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ENERGY INVESTMENT BANKING

MUSINGS FROM THE OIL PATCH

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

Is Predicting The Demise Of Saudi Arabia The New Sport?

"We will not be able to stop the draining of money, the political adolescence, and the military risks unless we change the methods of decision making, even if that implied changing the king himself."

In late September, several media articles jumped on a story published by *Middle East Eye*, a regional news source, disclosing that a letter, or possibly two, reportedly written by a grandson of the founder of Saudi Arabia, King Abdulaziz Ibn Saud, blaming the current King Salman for creating unprecedented problems for the country and possibly its survival was circulating in the country. The story contained the following quote from the letter saying "We will not be able to stop the draining of money, the political adolescence, and the military risks unless we change the methods of decision making, even if that implied changing the king himself." Is this the first signs of potential political riffs among the third generation sons over the future leadership of the kingdom, or does it signal a deeper political problem?

The questions were prompted by the aging of the rulers-in-waiting and the realization that the House of Saud might soon run out of second-generation sons able to assume the throne

At the time of King Abdullah's death in January, following a 10-year reign, and the subsequent elevation of Prince Salman to the throne, questions were raised about when and how the first leaders from the royal family's third generation would be identified. The questions were prompted by the aging of the rulers-in-waiting and the realization that the House of Saud might soon run out of second-generation sons able to assume the throne. King Salman's first act was to appoint his half-brother, Prince Muqrin, as Crown Prince, or the next in line to become king. At the same time, King Salman designated Prince Mohammed bin Nayef, the son of Salman's late brother Prince Nayef, as Deputy Crown Prince, or third in line for the throne, and the first potential king to come from the generation of Saudi grandson princes.

The guidelines and principles for the selection of the country's ruler have been adopted over time, and mostly in response to past issues with successions. The rule was originally that the oldest son of King

Abdulaziz would succeed to the throne, which did occur initially, but ultimately led to a contentious leadership issue later. In 1952, Prince Saud, the King's oldest son followed his father onto the throne, but he was forced to abdicate in 1964 by his younger brother Prince Faisal. King Faisal then established a policy that any future Saudi king must not only be a senior member of the royal family but also must be viewed as having national leadership credentials.

There are three main branches of the family: the family of the late King Faisal, which has weakened over time; the seven sons of Abdulaziz's favorite wife, Hassa al Sudairi, known as the "Sudairi Seven"; and King Abdullah's descendants

Another informal standard adopted later was to create a balance of power among the various branches of King Abdulaziz's family that would be maintained in the succession process. There are three main branches of the family: the family of the late King Faisal, which has weakened over time; the seven sons of Abdulaziz's favorite wife, Hassa al Sudairi, known as the "Sudairi Seven"; and King Abdullah's descendants. King Faisal imposed a separate informal policy, which was that not only would a crown prince be appointed, who also held the title of first deputy prime minister, but also that a second deputy prime minister, who would be third in line of succession, would be appointed. This policy was designed to ensure that the order of royal succession would be clear, but this policy was upset by the aging of the second generation of royal sons. Two crown princes died while waiting to assume the throne calling into question this succession policy, but probably highlighting its value as a guide to future leadership.

Succession was based exclusively on the son's seniority and a family consensus

In 1992, King Fadh introduced the Basic Law of Government that created two significant succession policies. First, it established the right of the King to appoint or dismiss his heir based on suitability rather than seniority. Before, succession was based exclusively on the son's seniority and a family consensus. The rule also legalized the passing of the title of king to the grandsons of King Abdulaziz, which at that point was becoming an issue as to when and under what circumstances power would move from the second to the third generation of royal males.

The purpose of the Council is to ensure a smooth transition in the event of the incapacitation or death of the King or Crown Prince

King Abdullah, in 2006, formed the Allegiance Council composed of representatives from the families of King Abdulaziz's sons. The purpose of the Council is to ensure a smooth transition in the event of the incapacitation or death of the King or Crown Prince. The Council votes by secret ballot and determines the line of succession. Importantly, the Council has the right to remove a sitting ruler for reasons of health.

This spring, after Crown Prince Muqrin reportedly asked to be relieved of his position due to health issues, the line of succession into the next generation of males became more clearly established. Deputy Crown Prince Mohammed was elevated to Crown Prince and King Salman's son, Prince Mohammed bin Salman, was designated Deputy Crown Prince. Herein may be where the real familial tension may rest. Prince Mohammed has headed his father's Royal Court since he was elevated to a crown prince in 2012, and he was also

He is also the first crown prince not to have been educated in the west

named the Defense Minister and is responsible for the war in Yemen and he chairs the Council for Economic and Development Affairs, the country's main economic policymaking body. Prince Mohammed is young, reportedly 35, but thought possibly to be as young as 30. He is also the first crown prince not to have been educated in the west, having received his degree from a Saudi Arabian university. According to media reports, Prince Mohammed's nickname is "Reckless."

The historical pattern of royal succession called for leaders to alternate from the various family branches

When considering the issue of familial tensions, it should be noted that Prince Muqrin was a half-brother of King Salman by virtue of them having different mothers. Muqrin's mother was a Yemeni, which might be contributing to the current friction. The friction coming from quasi-Yemeni loyalty among some of the third-generation sons through their grandmother's family. It is also possible that the friction is due to the future leadership coming from the Sudairi Seven branch of the royal family. The historical pattern of royal succession called for leaders to alternate from the various family branches.

"The king is not in a stable condition and in reality the son (Mohammed bin Salman) the king is ruling the kingdom"

According to one media report, the letter-writing prince says "The king is not in a stable condition and in reality the son (Mohammed bin Salman) is ruling the kingdom." That would suggest that he has usurped what would have been the potential prerogative of Crown Prince Mohammed bin Neyef. If this scenario is true, then the costly oil policy, the protracted war with Yemen with no apparent end in sight, the recent crane accident, the disaster at the Hajj in Mecca, and the government's slow response to these events have set the stage for serious questioning of the judgment of the new leaders.

The article pointed to a new peer-reviewed study in the Journal of Petroleum Science and Engineering that projects Saudi Arabia's oil production will peak in 2028, a mere 13 years hence

The *Middle East Eye* article went on to discuss the financial and economic outlook for Saudi Arabia in an attempt to bolster the appeal for changing the decision-makers under the king. Saudi Arabia's government revenues depend on its oil resources for 80% to 90% of its annual intake. At the same time, the domestic economy is the Middle East's largest energy consumer. The article pointed to a new peer-reviewed study in the *Journal of Petroleum Science and Engineering* that projects Saudi Arabia's oil production will peak in 2028, a mere 13 years hence. The study, according to its abstract, is a forecast of the future trend in OPEC oil production from a predictive model based on a variant of the multi-cyclic Hubbert Peak Theory. According to the abstract, "The model is simple, accurate, and totally data driven which allows a continuous updating once new data are available." The study concludes that for the 12 major oil producing countries of OPEC, a crude oil production peak will occur in 2028 at a production rate of 18.85 billion barrels per year (Gb/year).

