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## MUSINGS FROM THE OIL PATCH

February 23, 2016

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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

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### More Insights Into Mind Of Saudi Arabia About Energy Policy

We recently participated in the Australian American Chamber of Commerce 8<sup>th</sup> Annual Energy + Technology Conference. At the conference we heard a presentation by Janes Krane of Rice University. Mr. Krane is the Wallace S. Wilson Fellow in Energy Studies with the Baker Institute for Public Policy, a think-tank that has recently received high praise for its standing among all global research centers. His research addresses the geopolitical aspects of energy with a focus on the Middle East. His presentation was keyed around observations from a recent trip to Saudi Arabia and other Arabian Gulf countries.

**His points were quite interesting in light of the news of that day about Saudi Arabia, Russia, Venezuela and Oman conditionally agreeing to freeze their oil output at January 2016 levels**

Mr. Krane highlighted four key observations, several of which we found very enlightening in our attempt to fathom the thinking of the Saudi Arabian rulers about their oil policy. His points were quite interesting in light of the news of that day about Saudi Arabia, Russia, Venezuela and Oman conditionally agreeing to freeze their oil output at January 2016 levels. The agreement was tied to getting Iran onboard, and hopefully some other key members of OPEC. News reports shortly after the story broke indicated that Qatar and Kuwait had also agreed to cooperate in the production freeze. All eyes turned to the prospect of Saudi Arabian and Russian energy officials visiting Tehran the next day to discuss the agreement with the Iranians. Subsequently, the Iranians rejected the deal, effectively killing its prospect as a solution to the current oil market oversupply situation and low oil prices.

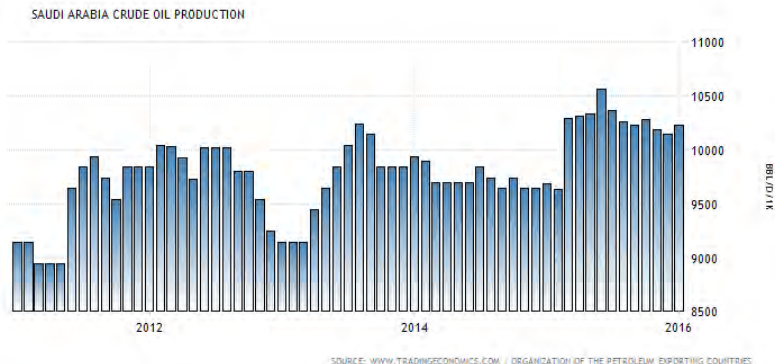
So what were Mr. Kane's four points, and what insight to Saudi Arabian oil policy do they provide, especially in light of the negotiations of last week? His first point was that Saudi Arabia has held to an oil output cap of 12.5 million barrels a day (mmb/d) for many years, which they have continually denied the existence of.

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**Since March of last year, the kingdom has consistently produced in excess of 10 mmb/d of oil**

The kingdom produced 10.088 mmb/d during January, down slightly from its peak output of 10.564 mmb/d achieved during June 2015 when the country’s summer heat drives power demand up for air conditioning that is generated by burning domestic oil production. However, since March of last year, the kingdom has consistently produced in excess of 10 mmb/d of oil at a time when global oil prices were crashing.

**Exhibit 1. Saudi Arabia Oil Output At High Levels Ever**



Source: [www.tradeeconomics.com](http://www.tradeeconomics.com)

**The denials of the existence of that production cap were disappearing during his trip**

Mr. Krane observed that the denials of the existence of that production cap were disappearing during his trip. The disappearance of the denials comes at the same time it was reported, and subsequently confirmed, that the kingdom was considering the possibility of an initial public offering for Saudi Aramco, the national oil company.

**The change reflects the anger and disappointment of the Royal Family over the Iranian nuclear weapons deal**

His second point dealt with the reform of energy subsidies being undertaken, largely due to budgetary considerations, but in step with similar actions by a number of Middle East, Latin American and Asian countries, too. Mr. Krane’s third point reflected how attitudes toward the actions of the United States, a long-term friend and protector of Saudi Arabia, had changed. The change reflects the anger and disappointment of the Royal Family over the Iranian nuclear weapons deal orchestrated by Secretary of State John Kerry under the direction of President Barack Obama and in conjunction with other western powers. As Mr. Krane put it, the Saudi Arabians he spoke with referenced the U.S. “dancing cheek to cheek with Iran.”

**The line of succession had always been through the next oldest son of the founder of the country**

The last observation made by Mr. Krane was a reflection of the shift in leadership within the government and the Royal Family. King Salman made the decision to change the order of royal succession last spring and removed his half-brother, Crown Prince Muqrin, from the line of succession. This was a radical move as the line of succession had always been through the next oldest son of the founder of the country, King Abdul Aziz ibn Saud. Instead, King Salman elevated Deputy Crown Prince Mohammed bin Neyef, his

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**He commented that the country's economy was much more complex today than at any time in the past**

**Producing more of Saudi Arabia's oil reserves sooner, in other words shortening the country's reserve-to-production ratio, makes perfect economic sense**

late half-brother's son, into the Crown Prince position as King Salman's likely successor. The king then appointed his son, Prince Mohammed bin Salman as Deputy Crown Prince and second in line to the throne. Besides becoming Deputy Crown Prince, Prince Salman was given responsibility for Saudi Arabia's military and he was installed as the chief economic policymaker, including overseeing energy policy.

Mr. Krane's observation about this personnel change was regarding its controversial nature. Deputy Crown Prince Salman has leapfrogged the hierarchy within the Royal Family, which for someone so young (only in his early 30's) creates concern. Some see the move as positive and a breath of fresh air, while others worry that the Prince Salman is untested, uneducated and lacks experience. Those claims could be from Royal Family members upset about the change.

In response to questions about what Mr. Krane thought was going on with Saudi Arabia's oil policy, he commented that the country's economy was much more complex today than at any time in the past. That increased complexity was forcing oil output decisions to be based on commercial considerations and not as a weapon to help friends and hurt foes. He also thought that the increased investment in refineries around the world – the United States, China, Japan and Korea – was an effort by the kingdom to shift away from merely exporting crude oil and to capture more of the value from refining its oil. This is not an uncommon path for national oil companies who see the greater value in a refined barrel of oil. The ownership or partnership in foreign refineries provides access to those markets that could be lost if Saudi Arabia were only to sell crude oil.

What we took away from the first two points made by Mr. Krane and along with his observations about the growing complexity of the Saudi Arabian economy and the desire to capture more of the oil value stream is that the new leaders see a more rapid ending of the Age of Fossil Fuels than maybe their fellow OPEC leaders see. As a result, producing more of Saudi Arabia's oil reserves sooner, in other words shortening the country's reserve-to-production ratio, makes perfect economic sense. That is especially true if you are increasingly concerned about waking up one day and finding that a portion of your crude oil reserves are stranded because the market for them has disappeared. That situation could be worse than producing the oil and selling it in a low-price era, something that might extend for years.

