
MUSINGS FROM THE OIL PATCH

September 22, 2015

Allen Brooks
Managing Director

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

As Paris Conference Draws Near, Energy Transition In Focus

The meeting's objective is to achieve a legally binding and universal agreement on climate, from all the nations of the world

In barely over 60 days, thousands of environmentalists, government officials and media will arrive in Paris to try and forge an agreement to limit the growth in global carbon emissions in order to limit the rise in future temperatures. The meeting's objective is to achieve a legally binding and universal agreement on climate, from all the nations of the world. There have been a number of intervening climate change conferences sponsored by the United Nations since the December 2009 meeting in Copenhagen, but none have generated the level of excitement as the upcoming Paris confab. The Copenhagen meeting's excitement developed because President Barack Obama was nearby receiving his Nobel Peace Prize and decided to drop in to try to broker the negotiations. While Obama was widely revered around the world, his rock-star credentials didn't endear him to some world leaders who met in secret to try to negotiate an agreement. The President and his Secretary of State sought out the secret meeting's location and crashed the discussions disrupting the negotiations that ultimately produced a less-than-satisfying final conference statement.

The agreement obligates the U.S. to cut its greenhouse gas emissions to 26%-28% below 2005 levels

One of the reasons for a high level of excitement about the Paris meeting is the earlier climate change and clean energy agreements between the United States and China late last year. The agreement obligates the U.S. to cut its greenhouse gas emissions to 26%-28% below 2005 levels. That cut would be achieved by upping the current 1.2% per year on average pace of carbon pollution reduction during 2005-2020 to 2.3%-2.8% per year on average between 2020 and 2025.

China's President Xi Jinping announced that his country would work to achieve a peak in its CO₂ emissions around 2030, with the intention of trying to peak earlier. An equally important commitment

China will need to deploy an additional 800-1,000 gigawatts of nuclear, wind, solar and other zero-emission electricity

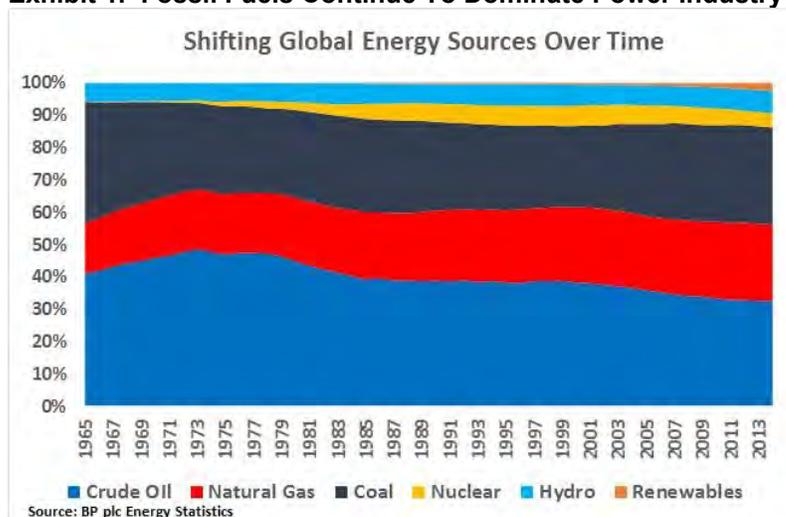
The euphoria from such a milestone-agreement will embolden the climate change movement to impose even more restrictions on the use of fossil fuels

by the Chinese president was for his country's non-fossil fuel share for all energy consumed in China to increase to around 20% by 2030. For that goal to be achieved, China will need to deploy an additional 800-1,000 gigawatts of nuclear, wind, solar and other zero-emission electricity generation capacity by 2030. That total exceeds all the coal-fired electricity generation existing in China.

With that agreement, the world's two largest carbon polluters may be reshaping the political landscape regarding climate change and decarbonizing the planet's economy. The prospect of a united world committed to limiting carbon emissions in hopes of keeping global temperatures from rising by more than 2°C (3.6°F) by the end of the century has people excited. The euphoria from such a milestone-agreement will embolden the climate change movement to impose even more restrictions on the use of fossil fuels. The best example is the recently announced clean energy plan issued by the Environmental Protection Agency (EPA) to limit emissions from existing power plants throughout the country. Plans such as the EPA clean energy plan and its new methane restrictions highlight the challenge the U.S. and the world will face in transitioning to a new energy resource structure.

Energy statistics from BP plc (BP-NYSE) provide the ability to examine the shifting mix of energy sources over an extended period. BP's economists have collected energy statistics by country and fuel source for 1965-2014. They have translated the individual country data into standard energy measurements that enable examination of long-term energy trends. We have plotted the percentage of global consumption by fuel sources for this period, which shows the ebb and flow of our more traditional fuels and the rise of renewables in recent years. This data is presented in the graph in Exhibit 1.

Exhibit 1. Fossil Fuels Continue To Dominate Power Industry



Source: BP, PPHB

Renewables contribution was 2.5% in 2014, up from 0.6% fifteen years earlier

One of the most telling points about the world's energy sector is how dependent we are on fossil fuels, in particular coal and crude oil. Renewable fuels, while growing rapidly, supply only a minimal amount of energy; and even with rapid growth in the future cannot completely power the globe's economy within decades, if ever. It is obvious from the chart how small the contribution of renewables is – solar, wind and biomass – to the world's energy supply. In fact, the contribution was 2.5% in 2014, up from 0.6% fifteen years earlier. In 1990, renewables accounted for 0.4% of total energy supply, but barely increased it (0.2 points) over the subsequent decade.

Collectively, this “clean energy group” accounted for 13.7% of the world's total energy consumed in 2014

Another interesting comparison is to group nuclear, hydro and renewables in a non-fossil fuel category and examine its contribution change to the world's energy supply over time. Collectively, this “clean energy group” accounted for 13.7% of the world's total energy consumed in 2014, up from 13.2% in 2000. This minor increase over the 15 year period was marked by the renewables' share soaring nearly fourfold. That gain came almost totally at the expense of nuclear's share of consumption, which dropped from a 6.2% share in 2000 to only a 4.4% share in 2014.

The push for renewables to solve the carbon emissions problem ignores the true economics of these fuels

While the environmentalists acknowledge the intermittent nature of renewables, they dismiss this issue due to the assumption that reduced costs of renewables will allow them to displace traditional fossil fuels. For this reason, we see continued discussion about how the cost of solar panels has declined sharply from \$60 per watt in 1970 to \$0.60 per watt today, with prospects that costs will continue to fall. The push for renewables to solve the carbon emissions problem ignores the true economics of these fuels. However, the use of renewables is mandated for utility companies and they are subsidized for consumers. These are the primary reasons why the installed generating capacity of wind and solar power have increased so dramatically in recent years.