What is the significance of the study's conclusion? The tone of the *Middle East Eye's* article is that following the peak in production, there will be a sharp falloff. We know, however, that that is not necessarily what will happen. Production could peak and remain high for an extended period of time before declining. A more interesting

It is quite possible that Saudi Arabia's oil outlook picture is not as bleak as suggested by the article

point is that current OPEC production is roughly 31.6 million barrels per day, or 11.5 Gb/year, according to the International Energy Agency's September Oil Market Report. If we accept the study's peak oil annual volume, then current OPEC production is only 61% of that estimated peak. This means that daily OPEC production could reach 51.6 million barrels per day, or roughly 55% of currently estimated total global oil demand of about 94 million barrels per day. Since we have not been able to attain a copy of the research report, we don't know whether there are projections for individual countries, but the overall growth number suggests that those OPEC member countries with very large oil resources will be carrying the lion's share of the organization's production in the future, meaning Saudi Arabia, Iran, Iraq, and possibly Venezuela. It is quite possible that Saudi Arabia's oil outlook picture is not as bleak as suggested by the article.

Some analysts have predicted that based on the current domestic oil consumption trajectory, Saudi Arabia might reach zero oil exports by 2030

Another research model the *Middle East Eye* points to is the Export Land Model created by Texas petroleum geologist Jeffrey J. Brown and Dr. Sam Foucher. The purpose of this model is to measure the ability of a country to translate production into exports against rising rates of domestic production. In 2008, these researchers concluded that Saudi Arabia's net oil exports had already begun declining as early as 2006. They forecast that this trend would continue; a judgement that has proven correct, as Saudi Arabia's net oil exports have experienced a 1.4% annual decline rate over 2005-2015. Part of the decline has been due to growth in domestic oil consumption, which has risen by 7.5% over the past five years – driven largely by population growth. Some analysts have predicted that based on the current domestic oil consumption trajectory, Saudi Arabia might reach zero oil exports by 2030. The policy of high production at low prices is at odds with that view. Over this same period, the country's population will grow from 29 million people to 37 million.

Saudi Arabia is moving quickly to exploit its natural gas reserves to displace crude oil currently used to produce electricity and to power the desalinization plants. When the new gas plants are up and running by the end of 2015, potentially 700,000 barrels per day of currently consumed oil will become available for export.

While the overall unemployment rate is 12%, the youth rate is 30%

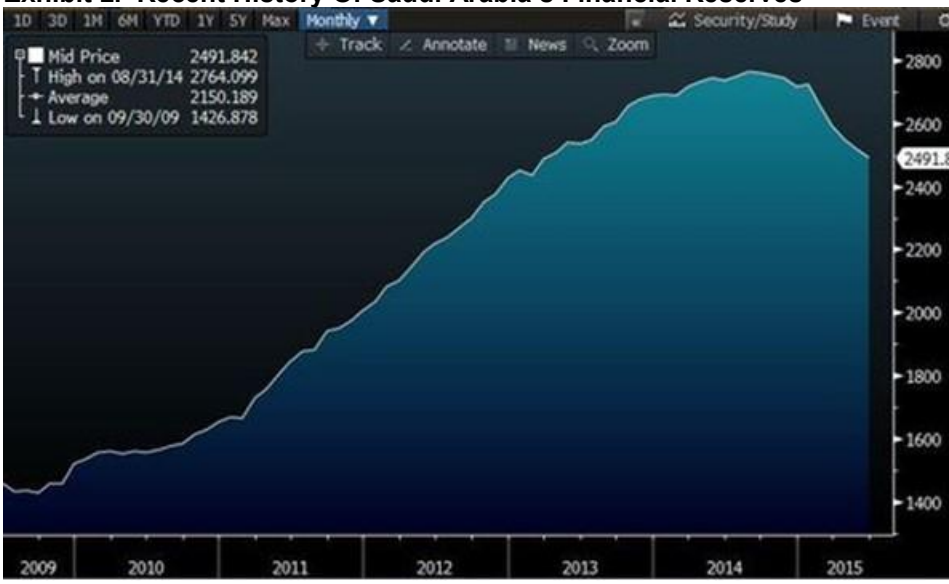
Economically, Saudi Arabia has demographic problems that compound the government's financial challenges. The country's population has been growing rapidly, such that 50% of it is under the age 30. More importantly, while the overall unemployment rate is 12%, the youth rate is 30%. The female population of educated women is growing rapidly, but there are limited employment opportunities, adding further frustration to today's youth. The vast majority of the country's labor force is composed of guest workers.

Many people are beginning to look at Saudi Arabia's financial condition for clues as to whether and when the government might be forced to change is oil policy and reduce output in an attempt to bolster global oil prices. These people point to the recent decision by

The recent bond sale was equivalent to 1.6% of the country's GDP

the Saudi government to sell $5 billion in bonds, the first time since 2007 that it has issued debt, as a sign of financial stress. In recent years with oil prices near $100 a barrel, Saudi Arabia paid off all the debt accumulated during 2007-2010 due to the financial crisis. The recent bond sale was equivalent to 1.6% of the country's GDP, leaving substantial room for further debt sales. Analysts also point to recent reports from money managers that the government has withdrawn between $50 billion and $70 billion in assets from various institutions as further evidence of the financial strain the low oil price strategy is having on the government's finances.

Exhibit 1. Recent History Of Saudi Arabia's Financial Reserves



Source: ***Bloomberg***

Based on the monthly reserve decline rate, the government would have 47 months before reaching the 2009 low level of reserves

The key focal point for analysts keen on assessing the financial stress in the Saudi Arabian government is measuring the country's foreign currency reserves. From a peak of $737 billion in August 2014, they have fallen to $672 billion in May 2015, or at a rate of $12 billion per month. That rate was partially impacted by generous grants to the population by King Salman immediately upon assuming the throne, but continued low oil prices, ongoing government expenditures and the Yemen war effort are taking its toll on the country's foreign currency reserves. Based on the monthly reserve decline rate, the government would have 47 months before reaching the 2009 low level of reserves, meaning it would happen in early 2019.

The Saudi Arabian government possess other options to help offset what the International Monetary Fund projects might be a spending deficit of 20% of GDP this year. Those options include delaying government capital spending, such as in the January decision to delay a $109 billion solar power facility; accelerating development of the country's natural gas reserves that would free up more domestic

oil for export; borrowing more money; reducing fuel and food subsidies; instituting an income or wealth tax; ending the war in Yemen; and lastly, reversing course on oil prices. Listing oil prices as the last option reflects our belief that this "oil price war" is very important for the long-term future of the Kingdom, and the government has other options available to fund itself without reversing course on oil prices.

Does the *Middle East Eye* article signal that the potential for an overthrow of the current king is on the horizon?

In our first issue of *Musings* for 2015, our lead story asked the question: "Saudi Succession To Be 2015's Energy And Mideast Wild Card?" That story may prove more profound than we realized at the time. The title reflects what has been a dominant theme in the energy and geopolitical arenas so far this year. Does the *Middle East Eye* article signal that the potential for an overthrow of the current king is on the horizon? We doubt it, but certainly cannot discount it 100%. Rather, we believe there is a power struggle emerging within the third generation over what type of country Saud Arabia will become in the future. Most likely a number of grandsons see the future of Saudi Arabia differently than those who are currently in the leadership. If, as they perceive, King Salman's son is driving the policymaking, then they are probably very concerned about the geopolitical, religious and economic, meaning oil pricing, policies and actions that are shaping their future. With King Salman, reportedly 80 years old, in poor health, the formal process exists to pressure him to step down.

