
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

Saudi Arabia Oil Policy Hammers Home The Austerity Case

Many oil market observers espoused the view that the Saudis would help coordinate an OPEC production cut to support global oil prices in the \$100 a barrel range

The “sawbuck” rule, however, was slowly being eroded by the weak and now seemingly even weaker outlooks for Europe and China

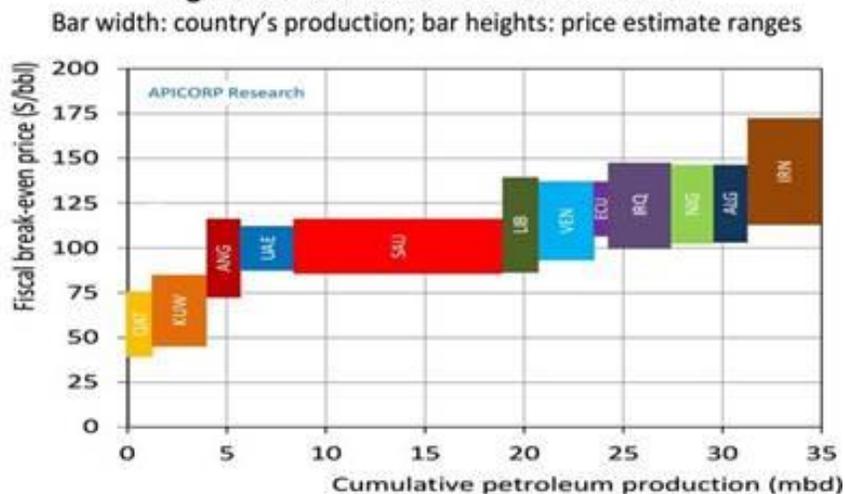
With little fanfare, the government of Saudi Arabia has sent the oil market into a tizzy with disclosure that it is willing to live for up to two years with oil prices below \$90 a barrel and possibly as low as \$80. For many oil market observers, this revelation shocked them as they were convinced, and espoused the view that the Saudis would help coordinate an OPEC production cut in order to support global oil prices in the \$100 a barrel range. That view was based on recent history of the Kingdom’s actions that seemed to support the idea it wanted stability in the oil market. With oil prices slumping since June, the pressure to act has been building, and one ingredient pushing for action was the growth in non-OPEC oil supplies.

The view that Saudi would lead OPEC toward a coordinated output cut was born from the actions of the government over the past few years. Since the Arab Spring and King Abdullah’s decision to throw money at his citizens to buy social peace, the Kingdom’s obvious and growing need for cash to support the cost of its government and these social payments seemed to drive the high oil price scenario. Additionally, Saudi Arabia’s Oil Minister Ali Al-Naimi had stated that his country believed \$100 a barrel was a “fair” price for oil producers and a price consumers could live with. The “sawbuck” rule, however, was slowly being eroded by the weak and now seemingly even weaker outlooks for Europe and China. Even in the United States, where gross domestic product (GDP) in the second quarter of this year climbed by an annualized 4.6%, which was a sharp rebound from the dismal -2.6% contraction experienced in the first quarter, the economy continues to struggle in order to achieve the projected 2.5% growth rate for all of 2014. Now with Asian and European economies weakening, the Ebola epidemic in West Africa and its recent transmission to the United States has created fears among American citizens that will likely impact spending. Add to

Those claims fall into the “best house in a bad neighborhood” argument

those concerns the fact that the American-led coalition’s battle against ISIS in Iraq and Syria appears to be struggling. As a result, prospects for 3% or better U.S. economic growth during the final half of 2014 look increasingly suspect. Economists continue to point out that America is doing better and is better positioned than European countries and even the major economies of Asia, but those claims fall into the “best house in a bad neighborhood” argument.