The Saudi Arabian investment in two new refineries in China is a further attempt to ensure the kingdom's global oil market share is sustained. Again, Saudi Arabia's contribution to creating a low oil price environment helps kill the industry's new long-term oil development projects such as Canadian oil sands and deepwater

**The sooner the Saudi Arabia economy is weaned off cheap oil and becomes more diversified, the better for the kingdom's future**

drilling, which further helps low-cost Saudi Arabian oil gain greater global market share, an important position for this one-product economy.

One can view the decisions to raise fuel prices and cut energy subsidies as risky but consistent with a view of a shortening of the Age of Fossil Fuels. The sooner the Saudi Arabian economy is weaned off cheap oil and becomes more diversified, the better for the kingdom's future. Neither of these steps will be easy and each action entails risks for the country's leadership. This is where concern about the untested leadership of Deputy Crown Prince Salman comes into play, a point we have raised before. He is young, but he seems to have had more experience within the government than many are giving him credit for. As far as the claim of him being uneducated, we wonder whether that is more a reflection of elitism since he did not attend a university in either the United States or Europe. He was educated at Riyadh Schools, where he ranked among the top 10 students upon graduation. He received his bachelor's degree in law from King Saud University, where he graduated second in his class. The prince also received various training courses during his education. We are not in a position to comment on the quality of Prince Salman's education, but the criticism of him could be based on the fact that his education was not at an Ivy League or major petroleum school in the United States, or an elite university in England or elsewhere in Europe. That does not mean his education was inferior, only that it was different from that of most of his contemporaries. It also may mean that those on the outside trying to fathom Prince Salman's thinking may need to reorient their perspective.

**There is little doubt that this may be another modern history example of great leadership resulting from on-the-job training, or a colossal failure**

We have always contended that the wildcard for what happens to Saudi Arabia, its energy policy and its geopolitical dealings, is the success of Prince Salman. There is little doubt that this may be another modern history example of great leadership resulting from on-the-job training, or a colossal failure. What we do know is that the current royal succession assures that a more traditional, but also a hard-liner, is poised to step up. If, however, Prince Salman's actions prove successful (and we are not sure we can define what success is), we would not be surprised to see another realignment of the royal succession order at some point down the road. If he does succeed his father, it will mark the official installation of the next generation to run Saudi Arabia. That generation will also reshape and reorient the kingdom's policies and actions in ways we cannot fully comprehend or predict at the present time due to the generational differences and experiences. Watch this young Salman and the twists and turns in the kingdom's military and oil actions in the foreseeable future as a guide to Saudi Arabia's future.

## Crude Oil Prices And The Underwhelming World Economy

**The meeting followed on the unsuccessful efforts of Venezuelan oil officials to broker a deal for a reduction in output**

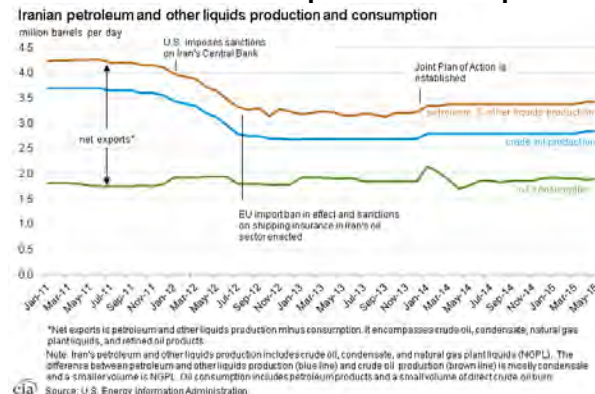
After trading in the high \$20s a barrel ten days ago, crude oil prices soared above \$30 on reports of an impending meeting of oil officials from Saudi Arabia, Russia, Oman and Venezuela. The meeting followed on the unsuccessful efforts of Venezuelan oil officials, after visits to Russia, Saudi Arabia and other Middle Eastern oil producing countries, to broker a deal for a reduction in output. As they say, hope springs eternal, and the news reports were enough for the oil bears to run away from their short positions, especially as they were staring into a three-day trading hiatus created by the Presidents' Day holiday in the U.S.

When the parties to the meeting announced they had agreed to consider freezing their output at January's levels, rather than orchestrate a cut, the air came out of the optimists' balloon, although there was a sliver of hope with news that the participants were heading to Tehran to see if they could convince the Iranians to jump onboard the freeze deal. After years of suffering under western economic sanctions that had cut Iran's oil exports by more than a million barrels per day, prospects of being able to sell additional crude into the world market, even at lower global oil prices, was an important ingredient behind the country's willingness to enter into a nuclear weapons deal with western powers.

**The best thinking is that Iran can boost its exports by about 500,000 barrels a day**

Iran reportedly had been stockpiling crude oil and condensate on some of the nation's tankers in anticipation of the lifting of the sanctions and in order to be ready to contract their sale. The country has stated that it plans to return to exporting similar volumes as it did before the sanctions were put in place, although petroleum industry experts question whether they can reach that past volume any time soon. The best thinking is that Iran can boost its exports by about 500,000 barrels a day, although some forecasters are more optimistic by estimating export volumes during the second half of 2016 adding 750,000 – 800,000 barrels a day.

**Exhibit 2. Sanctions Impact Iran Oil Exports**



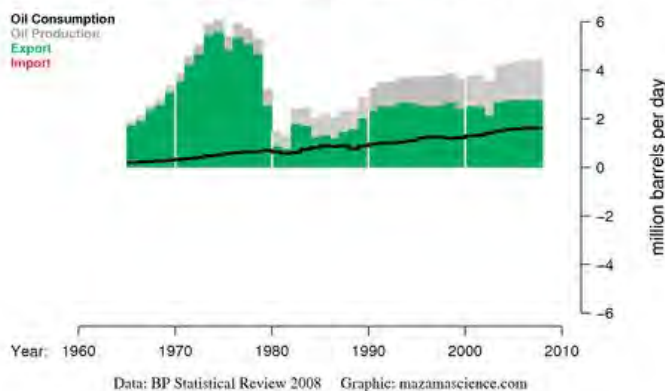
Source: EIA

**During most of the 1990s and 2000s, Iran's exports were around 3 million barrels a day, but down sharply from the 5 million barrels a day it exported during the 1970s**

Few forecasters hold out any hope that within a reasonable time period Iran can return to the lofty export levels of the pre-revolutionary period of the 1970s, when the country was a center of global oil and natural gas exploration and development activity. As shown in Exhibit 3, during most of the 1990s and 2000s, Iran's exports were around 3 million barrels a day, but down sharply from the 5 million barrels a day it exported during the 1970s.

### Exhibit 3. The Iran Oil Industry Has Changed Iran Crude Oil

From 2006 to 2007 : Exports Increased by 0.6 %



Source: BP

**Other government officials suggested that the plan was something that made some sense**

Global crude oil prices were extremely volatile following the Iranian meeting as the signals about the country's intentions were mixed. Iran said it wouldn't agree to a production freeze, which was not surprising given the state of its production recovery following the lifting of the sanctions, but then other government officials suggested that the plan was something that made some sense given the collapse of oil prices and the needs of virtually every oil exporting country for more revenues.

