
MUSINGS FROM THE OIL PATCH

April 5, 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

Climate Change Reality Will Force Debate Reassessment

Those people without electricity should have access, but at the same time the planet requires a significant reduction in fossil fuel usage in order to meet the agreed to warming goal

The issue of climate change has yet to become a major issue in the current run up to the presidential election campaign, but that will likely change once the respective political party nominees are selected. In the meantime, it is fascinating to watch the battle lines being drawn over the climate change issue and the potential hypocrisy that is being created. A new study to be published in *Energy Policy* concludes that with the current world population's growth rate and the fact that 20% of the population doesn't have access to electricity, a conflict has arisen that may derail the impact of the Paris climate change agreement. Those people without electricity should have access, but at the same time the planet requires a significant reduction in fossil fuel usage in order to meet the agreed to warming goal. Therefore, renewable energy must provide 50+% of the world's total energy by 2028 in order to maintain the <2° C warming goal. In an unconstrained energy scenario, meaning that all forms of energy are used, the renewable goal should be met by 2054. Today, renewables account for only 9% of the world's energy supply. The authors of the study conclude that in neither scenario will the magnitude of renewables needed be achieved in the time frames suggested. Therefore, the authors believe the Paris climate change agreement will fail. They also believe a more realistic objective would be to push to expand the use of renewable energy as quickly as possible in order to limit global warming to 2.5-3° C. Certainly not an acceptable outcome for environmentalists but possibly a more realistic objective.

While the debate over climate change rages on, we were intrigued to read of a new study to be published in the journal [Perspectives on Psychological Science](#) suggesting that the modern theory of "ego depletion" could be completely false. The study reports that after a "massive effort" to recreate "the main effect underlying" the theory

The problem is that the foundation upon which the study was based could be flawed

that humans have a limited amount of willpower, involving 2,000 subjects in 24 different laboratories on several continents, the scientists found nothing. The ego depletion theory, which was initially based on a study of human self-control involving fresh-baked cookies and radishes, has been cited more than 3,000 times in scientific literature and reportedly borne out in empirical studies. The problem is that the foundation upon which the study was based could be flawed.

A “paradigm” becomes accepted in the scientific community based on early research

So what do cookies and radishes have to do with climate change? Cookies create CO₂ and radishes don't? No. It has to do with the evolution of science as explained in 1962 by Thomas Kuhn in his book The Structure of Scientific Revolutions. A “paradigm” becomes accepted in the scientific community based on early research. The paradigm is supposedly confirmed by subsequent studies, but later it can collapse as new studies increasingly find results that don't fit the paradigm.

Could climate change research be following a similar pattern?

This psychology study comes at the same time the validity of scientific research is coming under attack. As pointed out by an article published in *Quartz*, a digitally native news outlet for business people, “at least 51% - and as much as 89% - of published papers are based on studies and experiments showing results that cannot be reproduced.” The *Quartz* article says that one reason for these results is the bias among scientific journals desiring to publish “exciting studies that show strong results.” Other studies that fail to come up with similarly significant outcomes are ignored, let alone those that arrive at contrary conclusions. Could climate change research be following a similar pattern? And might that explain the escalation in the attacks of scientists who have questioned the foundation and the conclusions of climate change research?

The facts remain that the use of coal in U.S. power plants is in a declining trend

Just as environmentalists are cheering their victory over coal, President Barack Obama's Clean Power Plan was put on hold due to a successful appeal to the Supreme Court by the 17 states challenging the plan's validity. However, the facts remain that the use of coal in U.S. power plants is in a declining trend. The Energy Information Administration (EIA) recently projected that natural gas-fired power will surpass coal-fired power in generating electricity this year for the first time ever. The decline in coal-fired electricity generation is due to the increased regulatory burden and its impact on the economics of older power plants. Low natural gas prices are also hurting coal's market share.

The attack is highly political, but clothed in the mantle of science

The increase in natural gas as an electricity-generating fuel is now under attack by the environmental movement over the methane leaks associated with the drilling and production of the fuel. The attack is highly political, but clothed in the mantle of science. It is being led by professor, author and founder of environmental movement 350.org Bill McKibben and is targeting the legacy of President Obama and cementing an environmental commitment

He acknowledges that in the past the environmental movement favored such a switch

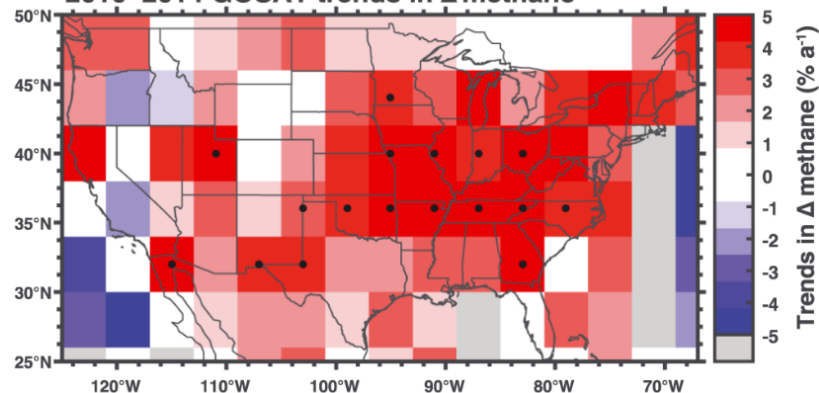
“[I]t’s even possible that America’s contribution to global warming increased during the Obama years”

from leading Democratic presidential candidate Hillary Clinton. Mr. McKibben recently authored an article in *The Nation* where he excoriates the belief that by shifting away from coal in favor of natural gas we are improving our climate. He acknowledges that in the past the environmental movement favored such a switch, but that was because they didn’t understand the dirty secret of the methane contained in the gas and how much of it was leaking into our atmosphere from poor energy industry practices. Methane, or CH₄, is a more damaging atmospheric heat trapping element than carbon dioxide, although its impact is measured in years rather than decades as in the case of CO₂.

To strengthen his argument, Mr. McKibben relies on a recent article in *Geophysical Research Letters* written by Harvard researchers. He writes, “Using satellite data and ground observations, they concluded that the nation as a whole is leaking methane in massive quantities. Between 2002 and 2014, the data showed that US methane emissions increased by more than 30 percent, accounting for 30 to 60 percent of an enormous spike in methane in the entire planet’s atmosphere.” The result is that methane is of much greater concern if we are to avoid a global warming catastrophe, even after we have done such an admirable job in reducing our carbon emissions. The problem is, according to Mr. McKibben, that “it’s even possible that America’s contribution to global warming increased during the Obama years” - text he put in italics in *The Nation* article. If that is the case, then everything the government has done to date in response to the fear of the damage from climate change has been for naught.

The article cherry-picks some of the data, but importantly, it does not attribute the increase in methane it found solely to the oil and gas business. It is interesting that the chart in Exhibit 1 showing the change in methane concentrations across the United States shows some of the smallest increases are over the northern and southern Texas regions, locations of the greatest output of natural gas in the

Exhibit 1. Where U.S. Methane Measures Are High
2010–2014 GOSAT trends in Δ methane



Source: *Geophysical Research Letters*

They also happen to be areas with substantial agricultural and livestock activity – both significant sources of methane

state. They also happen to be areas with substantial agricultural and livestock activity – both significant sources of methane. The trends in changes in methane concentrations are calculated by comparing air column measurements against those obtained from over the North Pacific Ocean, an area perceived to have low concentrations of methane.

