ENERGY INVESTMENT BANKING

MUSINGS FROM THE OIL PATCH

January 8, 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

History Doesn't Repeat, But The Energy Market Rhymes – Part 2

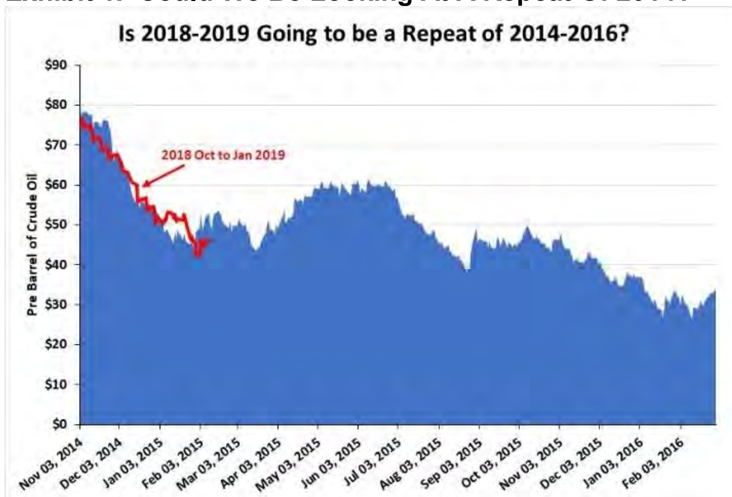
These are all short-term trading issues and don't address the more important fundamental trends driving energy and oil markets

The collapse of the global oil price in the fourth quarter, which seemed to be magnified by events during December, suddenly reversed during the morning trading on January 2nd. This sea change may reflect year-end selling pressure ending, as well as traders betting that the price decline was overdone. The sentiment change seemed to reflect a view that with OPEC's oil production falling during December and projected to decline further in January, the pressure from potential inventory builds is being alleviated. Unfortunately, these are all short-term trading issues and don't address the more important fundamental trends driving energy and oil markets in the coming years.

That meant cutting capital spending, laying off employees, opting for low-risk projects with quick cash flow paybacks over big reserve, long timeframe projects

As we highlighted in our last *Musings*, the precipitous decline in crude oil prices at the end of 2018 had people speculating we were heading for a repeat of the 2014-2016 industry debacle. Then, the "lower for longer" mantra sapped the oil and gas business of capital, and in turn, employment and initiative. As 2015 unfolded, after Saudi Arabia's strategy shift, oil industry executives pulled out their old playbooks for downturns and began executing. That meant cutting capital spending, laying off employees, opting for low-risk projects with quick cash flow paybacks over big reserve, long timeframe projects. Becoming more efficient was paramount. At the same time, the downturn energized investors to demand an attitudinal adjustment for the industry – live within cash flow, reduce financial and operational leverage, and return more of the free capital to the owners of the enterprises, either through share buybacks or dividends. Those managers who failed to embrace this new investment era were destined to be punished.

Exhibit 1. Could We Be Looking At A Repeat Of 2014?



Source: EIA, PPHB

The latest oil price downturn came at the worst time for the industry

While we stand on a precipice looking toward the balance of 2019, but importantly, the future of the next decade, we continue to worry about the long-term damage the months of super-high oil prices have done for the future of the oil and gas industry. The latest oil price downturn came at the worst time for the industry. It happened at budget setting time, creating a high level of uncertainty. That uncertainty is impacting spending decisions for 2019, but importantly, it may delay decisions about significant projects with longer time-horizons.

These trends will impact energy broadly, and oil and gas specifically

The oil price uncertainty also comes at a time when the entire industry's structure remains challenged financially, operationally and staffing-wise. What steps company managers take will depend not only on their view of commodity prices for the long-term, but also the unique position of each company. With the elevated stress level caused by the uncertainty, we expect changes to the trends driving the industry in 2019 and beyond to emerge. These trends will impact energy broadly, and oil and gas specifically. How managers and companies react will be driven by their views about the long-term future for fossil fuels.

The struggle over what fuels should be the backbone of our globe's future energy business will continue

Let us state what we believe is obvious: For the foreseeable future, fossil fuels will play a significant role in meeting the globe's energy needs, and continuing to help lift the living standards of billions of people around the world. This will happen regardless of the environmental war on fossil fuels, as there is not sufficient time or enough capital to redo the world's energy infrastructure for a future powered exclusively by renewable fuels, let alone the technology to make it happen. That said, the struggle over what fuels should be the backbone of our globe's future energy business will continue with new players and strategies being pushed into the marketplace of ideas.

We should be mindful that while developed economies are where the climate change war is being waged most prominently, faster energy growth is coming in the less developed economies, offering different challenges and opportunities. Although they possess the ability to leapfrog older technologies, just as they have with communications by skipping telephone land lines for cell phones, many of the "clean" fuel options remain "uneconomic" compared to fossil fuels. The promise of continued declines in the cost of "clean" fuels remain just that – promises based on projections. These fuels continue to demand government subsidies, which, for a number of economies, is becoming a significant financial burden.

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Much like what we see in the violent reactions in capital markets to the efforts of central bankers around the world to transition their economies off "cheap" money amid raising interest rates, shifting "clean" fuels off government subsidies is creating similar reactions. Two examples: 1) the move by General Motors (GM-NYSE) and Ford Motor Company (F-NYSE) to push for an extension of the U.S. federal tax credit for buying electric vehicles (EV) and the removal of the cap on the sales volumes; and 2) the $2,000 per unit cut in the price of all Tesla (TSLA-Nasdaq) cars to partially offset the half of the federal tax credit lost at year-end because of reaching its sales cap. Faced with state mandates for EVs, which remain poor sellers and unprofitable vehicles, the companies need help in order to transition their manufacturing from internal combustion engine (ICE) cars to EVs.

A third example of the challenge of promoting clean energy futures is the rioting in France by the "yellow vests" against that government's attempt to raise diesel prices. The violence was so significant that the government backed down on the tax increase.

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In Norway, star of the EV market in developed economies, the government is spending over $1 billion a year to support that market. The support comes in the form of tax credits, along with use incentives such as free tolls, reduced ferry fees, access to reserved bus lanes, and free parking in city centers. The cost of the support relative to the size of the Norwegian economy is low, only $1 billion out of a $400 billion economy. However, drivers are now finding growing congestion in the dedicated bus lanes, and ferry companies are clamoring for increased subsidies due to their reduced income. Based on the total number of EVs in the Norwegian vehicle fleet at year-end 2017 (6.6%), every EV on the road is being subsidized by roughly $4,800 annually, a number that will only increase unless changes are made in the subsidy program.

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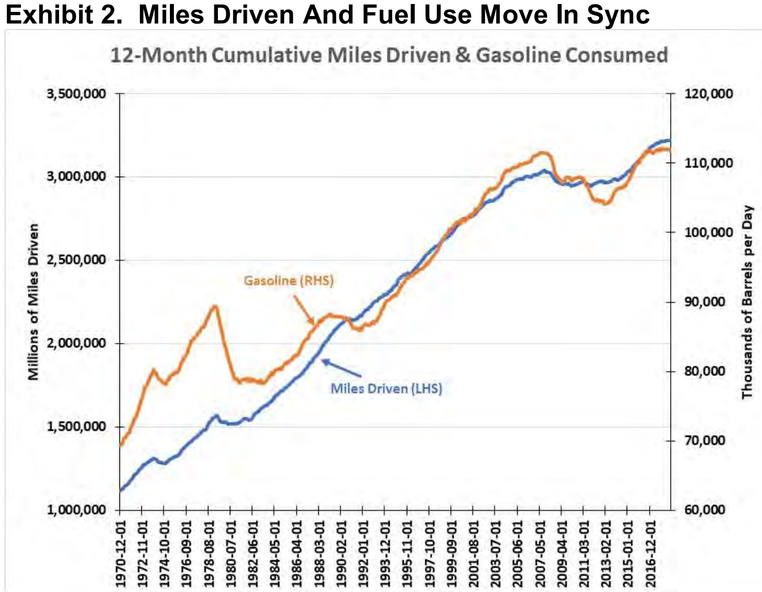
Globally, there are 2-3 million EVs on the road. But, out of a global vehicle fleet of one billion or more units, we are still talking about a quarter of one percent market share. Projections for the global EV fleet to reach one-third of the world's total vehicle fleet by 2040 may ignore the financial cost to governments to get there, and the willingness of their citizens to deal with the increased taxation burden to support the subsidies needed to achieve such a target. *BloombergNEF* projects global EV sales to grow from 1.1 million units in 2017 to 11 million in 2025 and to 30 million in 2030. By 2040, the consulting firm expects EV sales to account for 55% of all new car sales, and 33% of the global vehicle fleet.