Exhibit 1. OPEC Members Seem To Need High Oil Prices
Figure 3: OPEC Fiscal Cost Curve for 2013



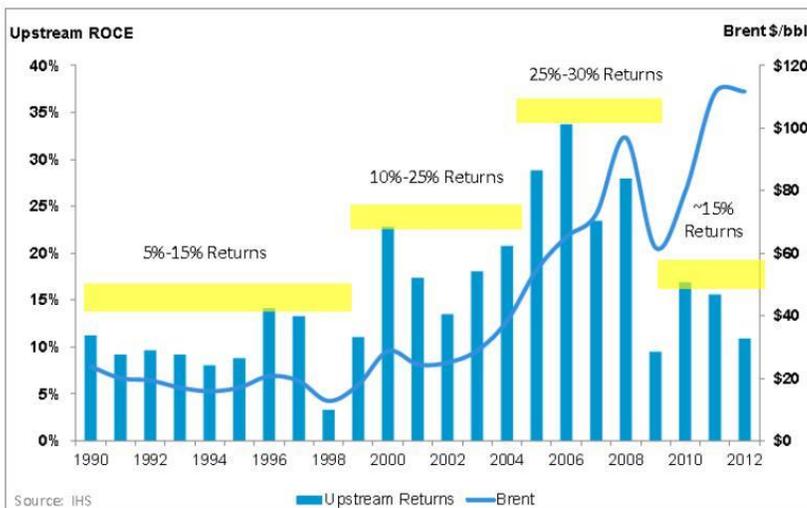
Source: APICORP Research

IHS recently calculated that the industry’s 2013 ROCE was only 8.6%, down from 11% in 2012

The challenge for the oil industry is to produce oil and gas at current market prices and generate a profit and a positive return on the investment necessary to find and develop the new production. Producers need to generate returns that exceed the industry’s cost of capital. In recent years, this has not happened as the shale revolution, which is behind the country’s crude oil production revival, requires substantial investment and long time periods to earn adequate returns. The economic and oil consulting firm IHS prepared a chart showing what has been the average return on capital employed (ROCE) for the oil and gas producing segment of the industry between 1990 and 2012. IHS recently calculated that the industry’s 2013 ROCE was only 8.6%, down from 11% in 2012. As the chart in Exhibit 2 shows (next page), recent years’ returns have averaged about 15%, which is about half of the earnings generated during the early years of the shale boom (2005-2008) when both natural gas and crude oil prices were high. Following the 2008 financial crisis and the 2009 recession, natural gas prices fell from the high single-digits to \$3-\$4 per thousand cubic feet (Mcf), and for a period of time were below \$3. While natural gas prices have increased to around \$4/Mcf, the fall in oil prices since early June has to be inflicting serious financial damage on the profit and loss statements of exploration and production outfits. Interestingly, ROCE results were much higher in the early years of this century

when oil prices were only in the \$20s and \$30s a barrel as opposed to the \$90s of recent years. Escalating oilfield costs are the culprit.

Exhibit 2. ROCE Results Reflect Severe Cost Strain



Source: IHS

More highly leveraged companies have fewer degrees of freedom to maneuver between the need to generate cash and the ability to fund ongoing and new projects

The prospect that oil prices may fall further - \$77 was suggested by the Kuwaiti oil minister as the point at which the bottom of the oil price correction will be reached – and that natural gas prices will remain below \$4/Mcf through 2015 will send exploration and production company managements back to the drawing boards to redo their future capital spending plans. Just how far they plan to peel back their spending will depend on the freedom each company has to stop current projects and/or postpone planned ones. Each company will have a different threshold price to trigger spending cuts because each company’s set of projects and its business priorities is unique. Moreover, the trigger price will be influenced by the company’s current production profile and its cost structure along with its financial position. More highly leveraged companies have fewer degrees of freedom to maneuver between the need to generate cash and the ability to fund ongoing and new projects. Those with low debt positions will enjoy greater flexibility to manage their business model and be in a position to possibly acquire the assets of companies forced to dispose of them at fire sale prices.

Existing production is seldom, if ever, cut back due to falling prices

Where could the industry be vulnerable to low oil prices as result of the current price decline? What projects may become uneconomic due to the price both now and in the future? What we know from the history of the industry is that existing production is seldom, if ever, cut back due to falling prices since the actual cash cost for producing a barrel of oil or cubic foot of gas is much smaller than the fully-loaded financial cost that takes into account all prior expenditures. Given that consideration, we will shift our focus to the marginal cost to produce the next barrel of oil or cubic foot of gas.