Natural gas, and the technology that has unleashed the explosion in production that is undercutting gas prices, is now a target of the environmentalists

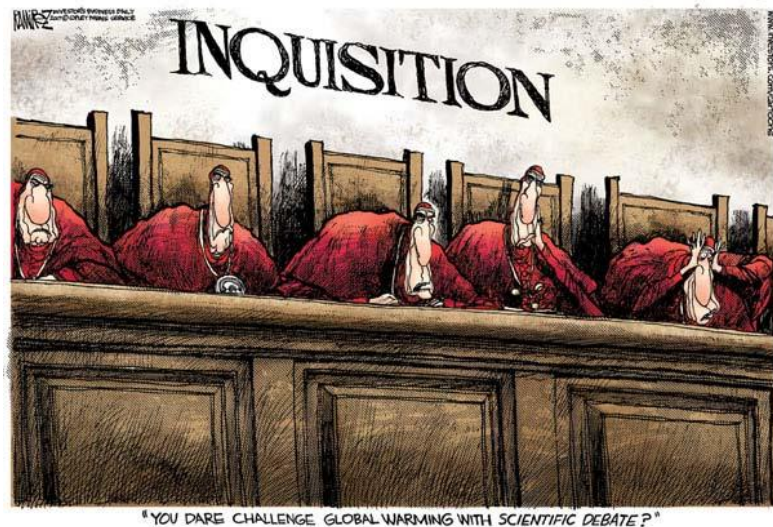
Mr. McKibben applauds the efforts of the Obama administration to limit carbon emissions, which is leading to the shutting down of coal-fired power plants, their work in securing the Paris global climate change agreement, the push to have the Environmental Protection Agency (EPA) rewrite methane emission rules, the attack on the oil and gas industry's regulation of methane emissions and now the agreement with Canada to attack methane emissions in North America. But, in his view, none of these actions gets to the core problem, which is the rapid spread of hydraulic fracturing. Natural gas, and the technology that has unleashed the explosion in production that is undercutting gas prices, is now a target of the environmentalists. They are fighting the impact low natural gas prices are having on the economics of power generated by renewable fuels that, even after significant cost reductions, still remain more expensive than power from coal and natural gas. Mr. McKibben's article is designed to put pressure on President Obama to do more to restrict the use of fossil fuels – especially natural gas now - as he builds his legacy before leaving office in January 2017. At the same time, Mr. McKibben is pressuring Hillary Clinton by citing fracking as our "core" environmental problem.

These environmentalists have even begun questioning Mrs. Clinton's fund-raising from energy companies

It is important to note that 350.org has had members attend Secretary Clinton's campaign rallies all over the nation. They have filmed one-on-one encounters with Mrs. Clinton where they have asked her about her position on fracking. You can expect to see these interviews in campaign ads during the presidential campaign, and as ammunition against her should she waver from her commitment to fight fracturing. That commitment was made clear in a recent CNN-sponsored Democratic debate when, after listing a set of requirements to which she would subject the oil and gas industry, she concluded by stating, "By the time we get through all of my conditions, I do not think there will be many places in America where fracking will continue to take place." These environmentalists have even begun questioning Mrs. Clinton's fund-raising from energy companies. A recent encounter resulted in a violent reaction by Mrs. Clinton that has engendered significant negative press.

The debate over climate change and the science underlying it has escalated in recent months. It is being fought over the recent study by scientists from the National Oceanic and Atmospheric Administration (NOAA) that claimed 2015 was the hottest year on record. The conclusion comes from the study of surface data measurements that are at odds with atmospheric temperature recordings. In order to reach its conclusion, NOAA scientists made

Exhibit 2. The Modern Day Spanish Inquisition



Source: Ask

AG Lynch admitted that the Department of Justice has discussed the possibility of civil action against climate change deniers and has referred to the FBI a request to determine whether the department could act

adjustments to the previously recorded land temperature data to “correct” for mistakes in the prior measurements. The reluctance of the NOAA scientists to disclose their adjustments and to make available their deliberations in reaching their conclusion has resulted in doubters of the claim questioning the study’s scientific integrity.

This latest Washington, D.C. battle has elevated the war between proponents and doubters of climate change to new levels as demonstrated in recent hearings on Capitol Hill involving Attorney General Loretta Lynch. At her hearing before the Senate Judiciary Committee, in response to questioning from anti-fossil fuel Senator Sheldon Whitehouse (RI-Dem), AG Lynch admitted that the Department of Justice has discussed the possibility of civil action against climate change deniers and has referred to the FBI a request to determine whether the department could act. The referral to the FBI raised eyebrows because that agency does not become involved in civil matters. However, Sen. Whitehouse has repeatedly urged the use of the Racketeer Influenced and Corrupt Organizations Act (RICO) against companies and individuals who are engaged in what he terms a “climate denial scheme” that he compared to the “mischief” of the tobacco industry in trying to deceive consumers about the health threats posed by smoking. His leading target is the oil and gas industry, and in particular Exxon Mobil Corp. (XOM-NYSE) that is already under investigation by activist New York State Attorney General Eric T. Schneiderman over the company’s supposed failure to adequately warn people about the climate abuse they are causing by using its product.

The Securities and Exchange Commission (SEC) recently instructed both ExxonMobil and Chevron Corp. (CVX-NYSE) to include resolutions on their 2016 annual meeting ballots, submitted by

This shareholder resolution campaign is modeled after the South African apartheid resolution movement

shareholders, mandating the companies to prepare reports outlining the damage climate change could cause them. These effort have been underway for a number of years and in each prior effort have been rejected by company managers with their decisions upheld by the SEC. This shareholder resolution campaign is modeled after the South African apartheid resolution movement that began in the 1970s and is credited with having shifted the debate and focus among the business community over time that is attributed with having helped end that official policy.

The Nebraska Peace Foundation, holder of one share of Class A Common Stock, has proposed that “the BH insurance division, within a reasonable period of time, issue a report describing the division’s response to the risks posed by climate change”

Given this escalation of the climate change debate and the involvement of the SEC, we noted with curiosity that there is a similar climate change-related question on the Berkshire Hathaway Inc. (BRK.A-NYSE) 2016 Annual Meeting proxy. The Nebraska Peace Foundation, holder of one share of Class A Common Stock, has proposed that “the BH insurance division, within a reasonable period of time, issue a report describing the division’s response to the risks posed by climate change.” In support of their motion, the Foundation cites the 2013 adoption by the National Association of Insurance Commissioners in the U.S. of “revisions to the Financial Condition Examiners Handbook to support examiners in assessing any potential impact of climate change on solvency of insurance firms.” They also point out that in September 2015, the Prudential Regulation Authority of the Bank of England, who oversees regulation of UK insurance companies, issued a report outlining the risks faced by the insurance industry due to climate change.