When the 1970s recession hit in response to high oil prices and interest rates, miles driven declined only modestly, but gasoline consumption fell precipitously as gasoline prices soared

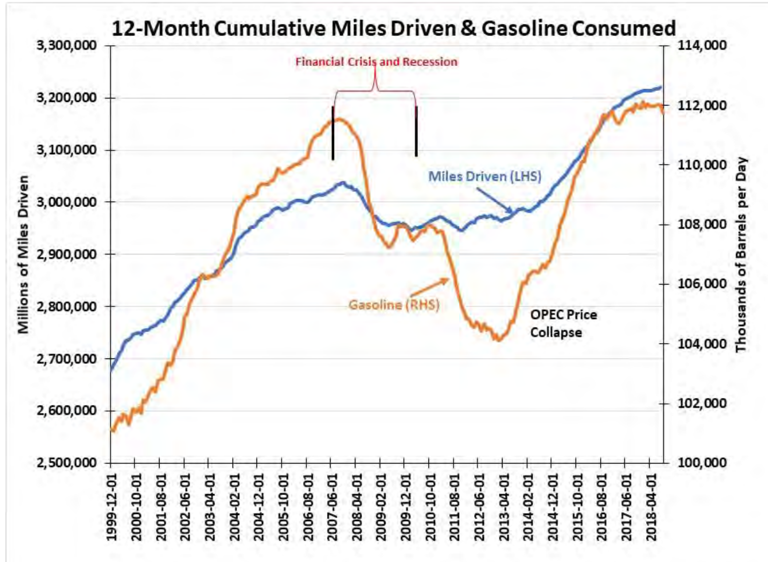
If the *BloombergNEF* projection happens, what does it mean for gasoline and diesel consumption, and in turn, crude oil demand? A look at a series of charts for driving and gasoline consumption in the United States may shed some light. Exhibit 2 shows the history of annual cumulative miles driven by the U.S. vehicle fleet and gasoline volumes consumed. Notice how rapidly miles driven and gasoline consumption rose in the early years, reflecting the low miles-per-gallon fuel-efficiency of the fleet at that time, and the economic and societal shifts that enabled increased driving. When the 1970s recession hit in response to high oil prices and interest rates, miles driven declined only modestly, but gasoline consumption fell precipitously as gasoline prices soared. This marked the shift away from low-mileage cars and the embrace of small cars and more fuel-efficient vehicles. In the most recent years, we have seen both a decline in miles driven and a corresponding drop in gasoline consumption. The recent growth in miles driven seems to be rising at a slower rate than historically.

Exhibit 2. Miles Driven And Fuel Use Move In Sync



Source: Transportation Dept., EIA, PPHB

Exhibit 3. Recession Takes Toll On Auto Fuel



Source: Transportation Dept., EIA, PPHB

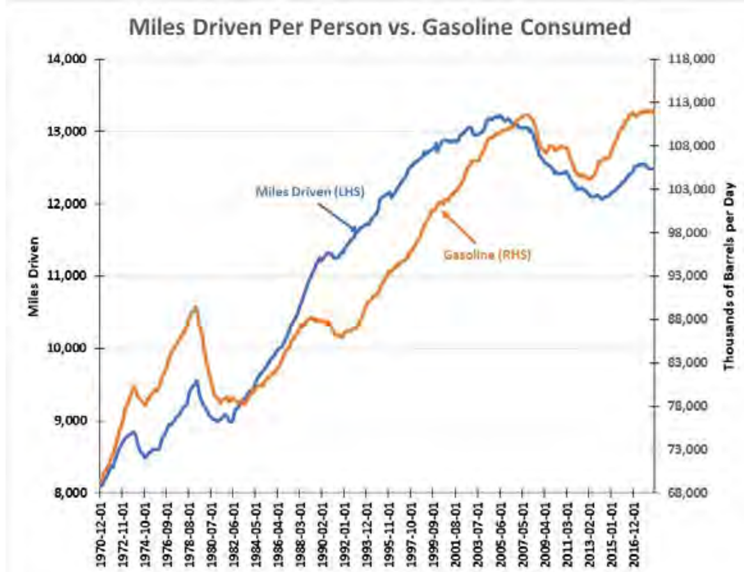
These patterns show how sensitive gasoline consumption is to high pump prices

A more detailed look at the miles driven and gasoline consumption data since 2000 (Exhibit 3) shows several interesting events. We have marked the period of the financial crisis and recession (2007-2009), which shows a decline in miles driven and gasoline consumption, largely due to the rise in unemployment and the pain of the recession. The fact that gasoline consumption fell dramatically during this period is a signal of the impact of costly fuels. Even after the miles-driven curve flattened out, before showing slight increases, gasoline consumption fell, largely due to the high price per gallon for gasoline, which was derived from $100-a-barrel crude oil. These patterns show how sensitive gasoline consumption is to high pump prices. It is interesting that in recent months, although miles driven have risen slightly, gasoline consumption has barely increased, even though pump prices were down. This performance likely reflects the increased fuel-efficiency of the vehicle fleet due to government mandates for improved average fuel efficiency for new cars sold.

With a progressively more fuel-efficient vehicle fleet and the introduction of more EVs into the fleet, gasoline consumption is probably close to, if not at, a peak

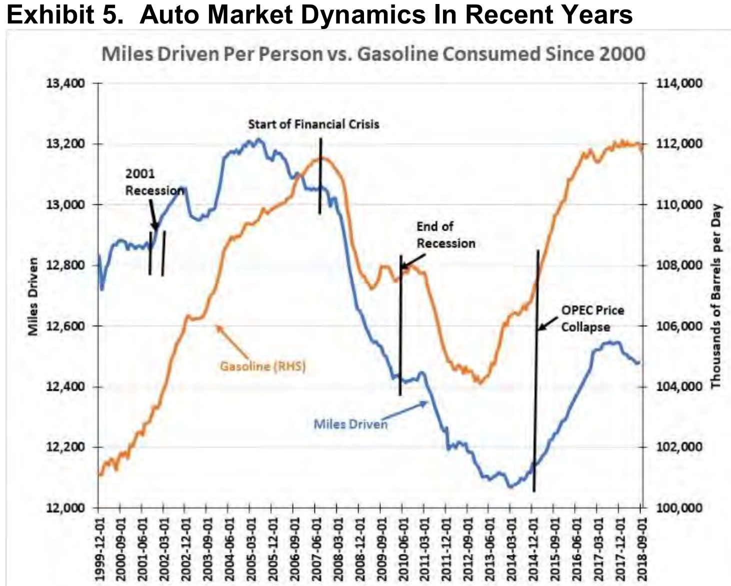
As we look to the future for transportation fuel, at least in the U.S., one has to question whether we will see a significant increase in miles driven, such as was experienced in the 1970s. If not, then with a progressively more fuel-efficient vehicle fleet and the introduction of more EVs into the fleet, gasoline consumption is probably close to, if not at, a peak in the U.S. The next two charts show the same driving and gasoline consumption data as earlier, but measured on a per capita basis.

Exhibit 4. Per Capita Fuel And Driving Deviate



Source: Transportation Dept., EIA, PPHB

Exhibit 5. Auto Market Dynamics In Recent Years



Source: Transportation Dept., EIA, PPHB

Driving peaked long before the financial crisis emerged, but didn't recover until well past the end of the recession in 2009

While Exhibit 4 shows the long-term trend in miles driven and gasoline consumption per capita, Exhibit 5 shows the same data for just the period beginning with 2000. This chart shows that driving peaked long before the financial crisis emerged, but didn't recover until well past the end of the recession in 2009. Gasoline consumption started to rise well before driving did (2012 versus 2014), which we attribute to the surge in SUV and light duty truck sales following the recession. Those vehicles are less fuel-efficient

Will we continue seeing as many SUV and pick-up truck sales in the future?

than standard cars, so fuel use would logically rise faster than miles driven. Will we continue seeing as many SUV and pick-up truck sales in the future? Will EV mandates force those ICE vehicle prices up sharply to help auto companies remain profitable, thus hurting sales? These are just some of the questions about how the automobile industry may evolve, which will impact future oil demand.

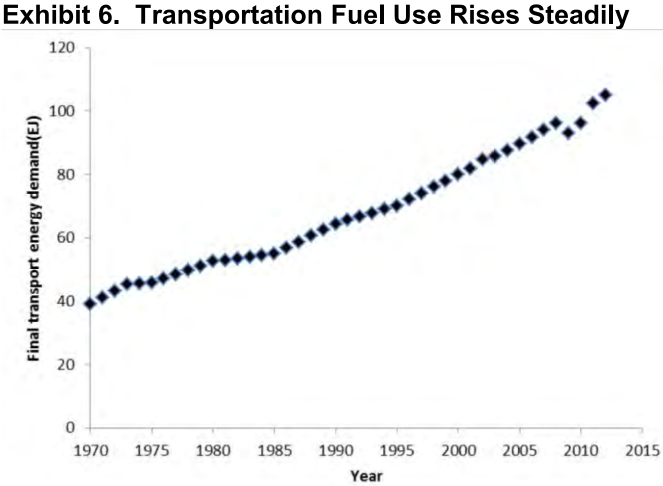
Although some might suggest that what happens in developed economies such as the United States is not indicative of what is, or will happen globally, we believe people in every country are facing similar choices in their vehicle selection – initial cost versus annual operating cost, as well as dealing with practical issues such as refueling and usage. The state of transportation fuel growth is changing.

80% of the world's population resides in non-OECD countries, and with rising standards of living transportation fuel consumption will grow at 2.5% per year

According to the Energy Information Administration's (EIA) 2016 Annual Energy Outlook, in 2012, OECD nations accounted for 55% of the world's total transportation energy consumption, with non-OECD nation's accounting for 45%. The EIA predicts that in 2020 the two groups will account for equal shares, but because non-OECD consumption is growing faster than OECD, by 2040 the former will represent 61% of total consumption. The market share gain reflects the fact that 80% of the world's population resides in non-OECD countries, and with rising standards of living transportation fuel consumption will grow at 2.5% per year.

In a paper titled "Global transport energy consumption," two Australian professors looked at the transportation market and how efficiency can be improved. They produced the chart in Exhibit 6, showing how global final transport energy demand grew from 1970 to 2011. It is interesting that the 1970s recession barely reduced transport fuel consumption compared to the measurable drop experienced during the financial crisis in 2008.