"Allow the oldest and most capable to take over the affairs of the state, let the new king and crown prince take allegiance from all, and cancel the strange, new rank of second deputy premier"

According to reports, the letter calls on the 13 surviving sons of Abdulaziz to unite and remove the current king and the succession line in a palace coup before choosing a new government from within the royal family. The letter states, "Allow the oldest and most capable to take over the affairs of the state, let the new king and crown prince take allegiance from all, and cancel the strange, new rank of second deputy premier." It goes on to say, "We are calling for the sons of Ibn Saud from the oldest Bandar, to the youngest, Muqrin, to make an urgent meeting with the senior family members to investigate the situation and find out what can be done to save the country, to make changes in the important ranks, to bring in expertise from the ruling family whatever generation they are from."

"How goes Saudi Arabia" will dictate the fate of the oil industry.

For Saudi Arabia, resolving issues such as living with Iran, the war in Yemen, the country's one-product economy, and its demographic and social challenges will determine the future generation's prosperity or its despair. In the energy world, everyone knows that "how goes Saudi Arabia" will dictate the fate of the oil industry. Stay tuned because we doubt the last chapter has been written, and that chapter will prove significant for the world.

What's Wrong With This Picture Of Europe's Green Energy?

Germany now has a problem with thousands of "aging wind farms" that will need to be dismantled and replaced

Two news items about green energy in Europe shocked us given the deluge of climate change events, discussions and supposed deals highlighted by the recent visits to the United States by Pope Francis and Chinese President Xi Jinping. One of the two news stories pointed out that Germany now has a problem with thousands of "aging wind farms" that will need to be dismantled and replaced. The other story highlighted that the new Denmark government is eliminating the federal subsidy for electric vehicles and will begin promoting diesel cars. These two story lines are coming from the two leading European countries who have embraced renewable energy as the future for powering their economies. Could it be that the performance of renewable energy sources and their economic cost has become too much for the respective governments?

There are nearly 7,000 of the current 25,000 active wind turbines in operation in Germany that are 15 years or older and in need of replacement

The story in Germany is that the country embraced wind energy in the 1990s, well ahead of the government push to replace its nuclear power plants with renewables following the Fukushima nuclear power plant accident in 2011. As a result, there are nearly 7,000 of the current 25,000 active wind turbines in operation in Germany that are 15 years or older and in need of replacement. There are two reasons why these wind turbines need to be replaced. One is that they have become less efficient and require greater repairs and modifications. Secondly and more important, the guaranteed wind power tariffs end at 20 years, making the turbines uneconomic to continue to operate.

No one points out that renewable power facilities need to be rebuilt two or three times to achieve the same lifespan

One of the admissions you never hear in the proponents' arguments for why wind power is as cheap or cheaper than electricity from conventional fossil fuel power plants is that wind turbines barely last beyond 15 years. So when a 40- or 50-year life fossil fuel power plant is compared with a wind farm, no one points out that renewable power facilities need to be rebuilt two or three times to achieve the same lifespan. We wonder what that math does to levelized-cost calculations of renewable power?

An argument made for replacing these aging wind turbines is that the new generation is more efficient because they are using newer technologies. That is the same argument for why a 2015 model car is better than a 1999 (our case), but if one is only interested in getting from point A to point B safely and efficiently, the older car meets the requirement, as should an old wind turbine. But if one is interested in modern conveniences such as on-board navigation systems, satellite radios and backup cameras, you're out of luck driving the older car. What really changes the economics is when the subsidy for the older wind turbine ends and the repair costs mount, the abandonment decision is dictated.

The estimated cost to remove one of these older wind turbines is about $33,500. What is involved is at least two 150-ton cranes, which are used to dismantle the turbines, tower houses, rotor blades

and other related equipment and parts. Offshore wind is even more intricate and costly, as offshore cranes and shipping vessels for the parts must be scheduled, plus there is the additional cost of removing the steel platforms from the seabed on which the turbines were mounted.

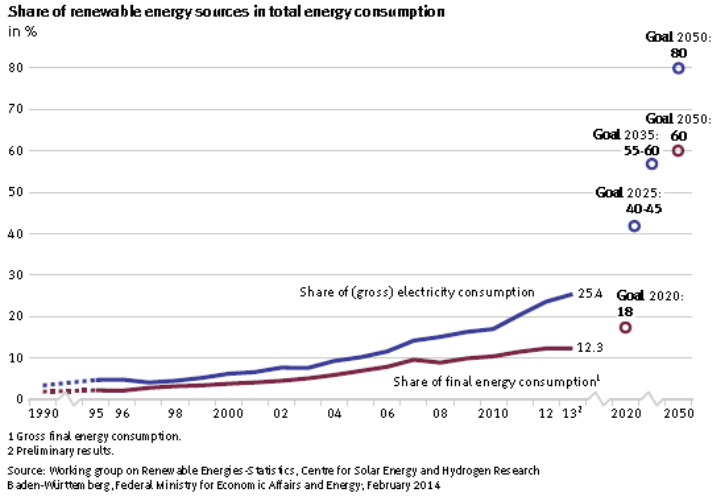
In Germany, reprocessing rotor blades is done in industrial plants where the blades are shredded and then mixed with other waste products and used in cement manufacturing facilities as fuel

The decommissioning of wind turbines will become a significant commercial market, and a costly endeavor, as time moves on. According to a recent study commissioned by Scottish National Heritage, that country, an aggressive developer of wind farms, will need to "recycle" approximately 225,000 tons of rotor blades by 2034. Just how will that be done? In Germany, reprocessing rotor blades is done in industrial plants where the blades are shredded and then mixed with other waste products and used in cement manufacturing facilities as fuel.

It was estimated that if 30% of U.S. wind turbines need to be decommissioned within the next 5-10 years, the total cost for the industry could be upwards of $1 billion

One point made in the article was that the United States wind energy industry will also eventually be confronted with a similar decommissioning challenge. The time frame for the challenge to begin is probably within the next 8-10 years. It was estimated that if 30% of U.S. wind turbines need to be decommissioned within the next 5-10 years, the total cost for the industry could be upwards of $1 billion, based on an estimated cost of $55,000 and above per turbine. Again, we wonder how much of that decommissioning expense has been built into the economic analysis of each wind farm project. Or maybe we will be left with thousands of rusting hulks such as those that adorned the hills leading into California in the 1980s and 1990s.

Exhibit 2. Renewable Energy Share Is Growing



Source: Federal Ministry for Economic Affairs and Energy

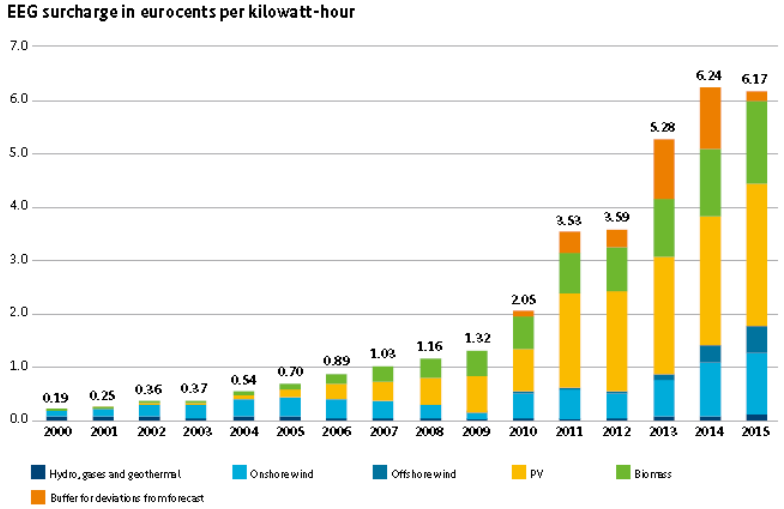
For Germany, the push into wind and solar renewables has come at a significant cost. Several charts from recent reports about the country's energy industry and its renewable sector show that despite the rapid growth in renewable energy, it still remains a relatively small

portion of the country's electricity supply. At the same time, the cost of electricity has been driven up by green energy subsidies, although with recent policy changes the pace of the price rise has slowed, or even declined as in 2014, when measured in final energy consumption.