We were surprised to see that the Board of Directors of Berkshire Hathaway unanimously favors a vote against the proposal

Warren Buffett, the Oracle of Omaha, is the long-standing chairman and CEO of Berkshire Hathaway, and acknowledged to be one of the most outstanding value investors of all-time. On his board is Bill Gates, a co-founder of Microsoft Inc, (MCFT-Nasdaq) and now the co-chair of the Bill and Melinda Gates Foundation. Both Messrs. Buffett and Gates are leading figures in social issues such as income inequality, climate change and children’s health. As we contemplated our proxy, we were surprised to see that the Board of Directors of Berkshire Hathaway unanimously favors a vote *against* the proposal. The company provided a condensed summary of Mr. Buffett’s thoughts about the issue of climate change in the proxy, but they referred readers to his letter in the company’s annual report for more detail.

It will be interesting so see if he comes under criticism from the climate change movement for his “weasel” stance

Mr. Buffett’s argument about climate change is intellectually interesting, but he hedges on the question when confronted with the facts. It will be interesting so see if he comes under criticism from the climate change movement for his “weasel” stance. Then again, it will be interesting to see whether Mr. Buffett, a successful investor who is optimistic about the long-term future of this nation and the world, is attacked for his reliance on the message being delivered by global markets about the world’s environmental future rather than the climate change doctrine. In the annual report, Mr. Buffett wrote:

He understands that the sponsor of the climate change resolution is concerned that the company's insurance business would be hurt by a deteriorating climate

"It seems highly likely to me that climate change poses a major problem for the planet. I say 'highly likely' rather than 'certain' because I have no scientific aptitude and remember well the dire predictions of most 'experts' about Y2K. It would be foolish, however, for me or anyone to demand 100% proof of huge forthcoming damage to the world if that outcome seemed at all possible and if prompt action had even a small chance of thwarting the danger."

He then went on to discuss how similar the question about climate change is to Pascal's Wager on the Existence of God. You should believe if there is even just a 1% chance of his existence because if you are wrong then you risked eternal misery. He understands that the sponsor of the climate change resolution is concerned that the company's insurance business would be hurt by a deteriorating climate. He then explained how the insurance business, while reacting to long-term trends, is repriced every year so it can adjust to any change in trends that become evident. But Mr. Buffett concludes his argument with the following two paragraphs.

"Up to now, climate change has *not* produced more frequent nor more costly hurricanes nor other weather-related events covered by insurance. As a consequence, U.S. super-cat rates have *fallen* steadily in recent years, which is why we have backed away from that business. If super-cats become costlier and more frequent, the likely – though far from certain – effect on Berkshire's insurance business would be to make it larger and more profitable. [Emphasis in the original.]

"But when you are thinking only as a shareholder of a major insurer, climate change should not be on your list of worries."

"As a citizen, you may understandably find climate change keeping you up nights. As a homeowner in a low-lying area, you may wish to consider moving. But when you are thinking only as a shareholder of a major insurer, climate change should not be on your list of worries."

He has significantly altered the energy industry landscape through overt regulation and strengthening the administrative state

As the pendulum of climate change has likely swung as far to the left as possible, any move back likely will not return it to either its starting point or even to the middle. Mr. Obama's environmental legacy is assured. He has significantly altered the energy industry landscape through overt regulation and strengthening of the administrative state. His policies have changed the global economy – probably committing it to a low-growth profile for the foreseeable future, which will limit the growth of energy demand. Moreover, the "green energy" policies put in place will not easily be overturned, further eroding the long-term demand for fossil fuels. The reality of this changed energy future is only now beginning to permeate the thinking of energy company managers as they contemplate how different their futures will be and what changes are needed for their business models. While the noise of the climate change debate will at times overwhelm people, the reality is that a new course has been set. The sooner company managers determine what will be needed

to be successful in this journey, the more profitable they will become. Buckle up!

BOEM Final Rule Confirms Its Eye For Regulatory Expansion

One thing the final rule did not address was substantive changes to the offshore bonding requirements for lessees and rights-of-way holders

Last week the Department of the Interior's Bureau of Ocean Energy Management (BOEM) published its final rule regarding Leasing of Sulfur or Oil and Gas in the Outer Continental Shelf. The final rule will become effective May 31, 2016. According to the summary of the bill published in the Federal Register on March 30, 2016, the final rule updates, streamlines and clarifies existing Outer Continental Shelf (OCS) leasing rules and requirements. Many of the changes were needed in order to conform to the language of other federal oil regulations that have been enacted in recent years. One thing the final rule did not address was substantive changes to the offshore bonding requirements for lessees and rights-of-way holders, which BOEM said will be done in a separate new proposed rulemaking, the timing of which is unclear. That area of regulation has become a "hot button" within the offshore oil and gas industry as the agency is making substantial bonding demands to insure against significant lessee and rights-of-way holder abandonment costs. The magnitude of these demands may force smaller operators to withdraw from the Gulf of Mexico market, which has the potential to significantly alter the competitive landscape in that market.

In this final rule, the only bonding language changes were editorial

It is reasonable to conclude that by not making any substantive changes to the bonding requirements in this regulation revamp that the agency is contemplating much more substantive changes. In this final rule, the only bonding language changes were editorial and those necessary to bring this rule's language into conformity with other rules and regulations governing oil and gas and sulfur operations.

BOEM has inserted an introductory sentence to the definition of "You" that expands the range of parties covered and that goes well beyond the specific parties previously listed

Possibly the most significant change in the final rule was the agency's redefinition of the term "You" as used in the regulations. As BOEM pointed out in its discussion of the changes made, several definitions were added in the final rulemaking that did not appear in the proposed rulemaking. They later explain that these new definitions were supposedly contained in prior agency regulations or were "apparent from the context of the prior regulatory language." We suspect this explanation relates to their revised definition of "You," which before only contained a list of those specifically covered by the rules. Now, BOEM has inserted an introductory sentence to the definition of "You" that expands the range of parties covered and that goes well beyond the specific parties previously listed. The explanatory sentence reads: "*You* means any party that has, or may have, legal obligations to the Federal government with respect to any operations on the OCS in which it is or may become involved." What exactly does this mean? The final phrase of the sentence would suggest an overly-expansive application of federal

Equally important is the fact that the phrase “legal obligations to the Federal government” is not clearly defined

regulation as it establishes that anyone who may become involved with OCS operations in the future is now already subject to BOEM regulation. Equally important is the fact that the phrase “legal obligations to the Federal government” is not clearly defined, apparently leaving it up to BOEM interpretation of who those parties might be who “has, or may have,” those obligations. Managements of companies engaged in offshore work, or who are even contemplating becoming engaged, should be concerned about the relentless regulatory encroachment into their business. We will be interested to see if the offshore industry reacts to the new rules as legal challenges may be available.

Is The Current Oil And Gas Industry Downturn About To End?

