
MUSINGS FROM THE OIL PATCH

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Allen Brooks
Managing Director

Note: Musings from the Oil Patch reflects an eclectic collection of stories and analyses dealing with issues and developments within the energy industry that I feel have potentially significant implications for executives operating and planning for the future. The newsletter is published every two weeks, but periodically events and travel may alter that schedule. As always, I welcome your comments and observations. Allen Brooks

Survey: Those Four Famous Words May Be Right This Time

The message those words convey is that past cycles or past patterns of behavior no longer hold, at least when people contemplate what appears to be a different environment

For most of the past three years this view of a new world was reinforced, only to be challenged in the past six months

“This time is different.” Those four words are often referred to as the most dangerous four words in use, especially in the investment business. The message those words convey is that past cycles or past patterns of behavior no longer hold, at least when people contemplate what appears to be a different environment. Most recently, a popular business book by economists Carmen Reinhart and Kenneth S. Rogoff, titled [This Time Is Different: Eight Centuries of Financial Folly](#), profiled the history of financial crises dating from England’s 14th century default to the 2008 U.S. sub-prime financial crisis. The conclusion of the study, based on a new dataset that spanned the world’s economic history, concluded that the recent U.S. sub-prime mortgage crisis was hardly unique, despite the media and politicians proclaiming it to be something new and unheralded. Summing up their study, the economists wrote: “More money has been lost because of four words than at the point of a gun. Those words are ‘This time is different.’” Some of those losses occurred in the oil and gas industry when people believed that the then-current environment was different. Will it happen again?

When Robert Dudley, CEO of BP plc (BP-NYSE) spoke of preparing his company for a “lower for longer” oil price environment at the start of 2015, people wondered whether he was falling victim to those famous four words. When the anticipated quick oil price rebound following OPEC’s decision to abandon its effort to manage the world’s oil market failed to materialize, people began to treat Mr. Dudley’s warning to prepare for a different energy world as the new wisdom. For most of the past three years this view of a new world was reinforced, only to be challenged in the past six months as rising oil prices have restarted drilling, which is leading to higher oil production from those countries that are not under the control of governments aggressively managing their national output.

The recovering oil industry is now raising questions about the sustainability of the recent mantra being pushed within the community for “increased capital discipline”

The recovering oil industry is now raising questions about the sustainability of the recent mantra being pushed within the community for “increased capital discipline.” The push by institutional investors to convince oil and gas company managements to abandon their historical approach to growing their companies through reserve and production increases at any cost became extremely strong late during the summer of 2017. Investors wanted new management plans that favored limiting capital spending on new oil pursuits, while also pledging to use some of the growing cash flows to reduce balance sheet debt and return money to shareholders in the form of share buybacks and/or dividends. This new vision for the oil business was foreseen as the ticket to higher company share valuations. For the oil and gas industry, these plans are the epitome of embracing those famous four words.

Companies that haven’t adopted this mantra are finding their share prices lagging

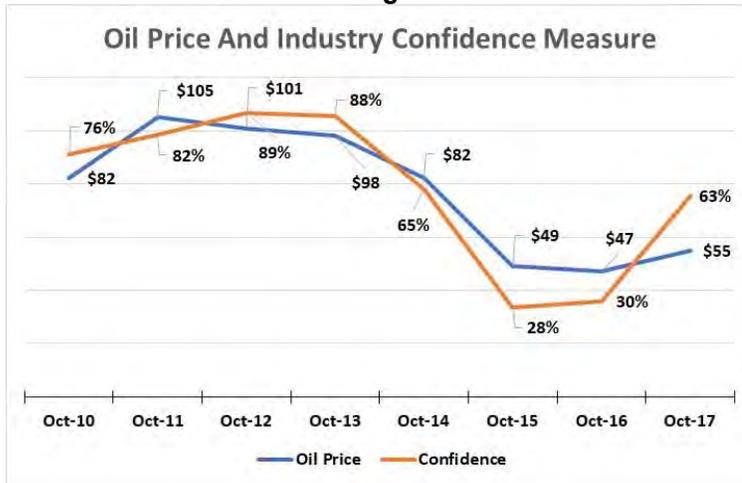
A new survey by global quality assurance and risk management company DNV GL appears to show that these famous four words are gaining traction and changing attitudes within the worldwide oil and gas business. Not every company is adopting the mantra of increased capital discipline, but the changing conditions within the oil and gas business, as well as changes to the overall energy market, are coming at the same time there is a sharp rise in industry confidence about the near-term future. Companies that haven’t adopted this mantra are finding their share prices lagging further behind their brethren who are demonstrating capital discipline. However, it is the role of oil and gas companies in the energy market of the future where this capital discipline mantra’s greatest impact may be felt.

The initial observation was the return of optimism about the future

Turning to the survey, DNV GL retained two research firms to interview 813 senior industry professionals and executives, as well as having 15 in-depth interviews with a range of experts, business leaders and analysts. The interviews were conducted during last October and November. The initial observation was the return of optimism about the future among those surveyed. In fact, the percentage of senior executives who are confident about growth in the industry has doubled in the past year – although, it still trails the euphoria existing before the 2014 downturn. An auxiliary observation was that a significant proportion of the industry intends to increase investment - both in its core business and also in diversification opportunities, R&D and digitalization.

The improvement in industry confidence was attributed to two factors. One was oil and gas prices. The other was costs, both operating and investment costs. Based on analyses from the survey responses, DNV GL concluded that the second factor – reduced costs – has been key to the current attitude improvement. DNV GL suggested that the improvement raised several critical questions for further investigation, such as: “How much is the industry encouraged by a strong belief in the impact and sustainability of new cost models and discipline?” According to Edward Morse, global

Exhibit 1. Confidence Growing Faster Than Oil Price Rise



Source: DNV GL, PPHB

“The confidence and stability we are seeing are deceptive”

head of commodities research at Citigroup (C-NYSE), “The confidence and stability we are seeing are deceptive.” He goes on to cite the problem that high oil prices are bringing, which is an increase in capital spending that will boost output and quickly put the industry at risk of another supply surplus, especially if, and when, OPEC and Russia decide to bring more oil supply into the market to attempt to regain any market share they are losing to the new supply sources, likely from U.S. shale oil producers.

43% of the companies it studied recently had hedged 25% of their 2018 output at \$53.40

While oil prices are rising, and now exceeding the projected annual price estimates from the leading energy information firms – Energy Information Administration (EIA) and International Energy Agency (IEA) – the industry is welcoming the higher prices and clamoring for more. As data from IHS Markit pointed out, 43% of the companies it studied recently had hedged 25% of their 2018 output at \$53.40 a barrel. These companies are likely leading the cheers for even higher oil prices to help offset the \$10+ per barrel income they are losing by having made this hedging bet.