Exhibit 6. Transportation Fuel Use Rises Steadily



Source: Moriarty & Honnery

Oil's share declined by about 1.5 percentage points, with natural gas more than doubling its share

The professors also produced some interesting statistics on fuel shares in the world transport market between 1973 and 2012. Oil's share declined by about 1.5 percentage points, with natural gas more than doubling its share. Surprisingly, coal's share fell from slightly over 3% to only 0.13%, reflecting the move away from the fuel by rail and ships. We aren't sure whether there are any steam-powered cars, other than a few classics in museums.

Exhibit 7. Oil Still Controls Transportation

Fuel	1973(%)	2012(%)
Oil	94.30	92.86
Coal	3.05	0.13
Gas	1.64	3.60
Electricity	0.98	1.02
Biofuels	0.03	2.39
TOTAL	100.00	100.00

Source: Moriarty & Honnery

In 2016, the first around-the-world flight by a plane powered exclusively by solar needed 505 days to fly 26,000 miles, averaging about 45 miles per hour

Another set of interesting statistics is the 2000 modal share of final world transport energy use. As expected, road use accounts for over 72%, while rail is a small 1.5% share. Air transport at 11.6% and shipping at 9.5% represent significant technological challenges for non-fossil fuel energy. In 2016, the first around-the-world flight by a plane powered exclusively by solar needed 505 days to fly 26,000 miles, averaging about 45 miles per hour. Solar Impulse 2 was equipped with 17,000 solar cells, weighing only 2.4 tons, but they needed a plane with a wingspan of 235 feet, shorter than that of an Airbus 380 (261 ft.), but longer than those of a Boeing 747 (224 ft.) and a Boeing 787-9 Dreamliner (197 ft.). The plane's flight was hampered by technical challenges, poor flying conditions and a delicate aircraft, which contributed to the slow speed.

Exhibit 8. Air And Sea Are Renewables Issue

Mode	Share(%)
Road	72.3
Private passenger vehicles	*46.1*
Freight vehicles	*25.0*
Buses	*6.2*
Rail	1.5
Air	11.6
Sea	9.5
All modes	*100.0*

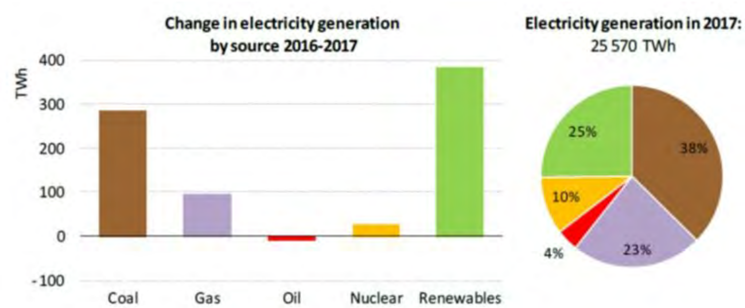
Source: Moriarty & Honnery

Solving power challenges for the shipping and air flight markets will prevent any quick shifts to renewable fuel power. There is a move to restrict the sulfur emissions of shipping fuel, and one solution is to use liquefied natural gas (LNG). Nuclear would also represent an option, but fear over the spread of nuclear technology that could be employed as weapons will stop that effort. If there is no significant renewable fuel breakthrough, then roughly 21% of transportation fuel needs will be dependent on fossil fuels.

For the power market to totally abandon fossil fuels, a breakthrough in battery technology will be necessary, or some new fuel must be invented

Progress is being made in eliminating the use of fossil fuels in the power generation market. The transition away from fossil fuels, especially the dirtiest ones, can be achieved. For the power market to totally abandon fossil fuels, a breakthrough in battery technology will be necessary, or some new fuel must be invented. Exhibit 9 shows how physical volumes of primary fuels in the power generation market in the U.S. have changed over the years since 1970. For most of the period up to about 2008, coal volumes grew. Starting at the end of the 1980s, natural gas consumption began climbing. It grew significantly in recent years leading into a peak in coal's use. Consumption of coal is in a decline. The major change in the power plant market from the early 1970s was the rapid decline in distillate and residual oil consumption. Oil had been substituted for coal due to environmental concerns and improvements in power plant efficiency. With the energy crisis in the 1970s and the sharp increase in oil's price, the market determined that oil should be turned into more profitable and useful products, as opposed to being burned under boilers to generate electricity.

Exhibit 9. Fossil Fuels Dominate Power Market



Source: EIA

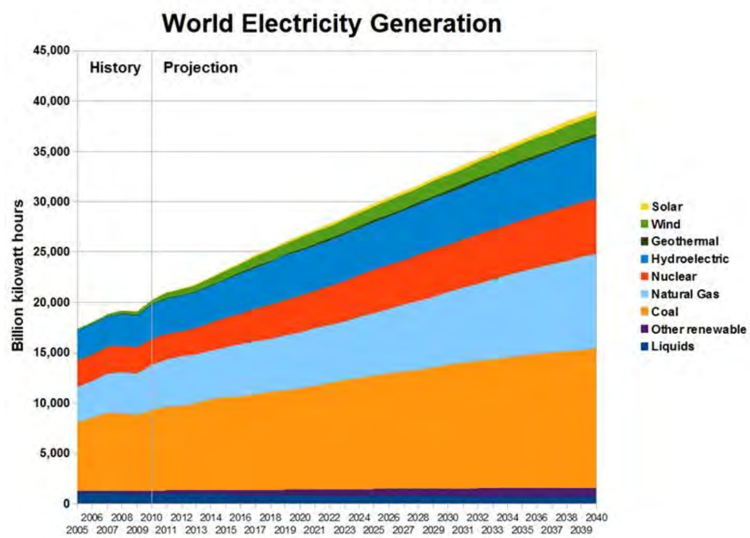
Non-OECD power generation comes 47% from coal, 20% from natural gas, and 19% from hydro

According to the 2018 International Energy Agency's "Electricity Information," non-OECD accounted for 56% of world gross electricity production in 2016, while OECD countries were at 44%. On a worldwide basis, coal produced 38% of world electricity, with natural gas at 23%, hydro at 17% and nuclear at 10%. The share produced by oil, biofuels and waste was 6%, roughly equal to the share from renewables. OECD electricity generation is much cleaner with coal only at 27%, while natural gas was 27%, nuclear at 18%, hydro at 13% and renewables at 10%. That contrasts with non-OECD power generation coming 47% from coal, 20% from natural gas, and 19% from hydro. The share of power produced from oil and nuclear were nearly the same at roughly 5%, but renewables only account for 4%.

Nuclear power is expected to also grow its contribution, but that forecast may be at risk

The great challenge for the environmental movement is to figure out how it can improve the fuel mix for non-OECD economies, with the two largest economies – China and India – firmly committed to using more coal, along with more renewables. As the International Energy Agency shows in Exhibit 10, the world's electricity is now generated largely by coal, with natural gas a strong contributor. Hydro power is a major contributor with nuclear the last major fuel contributor. In the IEA's forecast all fuels grow their volumes. If this forecast is realized, it will be a disappointment to the environmental movement, as coal will continue to increase. Nuclear power is expected to also grow its contribution, but that forecast may be at risk as a handful of developed economies are planning on shutting down their nuclear power plants either for political reasons or due to aging plants.

Exhibit 10. Coal Is Electricity's Future



Source: IEA

The general inverse relationship between the value of the dollar and commodity prices is well established

Another factor at play in the global oil market is the value of the U.S. dollar. All crude oil is traded in U.S. dollars, an outcome of an agreement between Saudi Arabia and the United States in the early 1970s. This has led to stability in oil prices, and the creation of substantial amounts of 'petrodollars' that have been reinvested in U.S. government bonds. The general inverse relationship between the value of the dollar and commodity prices is well established, although it may be stronger or weaker at various times.

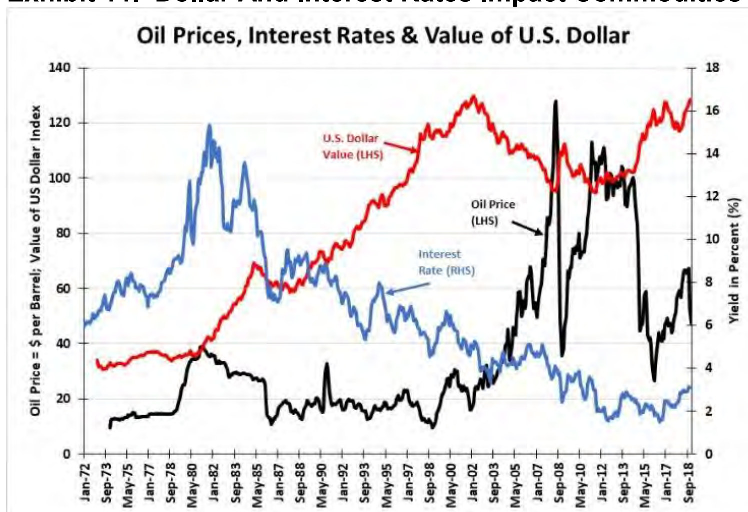
That need for more local currency works to diminish demand for the commodity, causing its price to fall

The inverse relationship exists because when the value of the U.S. dollar rises in relation to other world currencies, it takes more local currency to buy the same amount of a commodity as before the dollar strengthened. That need for more local currency works to diminish demand for the commodity, causing its price to fall. Likewise, a weaker dollar makes commodities cheaper in local currencies and tends to boost demand, pushing prices higher.

Interest rates have an effect on the value of the dollar, and thus on oil prices, too

Exhibit 11 shows the long-term trend in the value of the U.S. dollar and crude oil prices. The chart also shows the interest rate for the U.S Treasury 10-year bond, which is a representative measure of interest rates. Interest rates have an effect on the value of the dollar, and thus on oil prices, too. The impact may be less direct, however.

