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ENERGY INVESTMENT BANKING

# MUSINGS FROM THE OIL PATCH

**March 8, 2016**

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

## Understanding Historical Mindsets In Today's Energy World

One of the beauties of waterfowl such as swans is their apparent ease in gliding across the water. Those of us on the shore observing them don't see the effort of their webfeet paddling under the water in order to propel them from place to place. If one believes we are captive to a black-swan-world where everything we thought we knew and understood is upended by current events, then understanding how our new world works will be of great importance as we try to divine a way to a better economy and society.

**The growth of shale oil has created two problems for the domestic oil business – too much light oil for our refineries to use and inflated inventories facing reduced storage capacity that adversely impacts global oil prices**

In our last *Musings*, we wrote about crude oil prices and their relationship to lagging global economic growth. Yes, the argument is made cogently by many oil experts that the cause of today's low oil prices is really due to an oversupply of oil caused by the rapid growth of U.S. shale oil output and not a lack of demand. The growth of shale oil has created two problems for the domestic oil business – too much light oil for our refineries to use and inflated inventories facing reduced storage capacity that adversely impacts global oil prices. The first problem may be solved over time by the ending of our ban on oil exports. Cargoes are now starting to head to Europe where a market for light oil exists, but the refiners there are cautious in using this U.S. oil because they have never processed any in their refineries. The associated storage situation may prove a greater challenge to overcome.

**While the supply surge has helped create an oil market supply/demand imbalance, the absence of robust demand growth is often overlooked**

The surge in U.S. oil output from roughly five million barrels a day (mmb/d) in 2004 to over nine mmb/d by 2015 has significantly contributed to the currently estimated two mmb/d global oil market oversupply situation. While the supply surge has helped create an oil market supply/demand imbalance, the absence of robust demand growth is often overlooked, or believed to have had only a minimal impact, in assessing corrective market forces.

**All of these factors have combined over the past 18-24 months and created the perfect oil market storm**

Two other factors helped drive the global oil oversupply. Those factors included high oil prices and cheap capital, the latter in response to the zero-interest rate policy of western central banks in response to the 2008-2009 financial crisis and recession. All of these factors have combined over the past 18-24 months and created the perfect oil market storm. For most people, the images of a perfect storm are associated with Superstorm Sandy that blasted New Jersey, New York and Connecticut in 2012, or from the 2000 movie, The Perfect Storm, that told the story of the commercial fishing trawler *Andria Gale* lost with all hands during the 1991 perfect storm in the North Atlantic.

**Sandy achieved a number of notable firsts**

Superstorm Sandy, a post-tropical cyclone when it made landfall the evening of October 29, 2012, along the coast of southern New Jersey, is estimated to have been the second most costly tropical cyclone on record after 2005's Hurricane Katrina that led to the breech of the levee system protecting New Orleans and the city's resulting flood. Sandy achieved a number of notable firsts. It had the lowest barometric reading ever recorded for an Atlantic storm making landfall north of Cape Hatteras, North Carolina. The previous record holder was the 1938 "Long Island Express" Hurricane that devastated Long Island and Rhode Island. Sandy also created the largest surge at Battery Park, New York at 13.88 feet, surpassing the record set by Hurricane Donna in 1960 by 3.86 feet. It also created record surf in New York Harbor when a buoy measured a 32.5-foot wave, some 6.5-feet taller than the one caused by Hurricane Irene in 2011.

**People are still able to live and work in the damaged areas although they are not as they were before, much like today's oil business**

In terms of human measures, Sandy's death toll along its entire hurricane and post-tropical cyclone trek totaled 147, with 72 deaths in the U.S. and the remainder in Haiti and Cuba. Financially, New Jersey and New York, the two hardest hit locales experienced in excess of $80 billion in damages, with other states and Caribbean countries adding to the damage total. What we are periodically reminded of is that all the storm damage has yet to be repaired while preparations for protecting the area against another such storm are ongoing, nearly three and a half years later. That said, people are still able to live and work in the damaged areas although they are not as they were before, much like today's oil business.

**We would suggest that the roots of the current weak oil market predate 2008**

Those seeking to explain the current state of the global oil market are most likely to point to the damage from the 2008-2009 crisis and the slow economic recovery that has been partially hobbled by government policies implemented in response – the economic version of the perfect storm. We would suggest that the roots of the current weak oil market predate 2008. We believe that the Chinese economic miracle of 2004 may have set in motion the events that have put the oil market where it is now – in a significant oversupply situation. This suggests that a solid recovery in oil prices may still be years away, even if we do bounce up from the current $30 a barrel level. This fits with the admonition that Saudi Arabia Minister

**"We should allow markets to work, but we must remain vigilant, we need to work to understand new market dynamics."**

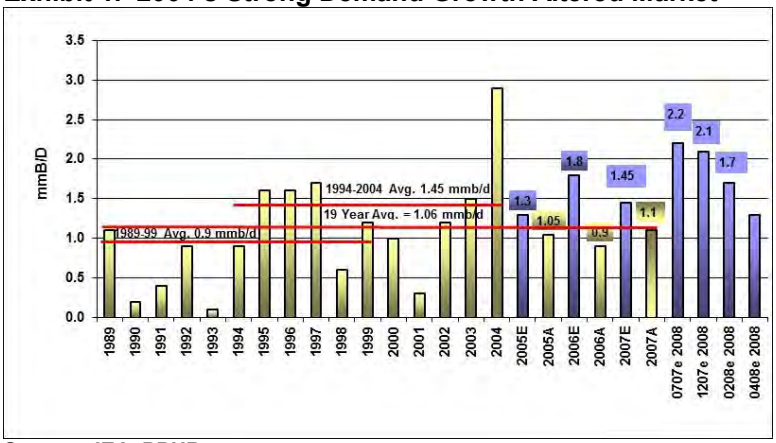
of Petroleum and Mineral Resources Ali Al-naimi delivered during his talk at the recent CERAWeek conference. Mr. Naimi said, "We should allow markets to work, but we must remain vigilant, we need to work to understand new market dynamics." This comment came after he declared that Saudi Arabia was not about to cut its oil production to accommodate other high-cost oil sources, but rather that his country would consider freezing its production at January 2016 levels if other producers followed along.

To demonstrate our point about 2004 being a turning point for the oil market, we dug back into our files and found the chart in Exhibit 1. It shows the change in annual global oil demand as reported by the International Energy Agency (IEA). The chart was put together in 2008 to demonstrate the impact that the surge in oil demand in 2004, which was underestimated by the IEA, had translated into the agency consistently forecasting greater expected demand growth than actually materialized. The series of progressively lower 2008 demand forecast revisions reflected the unfolding financial crisis that year that forecasters missed.

**During the 19-year period from 1989 through 2007, which included the surge in 2004, annual demand growth averaged slightly over 1 mmb/d**

What the chart shows is that during 1989-1999, which included several years of meaningful annual oil demand growth from Asia prior to the 1997 Asian currency crisis, annual demand growth averaged 900,000 barrels per year. On the other hand, if we measure demand over the decade 1994-2004, growth averaged 1.45 mmb/d per year. Most telling, however, is that during the 19-year period from 1989 through 2007, which included the surge in 2004, annual demand growth averaged slightly over 1 mmb/d.