Several observations about current oil prices and activity were reported in the study. Mr. Morse noted that “I think it is noteworthy that large integrated companies have resumed deepwater exploration activity. This is a sign that they are content that prevailing prices and lower structural costs will persist.” Again, reflecting the changing role of the largest oil and gas companies, Goldman Sachs (GS-NYSE) pointed out that over the past three years, seven of the largest companies have initiated 90% of the mega-projects, which compares with the 50 companies that accounted for the largest projects over the prior decade. This shift in who is driving the largest oil and gas projects reflects the impact that organizational cost cutting and low oil prices have had on the participation appetite of smaller companies in mega projects. This is

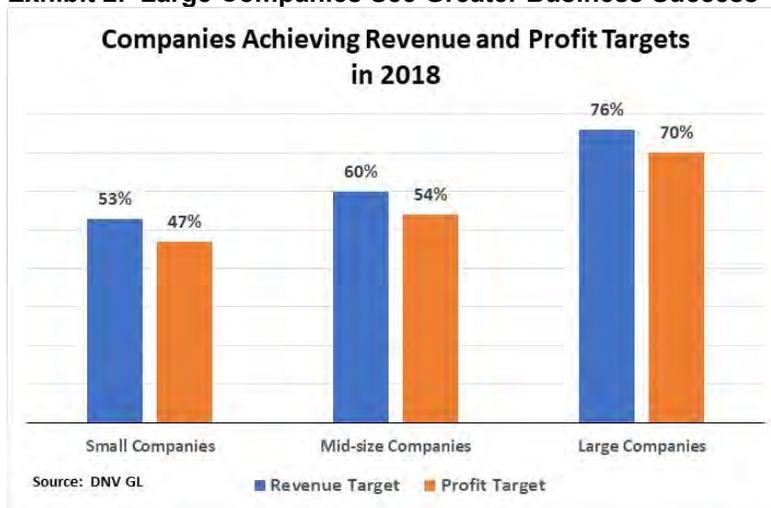
Shell had successfully shifted its culture from “engineering wonders” to “financial outcomes”

a return to the environment that existed during the 1990s, when extended low oil and gas prices crimped the activity of smaller companies and left the majors - who were busy transforming themselves into super-majors - to drive industry activity.

Amplifying this shift were comments from Royal Dutch Shell (RDS.A-NYSE) CEO Ben Beurden at the time the company announced it would resume paying cash dividends. He explained that Shell had successfully shifted its culture from “engineering wonders” to “financial outcomes.” While Mr. Beurden attributes the ability to make the shift to a “deep transformation in our ways of working,” we wonder how much of the change can be attributed to the refocusing of Shell from oil to natural gas following its acquisition of BG Group?

Another interesting data point arising from the survey was that 76% of large companies expect to reach their revenue targets in 2018, and 70% expect to achieve their profit goals. These high percentages contrast with those of smaller companies, where only 53% expect to reach revenue goals and 47% to hit profit targets.

Exhibit 2. Large Companies See Greater Business Success



Source: DNV GL, PPHB

44% of respondents say their organization is actively preparing for a transition to a less carbon-intensive energy mix

All of these data points and conclusions are important for understanding the oil and gas industry recovery currently underway. However, we were more intrigued with the analyses of the responses to questions dealing with longer term trends impacting the oil and gas industry. The primary shift relates to an energy transition. The survey showed that 44% of respondents say their organization is actively preparing for a transition to a less carbon-intensive energy mix. That is nearly double the 27% who are not preparing for such a transition, with 29% unsure or neutral about the issue. Isn't this a critical consideration that oil and gas industry executives need to be considering? That is what executives get paid to think about.

Exhibit 3. Energy Transition Growing In Strategies

Source: DNV GL, PPHB

Erik Wærness, senior vice president and chief economist at Statoil AS (STO-NYSE) commented about the energy transition underway:

“I think there’s an increasing feeling that we are facing the start of an energy transition. That makes decision-makers and the industry more cautious than they would be if this had been a normal boom-bust type of cycle.”

“That makes decision-makers and the industry more cautious”

This caution is creating a problem according to GNV GL, which sees industry leaders as having to deal with doing things differently in the near-term, while also reassessing their long-term strategies, making for a new series of hard decisions.

86% of respondents expect natural gas to become an increasingly more important part of the global energy mix over the next decade

One response to these choices is to increase a company’s focus on natural gas and liquefied natural gas (LNG). Shell made natural gas its priority with the BG purchase. Total (TOT-NYSE) invested heavily in Iranian natural gas in 2017. Mitsui & Co. (TYO:8031), the large Japanese trading company, has shifted its focus from crude oil to natural gas as Asian demand increases. In 2017, of the seven projects BP completed, six were natural gas focused. All of these corporate strategic moves are supported by data showing that 86% of respondents expect natural gas to become an increasingly more important part of the global energy mix over the next decade. That interest is higher than the 77% who were so inclined last year. Reportedly, some of that increased interest in natural gas is being driven by air pollution issues in Asia.

“The business case is proving increasingly attractive”

Equally as significant for the increased interest in natural gas is the growing interest in diversification into renewable energy. “The business case is proving increasingly attractive,” said Brian Sullivan, executive director of IPIECS, the global oil and gas industry association for environmental and social issues. This helps explain why 38% of survey respondents expect to increase their renewable

energy investments in 2018, up from 27% last year. Some of these investments may be perceived as “risk sharing” moves, but they can become platforms for new business initiatives.

Exhibit 4. Impact Of Shale On Industry Drilling Strategy



Source: DNV GL, PPHB

As the role of the largest companies in the global oil and gas industry grows, their strategy shifts will likely have a greater impact on overall business trends than in earlier periods

The growing percentages of respondents who expect more natural gas and renewables in their business plans in the future is a statement about the shifting nature of the energy business. Many energy industry executives understand that current crude oil prices may be precariously supported by the withdrawal of supplies by OPEC and Russia, and that the recent oil price increase might work to boost output from other oil suppliers while also reducing global oil demand. Not only may oil prices work to unseat the current oil price recovery, but the shift to electric vehicles (EV), which a number of forecasters see happening sooner rather than later, may further accelerate the adverse impact on oil demand. Based on a new EV forecast by Bank of America-Merrill Lynch (BAC-NYSE) investment analysts, they see a more rapid growth of EVs contributing to a peak in oil demand by 2035. Bank of America now joins Shell and oil consultant Wood Mackenzie with such an outlook. Although a 2035 peak in oil demand may not bother independents and small to mid-sized oil companies as they may be out of the business by then, the majors and super-majors need to contemplate such a development in their business future. As the role of the largest companies in the global oil and gas industry grows, their strategy shifts will likely have a greater impact on overall business trends than in earlier periods.

The uncertainty about the route - but not the destination - will work to keep much of the oil and gas industry from sharply ramping up its capital spending

As Mr. Morse of Citigroup put it, “Momentum is gradually building towards making decarbonization of the energy system a higher priority, but there is still a lot of uncertainty about how we will get to that desired outcome.” The uncertainty about the route - but not the destination - will work to keep much of the oil and gas industry from sharply ramping up its capital spending. Going forward, future annual spending increases are likely to be modest. Spending will increasingly be tilted in favor of natural gas projects. More

“Partly because there are strong investment opportunities outside oil and gas, and partly to position themselves for a changing future”

importantly, those investments will be competing against increased spending for renewables. Over time, these spending trends will alter the tilt of the industry, and potentially its power structure.

Two observations in the survey highlight how the oil and gas industry is changing for the future. Given the long-term energy transition underway, the observations of Maria Moræus Hanssen, CEO of international oil and gas exploration company DEA Deutsche Erdoel AG, provide insight into the future for the major and super-major companies in the business. She said, “The majors will turn into energy companies – they will broaden their portfolios. Partly because there are strong investment opportunities outside oil and gas, and partly to position themselves for a changing future.”