Exhibit 11. Dollar And Interest Rates Impact Commodities



Source: EIA, St. Louis FRED, PPHB

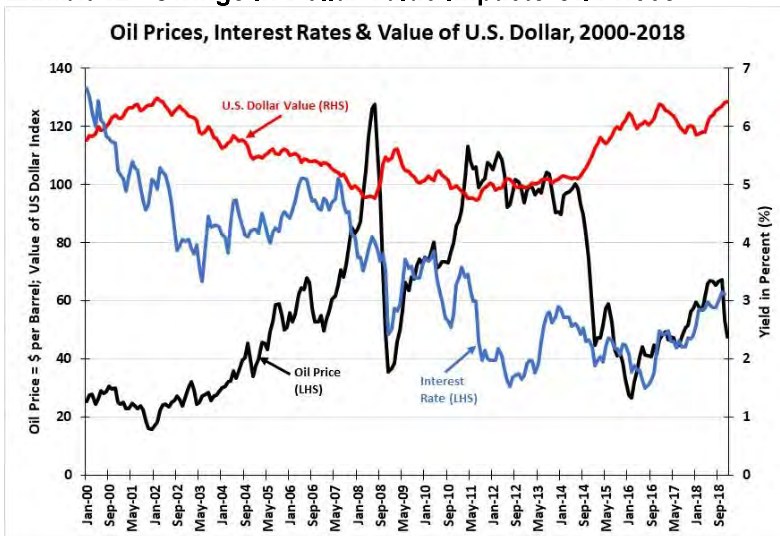
Although the rise of oil prices in the early 2000s was driven by China's exploding oil demand growth, prices were helped by a weakening U.S. dollar.

The chart in Exhibit 11 shows how as the dollar, after rising slowly during the early to mid-1970s, began climbing faster in the late 1970s. At the same time, crude oil prices began to weaken. The dollar strengthened almost nonstop between 1978 and 2000, and crude oil prices only began to recover from the 1970s inflationary era and resulting recession's demand impact some 20 years later. Although the rise of oil prices in the early 2000s was driven by China's exploding oil demand growth, prices were helped by a weakening U.S. dollar. Although the dollar's value jumped up during the financial crisis in 2008, it resumed its slide back to the 2007 low by 2011. At that point, the dollar's value began rising – slowly at first and then faster during the 2013-2016 time span. Oil prices were also rebounding.

It may be that the recent sharp drop in the oil price was triggered by the sudden upturn in the dollar's value

To gain a better understanding of the relationship between the dollar and crude oil prices in recent years, we have Exhibit 12 on the next page that covers just the 2000-2018 period. While oil prices were recovering from the 2014 collapse despite a stronger dollar, as its pace of strengthening flattened, oil was able to climb higher. It may be that the recent sharp drop in the oil price was triggered by the sudden upturn in the dollar's value. Maybe a delayed reaction to the stronger dollar?

Exhibit 12. Swings In Dollar Value Impacts Oil Prices



Source: EIA, St. Louis FRED, PPHB

Maybe oil prices will begin to trade more on industry supply and demand dynamics, rather than the value of the dollar

In thinking about the trajectory for oil prices during 2019, one has to consider the course of the dollar's value going forward and whether it will continue to influence oil prices. Maybe oil prices will begin to trade more on industry supply and demand dynamics, rather than the value of the dollar. Possibly for short periods of time, trading driven by oil industry supply/demand dynamics may hold sway, but the fundamental issue of the relationship between the cost of oil in local currencies versus the value of the U.S. dollar will overwhelm short-term industry fundamental dynamics.

Throughout the fourth quarter, investors threw oil and gas equities overboard

The oil downturn that knocked nearly 40% off its early October price has come at a bad time for industry planning, but equally important, it has reinforced the push by many large institutional money managers to demand greater financial discipline from energy company leaders. Throughout the fourth quarter, investors threw oil and gas equities overboard. The devastation has been so bad that some revered companies are trading at prices they were at during the mid-1990s. As a result, energy was the worst performing sector in the market during 2018.

Energy was the top performing sector twice during this period – 2007 and 2016

Exhibit 13 on the next page shows the performance of the S&P 500 sectors for the 12-year period 2007-2018. There are 12 market sectors, with ENRS representing energy. Energy was the top performing sector twice during this period – 2007 and 2016. The 2007 performance came when oil prices were well above $100 a barrel and the industry was raking in profits. The 2016 achievement came after two consecutive years as the worst performing sector.

Energy was the worst performing sector in 2014, 2015 and 2018. It was the second worst performer in 2017, so for the past five years, investors have seen their energy holdings among the worst

Exhibit 13. Energy A Disappointing Investment

S&P 500 Sector Performance

2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
ENRS 34.4%	CONS -15.4%	INFT 61.7%	REAL 32.3%	UTIL 19.9%	FINL 28.8%	COND 43.1%	REAL 30.2%	COND 10.1%	ENRS 27.4%	INFT 38.8%	HLTH 6.5%
MATR 22.5%	HLTH -22.8%	MATR 48.6%	COND 27.7%	CONS 14.0%	COND 23.9%	HLTH 41.5%	UTIL 29.0%	HLTH 6.9%	TELS 23.5%	MATR 23.8%	UTIL 4.1%
UTIL 19.4%	UTIL -29.0%	COND 41.3%	INDU 26.7%	HLTH 12.7%	REAL 19.7%	INDU 40.7%	HLTH 25.3%	CONS 6.6%	FINL 22.8%	COND 23.0%	COND 0.8%
INFT 16.3%	TELS -30.5%	REAL 27.1%	MATR 22.2%	REAL 11.4%	TELS 18.3%	FINL 35.6%	INFT 20.1%	INFT 5.9%	INDU 18.9%	FINL 22.2%	INFT -0.3%
CONS 14.2%	COND -33.5%	S&P 26.5%	ENRS 20.5%	TELS 6.3%	HLTH 17.9%	S&P 32.4%	CONS 16.0%	REAL 4.7%	MATR 16.7%	HLTH 22.1%	REAL -2.2%
INDU 12.0%	ENRS -34.9%	INDU 20.9%	TELS 19.0%	COND 6.1%	S&P 16.0%	INFT 28.4%	FINL 15.2%	TELS 3.4%	UTIL 16.3%	S&P 21.8%	S&P -4.4%
TELS 11.9%	S&P -37.0%	HLTH 19.7%	S&P 15.1%	ENRS 4.7%	INDU 15.4%	CONS 26.1%	S&P 13.7%	S&P 1.4%	INFT 13.9%	INDU 21.0%	CONS -8.4%
HLTH 7.2%	INDU -39.9%	FINL 17.2%	CONS 14.1%	INFT 2.4%	MATR 15.0%	MATR 25.6%	INDU 9.8%	FINL -1.5%	S&P 12.0%	CONS 13.5%	TELS -12.5%
S&P 5.5%	REAL -42.3%	CONS 14.9%	FINL 12.1%	S&P 2.1%	INFT 14.8%	ENRS 25.1%	COND 9.7%	INDU -2.5%	COND 6.0%	UTIL 12.1%	FINL -13.0%
COND -13.2%	INFT -43.1%	ENRS 13.8%	INFT 10.2%	INDU -0.6%	CONS 10.8%	UTIL 13.2%	MATR 6.9%	UTIL -4.8%	CONS 5.4%	REAL 10.9%	INDU -13.3%
REAL -17.9%	MATR -45.7%	UTIL 11.9%	UTIL 5.5%	MATR -9.6%	ENRS 4.6%	TELS 11.5%	TELS 3.0%	MATR -8.4%	REAL 3.4%	ENRS -1.0%	MATR -14.7%
FINL -18.6%	FINL -55.3%	TELS 8.9%	HLTH 2.9%	FINL -17.1%	UTIL 1.3%	REAL 1.6%	ENRS -7.8%	ENRS -21.1%	HLTH -2.7%	TELS -1.3%	ENRS -18.1%

Source: Standard & Poor's

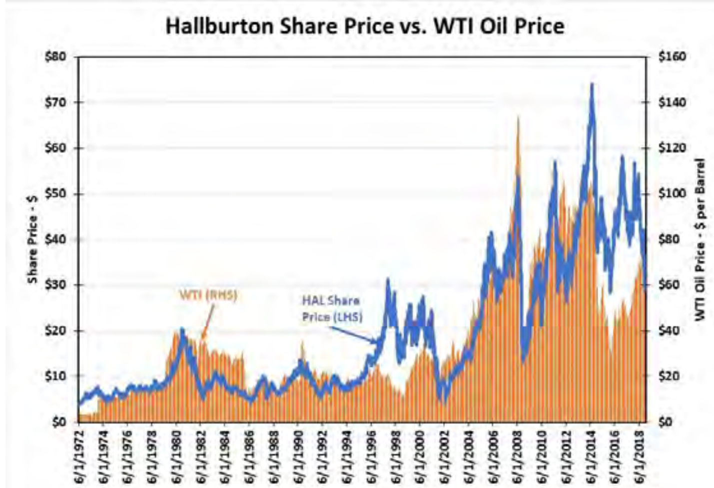
performers except for 2016. During the period studied, energy was the second worst performer twice and the third worst performer once. Other than the two best performing years, energy finished in the middle to lower end of the pack four times. This performance record has done little to endear investors to the sector.