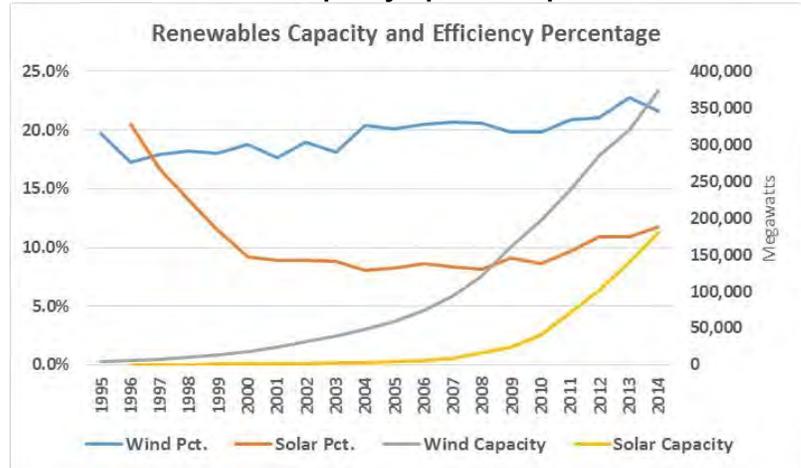
This controlling factor is demonstrated by the magnitude of the fuels' growth when global electricity generation between 2005 and 2014 only increased 28%

In Exhibit 2 on the next page, we have plotted the growth in global generating capacity for wind and solar power, which are shown to have ramped up sharply beginning either in 2005 for wind or 2008 for solar. From those starting points, wind generating capacity has increased by 630% while solar increased 1,133%. These are huge increases, but they do start from small bases. Their use is helped because they are largely dedicated to the electric power sector, where government controls are very strong. This controlling factor is demonstrated by the magnitude of the fuels' growth when global electricity generation between 2005 and 2014 only increased 28%.

The greatest challenge facing wind and solar energy is that their output is only a fraction of their capacity

The greatest challenge facing wind and solar energy, especially if these fuels are to replace fossil fuels, is that while their installed capacities have grown rapidly, their output is only a fraction of the capacity. This is one of the deceptions promoters of renewables engage in. For wind power, the efficiency rating for the past five years has ranged between 19.8% and 22.8%, while solar's

Exhibit 2. Renewable Capacity Up But Output Still Limited



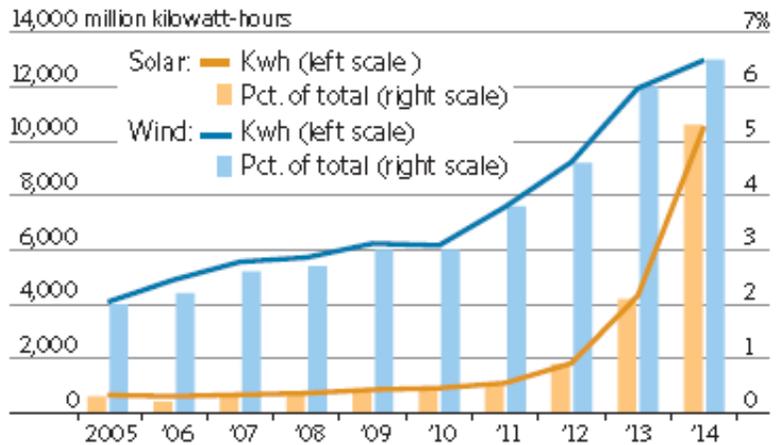
Source: BP, PPHB

The cost of this required back-up power is never disclosed when the cost of renewables is discussed

performance has been between 8.7% and 11.8%. What this means is that in a 24-hour day, these renewable sources will produce electricity only roughly 20% and 10% of the time, or for 5 hours for wind and 2.5 hours for solar. This performance, which has remained in these ranges since the data to measure their performance has been available (1995 and 1996, respectively) means that utility systems need back-up power and/or alternative power sources in order to ensure electricity to consumers 100% of the time. The cost of this required back-up power is never disclosed when the cost of renewables is discussed.

Exhibit 3. Renewables Growing But Still Minor Power Sources
Sun and Wind Rising

Electricity generated in California by these two renewable sources and their share of the state's total electricity production



Source: The Wall Street Journal

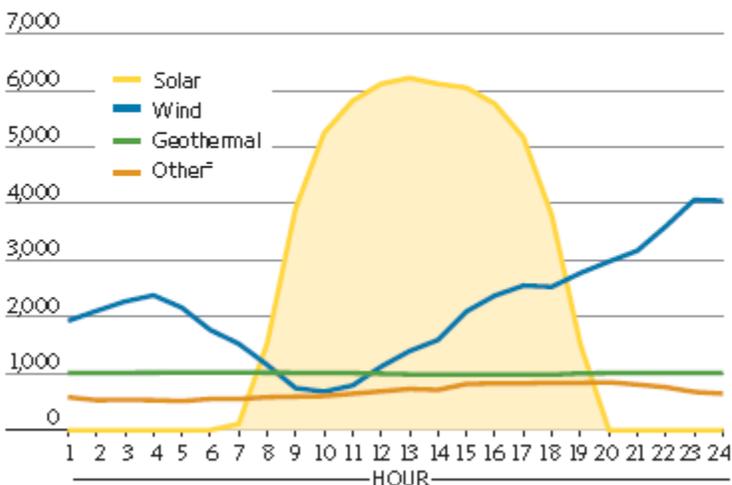
Yes, combined, renewables account for 11% of the state's power, but that remains a far cry from the 90%-100% environmentalists are demanding

One of the big challenges for using renewable power in our existing energy grid is determining how to integrate the supply and knowing how much and when it will arrive. A recent article in *The Wall Street Journal* about the success of California's power industry in using renewables contained two charts – one showing the history of renewables' contribution and how renewables perform during a typical day. Once again, in talking about the success of renewables, take notice from Exhibit 4 that wind power only accounts for 6% of the power, while solar delivers 5%. Yes, combined, renewables account for 11% of the state's power, but that remains a far cry from the 90%-100% environmentalists are demanding. Can the power industry get to those performance metrics? Most likely that target can only be reached with significant technology breakthroughs for storage of surplus power.

Exhibit 4. Wind And Solar Create Grid Management Issues

Daily Ups and Downs

An hourly breakdown of electricity production in California from renewable sources shows the big swings that can occur through the course of one day, posing a challenge to grid managers. Figures are for Aug. 17, in average megawatts by hour, but can vary widely from day to day and season to season.



* Includes biomass, biogas and small hydro.
Sources: California Energy Commission (top); California ISO THE WALL STREET JOURNAL.