Liv Hoven, CEO, DNV GL – Oil & Gas, stated, “The winners in our industry this year are those who can continue to make a clear shift from an expansion mindset to a margin mindset, and recognize the importance of implementing new models and technologies to improve operational efficiency.” That statement would seem to support the use of those famous four words, at least for the near-term, in operating businesses. There will always be a pull to return to what everyone considers “normal” for the business, but exactly what will be considered “normal?”

If that translates into higher corporate valuations, then the managers will begin to believe that “this time is different”

Near-term rewards for exercising capital discipline, coupled with growing pressure from increased energy efficiency, inroads from renewables and greater competition from low cost international oil suppliers are likely to make industry executives more cautious. If that translates into higher corporate valuations, then the managers will begin to believe that “this time is different.” Whether those famous four words carry any weight for the energy business in the long-term will require a much longer time frame to assess. We hope the phrase does mark a cultural change for the oil and gas industry. Current trends suggest we may find out our answer to this question sooner rather than later.

We Will Be Saved By Millennials, EVs and AVs – Really?

The role of transportation in decarbonizing our economy was a topic considered during a seminar focused on “A Sector in Transition: Transportation In The 21st Century” at the Baker Institute Center for Energy Studies, which co-sponsored the event with the Massachusetts Institute of Technology’s Center for Energy and Environmental Policy Research. A panel of economists and an executive involved in the Texas high-speed rail line between Houston and Dallas explored the future of transportation. In considering the typical road map for how the planet and the world’s economy will be saved by restructuring our transportation sector, Dr. Christopher Knittel from MIT dismantled the assumptions underlying that view.

One of the great mysteries about Millennials is why they are not buying cars and driving at the same rates as previous generations

In 2010, adults between the ages of 21 and 34 bought just 27 percent of all new vehicles sold in America, down from the peak of 38 percent in 1985

“What if Millennials’ aversion to car-buying isn’t a temporary side effect of the recession, but part of a permanent generational shift in tastes and spending habits?”

The road map cited by Dr. Knittel assumes that Millennials will save us because their rejection of the accoutrements considered necessary to enjoy “the good life” means fewer vehicles and less pollution. A corollary to the Millennials as saviors is that electric vehicles (EV) will help save us since they generate fewer carbon emissions. And lastly, we will be saved by autonomous vehicles (AV) as they will lead to less CO₂ and save lives. If we follow this road map, we will wind up in a world where people mostly live in urban areas and depend on ride-hailing services populated with AVs for moving around.

There has been much attention paid to the Millennial-generation, the world’s largest population segment. Millennials are very different from the Silent and Baby Boomer generations, which have been the primary driving force behind the creation of today’s economy and society. One of the great mysteries about Millennials is why they are not buying cars and driving at the same rates as previous generations. Is it because they are embracing a different culture, which favors other forms of interaction and attitudes? A column in late 2011, followed by an article in 2012, in *The Atlantic*, attempted to explain why their relationship with the car had changed. The article was titled “The Cheapest Generation,” which seemed to sum up what was driving the new attitude of Millennials towards automobiles.

One paragraph early in the article crystalized the conundrum confronting the automobile industry:

“Don’t blame Ford. The company is trying to solve a puzzle that’s bewildering every automaker in America: How do you sell cars to Millennials (aka Generation Y)? The fact is, today’s young people simply don’t drive like their predecessors did. In 2010, adults between the ages of 21 and 34 bought just 27 percent of all new vehicles sold in America, down from the peak of 38 percent in 1985. Miles driven are down, too. Even the proportion of teenagers with a license fell, by 28 percent, between 1998 and 2008.”

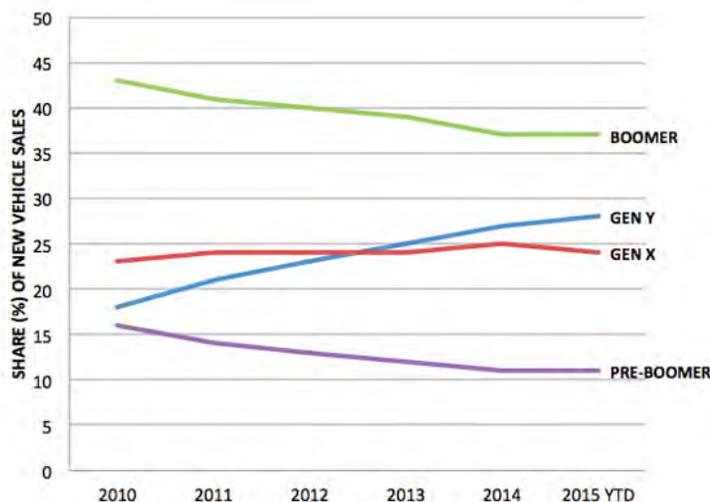
The article went on to explore the spending of Millennials, especially with respect to houses and autos. The authors used the data to explore the question being posed by auto manufacturers who were worried about changed attitudes among what will become their customer base for decades: “What if Millennials’ aversion to car-buying isn’t a temporary side effect of the recession, but part of a permanent generational shift in tastes and spending habits?” The authors questioned whether high gasoline prices, embracing urban living, stagnating wages and new technologies that allowed different interactions and consumption had fundamentally changed the game for Millennials.

Millennials’ purchases of new cars reached 27%, more than Generation X, and second only to the Baby Boomers

The success of Zipcar, the largest, at the time, supplier of autos on 250 college campuses that allowed students to rent and use a car for very small time periods, was touted in the article. It signaled the advent of the now dominant ride-hailing services. At the same time, social research was focusing on the critical badge of honor of being known as a “tech” person, which helped to explain the skyrocketing demand for smart phones and new apps. These trends were extremely disturbing for auto company executives, especially those involved in marketing new cars.

Nearly four years later, one of the authors of that earlier article wrote a follow-up piece titled, “Millennials: Not So Cheap, After All.” It was written in response to data from the auto industry chronicler, J.D Power, showing that Millennials’ purchases of new cars reached 27%, more than Generation X, and second only to the Baby Boomers. The author, shocked and upset about his earlier projection being wrong, sought the data from J.D. Power in hopes of finding something to support his and his partner’s earlier conclusions.

Exhibit 5. Millennial Car Purchase Rate Gaining On Boomers



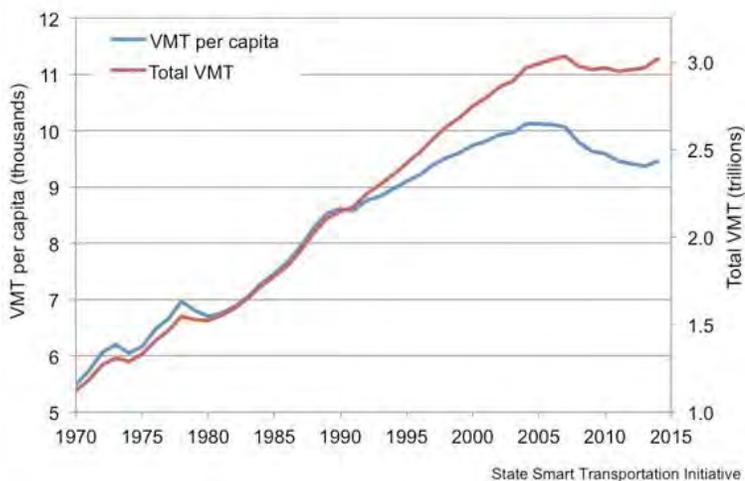
Source: *The Atlantic*

The data showed that not only were Millennials buying cars at a faster clip than Baby Boomers, but their share of new car sales was rising in an almost straight line. While wrong about Millennials’ car buying habits, it did seem as though the prediction that they would drive less was holding up when vehicle miles traveled (VMT) per capita were considered.