One wants to buy these stocks when oil and gas prices are rising and oilfield activity is increasing

What that means is that investors see the sector as a trading vehicle rather than an as a long-term investment sector. One wants to buy these stocks when oil and gas prices are rising and oilfield activity is increasing. That environment will ensure rising earnings and cash flows for energy companies, and it usually translates into rising share prices. Now, however, the idea of energy as an industry with sustainable growth is being questioned. Moreover, the decimation of the sector has reduced energy's share of the overall market to such a level that many institutional, as well as individual investors, view buying an energy index or one or two of the largest, most liquid energy companies for representation in their portfolios as the easiest option. They see little value in devoting the time necessary to understand the business nuances of individual energy companies that could relatively impact their price performance.

To demonstrate the problem for energy investing, we have two charts featuring the stock of Halliburton, the second largest oilfield service company, with an investment history from the early 1970s. Exhibit 14 (next page) shows Halliburton's stock compared to West

Exhibit 14. Mostly Energy Shares Trade With Oil Prices

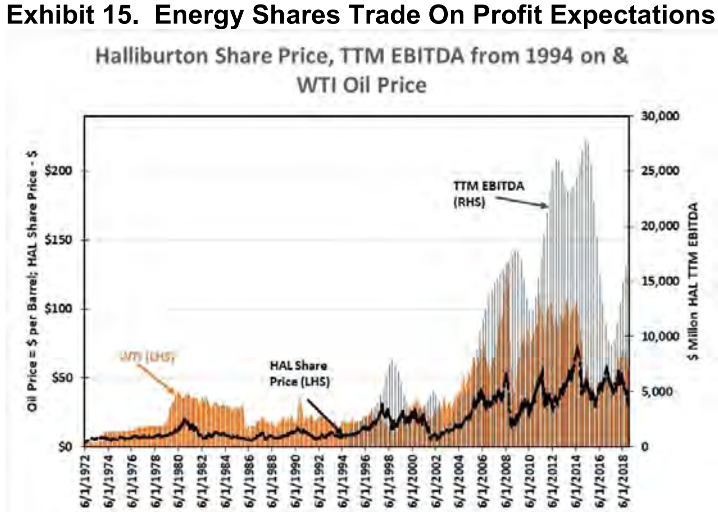


Source: EIA, Yahoo Finance, PPHB

Even though the oil price recovered in the early 2000s, the share price fell as earnings were negatively impacted by the earlier fall in oil prices

Texas Intermediate (WTI) oil prices over the 47-year period. For most of this period, Halliburton's share price tracked the move in WTI prices. There are two periods when the shares anticipated a recovery in the oil market – the late 1990s and 2015-2017. In the first period, the stock fell back because OPEC misread Asian oil demand as the Asian currency crisis emerged. Even though the oil price recovered in the early 2000s, the share price fell as earnings were negatively impacted by the earlier fall in oil prices. The more recent period was also marked by investors anticipating a recovery in oil prices following their collapse at the end of 2014. Halliburton's share price was volatile, but it stayed high given investor optimism for an industry recovery. When the recovery faltered due to weak oil prices, Halliburton's share price dropped sharply.

Exhibit 15. Energy Shares Trade On Profit Expectations



Source: EIA, Yahoo Finance, Capital IQ, PPHB

The share price rises before the TTM EBITDA, and generally falls well before the peak in cash flow

To better appreciate how investors treat energy shares as trading vehicles, Exhibit 15 (prior page) shows Halliburton's share price, WTI oil prices and the company's trailing twelve months' earnings before interest, taxes, depreciation and amortization (TTM EBITDA). EBITDA is a good measure of a company's cash flow, or its financial health and performance. What is evident is that the share price rises before the TTM EBITDA, and generally falls well before the peak in cash flow. Timing these moves can be tricky and for many investors no longer worth the effort. They are now worried about whether the historical trading relations are meaningful given all the questions about the future of the energy industry. The key question for investors is: Is energy a sunset industry?. That may require another article covering climate change and geopolitical issues.

The fossil fuel industry is not going away anytime soon

Energy doesn't repeat, but it does rhyme. That is why we spend as much time looking backward, as we spend looking forward. The damage and change that high oil prices in the 1970s brought to global economies and the energy industry in the 1980s and 1990s took a long time to become clear. It is impossible to know all the impacts that will alter global economies, energy supply and demand in the future, and on energy company outlooks from our recent excursion into super-high oil price territory. The fossil fuel industry is not going away anytime soon. However, predicting how it may evolve over the next one or two decades remains challenging. For us, that is the fun.

Sorting Out Trends Impacting The Natural Gas Market

Conditions in the market suggest that natural gas traders may be buying into the global warming thesis

The greatest enigma in the energy world in 2018 was trying to understand weak natural gas prices in the face of gas storage volumes being drained to their lowest level in over a decade. While tracking gas storage volumes and gas futures prices since spring, we have often speculated that conditions in the market suggest that natural gas traders may be buying into the global warming thesis. In that case, the nation will need less storage, given the current strong gas production, in order to meet winter needs, which will be lower than historically due to warmer weather. Support for the warming thesis was highlighted in a *Wall Street Journal* article discussing the dueling winter forecasts of the *Old Farmer's Almanac* and *Farmer's Almanac*, both centuries-old publications with solid followings.

The 226-years-old Old Farmer's Almanac is forecasting that we will see "above-normal temperatures almost everywhere" this winter

In one of our recent articles about the natural gas market, we focused on the upcoming winter weather forecasts made by multiple weather services, including the dueling almanacs. This winter may mark the first time these two iconic weather forecasters are 180-degrees different. The 226-years-old *Old Farmer's Almanac* is forecasting that we will see "above-normal temperatures almost everywhere" this winter. Its forecast, at the time it was published, aligned with the winter outlook from the Climate Prediction section of the U.S. government's National Oceanic and Atmospheric Administration (NOAA).

On the other end of the weather spectrum was the upstart *Farmer's Almanac,* only 200 years old, with its "teeth-chattering cold" season outlook. Its view, however, is mirrored by predictions from several meteorological services who are predicting a "cooler-than-normal" winter.

The difference in the almanacs' forecasts is interesting since both are made well before the winter – 18 months ahead in one case and two years for the other

The difference in the almanacs' forecasts is interesting since both are made well before the winter – 18 months ahead in one case and two years for the other. The *Farmer's Almanac* uses a secret mathematical formula applied to sunspot activity, planet positions and the moon's effect on the Earth to make its forecast two years hence. In contrast, 18-months ahead of time, the *Old Farmer's Almanac* relies on formulas employing solar activity, astronomy cycles and historical weather conditions to develop its forecast. While both almanacs claim about 80% accuracy, judging the results is often subjective. This winter may leave one almanac with bragging rights, but don't be surprised if the forecast variabilities projected offer opportunities for each almanac to claim victory.

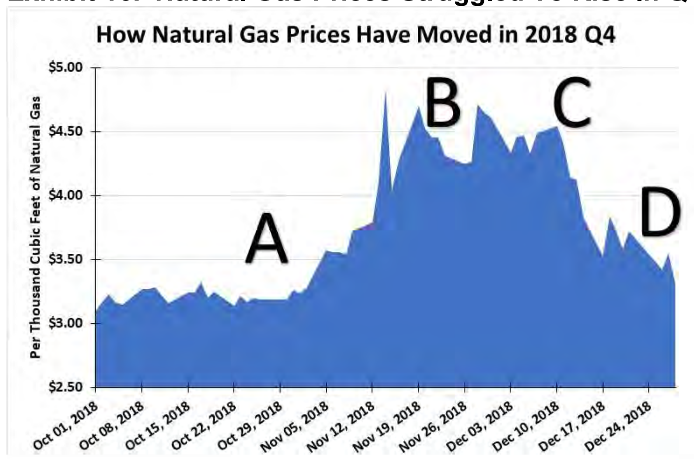
Other than for a handful of days in 2018, gas prices spent all year well below the $3 mark

Exhibit 16 on the next page shows natural gas futures prices for the fourth quarter, which started the period slightly above $3 per thousand cubic feet (Mcf), rarified territory that had been reached during the final week of September. Prior to then, natural gas prices had last been above that threshold on the last day of January, which closed out a string of 14 consecutive days above $3/Mcf. In other words, other than for a handful of days in 2018, gas prices spent all year well below the $3 mark. Why that happened remains the greatest unanswered, but most speculated upon, question.

To appreciate the volatility of natural gas prices this fall, we have labeled weather points along the price chart with the letters A, B, C and D. The first three letters coincide with the following series of temperature anomaly maps. In the case of D, we highlight a map showing a forecast of temperature anomalies for the first week of January prepared by *AccuWeather.com*.