Source: *The Wall Street Journal*

In examining the performance of renewables during a typical 24-hour day, wind power is stronger during the evening hours when solar is not a contributor

In examining the performance of renewables during a typical 24-hour day, wind power is stronger during the evening hours when solar is not a contributor. Early in the solar contribution, wind is not a meaningful contributor, but it grows during the day as solar is peaking. If these patterns were constant, grid operators could better manage the use of fossil fuel generating facilities. But as we know from European data, and even the renewables statistics from ERCOT, the Texas grid operator, there are many days when wind is

Despite claims by some environmentalists, weather forecasting may be better but not perfect

non-existent and certainly there are periods of time when bad weather eliminates solar's contribution. Despite claims by some environmentalists, weather forecasting may be better but not perfect, meaning that utility operators who have an obligation to deliver power to customers whenever they want it and not when nature makes it available, creates significant engineering challenges.

Prepare yourself for a deluge of articles and news shows about how renewables are the answer to our pollution problems

Between now and November 30 when the Paris climate change conference opens, prepare yourself for a deluge of articles and news shows about how renewables are the answer to our pollution problems. We fully anticipate renewables playing a greater role in the world's energy mix, if for no other reason than there is strong regulatory momentum behind them. Renewables are not the answer in the near-term to our climate change concerns. Since truly objective examination of the climate change debate suggests there is little certainty about what causes global warming. Failing to acknowledge this uncertainty may be setting the global economy on a course that will severely harm it in the future and thus retard the social and economic progress billions of residents of this planet are striving for.

Drive To Houston, Day 1 - Robert Frost Meets Big Data

This drive will have a different flavor because we are taking a several-day detour to drive the Blue Ridge Parkway in one of our favorite states – Virginia

For those who enjoy reading about our observations during our annual drives between our home in Houston and our summer home in Rhode Island, the following are observations from Day 1 of the return drive. This drive will have a different flavor because we are taking a several-day detour to drive the Blue Ridge Parkway in one of our favorite states – Virginia. For various reasons, we left in the middle of the week and with our publication schedule, we don't have many comments to make after the first day. That said, Day 1 brought an interesting aspect of our drive.

So that leaves the two primary crossing options as the GWB and the Tappan Zee

One of the great challenges in the trip from Rhode Island is getting across the Hudson River. There are only a few ways to make that crossing in the southern area of New York – the George Washington Bridge (GWB), the Hudson and Lincoln Tunnels, the Tappan Zee Bridge, and the Bear Mountain Bridge. Few people would consider driving into Manhattan merely to use the two tunnel options. On the other hand, few people would drive way north to use the Bear Mountain Bridge, which is a very old and small bridge near West Point. So that leaves the two primary crossing options as the GWB and the Tappan Zee. With extremely heavy traffic using both bridges, the roads leading to them can be crowded and subject to significant delays. A relative who recently drove from Rhode Island to Newark Airport started heading toward the GWB but by using Google Maps was advised to switch to the Tappan Zee, which he believed saved him time.

After that, we wondered whether the systems would make any further shifts, but both systems selected the exact same route

Based on that recommendation, we opted to try both the navigation system in our vehicle and Google Maps. The first failed to alert us to a serious traffic backup, but Google Maps did and sent us off to Route 1 through part of New Haven and then back onto the interstate. We know we saved time with that detour. The next backup was recognized by both systems with Google Maps recommending an alternative route, which we followed. After that, we wondered whether the systems would make any further shifts, but both systems selected the exact same route.

For those who know of the great American poet Robert Frost, they may know the poem, "The Road Not Taken." The final line of that poem states:

"Two roads diverged in a wood, and I—
I took the one less traveled by,
And that has made all the difference."

We'd like to think we were well advised by the navigation systems to take the correct road. But we will never know for sure.

We were shocked to see a sign as we entered Interstate 287 that announced a Gridlock Alert due to the upcoming UN General Assembly in Manhattan starting September 21st.

Day 2 news: We bought our first tank of regular gasoline at \$1.999 a gallon! Later that day we purchased our second tank at \$1.919 a gallon. Neither station had different prices for cash versus credit purchases.

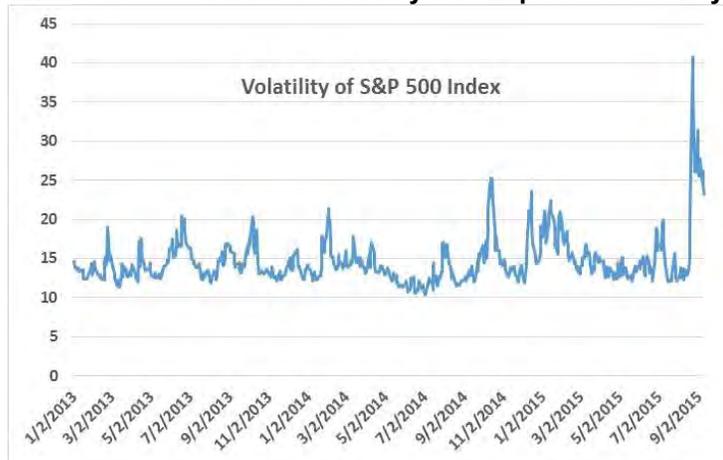
Dog Days Of Summer Bring A New Reality To the Oil Patch

The bull market since the end of the 2008 crisis has been largely driven by the Federal Reserve's easy money policy designed to stimulate U.S. economic growth

As August drew to a close, commodity and stock markets were buffeted by a tornado associated with the dark economic clouds growing over China and the rest of Asia. In our last *Musings* we covered the issue of the lack of economic transparency in China and the extremes to which analysts and investors must go to try to assess what may be happening in that country. What had been a remarkably benign year for the U.S. stock market, and, in fact, for most of the past three years, has suddenly come unhinged. The bull market since the end of the 2008 crisis has been largely driven by the Federal Reserve's easy money policy designed to stimulate U.S. economic growth. It has convinced investors that stock markets only go up. As shown in Exhibit 5, other than for a brief period in late June and early July of this year, and also at the end of 2014 and in early 2015, the Vix index has been essentially flat, and at a very low level. The Vix index is a trading vehicle that reflects the Standard & Poor's 500 Stock Index's volatility. When the Vix index goes up, it signals an increase in stock market volatility, while when the Vix index is low or stable, it reflects relatively low volatility. Jumps in the Vix index are taken by market students as an indication of growing

fear among investors that they see the market entering a difficult period. We have certainly seen that fear demonstrated in recent weeks as the Dow Jones Industrial Stock Index has experienced daily price swings of 400-700 points.

Exhibit 5. Stock Market Volatility Has Exploded Recently!