Millennials now own 0.4 cars per household more by age category than did Baby Boomers

Taking off from the various observations and conclusions from the two magazine articles, and after performing additional statistical tests, Dr. Knittel found that Millennials now own 0.4 cars per household more by age category than did Baby Boomers. This is

Exhibit 6. Millennials Appeared To Travel Less In The Past



Source: *The Atlantic*

Marriage has just been delayed and not abandoned – and, with that delay, so too were consumer purchases of things like houses and cars

certainly counter to the popular media view and somewhat surprising. Recent analysis of the VMT data also shows that Millennials and Baby Boomers drove similar amounts when the data is adjusted for age. What explains the misconceptions from earlier years? Simple - the Millennials came of age at the time of the Great Recession, which meant their being cheap was directly related to a lack of jobs and money. That recession set back in time the traditional lifestyle changes that each generation has undergone. Dr. Knittel provided an interest data set showing that 18-25 year old Millennials were 23% less likely to be married, but in the 26-30 age grouping, that lag was down to 15%, and for 31+ year old adults, it was only down 5%. In other words, marriage has just been delayed and not abandoned – and, with that delay, so too were consumer purchases of things like houses and cars.

The current Department of Energy battery cost target for 2020 of \$125/kWh equates to an oil price of \$110 per barrel

With respect to being saved by EVs, Dr. Knittel showed research demonstrating that the equivalency between battery electric cars (BEV) and internal combustion engine (ICE) cars is impacted by the cost per kilowatt hours of batteries. He cited Tesla’s (TSLA-Nasdaq) claim that its battery costs \$150 per kilowatt-hour (kWh) of power, which MIT’s research suggests is really more like \$200/kWh. Without some major breakthrough in battery technology, or oil prices soaring beyond previous peak levels, ICE cars are going to be cheaper than BEVs for a long time. The chart of the comparative prices of battery power versus crude oil is shown in Exhibit 7, on page 12. The current Department of Energy battery cost target for 2020 of \$125/kWh equates to an oil price of \$110 per barrel. The authors of that report are students of Dr. Knittel, so he oversees their research. And, the latest research still shows a wide price gap in favor of ICE cars. Battery technology is a critical issue the current MIT mobility study is wrestling with as it works on a new report about EV economics, according to Dr. Knittel.

He believes that if you can show tangible technology to those drivers who are not connected, they will embrace the new technology

In the 2016 paper Dr. Knittel co-authored, it was pointed out that most comparisons between battery costs and ICE vehicles is between future EV costs and current ICE vehicles. The authors argued that the comparisons need to be about future costs for both, which will not ignore the steady progress ICE cars have made in reducing pollution and boosting fuel efficiency. According to the authors, barring some technological change, EVs will not save us.

We heard a contrary view during a mobility panel discussion held at the Washington, D.C. Auto Show, and hosted by *Politico*. Gov. Rick Snyder of Michigan (R) said that technology is not the issue - it's the people and their attitudes. He believes that if you can show tangible technology to those drivers who are not connected, they will embrace the new technology. He bases that vision on his belief that we are having a generational change in automobile attitudes, which he equates with the growth of ride-hailing services. He cited a RAND study that argued that the technology should be deployed rapidly even if not perfect. He acknowledged that the auto companies disagreed, but believes that by using programmed routes in controlled areas the technology can be made to work and that it will win over the skeptics. (We remember Citibank's experiment with robot mail delivery machines in the late 1970s, which turned into a disaster. This was at the same time the bank required all employees to only use the new automated teller machines for their personal banking – a company rather than government mandate - to help promote the new technology.)

AVs would eliminate accidents saving the nearly 1.3 million lives lost worldwide due to vehicle crashes, of which, 90% are due to human error

The thrust of the panel was on the safety that comes with AV technology. Statistics quoted reported that AVs would eliminate accidents saving the nearly 1.3 million lives lost worldwide due to vehicle crashes, of which, 90% are due to human error. (Wonder how many of them would be eliminated if we banned cell phones?) The ability of AVs to open up mobility to restricted population groups – very young, elderly, handicapped and those living where no public transportation exists – is a wonderful thing the presenters said. While a positive, it also signals that vehicle miles traveled (VMT) will grow as more people are empowered with personal transportation. Another question asked was whether AVs would add to urban sprawl or increase density. No one knows, let alone which of the two options is preferable.

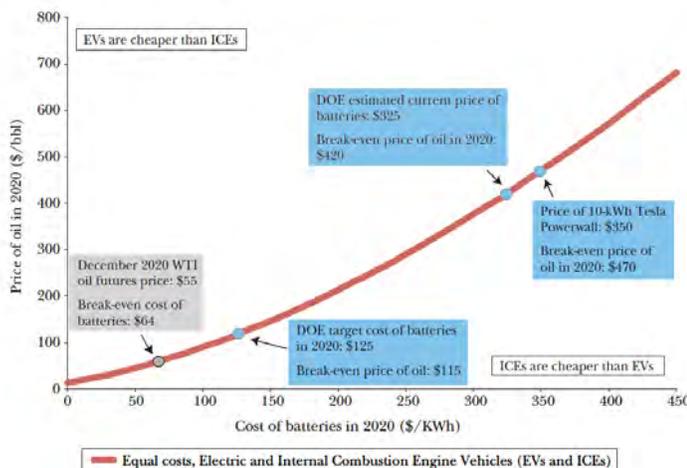
It is clear that the debate over EVs and AVs will go on. We will probably only have an inkling of success in meeting the hype after we are well down the road to mass introduction. How far down the road we need to go likely depends on how large are the blinders that we are forced to wear.

In the case of AVs, while they allow the reduction in road size because of vehicle spacing requirements and the ability to right-size the vehicles (no accidents means smaller and lighter vehicles), they

There are many questions about how AVs in ride-sharing applications will operate

will promote convenience and thus more VMT. There are many questions about how AVs in ride-sharing applications will operate – constantly circulating awaiting requests, or going to a central

Exhibit 7. Oil To Battery Oil Equivalency Prices Much Higher
Break-even Oil and Battery Costs



Source: Knittel.world.com

Yes, transportation is going through change, but the change is likely more evolutionary than revolutionary

station? Dr. Knittel wondered how tolerant people will be over wait-times compared to having their own vehicle readily available. There is also a question about how AVs will handle riders changing their mind about destinations?

As a data-driven researcher who focuses on what the trends are telling, and not one to make long-term forecasts, Dr. Knittel said he cannot see EVs and/or AVs becoming our climate savior anytime soon. He also sees that Millennial auto buying trends haven't declined compared to earlier population segments as thought earlier, but, rather, that they are growing and have merely been delayed due to the onset of the Great Recession and its slow recovery. Yes, transportation is going through change, but the change is likely more evolutionary than revolutionary. If correct, that may mean a less radical impact on energy demand.