We remember how many times in the past a similar view was expressed about the future of the domestic natural gas market

The latest domestic oil production data for January, recently reported by the Energy Information Administration (EIA), shows output continuing to slide, now down below 9.2 million barrels a day. As the January data shows, since domestic oil production peaked in April 2015, it has declined by 515,000 barrels a day over the nine-month period. The dramatic decline in drilling during the past 12 months, occasioned by the sharp fall of oil prices and the drastic shrinkage of industry cash flows, has encouraged forecasters that a recovery in oil prices is on the horizon as oil supply and demand return to balance. Our concern about that belief, however, is that we remember how many times in the past a similar view was expressed about the future of the domestic natural gas market. Gas production has yet to decline in concert with lower natural gas prices as was expected by the forecasters, especially given the drop in gas-oriented drilling. Natural gas production continues climbing while Henry Hub gas prices languish below \$2 per thousand cubic feet.

When the field was shut in, it was producing between 280,000 and 300,000 barrels per day

As optimism grows for an acceleration in the rate of decline in U.S. crude oil output, news from the international oil arena is countering that sentiment. At nearly the same moment the EIA was reporting the January 2016 domestic oil production data, Kuwait was announcing an agreement with Saudi Aramco to restart crude oil production from the jointly operated Khafji field, which has been closed since October 2014 for environmental reasons. When the field was shut in, it was producing between 280,000 and 300,000 barrels per day. The Kuwaiti official announcing the agreement did not give either a restart date or an initial production target, other than to say that the field’s output would gradually increase after start up.

Re-starting the Khafji field calls into question this assumption

The lack of clarity about the Khafji field’s status concerns oil market forecasters. They have been revising their models based on the assumption that the upcoming April 17th meeting of OPEC producers and Russia in Qatar will lead to a cap on output at the level of January 2016. Re-starting the Khafji field calls into question this assumption. What becomes a challenge for forecasters is to understand whether the Khafji field will be additive to the output of Saudi Arabia and Kuwait, or replace output from other fields. If it is

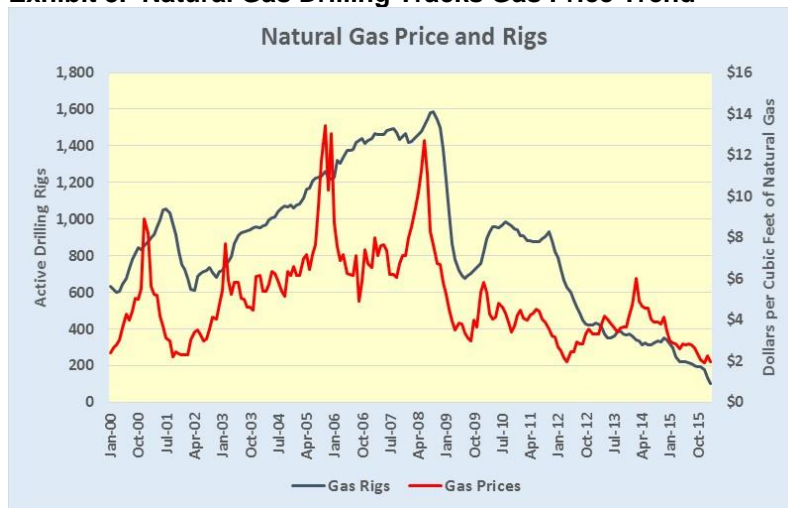
Often overlooked in this process was how higher oil prices would encourage producers to begin completing previously drilled but uncompleted wells

additive, assuming it restarts production at the low end of its final output, the addition negates over half of the recent decline in U.S. production.

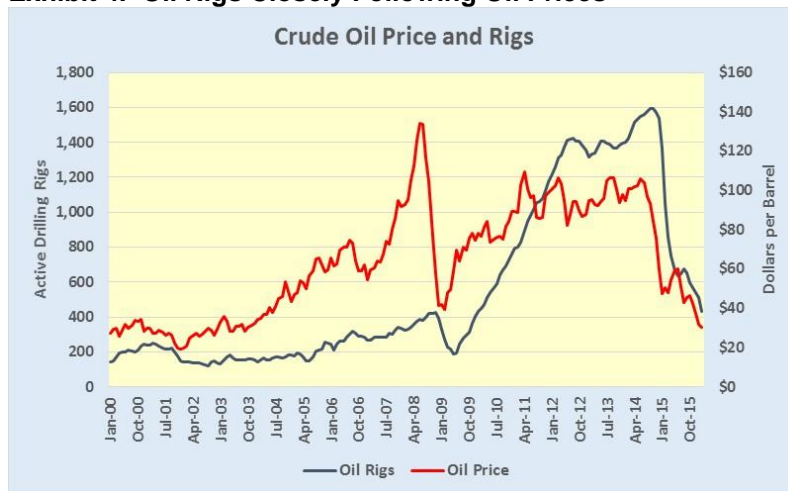
There is another aspect of U.S. production that is troubling given the rapid increase in oil prices during March. While we believe much of that increase was driven by speculators who had bet on oil prices falling and were rapidly covering those short positions as optimism about rising demand and falling output supporting higher oil prices grew. As oil prices rallied on the reports of steps being taken to reign in production growth and optimistic estimates for rising demand took hold, industry focus shifted to the question of at what oil price would producers resume drilling? Often overlooked in this process was how higher oil prices would encourage producers to begin completing previously drilled but uncompleted wells, or DUCs as they are referred to. DUCs will enable oil production to recover without an increase in the drilling rig count. It is this phenomenon that had us wondering whether we could see a repeat of what has happened in the natural gas market – steadily rising production despite fewer rigs drilling.

When we plot the price of natural gas and crude oil to the number of drilling rigs searching for each of these commodities, we find very close relationships. Those relationships are shown in the following exhibits.

Exhibit 3. Natural Gas Drilling Tracks Gas Price Trend



Source: EIA, Baker Hughes, PPHB

Exhibit 4. Oil Rigs Closely Following Oil Prices

Source: EIA, Baker Hughes, PPHB

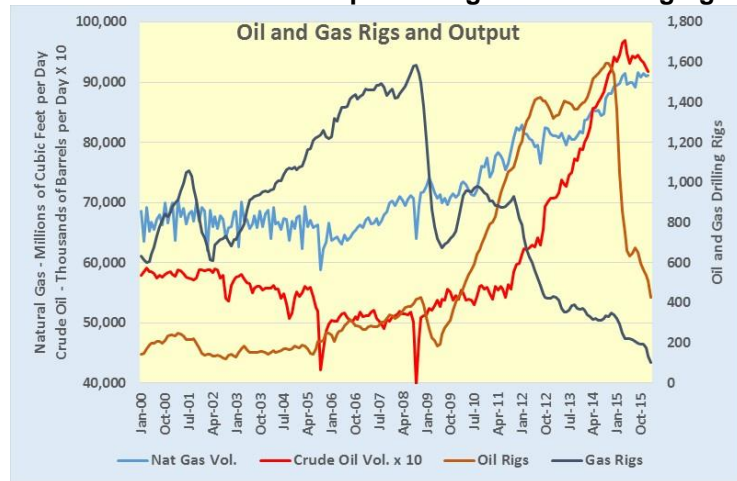
What makes the volume-to-drilling-rigs relationship for natural gas different from that of crude oil?