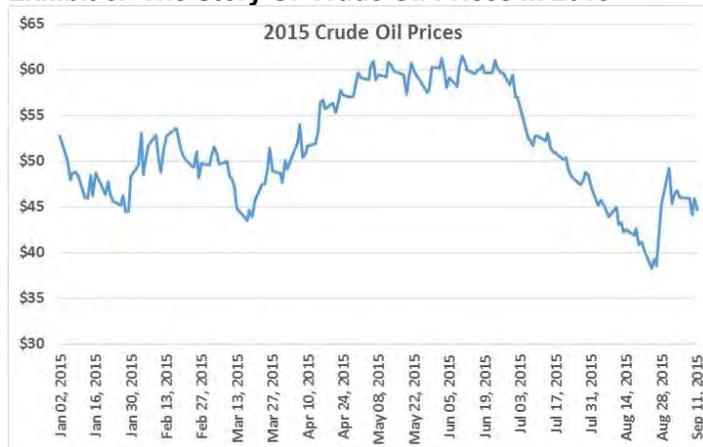


Source: Yahoo Finance

Crude oil prices have also experienced greater volatility in recent weeks

Crude oil prices have also experienced greater volatility in recent weeks. So far this year, crude oil prices have experienced two rallies and may be in the early phase of its third rally from the low levels that have not seen since the dark days of the 2008-2009 financial crisis. West Texas Intermediate (WTI) had clawed its way back to \$60 a barrel in June from its late March lows in the mid \$40s a barrel. The second cycle saw the oil price drop bottom out at \$38.50 a barrel, substantially above the 2008 cycle low of \$33.43, but consistent with recent technical trading patterns based on the past five years that suggest the bottom in oil prices should be in the range of \$38-\$40 a barrel.

Exhibit 6. The Story Of Crude Oil Prices In 2015



Source: EIA

The recent collapse in oil prices has been greeted with a sharp fall in the domestic drilling rig count

The recent collapse in oil prices has been greeted with a sharp fall in the domestic drilling rig count. The rig count had stabilized and actually increased slightly after oil prices bounced up. Higher oil prices and a rising rig count was embraced by the oil and gas industry as a signal that maybe this correction had seen its worst and the industry was beginning to heal. Analysts who examined past downturns found that in the 2008-2009 correction, oil prices fell from the \$140s a barrel in July 2008 to sub-\$34 a barrel by December, but then rebounded to \$65-\$70 a barrel by July 2009, or just over a 12-month time span. In comparison, the peak oil price preceding this correction occurred in June 2014 with oil at \$107 per barrel before falling to \$44 a barrel in March 2015 and then rising to \$60 in June 2015. This pattern of oil price movements fits the same time span as oil prices followed in 2008-2009. Then things changed!

One of the key trends to emerge from these calls was the acceptance that this downturn was worse than almost everyone had expected heading into it

The recent drop in oil prices has come at the same time oil and gas and oilfield service companies were presenting their second quarter financial results. None of those results were good, and much of the discussion on earnings conference calls with investors dealt with management team expectations for the future and detailing the steps they were taking to weather the downturn. One of the key trends to emerge from these calls was the acceptance that this downturn was worse than almost everyone had expected heading into it and that oil prices were likely to remain lower than anticipated and would last longer than expected. The "lower for longer" scenario has finally forced reluctant management teams to make more significant adjustments to their companies including additional employee layoffs.

Many of the company's competitors thought those cuts were draconian, but the reality seems to be that Schlumberger's management team had a better handle on the magnitude of the growing downturn

The first companies within the energy sector to cut employees were the oilfield service companies. Those cuts were not surprising given the rapid drop in the drilling rig count and its associated oilfield activity that began in late 2014. The workers being let go were those who ran those pieces of oilfield equipment who no longer had work to do. In early January, Schlumberger Ltd. (SLB-NYSE), the world's largest oilfield service company, announced it was laying off 9,000 of its 123,000 employees in response to the drop in oil prices from over \$100 a barrel to about \$75 in January. As oil prices continued to fall, by April the company was forced to announce an additional 11,000 job cuts, or a total of 15% of Schlumberger's worldwide workforce at the start of the year. Many of the company's competitors thought those cuts were draconian, but the reality seems to be that Schlumberger's management team had a better handle on the magnitude of the growing downturn. Maybe Schlumberger's managers thought that if they had cut too deep, they could easily rehire employees they needed. Then again, managers would be forced to examine how best to structure their business.

In the most recent turmoil, the oil and gas companies seem to be leading the layoff parade. ConocoPhillips (COP-NYSE) has announced it will cut 10% of its worldwide employment – some

Downturns force energy companies to seek new and more streamlined methods of operating in the future, and employees are a major cost factor

“If you’re here, then you either survived 1986 or were born after 1986”

18,000 people – and that those cuts will impact about 500 members of the 3,753 employees in the Houston staff. Chevron Corp. (CVX-NYSE) plans to cut 1,500 jobs, with 950 coming from their Houston employment, and Royal Dutch Shell (RDS.A-NYSE) will eliminate 6,500 positions worldwide. Marathon Petroleum (MRO-NYSE), which had indicated that it would cut 350-400 employees earlier this year, just announced plans to cut another 40 from the company’s conventional oil search group as the company plans to focus on offshore, shale, and its MarkWest Energy (MWE-NYSE) acquisition.

A month ago, according to Swift Worldwide Resource, an employment firm, 176,000 oil and gas industry jobs have been eliminated in the past year. That would certainly include the estimated 65,000 jobs cut in the North Sea since employment peaked at the start of 2014, according to Oil & Gas UK. Not only are people losing their jobs but those who are unemployed are finding it difficult to find new jobs. The industry web site *OilPro* reported that the number of oil and gas job openings have dropped from 24,000 to 11,600 between November 2014 and July 2015. Along with the figures on job losses, there are reports that 50% of oil and gas contract workers have had their compensation reduced, in most cases by 10%, although depending upon the position, some employees have experienced cuts of 15% to 20%. These numbers are the unpleasant aspect of commodity downturns. Downturns force energy companies to seek new and more streamlined methods of operating in the future, and employees are a major cost factor. While the oil and gas industry has experienced a handful of downturns since the 1970s, this downturn seems to be the worst since the 1980s. How it reshapes participants and companies remains to be seen, but the recovery will take longer than expected and the scars will be deep.

The August issue of *The Leading Edge*, the journal of the Society of Exploration Geophysicists (SEG), which is composed of workers in the seismic service industry and the exploration sector of the oil and gas industry, contained a column discussing the industry layoff experience. The author, who uses the name “Interpreter Sam,” recalled a presentation at the SEG 2010 Annual Meeting in Denver delivered by Kurt Marfurt, which Sam felt captured the essence of industry downturns. Mr. Marfurt said, “If you’re here, then you either survived 1986 or were born after 1986.” Sam reported that this comment elicited laughter from the audience, but it was nervous and uncomfortable laughter.