**Exhibit 1. 2004's Strong Demand Growth Altered Market**




**Source: IEA, PPHB**

What happened in 2004? China's economy was growing rapidly (~10%) and the country was building infrastructure in preparation for hosting the 2008 Summer Olympics. This was also shortly after China had become a net oil importer as domestic oil consumption had finally outstripped the nation's oil output. Between September

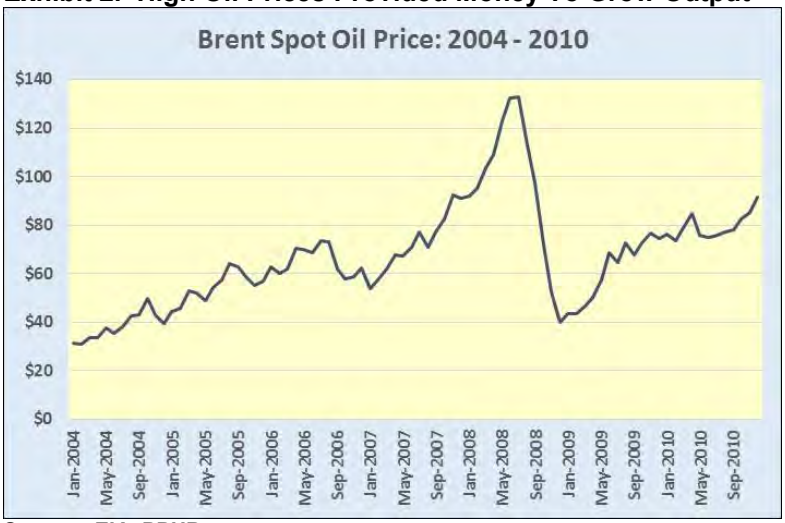
**China's demand jumped by about one mmb/d, or 18% higher**

2003, when the IEA firms up its oil demand and supply forecasts for the following year (2004), and June 2005, when the agency has finalized the figures for the preceding year, China's demand jumped by about one mmb/d, or 18% higher. This jump came as world oil demand was revised upwards by 3 mmb/d, or 3.9% higher. In the fall of 2004, we met a then-recently-departed IEA oil demand forecaster who told us that the agency's China and Asia forecasting models had failed woefully and were being rebuilt.

**With the global focus on the new Age of China and the rapid economic growth ongoing throughout Asia, expectations of a higher average annual oil demand growth rate became ingrained in planners forecasting**

One should note other data points in Exhibit 1. The average demand increase for the decade 1989-1999 was just under one mmb/d while for the ten years of 1994-2004, demand was about 500,000 barrels a day higher than recorded in the other period. With the global focus on the new Age of China and the rapid economic growth ongoing throughout Asia, expectations of a higher average annual oil demand growth rate became ingrained in planners forecasting. The huge underestimation of global oil demand in 2004, and especially the jump in Chinese oil consumption, set off a response within the world oil industry. If they were now looking at an acceleration in average annual oil demand growth, then the industry needed to step up its exploration and development activity. Greasing that effort was much higher than normal oil prices.

**Exhibit 2. High Oil Prices Provided Money To Grow Output**




**Source: EIA, PPHB**

**People may remember the outlandish oil price projections of that era – such as Goldman Sachs' forecast of oil hitting $150 a barrel – as the price approached its peak**

As shown in Exhibit 2, global oil prices began to climb in 2004 and rose steadily until economic difficulties arose in the latter part of 2006. Prices then resumed their climb shooting to the $130s a barrel in the spring of 2008 just before the financial crisis exploded onto the world stage. People may remember the outlandish oil price projections of that era – such as Goldman Sachs' (GS-NYSE) forecast of oil hitting $150 a barrel – as the price approached its peak. However, despite a collapse in oil prices during the financial crisis and recession, prices quickly recovered as the optimism for

strong oil demand growth remained high. It was this belief that contributed to oil prices rising to and remaining at the $100-a-barrel level for 2011-2014.

**The 2015 AEO calls for zero growth for petroleum in total during 2013-2040**

High oil prices drove drilling and production growth in anticipation of healthy oil demand growth. What people were missing, however, was that the high oil demand growth rates projected in the mid-2000s were being reduced as we moved through the following decade. The U.S. Energy Information Administration's (EIA) Annual Energy Outlook (AEO) 2004 projected petroleum demand including liquefied petroleum gas (LPG) would grow at 1.6% per year from 2002 to 2025. If we eliminate LPG from the total, the EIA projected petroleum volumes to increase from 34.40 quadrillion British thermal units (QBtus) in 2002 to 50.42 QBtus in 2025. In contrast, the 2015 AEO calls for zero growth for petroleum in total during 2013-2040, while the LPG component grows by 1.1% per year. That means overall petroleum demand will actually decline during the forecast period! The forecast projects 2012 petroleum demand to be 31.92 QBtus, which is narrowly higher than 2040"s estimate of 31.86 QBtus. Interestingly, the EIA forecasts petroleum demand to peak in 2020 at 33.16 QBtus, making its decline to 2040 roughly -3.9%.

**These represent forecast differences between the 2004 and 2015 AEO forecasts of -25.4%, -29.4% and -35.3%, respectively**

To demonstrate how dramatically the outlook for petroleum demand growth has changed, we compared common year demand estimates from the 2004 and 2015 AEO forecasts and found the following data points: 2015 – 43.94 vs. 32.76 QBtus; 2020 – 46.97 vs. 33.16 QBtus; and for 2025 – 50.42 vs. 32.64 QBtus. These represent forecast differences between the 2004 and 2015 AEO forecasts of -25.4%, -29.4% and -35.3%, respectively.

**High oil prices have hurt demand growth prospects while at the same time encouraging the development of high-cost, long-lived petroleum resources**

It is our belief that this dramatically altered long-term outlook for petroleum is at the heart of the Saudi Arabian oil strategy. High oil prices have hurt demand growth prospects while at the same time encouraging the development of high-cost, long-lived petroleum resources. These high oil prices have provided an umbrella for expensive alternative energy sources and, given the global embrace of climate change and anti-fossil fuel policies and mandates, made petroleum's long-term outlook even less rosy. In the U.S. where producers could sell everything they produced, few gave any thought to the shifting demand outlook globally and the role that domestic production growth would play in altering that outlook.

**Zero production growth in a declining demand business may not be the worst outcome for oil companies**

Recognizing that the outlook for petroleum demand is lower requires a mindset change for oil company CEOs; something we sense is just now beginning to sink in. While oil CEOs talk about lowered production growth forecasts as a result of low oil prices and the forced reductions in their capital spending plans, recognition that there are substantial low-cost oil reserves in the world held by countries desperate for income is beginning to resonate. Zero production growth in a declining demand business may not be the worst outcome for oil companies. Without production volume

growth, maximizing profitability becomes even more important. Determining how to organize and manage a company in this new black-swan-world of shrinking oil demand will be the real challenge.

## Will Saudi Arabia's Cash Drain Drive Oil Output Cut?

**We didn't say the war was being waged against the American oil shale industry, but rather it was being waged against all high-cost oil anywhere in the world**

The dramatic drop in oil prices during the first two months of 2016 coupled with the slashing of oil industry capital spending plans, the growing line of exploration and production companies at the bankruptcy court door, the collapsing rig count, and declining oil output has many speculating that Saudi Arabia may be getting closer to claiming victory in its war against the western oil industry. Notice that we didn't say the war was being waged against the American oil shale industry, but rather it was being waged against all high-cost oil anywhere in the world.

**Will Iran cooperate given its oil minister's declaration that a production freeze is a "joke?"**

A sign that Saudi Arabia may be softening its stand includes the recent report from Russia about an impending agreement among most of the world's large oil producers to freeze their output at January's volumes. The reports state that the key parties will meet later this month to seal the agreement, although there is no firm commitment from Iran as of yet, but Russian energy officials are supposedly going to visit with them shortly. Will Iran cooperate given its oil minister's declaration that a production freeze is a "joke?" That happened on the same day, Saudi Arabian Minister of Petroleum and Mineral Resources Ali Al-naimi stated at an energy conference in Houston that his country would not cut its production because all the other countries pledging to do likewise would not adhere to their commitment.

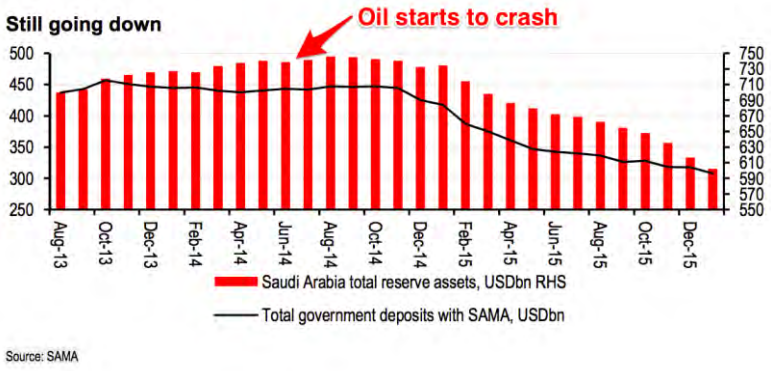
**OPEC member countries with large populations such as Venezuela and Nigeria have serious economic problems**

Given the latest Russian rumor, one wonders whether the Saudi Arabian and Iranian positions were merely posturing statements to distract observers from what was going on below the surface – the need for OPEC action. Certainly every oil exporting country is suffering – some more than others. OPEC member countries with large populations such as Venezuela and Nigeria have serious economic problems that could produce civil unrest and topple the governments as the citizens take revenge on their current leaders.

