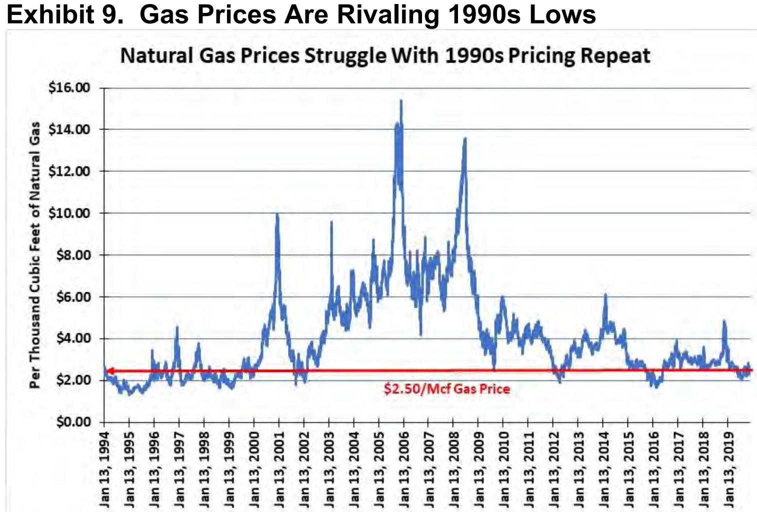
After jumping in late November as early cold temperatures blew across the nation, natural gas prices have slumped once again. Gas prices are languishing at decade lows. In fact, as Exhibit 9 (next page) shows, natural gas prices now are back to where they traded in the 1990s, before global warming pushed utility companies to seek cleaner-burning natural gas to generate electricity rather than dirty coal. As utilities pushed up gas demand, prices rose into the high-single digit to low double-digit range. Natural gas was praised by environmentalists for its lower greenhouse gas emissions quality, but secretly they were pushing "natural gas is the bridge fuel to a cleaner environment" mantra because high gas prices provided a price-umbrella over expensive renewables, their preferred option.

What undercut those high gas prices was the success of the shale gas revolution. The pioneering work of George Mitchell and his engineers at Mitchell Energy in developing the techniques for drilling wells horizontally through shale strata and then applying massive hydraulic pressure to break the formations and prop them open allowing gas to flow to the wellbore was confirmed and refined. The improvements enabled producers to flow huge volumes of natural gas from initial well completions, although they then experienced

Large hydrocarbon flows and quick cash returns became a siren song that lured producers of all stripes to the gas shale basins throughout the United States

rapid output declines. However, shale wells were quick to return cash to operators, which was highly valued. Large hydrocarbon flows and quick cash returns became a siren song that lured producers of all stripes to the gas shale basins throughout the United States. The result was a surge in natural gas production and a collapse in gas prices. That outcome drove producers to experiment with oil shale formations, with similar results, but better economics.

Exhibit 9. Gas Prices Are Rivaling 1990s Lows



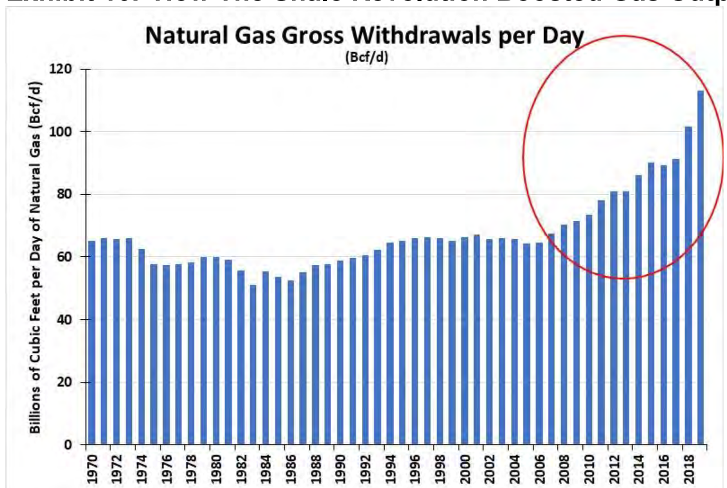
Source: EIA, PPHB

These greater market options have been facilitated by the dramatic growth in gas production

What has proven to be amazing about the domestic natural gas market is that we have experienced a significant increase in power generation use at the same time we have begun exporting greater volumes of gas via pipeline to Mexico and via ships to world markets. These greater market options have been facilitated by the dramatic growth in gas production. If we focus on gross natural gas withdrawals, we see the sharp upturn in output starting about 2007 and continuing through 2019 (annualized 11-month data).

What is particularly interesting is the significant production jumps in 2018 and 2019. That is explained by the surge in associated natural gas from the Permian Basin where shale oil drilling has been increasing until recently. The production increase has also been helped by the startup of gas pipelines from several supply basins resulting in more gas being able to get to market, which encourages producers to drill and complete more wells.