This subsidy is guaranteed for 20 years, and the cost is passed on to electricity consumers via the "EEG surcharge"

When we examine the cost of electricity in Germany, it is important that one understand that the previously unworkable green energy policies were reworked in late 2014 due to the explosion in power costs that hit residential ratepayers the most, and that were also impacting business, too. Germany enacted the Renewable Energy Sources Act (EEG) in 2000. That law contained the following principle: anyone generating electricity from sun, wind, water or biomass is entitled to fixed remuneration for every kilowatt-hour of electricity produced. This subsidy is guaranteed for 20 years, and the cost is passed on to electricity consumers via the "EEG surcharge."

Exhibit 3. Renewable Energy Is Boosting Power Costs



Source: Federal Ministry for Economic Affairs and Energy

If one looks only at the absolute costs from the various renewable fuel sources, the increase in 2015 was considerable compared to 2014

As the government report highlights, the EEG surcharge transformed renewable energy from a niche supply source into a mainstay of energy supply. The reports also cite advances in technology as contributing to a significant reduction in the cost of generating electricity from renewable sources. But, the EEG surcharge rose sharply as renewable power grew. It was this experience that led the government to reform the Renewable Energy Sources Act effective on August 1, 2014. As can be seen from Exhibit 3, the EEG surcharge has declined in 2015 after rising sharply in 2013 and 2014. What we notice, however, is that if one looks at the components of the EEG surcharge, the decline in 2015 has come because the "buffer for deviation from forecast" has shrunk meaningfully. If one looks only at the absolute costs from the various renewable fuel sources, the increase in 2015 was considerable compared to 2014.

The new government in Denmark has moved to drop some green energy subsidies in response to their cost and as a way to boost the country's economy

Green energy economics, i.e., subsidies, have hurt not only Germany but Denmark as well. The new government in Denmark has moved to drop some green energy subsidies in response to their cost and as a way to boost the country's economy. The subsidy changes were unveiled with the filing of the government's 2016 budget. The changes involve extending the 180% tax on all luxury cars regardless of their emissions levels. This has the impact of raising the price of a Tesla Motors (TSLA-NYSE) Model S from a price of 650,000 kroner ($97,665) to nearly 1.8 million kroner ($270,500). This change recognizes that the Tesla Model S competes with other luxury cars powered by conventional engines that are being highly taxed, so it levels the competitive playing field.

1,246 electric vehicles were sold in Denmark during the first half of 2015, up 97% over the same period in 2014

According to the Tax Minister, the Danish government expects to receive approximately 30 billion kroner ($4.5 billion) in 2016 from automobile levies. The impact of changing the taxation of electric vehicles will be to add approximately 450 million kroner ($67.6 million) in revenue for the government. According to data from the European Automobile Manufacturers Association, 1,246 electric vehicles were sold in Denmark during the first half of 2015, up 97% over the same period in 2014. The Tesla Model S was the number one electric vehicle sold in the country during that time period.

The lost revenue from this move is equal to 0.04% of the Danish government's annual receipts

The government has also announced it plans to abandon the prior ambitious CO_2 emissions targets and is dropping plans to become a fossil-fuel free economy by 2050. One of the first steps is the government's plan to end the NO_x tax, which is expected to save businesses in Denmark approximately 240 million kroner ($36 million) in 2016. The lost revenue from this move is equal to 0.04% of the Danish government's annual receipts.

For environmentalists and prior government officials, this was a huge blow. As Ida Auken, an opposition legislator who previously served as environment minister told *Bloomberg*, "This government only supports old technologies and has no vision for the future."

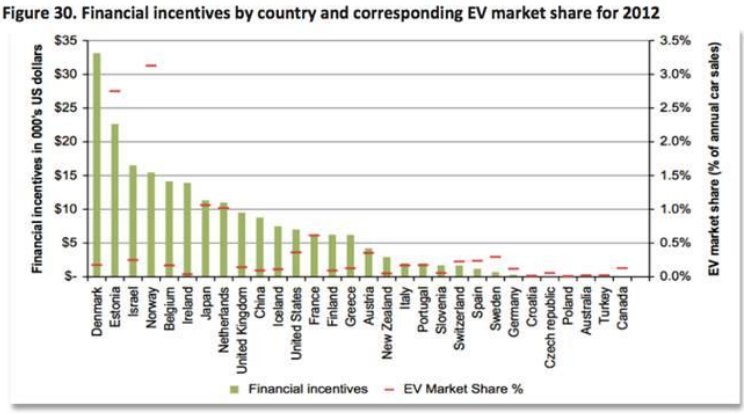
"The former government may have promised to keep electric cars exempt from car taxes, but they just forgot one thing: finding the money to do so"

The problem was, as often is the case with progressive agendas, the electric vehicle subsidy and the negative impact on economic activity and job creation due to the NO_x tax was creating a widening fiscal deficit. As Finance Minister Claus Hjort Frederiksen pointed out, "The former government may have promised to keep electric cars exempt from car taxes, but they just forgot one thing: finding the money to do so."

Despite the subsidies, most of the countries are not finding electric vehicles that popular a choice

To put the situation with electric vehicles in Denmark in perspective, financial subsidies for these pollution-free cars has become a significant driver behind their sales. However, despite the subsidies, most of the countries are not finding electric vehicles that popular a choice. Charts from several studies show the degree of success for electric vehicles in carving out a share of their respective nation's automobile population. Exhibit 4 on the next page shows that in

Exhibit 4. Market Penetration Low Despite High Incentives

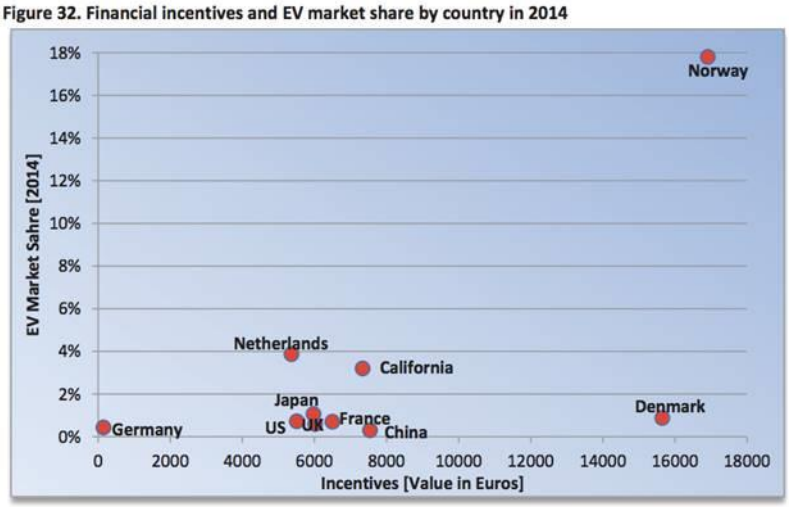


Source: Amsterdam Roundtables Foundation

The only countries where it appears that financial incentives have produced a relatively high penetration rate are Estonia and Norway

2012, Denmark led the world in the financial incentives given to buyers of electric vehicles, yet their market penetration was slightly over one-tenth of one percent. The only countries where it appears that financial incentives have produced a relatively high penetration rate are Estonia and Norway. Both of these markets are small such that the correct incentives targeting the right buyers can induce relatively high penetration rates.