**That challenge is the lack of global economic growth**

While the focus on the state of the world's oil industry continues to highlight the oversupplied market condition, the ability to reign in producers' output frustrates everyone. Further to the current oversupply situation, an announcement from the Organization for Economic Co-operation and Development (OECD) points out a key challenge for the global oil industry. That challenge is the lack of global economic growth. The OECD, which represents most of the world's developed and emerging economies, cut its projections for growth for 2016 and 2017, with that future year's projection the more troubling one. The organization also called for "urgent" action to boost economic growth.

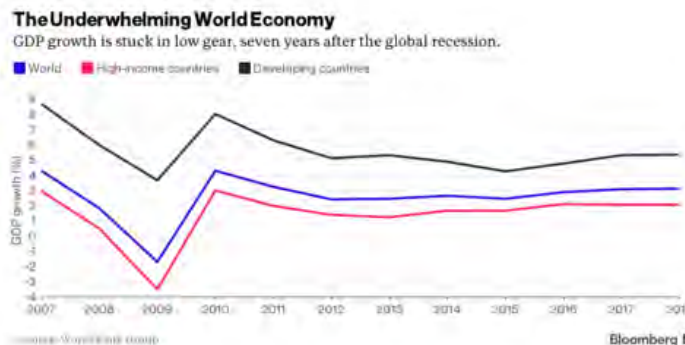
In its latest Economic Outlook, the OECD followed a path previously set forth by the World Bank and International Monetary Fund who previously reduced their economic growth forecasts. For 2016 and 2017, the OECD now sees global economic activity growing by only

**This cycle’s end is creating havoc throughout the world of natural resource producers**

3% and 3.3%, respectively. Those forecasts are down from the organization’s reduced estimates of last November of 3.3% for 2016 and 3.6% for 2017. These projections compare against a long-term trend line of average annual growth of 3.75%.

As shown in Exhibit 4, following the 2008-2009 financial crisis and recession, world economic growth has essentially flat-lined around 3%. The optimistic uptick in economic growth anticipated in 2017 appears to be largely driven by better performance among developing country economies. Many of these economies, however, are the same ones that depend on exploitation of their natural resources and are suffering due to the ending of the commodity super-cycle and the corresponding collapse in commodity prices. This cycle’s end is creating havoc throughout the world of natural resource producers. In response to the economic devastation befalling them, many of these countries are being forced to increase the prices of heavily subsidized energy, which, unfortunately, will cut demand further and possibly slow the pace of the energy industry’s recovery, while also inflicting pain on low-income families.

**Exhibit 4. World Struggles To Raise Growth Rate**



Source: **Bloomberg**

**“Global GDP growth in 2016 is projected to be no higher than in 2015, itself the slowest pace in the past five years.”**

For the past three years, almost like clockwork, the IMF, World Bank and OECD have cut their yearly economic growth projections due to a lack of response of world economies to strong financial and fiscal stimulus. The comments of the OECD are instructive for trying to understand the dilemma of economic policy advisers and politicians. As the OECD pointed out, “Global GDP growth in 2016 is projected to be no higher than in 2015, itself the slowest pace in the past five years.” This period marks the years following the 2009 recession and the collective efforts of governments around the world to pump up economic growth after the 2008 financial crisis. Part of the problem is that to address the financial excesses that contributed to the 2008 crisis, governments introduced easy-money policies designed to lower interest rates and make cheap money available for borrowers. At the same time, many countries revamped their economic regulations and laws in order to prevent a repeat of the dangerous financial deals that helped cause the financial crisis.

**The OECD would like to see countries move away from their “austerity” fiscal policies**

These new regulations, coupled with the huge fines and legal settlements for banks and financial companies, made them less willing to lend when they could collect risk-free returns by leaving their reserves on deposit with the Federal Reserve.

The OECD addressed this problem. “A stronger collective policy response is needed to strengthen demand. Monetary policy cannot work alone,” stated the organization. While continuing to urge governments to maintain “highly accommodative” monetary policies, the OECD also argued that “Quality infrastructure projects would help to support future growth, making up for the shortfall in investment following the cuts imposed across advanced countries in recent years.” In other words, the OECD would like to see countries move away from their “austerity” fiscal policies, which have largely been instituted to address growing debt levels that hurt the value of their currencies and cause other economic challenges.

**The result has produced the weakest economic recovery following a recession since the Great Depression**

We continue to look for Black Swans that are impacting the world and the energy industry in particular. The 2008 financial crisis generated serious questions about the viability of the world’s financial system. In response, governments flooded the world with cheap money, opened their purses to greater economic and social spending, and jawboned consumers and businesses to spend, spend, and spend. The result has produced the weakest economic recovery following a recession since the Great Depression. The typical policy actions are not working, and importantly, they may never work because of the era we are in.

**We think the analysis clearly identifies critical considerations about the economic and social transition we are engaged in and the hurdles it is facing**

In response to previous articles we have authored about the Black Swans and the economic and energy challenges associated with them, a friend offered his analysis that has considerable merit. Unfortunately, the analysis doesn’t give us a road map or a set of policy prescriptions to ending our problems. That doesn’t mean that we think his analysis is weak. Rather, we think the analysis clearly identifies critical considerations about the economic and social transition we are engaged in and the hurdles it is facing. In his view, everything about today is a Black Swan.

**The pace of eliminating those middle income jobs is happening faster than our ability to replace them**

The hypothesis of the analysis is that we are in a transition from the “industrial economic era to a new yet unknown era.” Man, how everyone hates unknowns! His example is the transition from the Bronze Age to the Iron Age, but as he puts it, we are making the transition in decades rather than centuries. Ah, the speeding up of our economy and society, largely due to technology. The problem is that technology is erasing good-paying middle income jobs that were created by the industrial age for less rewarding and lucrative new jobs. Moreover, the pace of eliminating those middle income jobs is happening faster than our ability to replace them. Yes, we know the U.S. economy has created 40+ months of consecutive private sector job growth courtesy of the Obama administration, but we are in a “gig” economy where people are working multiple part-time jobs or



**The significance of technology is important because it plays a key role in eliminating the highest cost input factor – human labor**

surviving by mixing part-time employment with government support, or working off-the-books. (Take note of the new effort to eliminate the \$100 bill under the pretext of attacking crime. It may, however, be designed to shut down the underground economy and capture the taxes being avoided. That economy might be how more people are avoiding having to live off the government dole.)

One of the major new issues for economic research and debate is the lack of productivity growth in the economy, which directly impacts wages and job growth. The significance of technology is important because it plays a key role in eliminating the highest cost input factor – human labor. Until we can come up with new, well-paying and challenging jobs within a new economic structure, we may be consigned to this low-growth environment we are living in. The problem is that getting out of this world requires a “reboot” and that is extremely disruptive. Quoting from our friend’s analysis:

“Reboots are economically and socially cataclysmic. They destroy the legacy order...legacy governments. But of course standing governments are not interested in being replaced by whatever is most productive in the new era. This is what’s really happening when we see the massive fiscal and monetary stimulus that’s needed to keep economy operating under the old order. Governments obviously don’t want to collapse. They don’t want to be replaced by a new order.” This is not only an excellent expression of our economic challenge, but it helps explain the amazing election process we find ourselves in, an era virtually everyone is having a tough time explaining.