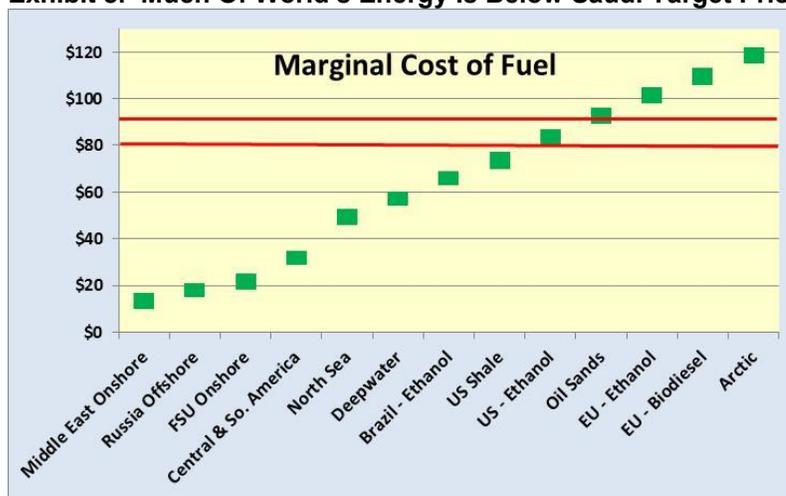
Industry data shows that the marginal cost of a barrel of crude oil produced from mature North Sea fields is in the range of \$46 to \$53 per barrel

Costs extending from the lowest-cost Middle Eastern onshore oil fields at \$10-\$17 per barrel to the highest-cost Arctic oil fields at \$115-\$122 per barrel

One industry analyst has estimated that the total marginal extraction cost of an additional barrel of oil from North Sea ultra-high pressure/high temperature oilfields ranges from \$95 to \$110 per barrel based on British tax rules that were in place up until the start of 2014. Given the new tax rules, the marginal cost range is now closer to \$85 to \$95 per barrel. Those high costs contrast sharply with industry data showing that the marginal cost of a barrel of crude oil produced from mature North Sea fields is in the range of \$46 to \$53 per barrel, or roughly 60% of the cost of the high pressure/high temperature incremental barrel.

In order to attempt to gauge the sensitivity of the marginal cost of production of various energy sources around the world to lower oil prices, the news service *Reuters* gathered estimates from nine oil consultants, commercial banks and independent oil analysts. Not surprisingly, the range of costs varies widely, extending from the lowest-cost Middle Eastern onshore oil fields at \$10-\$17 per barrel to the highest-cost Arctic oil fields at \$115-\$122 per barrel. Exhibit 3 shows the various marginal costs for producing an extra barrel of fuel output.

Exhibit 3. Much Of World’s Energy Is Below Saudi Target Price



Source: *Reuters*, PPHB

While important at the margin, these fuel source volumes are small relative to an oversupplied oil market

We have ranked the marginal fuel costs from lowest to highest in order to better understand the impact of the announced Saudi Arabian oil pricing strategy on the energy industry. The two red lines on the chart show the \$80 and \$90 per barrel points consistent with the Saudi statement about its tolerance for lower prices. What those lines do is isolate those fuels that have a marginal per barrel cost above the Saudi price range. At \$90 a barrel, Arctic and Canadian Oil Sands production are uneconomic as is the European Union’s efforts in Ethanol and Biodiesel. At \$80 a barrel, U.S. Ethanol would become uneconomic. While important at the margin, these fuel source volumes are small relative to an oversupplied oil market.

Exhibit 3 also provides some assistance in dealing with the multitude of explanations of what is behind the Saudi Arabian decision to cut their oil price rather than to orchestrate an OPEC output reduction. Let's tick off some of the supposed explanations and then see whether they have validity.

1. Saudi's pricing strategy is to deter the U.S. efforts at energy independence.
2. Saudi wants to punish Iran, its political opponent.
3. Saudi's price move is designed to support the U.S. and European efforts to depress the Russian oil industry and its government's revenues and punish the country.
4. Saudi wants to teach its fellow OPEC members about who is in charge of the oil market and who bears the brunt of any production cutback.
5. Saudi desires to gain a greater market share in Asia to offset its lost share in the U.S. market.
6. Saudi is deeply concerned about the health of Europe and wants to help generate economic growth.