At the end of the column, Interpreter Sam offered his poem, “Layoff Fever,” based on John Masefield’s classic poem, “Sea Fever.”

“We must lay off some staff again, to cut our costs once more,
And all we ask is a legal scheme to show more staff the door;
Restructuring and outsourcing their ends did not quite meet,
And so to these means we revert to show more staff the street.

“We must lay off some staff again, for the call of the corporate board
Is a harsh, shrill, insistent call that cannot be ignored;
And all they ask is a world in which supply shortfalls demand,
And a strategy to find some oil in a friendly foreign land.

“We must lay off some staff again, it’s all we really know,
With prices low and forecasts dim we stay, but staff must go;
And all we want is a ranking list and a gleaming whetted blade,
And a cold eye and a steady hand as this round of cuts is made.

“We must lay off some staff again, and this won’t be the last,
We’re certain that the heady days of boom times are long past;
And all we ask of those who stay is to follow orders drawn,
All others, look not back here – once empowered, now you’re gone.”

Will E&P Lack Of Cash Flow Finally Tip Production Outlook?

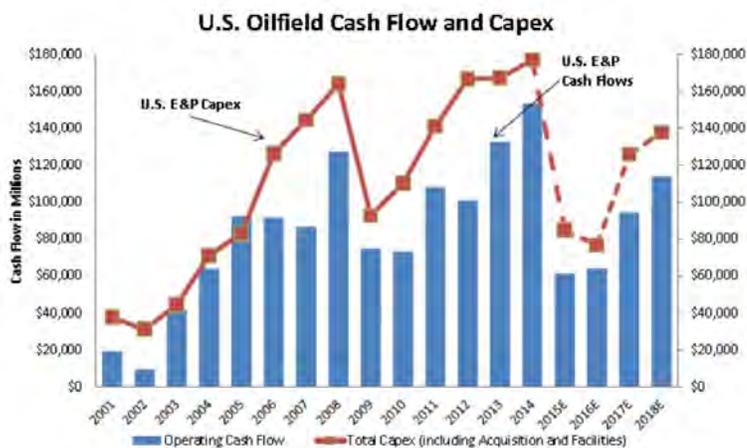
When all direct and indirect costs are included, the domestic E&P industry has been operating in a cash flow negative position for years

Since oil prices peaked in June 2014, a key question for the domestic industry has been when will the industry stop drilling uneconomic shale wells? Up until the start of the collapse in oil prices in late November of last year, producers continued to argue that the wells they were drilling would ultimately produce healthy profits, it was just a matter of time. They pointed to all the front-end costs for shale developments versus a revenue stream that only arrived later, but that would last for years. Yes, in the long-term wells do produce oil that doesn’t have any material finding and development expenses associated meaning that profits will flow when only lifting costs are counted. The problem with this analysis is that it fails to acknowledge that operators had to invest substantial sums to lease the acreage initially, and then they had to spend money to prepare geological and engineering studies about the resource’s location and how best to tap it. Finally, operators had to pay to drill and complete the wells and invest in new production infrastructure to get the output to market. These are all the costs directly associated with drilling, completing and producing shale wells, but producers have been ignoring the corporate expenses of running the business including interest expense, any dividends paid along with income taxes, although that is usually a minor expense for active E&P companies. In addition, gross income is reduced by the royalties paid to the landowners and production taxes paid to state and local governments. When all direct and indirect costs are included, the domestic E&P industry has been operating in a cash flow negative position for years.

There were only two years when capital spending and industry cash flow were in sync – 2003 and 2005

The chart in Exhibit 7 on the next page shows how the domestic oil and gas industry has consistently outspent its cash flow, and based on the forecast of broker Raymond James, that pattern will continue through 2018. As noted in the chart, there were only two years when capital spending and industry cash flow were in sync – 2003 and 2005. Importantly, those years were very early in the shale development era, which was driven by extraordinarily high oil prices.

Exhibit 7. Over Investing In Energy Business



Source: Raymond James Research, Spears & Associates; EIA, Company Reports; Bloomberg

Source: Raymond James

These dynamics contributed to the view that the United States would soon become “Saudi America”

Spending was also boosted in response to the hype of dramatic initial well output coming from these shale wells and prospects that the U.S. possessed many very large and highly productive shale basins. These dynamics contributed to the view that the United States would soon become “Saudi America.”

QE made high-yield debt investments fashionable, while also putting commodity-related investment plays in the spotlight, which was further helped by the rise in crude oil prices prior to the 2008 crisis and their quick recovery following the crisis

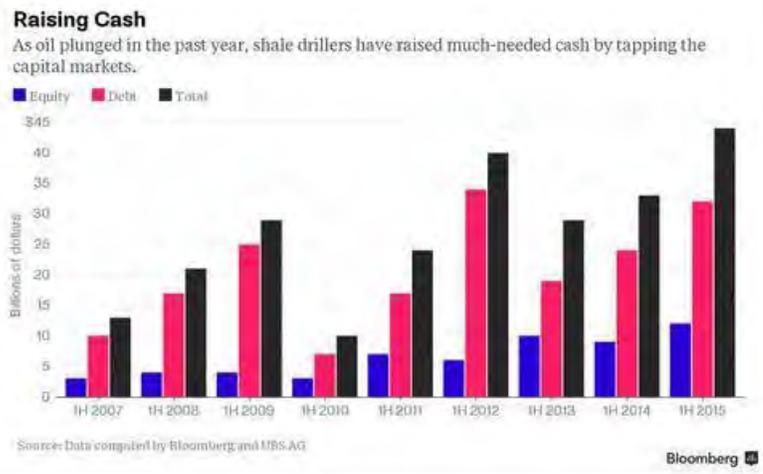
A key factor in the U.S. economy changed in the seven years that contributed to the domestic petroleum industry overspending by huge amounts – the introduction of quantitative easing (QE) by U.S. monetary authorities. QE was instituted in response to the need to reboot the country’s economy following the global financial crisis in 2008 and recession in 2009. QE dropped domestic interest rates to near zero, forcing all investors to increase their risk profile in order to earn returns comparable to what they had been earning before the financial crisis. QE contributed to a soaring stock market. QE made high-yield debt investments fashionable, while also putting commodity-related investment plays in the spotlight, which was further helped by the rise in crude oil prices prior to the 2008 crisis and their quick recovery following the crisis. For professional investors, one way to participate in this “reach for higher-risk returns” was to increase allocations to private equity investment funds, especially those targeting the commodity and energy sectors.