What is equally interesting is the pattern between natural gas and crude oil production versus the number of active drilling rigs seeking the respective commodities. The chart in Exhibit 5 (next page), while busy, is instructive for its relationship between natural gas output and gas drilling rigs. One goes up relentlessly while the other steadily declines. In contrast, crude oil output, which had risen unchecked is now in decline, but only months later than the drop in drilling rigs began. The decline is now being hastened as a result of how few oil drilling rigs are working. What makes the volume-to-drilling-rigs relationship for natural gas different from that of crude oil? Most likely it is the impact of associated natural gas volumes. In 1993, associated natural gas from crude oil wells accounted for 26% to 28% of gross natural gas produced. The ratio declined steadily until 2013 when it was in the 15% to 18% range, but by the end of 2013 was up sharply to 20%.

With crude oil output now falling and both oil and natural gas drilling off sharply, one has to believe that the associated natural gas component of supply will shrink, possibly finally stopping the climb in natural gas volumes

In the case of natural gas drilling, the fewer rigs working are targeting the most productive areas of the formations. On the other hand, during 2014 and early 2015, oil drilling continued at a high rate adding, we suspect, additional associated natural gas. This probably explains why gas volumes have continued to climb. With crude oil output now falling and both oil and natural gas drilling off sharply, one has to believe that the associated natural gas component of supply will shrink, possibly finally stopping the climb in natural gas volumes. If that happens, look for natural gas prices to begin rising, even with the huge volumes of gas in storage. Should we get a warm summer and economic activity continue to grow, we could see a more positive response by natural gas prices heading into the fall of 2016. That might become the surprise of 2016.

Exhibit 5. Oil And Gas Output To Rigs Ratios Changing

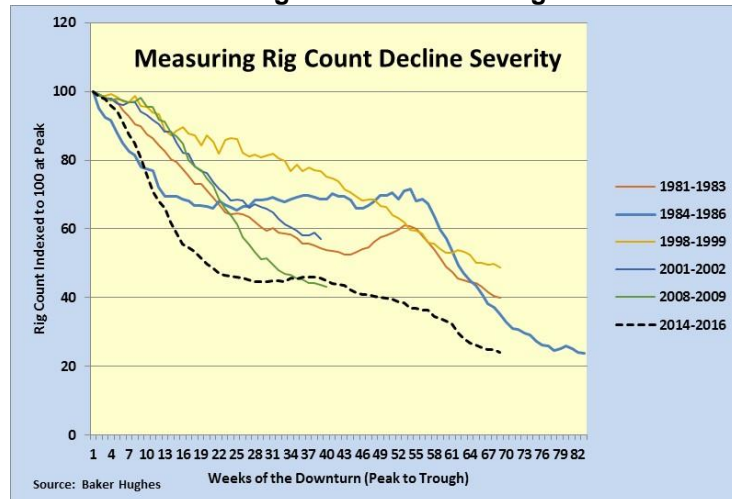


Source: EIA, Baker Hughes, PPHB

While the current decline has reached a comparable decline percentage as when the earlier decline ended, it has been reached much quicker

Given these market dynamics and the decline in crude oil and natural gas prices, it is not surprising that the drilling rig count has fallen sharply in recent months. We are reminded of the magnitude and duration of the current rig count downturn when we look at previous downturns indexed to their highest starting points. For reference, we have emphasized the current rig decline along with the 1984-1986 decline, which this one is closely mirroring. While the current decline has reached a comparable decline percentage as when the earlier decline ended, it has been reached much quicker. When people question whether this downturn is worse than the 1980s, they often forget that the earlier period encompassed two downturns as shown in Exhibit 6. Based on the past two weeks of double-digit rig count declines, it is likely that the current downturn will be worse than 1984-1986.

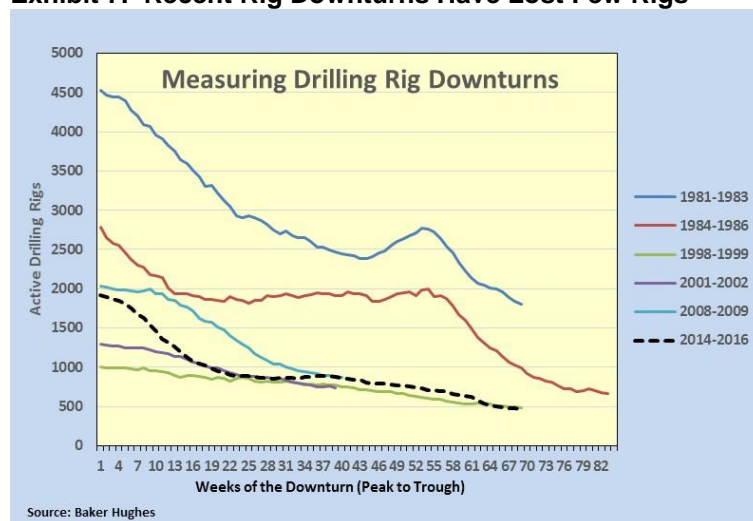
Exhibit 6. Current Rig Downturn Matching 1984-1986 Decline



Source: Baker Hughes, PPHB

Besides indexing the rig downturns, we also plotted the absolute declines just to put them into perspective. Exhibit 7 also highlights how the change in the number of drilling rigs working in each cycle was different – usually fewer rigs in recent cycles. The chart provides an interesting perspective to contemplate in thinking about the next upcycle.

Exhibit 7. Recent Rig Downturns Have Lost Few Rigs



Source: Baker Hughes, PPHB

If, as seems possible, we are approaching the bottom in the current rig downturn, then it becomes imperative that we begin envisioning when the recovery will start, what will drive it and how high the next cycle might climb

People are quick to suggest that the drilling cycle will peak somewhere between 1,000 and 1,200 rigs. Others suggest it might reach a high of 1,600 rigs. If, as seems possible, we are approaching the bottom in the current rig downturn, then it becomes imperative that we begin envisioning when the recovery will start, what will drive it and how high the next cycle might climb. That requires looking not only at supply and demand trends but how technology and efficiency may have altered historical rig-to-production relationships. Those altered historical relationships will need to be assessed and factored into an analysis of changed industry economic and overall energy demand factors. The overarching question to be answered is: What will the energy business look like in five years? That is becoming our new research focus.

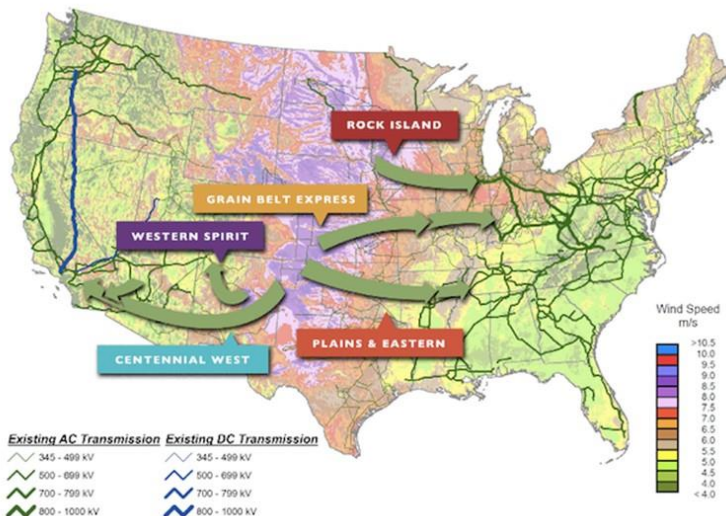
Is Energy Department Chasing Its Next Solyndra Fiasco?