We're sure that there are other scenarios but this list covers the prominent theories we have heard. Given the market and political environment of the past few weeks, it is entirely plausible that each explanation could be correct. Let's take a brief look at each of them and what we believe the reality is.

Saudi Arabia is the number two supplier of oil to the United States

1. If the U.S. becomes energy independent then theoretically it wouldn't need to import Saudi Arabian oil. Based on the latest data from the Energy Information Administration (EIA), Saudi Arabia is the number two supplier of oil to the United States. This is based on both the latest 4-week average of imports by country as of October 3rd, and by examining the ranking for the prior five weekly estimates. The U.S. imported an average of 6.6 million barrels a day (mm b/d) with Canada being the largest supplier with 2.9 mm b/d and Saudi Arabia in second place with 1.0 mm b/d. Mexico and Venezuela are the third and fourth most important suppliers, each delivering approximately 800,000 b/d. The remaining five import sources, ranked by their 4-week average import volumes, were Iraq, Colombia, Kuwait, Angola and Nigeria. If the U.S. is able to produce 13 mm b/d, as recently suggested by the head of the EIA, or roughly four million b/d of additional domestic output, then Saudi's export shipments to the U.S. would be at risk. Based on the country's current

Some estimate the cost at \$85 or more

exports of 10 million b/d, the U.S. accounts for 10% of Saudi's output. The U.S. is undoubtedly an important market for Saudi oil, but certainly not its only customer. The problem with this thesis is that the marginal cost of U.S. shale oil, which is driving domestic output, is \$70-\$77 a barrel or below the Saudi suggested target price range. Some estimate the cost at \$85 or more.

Iran is already under financial sanctions that have limited its oil sales

2. Punishing Iran is quite possible as these two countries are long-standing enemies due to ethnic heritages. The two countries are on opposite sides of the ISIS conflict and in the Syrian situation, also. We are sure that Saudi Arabia would like to inflict more financial pain on Iran, especially as it fears that Iran may become a nuclear power before too long, despite the supposed best efforts of the U.S. and western powers to prevent that from happening. However, Iran is already under financial sanctions that have limited its oil sales, so we are not sure how much more it could be hurt by lower oil prices.

Bringing down the world price of oil, and in turn natural gas contract prices that are linked to world oil prices, would help European countries deal with the high cost of energy this winter

3. The Saudi oil pricing strategy would force down the prices paid for Russian oil and would weaken the country's economy. That would be perceived as Saudi Arabia helping its western partners achieve an important advantage over Russia that they have not been able to achieve with their sanctions due to the vulnerability of European countries to Russian energy supplies. Bringing down the world price of oil, and in turn natural gas contract prices that are linked to world oil prices, would help European countries deal with the high cost of energy this winter. The problem with that scenario is that Russia retains the power to shut off or severely restrict the flow of oil and gas to its European customers in order to extract higher prices to offset the lower price engineered by the Saudis. Additionally, not that long ago that Saudi officials were meeting in Moscow and hosting Russian officials in Riyadh as the two countries executed military weapon purchase and economic cooperation agreements.

Saudi was more interested in protecting its own market share rather than enriching its fellow OPEC members

4. Teaching its fellow OPEC members who is boss of the oil market has often been a frustrating exercise in diplomacy for Saudi Arabian oil officials. One could say that the recent short attendance of the Saudi Oil Minister at the latest OPEC get together probably signaled that Saudi was about to go its own way on oil pricing and was more interested in protecting its own market share rather than enriching its fellow OPEC members.
5. Gaining a greater share of the Asian oil market has long been a goal of Saudi Arabia. It knows that Asia, because of its huge populations and rising living standards, has

We're not sure that Saudi needs to cut oil prices in order to gain greater market share in Asia

significant energy needs that will only grow in the future. If one remembers back to 1998, Saudi helped engineer a production increase by OPEC to meet the growing needs of Asian economies just as the currency collapse in Thailand triggered a serious Asian economic crisis that morphed into a mini-recession. Oil prices crashed and it was only when the Russians helped broker a deal to get western countries along with themselves and OPEC to cut output and bring global oil markets back into balance that the oil price rebounded. We're not sure that Saudi needs to cut oil prices in order to gain greater market share in Asia. Saudi's sheer capacity to supply the oil consumption growth of Asia makes it a desirable partner.