**None of this suggests blue skies and rainbows ahead for the energy business**

As we go through this reboot, we need to understand that all our assumptions about how governments, economies and society work need to be reassessed. None of this suggests blue skies and rainbows ahead for the energy business. That is a troubling and frustrating message, but an important one nevertheless.

## **Crumbling Oil Industry Offers Challenges And Opportunities**

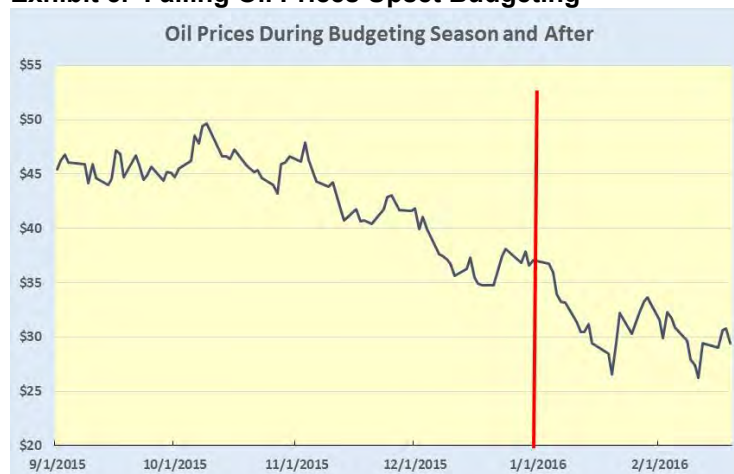
**The growing reality is that 2016 will not be the industry-recovery year that most industry executives assumed it would be as they were preparing their corporate budgets in late 2015**

Two weeks ago in the email introduction to the prior issue of the *Musings*, we used the term “crumbling” to describe what we saw happening in the oil business, but more importantly in the entire energy industry. The industry news since that time has only gotten worse as oil prices have once again fallen below \$30 a barrel reinforcing fears about the prospect of oil reaching \$20 a barrel before long. The growing reality is that 2016 will not be the industry-recovery year that most industry executives assumed it would be as they were preparing their corporate budgets in late 2015. As shown in Exhibit 5 (next page), the price of oil was stable in the \$45 a barrel range for most of September 2015 before rallying up to \$50 a barrel at the start of October. That price action provided ammunition for the industry optimists who were expecting an industry recovery beginning before year-end. Unfortunately, before they were able to

**Whatever optimism existed among industry participants was flushed out by the oil price volatility and the growing reality that the “lower for longer” scenario was becoming the mainstream scenario**

open their champagne bottles, the oil price began dropping uninterrupted, except for brief periodic short-covering rallies, until the middle of January, bottoming out in the mid-\$20s a barrel. Immediately afterward, the oil price bounced up to the low \$30s a barrel before reversing and heading back to the mid-\$20s a barrel once again. Throughout the first two months of 2016, industry headline after industry headline remarked how a new multi-year price low had been reached the day before, with the time period of these new lows extending backwards from just a few years up to 12 years. Whatever optimism existed among industry participants was flushed out by the oil price volatility and the growing reality that the “lower for longer” scenario was becoming the mainstream scenario. Even one of the primary industry oil price bulls who had been calling for a V-shaped recovery for much of 2015 was forced to push the prospective timing of this oil price recovery into the second half of 2016. People are beginning to wonder whether an oil price recovery will even happen in 2016.

#### Exhibit 5. Falling Oil Prices Upset Budgeting



Source: EIA, PPHB

**The reality of the magnitude of damage being done to companies by the sharp reduction in their revenues and cash flows due to weak oil prices has finally forced managements and boards of directors to act, and act dramatically**

While January brought bad news from companies with respect to capital spending reductions, some of the worst news such, as dividend cuts and massive layoffs, only emerged in the past couple of weeks. The reality of the magnitude of damage being done to companies by the sharp reduction in their revenues and cash flows due to weak oil prices has finally forced managements and boards of directors to act, and act dramatically. For example, the surprise decision by Southwestern Energy (SWN-NYSE) to lay off 40% of its staff, or more than 1,100 employees, and shut down all its drilling rigs after having recently moved into a massive new headquarters building shocked the industry. Likewise, ConocoPhillips (COP-NYSE), after defending its dividend through the first year of this downturn even at the cost of laying off staff, finally caved and cut its quarterly dividend by two-thirds from 74-cents to 25-cents per share. ExxonMobil (XOM-NYSE), after reporting weak earnings results for

its fourth quarter, followed up last Friday by announcing it had failed to replace its production last year for the first time in 22 years, announced a 25% cut in its 2016 capital spending plans and the suspension of its share repurchase program. These steps are designed to reduce the drain in the company's cash balances. Another optimist, Pioneer Natural Resources (PXD-NYSE), after signaling late last year that it might actually increase its 2016 capital spending by 20%-30% as a result of the multiple attractive exploration opportunities it has in its Permian Basin acreage, announced a 10% capex cut this year, which means it will be forced to cut in half the number of drilling rigs it operates, going from 24 at year-end 2015 to 12 by mid-year 2016. The latest industry bombshell was Devon Energy's (DVN-NYSE) announcement just last week that it was slashing its 2016 capital spending by 75% and laying off 1,000 employees, or about 20% of its staff. The shock from this announcement had barely been digested when Devon announced the sale of up to 69 million shares of stock and raising potentially \$1.6 billion in cash to shore up its balance sheet. The cash infusion also helps the company by reducing the pressure to depend partially on selling assets to help fund capital spending.

**According to Bloomberg, the energy industry has announced plans to raise \$4.6 billion in new equity, accounting for nearly 30% of all new equity raised so far this year**

The sale of stock by Devon is another example of the continuing ability of energy companies to tap capital markets, something a growing number of observers believe is prolonging the needed spending reduction that will cause oil output to fall off materially and set the stage for a recovery in prices. According to Bloomberg, the energy industry has announced plans to raise \$4.6 billion in new equity, accounting for nearly 30% of all new equity raised so far this year. The amount of equity being raised is almost evenly split among three deals – Pioneer Natural Resources, Hess Corporation (HES-NYSE) and Devon. Each of these deals was upsized from their original announcement reflecting high levels of demand from investors betting not only the individual companies surviving but that their share prices will soar when the oil price rises and energy industry fortunes improve.