**As of January 2016, Saudi Arabia's reserves had fallen by about $140 billion to around $600 billion**

One of the arguments for Saudi Arabia's possibly easing its position is the country's falling foreign currency reserves as its budget deficit grows. As shown in Exhibit 3, Saudi Arabia's foreign reserves peaked shortly after oil prices peaked at about $740 billion (right hand scale) in June 2014. Once oil prices started falling, budget deficits started growing, eating into the country's pool of foreign reserves. As of January 2016, Saudi Arabia's reserves had fallen by about $140 billion to around $600 billion. At that rate of decline, Saudi Arabia has a financial cushion to survive several years of low oil prices before being pressured to push global oil prices up.

**Exhibit 3. Saudi Arabia Foreign Reserves Are Shrinking**




**Source: ZeroHedge**

**The government still has other fiscal levers to pull such as reducing fuel subsidies further and/or extending the cuts to other social costs, although that risks generating social discontent**

The rate of decline in foreign currency reserves has accelerated in recent months as a result of how low oil prices have fallen, as well as increased military expenditures for the fighting in Yemen and the support for ousting the Syrian leadership. Offsetting the falling reserves are the changes the government implemented for its fuel subsidies. The government still has other fiscal levers to pull such as reducing fuel subsidies further and/or extending the cuts to other social costs, although that risks generating social discontent. The government is working aggressively to diversify the economy, but that shift will require a much longer time horizon. Although Standard & Poor's rating service cut the kingdom's rating by two notches from A+ to A- with a stable outlook, Saudi Arabia could also sell government bonds to boost it financial resources if needed.

**The kingdom is aggressively drilling its natural gas reserves in order to ease the need for increased burning of crude oil for power generation and to handle the growing needs of its petrochemical industry**

A step the government could take to boost its income would be to reduce the country's use of its own oil output for power generation. As the nation's population continues growing, as it has been among the fastest growing Middle Eastern countries, Saudi Arabia's economy will need more energy. With summer temperatures averaging well above 100$^{o}$ F, and heat waves reaching into the 120$^{o}$+ F range, electricity demand soared causing power plants to burn crude oil to generate power. The kingdom is aggressively drilling its natural gas reserves in order to ease the need for increased burning of crude oil for power generation and to handle the growing needs of its petrochemical industry.

**The increased domestic consumption cuts into the kingdom's oil export volumes**

In 2009-2013, the burning of crude oil for power generation averaged 0.5 million barrels a day (mmb/d) with a range of 0.3 mmb/d in the winter months and 0.7 mmb/d during the summer months, peaking at about 0.9 mmb/d in August. In July 2014, oil burned for power reached 0.9 mmb/d, suggesting that the nation's power needs were growing faster than anticipated. The increased domestic consumption cut into the kingdom's oil export volumes. Without alternative power generation sources, the kingdom could be facing an income squeeze in the future as its oil export volumes shrink. Besides using domestic natural gas, Saudi Arabia could

consider importing natural gas from neighboring countries. It is also planning to add 41 gigawatts (GW) of solar power, 18 GW of nuclear power and 4 GW of power generated from other renewable sources. These facilities will expand the country's generating capacity from 58 GW now to 120 GW by 2032.

**We will see whether they are up to the challenge**

Saudi Arabia has many challenges in managing its oil economy. A rapidly growing population conditioned to cheap energy, especially in a hot locale, makes for difficult choices for the nation's leaders. Faced with the geopolitical conditions in the region, these economic and social choices will weigh on the relatively inexperienced royal leadership. We will see whether they are up to the challenge. If not, we could be facing sharply higher oil prices in the future.

## Oil, Oil Everywhere But Not Many Containers For Storage

**That seems to be the curse of the modern oil industry as global production continues at almost breakneck speed while everyone searches for available containers to store the oil not currently needed to power today's economy**

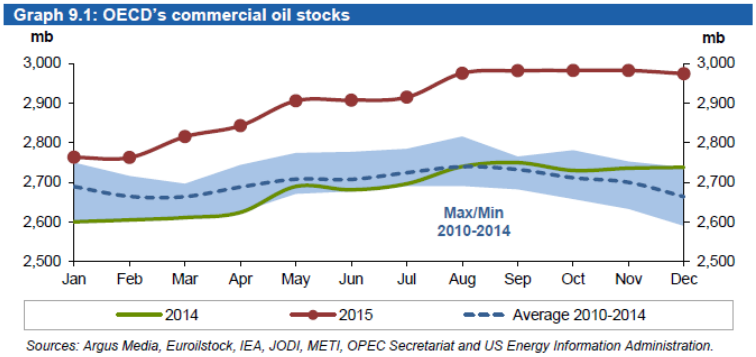
With all due apologies to Samuel Taylor Coleridge, the author of The Rime of the Ancient Mariner, he was describing a situation for sailors on long journeys who would run out of water while being completely surrounded by water. That seems to be the curse of the modern oil industry as global production continues at almost breakneck speed while everyone searches for available containers to store the oil not currently needed to power today's economy. The result is that when people understand we cannot manufacture containers as quickly as they are needed to store oil, the only way to force producers to stop producing will be to send the oil price down – or to a level approximating zero for oil the business or below $30 a barrel.

**It meant that global inventories had increased by about 140 million barrels, or nearly a 5.5% increase in 2014**

During January and February there were 39 trading days for oil futures. Nearly 31% of the time, or 12 days, the near-month crude oil price ended the trading day below $30 a barrel. That is a pretty strong message to the industry that the market imbalance between oil supply and demand is meaningful. The imbalance is reflected in record crude oil inventories both in the United States, the world's largest oil consuming market, and throughout the western world as shown in Exhibit 4 (next page). The chart shows the monthly inventory levels for 2014 and 2015 along with the range of monthly inventory levels for 2010-2014. As can be seen, 2014 started with OECD, the body representing the western world's economies, inventories at the bottom of the prior 5-year range. By late summer that year, inventories were at the mid-point of the range but the pace of increase slowed sufficiently so that by the end of 2014 inventories were only at the top end of the historical range. It meant that global inventories had increased by about 140 million barrels, or nearly a 5.5% increase in 2014. The inventory growth occurred as global oil demand increased by 1%, or about 878,000 barrels a day, according to the International Energy Agency (IEA).

By reaching a record three billion barrels of oil in western country storage facilities, the focus is not on the interaction of storage volumes and capacity utilization ratios at key oil pricing and

**Exhibit 4. Oil Oversupply Drives Inventories To All-time High**



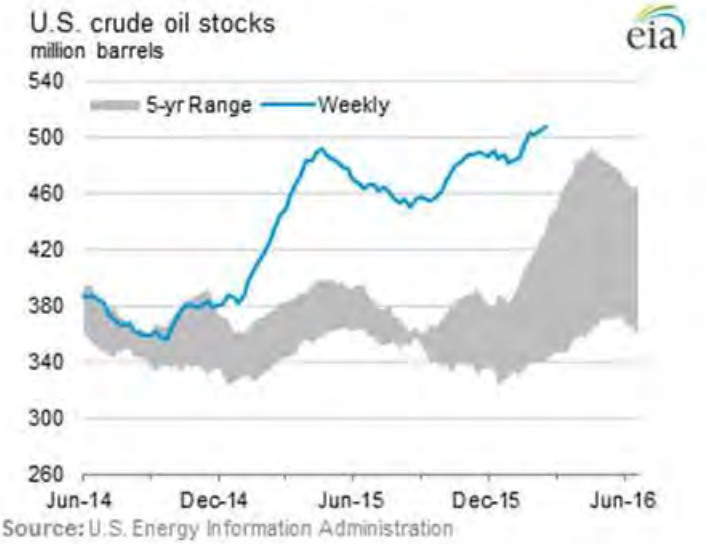

**Source: OPEC**

**As the switch over occurs, refineries stop buying crude oil until they are ready to restart their operations**

operational centers, and overall oil pricing levels. It is these relationships that have people concerned we might experience another significant drop in oil prices in the coming weeks as refineries shut down in order to switch over from producing primarily distillate (heating oil) for winter needs to gasoline for the upcoming driving season. During the switch over, refineries are shut down partially or completely to facilitate the operational changes necessary. As the switch over occurs, refineries stop buying crude oil until they are ready to restart their operations.