Exhibit 5. Norway Scores In Market With High Incentives



Source: Amsterdam Roundtables Foundation

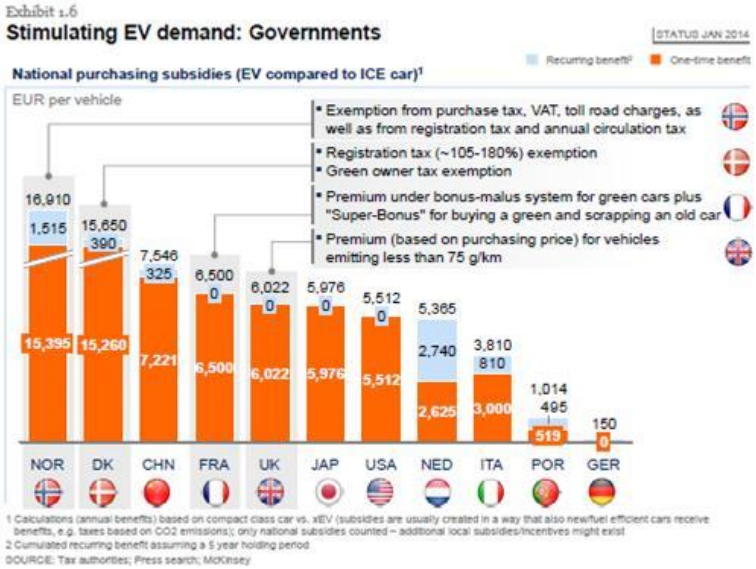
In Exhibit 5, we show a similar matrix of financial incentives versus market penetration rate, but this time for 2014. Once again Denmark and Norway stand out with extremely high financial incentives. However, Denmark has an extremely low penetration rate, while Norway's penetration rate is nearly off the chart. The significance would appear to be either that the value of the financial incentives

increased in 2014 or some other factors are at work. For the Norwegian electric vehicle market share to go from slightly over 3% in 2012 to nearly 18% in 2014, there had to be a driver that is not totally clear since the value of the financial incentives in those two years did not change materially.

Germany's financial incentive for electric vehicle purchases is zero

One interesting point about these two charts is the lack of support for electric vehicle technology from the German government. One will note that the financial incentives offered electric vehicle buyers in 2012 and 2014 were virtually non-existent, with the result that market penetration barely registered. Is that due to the strength of the German car manufacturers and the significant economic and employment role they play in the German economy? While we have no explanation, as Exhibit 6 shows, Germany's financial incentive for electric vehicle purchases is zero.

Exhibit 6. Incentives Key For EV Market Penetration



Source: Amsterdam Roundtables Foundation

However, as one news report about the Danish government's announcements pointed out, the timing could not have been worse

As we mentioned at the start of this article, these two noteworthy news items impacting the leading green economies in Europe have not received much attention from the press. However, as one news report about the Danish government's announcements pointed out, the timing could not have been worse. The declaration of abandoning the fossil-fuel free economy by 2050 came on the same day that President Barack Obama gave a major speech about climate change and the need for all of the world's governments to embrace major economic restructurings in order to reduce carbon emissions. Their most recent announcement about taxing electric vehicles came merely hours after Elon Musk, CEO of Tesla Motors visited Copenhagen and the Volkswagen scandal emerged over deception regarding diesel vehicle testing for NO_x emissions. But as the Danish government was open to admitting, and Germany is beginning to

recognize, the cost of renewable energy has become a serious drag on economies. Unfortunately, we hold out little hope that the leaders of the world will assess the economic impacts of green energy before venturing off to Paris to pledge massive economic restructurings in order to try to restrain carbon emissions from growing beyond supposed catastrophic limits.

Saudi Arabia Must Worry Over Comments By Imperial Oil

The potential to more than double production from a number of the company's proposed oil sands projects

One announcement that hasn't received much, if any, attention from either the mainstream media or the investment community, but which does have a potentially meaningful impact on long-term crude oil prices, came from Imperial Oil Ltd. (IMO-NYSE). The comments were made by Imperial Oil's President and CEO Rich Krüger at the company's Investor Day presentation to an audience of investment professionals and shareholders in late September. The comments dealt with technology that Imperial Oil researchers have developed that offers the potential to more than double production from a number of the company's proposed oil sands projects.

Mining is used to tap the near-surface oil sands deposits

Oil sands deposits in Canada are produced in one of two ways: either they are mined or liquefied by injecting steam that sweats the oil particle loose from the sand grain. Mining is used to tap the near-surface oil sands deposits. The process involves digging up with a power shovel the oil-soaked sand, loading it in a dump truck and hauling it to a processing facility where the mixture is heated up in order to separate the oil molecules from the sand deposits. These oil sands mining operations are the marvel of the media since all the equipment is oversized and they operate 24 hours regardless of weather.

SAGD is utilized primarily for deeper oil sands deposits where the volume of surface material makes mining operations uneconomic

The alternative extraction method, referred to as in-situ or Steam Assisted Gravity Drainage (SAGD), is utilized primarily for deeper oil sands deposits where the volume of surface material makes mining operations uneconomic. The SAGD process involves drilling two horizontal wells into the deposit that are located only a few feet apart and one above the other. Steam is injected into the upper well, which allows the heat to liquefy the oil attached to the sand grains in the immediate area. That liquid gradually drops down to the lower well bore from which it is extracted.

The carbon emissions from oil sands output are significantly less than those of California's heavy oil and Venezuela's Orinoco Belt oil

Both oil sands extraction processes are expensive and the bitumen resource extracted is not exactly the same as traditional oil, but its qualities are similar to the heavy oil from California, Venezuela and Mexico. More importantly, as pointed out by Imperial Oil in its presentation, the carbon emissions from oil sands output are significantly less than those of California's heavy oil and Venezuela's Orinoco Belt oil. The carbon emissions from oil sands are similar to those from Mexico's Maya heavy oil. The point of this discussion is that oil sands volumes could displace other heavy oil the United States is refining and burning and produce less pollution. It is

disappointing that this argument was never central to the debate over approval of the Keystone XL pipeline. It is clearly a reason why the State Department environmental review found no negative impact on the U.S. environment if Keystone is constructed.

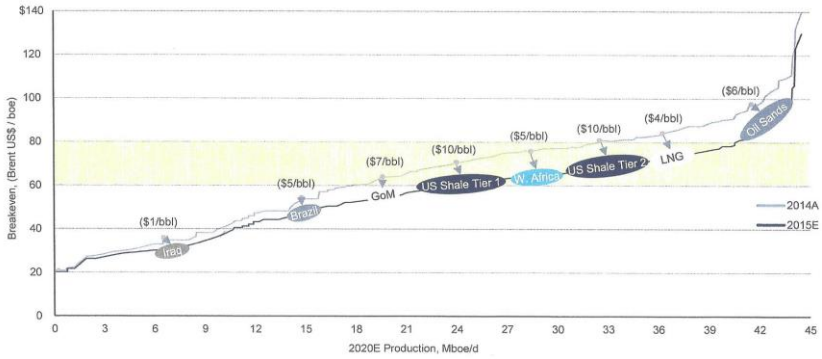
Currently proposed oil sands projects could produce 55,000 to 75,000 barrels a day in oil output compared to their presently planned output of 30,000-40,000 barrels a day