**Exhibit 6. 2016 Energy Equity Raising Significant**

**Tapping Investors**  
 Energy companies have announced plans to raise \$4.6 billion in equity, accounting for 29.3% of the total in the U.S. so far this year



Source: Bloomberg Data

Bloomberg

Source: Bloomberg

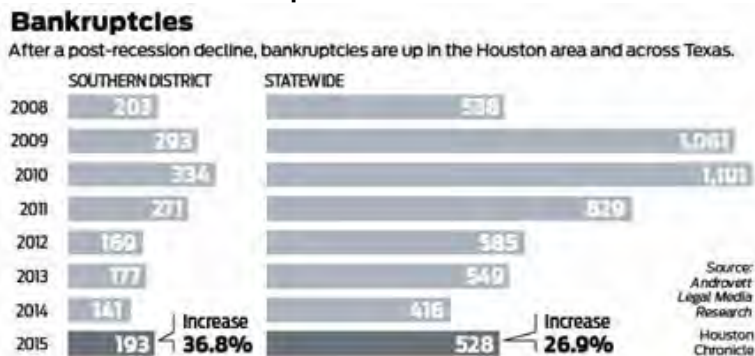
**The \$4.6 billion equity raise so far this year compares with the \$7.8 billion raised by exploration and production companies during the first two months of 2015, the fastest pace in raising new equity in over a decade**

The \$4.6 billion equity raise so far this year compares with the \$7.8 billion raised by exploration and production companies during the first two months of 2015, the fastest pace in raising new equity in over a decade. An interesting question is whether the capital raised in early 2015 has been wasted? If we consider what has been happening to companies within the E&P and oilfield service sectors, the oil price collapse is finally ending the corporate and investor strategy of “pretend and extend.” That strategy means that company executives have been selling lenders and investors on the view that a turnaround is just around the corner, so if they will just give them a little more time (and money?) the companies will be fine. As this strategy evaporates, the battle lines are drawn between managements and their owners. A change in the past is that many of the owners of the companies are investors who specialize in distressed securities. As a result, the struggle over how to redo the capital structure of energy companies becomes more intense as debt-owners, who have legal claims against the assets of the company, fight to gain the most ownership and thus stand to benefit the most whenever the share price recovers.

**The last great boom for the local bankruptcy industry occurred in the period of the 2008 financial crisis and the recession that followed**

Many of these recapitalization struggles are being fought in the esoteric world of corporate bankruptcy law. The last great boom for the local bankruptcy industry occurred in the period of the 2008 financial crisis and the recession that followed. For energy, the greatest bankruptcy boom was the demise of the industry in the 1980s bust. A recent article about the state of the bankruptcy business, in response to the collapse in oil prices, was in *The Houston Chronicle*. The article included a graphic showing the number of Chapter 11 (the section of the bankruptcy law that provides for restructuring of financially distressed companies rather than liquidations of companies that is conducted under Chapter 8 of the code) filed in the Southern District and the State of Texas. In 2015, the number of bankruptcies filed in the Southern District approached close to those filed in 2008, the start of the financial crisis. The article cited a survey of 18 bankruptcy legal experts by *The Texas Lawbook* calling for a doubling of filings this year.

**Exhibit 7. 2015 Bankruptcies Near Financial Crisis Level**



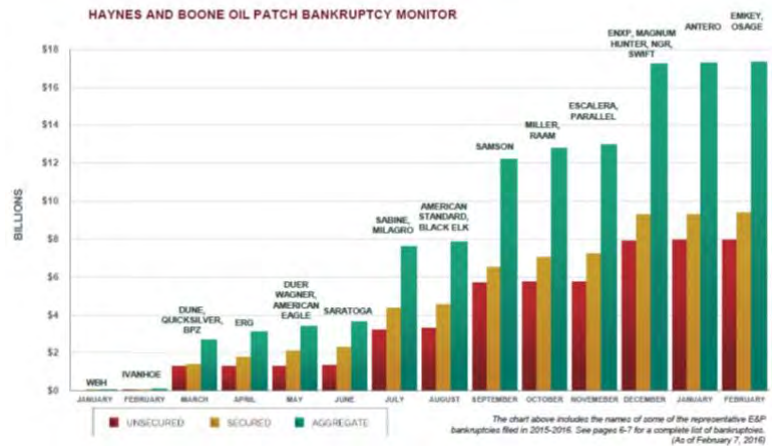
Source: *The Houston Chronicle*

**The total of secured and unsecured debt involved in these bankruptcy filings totals \$25.1 billion**

The fallout from the low oil prices and the hefty cash outlays producers have been making to play the shale revolution and/or to continue to generate cash flows is showing up in the growing number of exploration and production companies filing for bankruptcy. The Houston energy practice of the law firm Haynes & Boone is tracking those filings for both E&P and oilfield service companies in the United States and Canada. As of the listings on their web site, as of early February, 48 E&P companies and 44 oilfield service companies have filed since the start of 2015. The total of secured and unsecured debt involved in these bankruptcy filings totals \$25.1 billion, split \$17.3 billion for E&P companies and \$7.8 billion for oilfield service companies.

**Exhibit 8. 2015-12016 E&P Bankruptcy Debt Level**

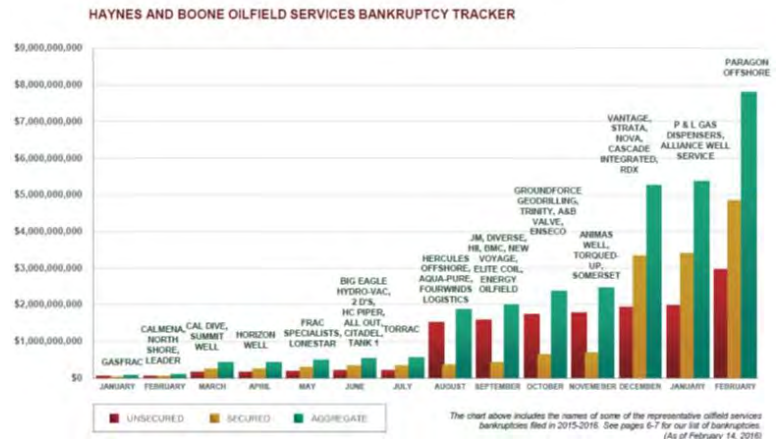
2015-2016 CUMULATIVE E&P UNSECURED DEBT, SECURED DEBT AND AGGREGATE DEBT



Source: Haynes & Boone LLP

**Exhibit 9. 2015-2016 OFS Bankruptcy Debt Level**

2015-2016 CUMULATIVE NORTH AMERICAN OILFIELD SERVICES UNSECURED DEBT, SECURED DEBT, AND AGGREGATE DEBT



Source: Haynes & Boone LLP

**Most times the companies that enter bankruptcy are not the same companies that exit**

The struggles for companies in bankruptcy proceedings can be monumental. Most times the companies that enter bankruptcy are not the same companies that exit. They are often forced to sell assets and possibly the entire company, besides dramatically altering the ownership of the company. Even strategies called “pre-packaged” bankruptcies, where supposedly all the creditors agree as to how to reorganize the company, can become contentious when a small number of debtholders challenge the plan. We have seen this situation develop following the recent filing for Paragon Offshore Plc.

**There are only three offshore drillers among the 44 companies, and they represent over 83% of the total debt involved**

Another interesting trend about the oilfield service bankruptcy universe is that there are three offshore drillers among the 44 companies, but they represent over 83% of the total debt involved. That speaks to the very capital intensive nature of offshore drilling, and the difficulty in reorganizing the companies other than restructuring the ownership. Another development that points to the continued difficulties energy companies are dealing with is the announcement by Hercules Offshore, Inc. (HERO-Nasdaq) shortly after exiting bankruptcy protection that it has created a special committee comprised of all its independent directors to consider strategic alternatives including selling, merging or restructuring the company.