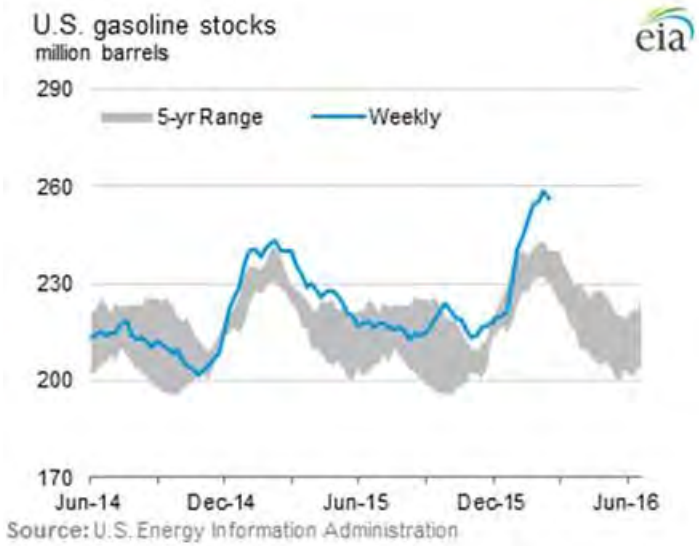
We can see the impact of the crude oil and refined product supply gluts on U.S. petroleum storage volumes. The series of charts below show recent storage volumes for crude oil, gasoline and distillate. The Energy Information Administration (EIA) releases weekly inventory numbers and produces the charts that show weekly stock levels and the 5-year volume range.

**Exhibit 5. Crude Oil Inventories Are At Record Highs**



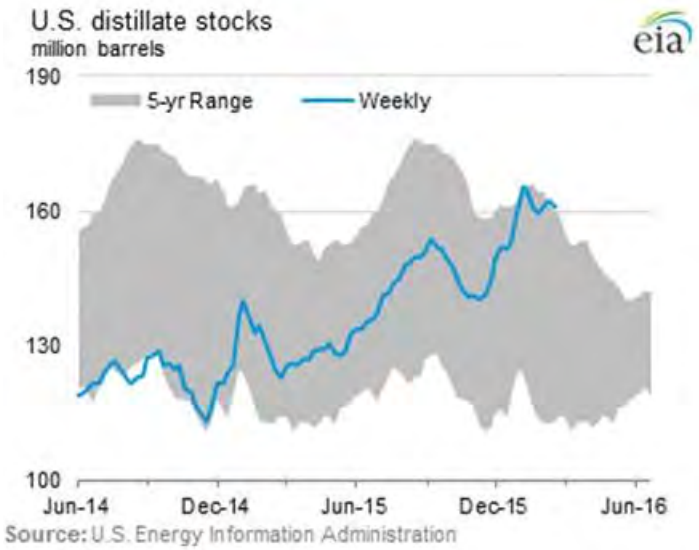

**Source: EIA**

**Exhibit 6. Gasoline Inventory Well Above Historical Levels**




**Source: EIA**

**Exhibit 7. Distillate Inventories At Peak Levels**




**Source: EIA**

**These fluctuating storage dynamics will impact spot oil prices, and potentially future oil prices, too**

As a result of the fluctuating demand for crude oil and refined product storage given the operational changes of refineries, the amount of storage capacity becomes an issue as well as the utilization rate. The latter is particularly important when storage volumes increase because there can be issues with customers being able to find sufficient storage space available. These fluctuating storage dynamics will impact spot oil prices, and potentially future oil prices, too. The most important pricing point in the United States is Cushing, Oklahoma where the industry has

concentrated significant storage capacity because it represents a key interconnection point for many major crude oil and refined product pipelines that crisscross the nation.

A more insightful chart is one showing the effective utilization of storage facilities at Cushing as the higher the capacity utilization rate, the greater the downward pressure on crude oil prices to force producers to limit their output. The chart in Exhibit 8, prepared by industry logistics consulting firm Genscape, shows the amount of oil stored at Cushing since 2009 along with the capacity utilization of the available storage facilities. The orange line on the chart shows the operational utilization, which addresses the issue of the need to move output into storage in order to provide refineries with operational flexibility. That line shows current operational utilization slightly above 80%, a level at which the industry begins to lose flexibility, which can impact industry operations and thus oil prices.

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Genscape's analysis focuses on the growth in storage capacity at Cushing since it began monitoring the tanks and utilization in 2009. A significant amount of new storage capacity has been constructed by pipeline owners in recent years to facilitate their operations, which may change the industry's dynamics going forward. Genscape points out that since 2009 Cushing capacity has increased by 31.6 million barrels, or a 38% increase. Throughout Cushing's history, its capacity utilization has never exceeded 80%. Therefore, the math suggests a maximum storage level of 66 million barrels.

**Throughout Cushing's history, its capacity utilization has never exceeded 80%**

**Exhibit 8. Cushing Storage Capacity Is Getting Full**


**Source: Genscape**

Genscape further opines that based on Cushing's destocking experience during 2013-2014, it is possible that the storage

operators could actually achieve a higher operational utilization level than expected. They point out that few believed Cushing could reach the all-time inventory lows of 2008, which were reached in the early summer of 2014. This performance leads Genscape to believe it is possible Cushing could reach 70 million barrels of storage, or an 85% capacity utilization level. To achieve that level, however, implies that all the new storage capacity built is merchantable, meaning it can be rented out to owners of crude oil or refined product volumes. What Genscape also believes is that since 2011, Cushing storage capacity has grown by more than 28 million barrels, but about 36% of that increase is believed to be for operational flexibility of pipeline operators and only 63% is merchantable. Based on those assumptions, Genscape believes that the maximum operational capacity utilization is 82%, something close to where storage volumes are now.

**What Genscape also believes is that since 2011, Cushing storage capacity has grown by more than 28 million barrels, but about 36% of that increase is believed to be for operational flexibility of pipeline operators and only 63% is merchantable**

If Genscape is right in its estimate, what will the industry do? Obviously, it could let oil prices drop significantly, but the problem is that it would take some time for the low price to effect a shutdown in domestic oil output. Herein is where the industry needs to become creative – or find other places to store its oil. Hello tanker owners. Hello railroad car owners. Hello swimming pool owners.

**Hello tanker owners. Hello railroad car owners. Hello swimming pool owners**

We might even be able to convince car owners to operate with more fuel in their tanks. There was a period immediately following the Arab oil embargo in 1974 and the Iranian revolution in 1979 when American car owners, faced with physical shortages of gasoline (closed stations, rationing by restricting purchases to odd and even days, or odd and even license plate numbers) boosted the amount of fuel they maintained in their vehicle's tanks. Traditionally, Americans operated with less than half a tank of fuel – on average closer to a quarter. Faced with fuel shortages, they started keeping their tanks three-quarters full. In effect, with each car holding an additional five gallons of fuel, the nation shifted one billion gallons (about 23.8 million barrels) of fuel from tank farms to automobiles.