It is designed to move wind-generated electricity from the Oklahoma panhandle through Arkansas to Tennessee

A week ago, the Energy Department elected to exercise its authority under Section 1222 of the Energy Policy Act of 2005 (EPA) to approve and become involved in the construction of the 705-mile transmission line called the Plains and Eastern Clean Line. The line, one of four such projects being developed by Clean Line Energy, is designed to move wind-generated electricity from the Oklahoma panhandle through Arkansas to Tennessee, where it will connect with the utility grid spanning the South and Southeastern states.

This project marks the first time the Energy Department has utilized federal authority over eminent domain granted it under the decade-old law regardless of state-level opposition to the project.

Exhibit 8. Clean Line Energy Power Transmission Projects



Source: Clean Line Energy

The partnership with the Department of Energy (DOE) will help this project, and maybe others Clean Line Energy is planning

The EPAct, which expanded the powers of the Federal Energy Regulatory Commission, was designed to help the utility and gas transmission industries deal with issues in securing rights-of-way for their energy infrastructure projects that had been identified as stumbling blocks for improving the nation’s power grid. The partnership with the Department of Energy (DOE) will help this project and possibly others Clean Line Energy is planning.

The Public Utility Commission (PUC) of Arkansas determined that while the project is desirable, the company does not qualify as a utility for regulatory purposes

Clean Line Energy is a private equity fund backed by investors including the Zilkha family of Houston, funds associated with ZBI Ventures, a wholly-owned subsidiary of Ziff Brothers Investments, the private investment firm of the New York-based Ziff family, National Grid (NGG-NYSE), the UK-based international utility company, and Bluescape Resources, a private, independent energy investment and operating company. The purpose of Clean Line Energy is stated on its web site: “Clean Line develops long-haul transmission lines to connect the best renewable energy resource in North America to communities and cities that lack access to new, low-cost renewable power.” Therein is the problem that arose from the Plains and Eastern Clean Line project – the Public Utility Commission (PUC) of Arkansas determined that while the project is desirable, the company does not qualify as a utility for regulatory purposes. Therefore, the PUC could not grant the company the right of eminent domain for constructing the transmission line through Arkansas. To be a utility in Arkansas you must serve retail customers within the state, which Clean Line Energy will not because the transmission line will merely cross the state. Both

There are many landowners in Arkansas who are planning to fight the power line

The objectors to the Energy Department’s approval are questioning whether this is further overreach by a federal bureaucracy

Job creation and renewable energy were reasons why the Obama Energy Department in 2009 supported a \$535 million loan to the solar panel manufacturer Solyndra

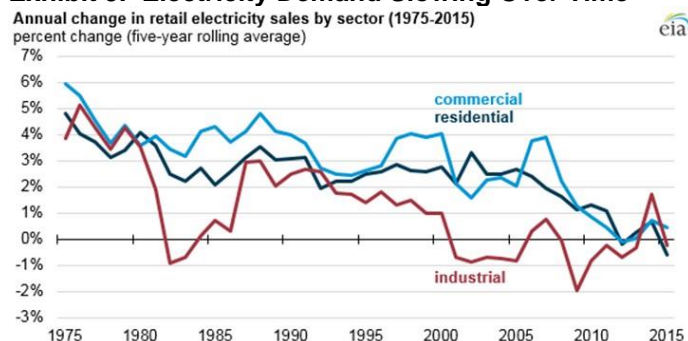
Oklahoma and Tennessee have approved the company’s utility status, thus clearing it to apply for permits for construction and operation of the line.

Energy Secretary Ernest Moniz explained his department’s support for the project in the following statement: “Congress recognized the need for a modern and resilient grid that could accommodate increasing demands for power with newly available resources. Based on our thorough review of the Clean Line project, it satisfies the goals for which Congress established DOE’s authority.” This support doesn’t end the story as there remain objectors in Oklahoma – most notably the Cherokee Nation - and local and federal politicians in Arkansas who are questioning whether every test required in the 2005 law has been met. Lastly, there are many landowners in Arkansas who are planning to fight the power line, and they have been gearing up for the battle since the project was initially announced in 2010.

In some cases, the objectors to the Energy Department’s approval are questioning whether this is further overreach by a federal bureaucracy, and it feeds into the battle over states’ rights versus federalism that has been a part of the polarization of the political populous in recent times. Add the battle among the Republican Party presidential candidates over the use of eminent domain and private economic development projects to the mix and you have a potentially “hot button” political issue.

One factor about the Clean Line Energy project is how the 10,000 jobs to be created by its construction are being hailed as justification for federal support. As Secretary Moniz stated, “Moving remote and plentiful power to areas where electricity is in high demand is essential for building the grid of the future. Building modern transmission that delivers renewable energy to more homes and businesses will create jobs, cut carbon emissions, and enhance the reliability of our grid.” Job creation and renewable energy were reasons why the Obama Energy Department in 2009 supported a \$535 million loan to the solar panel manufacturer Solyndra that

Exhibit 9. Electricity Demand Slowing Over Time



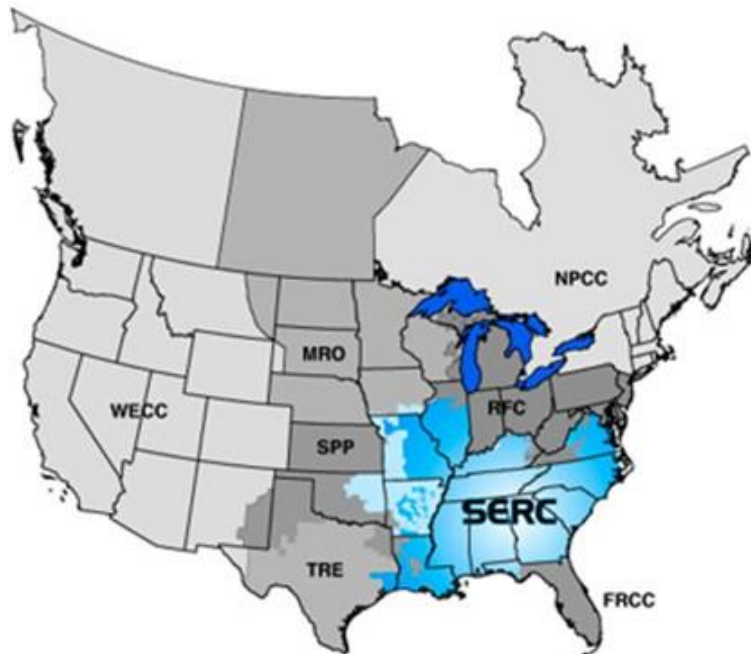
Source: EIA

For 2015, 2017 and 2018, the capacity margin is projected to be 15.4%

eventually went bankrupt costing taxpayers that money. On the other hand, the 20,000 construction jobs that would have been created in building the Keystone XL pipeline were dismissed as “immaterial” because they weren’t permanent.