What we have seen since the shale industry boom took off around the time of the financial crisis has been a steady increase in E&P companies tapping the equity and debt markets

What we have seen since the shale industry boom took off around the time of the financial crisis has been a steady increase in E&P companies tapping the equity and debt markets. An interesting chart in Exhibit 8 on the next page shows the amount of public corporate debt and equity money raised by shale-focused E&P companies in the first half of each year since 2007. What can be gleaned is a steadily increasing progression in the amount of money raised, despite several interim years reflecting lower volumes of money raised. For example, after two consecutive yearly increases

in 2008 and 2009, the amount of money raised fell to a low level in 2010, which may have reflected the lingering fallout from the financial crisis.

Exhibit 8. Public Equity And Debt Markets Keep E&Ps Alive



Source: **Bloomberg**

Help came in the form of cost savings from reduced oilfield service company charges, lower spending on new well drilling and completions, and cost savings in overhead and G&A expenses

With the upcoming bank loan redeterminations, we expect to see increased E&P sector financial stress

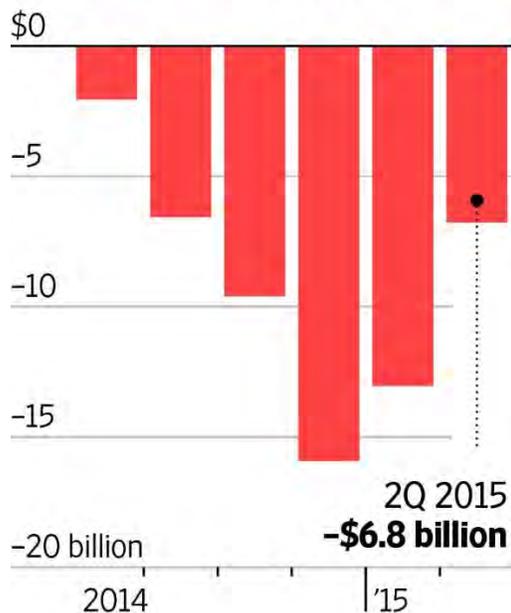
Those financial resources have been crucial for the E&P industry’s survival as demonstrated by the chart in Exhibit 9 that shows the negative cash flow reported by 59 U.S. producers with at least \$100 million in revenue in 2014. The chart shows that the worst quarter for this group of companies was the fourth quarter of 2014 when they lost about \$16 billion. The loss rate has improved during the first two quarters of 2015 as the negative cash flow was only \$6.8 billion in 2015’s second quarter. This improvement came despite the sharp drop in crude oil prices and little improvement in natural gas prices. Help came in the form of cost savings from reduced oilfield service company charges, lower spending on new well drilling and completions, and cost savings in overhead and G&A expenses.

Other than public debt and equity, the E&P industry has also been seeking other sources of capital. Drawing down bank credit lines has been one avenue, but lower oil prices will mean reduced asset values, especially as some of the assets will be redlined because they have been in the undeveloped category for too long so will be considered uneconomic. With the upcoming bank loan redeterminations, we expect to see increased E&P sector financial stress. In March, the last time loan redeterminations were conducted, oil averaged \$71 per barrel. Now, the average is \$57 a barrel; helped by the spring run-up in oil prices. By the fourth quarter, it is possible the average oil price will be in the \$40s. A 40% haircut in the borrowing base will impact 2016 E&P spending.

Exhibit 9. U.S. E&P's In Negative Cash Flow Position

Cash Crunch

Cash flow* for 59 U.S. oil-and-gas producers with at least \$100 million in revenue in 2014



*Cash from operations net of capital expenditures

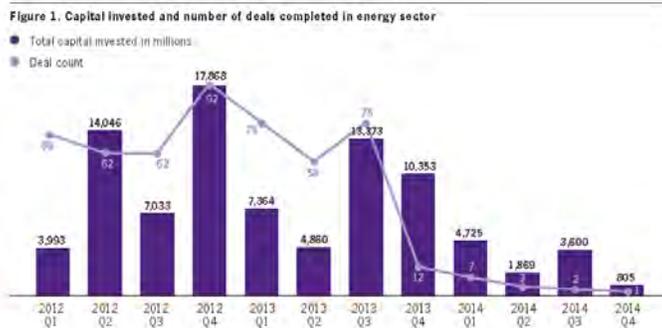
Source: S&P Capital IQ

Source: *The Wall Street Journal*

Next year, those companies only have 18% of their output hedged, and at an average price of only \$67 per barrel

The E&P industry has also lived off its earlier production hedges. As a result, some companies were being paid in the \$90s a barrel for their output, but most of those high-priced hedges are running out. An analysis by investment banker Simmons & Company International and quoted by *The Wall Street Journal*, cited 36 U.S. oil producers with hedges covering 33% of their 2015 output at an average of \$80 a barrel. Next year, those companies only have 18% of their output hedged, and at an average price of only \$67 per barrel. Those high-valued hedges during the first half of this year was a reason why layoffs and G&A cuts were not severe, if at all. Management teams' days of living in a world of unreality is rapidly coming to an end, and the pain will be severe.

Another source of capital for the energy business has been private equity - pools of capital that can be used to start new companies, buy companies on which to build much larger companies, and to

Exhibit 10. Energy Private Equity Investing 2012-2014

Source: PitchBook Data Inc., December 2014

Source: *Pitchbook.com*

Private equity deals this year have been sparse as fund managers struggle to find attractive deals in an environment in which it is difficult to assess what companies are worth

With billions of dollars sitting in these energy-focused private equity funds, finding and executing deals has become a high-pressure effort

The energy business truly needs to have the capital flow turned off, not merely turned down

provide capital for companies to grow. Data for the past three years (Exhibit 10) shows that private equity invested \$43 billion in 2012, \$36 billion in 2013, but only \$11 billion in 2014. Private equity deals this year have been sparse as fund managers struggle to find attractive deals in an environment in which it is difficult to assess what companies are worth. That also explains why deal-making in 2014 was down sharply from the prior two years.

As a result of the 2010-2014 period of high oil prices and expectations that these prices would only go higher in the future, private equity targeted the energy business due to its large capital needs. Virtually every major private equity firm raised one or more energy-focused funds. Those private equity firms who have ploughed the oil patch for years were easily able to raise large new funds off their successful track records. With billions of dollars sitting in these energy-focused private equity funds, finding and executing deals has become a high-pressure effort.

Increasingly, private equity managers are recognizing that this potential avalanche of capital seeking energy deals is their biggest problem. It has, and is, leading to overvalued deals. As long as this money has to be put to work due to the mandates of the funds, the pain in the industry is likely to continue. The energy business truly needs to have the capital flow turned off, not merely turned down. Only then can the industry washout occur and the healing begin.

Is The Saudi Arabia-US Oil Price War Nearing An End?