January Cruel To Natural Gas Although Good For Crude Oil

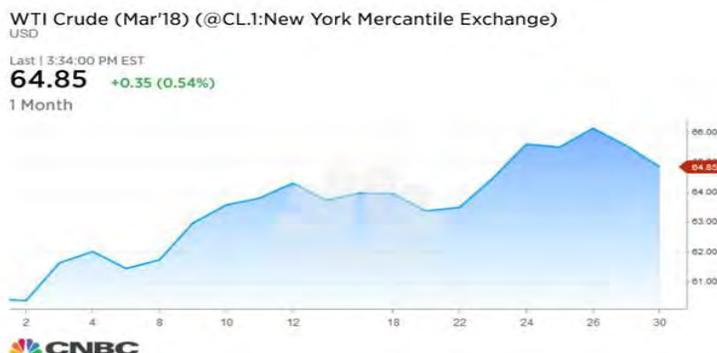
If the stock market is up over the course of January, there is a very high likelihood that the market will end up higher by the end of the year

In the investment world there are a number of statistical myths tied to the stock market's performance during January and how it is a precursor for performance for the remainder of the year. People look at how the overall market does during the first five trading days as one indicator. A more famous indicator – the January Barometer - was developed by Yale Hirsch, author of the *Stock Trader's Almanac* in 1972. According to this measure, if the stock market is up over the course of January, there is a very high likelihood that the market will end up higher by the end of the year.

Many money management professionals live by that guide, but Mark Hulbert, the author of the *Hubert Financial Digest* and a senior columnist for *The Wall Street Journal*, wrote critically about this measure in a column last year. According to Mr. Hulbert, "...the January Barometer has been right only 64% of the time since 1972. For a sense of how faulty that is, consider this: If there was a rule that simply predicted the market would go up every year, it would have been right 76% of the time over the same period." As expected, Mr. Hirsch's son, who now runs his father's publication, fired back that his data says it gave an 86.4% accuracy since 1950.

These claims progressed into an analysis of data mining – cherry picking data and measurement calculation – to support one's conclusions. Leaving that debate aside, the January Barometer lore will quickly fade as the calendar turns to February. The next calendar phenomenon is not the Ides of March, but rather, the month of October, known for its market routs. But does January tell us anything about future oil and gas prices? In a word, no.

Exhibit 8. How Crude Oil Futures Traded In January



Source: CNBC.com

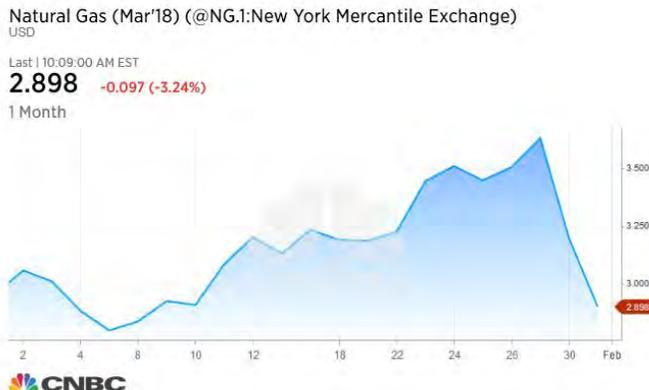
What we do know about January, now that commodity trading is complete, is how it favored crude oil but teased natural gas traders, before delivering a devastating blow in the final two days of the month

What we do know about January, now that commodity trading is complete, is how it favored crude oil but teased natural gas traders, before delivering a devastating blow in the final two days of the month. Crude oil futures for the month of January rose 7% to nearly \$65 a barrel for West Texas Intermediate (\$64.73). Oil prices were helped by sharp drawdowns of U.S. oil storage, a weaker U.S. dollar that benefits all commodities priced in dollars, and a high compliance rate with the production cut engineered by OPEC and non-OPEC exporters. Forecasts for a stronger global economic growth outlook have also helped boost demand forecasts for 2018 that underpin expectations for a rapid rebalancing of world oil markets and higher oil prices.

On the other hand, natural gas futures prices fell 2.0% between January 2nd and January 31st. Futures prices for March 2018 natural gas began the month trading at \$3.06 per thousand cubic feet (Mcf).

They finished the month at \$3.00/Mcf. During the month there was some dramatic price action, which highlights the impact short-term weather forecasts can have on the market.

Exhibit 9. How Natural Gas Futures Traded In January

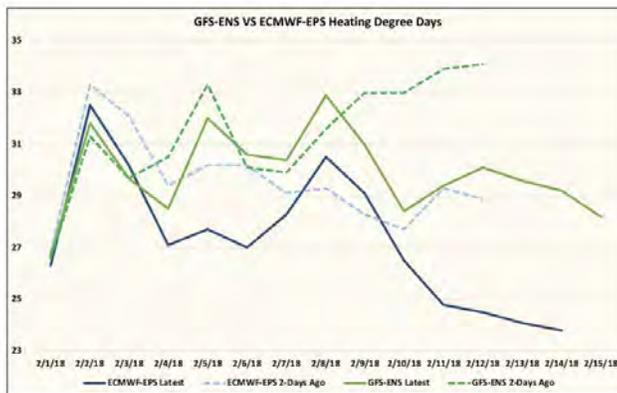


Source: *CNBC.com*

A battle between two different weather forecasters emerged at that point, creating concern among gas traders that the forecasted cold temperatures might not be as extreme or last as long as previously expected

During the first third of January, natural gas prices were on a roller coaster – falling from \$3.06/Mcf on January 2nd to \$2.80 on the 5th, and then rallying strongly, climbing to \$3.20/Mcf on January 12th. Prices then rose more slowly, eventually reaching \$3.22/Mcf on January 22nd. It was at that point that predictions of super cold weather, coupled with several weeks of record, or near record, natural gas withdrawals from storage, caused futures prices to jump to an intraday high of \$3.66/Mcf on January 29th, before closing that day at \$3.63. A battle between two different weather forecasters emerged at that point, creating concern among gas traders that the forecasted cold temperatures might not be as extreme or last as long as previously expected. As a result, gas futures prices collapsed to \$3.00/Mcf 24-hours later.

Exhibit 10. Falling HDD Forecast Destroyed Gas Prices



Source: StormVistaWaModels, HF1 Research

Source: *HFIR Energy*

As trading on February 1st demonstrated, more traders began accepting that there would be fewer heating degree days (HDD) during the next two weeks. March 2018 gas futures prices continued to slide in early trading after the market opened. What the chart in Exhibit 10, on the prior page, shows is how the forecast for fewer future HDDs evolved over the two-day period, sending natural gas futures prices cascading downward.

“It’s not nice to fool Mother Nature”

To understand how powerful the change in the HDD forecast was, look at the solid blue line (Jan. 31 forecast), which declined sharply from the dotted blue line (Jan. 29 forecast). According to the forecasts, for Feb. 11, the difference between the earlier and later forecasts predicted a roughly 15% drop in HDDs. As a result, from the intraday high on January 29th to the close of NYMEX trading on the 31st, the gas futures price dropped 18%. This event reminded us of a 1970s television commercial for Chiffon margarine, which was marketing itself as similar to real butter. The commercial ended with the character portraying Mother Nature stating: “It’s not nice to fool Mother Nature.” Traders caught on the wrong side of weather forecasts might say the same thing.