Our concern is that the Southeast region, based on the latest forecast from the Energy Information Administration (EIA) for electricity supply and demand, may not need the additional power to be delivered by the Plains and Eastern Clean Line. Note the downward trend in electric power demand since the 1970s as shown in Exhibit 9 (prior page). The EIA’s 2015 forecast for summer electricity demand, capacity and capacity margins by regions show that the SERC region, which represents approximately 17% of the nation’s total projected electricity demand for 2014-2018 and maintains between 17% and 17.5% of total national generating capacity, is not at risk of a power shortage during the forecast period. In fact, the summer capacity margin will range from a low of 14.9% in 2016, down from a high of 17.9% in 2014. For 2015, 2017 and 2018, the capacity margin is projected to be 15.4%. It may be important, however, that the new transmission line is not projected to be in service before 2020, assuming construction begins in 2017.

Exhibit 10. SERC Covers Almost A Quarter Of U.S.



Source: SERC Reliability Corp.

Long-term electricity demand and capacity forecasts are notoriously bad

Long-term electricity demand and capacity forecasts are notoriously bad, as are most economic and financial projections. With respect to power, that conclusion is supported by the recent lawsuit brought by Dallas-based Panda Power Funds against the Electric Reliability Council of Texas (ERCOT) for supposedly poor forecasts that

Panda is accusing ERCOT of negligent misrepresentation or “fraud” due to changes it made in its methodology for preparing the CDR report

convinced the funds to build new power generation facilities that appear to be unnecessary now. Panda relied on ERCOT’s Capacity, Demand, Reserves (CDR) report. As the suit states, “[t]he state’s power grid operator, five years ago, offered up ‘seriously flawed or rigged’ data on projected power demand and supply to convince companies to build new power plants, which now struggle to turn a profit....” The charges grow even more interesting as Panda is accusing ERCOT of negligent misrepresentation or “fraud” due to changes it made in its methodology for preparing the CDR report. As a result of these changes, Panda argues, after 2011 and 2012, the future Texas power market went from “tight” to “surplus,” meaning that new plants were not required. Unfortunately, this was after Panda had invested \$2.2 billion and begun construction of three new power plants.

The suit alleges that ERCOT maintained its “tight” market outlook in order to lure more investors into building new plants

A Moody’s Investors’ Service report discussed how ERCOT increased its desired power capacity margin in 2010 and in 2011 after a severe drought and extreme heat wave in the state contributed to a surge in power usage. At that point, ERCOT projected a “tight” reserves picture for the Texas power market as it forecast a continued strong growth in the state’s electricity consumption. Previously mothballed power plants were put back into service and multiple new power plants were proposed, including the Panda plants. ERCOT did not incorporate these new generating sources into its forecasts for the Public Utility Commission until 2013. The suit alleges that ERCOT maintained its “tight” market outlook in order to lure more investors into building new plants. ERCOT acknowledges that it held off making assumption changes until some of the proposed new power plants actually began construction. Since then, the fall in natural gas prices, the growth of low-cost wind power and mild weather have combined to lower wholesale power prices that are projected to remain low for the foreseeable future.

“no investor would invest based on the year-to-year changes in the CDR, since they are not guaranteed”

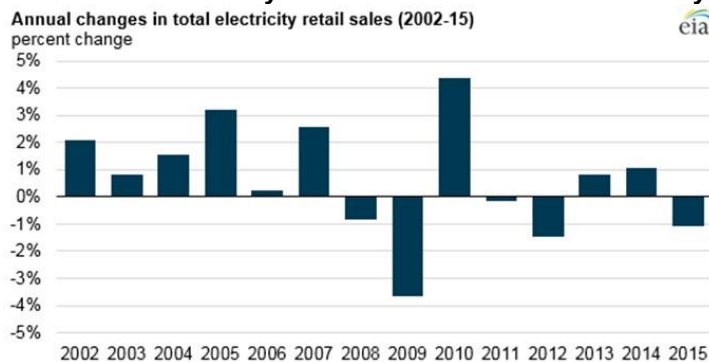
As reporter Paul Ring of *Retail EnergyX* reported in his story about the lawsuit, “This [Panada’s reliance on the CDR report] stands in stark contrast to nearly every other generator in the ERCOT market who have assured the Public Utility Commission – in opposing continuation of an energy-only market – that no investor would invest based on the year-to-year changes in the CDR, since they are not guaranteed.”

ERCOT issued the following statement about the lawsuit. “The lawsuit is based on a misunderstanding of the purpose of ERCOT’s Capacity, Demand & Reserves (CDR) reports, how the reports are prepared in accordance with the methodology in the ERCOT Protocols, and the open and public stakeholder discussion ERCOT goes through before changing components of the CDR. ERCOT will vigorously defend its position when it responds to the lawsuit.”

In mid-March, the EIA issued an electricity report with the heading: “Total electricity sales fell in 2015 for 5th time in past 8 years.”

We find all of this amusing given that the EIA’s 2015 summer demand, capacity and capacity margins forecast and its 2015 Annual Energy Outlook forecast both show increases in electric power demand for 2015. However, in mid-March, the EIA issued an electricity report with the heading: “Total electricity sales fell in 2015 for 5th time in past 8 years.” A chart showing the annual changes in total electricity retails sales for 2002-2015 is below.

Exhibit 11. Electricity Sales Have Fallen Often Recently



The Panda/ERCOT case may illuminate the greater challenge the utility industry, and its customers, will encounter as the utility industry transitions from its traditional business model to a new, as yet undefined, business model

There is an old expression: “He who lives by the sword, dies by the sword.” The same could be said about people who make and invest based on forecasts. The Panda/ERCOT case may illuminate the greater challenge the utility industry, and its customers, will encounter as the utility industry transitions from its traditional business model to a new, as yet undefined, business model. If a traditional utility company made a poor investment decision based on a bad forecast, it usually had the financial strength, operational flexibility and experience, and regulatory protection to withstand the financial fallout. As utility markets move to break down the traditional utility model – a fully-integrated power generation, transmission and distribution business – in favor of stand-alone segments, presumably offering greater profit potential than the regulated-return utility model, we may see business make horrendous investment mistakes. What will be the obligation of public utility commissions to correct these mistakes while fulfilling their mission of protecting customers? This may become acute as the renewable energy business grows, driven by mandates and tax incentives that have lured, and will continue to lure, investors only interested in quick financial returns. These regulatory morasses represent examples of policy potholes confronting utility companies attempting to navigate the evolving energy market as they search for the optimal new business model.

GOM Lease Sale Portends Further Offshore Weakness

While demonstrators interested in keeping America’s oil and gas resources in the ground protested at the Bureau of Ocean Energy

The Eastern Gulf sale attracted no bids

The lack of industry interest in the sale continued a trend that has been underway since the most recent peak in interest in 2007

Management’s Gulf of Mexico lease sales in New Orleans, the results suggest current industry conditions are helping accomplish what the protesters desire. The results of the Central Gulf of Mexico lease sale 241 and Eastern Gulf of Mexico lease sale 226 confirm the problem the oil and gas industry faces with continued low commodity prices and high drilling and development costs. The Eastern Gulf sale attracted no bids for the acreage being offered, reflecting the less-than-attractive geology of the area at a time when offshore economics are under extreme pressure.