Exhibit 10. How The Shale Revolution Boosted Gas Output

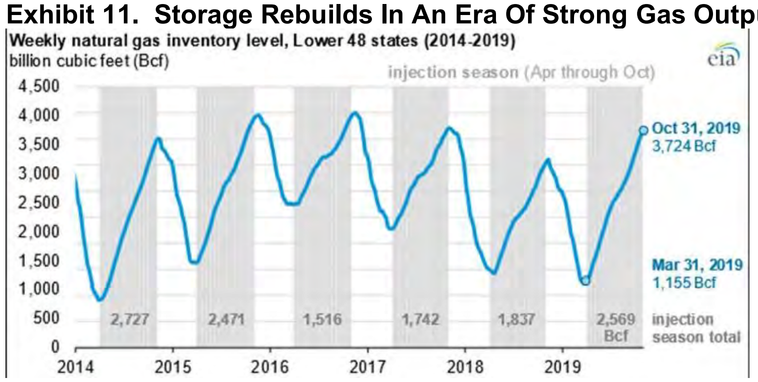


Source: EIA, PPHB

There were no years with as much gas injected as in 2014 and 2019

The dramatic growth in gas production enabled the gas industry to rebuild storage when abnormally cold temperatures depleted reserves. The Energy Information Administration (EIA) published the chart shown in Exhibit 11 noting the dramatic rebuilding of storage this past injection season. That effort was done without forcing gas prices up, another reflection of the sheer volume of gas production. While the chart shows the amount of gas volumes injected during the season back through the 2014, this past season's volume was the second largest amount injected after the 2014 season. However, when we examined earlier years back to 1994, we find many other years in which large storage injection volumes were achieved. There were no years with as much gas injected as in 2014 and 2019. The 2001 (2,414 Bcf) and 2003 (2,491 Bcf) injection seasons came the closest to the 2019 injection volume. Those earlier years were when natural gas prices were extremely high and the market was worried about the ability of producers to ensure that there would be sufficient gas for the upcoming winters.

Exhibit 11. Storage Rebuilds In An Era Of Strong Gas Output

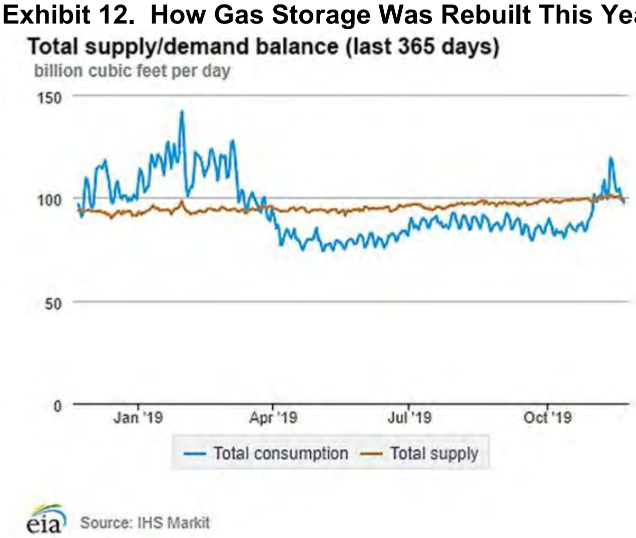


Source: EIA

That surplus production is what allowed the gas storage volumes to be rebuilt rapidly during the summer and fall, despite a hotter than normal summer and the export demand growth

It is important to understand that the surge in gas output due to the shale revolution has not only allowed such record gas injections, but also enabled the industry to satisfy the increased gas needs of the electricity generation industry, the growth of LNG exports, and increased volumes being shipped to Mexico. The net result of the production growth is shown in the chart prepared by the Energy Information Administration (EIA) that plots weekly production and demand estimated by research firm *IHS Markit* for the past year. What can be seen is how demand was well above production during the winter months of early 2019, but demand then fell below production, which continued to grow throughout the year. That surplus production is what allowed the gas storage volumes to be rebuilt rapidly during the summer and fall, despite a hotter than normal summer and the export demand growth. This supply/demand trend is why natural gas prices have sunk as low as they have, with few prospects of them rising significantly, absent an extended blast of polar air across the United States.

Exhibit 12. How Gas Storage Was Rebuilt This Year



Source: EIA

One investment bank's commodity forecast calls for gas storage volumes this winter to end the winter withdrawal season 25% ahead of the 5-year average

Currently, forecasts for warmer winter weather over the next few weeks is driving gas prices sharply lower. One investment bank's commodity forecast calls for gas storage volumes this winter to end the winter withdrawal season 25% ahead of the 5-year average. In their estimation, this will drive natural gas prices at some point in the second quarter of 2020 below $2 per thousand cubic feet (Mcf), a level not seen since April 2016. This view seems to be prevailing in the commodity market as the short position for gas futures contracts has reached an unusually high level for this time of the year.

According to one trader, he expected his low-price objective to hold at $2.27/Mcf, although it actually fell below that level to $2.24. He pointed out that the market was setting itself up for an ugly spring

if demand falls due to an absence of winter, and/or there are any disruptions in LNG or pipeline exports, the gas market could easily be swamped driving prices down sharply

due to the lack of winter demand and continued robust production. He pointed out that last time the near-month gas futures contract price fell below $2.27 in November or December was in 2015. That year, the November low was $2.05, which was followed by a December low of $1.68 before the price rallied to $2.50 in January 2016. By March 2016, however, the gas price had fallen to a low of $1.66/Mcf. We see few projections for the current price to drop to such low levels, but if demand falls due to an absence of winter, and/or there are any disruptions in LNG or pipeline exports, the gas market could easily be swamped driving prices down sharply.

Frustration on the part of gas producers and complacency by gas buyers is a formula for a surprise shock. We are not predicting what the shock might be, but we are pretty confident that the conventional wisdom about the outlook will prove wrong, as it usually does.

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