The new Imperial Oil technology involves adding a solvent to improve the flow of oil to the surface as well as generators that burn less natural gas to supply the steam. What we understand about Imperial Oil's new technology is that currently proposed oil sands projects could produce 55,000 to 75,000 barrels a day in oil output compared to their presently planned output of 30,000-40,000 barrels a day according to Mr. Krüger. As he was quoted during the presentation, "This is bigger on a per phase basis than we've talked about in the past." From Mr. Krüger's viewpoint, this technology represents "a very large, long-term growth opportunity." Even though the company seems satisfied with the new technology, it is not ready to move forward with some of these planned oil sands projects while management assesses their cost, possible changes to Alberta's regulatory policies and the outlook for global oil prices.

if the Imperial Oil claims are correct and can be implemented commercially, then a 30% output improvement might translate into $25-$30 per barrel cost reductions

Citi Research has prepared a chart showing its assessment of the impact of technological and economic cost reductions of various oil outputs between 2014 and 2015, based on assumed 2020 output contribution, due to the industry downturn. Most of the decline since 2014 is about $5 per barrel, although Gulf of Mexico costs may have declined by $7 a barrel and the shale formations by $10 a barrel. If Mr. Krüger's assessment of the impact on output from Imperial Oil's new technology is correct, then there would likely be a significant reduction in the cost of new oil sands output. According to the Citi Research chart, they estimate that oil sands currently cost between $80 and $100 a barrel. However, if the Imperial Oil claims are correct and can be implemented commercially, then a 30% output improvement might translate into $25-$30 per barrel cost reductions. Obviously there are a number of assumptions that must be made in reaching this conclusion, including that the solvent-added SAGD process is not more costly than what is being done now and that the

Exhibit 7. Oil Output Costs Are Coming Down



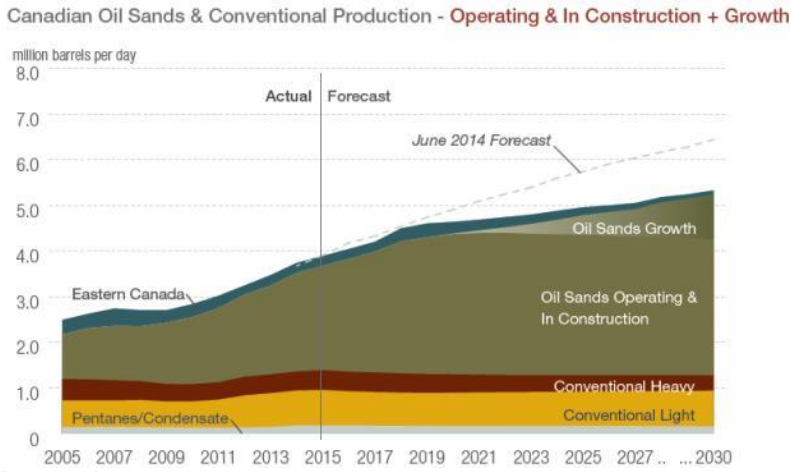
Source: Citi Research

additional output volumes require extensively larger facilities in order to handle them.

It has been our contention that Saudi Arabia's target was these deposits, including Arctic output, and less about the domestic shale business

If you are Saudi Arabia and you have targeted new, large and long-term output sources such as oil sands and deep water oil in your price war, the prospect of their costs declining materially has to be unnerving. It has been our contention that Saudi Arabia's target was these deposits, including Arctic output, and less about the domestic shale business. Why? The shale revolution is a "real-time" output, meaning that if producers are forced by economics to stop drilling, eventually oil prices will rise, drilling will resume, as will shale output, and the price cycle will start all over again.

Exhibit 8. Oil Sands Are Key For Canada's Energy Future



Source: CAPP

This output volume should remain stable for the foreseeable future

The significance of the oil sands output in the Saudi Arabian thinking is demonstrated by the latest oil output forecast from the Canadian Association of Petroleum Producers (CAPP). The forecast, as shown in Exhibit 8, shows how significant oil sands output is to the country's current oil production. The chart also shows that this output volume should remain stable for the foreseeable future. Total oil sands output will grow in the future as new mines and in-situ projects are brought on stream, many of which have been and remain delayed due to the current low oil prices. Imperial Oil's new in-situ SAGD technology could be a game-changer, even though it will not arrive for possibly five years. While it may not shape the oil price recovery in the next few years, it has the potential to help cap the price trajectory in the future.

Brief Comments About Current Energy Matters

Events impacting the energy world seem to be happening at a blistering pace, which barely leaves time to assess them before the next wave hits. We thought we would offer some very brief

comments on the energy significance of some of these events from the past couple of weeks.

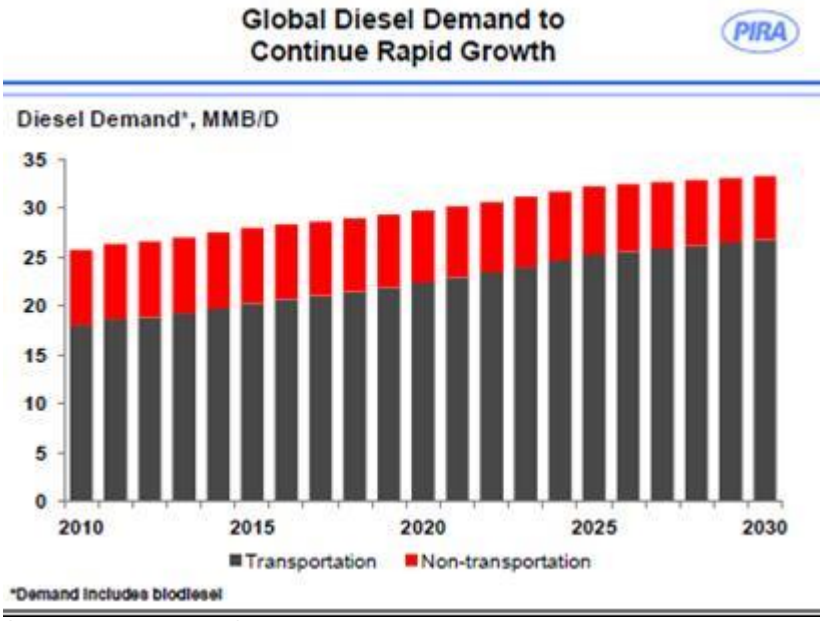
The Demise Of Diesel Due To Volkswagen Scandal?

There are questions about whether this means the demise of "clean diesel," if there ever was such a thing, as an automobile fuel

The scandal engulfing the world's largest automaker, Germany's Volkswagen AG (VLKAY-OTC), is raising questions about whether this means the demise of "clean diesel," if there ever was such a thing, as an automobile fuel. If true, there would certainly be implications for the global oil refining business. The existence of software in diesel cars that enabled them to know whether they were being tested or not, and if the nitrogen oxide emissions control hardware needed to be engaged to comply with environmental testing standards is simply amazing. That must be pretty smart emissions control equipment and software!

According to a 2014 study prepared by the PIRA Energy Group for the Fuels Institute, global diesel demand in 2015 is estimated to be about 27 million barrels per day (mmb/d), with approximately 25 mmb/d of that used in transportation with the remaining balance for non-transportation uses such as off-road, farming, home heating, etc.