Italy and Spain may already be officially in recession and Germany may be teetering on the brink

6. The one explanation that makes the most sense to us, and one not mentioned prominently, is the role of lower oil prices in boosting the economies of Europe. A handful of European economies have already posted negative GDP results in the second quarter. In fact, Italy and Spain may already be officially in recession and Germany may be teetering on the brink. The latest economic statistics from these countries suggest that growth is faltering across the continent and even in the prosperous UK. We can envision Saudi officials looking around the world and seeing a recovering U.S. economy and a growing Asian one, albeit with mixed results throughout the region. But Europe has to be the most troubling region of the world as all the economic and financial steps taken over the past five years have failed to produce any meaningful recovery. With the possibility of a deflating Europe, one has to wonder what might be the unintended consequences for the rest of the world's economies.

The Saudis appeared to disclose their price strategy almost immediately following the European Union's decision to not label Canada's oil sands as "dirty" oil

What gives us greater confidence in this scenario is the fact that the Saudi officials have suggested that they are prepared to accept these lower oil prices for up to two years. That time period is longer than the near-term impacts suggested by some of the other scenarios. More importantly, the time frame is too short to derail the U.S. shale effort, especially since the marginal cost of that effort is \$70-\$77, or below the low end of the Saudi target oil price range. Two years may be how long it will take for lower energy costs to help Europe to recover. The last point about this scenario that seems quite interesting is the timing of the Saudi disclosure, even though it has been offering small price reductions to Asian and U.S. buyers in recent weeks. The Saudis appeared to disclose their price strategy almost immediately following the European Union's decision to not label Canada's oil sands as "dirty" oil. That ruling opens up this market to Canadian oil sands producers, just at a time when they are struggling with rapidly escalating development costs that has even caused some projects to be delayed. From our chart of marginal oil costs, oil sands is just at or above the top end of the

Saudi oil pricing strategy is all about attempting to restart economic growth that the world desperately needs

Saudi target price range, suggesting that the Kingdom wants to make sure that by continuing to hold an umbrella above oil sands' costs it would concede the European market to Canada. Essentially, the Saudi oil pricing strategy is all about attempting to restart economic growth that the world desperately needs for its political health and the Saudis and its fellow OPEC members need for their oil exports. The unknown unknowns (tip to Donald Rumsfeld) of this strategy are what we should be worrying about.

Truckers, Gas Prices And Mexican Food – The New Economics

We just completed our annual sojourn back to Houston from our summer home in Rhode Island. As usual, we look for any and all trends in traffic, social habits and transportation economics as an indicator of the health of the American economy, and as a possible sign of change underway that might impact petroleum consumption. This trip was driven in a slightly different manner than in the past, but it still offered important observations.

An amazing trend has developed in our little corner of Rhode Island – real Mexican restaurants have arrived!

Having returned from delivering a speech in Georgia late on a Tuesday evening, we finished closing up the house Wednesday morning, packed up our belongings, loaded the car and then stopped for a Mexican lunch with relatives before hitting the highway. An amazing trend has developed in our little corner of Rhode Island – real Mexican restaurants have arrived! There had been a Mexican restaurant in downtown Westerly some years ago that may have ranked as one of the worst restaurants we've ever eaten at. After it closed, another version opened, and even though it is owned by two Mexicans, the quality of the food was lacking – especially for people from the Southwest! But this summer, two Mexican restaurants have opened – one on each side of town and both much more like what we are accustomed to in Houston.

If you eat Italian sausage made in the area (home to many Italian families who migrated to Westerly around the turn of the 20th century to work in the granite quarry as stone masons), you wouldn't think locals would have a problem with hot salsa

We were curious about their menus, based on our past experiences, and we talked to the respective establishment's servers about the food items. We are familiar with the routine of chips and salsa being deposited on your table while you contemplate what you want to eat and drink. In the downtown Westerly Mexican restaurant, you have to order chips and salsa – and they are not free! Also, as we all know, every restaurant has its own version of salsa, something that often distinguishes one Mexican restaurant from another and often influences which one people frequent. That was the case at these new Mexican restaurants. One has a salsa that is more like a soup with chunks of tomato, peppers and garnish. It definitely needs a shot of hot sauce to liven it up! The other restaurant has a thicker and slightly spicier salsa, although it could stand some more peppers in the mix. We were told by servers that the locals really don't like hot salsa, although we wonder about that observation. If you eat Italian sausage made in the area (home to many Italian families who migrated to Westerly around the turn of the 20th century

We also aren't used to getting all our tacos wrapped in tinfoil on the plate as is the serving protocol at one restaurant

to work in the granite quarry as stone masons), you wouldn't think locals would have a problem with hot salsa.