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As oil inventories have grown, starting last fall, we began to see media stories about the growing number of idle oil tankers parked offshore ports such as Galveston, Texas and Rotterdam, The Netherlands. The map in Exhibit 9 showing the number of tankers pictured off Galveston last December and the recent *BloombergBusiness* headline that "Europe's Biggest Oil Hub Fills as Ship Queue at Seven-Year High" are just a few examples of the attention to the issue of oil producers not wanting to reduce output but rather to store the oil. The Rotterdam article said 50 oil tankers were waiting to unload but that storage is the highest level since 2013 according to Genscape. Royal Vopak NV, the world's largest tank storage operator, said its 11 terminals are at 95% capacity compared to 85% at the same time a year ago. In the past, the specter of idle tankers parked offshore was used to stoke up conspiracy claims that oil companies were merely waiting for

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gasoline pump prices to rise before unloading the oil. Now the glut of idle tankers is offered as evidence of the magnitude of the oil oversupply situation. In fact, BP plc (BP-NYSE) CEO Robert Dudley even acknowledged last month that people would be "filling their swimming pools" with oil by this summer.

**Exhibit 9. Idle Tankers For Lack Of Storage Capacity**


**Source:** ***The Wall Street Journal***

**By increasing the journey time, the volume of oil "on the water" will grow adding to effective industry storage capacity**

Another technique oil operators can employ to effectively increase their storage capacity is having the ships hauling the oil or refined product travel at a slower than normal speed. By increasing the journey time, the volume of oil "on the water" will grow adding to effective industry storage capacity. "Slow steaming" is an accepted practice for producers and refiners, and even for ship owners who are trying to lower their operating costs by consuming less fuel per voyage. It all boils down to the incremental cost of sailing for a few more days versus lower fuel consumption by the tanker.

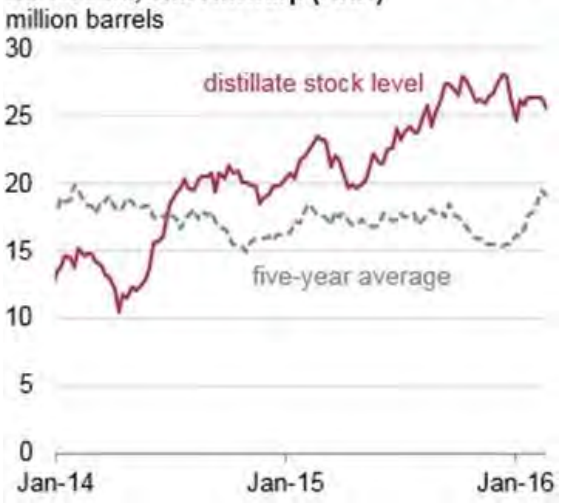
**Exhibit 10. How To Expand Storage Capacity**


**Source: EIA**

**The need to resort to these tactics reflects growing European product inventories and storage challenges**

An analysis prepared by the EIA showcased how refiners in the Middle East have even resorted to sending their cargos on ships directed to sail around the southern tip of Africa rather than utilizing the shorter route through the Suez Canal and across the Mediterranean Ocean. The need to resort to these tactics reflects growing European product inventories and storage challenges.

**Exhibit 11. Product Storage In Europe Is Very High**
**Weekly distillate stock levels in Amsterdam, Rotterdam, and Antwerp (ARA)**

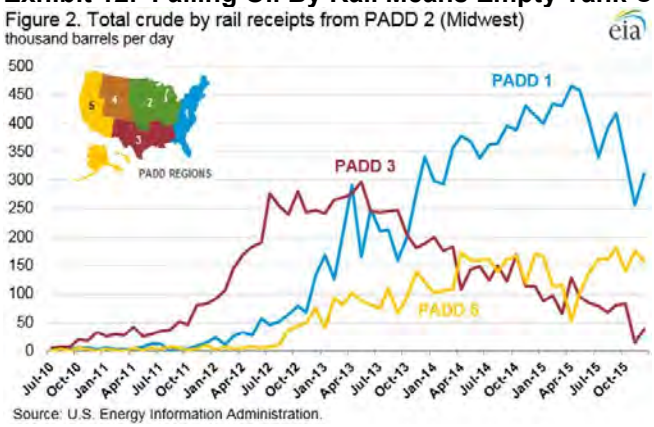



**Source: EIA**

**With the decline in the volume of oil being shipped by rail cars, they offer potential capacity for storage oil**

We have even read about the owners of idle railroad tank cars who are experimenting with storing oil in them. With the decline in the volume of oil being shipped by rail cars, they offer potential capacity for storage oil. With storage space at Cushing filling up, rail car storage may become a safety valve against a collapsing oil price while at the same time offering increased flexibility for those volumes to be shipped to different markets depending on spot demand.

**Exhibit 12. Falling Oil By Rail Means Empty Tank Cars**




**Source: EIA**

**The problem is that these techniques for boosting storage may only delay the inevitable need for lower oil prices to force producers to stop producing**

Never underestimate the ingenuity of the oil industry to deal with an oversupply situation. The problem is that these techniques for boosting storage may only delay the inevitable need for lower oil prices to force producers to stop producing. The challenge is attempting to guess just how low prices need to fall and then how long they will need to stay low in order to correct the oversupply situation. If it is like everything else about the current downturn, expect it to take longer than everyone expects.

## The Puzzle Of China's Demand Hurts Oil Market Recovery

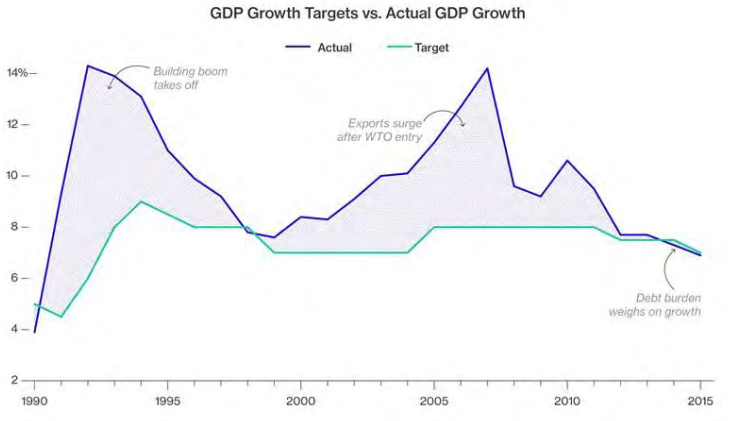
**The problem is that the bell-cow has been dancing to the music from China, and for much of the past two years the tune played reflects a funeral dirge rather than a hip-hop beat**

The oil market has followed the Saudi Arabian bell-cow in trying to predict what will happen to global crude oil supply – although most forecasters have gotten both the trajectory and magnitude wrong. The problem is that the bell-cow has been dancing to the music from China, and for much of the past two years the tune played reflects a funeral dirge rather than a hip-hop beat. Even though Saudi Arabia may have insights into China's oil and energy markets, the Chinese government works hard to obscure from the outside world the true facts about its oil supply, demand and import needs, along with the general health of its economy.

**That transformation contributed to annual double-digit economic growth, and in turn a jump in the nation's energy needs**

For many years, the modernization of China's economy and the power behind its growth was its cheap labor, as the country's rural peasants, no longer needed on the farms to supply the country's food, moved to cities for work. Given China's abundant labor supply, the government based its economic policy on becoming the center of the world's manufacturing and assembly operations. That transformation contributed to annual double-digit economic growth, and in turn a jump in the nation's energy needs. As the economy grew and people prospered, they desired nice homes and transportation options that helped make China the world's largest automobile market.