**The environment engulfing the energy industry will force it to change**

The environment engulfing the energy industry will force it to change. How that change is undertaken is impossible to know but we are seeing various routes – limiting operations, downsizing, stopping cash returns to shareholders, diluting existing shareholders by issuing new equity, selling assets, merging and/or reorganizing either within or outside of bankruptcy protection. We will watch with great interest how this restructuring occurs as the future of the industry will be shaped by the various routes taken.

## **Are Oil Companies Vulnerable To Electric Vehicles?**

**Liquids fuels (primarily oil) powered electricity generating plants providing 4.5% of the world’s electricity in 2010**

The climate change movement is fighting the fossil fuel industry primarily over what the proper mix of fuels should be to power our electric generating plants. The rationale for that battle is twofold. First, in the United States and most other developed economies, few power plants are fired by petroleum. According to data and a forecast prepared in 2013 by the Energy Information Administration (EIA), liquids fuels (primarily oil) powered electricity generating plants providing 4.5% of the world’s electricity in 2010. According to the EIA’s forecast, the percentage of power generated from liquids fuels will steadily decline from 2010 to where it will only account for 1.7% of total electricity generated despite overall electricity use having grown by 92.8%.

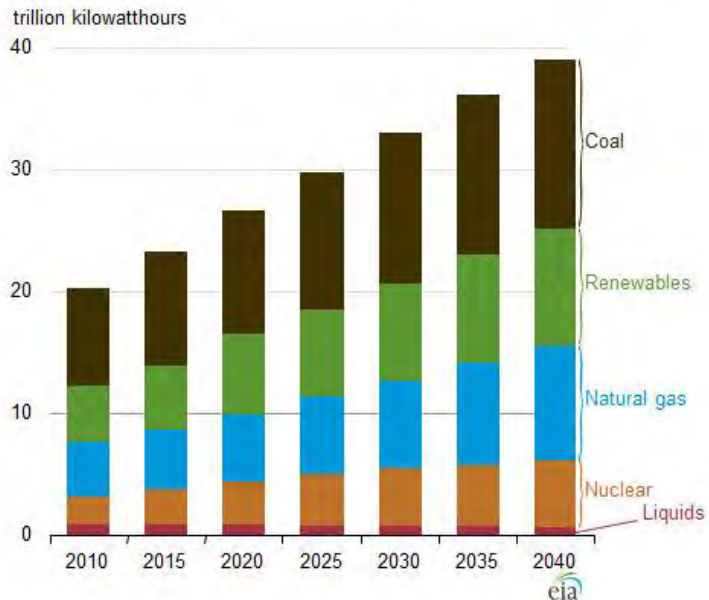
While an electricity generation forecast made in 2013 might not fully reflect the impact of the growing power of the climate change movement to influence governments to limit the use of “dirty” fuels,

**It is interesting that coal will still account for more than a third of all electricity generated**

we were surprised to see that coal's share of world electricity generation grows absolutely by 72%, although its share of total electricity generated does decline between 2010 and 2040 by 4.2 percentage points to 35.6%. It is interesting that coal will still account for more than a third of all electricity generated. In the forecast, which has to reflect the climate change movement to some degree, renewables, natural gas and nuclear all grow as a share of total electricity generated with renewables moving from third place into second, displacing natural gas. Nuclear power remains in fourth place throughout the forecast period.

**Exhibit 10. Fossil Fuels Are And Remain Key**

**Figure 83. World net electricity generation by fuel, 2010-2040**



Source: EIA

**The question is whether all aspects of the economy can be powered by electricity**

With oil supplying only a small share of the electricity generating market, its real market is, and will remain, the transportation sector. What we know is that the climate change movement would like to rewire the world using only renewables because they are carbon free. To make that happen in the transportation sector means promoting electric vehicles. We were intrigued to read an analysis comparing electric vehicles to internal combustion engines in an attempt to answer the question of whether electric vehicles threaten the end for the oil business. (The analysis was published in a report posted on *Seeking Alpha*, an investment web site.) We'll run through the data (some of which we have updated) and the mathematics utilized in the analysis, but first it should be pointed out that electrification of the economy is the key to a carbonless view of the future economy. The question is whether all aspects of the economy can be powered by electricity that is anticipated to be

generated from clean, renewable fuels. The answer requires addressing technical challenges, as highlighted in this analysis, and the cost, both in terms of dollars and cents and changes to lifestyles.

The analysis attempted to determine the electricity needed to power an electric vehicle – in this case the author used the Tesla (TSLA-NASDAQ) model S 70 – compared to the potential loss in gasoline volumes that would come from such a switch. While the S 70 is an expensive car with a base price of \$76,000 before federal and state tax credits and excluding the \$1,200 destination charge, the author’s selection was keyed to the probability that its cost will decline in the future. Depending upon which available options an S 70 buyer selects, the purchase price could be much higher than the base price quoted.

**The EPA fuel efficiency rating says the vehicle is rated for city/highway economy at 101/102 miles per gallon equivalent**

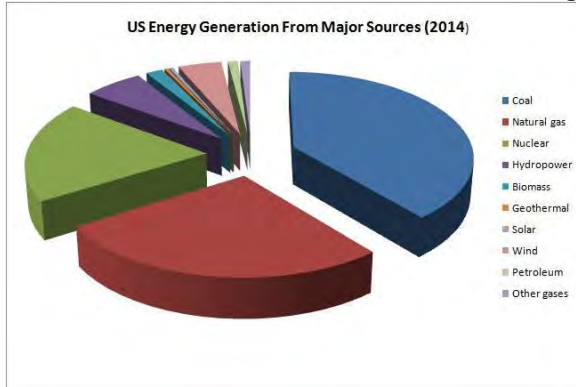
According to the specifications for the Tesla Model S 70, it comes with an AC electric motor with a 70 kilowatt hour (kWh) battery pack that generates 329 horsepower. The EPA fuel efficiency rating says the vehicle is rated for city/highway economy at 101/102 miles per gallon equivalent (mpge), meaning that the vehicle has a range estimated at 240 miles on a full battery charge. That mileage estimate depends a lot on the landscape and the weather as cold and hot weather impact the performance of batteries, reducing the life of their charge and thus the distance the vehicle can travel.

**Based on the battery capacity, the 70 kWh engine will achieve 3.43 miles per kWh**

Based on the battery capacity, the 70 kWh engine will achieve 3.43 miles per kWh. The challenge now becomes determining how much electricity is needed to power the S 70 and what supplies the fuel to generate that electricity.

The U.S. electricity system has a multitude of fuel supplies as shown in Exhibit 11. Coal generates 39% of the total electricity produced, while natural gas contributes 27%, nuclear power 19% and petroleum only 1%. Renewables make up the balance of electricity generation with hydropower representing 6%, wind 4.4%, biomass 1.7%, geothermal 0.4%, solar 0.4%, and other gases less than 1%.