Central Gulf of Mexico Lease Sale 241 attracted only 30 oil company bidders who waged a total of \$178 million, significantly below previous sale bids. The lack of industry interest in the sale continued a trend that has been underway since the most recent peak in interest in 2007. The 128 tracts won at Sale 241 attracted a total of \$156 million in high bids, or a ratio of 1.16 bids to tracts. That ratio was almost exactly the ratio posted by Sale 235 for the central region held last March. At that sale, the ratio of bids to tracts was 1.15, however, the amount of money wagered and spent in high-bids was much greater than this year. In 2015, the industry wagered \$583.2 million, of which \$538.8 million represented high-bids. That money was spent on 169 tracts, which received 195 total bids. The most recent sale results continue the recent trend of reduced interest in the area’s resource potential.

Exhibit 12. Recent CGOM Sale Continues Lackluster Trend



Source: BOEM, PPHB

That year’s Central Gulf of Mexico lease sale saw the industry bid \$5.2 billion dollars, of which \$2.9 billion were high bids on 723 tracts

If we examine the industry’s interest at the time of the Gulf of Mexico lease sale in 2007, when oil prices were in the upper \$50s and low \$60s a barrel but were projected to go much higher, it was extremely high. That year’s Central Gulf of Mexico lease sale saw the industry bid \$5.2 billion dollars, of which \$2.9 billion were high bids on 723 tracts. The industry actually submitted 1,428 total bids, for a bids-to-tracts ratio of 1.98. The average high bid per tract was \$4.0 million. That compares with the average high bid of \$3.2 million last year, but only \$1.2 million this year.

This litany of explanations may also signal that the maturity of the Gulf of Mexico as a major oil and gas basin is catching up with the industry

Why has there been such a drop-off in bidding activity this year? There are a number of possible explanations including a shortage of available cash due to the collapse in oil prices in 2015, concern about offshore project economics given a view of lower-for-longer commodity prices, the higher costs of offshore exploration and development, and a shift in focus toward faster-response and lower-cost onshore oil and gas opportunities. This litany of explanations may also signal that the maturity of the Gulf of Mexico as a major oil and gas basin is catching up with the industry. Low commodity prices make it difficult to justify the development of small, shallow-water resource pools. That is confirmed by the fact that the number of tracts in water depths greater than 800 meters (2,640 feet) was three times the number in less than 200 meters (660 feet) in the most recent sale. Of the nine sales since 2017, three had deepwater-to-shallow water tract ratios of less than two, and one of those sales had a 1.7 ratio. Clearly, deepwater has been, and remains the frontier focus of the industry. Given the need for highly sophisticated deepwater drilling rigs and subsea field development schemes that often require new deepwater pipelines, deepwater economics will remain challenged until commodity prices climb substantially higher. That is not good news for the offshore industry and its employees.

Oil And Gas Industry Under Assault Like Never Before?

The groups claiming success in convincing the Obama administration to cut that sale now want to see the entire offshore federal lease program scrapped

At the March 23, 2016, Gulf of Mexico federal offshore lease sale held in the New Orleans' Mercedes-Benz Superdome, a band of 150-200 protestors attempted to disrupt the proceedings as they voiced their displeasure for offshore drilling. Media reports state that the protestors were unsuccessful in disrupting the sale, although supposedly they often made it difficult to hear the announcement of the bidding results. This effort is part of a growing movement to attack the domestic oil and gas industry that has been encouraged by President Barack Obama's administrative decision to exorcise the sole offshore lease sale targeting the Atlantic coast from the proposed new five-year offshore lease schedule under consideration. The groups claiming success in convincing the Obama administration to cut that sale now want to see the entire offshore federal lease program scrapped.

Last week a petition was filed urging President Obama to use his executive authority to shut down all oil and gas offshore leasing

Last week a petition was filed urging President Obama to use his executive authority to shut down all oil and gas offshore leasing. The petition was signed by 45 environmental groups who urged the President to undertake this course of action as an important step to limit global warming as agreed to by the roughly 195 countries who signed the Paris climate change agreement. The organizations are hoping to capitalize on the Department of the Interior's removal of the Atlantic Ocean oil and gas lease sale action and convince Mr. Obama that broader restrictive actions should be part of his presidential legacy. While executive actions take time to enact, they are also subject to non-enforcement or outright cancellation by future presidents, raising questions about their long-term

Exhibit 13. BOEM Lease Sale Official Among Protestors

Source: Julie Dermansky

This petition did not include either the Sierra Club or the Natural Resources Defense Council, two of the largest and oldest environmental groups

effectiveness. In that vein, it is interesting that the large number of environmental groups backing this petition did not include either the Sierra Club or the Natural Resources Defense Council, two of the largest and oldest environmental groups. The sponsors of the petition did not respond to media requests to explain the absence of these organizations, nor did the heads of either organization respond to requests to explain why they did not participate.

This group of state attorneys general posed with former Vice President Al Gore and New York Attorney General Eric Schneiderman during their announcement

It is clear these environmental groups are focused on achieving as much support from the federal government for their agendas as possible before President Obama's term in office ends. The recent announcement of support by a coalition of Democratic attorneys general in 16 states for an unprecedented campaign to pursue companies that challenge the catastrophic climate change narrative highlights how emboldened the climate change proponents have become. This group of state attorneys general posed with former Vice President Al Gore and New York Attorney General Eric Schneiderman during their announcement. A few days later, the attorneys general of Oklahoma and Texas announced their support of Exxon Mobil in its battle with California and New York attorneys general over the company's supposedly misleading comments about the dangers of climate change and the use of their product. Not only do we have lawyers battling over the "science" of "settled" climate change, we have them fighting over free speech and the use of state authority to punish political opponents.

The oil and gas industry is under attack in ways it has not experienced since Ida Tarbell's 19-part serial in McClure's magazine

Our point in raising this issue is not to debate the issue of climate change or the societal value that is derived from oil and gas energy. Rather, it is to highlight how the oil and gas industry is under attack in ways it has not experienced since Ida Tarbell's 19-part serial in *McClure's* magazine that ran between November 1902 and October 1904 and which then became the book, [The History of the Standard Oil Company](#). Readers may recall that the outcome of this effort

Few people in 1911 would have predicted the wealth benefit for Mr. Rockefeller from that “muckraking” exposé

was a 1911 U.S. Supreme Court finding that the company had violated the Sherman Antitrust Act. The result of the verdict was the breaking up of Standard Oil into 34 “baby Standards.” The perverse result of the outcome was that the holdings of John D. Rockefeller, who founded and controlled Standard Oil, increased in value as a result of the impact the creation of the 34 “baby Standards” had on the value of the nation’s stock market. Mr. Rockefeller held 25% of the shares of Standard Oil and, subsequent to the breakup, a similar percentage in the 34 “baby Standards.” According to Daniel Yergin’s history of the oil industry, The Prize, Mr. Rockefeller’s holding doubled in value making him the richest man in the world at that time. Few people in 1911 would have predicted the wealth benefit for Mr. Rockefeller from that “muckraking” exposé. As a result, we hesitate to suggest where the potential outcome of this morass may lead us and who might win or lose.

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