



MUSINGS FROM THE OIL PATCH

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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

New Energy World Means Offshore Company Regulation

It was called “A date that will live in infamy.” That was how President Franklin Roosevelt described the Japanese sneak attack on the U.S. Navy’s fleet in Pearl Harbor, Hawaii, on December 7, 1941. The offshore oilfield service industry may look back 1,227 days to August 15, 2012, and rue that as its “Pearl Harbor” That day was when the Bureau of Safety and Environmental Enforcement (BSEE) announced two actions that effectively are reshaping the regulation of oil and gas operations conducted in U.S. waters.

Henceforward, the federal government would now hold oilfield service companies responsible for failure to comply with rules and regulations

One BSEE action was called an Interim Policy Statement that expressly announced that henceforward, the federal government would now hold oilfield service companies responsible for failure to comply with rules and regulations. The Interim Policy Statement, a self-described internal policy document, which wasn’t intended to create any rights or impose duties on offshore workers, gave BSEE inspectors four standards under which they would determine whether contractors had committed “serious violations of BSEE’s regulations.” If the standards were met, BSEE inspectors could issue an Incident of Non Compliance (INC) with the rules to the contractor. As part of this statement, contractors would now be held jointly and severally liable along with the lessee/operator for any failures when performing any activity that is subject to regulation.

The other BSEE action was its issuance of the Final Rule for Offshore Drilling Safety, which was a follow-on to an Interim Final Rule that had been issued the previous October and had been subject to public comment. The Final Drilling Safety Rule was issued after considering all public comments, but it also reiterated BSEE’s claim coming from the Interim Policy Statement for extending its jurisdiction to oilfield service companies operating offshore.

The regulation of offshore operations has always been conducted through the operator/lessee

On September 25, 2015, the Interior Board of Land Appeals (IBLA) within the U.S. Department of the Interior decided a case over BSEE's issuance of an INC to an offshore contractor. The contractors' appeal included a challenge to the authority of BSEE to regulate offshore contractors. The IBLA ruled that Island Operating Co., Inc., an oilfield service company, was liable for a penalty associated with the INC that BSEE inspectors had issued the contractor due to the failure of two of its employees to conduct the safe transfer of chemicals offshore that contributed to a fire on the producing platform.

Since the passage of the Outer Continental Shelf Lands Act (OCSLA) in 1953, and its amendment in 1977, the regulation of offshore operations has always been conducted through the operator/lessee. That practice continued for nearly 57 years up until April 20, 2010, when the Deepwater Horizon accident resulted in the well, which was being drilled for BP Ltd. (BP-NYSE) on its Macondo prospect in the Gulf of Mexico, blew out and caused nearly five million barrels of crude oil to be spilled before the well was shut in on September 19, 2010. Eleven workers were killed due to the accident, subsequent fire and sinking of the Deepwater Horizon semisubmersible drilling rig.

The first inkling of the regulatory change came in a speech delivered at the 2011 Offshore Technology Conference

From the time of the blowout, the offshore industry was resigned to the fact that the regulation of offshore operations would change – both the equipment used and operating procedures. What was not envisioned, however, was an expansion of the regulatory structure to include contractors working offshore and making them directly subject to government control. The first inkling of the regulatory change came in a speech delivered at the 2011 Offshore Technology Conference. Up until the Deepwater Horizon accident, offshore regulation was administered by the Minerals Management Service (MMS). Following a review of the regulatory structure and its response to the accident and oil spill, the federal government reorganized the MMS, creating the Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE). Later that organization was split with one organization focusing on the management of offshore assets while the other concentrated on offshore operations and safety.

Director Bromwich set out two policies – one for regulation of offshore permitting and the other for extending offshore regulation to oilfield service contractors

Michael Bromwich, a former Inspector General of the U.S. Department of Justice and a partner in a global law firm, was named to head BOEMRE. In his speech at the 2011 Offshore Technology Conference, Director Bromwich set out two policies – one for regulation of offshore permitting and the other for extending offshore regulation to oilfield service contractors – that would underlie his agency's approach to offshore oversight. His prepared comments contained the following statement regarding the second objective: "We have completed our review of the issue and have concluded that in fact we have broad legal authority over all activities relating to offshore leases, whether engaged in by lessees, operators, or

For government policy makers, regulation eliminates the odds of failure associated with luck

contractors. We can exercise such authority as we deem appropriate.” He acknowledged that all prior regulation had been limited to operator/lessees, which was designed to keep a clearly defined line of regulation, but now the agency believed it could also pursue contractors for violations of regulations, too. One has to believe that the visibility and severity of the Deepwater Horizon disaster and the active involvement of a handful of leading offshore oilfield service companies may have contributed to this broadened reading of OCSLA. Every utterance by Director Bromwich about the outstanding safety record of the offshore industry referred to it as “luck.” For government policy makers, regulation eliminates the odds of failure associated with luck.

Long-time readers of the *Musings* will know that we have followed and written extensively about this regulatory expansion – not from the viewpoint that it reflects Armageddon for the industry, but rather because the service industry has never been regulated and as such is about to have its business model subjected to forces about which management teams have no experience and little or no understanding.

The APA has been in place since 1946 and requires an agency to issue proposed regulatory procedures for public comments, which then must be considered before final regulations can be put into place

Prior to the issuance of the Interim Policy Statement, we had argued that the industry should organize a challenge to the expansion of regulation. We said there were two questions about BSEE’s position – one, whether it actually had the right to regulate contractors in addition to operator/lessees, and second, why wasn’t the proposed regulatory change subjected to the procedures outlined in the Administrative Procedure Act (APA) that dictates how agencies are to produce regulations and modify existing rules and practices? The APA has been in place since 1946 and requires an agency to issue proposed regulatory procedures for public comments, which then must be considered before final regulations can be put into place.