Auto Executives Survey Offers View Of Market’s Evolution

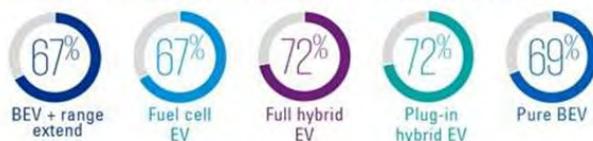
More than half (54%) of the global auto execs who responded to the survey believe pure battery-powered electric vehicles (BEV) will fail commercially

There were some interesting observations by auto executives in the recently released 2018 KPMG Global Automotive Executive Survey. The primary surprise was that more than half (54%) of the global auto execs who responded to the survey believe pure battery-powered electric vehicles (BEV) will fail commercially. Either they are on to something that BEV and transportation mobility forecasters are missing, or they have their heads in the sand. We know what a lot of people would say, but these are the people who are making the decisions about where to invest billions of dollars in new car models, auto technology and manufacturing facilities. Could it be

Exhibit 11. Survey Says Battery Cars To Fail Commercially

More than half of global auto execs say pure battery EVs will fail commercially.

Despite skepticism, automakers are investing in electric powertrains over next 5 years:



KPMG

Source: KPMG

It suggests an automobile market unsure about its future

that much of the hype about BEVs, autonomous vehicles and the mobility-as-a-service model is really lip service being paid to government officials who are instituting policies to demonstrate to their voters that they are doing something about climate change?

The prediction of BEV failure presents an interesting contrast to the execs planning to continue to invest in electric power trains over the next five years. That may be a hedging strategy, but looking at some of the other data points, it suggests an automobile market unsure about its future. The reason given for the failure of BEVs is infrastructure challenges; although, a greater share of the respondents actually believe it will be the continued excessive recharging times.

Outside of the U.S., 50% of the consumers surveyed would opt for a hybrid – hybrid electric (33%) or plug-in hybrid (17%) vehicles

According to the KPMG data, two-thirds of U.S. auto executives believe BEVs will fail commercially, which is much higher than executives elsewhere. The KPMG research polled 1,000 auto executives (90 from the U.S.). The firm also surveyed 2,100 consumers from 42 different countries (182 from the U.S.) to compare their perceptions with those of the auto executives. Only 13% of consumers outside of the United States, and 5% in the U.S., said they would purchase a BEV over the next five years. Consumer preferences present an interesting outlook. Outside of the U.S., 50% of the consumers surveyed would opt for a hybrid – hybrid electric (33%) or plug-in hybrid (17%) vehicles. Some 18% said they would buy an ICE car. In contrast, U.S. customers favored ICE cars (54%), with hybrids (24%) next.

The comments may also point to alternative paths that the global auto and transportation businesses may take, something not receiving sufficient attention, in our opinion

What we found extremely interesting were some of the respondent quotes highlighted by KPMG in the report. They were selected to support the survey's observations. The comments spanned a number of topics related to the global auto market and the shifts underway in the transportation business. They provide perspective on where auto executives see current trends potentially leading and what it may mean for the business. After reading some of the comments, one may wonder about the overall conclusions of the survey. That said, the comments may also point to alternative paths that the global auto and transportation businesses may take, something not receiving sufficient attention, in our opinion. We have provided some of what we considered the most interesting observations with our commentary on their possible implications.

"Fuel cell electric vehicles have replaced battery electric vehicles as this year's #1 key trend until 2025." If true, this would seem to vindicate the dedicated effort of Toyota Motor Company (TM-NYSE) in pioneering and promoting fuel cell development. This fuel is the cleanest option available but lacks sufficient infrastructure, which fortunately California is taking the lead in constructing.

"The flip side of regional shifts: 74% of executives believe that production in Western Europe will be less than 5% by 2030. [2017:

It would not be surprising for that region to become the center of the global automobile industry

65%].” Should this actually happen, it would be surprising, but the observation reflects the economic reality of Europe given its geography and demographics. Much of today’s oil and gas consumption growth has shifted to Asia and other developing regions of the world, so it would not be surprising for that region to become the center of the global automobile industry.

“Of the executives, 74% believe that mixing autonomous and non-autonomous traffic will lead to severe safety issues”

“Almost half (43%) of the surveyed respondents show confidence that half of the car owners they know today will no longer want to own a personal vehicle by 2025.” This trend helps explain why those sponsoring autonomous vehicles and mobility-as-a-service are so enthusiastic about their future. What has gained less attention, however, is that this shift will have unintended consequences, many of which may dramatically alter lives, jobs and city organizations.

“Of the executives, 74% believe that mixing autonomous and non-autonomous traffic will lead to severe safety issues.” It is this fear that should be driving the regulatory efforts at all levels of governments, especially to ease the fear of drivers/passengers in these vehicles. These safety issues will also reverberate within the corporate world as legal responsibilities and obligations must be sorted out and assumed. Industries that have operated traditionally for decades, and some for more than a hundred years, will face challenges about which they are now just beginning to comprehend. Some will successfully make the adjustments necessary to survive and prosper, but others will not. Much like buggy whip manufacturers and typewriter makers, they may disappear or become only shadows of their former selves. But, we would expect new businesses to emerge and grow as exemplified by automobiles and computers.

Moving goods and people in autonomously-driven vehicles may be easier to execute for certain aspects of transportation than others

“57% of all executives say that in the future we will no longer differentiate between the business models for transporting humans and goods.” While this view is shared by America’s Big Three auto companies, executing that vision will take time. With respect to some of the new technologies being developed within the transportation sector, some may only work for moving goods as opposed to people. Moving goods and people in autonomously-driven vehicles may be easier to execute for certain aspects of transportation than others. Platooning of over-the-road trucks between warehouse locations using autonomous technology may be easier to achieve than moving people around cities. These differences offer unique opportunities to develop variations of similar technologies, but the markets may develop at different rates.

We already have autonomous vehicles - they are our public transit systems

“73% of executives are convinced that traditional public transport solutions could be replaced by on-demand autonomous capsules in 10 years’ time.” As some have stated, we already have autonomous vehicles - they are our public transit systems. The only problem is that these trips always require some portion of the journey to be done on foot. If the 73% of executives who believe in this vision

The changes underway in the transportation sector will bring major, and potentially radical, changes to two of the largest and most important industries in the global economy

work hard, it is possible it may come true. However, as stated earlier, many believe that mixing autonomous and non-autonomous vehicles is dangerous, and within 10 years, that will be the reality. Which view will prevail?

We are left with mixed emotions about the data, impressions and conclusions expressed in the KPMG survey. It has often been stated that the changes underway in the transportation sector will bring major, and potentially radical, changes to two of the largest and most important industries in the global economy – automobiles and petroleum. If any energy executive is not paying close attention to what changes are underway in the transportation sector, then they are doing themselves a huge disservice.