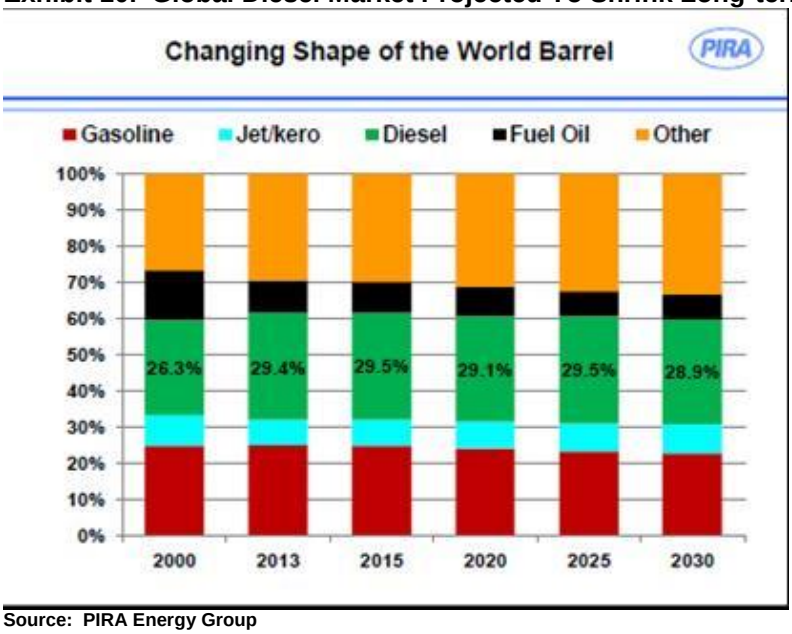
Exhibit 9. Near Term Diesel Market Growth Questioned



Source: PIRA Energy Group

Diesel represents nearly 30% of global oil consumption this year and was projected to rise in the study. In the U.S., diesel output is about 4 mmb/d of approximately the country's nearly 19.9 mmb/d of demand, however, roughly 1.1 mmb/d of this volume is exported, primarily to Europe.

Exhibit 10. Global Diesel Market Projected To Shrink Long-term



Source: PIRA Energy Group

Will a war against diesel fuel, coupled with driver distrust of auto companies selling diesel vehicles, kill this market?

Will a war against diesel fuel, coupled with driver distrust of auto companies selling diesel vehicles, kill this market? At the margin, probably yes. But in terms of the entire diesel market, probably not. High-end diesel vehicles can support the required emissions equipment, and certainly the over-the-road trucking industry's shift away from diesel will take decades to occur. Bottom line, we suggest not worrying about a major disruption to the refining industry over a cataclysmic drop in diesel fuel consumption.

Rhode Island Meets Realities Of Offshore Wind Adventure

In dealing with concerns about the cranes being used and the lifting process, the report suggested that the cranes were older and poorly suited for offshore use

The Deepwater Wind project off the coast of Rhode Island has encountered a series of safety issues during this year's construction phase for the five offshore wind turbines, according to a report from ABS Group. The report was based on a five-week study in July and August, and dealt with issues such as "outdated" equipment and workplace hazards. In dealing with concerns about the cranes being used and the lifting process, the report suggested that the cranes were older and poorly suited for offshore use. There were numerous references to the crane and pile-driving equipment and reportedly repeated failures of rigging equipment that led to the loss of materials. An unsecured equipment barge hit one of the already installed jackets damaging a leg section, but not severely enough to create a structural problem. One does wonder, however, whether this dent could become a long-term problem.

These jackets may get tested in the next few days with the nearby passage of Hurricane Joaquin. Deepwater Wind assured the Coastal Resources Management Council, who oversees the offshore wind

One wonders why Deepwater Wind and its contractors are experiencing such problems

business for the state that it is working to resolve the concerns and will be dedicating additional safety people to all work shifts. Given the experience of offshore wind turbine installations in Europe and the long history of offshore oil and gas development in the Gulf of Mexico, one wonders why Deepwater Wind and its contractors are experiencing such problems. Could it be that Deepwater Wind is run by financial types more interested in maximizing profits rather than conducting safe offshore operations?

National Grid wants fees to be charged to owners and operators of solar and wind power facilities to offset the cost of improving the state's electricity grid and to ease the financial cost due to lost revenues from growing distributive power

Residents of Rhode Island are already confronting the impact of the high cost of this offshore wind power, but now National Grid (NNG-NYSE), the principle electric utility in the state, is asking the Public Utility Commission for fees to be charged to owners and operators of solar and wind power facilities to offset the cost of improving the state's electricity grid and to ease the financial cost due to lost revenues from growing distributive power. As expected, all the environmental groups are up in arms and moving to get the request dismissed. This is happening in a state where a Republican governor and Democratic legislators collaborated to rewrite the PUC laws to secure the approval of Deepwater Wind and its high-cost power following the PUC's rejection of the power purchase agreement due to its negative impact on the state's ratepayers. Don't hold your breath for any deal on his proposal that helps the ratepayers.

Immigrant Migration To Europe And Energy Demand

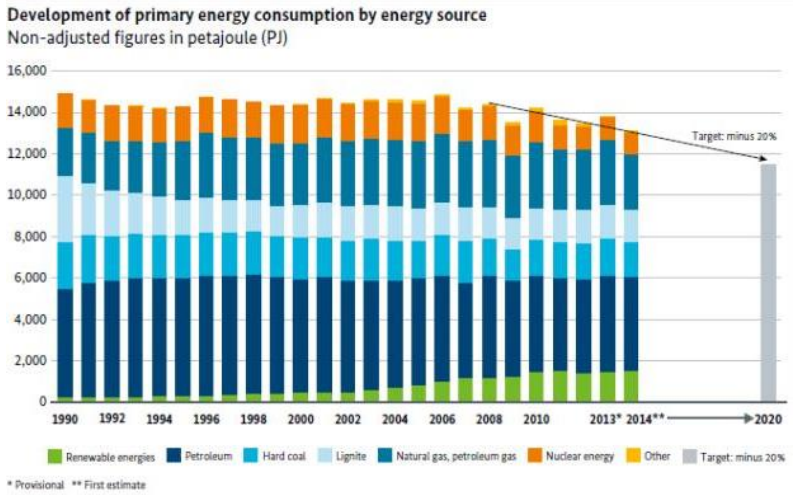
Germany has a demographic problem due to a rapidly aging population causing it to shrink

The story of the surge in Middle East immigrants flowing into Europe has dominated the news with discussions about the human toll it is taking. Germany is leading the world in accepting these immigrants, although the country is being overwhelmed and is seeking help from other countries. Germany has a demographic problem due to a rapidly aging population causing it to shrink. With 81.2 million people as of 2014, according to the Federal Statistical Office of Germany, or 1.14% of the world's total population, and a zero or declining population growth rate due to only a 1.4 birth rate (the number of live births per thousand of population per year), the country needs more workers. As of 2013, 21% of the country's population was 65 or older. Immigrants account for just under 8% of the population.

Germany has one of the highest per capita energy consumption rates among the large economies on the continent at 3,874 kilograms per person

Given these conditions, it is little wonder why German Chancellor Angela Merkel is opening the country's doors to upwards of one million immigrants this year. Germany has one of the highest per capita energy consumption rates among the large economies on the continent at 3,874 kilograms per person. An additional one million residents, equal to a 1.2% increase in the total population, would translate into a 1.2% increase in the nation's energy consumption, assuming per capita consumption remained stable. When these displaced persons from Middle Eastern conflicts, whom are not productive citizens, arrive in European countries such as Germany, they may boost Europe's overall energy demand, a positive for the global energy industry.