For various reasons, no offshore contractors were willing to challenge BSEE’s failure to adhere to the APA

From our viewpoint, the second issue was the more important one, assuming that the first issue was decided in favor of the agency. If, based on information about the legislative history of the act and its subsequent amendment, there was evidence that regulatory language that included contractors was stripped out of the final legislation. That suggests that Congress wanted the regulation to be directed at and through the operator/lessee. But, even if it was determined that BSEE was entitled to regulate contractors, we wanted it to follow the APA procedures ensuring that contractors would be able to comment on the draft regulations. In other words, the service industry would be able to help shape the final rules they would be subject to, so there would be no surprises or ex post facto rules violations. For various reasons, no offshore contractors were willing to challenge BSEE’s failure to adhere to the APA.

Some discussions were held by offshore contractors in conjunction with their primary industry association, the National Ocean Industries Association (NOIA), about organizing an appeal. NOIA had sent a

Had NOIA challenged the Interim Policy Statement, the debate would have been theoretical as opposed to being involved in an actual INC case

letter to BSEE seeking clarification of its intent to regulate the industry. The response was not particularly enlightening. After Island Operating, Inc. was served with its INC and proceeded to challenge it and the authority of BSEE's regulatory power, NOIA decided to file an amicus brief. It was actually referenced in a footnote to the IBLA's decision. Unfortunately, the brief carried little weight. In hindsight, it appears that NOIA's and the industry's strategy of passivity in responding to the regulatory change threat and then tying its intervention to an actual case rather than attacking the Interim Policy Statement immediately after it was issued was a mistake. Had NOIA challenged the Interim Policy Statement, the debate would have been theoretical as opposed to being involved in an actual INC case with possibly a weak set of facts that would sway the IBLA's thinking. In our view, the odds of a more favorable outcome would have been enhanced by an earlier challenge to BSEE. Other legal advice was for NOIA to actually challenge BSEE in federal court rather than through the IBLA, which essentially provides BSEE the "home field" advantage.

The key language from the Island Operating, Inc., decision stated: "We conclude that, under the facts of this case, BSEE's ability to pursue enforcement actions against contractors is supported by a proper reading of OCSLA and its implementing regulations." As the saying goes – signed, sealed and delivered.

Adding more expense to an offshore contractor's operating structure in the midst of a deep and protracted industry downturn is not a positive and could create unintended consequences

We hope offshore contractor management teams understand their new status – a regulated industry. That new regulatory structure mandates that contractors assume joint and severable liability with all other parties involved in the offshore work – all contractors plus the operator/lessee. Therefore, any act that causes a problem could rebound to all the other parties involved, regardless of whether they were involved in the actual work that contributed to the INC or not. This changes the nature of the insurance contract that contractors must obtain, as well as the magnitude of their potential legal exposure. This could wind up costing offshore contractors more money and quite possibly it could prohibit some companies from working offshore if they cannot obtain the necessary insurance. Adding more expense to an offshore contractor's operating structure in the midst of a deep and protracted industry downturn is not a positive and could create unintended consequences, such as a potential lack of sufficient insurance capacity to underwrite the entire offshore industry's risk exposure.

A final issue offshore contractors should keep in mind is how important contractor-INC's will be for BSEE. David Bernhardt of the Washington, D.C. law firm Brownstein Hyatt Farber Schreck pointed to a potential problem for contractors during his presentation about the "Regulation of Contractors" at the spring 2014 NOIA conference. He said that when the Interior Department was asked to submit its estimates for revenue and expenses for the upcoming federal budget, Interior indicated it anticipated generating half its INC

Either substantially more INCs will be given to contractors and that the fines will be large, or BSEE will be serving fewer INCs on operator/lessees

fee income from contractor INCs. According to Mr. Bernhardt, in the prior year BSEE had handed out seven INCs to contractors and 8,000+ INCs to operator/lessees. Those two statements suggest that either substantially more INCs will be given to contractors and that the fines will be large, or that BSEE will be serving fewer INCs on operator/lessees. We certainly hope the industry doesn't experience another Deepwater Horizon disaster, but this new regulatory structure could challenge the financial health of the offshore industry. Do management teams understand the change?

Politics And The Hypocrisy Of The Scientific Method

That study was published last June by the journal *Nature*, and called into question previous studies of NOAA temperature data showing that global warming has stopped for the past 15-18 years

Recently, a battle has emerged between the chairman of the House of Representatives Committee on Science, Space and Technology, Rep. Lamar Smith (R-TX), and the National Oceanic and Atmospheric Administration (NOAA) over internal communications and other information related to the agency's recently published study on climate change. That study was published last June by the journal *Nature*, and called into question previous studies of NOAA temperature data showing that global warming has stopped for the past 15-18 years. A lack of rising global temperatures is referred to within the climate community as "the Pause." The importance of that data trend is that it was not predicted by any of the tens of climate change computer models used by climate change promoters and the UN's Intergovernmental Panel on Climate Change (IPCC). Moreover, climate change supporters have been searching, so far in vain, for an explanation of where the warming air has gone.

NOAA officials have relied on claims that they must protect the confidentiality and integrity of the scientific process

In declining to supply the data in response to the House committee's subpoena, NOAA officials have relied on claims that they must protect the confidentiality and integrity of the scientific process. *Nature* was the first to break the story of NOAA's non-cooperation. According to the journal, the study analyzed NOAA's temperature records and concluded that global warming has continued at a steady pace throughout the time period under study, contradicting the findings of other studies suggesting that the warming has slowed since the late 1990s.

"The American people have every right to be suspicious when NOAA alters data to get the politically correct results they want and then refuses to reveal how those decisions were made."