California Imposes More Aggressive Vehicle Fleet Transition

This Governor Brown is quite different from the one who served 40 years ago

California Governor Jerry Brown (D) delivered his final State of the State talk two weeks ago. It was short – 30 minutes – but focused on his two pet projects, which are essentially based on one theme: climate change. Gov. Brown, who is in the final year of his fourth term as the state's leader, has become a champion of fighting climate change. This Governor Brown is quite different from the one who served 40 years ago. Now, big public works programs and strong government mandates are the hallmark of Governor Brown, in sharp contrast to the Governor Brown version who served in the 1970s when "small is beautiful" and "lower your expectations" was his governing philosophy.

Gov. Jerry Brown, in his latest iteration, appears to be following in the footsteps of his father with respect to large public works projects

The Brown family – Jerry and his father Edmund G. "Pat" Brown – collectively have served as the head of California for 40% of the past 60 years. Gov. Jerry Brown, in his latest iteration, appears to be following in the footsteps of his father with respect to large public works projects. Unfortunately, one of Pat Brown's signature projects is at risk of failing, and Jerry Brown's two projects are floundering badly. The Oroville Dam, a key part of Pat Brown's water system plan, nearly collapsed this past summer, and an expert panel has concluded that the dam was poorly designed, poorly constructed and poorly maintained. Its condition means that hundreds of millions of dollars of state funding will need to be spent to shore it up.

That is because the \$15 billion cost of the project is considered too expensive

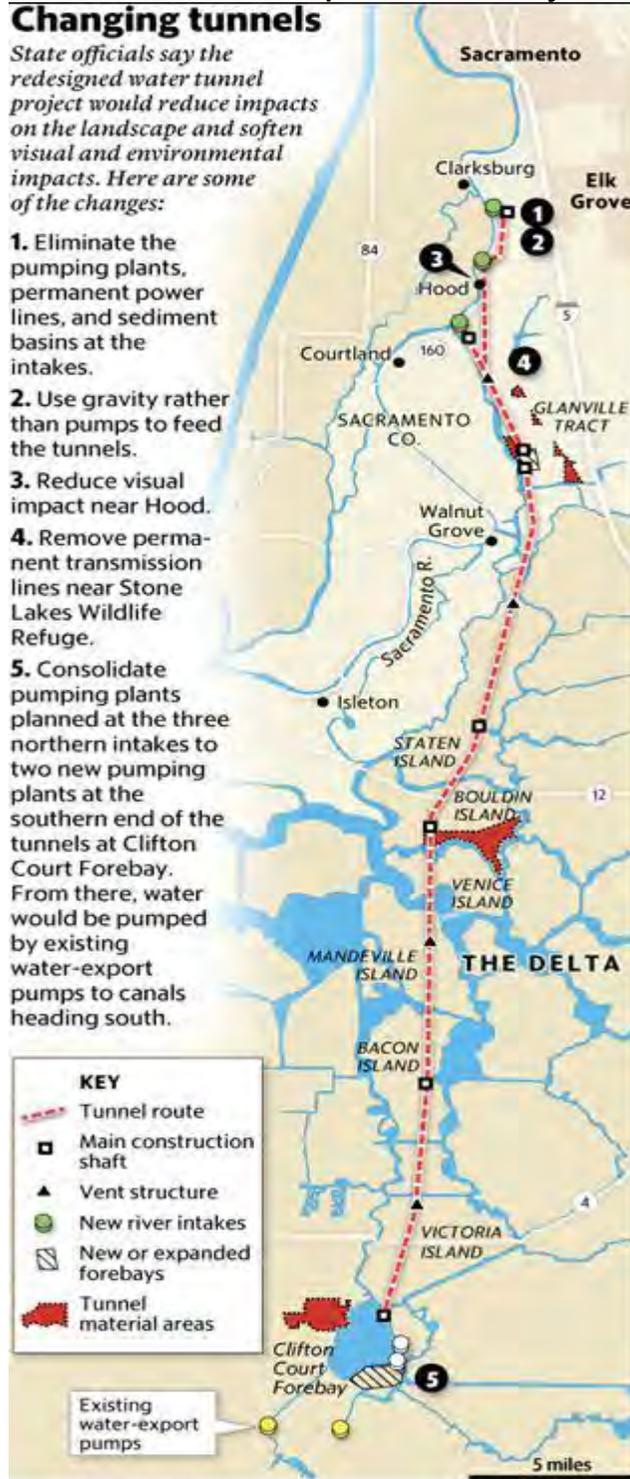
In Jerry Brown's case, his twin tunnels and pipeline project for moving water through the Sacramento-San Joaquin River Delta, east of San Francisco, to central and Southern California (essentially finishing the state water project his father began), has become toxic for many municipalities that would benefit. That is because the \$15 billion cost of the project is considered too expensive. As a result, the California Department of Water Resources is contemplating scaling the project back to only a single tunnel, in hopes that by reducing the project's cost it can attract defecting municipalities back to support it.

Exhibit 12. Water Development Plan Is Very Costly

Changing tunnels

State officials say the redesigned water tunnel project would reduce impacts on the landscape and soften visual and environmental impacts. Here are some of the changes:

- 1.** Eliminate the pumping plants, permanent power lines, and sediment basins at the intakes.
- 2.** Use gravity rather than pumps to feed the tunnels.
- 3.** Reduce visual impact near Hood.
- 4.** Remove permanent transmission lines near Stone Lakes Wildlife Refuge.
- 5.** Consolidate pumping plants planned at the three northern intakes to two new pumping plants at the southern end of the tunnels at Clifton Court Forebay. From there, water would be pumped by existing water-export pumps to canals heading south.



Source: California Natural Resources Agency The Sacramento Bee

Source: California Natural Resource Agency

But the bad news is that this construction project, which was originally estimated to cost \$6 billion, then jumped to \$8 billion, and now is being estimated to cost \$10.6 billion

The other pet project, a high-speed rail line from San Francisco to Los Angeles, is also struggling. Construction has already begun on 119 miles of track in the San Joaquin Valley, from Madera to near Bakersfield. The current section of the rail line is often referred to as a train to nowhere, since neither terminus is near a population center. But the bad news is that this construction project, which was originally estimated to cost \$6 billion, then jumped to \$8 billion, and now is being estimated to cost \$10.6 billion. The original cost was supposed to be financed from a federal grant and state bonds. Now that the project's cost is being hit with rising construction and higher land acquisition costs, the estimated total expense is north of \$70 billion. As the cost could easily be much greater, there is no feasible plan to finance the project.

Exhibit 13. High-speed Rail Will Be Very Expensive



Source: *New York Times*

To put at least five million ZEVs on California's roads by 2030

Undeterred by the problems being experienced by these two very expensive public works projects, Gov. Brown launched an even more aggressive zero emission vehicle (ZEV) program in keeping with his goal to be considered the foremost governor dealing with climate change. In his State of the State talk, Gov. Brown announced his plan, following up with an executive order the next day, to put at least five million ZEVs on California's roads by 2030, as well as ordering all state entities to work with the private sector to

Approximately half of all ZEVs in the nation are sold in California

spur construction and installation of 200 hydrogen fueling stations and 250,000 ZEV chargers, including 10,000 direct current fast chargers, by 2025. To achieve this goal, Gov. Brown's administration is pledging to spend \$1.5 billion to continue the subsidization of Californians' purchases of ZEVs.