There are subtle differences in how Mexican dishes are prepared and presented. We had extended discussions about how to prepare Tacos al Carbon, something these restaurants didn't understand. We even showed the chef at one of the restaurants a picture of the dish on our cell phone. We also aren't used to getting all our tacos wrapped in tinfoil on the plate as is the serving protocol at one restaurant. That place also serves a side order of charro beans in a bowl rather than a cup. The other restaurant only serves refried or black beans. One of the more interesting observations about these new restaurants is that they are mostly staffed by Hispanics, which happens to have a large community in Rhode Island. While they aren't necessarily from Mexico, the restaurants possess a closer-to-home feel for us. Here's hoping that these Mexican restaurants survive this winter when they must live off the locals as tourists and summer folks are gone. We have our fingers crossed.

The volume of trucks was very heavy in the stretch from Rhode Island through Virginia, but then thinned out during the rest of the trip

One of our favorite pastimes when making our drive is watching the make-up of the traffic we encounter. Trucks are an interesting indicator of the health of the economy and when we see a lot of them – either traveling with us or in the opposite direction – we gain a feel for the health of the economy in the region we are passing through. This trip was no different. The volume of trucks was very heavy in the stretch from Rhode Island through Virginia, but then thinned out during the rest of the trip through Tennessee, Georgia, Alabama, Mississippi, Louisiana and into Texas. Could it be that more supplies are moving by rail in these regions, or are these states' economies less robust?

We believe, based on research, that the truck patterns we witnessed are a function of the revised work rules and rest hours for over-the-road truckers

Another observation about the truck traffic was that it was light in the early morning hours but then built in volume until dark. Within a couple of hours following the arrival of dusk (5:30 pm), truck traffic almost completely stopped. The other phenomenon we observed was the overloading of the truck stops and rest areas. The number of trucks parked at these facilities grew enormously as darkness descended but there were often a large number of trucks parked in them even at lunch time. We believe, based on research, that the truck patterns we witnessed are a function of the revised work rules and rest hours for over-the-road truckers. Today, truckers may drive for 11 hours after 10 consecutive hours off duty. There are some special rules about when a driver can drive for 14 hours in a day, but those appear to be highly restrictive. Overall, the work week is now limited to 70 hours in a 7-8 day period that can only be resumed following 34 hours of rest that included two nights when the driver's body clock demands the most sleep – between the hours of 1 am and 5 am. There is also a mandatory 30 minute rest period during the first 8 hours of driving. Also, driving, or allowing a driver to drive, more than 3 hours beyond the driving-time limit may be considered an "egregious" violation and subject to the maximum civil penalties.

What this has also done, as we have read, is put the bulk of truck traffic on the highways during daylight hours increasing congestion and adding to the potential for accidents

What we were observing was the impact of these new rules on the length of truck drivers' work day. That is why they are all congregating at the truck and rest stops, and when they can't fit in there, they are parked on the interstate off-ramps. What this has also done, as we have read, is put the bulk of truck traffic on the highways during daylight hours increasing congestion and adding to the potential for accidents. This issue is becoming of great concern to some auto safety professionals. Truckers obviously now have to plan their trips more tightly in order to maximize their travel time. If they elect to drive into the night, then they wind up having to rest during the day. From our perspective, we found that we needed to be careful approaching truck and rest stops because of the congestion. Another unintended consequence of the rest rules is

the increase in traffic at the truck weighing stations, often creating lines of trucks well back onto the highway. At one New Jersey weigh station the line extended for about half a mile before the start of the off-ramp, meaning that high-speed drivers needed to be aware of stopped truck traffic on the highway.