According to *Nature*, Rep. Smith, a critic of climate change, asked NOAA in July for the data used in the study and for any internal communications related to it, but NOAA has only given his committee publicly available data. The Congressional newspaper, *The Hill*, reports that Rep. Smith issued a statement accusing NOAA's work of being politically driven. In his statement, he wrote, "It was inconvenient for this administration that climate data has clearly showed no warming for the past two decades. The American people have every right to be suspicious when NOAA alters data to get the politically correct results they want and then refuses to reveal how those decisions were made."

The agency has eliminated its adjustment factor to correct for those land-based monitoring stations that are adjacent to heat sources

According to a NOAA spokeswoman, the internal deliberations related to the study are confidential. She claimed that the deliberations are not related to what Rep. Smith is trying to find out, but we must admit that we are puzzled by that conclusion. She went on to say, "We have provided data, all of which is publicly available online, supporting scientific research, and multiple in-person briefings." She further stated, "We stand behind our scientists who conduct their work in an objective manner. It is the end product of exchanges between scientists — the detailed publication of scientific work and the data that underpins the authors' findings — that are key to understanding the conclusions reached." While we have not used the NOAA temperature data, we do know that the agency has eliminated its adjustment factor to correct for those land-based monitoring stations that are adjacent to heat sources. We would also say that if NOAA data is like the federal government's energy and economic data, then we are often faced with having to correct errors within the data series we download for research. If the NOAA scientists did this then they should be forced to acknowledge that fact and explain what adjustments they made.

They would rather just wave it off as immaterial as the IPCC has done

What we have concluded about scientists and government policymakers dealing with scientific data is that they can be highly selective about the data they use and believe. The inability of climate change believers to explain why their computer models failed to forecast the warming pause, or to develop and substantiate an alternative explanation doesn't seem to make them curious about why that is the case. They would rather just wave it off as immaterial as the IPCC has done.

The positive benefits come because crop yields are enhanced

On the other hand, bio-scientists in Europe are quick to demand a ban on the planting of or feeding to livestock any genetically-modified organism (GMO) when the science established by the U.S. Agriculture Department, the U.S. Food and Drug Administration, the UN agriculture bodies and a substantial number of other academic, corporate and government research organizations shows absolutely no harm for individuals, animals or wildlife and substantial benefit. The positive benefits come because crop yields are enhanced. The amount of acreage that needs to be farmed and the volumes of fertilizers, pesticides and water needed to boost output are reduced with significant climatic benefits.

The history of the corruption of the scientific method goes back to the 1960s when biologist Rachel Carson published a book in 1962, Silent Spring

The battle over GMOs is one of control, which is secretly what underlies the climate change debate. The history of the corruption of the scientific method goes back to the 1960s when biologist Rachel Carson published a book in 1962, Silent Spring, which urged the banning of the pesticide dichlorodiphenyltrichloroethane, or DDT. DDT was first synthesized in 1894 but it wasn't until 1939 when Swiss chemist Paul Hermann Müller discovered its successful use in controlling certain insects, the mosquito in particular, which carries the malaria virus. For his work, Dr. Müller received the Nobel Prize in Chemistry.

After a six-month review, the EPA's first administrator, William Ruckelshaus, rejected an immediate suspension of DDT's registration, citing studies by the EPA's internal scientific staff that concluded that DDT was of no immediate harm to people and wildlife

“The ultimate judgment [on DDT] remains political. Decisions by the government involving the use of toxic substances are political with a small ‘p.’”

The science behind Silent Spring – the thinning of birds' eggs and the deaths of monarch butterfly larvae were both proven to have been faulty at best or fraudulent at worst

In 1967, scientists and lawyers organized the Environmental Defense Fund (EDF) and began suing manufacturers of DDT over the environmental damage caused by the indiscriminate spraying of the chemical. In 1971, in response to an EDF lawsuit, the U.S. District Court of Appeals ordered the newly created Environmental Protection Agency (EPA) to begin the de-registration procedure for DDT. After a six-month review, the EPA's first administrator, William Ruckelshaus, rejected an immediate suspension of DDT's registration, citing studies by the EPA's internal scientific staff that concluded that DDT was of no immediate harm to people and wildlife. The action created a scientific firestorm as it was claimed that the studies were conducted by economic entomologists who had been inherited from the U.S. Department of Agriculture and were sympathetic to agribusiness interests and tended to minimize the risks of chemicals to humans. With a scientific controversy raging, the EPA commenced hearings.

The hearings, extending over seven months during 1971, involving 125 witnesses who generated 9,362 pages of testimony and scientists on both sides of the issue. At the end, EPA judge Edmund Sweeney ruled that “DDT is not a carcinogenic hazard to man...is not a mutagenic or teratogenic hazard to man...[and the] use of DDT under the regulations involved here [does] not have a deleterious effect on freshwater fish, estuarine organisms, wild birds or other wildlife.” On January 1, 1972, however, Administrator Ruckelshaus overruled Judge Sweeney and announced the cancellation of the registration for most of the uses of DDT. An exemption was retained that allowed use for public health reasons under certain conditions. In explaining his reasoning for overruling the judge's decision, Mr. Ruckelshaus stated, “The ultimate judgment [on DDT] remains political. Decisions by the government involving the use of toxic substances are political with a small ‘p.’”