Although the map associated with letter A, shows much of the eastern half of the country with below-normal temperatures, they are quite moderate over most of the area. Map B shows nearly as large an area of cooler temperatures, but some areas have much greater deviations from normal winter temperatures. That coincided with a slight dip in gas prices. By the time we get to map C, even though the total area of the country with cooler temperatures is the largest of all the maps, the areal extent of much colder temperatures is small and not concentrated in areas with large populations. Lastly, map D shows the eastern half of the country with warmer than normal temperatures, helping to explain why natural gas prices as of

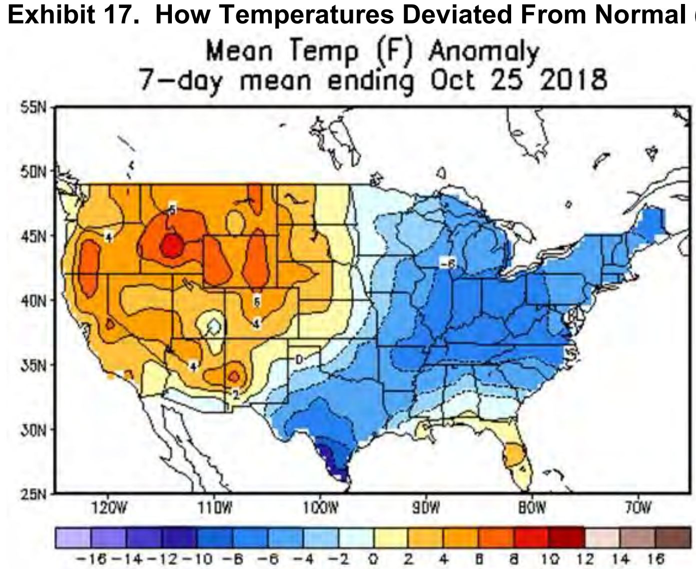
Exhibit 16. Natural Gas Prices Struggled To Rise In Q4



Source: EIA, NOAA, *AccuWeather.com*, PPHB

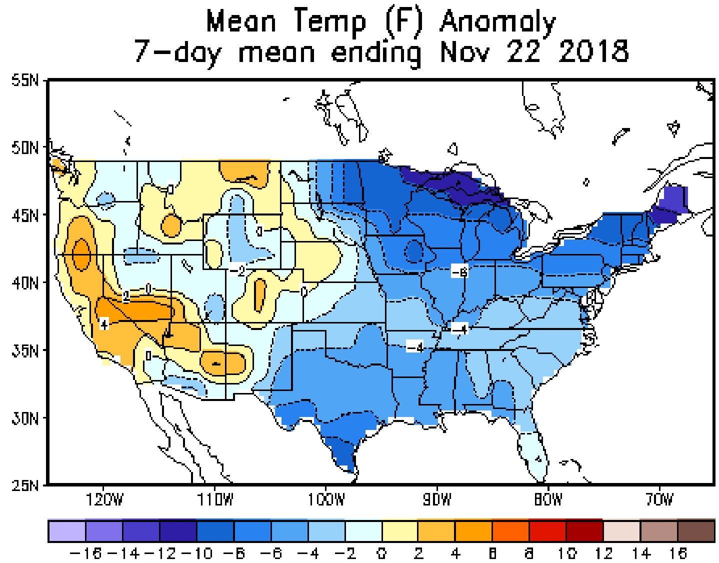
Friday, December 28, closed barely over $3.30/Mcf, down nearly 10% for the day.

Exhibit 17. How Temperatures Deviated From Normal (A)



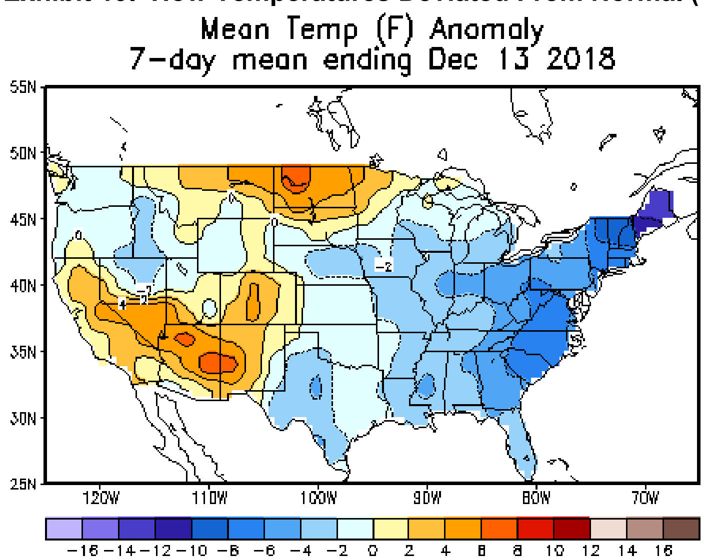
Source: NOAA

Exhibit 18. How Temperatures Deviated From Normal (B)



Source: NOAA

Exhibit 19. How Temperatures Deviated From Normal (C)



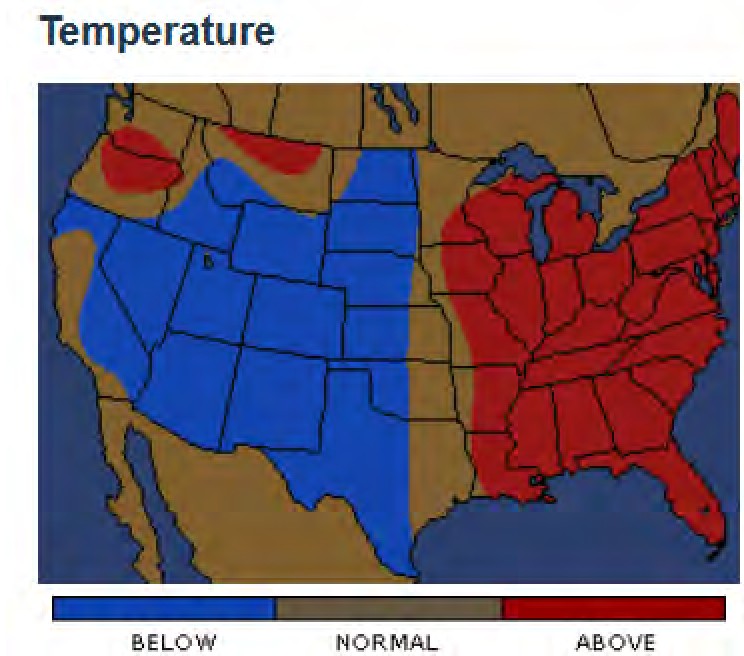
Source: NOAA

NOAA's forecast for the upcoming winter is summarized in the following statement by the agency on its web site:

> SUMMARY OF THE OUTLOOK FOR NON-TECHNICAL USERS
> THE JANUARY-FEBRUARY-MARCH (JFM) 2019 TEMPERATURE OUTLOOK FAVORS ABOVE NORMAL TEMPERATURES THROUGHOUT THE WESTERN CONUS WITH THE HIGHEST ODDS (ABOVE 60

PERCENT) ACROSS THE PACIFIC NORTHWEST. THESE HIGH ODDS FOR ABOVE NORMAL TEMPERATURES EXTEND NORTH TO THE ALASKA PANHANDLE. A SLIGHT TILT IN THE ODDS FOR BELOW (ABOVE) NORMAL TEMPERATURES IS FORECAST ACROSS THE UPPER OHIO VALLEY, TENNESSEE VALLEY AND SOUTHERN APPALACHIANS (SOUTH FLORIDA). THE EXPECTATION FOR A HIGHLY VARIABLE TEMPERATURE PATTERN DURING THE 3-MONTH PERIOD RESULTS IN A FORECAST OF EQUAL CHANCES (EC) OF BELOW-, NEAR-, OR ABOVE-NORMAL TEMPERATURES ACROSS A MAJORITY OF THE EASTERN CONUS AND CENTRAL TO SOUTHERN GREAT PLAINS.

Exhibit 20. Warmer Day 1-5 Temperatures In January 2019 (D)



Source: ***AccuWeather.com***

The difference in populations in these regions and their use of natural gas for heating and power generation can mean noticeable differences in demand forecasts

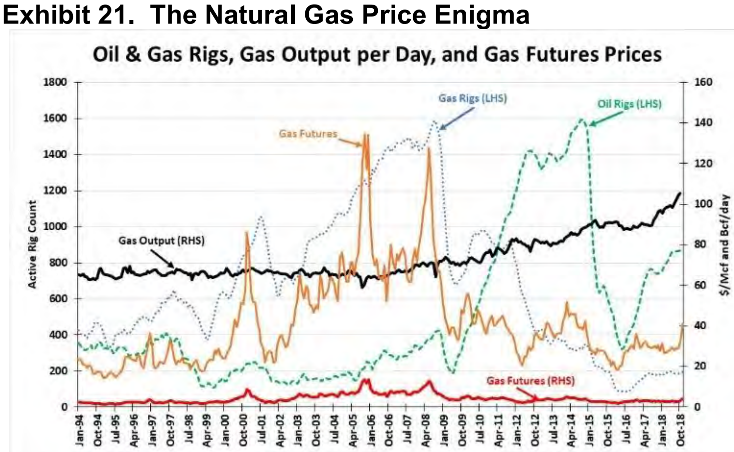
AccuWeather.com is expecting warmer than normal temperatures for the eastern half of the country for both the first five days of 2019 and all along the Eastern Coast during the following five days. However, other forecasters are predicting the possibility of a polar vortex during the first three days of January, and/or possibly one during the middle of the month. Not only is the timing uncertain, but there are also questions about where the polar vortex might impact the U.S. – either the Midwest or the Northeast – and how far it might dip into the country. The difference in populations in these regions and their use of natural gas for heating and power generation can mean noticeable differences in demand forecasts.

As a result of gas storage not shrinking as fast as expected, natural gas production continuing to grow rapidly, and projected warm weather, it was not surprising that the decline in gas futures prices continued the following Monday

On the final Friday of 2018, as the near-month (February 2019) gas futures price fell by 9.1% to $3.31/Mcf, the April 2019 futures price closed at $2.82, nearly 50-cents/Mcf lower, clearly reflecting speculators' expectations for an early end to winter and cold weather. The gas storage report for December 21 showed a 48-billion-cubic-foot reduction, which was in-line with expectations, but about one-third of the 5-year average drawdown. As a result of gas storage not shrinking as fast as expected, natural gas production continuing to grow rapidly, and projected warm weather, it was not surprising that the decline in gas futures prices continued the following Monday. (The December 28 gas storage report showed only a 20 Bcf drawdown.) Admittedly, there may have been some year-end tax-loss selling in the lower price. New Year's Eve, however, witnessed another day of dramatically lower gas futures prices. The near-month price dropped by 10.3% to $2.97/Mcf, under the important $3 threshold. The entire winter gas futures price structure fell, as March 2019's price declined by 30-cents/Mcf from Friday, and the April 2019 price was off an additional 14-cents/Mcf. If the expectation about an early end to winter proves incorrect, we will see substantially higher gas prices given the low storage supply that would exist during March and heading into April.