**Exhibit 13. Recent Low Growth Rate Match Reduced Goals**




**Source:** ***Business Insider***

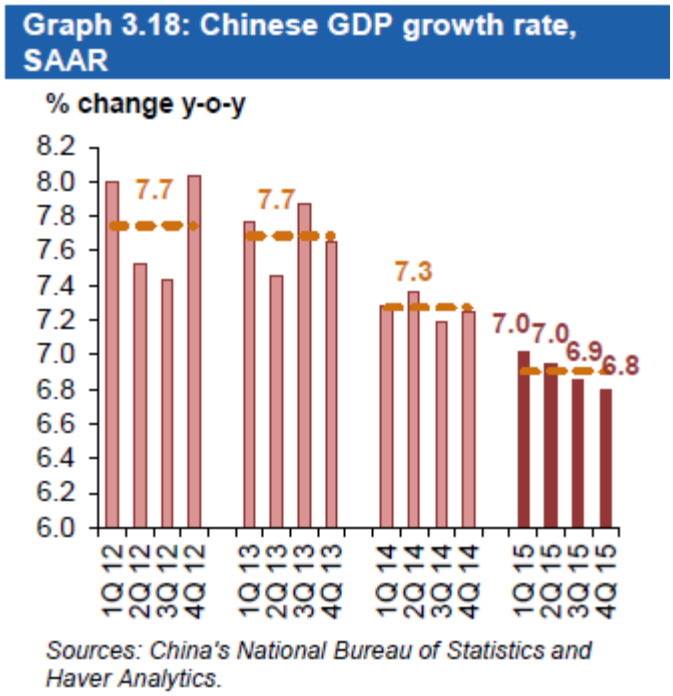
**As China reached the latter part of this century's first decade, its economic growth rate began to slow**

As China reached the latter part of this century's first decade, its economic growth rate began to slow. From double-digit annual growth rates, the rate fell into the 7-8% per year range, although outside observers believed the annual growth rate was falling below the official growth targets. As Chinese labor costs began rising, the country began to lose work to other Asian and sometimes Latin American countries with even cheaper labor.

**Other observers have suggested that the economic headwinds that kept China from reaching its growth target may actually be holding the country's growth rate closer to 2.5% to 4%**

Early last year, Chinese President Xi Jinping established a 7% annual growth rate target for 2015, the lowest annual rate established in more than 15 years. The new target was down from the aspirational 7.5% target for 2014. However, as suggested by the data from China's National Bureau of Statistics and Haver Analytics, and published by the secretariat of the Organization of Petroleum Exporting Countries (OPEC), economic growth in 2015 probably fell slightly below the country's target. Other observers have suggested that the economic headwinds that kept China from reaching its growth target may actually be holding the country's growth rate closer to 2.5% to 4%.

**Exhibit 14. Reality Of Slowing China Economy**




**Source: OPEC**

Regardless of the current growth rate of China's economy, with an estimated 1.4 billion people, according to the latest projection from the United Nations, the country is easily the largest on the planet. Depending on how China's economy is measured, and there are several academic studies suggesting it is 11%-15% larger than

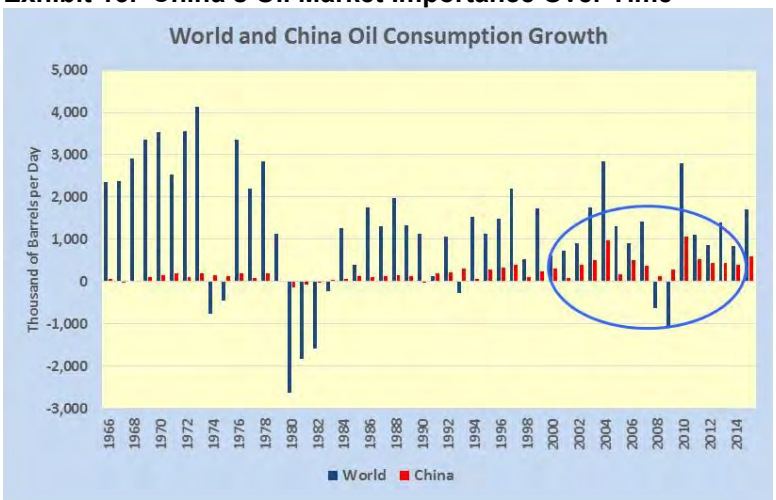
official estimates, it is in second place behind the U.S. The issues about how the economy is measured determines whether China is either half the size of the U.S. economy or just 13% smaller. Those measurement differences also impact the year China's economy is projected to surpass the current $16 trillion U.S. economy. Despite the measurement question, given the country's population and its hefty economic growth rate, China has become the largest importer of crude oil and petroleum products surpassing the United States in 2013. Given that status, China's oil market is the target of the major oil exporting nations – Saudi Arabia, Iran and Russia – and plays a role in the current oil market imbroglio.

**Given that status, China's oil market is the target of the major oil exporting nations – Saudi Arabia, Iran and Russia – and plays a role in the current oil market imbroglio**

To appreciate the importance of China for the world's oil market, we plotted the annual growth in world oil demand along with that of China. As can be seen (in the blue circle) in Exhibit 15, China's annual oil demand was very low from the mid-1960s until the early 2000s. In 2004, China's demand growth exploded, shocking the world's oil market and its forecasters. The demand growth was attributed to the country's aggressive infrastructure construction effort as it prepared for the 2008 Summer Olympics. Annual growth subsequently fell back to its long-standing pattern of limited annual increases until 2010 when there was another demand spike following the global financial crisis and recession, and presumably in response to the subsequent economic recovery. After 2010, annual demand growth again dropped back, but this time to a level about twice the annual demand growth experienced in earlier years.

**In 2004, China's demand growth exploded, shocking the world's oil market and its forecasters**

**Exhibit 15. China's Oil Market Importance Over Time**



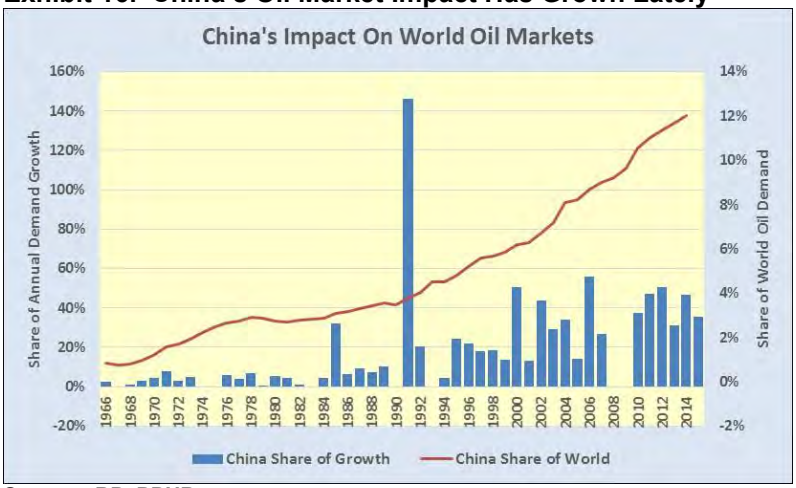

**Source: BP, PPHB**

In order to gain a better understanding of the role of China's oil demand in the world oil market, we calculated the amount of the country's annual demand growth and how that related to annual global demand growth. We compared that to the percentage China's oil demand represented of total global demand. Both

**We found its importance grew from a low single-digit percentage in the early years of analysis to a range between 30% and 50% in recent years**

percentages are displayed in Exhibit 16. What we see is that over time China's importance to the world's oil market has increased from under one percent in 1966 to 12% in 2014. Looked at from the viewpoint of how important China's demand growth is to the world's annual demand growth, (in years when China's demand was positive but global demand was negative we elected not to plot those data points), we found its importance grew from a low single-digit percentage in the early years of analysis to a range between 30% and 50% in recent years. (Readers should ignore 1991 when China's annual demand growth was 200,000 barrels a day, which exceeded the world growth of only 137,000 barrels a day, yielding 146% measure of importance for the country.)

**Exhibit 16. China's Oil Market Impact Has Grown Lately**



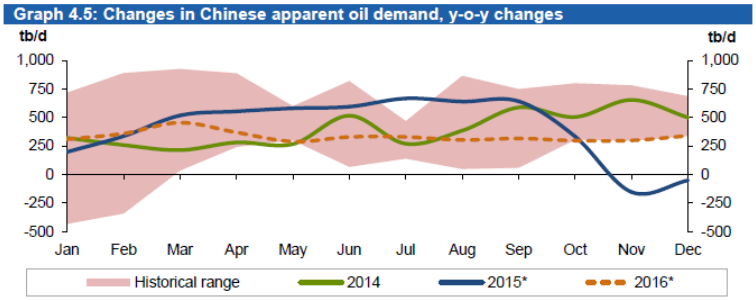

**Source: BP, PPHB**

**Compounding the measurement of implied Chinese oil demand is understanding how much of the additional oil it is importing is destined for the nation's growing strategic storage facilities and how much is destined as feedstock for new and expanded export refineries**

With China accounting for somewhere between a third and a half of annual global oil demand growth, one can see why it is the target of Saudi Arabia, Iran and Russia. This makes for challenging times for the global oil market if China's economy is slowing and its need for additional oil supply wanes. Compounding the measurement of implied Chinese oil demand is understanding how much of the additional oil it is importing is destined for the nation's growing strategic storage facilities and how much is destined as feedstock for new and expanded export refineries. As the Asian region has always been short of refining capacity to meet its demand needs, it has always been a refined product target for oil exporters. China, and sometimes in partnership with oil exporters or oil companies, has built refineries designed specifically for refining oil for export to other Asian countries.