Mr. Ruckelshaus' ruling emboldened the EDF and provided the impetus for the rise of other environmentally-motivated movements. So there you have it. Politics overrules science when the uproar is loud. Forget the “science is settled” and “97% of scientists agree” mantras, politics will always trump science, even crappy science. In this case, the science behind Silent Spring – the thinning of birds' eggs and the deaths of monarch butterfly larvae were both proven to have been faulty at best or fraudulent at worst. The resurgence of malaria in parts of the world such as Southeast Asia and Africa has prompted the increased use of DDT, but only under specific exemptions. Over the years since Mr. Ruckelshaus' decision, how many people have died because DDT was not available to protect them from the deadly malaria disease? We always hear how many lives will be saved by a certain environmental policy action but never how many lives are actually lost by other restrictions – the law of unintended consequences. Unfortunately, as long as politics trumps science, that law will never be considered by “popular” actions.

Could Self-Driving Vehicles Destroy The Oil Business?

In a world populated by only self-driving vehicles, the oil industry will have a bleak future

We were recently asked whether we had written or seen anything about the impact of self-driving vehicles on fuel demand. Unfortunately, we hadn't. The question prompted us to begin researching the issue and what we have found suggests that in a world populated by only self-driving vehicles, the oil industry will have a bleak future. That future would certainly force dramatic change on the petroleum industry.

What we found when we looked into the issue is that the answer is a small part of a much broader discussion dealing with economic growth and overall energy and materials consumption. The issue also brings into the debate other technologies, some of which are very new and revolutionary but are just starting to reshape the industrial world and its energy use. These discussions also spill over into the moral debate over fossil fuel use and climate change. We will try not to get too deeply into the moral issue in this analysis, as it is not the appropriate forum for that discussion. We will, however, try to spell out what history has shown us about that question and what a world of self-driving, or autonomous vehicles will mean for the energy industry.

Modern economic growth is generally the result of industrialists and consumers constantly figuring out how to do more with less

Modern economic growth is generally the result of industrialists and consumers constantly figuring out how to do more with less. To the extent this effort is successful, it is largely due to the impact of modern technology, meaning that humanity has, over time, been able to create ever more value while using less and less material. To that point, data collected by University of Manitoba natural scientist Vaclav Smil shows that today it requires 20% less energy to produce a ton of steel than it did in 1900. For aluminum and cement, the energy reduction needed to produce a ton today versus 1900 is 70%. It takes 80% less energy than it did in 1900 to synthesize nitrogen fertilizer. The amount of energy used to heat a home in the United States is down 50% from the amount consumed in 1978. Lastly, it takes 90% less energy to desalinate a gallon of water today compared with 1970. These are all significant reductions in energy use and reflect the improvement in technologies for producing these products.

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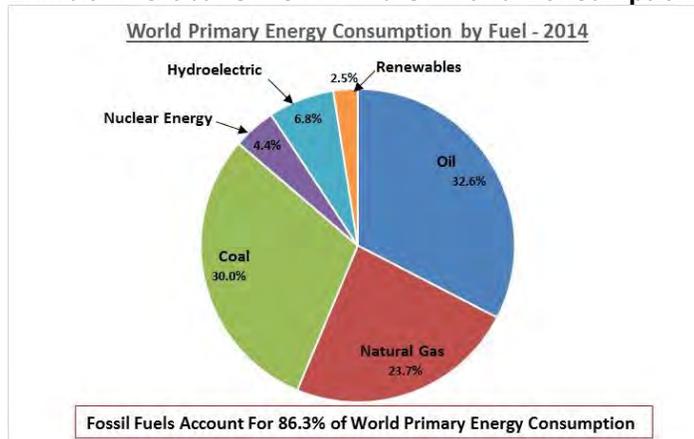
Dr. Smil has calculated that in the United States it took about 10 ounces of materials in 1920 to produce one dollar's worth of value. Today, that relationship has declined to 2.5 ounces, a 75% decline in less than a century. Energy is certainly a part of that equation, which is supported by the 2013 study produced by the Alliance to Save Energy. One of the key conclusions from that study stated: “Over the past forty years, the United States made significant gains in energy productivity. U.S. economic output expanded more than three times since 1970 while demand for energy grew only 50%.” Clearly that data demonstrates that we have become significantly more efficient in utilizing energy to maximize economic output. It

“If energy productivity had remained constant since 1970 [when about 68 quadrillion Btu (Q or quad) were consumed], the U.S. would have consumed 207.3 quadrillion Btu in 2007, when it actually only consumed 101.6 quads.”

also speaks to the role of technology in helping to improve manufacturing processes, boost the efficiency of the nation’s distribution system and revolutionize the products and services today’s consumers can enjoy.

To further demonstrate the impact of what new technologies and greater energy efficiencies have meant for growth of the United States economy, we have the following statement based on data collected by the Rocky Mountain Institute. “[I]f energy productivity had remained constant since 1970 [when about 68 quadrillion Btu (Q or quad) were consumed], the U.S. would have consumed 207.3 quadrillion Btu in 2007, when it actually only consumed 101.6 quads.” What does consuming less than half the number of quads of energy mean? A quad is roughly equivalent to 170 million barrels of oil. If we saved 106 quads of energy, it would equate to 18,020 million barrels of oil, or approximately 18 billion barrels. On a daily basis, that would be the equivalent of 49 million barrels of oil a day. But let’s understand that crude oil represents only about 30% of total primary energy consumption. So out of the 106 quads of energy savings, the oil savings would have been about 31.8 quads of energy represented by oil, or about 5.4 billion barrels of oil. At the present time, the United States consumes about 20 million barrels of oil per day, or 7.3 billion barrels of oil annually. By the more efficient use of oil, we do not need to be burning 34.8 million barrels of oil a day as otherwise would have been the case.