Understanding why gas prices, and surprisingly, gas storage volumes remain low, one needs to have a grasp of the long-term trends at work in the natural gas market contributing to the aforementioned conditions. Exhibit 21 shows monthly natural gas output, gas futures prices, and the Baker Hughes oil- and gas-directed rig counts. The chart covers the period of June 1994 to September 2018 for gas output (the latest data available), and for gas futures prices and the two drilling rig counts the data extends through November. To help see more clearly the relationships between the various data series, we plotted a second natural gas futures price line reflecting a multiple of 10-times the actual data.

Exhibit 21. The Natural Gas Price Enigma



Source: EIA, Baker Hughes, PPHB

This was when there were serious concerns about a growing and permanent shortage of natural gas supply

The period of high natural gas prices occurred in the 2003-2008 period. This was when there were serious concerns about a growing and permanent shortage of natural gas supply. This view translated into gas pipeline companies starting to build liquefied natural gas (LNG) import terminals to handle the expected surge in overseas gas supplies that would be needed based on projections of a continuing decline in domestic gas output. The U.S. was also stepping up its imports of natural gas via pipelines from Canada. The period marked a sharp rise in the number of gas-directed drilling rigs, which actually began climbing at the end of the 1990s, as producers sensed a worsening of the gas supply shortage. Note that about the time the gas rig count reached 1,300, natural gas production suddenly started rising. This reflects the early success of the gas shale revolution that opened up significant new gas producing basins for drilling.

The decline in gas prices forced producers to shift their focus from drilling for natural gas

In 2008, the gas rig count peaked shortly after the spike in gas futures prices. Both gas prices and the gas rig count dropped precipitously, but the declines also coincided with the financial crisis and then the developing economic recession, which created problems for oil and gas companies. The decline in gas prices forced producers to shift their focus from drilling for natural gas, as production grew, and toward crude oil, utilizing the newly perfected shale gas drilling techniques.

If we fast forward, we see a gentle downward sloping natural gas futures price, as gas output kept climbing and the oil-directed drilling rig count rose while gas rigs continued to decline. The growth in gas production reflected two phenomenon – greater productivity from the gas wells being drilled and increased associated natural gas volumes from the growing number of crude oil wells drilled. These two phenomena have continued to impact the gas market and the activities of producers.

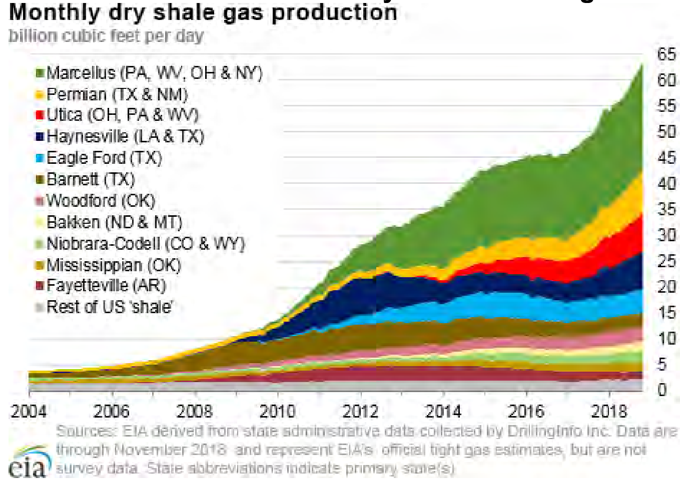
The oil produced from this basin also unlocks substantial volumes of associated natural gas

During this period, the Permian Basin in West Texas and New Mexico emerged as a crude oil drilling hot spot due to its multiple layers of thick productive sands. The oil produced from this basin also unlocks substantial volumes of associated natural gas. This production is part of the reason for the continued rapid growth in U.S. gas output. In Exhibit 22 (next page), the Permian Basin natural gas production (shown in yellow) began growing in 2012, just as the Haynesville and Barnett basins' outputs begin to decline.

Natural gas output in the Permian has grown by nearly threefold, to about 12.5 billion cubic feet per day (Bcf/d), at the end of 2018

The absolute low for Permian Basin monthly natural gas output was December 2011. From that low point, natural gas output in the Permian has grown by nearly threefold, to about 12.5 billion cubic feet per day (Bcf/d), at the end of 2018. The amazing statistics are the drilling rig count in the Permian during this time span. At the end of December 2011, there were 31-32 gas-directed rigs working, along with 450 oil rigs. Two years later, the oil rig count had increased by about 20, but the gas rig count was only one-third of

Exhibit 22. Gas Production By U.S. Producing Basin

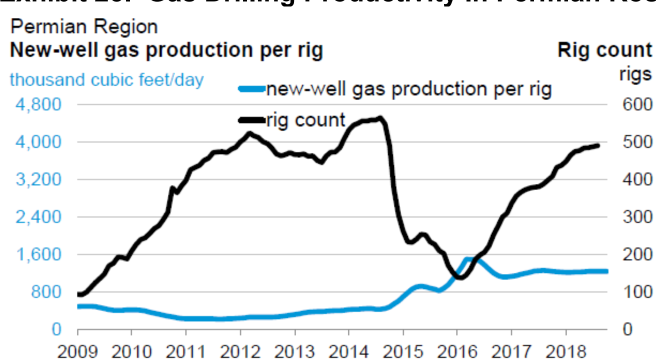


Source: EIA

By May 2016, there were no gas rigs working in the Permian, a condition that has continued through the end of 2018

2011's activity. By May 2016, there were no gas rigs working in the Permian, a condition that has continued through the end of 2018, with the exception of a three-month span in mid-2018 when one gas rig worked. The oil rig count from the end of 2013 dropped to a low of 137 in May 2016, but has now climbed to 486 at 2018 year-end. This rig performance history speaks to the productivity of the rigs working in the basin, but importantly, the significant volume of associated natural gas coming from new oil wells being drilled.

Exhibit 23. Gas Drilling Productivity In Permian Rose

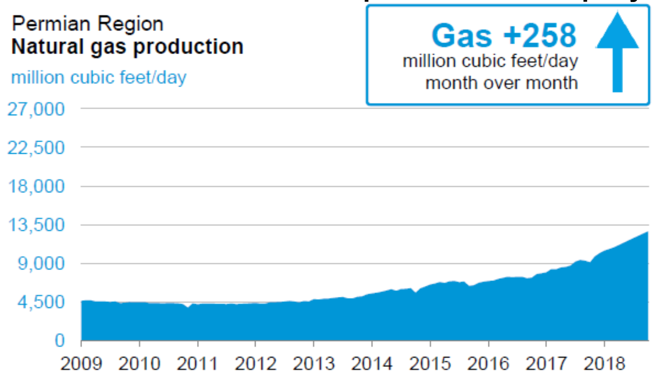


Source: EIA

All this supply has helped convince the gas market that we do not have an issue with low gas storage, given the growth in gas production, which is assumed to continue at a healthy rate

All this supply has helped convince the gas market that we do not have an issue with low gas storage, given the growth in gas production, which is assumed to continue at a healthy rate. One of the issues with this assumption is that there are bottlenecks in gas egress from the basin. The inability of gas to exit the Permian Basin, as well as a lack of need for it at certain times, has translated into prices at Waha, the gas trading hub in West Texas, falling into negative territory in late November. A chart of Waha gas price daily trading ranges during October through late December, shows how

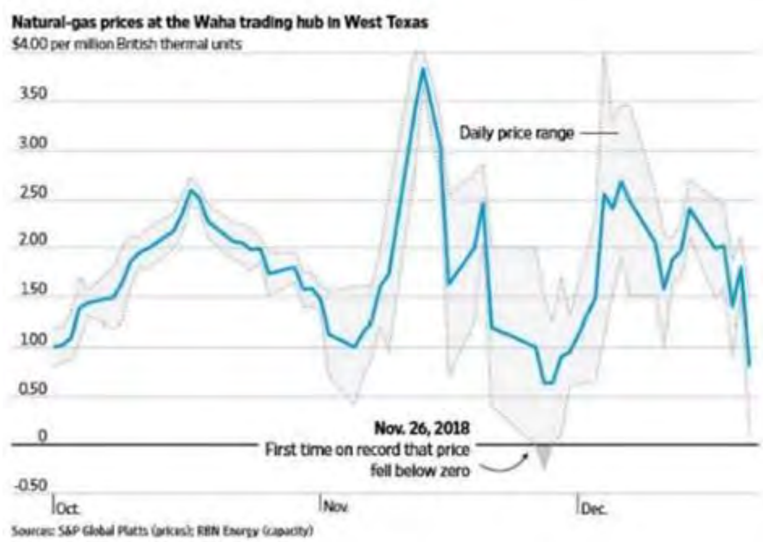
Exhibit 24. Permian Gas Output Has Risen Rapidly



Source: EIA

low gas prices were for many days in the time span relative to higher Henry Hub prices. Only on a few days did Waha gas prices approach prices being quoted at Henry Hub.