**Exhibit 11. The Menu of Fuel Sources Is Large**



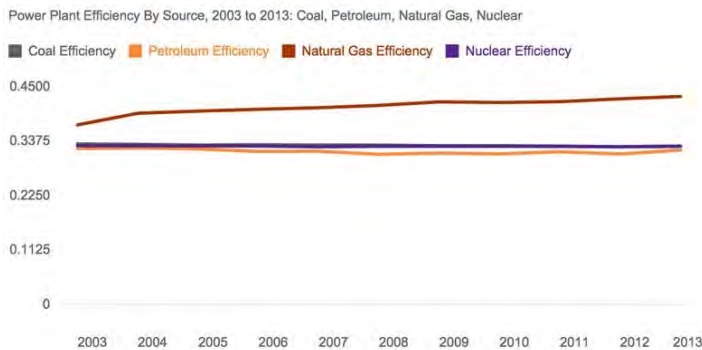
Source: EIA



**To calculate the efficiency of a generator or power plant as a percentage, we have to divide the equivalent British thermal unit (Btu) content of a kWh of electricity (3,412 Btu) by the heat rate of the energy source producing that electricity**

To determine the amount of electricity needed to charge the S 70 battery pack, we need to understand the amount of electricity lost during its generation, transmission and distribution in order to see how much power we need to start with. To calculate the efficiency of a generator or power plant as a percentage, we have to divide the equivalent British thermal unit (Btu) content of a kWh of electricity (3,412 Btu) by the heat rate of the energy source producing that electricity. Electricity generators are powered by different fuels. Each fuel has a different heat rate. Based on survey data of both utility and independent power producers by the EIA, we can see the average heat rate for each fuel – coal, petroleum, natural gas and nuclear. For 2014, the heat ratings for each fuel were as follows: Coal – 10,428 Btu/kWh; Petroleum – 10,814 Btu/kWh; Natural Gas – 7,907 Btu/kWh; and Nuclear – 10,459 Btu/kWh. If we average these four fuel heat ratings based on the 2014 data, we get 10,134 Btu/kWh.

**Exhibit 12. Fuel Burn Rates Are Largely Similar**



Jordan Wirfs-Brock | Inside Energy  
Source: EIA

Data: Energy Information Administration

To calculate efficiency, we divide the heat content of a kWh or electricity by the average heat rating of the fuels, which yields a 33.7% efficiency rating for a generator or power plant.

$$\text{Efficiency} = [(3,412/10,134)] * 100 = 33.7\%$$

The significance of this calculation is that essentially two-thirds of the energy in the raw fuel materials is lost due to heat.

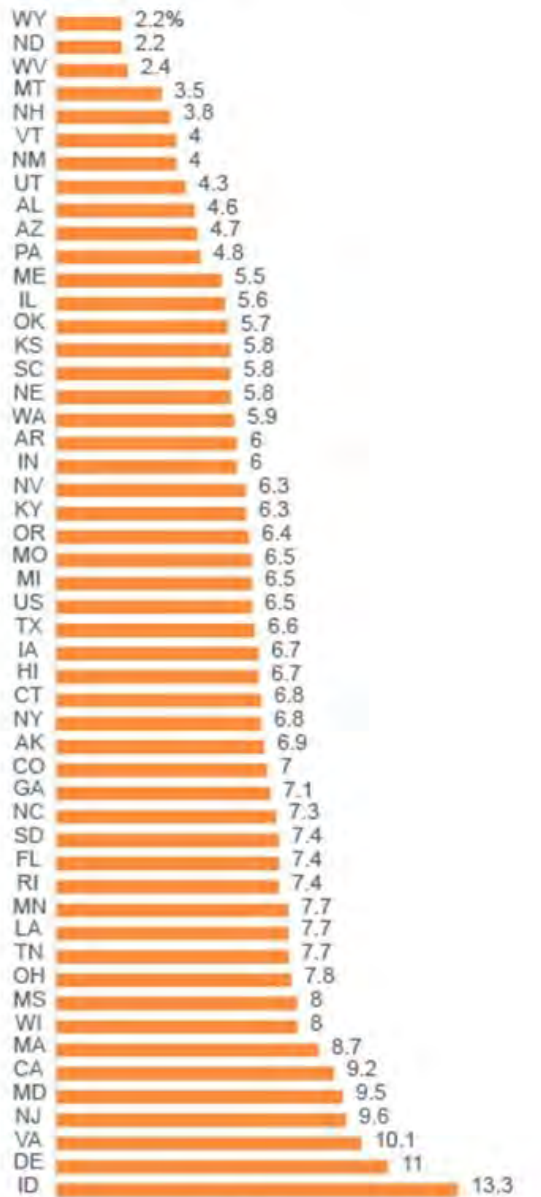
The next step is to estimate the amount of energy lost as the generated electricity travels to a home or business where it is used, i.e., the loss during transmission and distribution. The path that electricity travels is from the generating plant through high voltage transmission lines to a substation where it is stepped down in voltage for distribution, and then into distribution lines and into a home or business. The EIA estimates that approximately 6% of all electricity is lost – 2% for transmission and 4% for distribution – moving from the generator to the residential or business meter.

**The EIA estimates that approximately 6% of all electricity is lost – 2% for transmission and 4% for distribution – moving from the generator to the residential or business meter**

Based on the average electricity loss for 1990 to 2013 in transmission and distribution, the U.S. loses 6.5% (Exhibit 13).

**Exhibit 13. Power Losses In Transmission**

Average Electricity Losses By State, 1990 to 2013



Percent Electricity Lost in Transmission and Distribution

Data Source: Energy Information Administration, compiled by Inside Energy

Source: EIA

**You will need more than 70 kWh of electricity to charge the 70 kWh battery pack**

Now that the electricity has reached your home, you must then charge the battery pack of the S 70. Unfortunately, you will need more than 70 kWh of electricity to charge the 70 kWh battery pack. Tesla claims that its peak charging efficiency is 92%. Peak charging is probably too optimistic, but to be generous we will use a 90% efficiency ratio.

**Its real efficiency rating drops to 0.972 miles/kWh**

To estimate the amount of real energy cost for an electric vehicle such as the S 70, accounting for the lost power along the way, we have the following formula: The power needed (70) divided by Generation efficiency (33.7%) divided by Transmission/Distribution efficiency (93.5%) divided by Charging efficiency (90%). That gives us 246.8 kWh.  $[(70/0.337)/(0.935)]/(0.90) = 246.8 \text{ kWh}$ .

Since it takes so much additional electricity to charge the S 70, its real efficiency rating drops to 0.972 miles/kWh compared to Tesla's calculation of 3.43 miles/kWh.

**we can say that the Tesla S 70 requires the equivalent of 7.32 gallons of gasoline**

According to the EPA, one gallon of gasoline has an energy equivalent of 33.7 kWh. If the S 70 goes 240 miles on a single charge and that charge requires 246.8 kWh of electricity, then we can say that the Tesla S 70 requires the equivalent of 7.32 gallons of gasoline.  $[(246.8/33.7) = 7.32]$  That means the fuel efficiency of the S 70 should be approximately 32.8 miles per gallon.  $[240/7.32) = 32.8]$

**The fuel efficiency of the Tesla S 70 at 32.8 mpge is about a third of what the company claims**

The fuel efficiency of the Tesla S 70 at 32.8 mpge is about a third of what the company claims (101/102 mpge) and only 58.6% of the fuel efficiency rating for a 2016 Toyota (TM-NYSE) Prius (combined fuel rating 56 mpg).