Exhibit 1. Global Oil Is A Third Of World Consumption



Source: BP, PPHB

He worries that energy production and consumption technologies are so capital intensive that humanity will be locked into dependence on increasingly scarce and expensive fossil fuels for decades to come

Turning to self-driving vehicles, Dr. Smil offered up his concern about the direction in which we are going in the demand for materials and energy. He worries that energy production and consumption technologies are so capital intensive that humanity will be locked into dependence on increasingly scarce and expensive fossil fuels for decades to come. To demonstrate his concern, he painted the following scenario. If automobile ownership in currently poor countries rises to roughly one-third of the level of Japan, or 600

The world would only need 800 million vehicles to supply transportation services for nine billion people, or 200 million fewer cars than what already exists in the global vehicle fleet

Shared autonomous vehicles reduce the average cost of an individual's travel by as much as 75% versus a conventional driver-owned vehicle

We would also have fewer vehicles needing to be parked, which means that upwards of 20% of urban land currently devoted to parking could be transformed into close-in housing and businesses

Several decades ago, prognosticators did not foresee how the world would skip over the building of landline telephone infrastructure and go directly to cellular phones

vehicles per 1,000 people in the country's population, the global fleet would double to about 2.2 billion vehicles. Can the world afford twice as many vehicles as we have now causing higher energy consumption and carbon emissions?

Self-driving vehicles may be the answer. Researchers at the University of Texas have conducted a realistic simulation of vehicle use in cities that took into account traffic congestion and rush-hour use. They found that if our vehicle fleet was fully autonomous, every shared autonomous vehicle could replace 11 conventional vehicles. As their study showed, the world would only need 800 million vehicles to supply transportation services for nine billion people, or 200 million fewer cars than what already exists in the global vehicle fleet. That doesn't sound like a bright future for either the automobile or petroleum industries.

The UT simulations showed that riders would wait for an average of 18 seconds for an autonomous vehicle to show up. Each vehicle would serve 31-41 travelers a day. Importantly, less than 0.5% of travelers waited for more than five minutes for an autonomous vehicle to arrive. Equally important, shared autonomous vehicles reduce the average cost of an individual's travel by as much as 75% versus a conventional driver-owned vehicle.

A global vehicle fleet of autonomous vehicles could easily be electrified since they would be able to go off to be recharged and cleaned during periods of low demand without sacrificing service quality for travelers. We know that one of the key objectives of autonomous vehicles is for them to be able to travel faster, in tighter spacing and in smaller-sized units. This means that we will need less material for constructing these vehicles with a favorable impact on overall energy and material needs besides less fuel. Here is another example of savings from fewer vehicles due to an autonomous vehicle fleet. We would also have fewer vehicles needing to be parked, which means that upwards of 20% of urban land currently devoted to parking could be transformed into close-in housing and businesses. Increased urban density could further reduce overall energy demand by boosting the use of mass transit.

While Dr. Smil is concerned about the increasing cost of extracting energy and materials due to their capital intensity, which could doom our economy by subjecting it to increasingly more expensive fossil fuels for decades into the future, what would happen if our energy future follows a deployment path similar to that of information technologies? Several decades ago, prognosticators did not foresee how the world would skip over the building of landline telephone infrastructure and go directly to cellular phones. In 2014, there were only 1.1 billion fixed telephone landlines worldwide compared to more than seven billion cellular phones. Equally as impressive is how much the cost to make these phones has declined during the transition.

With 3-D printing, parts can be made while using only 2%-25% of the energy required to make a new part

So how much energy will we need and in what form in 2100? As has been suggested by some, the answer to this question would be the equivalent of assembling a committee of Thomas Edison, Marie Curie and Albert Einstein in 1900 to predict how much and what types of energy we would be using today. Consider the impact that 3-D printing currently has, and will have, on the manufacturing sector, and in turn on energy consumption. By the use of additive manufacturing where old parts are remanufactured through laying down strips of metal or some other material via a computer controlled printer, parts can be made while using only 2%-25% of the energy required to make a new part. This technology will also eliminate storage and inventory costs as well as reducing transportation costs.

Autonomous vehicles will allow faster electrification of the fleet

Returning to the question of the impact of self-driving vehicles on energy consumption, we now know that there can be a significant impact if these autonomous vehicles are employed in a shared system. That scheme, while it will take a long time to occur, will continue to erode energy consumption. Autonomous vehicles will, if used in the suggested manner as the University of Texas simulations call for, allow faster electrification of the fleet, which could come sooner if there is a technological breakthrough in car batteries that enables them to overcome the range-anxiety of electric vehicle buyers. Future signs point to more challenges for oil's use.

The question is: How well do self-driving cars work in snow and ice?

We would offer one thought about self-driving vehicles that we have not seen mentioned in the analytical research and media coverage of the topic. The question is: How well do self-driving cars work in snow and ice? If you have driven in those conditions (we were raised in the northeastern snows and learned to drive in those conditions in our empty high school parking lot), you know that those skills require different handling measures. Will an autonomous vehicle be able to make all those adjustments in a split second? Until those capabilities are demonstrated, no autonomous vehicles should be allowed to be sold unless they are restricted to states with non-winter conditions.

Get Ready – The Third Quarter Energy Storm Has Arrived

Management conference calls with investment analysts were full of dismal news and disclosure of new steps to reduce company cost structures and the setting of new courses

The expression is that it is darkest before the dawn. If true, the oil industry can't wait for sunrise to arrive! As we predicted in our last *Musings*, the energy company earnings reports accompanied by management conference calls with investment analysts were full of dismal news and disclosure of new steps to reduce company cost structures and the setting of new courses in response to the realization that crude oil and natural gas prices will remain lower for longer. The earnings results reported last week by energy companies reflected this reality. For example, Chevron Corp. (CVX-NYSE) announced plans to lay off 6,000-7,000 employees, up to 11% of its current labor force, along with an equal number of contractors, reduce capital spending plans for 2016 by 25%, but also

Once again, COP management signaled its support for maintaining its dividend even at the expense of future investment in the business

The company announced that its target is to be able to continue paying its dividend to its shareholders while bringing operating costs in line with cash flow by 2017 even if crude oil prices never rise above \$60 a barrel

to cut spending in 2017 and 2018 by a further roughly 15%. Lastly, Chevron announced a trimming of its oil production growth goal from 20% to between 13% and 18%.