Exhibit 25. Pipeline Constraints Drive Down Permian Price

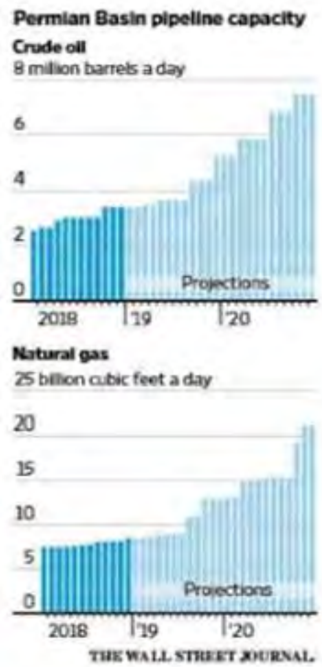


Source: *The Wall Street Journal*

The key for higher Waha gas prices will be more export pipeline capacity, as opposed to trying to limit new supply. According to information from RBN Energy, an energy consulting firm, both oil and natural gas pipeline capacity to boost takeaways from the Permian Basin are scheduled to increase in both the second half of 2019 and during 2020. This additional capacity will help deal with the issue of low gas prices, while also encouraging additional drilling for oil and associated natural gas. Without it, gas prices will stay low and impede drilling activity.

This additional capacity will help deal with the issue of low gas prices, while also encouraging additional drilling for oil and associated natural gas

Exhibit 26. RBN Sees More Egress Capacity



Source: ***The Wall Street Journal***

Such a mindset will work to depress gas prices, at the same time growing export demand, coupled with more gas for generating electricity previously produced by burning coal, is working to boost gas prices

The enigma of low natural gas prices remains embedded in the continued rapid growth in gas output, while the industry's infrastructure remains constrained. Plans for additional LNG export facilities along the Gulf Coast will certainly need the new pipeline capacity in order to meet their shipment commitments. At the moment, the pipeline expansion appears on track. That reality, however, may not change the attitude of gas traders that we have entered a world of global warming that means we do not need the same volume of gas storage as was maintained in previous years. Such a mindset will work to depress gas prices, at the same time growing export demand, coupled with more gas for generating electricity previously produced by burning coal, is working to boost gas prices. The clashing of these two forces, against the experience of the upcoming winter weather, will shape the 2019 natural gas price curve. Based on the average of the final closing prices for the next 12 monthly futures contracts, gas prices will average about $2.80/Mcf, which compares with the average futures price for 2018 of $3.07/Mcf. Will we average such a low gas price for 2019, or will the market surprise us? The gas enigma continues.

Canada Oil Prices Recover After OPEC-like Actions

On Sunday evening, December 2nd, Alberta Premier Rachel Notley delivered a message to the citizens of her province about the ongoing oil crisis that was imperiling the health of its largest industry. The message was that she was ordering a mandatory oil production cutback by Alberta producers.

Crude oil prices had been under severe financial pressure since summer

Crude oil prices had been under severe financial pressure since summer due to the lack of sufficient egress capacity to move the rising provincial crude oil output. With the stalemate over construction of the Keystone XL pipeline, and litigation derailing the planned Trans Mountain pipeline expansion, Alberta oil producers are facing restrictions on getting more of their output to market, which was weighing on wellhead prices and, in turn, sapping cash flow from the companies and the provincial government.

The oil oversupply led to storage volumes in the province swelling to 35 million barrels, about twice normal levels

Alberta produces about 3.7 million barrels per day of oil, an estimated 250,000 barrels more than can be currently shipped from the province. Production is rising and projected to increase further, depressing oil prices. The oil oversupply led to storage volumes in the province swelling to 35 million barrels, about twice normal levels. Ms. Notley's mandatory production cut of 8.7% is targeted to reduce output by 325,000 barrels per day, starting January 1, 2019. Company's output cuts are from the average of its six highest output months. For some producers, their actual reductions may be greater than the mandated percentage. The plan calls for storage volumes to fall by half in the first quarter, after which the mandatory cutback shrinks to only 95,000 barrels per day for the balance of 2019.

The oil market immediately responded to the production cut announcement. On July 10, 2018, the discount between WTI and Western Canadian Select (WCS) was $20.02 per barrel. By October 23, it had widened to $47, making the oil glut a high-profile issue. Premier Notley announced her oil-for-rail expansion plan on November 28. Two days later, the discount had shrunk by $4.50 a barrel to $28.50. However, it still exceeded the estimated $22 a barrel cost to ship oil by rail from Alberta to the U.S. Gulf Coast.

A week later, the discount had shrunk by another 10 percent

On December 3rd, the first trading day following the production cut announcement, the discount fell to $21.58 a barrel. Ten days later, the discount was down to $17.52. A week later, the discount had shrunk by another 10 percent. The shrinking of the price differential continued, such that for the first trading day in January 2019, a day after the production cut went into effect, the discount had narrowed to $12.50 a barrel.

It built its business model "to capture value through commodity cycles"

Canadian integrated producers who were not happy with Alberta's action were not shy about expressing their displeasure. According to Husky Energy Inc. (HSE-TSX). It built its business model "to capture value through commodity cycles, whether it comes from refining margins in the Downstream or from improved prices in the Upstream." Suncor Energy Inc. (SU-NYSE), the largest oil producer in Canada, was more pointed in its criticism. It said in a press release: "In the short term, the Government of Alberta action has resulted in winners and losers in the market, shutting in valuable upgrading throughput and has made transporting crude oil out of the province by rail uneconomic." The contempt for non-integrated producers is evident in these statements.

Premier Notley's move was economically motivated, but it also carried political implications

Premier Notley's move was economically motivated, but it also carried political implications, such as countering the growing "separatism" movement in Alberta, hopefully boosting her re-election chances this spring. Politics and energy remain deeply intertwined. This time it is in energy-rich Canada, one of the last places expected to embrace OPEC-like tactics.

Surprise! Surprise! Falling Prices Do Hurt Oilfield Activity

Terms such as "fell flat" and "activity plunges" characterized the media's interpretation of the Dallas Fed's report

The Dallas Federal Reserve Bank released its fourth quarter 2018 survey of energy markets on January 3, 2019. The headline "Oil and Gas Sector Growth Stalls amid Sharp Oil Price Decline" should not be a surprise to people either in the industry or living in areas where the industry operates. Newspapers and other media outlets reporting on the results used other verbs to describe the survey's results. Terms such as "fell flat" and "activity plunges" characterized the media's interpretation of the Dallas Fed's report. Will those verbs stand the test of time? Will they be used to describe activity in December 2019, or for all of 2019? Maybe they will only be used to highlight how different future periods in the oil patch turned out compared to 2018's fourth quarter?

The quandary oil and oilfield company executives are facing

Comments by industry respondents to the Fed survey were also not surprising, and they highlighted the quandary oil and oilfield company executives are facing. Although some respondents lamented the price decline and the difficulty it was creating for planning, others were actually acting in response to the lower oil price and cash flows they are forced to live with. Comments from the survey included:

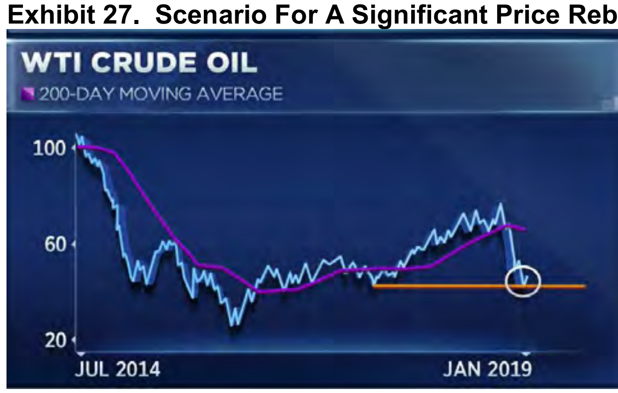
> "Between the Permian differential and the decline in the WTI price, we have revised our capital expenditure budget and will watch markets closely over the first quarter to determine if cuts are necessary.
>
> "Uncertainty around the price of crude oil has hurt our attitude moving forward.
>
> "I expect the dramatic, unexpected and significant drop in oil prices will significantly decrease revenue for the first half of 2019. I intend to mitigate this by stopping all drilling and deferring any new projects.
>
> "It feels like the capital markets (equity and debt) are backing up fairly hard, which will have a noted impact on

> capital spending if sustained. Coupled with the fall in oil prices in the past six weeks, this could cause 2019 plans to get pared back.
>
> "Commodity price volatility is of concern and hampers planning.
>
> "Near-term price uncertainty has made us more cautious going into 2019, which will result in a cutback in capital expenditures.
>
> "There is no certainty about 2019 with respect to crude pricing.
>
> "The blow to confidence is due to the recent dramatic fall in crude oil prices, which will have a negative impact on E&P spending in 2019."

It is always darkest before the dawn

It is always darkest before the dawn. The rude awakening to lower oil prices has created that darkness. On a *CNBC* stock market show, Matt Maley, equity strategist at investment firm Miller Tabak demonstrated how crude oil is positioning itself for a potentially explosive rally.

Exhibit 27. Scenario For A Significant Price Rebound



Source: ***CNBC***

Any significant hike would take oil prices to levels that would help restore confidence

As Mr. Maley put it, "It [WTI oil price] got down to the $42.53 level, or $42.50, and that was the low it saw back 18 months ago in June 2017. Now after we saw that low, crude oil rallied 80 percent." He went on to say, "It got right exactly to that level on Christmas Eve and has bounced almost 10 percent since then." If crude oil trades above $50, then the market has established a "double bottom" signaling the possibility for a significant rally. The $50 price level is significant because crude oil prices in November and December traded around that price for a while, creating a market overhang, which can only be broken with oil trading higher than $50. Mr. Maley was not predicting another 80% price rise, but any significant hike would take oil prices to levels that would help restore confidence for

E&P companies to continue, or even increase, their planned capital spending in 2019. That might produce in 2019 what TV character Gomer Pile use to say: Surprise! Surprise!

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