Their forecast is based on a pessimistic reading of fundamentals for oil supply and demand

Just over a week ago, investment bank Goldman Sachs (GS-NYSE) proclaimed that crude oil prices might fall as low as \$20 per barrel in order to end the oil price war. Their forecast is based on a pessimistic reading of fundamentals for oil supply and demand, which has led Goldman to believe that the world's oil surplus is higher today, even with recent data showing a decline in United States production, than previously thought. Their thesis is that the

Lower oil prices so far have not forced producers to cut back as expected

global oil supply has continued to grow due to more non-OPEC and OPEC oil despite U.S. production being on a downward trend. Lower oil prices so far have not forced producers to cut back as expected, as it appears that many see boosting output as a viable solution to cash flow shortfalls. Until producers of all types recognize that only by reducing their output can they expect to see meaningful higher oil prices anytime soon; the struggle to balance supply with demand will continue.

Amazingly, the clout of Goldman Sachs was deemed more important for pointing to the near-term direction in oil prices than the bullish report from the IEA

This dramatic forecast from a firm known for making outrageous predictions in the past – the Super Spike in oil prices; crude oil prices will hit \$150 per barrel by July 4th 2007, etc. - overwhelmed a positive market report issued by the International Energy Agency (IEA) on the same day. That report suggested that global oil demand would be higher in 2015 (+1.6 million barrels a day, up 200,000 barrels a day from its previous forecast) and in 2016 (+1.4 million barrels a day, up 200,000 barrels a day from its previous forecast), which would restore a supply/demand balance by 2016's fourth quarter. That balance in the oil market would lead to higher oil prices. Amazingly, the clout of Goldman Sachs was deemed more important for pointing to the near-term direction in oil prices than the bullish report from the IEA. That day, traders sold oil futures and bet that lower was the likely direction for oil prices in the near-term, although higher oil prices will be the long-term outcome. The dilemma is that no one knows when the long-term will arrive.

Key moving parts in trying to decipher the oil price outlook include: U.S. oil production, especially tight and shale oil output; OPEC production, especially with the likely return of Iran's oil production to the world market following the ending of economic sanctions associated with the approval of the Iranian nuclear agreement; non-OPEC production, other than that of the United States; and global oil demand. Analysts, OPEC and various government officials, along with energy company managements, have differing views about the trajectory of each of these variables, which leads to widely different outlooks for near-term oil prices as demonstrated by the Goldman Sachs and IEA reports.

The longer we stay at low oil prices the greater the risk of a slingshot response to higher oil prices down the road

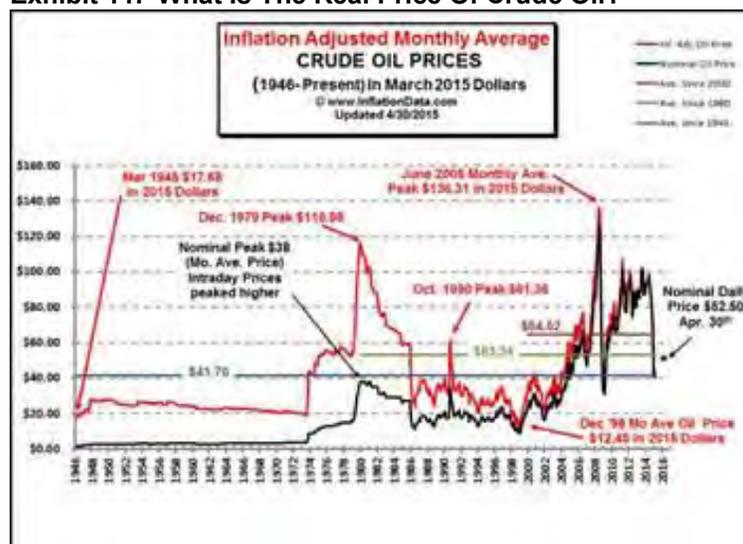
One thing about which there is virtually unanimous agreement is that oil prices cannot remain at current levels (low \$40s per barrel) for an extended period without crippling the development of future global oil supply. In other words, the longer we stay at low oil prices the greater the risk of a slingshot response to higher oil prices down the road. Of course, the theory underlying higher oil prices in the long-term is the assumption of continued global population growth that will drive oil demand higher.

We have produced a chart showing the inflation-adjusted oil price history and its implications for oilfield activity that we will refer to later, but for the time being we will use the chart in Exhibit 11 on the next page. This chart shows inflation adjusted oil prices since 1946

Over the entire period since 1946, inflation-adjusted crude oil prices averaged \$41.70 per barrel, or not very far below the current oil price

through March 2015, but the important points on the chart relate to average oil prices calculated for different historical periods. Over the entire period since 1946, inflation-adjusted crude oil prices averaged \$41.70 per barrel, or not very far below the current oil price. This long-term oil price offers support for the view that the recent oil price fall into the high \$30s per barrel may have marked a near-term bottom, although we know that in stock and commodity markets, prices often go above or below expected long-term support or resistance levels in response to emotions in the trading pits.

Exhibit 11. What Is The Real Price Of Crude Oil?



Source: [Inflationdata.com](http://inflationdata.com)

The chart also shows that for the 1980-2015 period, the average inflation adjusted oil price was \$53.24 per barrel, and for the shorter period of 2000-2015, the average oil price was \$64.52 per barrel. This chart was prepared for an analysis done in May. As the chart shows, the April 30, 2015, oil price was \$52.50 per barrel, or not far off the 1980-2015 average price, and within a reasonable distance above the long-term low price average and a little bit below the recent average. In and of itself, that price level didn't mean anything as we witnessed oil prices climbed back above \$60 per barrel last summer before falling back into the \$38 range.

We would point out that the absolute inflation adjusted low oil price was \$12.45 per barrel in December 1998, at the tail end of what was considered one of the worst oil market downturns

We would point out that the absolute inflation adjusted low oil price was \$12.45 per barrel in December 1998, at the tail end of what was considered one of the worst oil market downturns. That downturn was created by OPEC producers misreading the magnitude of demand coming from Asia that was derailed by currency problems caused by the collapse in real estate in certain Asian countries. That downturn required a concerted effort among Saudi Arabia and non-OPEC producers Russia and Mexico to orchestrate a unified production cutback that restored the supply/demand balance.