According to the governor's executive order, California has increased the number of ZEVs on the state's highways from 25,000 in 2012 to more than 350,000 now. ZEVs now account for approximately 5% of all new car sales in California, making it the largest such market in the United States. Approximately half of all ZEVs in the nation are sold in California. Given the size of the California vehicle market, and the requirement that auto manufacturers must sell ZEVs in the state to be able to sell any other type of vehicle there, it is no wonder that the car companies are willing to dance to the governor's music. In order to reach Gov. Brown's target for ZEV sales and the number on the road, it is estimated that 40% of vehicle sales in 2030 will have to be ZEVs, meaning an eightfold increase over the current sales rate.

Exhibit 14. A Long List Of Government Support For EVs

State policies promoting battery electric vehicle sales

Electric vehicle purchase incentives	EV use and ownership incentives	Waivers on access restrictions
<ul style="list-style-type: none"> • California • Colorado • Connecticut • Delaware • DC • Louisiana • Maryland • Massachusetts • Missouri • New Jersey • Oregon 	<ul style="list-style-type: none"> • Pennsylvania • Rhode Island • Texas • Utah • Washington 	<ul style="list-style-type: none"> • Connecticut • Hawaii • Massachusetts • Missouri • Nevada • New York • Rhode Island
		<ul style="list-style-type: none"> • California • Colorado • Georgia • Hawaii • Maryland • New York • Utah

Source: EIA

According to the Energy Information Administration, in 2017 there were nine other states that are following California's ZEV policy

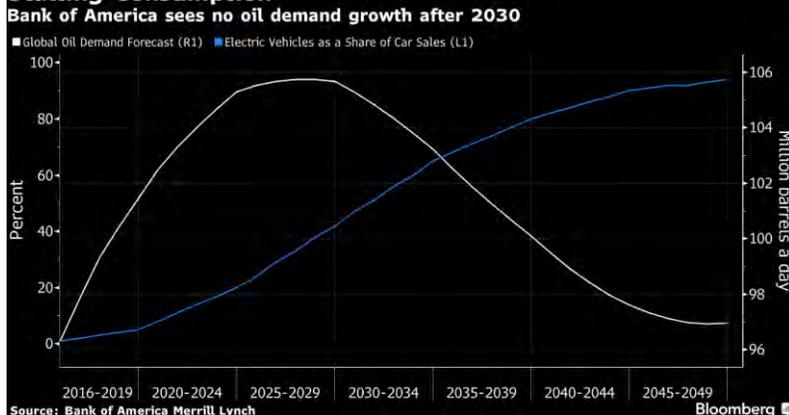
As Gov. Brown is moving ahead with his ZEV initiative, other states will likely follow. According to the Energy Information Administration, in 2017 there were nine other states that are following California's ZEV policy. At the moment, California's ZEV plan is less aggressive than that of a handful of foreign countries actually seeking to ban the sale of internal combustion engine (ICE) cars. Seeking to ban ICE cars by 2025 is the Netherlands, with Norway and India planning to stop sales by 2030. A decade later, those countries will be joined by France and the UK. China has yet to suggest its termination date, but 2040 is rumored to be a possibility. Germany is also in the mix, but it is currently involved in litigation over its plans and timing. A growing number of cities such as Auckland, Barcelona, Cape Town, Copenhagen, Mexico City, Milan, Quito, Seattle and Vancouver have announced total bans on ICE vehicles or limits on where they can drive within the cities' boundaries.

As this momentum to ban or severely limit the sale and use of ICE vehicles grows, it is not surprising that forecasts for auto sales and

The analysts foresee oil demand peaking in 2030 and then beginning a steady downward trend

the resulting impact on oil demand growth are being revised to show more aggressive impacts. The latest comes from Bank of America Merrill Lynch (BAC-NYSE). Based on how they see the electric vehicle share of new car sales growing (reaching 60% by 2033), the analysts foresee oil demand peaking in 2030 and then beginning a steady downward trend.

Exhibit 15. BoA Sees EVs Cars Gaining Market Share Rapidly Stalling Consumption



It is possible that by 2025, the momentum in the oil market may be stalling, which could put increased pressure on oil exporters to aggressively compete for weakening oil demand by lowering oil prices

A key consideration and concern for oil and gas industry executives is understanding when potentially their market may transition into a slow- and then no-growth condition. If one believes that oil prices will react to the realization that demand is waning, then people should focus on when the upward trending portion of the oil demand curve begins to flatten and then peaks, before starting its decline. In other words, it is possible that by 2025, the momentum in the oil market may be stalling, which could put increased pressure on oil exporters to aggressively compete for weakening oil demand by lowering oil prices.

We are not predicting that the Bank of America Merrill Lynch forecast is accurate, but the growing push to limit or ban ICE vehicles by 2025-2040 will cause auto manufacturers to begin planning to drop ICE models from their lineups. As that happens, the oil demand tipping point will become more clearly defined. Will it happen sooner than many people anticipate, or, is it possible that other developments delay the push and extend the hydrocarbon era?

B.C. Pipeline Battle Is Problem For Canada’s O&G Industry

A major challenge for the Canadian oil and gas industry in recent years has been its inability to secure increased access to world energy markets. As a result, Canadian oil and gas producers suffer in the prices they realize for their output. New pipelines are seen by

Producers are losing C\$5.00 (US\$4.08) per barrel of profit from an average western Canadian well

Already, the pipeline in-service date has been extended by one year into 2020, due to the province's delay in issuing construction permits

environmentalists as the easiest way to disrupt the industry's production growth, and thus force potential resources to remain undeveloped. By preventing new pipelines from being built, or expansion of existing pipelines, Canadian producers are relegated to reduced profits. According to a recent study by the C.D. Howe Institute, producers are losing C\$5.00 (US\$4.08) per barrel of profit from an average western Canadian well. Surprisingly, few Canadians also focus on what lost profits mean for the public at large through reduced taxes at all levels of government.

The latest pipeline battle involves the already federally-approved Kinder Morgan Canada (KML-TSX) C\$7.4 (US\$6.0) billion Trans Mountain expansion that will boost throughput from 300,000 barrels per day to 890,000/bpd of heavy oil flowing from Alberta to a British Columbia export port. The B.C. government, now run by a coalition of liberal and environmental interests, who campaigned in last year's election on platforms that they would use every tool available to stop pipelines from moving hydrocarbons through the province to world markets, is proposing new rules that inject greater uncertainty into the pipeline construction effort. Already, the pipeline in-service date has been extended by one year into 2020, due to the province's delay in issuing construction permits. Moreover, as Alberta's government has claimed, all the data about the composition of bitumen and how spilled bitumen would be cleaned up has been made available to B.C., so there should be no mysteries. As a result, Alberta sees B.C.'s efforts as a constitutional crisis between the provinces and involving the federal government.

Exhibit 16. Trans Mountain Expansion Risked By B.C. Rules



Source: National Energy Board

Attacking energy infrastructure projects has proven to be the most effective way for environmentalists to exercise their “keep it in the ground” attacks

Unfortunately, the B.C./Alberta spat over the Trans Mountain pipeline is likely to wind up in court, which could set back the pipeline’s construction, further aggravating producer profit improvement and increased government tax revenues. It will also mean fewer construction jobs and economic benefit for B.C. through which most of the pipeline travels. Attacking energy infrastructure projects has proven to be the most effective way for environmentalists to exercise their “keep it in the ground” attacks. These campaigns are becoming a permanent aspect of the energy business.

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

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