ConocoPhillips (COP-NYSE) is abandoning its deepwater drilling efforts by 2017 and redirecting its capital spending to its onshore shale properties. The company was forced to write down the value of some of its oilfields due to low oil prices while it also absorbed a loss from the cancellation of a deepwater drilling rig contract. All in all, COP reported a loss of \$1.1 billion for the third quarter. The deepwater shift followed management's vow earlier this year that it would focus its offshore efforts on developing fields it had already discovered. Once again, COP management signaled its support for maintaining its dividend even at the expense of future investment in the business. On the other hand, Marathon Oil Company (MRO-NYSE) cut its dividend by 76% in order to improve its financial position. The cut from 21-cents to 5-cents per share per quarter will boost the company's annual cash flow by more than \$425 million. Occidental Petroleum (OXY-NYSE) announced the sale of its Bakken properties for \$500 million, some one-fifth the value assigned to it by Wall Street analysts. OXY stated that it wasn't making any money (and presumably didn't see that changing any time soon) so it elected to exit and redeploy the cash towards its large and profitable position in the Permian Basin.

In Europe, Royal Dutch Shell (RDS.A-NYSE) posted a \$6.1 billion loss after asset write-downs and severance costs announced in conjunction with canceling two long-term growth initiatives – drilling in the Arctic Ocean north of Alaska and a Canadian oil sands project. Shell CEO Ben van Beurden told investors that “We have to live within our means.” French oil company, TOTAL (TOT-NYSE) also took a write-down on an oil sands project, while Italian oil company Eni (E-NYSE) announced the sale of 12.5% of its investment in oilfield service company Saipem Spa (SAPMY-OTC). BP Ltd. (BP-NYSE), who first coined the phrase, “Lower for longer,” answered the question of what that means for its business. The company announced that its target is to be able to continue paying its dividend to its shareholders while bringing operating costs in line with cash flow by 2017 even if crude oil prices never rise above \$60 a barrel. That means more assets sales, capital spending cuts and layoffs. The latter move, while not spelled out by management during its earnings call, was signaled by disclosure that after taking a \$151 million restructuring charge in the third quarter, the company plans a total of \$2.5 billion in restructuring charges between the fourth quarter of 2014 and the end of 2016.

We won't even attempt to highlight the outcome from the various oilfield service companies that reported last week, but the results were dismal although comments were made by the managements of some of the better-capitalized companies about their financial strength allowing them to target acquisitions to build their companies

and/or to consolidate the industry. The key problem service companies have is the lack of visibility about activity levels in 2016, especially given the plans of their customers. It is clear the energy industry is in the throes of being revamped – the problem is no one knows just how much change is needed, or how quickly it must be achieved.

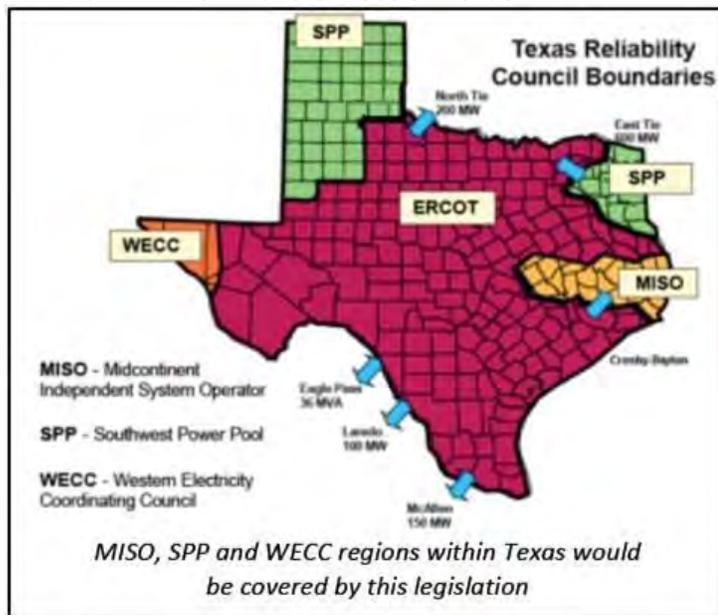
Texas Wind Generators Pay Utilities To Take Their Power

The renewable fuels industry has found that it is possible to have negative power costs

In a world of zero interest rates, economists are wrestling with answering the question of whether the Federal Reserve will eventually need to push interest rates below zero in order to truly stimulate the U.S. economy. The U.S. Treasury has already sold short-term notes with a zero interest rate, i.e., you send them money and at the end of the life of the notes the government sends you the exact same amount of money back! Surprisingly, the renewable fuels industry has found that it is possible to have negative power costs, as amazing as that concept appears. A power generator produces electricity and then has to pay a utility to take it! How could that happen?

You had to get up in the middle of the night in order to catch this anomaly. No, this anomaly didn't happen with solar power. By the way, what is the price of solar power at 2 a.m. in the morning? This anomaly we are about to describe only exists with wind power and it arises due to several factors unique to the Texas electricity business.

Exhibit 2. ERCOT Covers Most Of Texas



Source: Wikipedia.com

For those areas under ERCOT's control there are virtually no connections with the other power grids of the nation

First, Texas is an electricity island. The Texas power grid is run by the Electric Reliability Council of Texas or ERCOT. The state's history of independence (we were a republic for nearly 10 years and entered the United States via a treaty rather than through annexation or purchase as did most other states) has carried through to our power grid. Even though the Texas power grid doesn't cover the entire state, for those areas under ERCOT's control there are virtually no connections with the other power grids of the nation. For example, PJM is a regional organization that covers 13 states in the Midwest and Middle Atlantic regions of the country, while MISO covers much of the middle of the country.