For those believing in very long cycles for the oil business, and commodities in general, the peak in 2014 oil prices would mark the end of a nearly 16-year positive oil price cycle that outlasted both the 2001 recession and the 2008-2009 financial crisis and recession

When viewed from a long-term perspective, one might consider that the downturn at the end of the 1990s marked the terminus of an extended oil price decline that started in 1980 and lasted nearly 18 years. For those believing in very long cycles for the oil business, and commodities in general, the peak in 2014 oil prices would mark the end of a nearly 16-year positive oil price cycle that outlasted both the 2001 recession and the 2008-2009 financial crisis and recession. Is it possible that we are beginning another extended period of low oil prices? Of course, that partly depends on one's definition of "low" as it relates to global oil prices. Is that the \$41.70 per barrel average experienced since 1946? Maybe it is the \$53.24 per barrel average price over the period since 1980. Or could it be that the low oil price for the future is the \$64.52 per barrel average experienced since 2000? Right now, we are sure the oil industry would be very happy if they knew oil prices would stay around the mid-\$60s per barrel, even for an extended time period, because at that level they would figure out how to make their new oil output cash flow profitable.

We have created a similar adjusted oil price chart but with several differences. First, we started the chart in 1970 because later we wanted to examine movements in the global drilling rig fleet and we needed monthly oil price data. Second, we extended our oil price to July 2015 and utilized the July 2015 consumer price index to calculate inflation-adjusted past oil prices. What one finds when adjusting oil prices is that it depends on the starting date and the price index used. Differences in those measures will yield slightly different adjusted oil prices compared to other similar data series. In most cases these differences are very small, although they can become larger the further back in time the prices are adjusted. The final difference in our chart is that we have marked those months when oil prices were above \$90 per barrel, what we consider to be ultrahigh prices and corrosive to the oil market.

It is also important to note the 17-year period following the end of the 1970s oil boom during which oil prices were low and the industry was forced to make many adjustments

When we examine our chart (Exhibit 12 on the next page), three periods stand out for when adjusted oil prices traded above \$90 per barrel: the final three years of the 1970s bull market for oil; the one year period leading up to the 2008 financial crisis; and lastly the 44 months of high oil prices during 2010-2014. It is also important to note the 17-year period following the end of the 1970s oil boom during which oil prices were low and the industry was forced to make many adjustments to its business models in order to operate and survive in the oil bust era of the mid-1980s.

The industry has existed for roughly half its time in a low oil price environment

When we consider the entire period of 1970 through 2015, if we add the 17 years of low oil prices that dominated the middle period to the two most recent years of low oil prices, we find the industry has survived 19 years of difficult economic times. Add to that span, the four years from 1970-1973 before oil prices jumped in response to the Arab oil embargo, and the industry has existed for roughly half its time in a low oil price environment. If that is the case, then one needs to ask what constitutes the norm for the industry – high oil

Does a mid-\$60s a barrel oil price constitute a high oil price?

prices or low oil prices? Then we also need to define what constitutes high and low for oil prices. Does a mid-\$60s a barrel oil price constitute a high oil price, especially given the average price for the entire period? Or is that still a low price? What can we make of oil prices in the \$80s and \$90s a barrel? Are those potentially normal years, or were they truly outliers? We believe we know what most in the industry would like the definitions to be, but wishing does not make it so.

Exhibit 12. Helping Define High And Low Oil Prices



Source: BP, Federal Reserve, PPHB

The international offshore rig count has continued to grow even up to now, although it is suffering in the current downturn

One thing we did with the adjusted oil price chart was to superimpose on it the drilling rig count divided between North American and International, as reported in the monthly international rig count by Baker Hughes (BHI-NYSE). The patterns of these two counts mirror each other on a broad basis – rising and falling together over long time periods. The one interesting thing is we plotted the international offshore drilling rig count, which showed a steady increase during the low-oil price era when the overall rig counts were declining. The international offshore rig count has continued to grow even up to now, although it is suffering in the current downturn. Even while suffering, international offshore drilling accounts for more than half the drilling rigs currently working.

The 1980s were a period when the oil industry expanded internationally as oil producers sought to find oil reserves outside of OPEC and especially the Arab nations, given the then-recent Arab oil embargo

When we first noted the increase in the international offshore rig count during the 1980s and 1990s, we were forced to stop and think about why that would be the case. The 1980s were a period when the oil industry expanded internationally as oil producers sought to find oil reserves outside of OPEC and especially the Arab nations, given the then-recent Arab oil embargo. This was when the North Sea blossomed and there was greater drilling offshore West Africa that produced many new discoveries. Many countries around the world offered their offshore areas for exploration and development, both in hopes of finding a new source of government revenue but also because it was an easy way to jump-start their economies.

Countries with coastlines were already exposed to the maritime industry, so offshore drilling, construction and production offered various opportunities for the local businessmen to establish new businesses that would create jobs and tax revenues.

Exhibit 13. The Challenge Of Low Oil Prices For Drillers



Source: BP, Federal Reserve, Baker Hughes, PPHB

Geological research suggests that offshore, the world is divided into two parts, separated by the rocks in them and the hydrocarbons they hold

If we are entering an extended (several years) period of low oil prices (\$40s), then are there similar conditions that could offer opportunities and hope for oil and gas producers and oilfield service companies? Geological research suggests that offshore, the world is divided into two parts, separated by the rocks in them and the hydrocarbons they hold. The division seems to be based on the Atlantic Ocean basin being primarily an oil-bearing region while the Indian Ocean and Pacific Ocean regions are more natural gas-bearing. One only needs to look at the recent success of explorers offshore South America's Guyana, various West African nations and Brazil to substantiate that view. The belief is that the African and South American continents were linked billions of years ago and that the oil we are finding off the coasts of the two continents was all part of one giant oil pool that was split when the continents separated. The explanation for natural gas dominating the other regions of the world relates to their different rocks, temperatures and pressures present in the formations.

If this geological belief is correct, it may suggest that the age of oil has a more defined future and that the world will evolve into a gas-driven future. That is good news for the liquefied natural gas (LNG) business, but for its success to continue, many of the energy uses of petroleum may need to shift to a form of natural gas.

Given this theory about the long-term evolution of the petroleum business, it may signal that the challenge for the industry in the immediate future will be exploring for crude oil in deeper formations within those Atlantic basin countries that are already oil-producers,

The next extended low-oil period lacks a key dynamic that kept the industry going during the 17-year period of low oil prices that dominated the 1980s and 1990s

offering limited growth opportunities from new geographic locations. The geographic opportunities may come from new countries being explored in the rest of the world in the search for natural gas. That search, however, may be slower on the uptake due to the lack of growth in LNG use and correspondingly lower LNG prices. If that proves to be the case, then the next extended low-oil period lacks a key dynamic that kept the industry going during the 17-year period of low oil prices that dominated the 1980s and 1990s.

**Contact PPHB:
1900 St. James Place, Suite 125
Houston, Texas 77056
Main Tel: (713) 621-8100
Main Fax: (713) 621-8166
www.pphb.com**

PPHB is an independent investment banking firm providing financial advisory services, including merger and acquisition and capital raising assistance, exclusively to clients in the energy service industry.