Exhibit 11. German Energy Consumption Has been Falling



Source: Federal Ministry for Economic Affairs and Energy

Their impact on total energy demand should be greater than the strict per capita ratio to the total population

Remember, these arriving immigrants come with little, but assume they can gain employment. Their near-term living needs likely mean that their energy consumption will be much higher than ordinary citizens. Thus, their impact on total energy demand should be greater than the strict per capita ratio to the total population. This will be important for Germany where energy consumption has been falling in recent years, despite environmentalists wanting to see the nation's power use fall further.

WSJ Suggests Investors Warming To Energy Offerings

For the month of September, four equity deals were completed raising $1.3 billion

Friday's *Wall Street Journal* carried an article pointing to two successful equity offerings by exploration and production companies in the past couple of weeks as a sign that maybe the dry-spell for oil and gas producers hurt by falling commodity prices is ending. For the month of September, four equity deals were completed raising $1.3 billion. That was four-times the amount raised in July and August, respectively. The amount raised in September was equal to the amount of money raised in the months of June, April and January, but well short of the $4.5 billion and $5.7 billion raised in February and March, respectively, when the expectation of a sharp rebound in oil prices was the conventional view.

More outside capital entering this industry is not a good sign for those seeking a structural recovery

While an improving E&P equity market is welcomed by those companies with their tin cups extended, more money coming into the industry may not be good news for the overall business. In a harsh assessment, more outside capital entering this industry is not a good sign for those seeking a structural recovery. Classic market bottoms are only established when "blood is flowing in the streets." As the *WSJ* article pointed out, equity markets are receptive to those E&P companies seen as resilient and possessing a compelling case for spending the new money responsibly in order to help create

shareholder value. It is possible that this opening of the equity window is signaling that the industry is at, or closer to, a bottom than most people believe.

Further Observations From Our Drive From Rhode Island

We made several observations about our annual drive home from our summer home in Rhode Island in the last *Musings*, but there were others. The nature of this drive was very different from past ones in that we drove to northern Virginia on day one in order to enter the Blue Ridge Parkway for a couple of days before getting back on the interstate highways to find our way to Houston. Our two-day detour provided many spectacular views of the Shenandoah Valley and the various Appalachian Mountains that form the valley. The Blue Ridge Parkway runs between the southern terminus of the Skyline Drive that traverses the Shenandoah National Park in Virginia and the Great Smokey Mountains National Park in North Carolina. We did not drive the entire parkway, instead electing to stop in Asheville, North Carolina, for our third night on the road. We then decided to make a big push (1,016 miles) to get home on the fourth day.

Our two-day detour provided many spectacular views of the Shenandoah Valley and the various Appalachian Mountains that form the valley

One stop we made before getting on the parkway was to visit the Woodrow Wilson Presidential Library and Museum in Staunton, Virginia. We have talked about visiting this site numerous times, but each time we got close, it was always too late, too early or we didn't want to take the time to stop. This library is not part of the presidential library program that receives federal money. It is dependent on grants, donations and entrance fees. The visit gave us an opportunity to reacquaint ourselves with the most liberal (progressive) president before President Barack Obama. President Wilson experienced an interesting life and career. As a born and raised southerner, we were amazed at his progressive positions with respect to women and government power, while at the same time remaining a segregationist.

The visit gave us an opportunity to reacquaint ourselves with the most liberal (progressive) president before President Barack Obama

One enters the Blue Ridge Parkway from the stretch of I-64 running between Staunton and Charlottesville, Virginia, near Waynesboro. Therefore, day one of our trip was on interstate highways we always travel, so we could make some observations about the road conditions. The level of traffic was relatively light, with the only serious truck traffic experienced on the Pennsylvania stretch. There were some stretches with bunches of trucks on the Connecticut, New York and New Jersey highways, too, but that reflected the issue of trucks not being able to drive substantially faster than their compatriots. We did find the greatest amount of road construction during this portion of the trip.

The level of traffic was relatively light, with the only serious truck traffic experienced on the Pennsylvania stretch

Surprisingly, we saw only a handful of state troopers on our side of the road during the entire trip, although they do not patrol the Blue Ridge Parkway. We did think very early in our drive that we were being pulled over as a Connecticut state trooper pulled up behind us

with his lights on, although not flashing. He merely wanted us to pull over so he could pass!

Probably 40% of the traffic was motorcycles, with many of them the three-wheel variety

Our drive on the Blue Ridge Parkway was interesting. The maximum speed limit is 45 miles per hour, which often cannot be attained due to the winding nature of the roads, although there were places where one could comfortably exceed the speed limit. Since we were between seasons for the highway – summer tourists were gone and the fall foliage viewers hadn't arrived, the traffic was very light. Interestingly, probably 40% of the traffic was motorcycles, with many of them the three-wheel variety. Also, noticeable was that the drivers and riders were older travelers.

After filling up in Pennsylvania, we never bought gasoline for more than $1.99 a gallon, more often in the low $1.90s

Our first observation is that in Asheville, always a busy tourist destination, we had to wait in line for a table at the local Cracker Barrel restaurant. We commented that this was the first time in several years we had to wait, but it probably reflected the Asheville location. In contrast, we experienced no waiting time at the restaurant in Lafayette, Louisiana. Secondly, after filling up in Pennsylvania, we never bought gasoline for more than $1.99 a gallon, more often in the low $1.90s. Unfortunately, in an early portion of our drive from Asheville down to Atlanta, we were on NC 25 when all we saw were gasoline stations advertising regular gasoline for $1.75 a gallon. Since we didn't need any fuel, we didn't take advantage of the fire-sale prices, which means we don't know whether those were "cash only" prices. Clearly, more and more of the nation is enjoying low gasoline prices. While the weekly gasoline demand figures would suggest more is being consumed, and the auto industry continues to sell SUVs and pickup trucks, but not sedans, we didn't see a surge in vehicle traffic.

He then proceeded to walk under the canopy to the other side of the gas pumps while still smoking his cigarette!

We did encounter one strange and dangerous situation at a gas stop. As we drove into the station and under the canopy over the gasoline pumps, the driver of a car parked at the opposite pump island was wondering around the edge of the canopied area smoking a cigarette. Our car, a hybrid, is silent when driving at low speed as it is operating on its battery charge. As a result, we had to move very slowly until he realized we were behind him. He then proceeded to walk under the canopy to the other side of the gas pumps while still smoking his cigarette! Our progress was further impeded by the driver's wife who had all the car doors on the passenger side of their vehicle open but oblivious to our arrival. The guy stood maybe six feet away from the rear of his vehicle finishing his cigarette until the pump shut off. When my wife got out to go into the service station, the guy apologized for blocking our way, but he seemed nonplused at her comment about his smoking. We guess all those warning signs don't register with people. We guess we were lucky he wasn't talking on his cell phone at the same time.

The last point ties to something we have popularized and discussed many times in the past, and that relates to trucks. As we crossed into

Rather than highlighting its low fuel price, the featured item on the billboard was the announcement of "expanded 200 truck parking"

South Carolina, there was a large billboard advertising a BP truck stop. Rather than highlighting its low fuel price, the featured item on the billboard was the announcement of "expanded 200 truck parking." What we couldn't determine is whether that meant the expansion now provided space for a total of 200 trucks or the expansion added 200 new truck parking spaces. Either way, the sign demonstrated how one truck stop owner has responded to the new driving rules for over-the-road truckers. We bet that truck stop gets a lot of extra business with its expansion based on our experience viewing rest stop and truck stop overloads at night.

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