Exhibit 3. Nation's Electricity Operational Structure



Source: *Wikipedia.com*

Since the state's power grid is independent, Texas will not suffer from blackouts if there are power problems in neighboring Oklahoma or Louisiana. On the other hand, when we produce electricity it must be consumed here or it is lost as there is no place to ship it.

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Another factor that accounted for the negative wind power price is that Texas has the largest installed wind power generation capacity in the country by a wide margin. According to the American Wind Energy Association, at the end of the third quarter of 2015, Texas had 16,406 megawatts (MW) of installed wind generating capacity, leading the second largest state, California (6,022 MW) by over 10,000 MW. More importantly, when it comes to actually generating electricity by wind, in 2014, Texas generated 10.4% of its electricity, while nationally wind accounted for 4.4% of electricity production. Iowa generated 28.5% of its electricity from wind putting it in first place. However, with the largest installed base of wind generating capacity and strong winds, Texas has become the gorilla of wind power in the United States.

The final unique factor contributing to the negative power price is the market structure in Texas. ERCOT has the grid set up such that it

ERCOT fills its open needs by selecting those bids that are cheapest and that make the most sense from a grid-management perspective

acquires power through continuous auctions. Every five minutes, power generators in the state electronically bid into ERCOT's real-time market, offering to provide blocks of power at particular prices. ERCOT fills its open needs by selecting those bids that are cheapest and that make the most sense from a grid-management perspective. That means they select power offers for taking into the system and distributing it in a way that the grid can handle. Every 15 minutes, the bids are settled at the highest price paid for electricity accepted in that round. Therefore, if the system needs 100 MW of power and a producer offers 60 MW at \$50 per megawatt-hour (mWh) and another producer offers 30 MW at \$80/mWh and another producer offers 40 MW at \$100/mWh, all the bidders will receive the highest price, or \$100/mWh because the highest-priced offer supplied 10 MW of power.

Wind power producers, since they have no fuel cost, tend to bid at the lowest prices offered to ERCOT

One night in the middle of September, the demand for power in the system was 45% lower than during the normal evening peak. But the wind was blowing particularly hard that night such that ERCOT actually established a new instantaneous wind generation record. At 3 a.m. that morning, wind was supplying about 30% of the state's electricity. Wind power producers, since they have no fuel cost, tend to bid at the lowest prices offered to ERCOT. That night at 12:15 a.m. the real-time market went from \$17.40/mWh to zero for the interval ending at 1:45 a.m., merely 90 minutes later. Then the market either stayed at zero or went negative until about 8:15 a.m. For the interval ending at 5:45 a.m., the real-time price of electricity was minus \$8.52/mWh.

The answer is the federal production tax credit of 2.3 cents per kilowatt-hour, or \$23/mWh that applies to every kilowatt of power produced by a wind turbine for the first ten years of its operation

So how could a power generator justify paying ERCOT to take his power? The answer is the federal production tax credit of 2.3 cents per kilowatt-hour, or \$23/mWh that applies to every kilowatt of power produced by a wind turbine for the first ten years of its operation. Thus, even though the power generator was paying ERCOT in this case, he was netting a positive \$14.48/mWh in tax credits. Even if the power generator cannot utilize those tax credits, he can sell them to others who can use them for cash. In this manner, much like the deceptive moves of a slight-of-hand artist designed to keep his audience distracted while he completes his trick, the federal tax credit performs the same role in explaining the mystery of negative wind prices.

Will Politics Or Economics Derail Canada's Energy Outlook?

There is a phrase used in sports and politics called "piling on" that refers to when multiple players gang up on a ball carrier to tackle him. In politics, that phrase addresses the situation where the number of people rebutting an individual's claim overwhelms the original thought to the point that hardly anyone remembers what that thought was. For most Canadians involved in the oil business, especially those in Alberta, October 19th's Canadian federal election results was the equivalent of being piled on. That's because the

The Liberals won a majority of the seats up for election

industry was already reeling from the earlier election of the liberal and environmentally focused New Democrat Party (NDP) to leadership of Alberta's government.

The federal election outcome was somewhat of a surprise. Almost unanimously, pollsters had correctly predicted that Justin Trudeau of the Liberal Party would win, but instead of it being a minority government, the Liberals won a majority of the seats up for election. For American readers, Mr. Trudeau is the son of former Canadian Prime Minister Pierre Trudeau, the 15th prime minister of Canada, a leading Liberal Party historical figure and a controversial leader.

His years in office overlapped the period of dramatic upheaval for the global oil industry

Pierre Trudeau held office from April 20, 1968, to June 4, 1979, and again from March 3, 1980, to June 30, 1984. His years in office overlapped the period of dramatic upheaval for the global oil industry – marked by the Arab oil embargo in response to western nations' support of Israel in the Six Days War in 1973, and the Iranian revolution of 1978 that witnessed the overthrow of a loyal supporter of the West. Each event produced a dramatic increase in global oil prices as the oil industry's pricing power shifted from the United States to the Middle Eastern oil exporting countries.

The western provinces, on the other hand, were growing the foodstuffs, extracting the minerals and producing the energy necessary to feed, supply and power the eastern provinces

In response to these dramatic industry and oil price changes, most western countries scrambled to institute plans to control oil prices in hopes that such plans would insulate citizens from the price shock while not stifling the development of a country's resources. Canada was no different as Mr. Trudeau's government instituted federal policies to control the oil industry. The policies, known at the National Energy Program (NEP), created significant friction – or maybe outright resentment - towards the energy-poor, populous eastern provinces who were being coddled at the expense of the energy companies and the citizens of the western energy-rich provinces. The eastern portion of Canada was not only populous, it was also the center of the nation's industrial activity. The western provinces, on the other hand, were growing the foodstuffs, extracting the minerals and producing the energy necessary to feed, supply and power the eastern provinces.