When we examine the data prepared by OPEC showing changes in apparent Chinese oil demand, we can see both its contribution to the oversupplied oil market in 2015 and based on OPEC's forecast, how it will remain a drag on 2016's oil market recovery efforts.

**Exhibit 17. China's Oil Demand Will Be Lower In 2016**




**Source: OPEC**

**At those percentages, 2015 and 2016 would represent the lowest contribution to world oil demand growth since 2005**

According to OPEC's estimates, Chinese oil demand grew by 370,000 barrels a day in 2015 out of an estimated 1.7 million barrels a day world growth, or a 21.8% share. OPEC is projecting China's demand to grow by 290,000 barrels a day in 2016, or account for 23.2% of total world demand growth of 1.25 million barrels a day. At those percentages, 2015 and 2016 would represent the lowest contribution to world oil demand growth since 2005. If China's economy is only going to need that much oil, and by OPEC's estimate less in 2016 than it needed in 2015, correcting the global oil supply imbalance will be challenging. We know that not only is OPEC expecting global oil demand growth in 2016 to be lower than in 2015, but both the EIA and the International Energy Agency (IEA) are expecting similar annual demand changes.

**However, as the OPEC forecast for China's oil demand in 2016 highlights, global oil demand growth will be key to the timing of a sustained oil price increase**

The recent claim by the Russian oil minister that a number of oil producing countries are close to concluding a freeze on their production at January levels has provided a lift to oil prices. Oil speculators are anticipating that global demand growth and falling U.S. oil production will leave the world's oil supply below growing oil demand. That combination should lead to a reduction in the world's record oil inventories that are overhanging the market and helping depress oil prices. It is this confluence of trends that has investors, speculators and oil industry executives encouraged that they can begin to see a path to higher oil prices later this year or in the first half of 2017. However, as the OPEC forecast for China's oil demand in 2016 highlights, global oil demand growth will be key to the timing of a sustained oil price increase.

# A Man With Great Impact On The Shale Revolution Dies

Arguably the second most influential force in the history of the American shale revolution died in a fiery car crash last week, one day after being indicted by a Federal grand jury for violating anti-trust laws. Aubrey Kerr McClendon, the colorful and controversial former head of Oklahoma City-based exploration and production company Chesapeake Energy Company (CHK-NYSE), was

**Regardless what one feels about Mr. McClendon, we are sorry to see him pass in such a terrible way**

acknowledged for his inspirational skills in building one of the world's most significant oil and gas producing companies and was often mentioned in the same breath with George Mitchell, the father of the technology that has unlocked hydrocarbons trapped in shale formations, as critical to the industry's development. Regardless what one feels about Mr. McClendon, we are sorry to see him pass in such a terrible way, and our thoughts and prayers go out to his wife and children.

**Mr. McClendon was the grand-nephew of former Oklahoma Governor and U.S. Senator Robert Kerr, a lawyer, oil man and politician**

Mr. McClendon was the grand-nephew of former Oklahoma Governor and U.S. Senator Robert Kerr, a lawyer, oil man and politician. Senator Kerr was a co-founder of Anderson-Kerr Drilling Company that by 1929 had become so successful that he gave up his law practice. Over the years and through key relationships, the small regional drilling company evolved into the leading independent oil and gas producer, Kerr-McGhee Corp.

Senator Kerr was born in the Indian Territory near Ada, Oklahoma, about a decade before the state entered the union in 1907. He was the state's 12th governor and the first native-born Oklahoman to hold that office. In 1949, following one term as governor, he was elected to the United States Senate for the first of three times. He focused on issues that benefited the development of Oklahoma and the domestic oil industry.

**Senator Kerr's oil industry history was replete with stories of his deal-making**

Senator Kerr's oil industry history was replete with stories of his deal-making with other oil producers in Oklahoma such as Frank Phillips of Phillips Petroleum that enabled Senator Kerr to build a highly successful drilling company and eventually a profitable oil producer in the years prior to the Great Depression.

**It is said by some people that Mr. McClendon inherited Senator Kerr's deal-making genes**

It is said by some people that Mr. McClendon inherited Senator Kerr's deal-making genes. After graduating from Duke University, Mr. McClendon returned to Oklahoma and became a landman, a unique petroleum industry occupation that relies on deal-making skills. He founded Chesapeake Energy in 1989 with his partner landman, Tom Ward, and $50,000, which they successfully grew to become the second largest natural gas producer in the country. In the company's initial years, it focused on drilling horizontal wells in unconventional reservoirs in south-central Oklahoma and in southeast Texas around Giddings. The company then attempted to extend the Austin Chalk play of central Texas into Louisiana, but the downturn in oil and gas prices in the late 1990s almost bankrupted the company.

**Some observers felt Mr. McClendon was the equal of the con man character Harold Hill of The Music Man**

Mr. McClendon salvaged Chesapeake Energy and began expanding it by engaging in the "land grab" necessary to assemble the acreage positions key to the successful exploitation of the underlying shale resources. His methods of assembling those land positions created the impression among some observers that Mr. McClendon was the equal of the con man character Harold Hill of The Music Man, the

**It is the fallout from the Traveling Circus that led to Mr. McClendon's final image as an indicted petroleum executive**

1950s Broadway show and movie, who convinced River City to fund the purchase of musical instruments and form a band whose musicians he would train and lead. Others were convinced that the American shale revolution land grab was the equivalent of a Traveling Circus that came to town, put on a show (leased up the acreage and drilled wells), packed up and moved on to the next city. It is the fallout from the Traveling Circus that led to Mr. McClendon's final image as an indicted petroleum executive, and that may have contributed to his death.

**Exhibit 18. Controversy Followed Aubrey**


**Source:** ***Forbes Magazine***

**Much like the efforts of his grand-uncle to improve the economy of Oklahoma and the lives of its residents in the 1940s, 1950s and 1960s, Mr. McClendon did the same with his and Chesapeake's efforts to revitalize Oklahoma City - its culture and sports environment**

There was much about how Mr. McClendon lived and worked that created controversy in the business world and energy industry. On the other hand, he was an unapologetic promoter and booster of Oklahoma and Oklahoma City. Much like the efforts of his grand-uncle to improve the economy of Oklahoma and the lives of its residents in the 1940s, 1950s and 1960s, Mr. McClendon did the same with his and Chesapeake's efforts to revitalize Oklahoma City - its culture and sports environment. At times Mr. McClendon seemed bigger than life, but there is little doubt that he will go down in history as being one of the most important people in the history of the U.S. natural gas industry.

# Houston Growing Despite Energy Industry Downturn

**Throughout much of the economic recovery since the end of the 2008-2009 financial crisis and recession, the improvement in the national labor market has been driven by the shale oil miracle as oil companies put more and more drilling rigs to work**

Throughout much of the economic recovery since the end of the 2008-2009 financial crisis and recession, the improvement in the national labor market has been driven by the shale oil miracle as oil companies put more and more drilling rigs to work. At the end of June 2009, as the oil industry recovery was starting, the rig count sat at 917 active rigs but climbed to 1,929 the week before OPEC met in late November 2014. Since that meeting, which hastened the global oil price collapse, the domestic rig count has fallen to 502 active rigs as of the end of February. Since oil prices peaked in June 2014, they have fallen by roughly 70% before their current rebound sent them from the upper $20s to mid $30s a barrel. Natural gas prices have also dropped to rock bottom levels in response to sustained production, overflowing storage and weak demand due to the El Niño impact on winter temperatures. The nearly 5½ year period of super-high oil prices generated a gain of slightly over 1,000 active drilling rigs, however the current 15-month commodity price collapse has eliminated over 1,400 rigs from active status.