**The transmission lines associated with renewables tend to be longer than those of fossil fuel-fired power plants that can be located much closer to consumption centers**

We don't claim that these numbers are absolutely correct, but they point out several issues. First, there is a lot of potential power lost during the generation of electricity. Secondly, there is a meaningful loss of electricity in its transmission and distribution. These issues represent challenges for both fossil fuels and renewables in the effort to improve our energy efficiency. Unless we have a totally distributed electricity generation system – roof-top solar or backyard wind turbines – the placement of solar and wind farms and the consumption of their electricity means power losses in transmission. The transmission lines associated with renewables tend to be longer than those of fossil fuel-fired power plants that can be located much closer to consumption centers. In essence, you have to go to the power source to generate electricity by wind or solar efficiently and then move it to the consumers, while with fossil fuels you move the fuel to a plant located close to where the electricity is consumed.

The basis of this analysis, which we have modeled with updated information, was to answer the question of whether electric vehicles are the death-knell for oil companies. The conclusion is no, or maybe more appropriately, not yet. Why do we conclude that?

### **Only 40% of President Barack Obama's goal of one million electric vehicles on the road**

As of 2013, according to *Polk's Automotive*, there were 255.8 million vehicles registered in the U.S. We know that new light vehicle sales have average approximately 17 million units a year, but the estimated average age of vehicles hasn't changed in the past three years, suggesting that vehicle scrapping has matched new vehicle sales meaning the fleet hasn't grown.

As of 2015, there were 410,000 plug-in electric vehicles registered in the U.S., or only 40% of President Barack Obama's goal of one million electric vehicles on the road. Low gasoline prices are hurting the sales of electric vehicles and keeping gasoline demand high – approximately 8.9 million barrels per day.

The government is working to boost electric vehicle sales and is counting on the automobile fuel-efficiency standards forcing car manufacturers to sell them as a way to enable the sale of less fuel-efficient SUVs and pickup trucks. The most interesting development in this strategy is the suggestion that VW build and sell electric vehicles to make up for their diesel car emissions cover-up. We believe the Department of Justice is considering this remedy.

### **Given how long it will before electric vehicles truly impact the domestic vehicle fleet, we don't think the oil industry has much to worry about**

As for the electric vehicle market, without higher gasoline prices, growing the fleet of electric vehicles will require government mandates and other incentives. Given how long it will before electric vehicles truly impact the domestic vehicle fleet, we don't think the oil industry has much to worry about. The transition to a carbonless world will require decades to occur. If, however, we can make significant progress in minimizing the power losses throughout the entire generation, transmission and distribution process, we could reduce our total energy needs and improve our efficiency in their use, while further helping to improve our environment, economy and society. Electric vehicles will play a role in this new world ultimately reducing the oil industry's importance.

## **Look Out Cows! Here Come The Regulators**

### **A technology - anaerobic digesters – is used to turn manure into electricity, which farmers contract to sell to local utilities as a source of income to pay for these expensive systems**

Low energy prices and higher than anticipated maintenance costs are undercutting the market for turning cow manure into electricity and reduce the amount of methane released into the atmosphere. A technology - anaerobic digesters – is used to turn manure into electricity, which farmers contract to sell to local utilities as a source of income to pay for these expensive systems, which can cost millions. Digesters are oxygen-free tanks in which microorganisms break down cow waste and capture methane that would otherwise be released into the atmosphere. The biogas captured in the process, which is primarily methane, can be either burned to generate electricity on the farm or cleaned, compressed and transported to natural gas pipelines for sale to utilities.

There are about 260 digester projects active or under construction on U.S. farms as of May 2015, according to the Environmental

**Only six new projects became operational or were under construction in 2014, down from an average of about 30 a year from 2008 to 2013, due to low natural gas prices**

Protection Agency (EPA). Only six new projects became operational or were under construction in 2014, down from an average of about 30 a year from 2008 to 2013, due to low natural gas prices. The challenge for digesters has been both the decline in natural gas prices and the reduced cost of alternative clean power sources such as wind and solar. The farmers who have installed these digesters are finding that not only are they being squeezed by reduced prices utilities are willing to pay for their gas output, but also that these plants require greater maintenance than anticipated.

**The lack of interest in digesters may foil one aspect of the Obama administration's plan to reduce methane emissions**

In Germany, there are 8,000 digesters operating as the government guarantees that renewable energy producers receive above-market rates for their power for years. Other countries such as Denmark, France and China are encouraging the use of digesters, so the industry is now primarily an international business.

**36% of methane emissions come from natural sources such as wetlands, termites and oceans, meaning there is little we can do to control them**

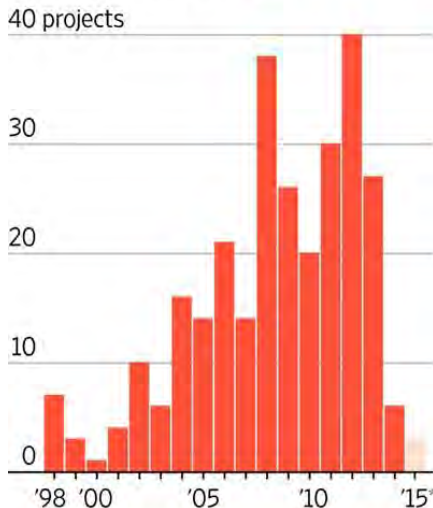
The lack of interest in digesters may foil one aspect of the Obama administration's plan to reduce methane emissions in this country. The Agriculture and Energy Departments along with the EPA have developed a plan to have 500 new digesters installed and working by 2025. These new digesters could power up to one million homes in 2025, up from 70,000 homes in 2014. A typical 1,000 cow farm will produce enough manure to fuel electricity generation for about 250 homes. Since the EPA has targeted methane reduction as a prime environmental effort to meet the Paris climate change commitment of the United States, cows should begin to worry about what the regulators will do next to limit their environmental footprint.

The energy industry was recently targeted to reduce its methane emissions. According to the EPA fact sheet in 2014 when it initially proposed the methane capture rules, the agency is targeting reducing methane emissions by 400,000 short tons, or the equivalent of 8 million tons of carbon dioxide emissions. Based on a 2006 research paper, the U.S. emitted 531 million tons of methane, of which fossil fuels represented 21%. Importantly, 36% of methane emissions come from natural sources such as wetlands, termites and oceans, meaning there is little we can do to control them. Another 10% comes from landfills, while a combined 11% comes from biofuels and biomass. Livestock, including cows, accounted for 17% of methane emissions, suggesting that they will become a regulatory target, otherwise, how can one explain the targeting of the oil industry to capture such a small amount of methane emissions?

**Exhibit 14. Manure Power Hurt by Low Gas Prices**

**Down on the Farm**

Number of new anaerobic digester projects on U.S. farms



\*Through May  
 Source: Environmental Protection Agency  
 THE WALL STREET JOURNAL.  
 Source: *The Wall Street Journal*

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