Although the embargo and Iranian revolution occurred half a decade apart, most people believe that oil prices rose steadily throughout the period rather than in a stair-step manner as actually happened

The decade of the 1970s is often misunderstood. Although the embargo and Iranian revolution occurred half a decade apart, most people believe that oil prices rose steadily throughout the period rather than in a stair-step manner as actually happened. That decade also produced a severe recession and exploding inflation due to the impact from sharply higher oil prices on the costs of all manufactured and transported goods. The inflation wave was eventually broken when Paul Volker, the head of the Federal Reserve, jacked up short-term interest rates to such a level that the bank prime rate soared to 21%. The recession and high fuel costs sabotaged energy demand, a decline that needed a decade to overcome. Its recovery was helped by the collapse of oil prices when Saudi Arabia moved to teach its wayward fellow OPEC

Albertans, who controlled the lion's share of the country's oil, felt the NEP was a federal intrusion into their governing affairs

members who refused to cut their production as prices fell, after having been left the chore of cutting their production to support the organization's oil price. That collapse in oil prices nearly destroyed the entire oil industry.

In Canada, the NEP, which controlled oil prices, raised taxes and royalty rates, alienated the western provinces so much that the country's continued unity was questioned. Energy policy was supposedly the responsibility of the provinces. Therefore, Albertans, who controlled the lion's share of the country's oil, felt the NEP was a federal intrusion into their governing affairs. The economic boom in Alberta that followed the rise in oil prices was cut off and the economic health of the oil business was pressured by both low oil prices and higher taxes and other tax-law changes that reduced company profitability. As the 1980s unfolded, support for the NEP, along with that for Pierre Trudeau, ebbed and led to the election of the Progressive Conservative Party headed by Brian Mulroney with the support of Western Canada after he campaigned against the NEP. It eventually required two and a half years of this new government before the last vestiges of the NEP were eliminated. The dislike of Pierre Trudeau was engrained in the conscience of western Canadians and remains there for many older citizens today.

Is it any wonder why Canadian oilfield spending and activity have imploded taking thousands of energy jobs with them?

The election of the younger Trudeau has conjured up images of a NEP II for Albertans. Given the problems the province's energy companies currently face due to weak global oil prices, depressed U.S. natural gas prices, limited access to world markets for the province's oil and gas output, increased environmental regulations, higher Alberta corporate taxes and the prospect for higher royalties, is it any wonder why Canadian oilfield spending and activity have imploded taking thousands of energy jobs with them? While the Canadian energy companies are benefiting from a favorable exchange rate with the U.S., solving structural industry problems will require time and the support of both the provincial and federal governments. That prospect looks about as likely as a July snowfall in downtown Calgary.

We wonder whether his support of Keystone was a campaign strategy to garner Conservative votes in Alberta

During the election campaign, Justin Trudeau embraced his party's environmental policies, although he wavered somewhat by indicating support for TransCanada's (TRP-NYSE) Keystone XL pipeline to haul oil sands output south to the U.S. Gulf Coast. He did stand by his party's objection to Enbridge's (ENB-NYSE) Northern Gateway pipeline for moving Alberta oil sands output to the coast of British Columbia. His opposition to Northern Gateway is due to its route through the Great Bear rainforest ecological area along the northern coast of B.C. We wonder whether his support of Keystone was a campaign strategy to garner Conservative votes in Alberta since he probably counts on U.S. President Barack Obama rejecting the construction permit making Mr. Trudeau's support a moot point.

Exhibit 4. Canada Needs More Oil Export Capacity

Source: *Wikipedia.com*

“We need to get those resources to market, whether it is Energy East, whether it is a western pipeline, whether it is Keystone XL because the alternative is more rail cars carrying oil, which nobody wants across the country.”

Without further clarity, Canadian oilmen will remain skeptical of Mr. Trudeau and question whether, when all is said and done, the oil and gas industry will be set back by government policies much as it was during his father’s period as prime minister

With respect to Energy East, the 4,600 kilometer (2,858-mile) pipeline designed to move 1.1 million barrels per day of oil sands output from Alberta and Saskatchewan to refineries and terminals in Eastern Canada, it appeared that Mr. Trudeau was supportive of the project. However, on a CBC Radio show in late July, when questioned about his support for Energy East, Mr. Trudeau said that was “incorrect” as the pipeline is going through an approval process, which he characterized as “torqued and flawed by [Prime Minister Stephen] Harper...” Mr. Trudeau went on to highlight his view of the dilemma facing Canada and what it needs to do. He said, “We need to get those resources to market, whether it is Energy East, whether it is a western pipeline, whether it is Keystone XL because the alternative is more rail cars carrying oil, which nobody wants across the country.”

Mr. Trudeau is scheduled to inaugurate his cabinet on November 4 and shortly thereafter head to an economic meeting of world leaders. He will then lead Canada’s delegation to the Paris climate change conference at the end of November where he will lobby for green-energy policies. Although Mr. Trudeau recognizes the greater environmental risk of carrying oil in rail cars rather than moving it more safely by pipeline, his selective support for the various export pipeline projects leaves one to wonder how hard he will fight to ensure that Canada can increase fossil fuel exports. Without further clarity, Canadian oilmen will remain skeptical of Mr. Trudeau and question whether, when all is said and done, the oil and gas industry will be set back by government policies much as it was during his father’s period as prime minister.

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