**Because Texas, and Houston in particular, are the focal point of the domestic oil and gas business, the state and city are suffering from the energy industry downturn**

This price collapse and fear that commodity prices may not rebound in the near-term has sent energy companies into retrenchment mode, meaning the industry is implementing drastic cuts to capital expenditures and the laying off the hundreds of thousands of employees – from roustabouts on drilling rigs to senior executives of energy companies. Because Texas, and Houston in particular, are the focal point of the domestic oil and gas business, the state and city are suffering from the energy industry downturn. The question asked by many people is whether this downturn is equal to, better or worse than the 1980s downturn.

**Exhibit 19. February Jobs Report Beat Estimates**


**Source:** ***The Wall Street Journal***

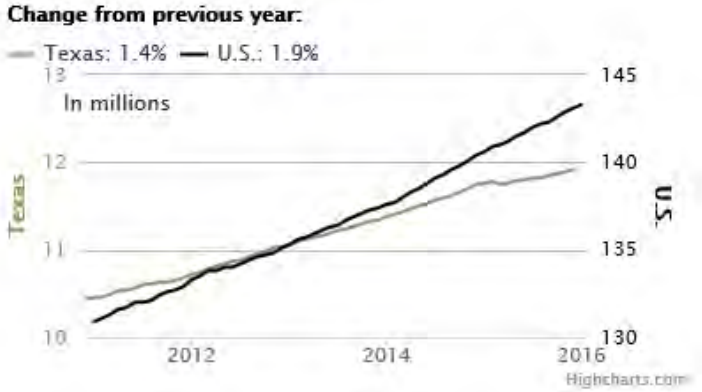
The latest statistics for Texas show that the state is still performing better than the nation overall, but the data most responsive to

energy industry fortunes is beginning to show negative effects. The February employment report of new job creation showed the nation added 242,000 new jobs, although the national unemployment rate remained stable at 4.9%.

**The year-over-year growth rate in Texas employment has lagged the comparable national non-farm employment growth rate**

The Texas situation doesn't look quite as rosy. While the latest monthly employment data for Texas is not yet available, the trend evident since the start of 2014 shows that the year-over-year growth rate in Texas employment has lagged the comparable national non-farm employment growth rate.

**Exhibit 20. Texas Job Creation Lagging National Rate**




**Source: Texas Comptroller Office**

**The economist behind the forecast has suggested that as many as 50,000 jobs could be lost by the oil and oil-related industries with those losses mostly centered in the west side of Houston**

According to the 2015 year-end economic outlook forecast for Houston in 2016 issued by the Institute for Regional Forecasting (IRF) by the Bauer College of Business at the University of Houston, the "fracking bust," as they label the current downturn, has broken the Houston metro job creation machine. The IRF estimates that there was a net 14,000 jobs created in 2015 in Houston after factoring in an estimated 30,000 jobs lost by oil and gas production, oilfield services and oil-related manufacturing businesses. To develop a forecast for 2016 and future years, the IRF developed three scenarios, each tied to a different outlook for a recovery in oil prices and petroleum activity. The IRF also prepared a 40/40/20 scenario by weighting the three forecasts – U-shape, Check Mark and Damage – by the respective percentages. For 2016, the three scenarios suggest job gains ranging between 16,800 and 27,500. The range improves dramatically in 2017 with an estimated 48,500 to 100,800 new jobs created. The economist behind the forecast has suggested that as many as 50,000 jobs could be lost by the oil and oil-related industries with those losses mostly centered in the west side of Houston, primarily the home of energy company corporate headquarters. Those losses would be offset by further hiring gains on the city's east side tied to the expansion of the area's refining and petrochemical industries. So the immediate answer to the question about this downturn versus the 1980s is: It is not the same!

**In the recession of the 1980s, Houston lost 225,000 jobs, some 13.3% of its payroll employment, between 1982 and 1987**

In the recession of the 1980s, Houston lost 225,000 jobs, some 13.3% of its payroll employment, between 1982 and 1987, or about one of every eight jobs that existed in 1982. The good news the IRF study, however, was the historical strength of Houston over the past 45 years – or why it has been a great place to live. Since 1969, measured by personal income growth, which includes numerous energy busts, Houston generated the second highest increase among the top 20 metro areas in the nation, placing just behind Phoenix. Houston's income growth was 1.8% per year faster than the average metro area during the period.

**Exhibit 21. The Surprising Economic Performance Of Houston**

**Table 3: Houston Is Second-Fastest Growing Major Metro Over 45 Years**

| Rank By Personal Income | Metro Area | Personal Income $ Billion 1969 | 2014 | Annual Growth Percent |
|---|---|---|---|---|
| 15 | Phoenix | 3.9 | 178.9 | 8.5 |
| 5 | ***Houston*** | ***8.4*** | ***355.8*** | ***8.3*** |
| 6 | Dallas-Fort Worth | 9.7 | 344.3 | 7.9 |
| 11 | Atlanta | 7.0 | 244.1 | 7.9 |
| 19 | Riverside | 4.4 | 147.7 | 7.8 |
| 18 | Denver | 4.7 | 148.7 | 7.7 |
| 10 | Miami | 9.4 | 286.0 | 7.6 |
| 20 | San Jose | 5.1 | 144.3 | 7.4 |
| 16 | San Diego | 6.3 | 167.9 | 7.3 |
| 12 | Seattle | 8.4 | 213.7 | 7.2 |
| 4 | Washington, DC | 16.3 | 380.0 | 7.0 |
| 14 | Minneapolis | 9.0 | 185.8 | 6.7 |
| 7 | San Francisco | 16.4 | 332.4 | 6.7 |
| --- | **U.S, Metro Average** | **682.6** | **12,983.1** | **6.5** |
| 9 | Boston | 17.4 | 304.3 | 6.4 |
| 17 | Baltimore | 8.7 | 149.6 | 6.3 |
| 2 | Los Angeles | 40.4 | 673.1 | 6.3 |
| 8 | Philadelphia | 22.8 | 332.4 | 6.0 |
| 1 | New York | 85.9 | 1,234.5 | 5.9 |
| 3 | Chicago | 36.8 | 484.3 | 5.7 |
| 13 | Detroit | 19.8 | 191.2 | 5.0 |

Note: These are current dollars. There is no comprehensive set of metro area deflators; if we assume all metros are subject to similar national inflation, the ranking is unchanged

**Source: IRF**

**Diversifying to become a tech center may not be what every city should strive for based on these comparisons**

Additionally, although Houston lost those 225,000 jobs by 1987, they were fully restored by early 1990. In contrast, San Jose, California, in the heart of the tech industry, lost 211,000 jobs, or 19.7% of its payroll employment, between 2001 and 2004. In the next month or so, the city should have restored all those lost jobs, but it didn't do so until 14 years later. Diversifying to become a tech center may not be what every city should strive for based on these comparisons.

**Midland, in the heart of the Permian Basin, is reeling due to the collapse of oil prices and oil-related activity**

When ExxonMobil's (XOM-NYSE) CEO Rex Tillerson told a CNBC anchor that parts of the Texas economy have been hit harder than others, he is well grounded. Midland, in the heart of the Permian Basin, is reeling due to the collapse of oil prices and oil-related activity, Houston's economy is not doing too poorly despite pockets of problems such as commercial real estate, sales tax collections and home sales. Mr. Tillerson pointed to the greater diversity of the Houston economy since the 1980s, which is supported by the IRF

**Houston will be back to its usual prominence sooner than many expect**

analysis. Based on their numbers, and the likelihood that we are near a bottom in the economic fallout from the oil downturn, Mr. Tillerson's comment that "I'd say by and large the state's doing fine" may shatter some illusions about Texas around the country. No, tumbleweed is not being blown down the streets of Houston, nor are we asking the last person to leave to turn out the lights. We expect Houston will be back to its usual prominence sooner than many expect – maybe even by next year's Super Bowl.

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