We counted only 12 recreational vehicles

Another highway traffic observation is that we counted only 12 recreational vehicles, all but two were pulling cars/SUVs behind them, on the entire drive. Surprisingly, we saw half of them on I-10. It was evident that we were later than normal (we wanted to see the leaves change up north) so the vacation season was definitely over. Those RVs we did see were either late in traveling home or were heading to warmer climates for the upcoming winter.

For about two-thirds of the trip, we were in the land of \$3 a gallon gasoline prices

A most pleasant surprise was that for about two-thirds of the trip, we were in the land of \$3 a gallon gasoline prices. As we have been living in one of those high-priced gasoline parts of New England, seeing \$3 on the signs was initially a shock, but something we quickly adjusted to. Finding hotel rooms was not a problem, and hotel apps made it easier.

After several visits by our waitress to tell us our food was coming, she then told us that the manager had gone in to help since there was a new chef

At our food stop stops we encountered heavy activity. The one bad food stop – maybe a reflection of an improving economy, but possibly poor management – was the Cracker Barrel in Meridian, Mississippi. When we arrived, the dining room was nearly full, although we didn't have to wait. What we did have to wait for, however, was the food. After several visits by our waitress to tell us our food was coming, she then told us that the manager had gone in to help since there was a new chef. By the time we got our food, many of the people eating when we arrived were long gone. The poor waitress kept apologizing and commenting that she hoped we wouldn't take it out on her. We know the wait staff doesn't control the kitchen so we certainly weren't going to punish her for the chef's problems. In fact, we were pleased that she kept us informed, but it was the longest we've ever waited for dinner at a Cracker Barrel.

The trip seemed to reflect what we are seeing from the economic statistics – slow growth with spotty pockets of strength

Overall the drive was uneventful, with not too much congestion and only a brief span of bad weather. We saw few police either active with pulled over vehicles or sitting looking for traffic offenders. We listened to two audio books, so that was an accomplishment of good timing. In general, what we observed on the trip seemed to reflect what we are seeing from the economic statistics – slow growth with spotty pockets of strength.

Climate And The Great Unknown – Cause For Concern?

The battle over climate change has become much more about how to emotionally motivate people to protest against our energy consumption and the types of fuels we utilize than it is about scientific facts about carbon emissions and global temperatures. As we wrote in our last *Musings* when discussing the People's Climate

March in New York City and the corresponding fossil fuel divestment effort, one of the key principles of 350.org, the activist environmental organization behind these movements, is to focus on the negative story about climate change's possible impacts on society and our habitat rather than the science behind climate models and whether their results portend either cataclysmic or merely manageable outcomes.

“The human impact is more complex than early climate models”

The most recent issue of the *Browning Newsletter*, which contains “world reports covering climate, behavior, and commodities,” devoted a portion of its commentary to the human impact on climate change. The report written by Evelyn Browning Garriss highlighted the following points about the role of humans on our climate: “The human impact is more complex than early climate models. Instead of a general fever, it is a complex and localized combination of stab wounds (urban heat islands), scrapes (land clearing) and coughs (anthropogenic gases and aerosols). While scientists debate on the extent of humanity's impact on global climate, it is a safe assumption that it interacts with natural factors and makes some climate changes more extreme.” Ms. Garriss' article points to a number of issues dealing with the climate science that are in concert with the conclusions of other scientists who have studied the climate models, the data used to create and drive them, and the record of the UN's Intergovernmental Panel on Climate Change (IPCC) reports.

Absent from the Agency's claims was any suggestion that the regulations will affect climate change

One such student of the climate change debate is Steven Hayward, a professor at the University of Colorado at Boulder and also at Pepperdine University's Graduate School of Public Policy. Mr. Hayward wrote an article this summer about the climate “cultists” and what he perceived to be the real issues surrounding climate change policy, especially as it related to the Environmental Protection Agency's (EPA) proscription for reducing the nation's carbon dioxide emissions from power plants 30% by 2030. As he pointed out, when the EPA released its proposed regulations and corrective action plan, it touted the enormous health benefits from

The real debate about climate change should be over the question of climate sensitivity

reduced emissions. However, all of the benefits come from reducing conventional air pollution such as ozone smog and fine particles. Absent from the Agency's claims was any suggestion that the regulations will affect climate change. Mr. Hayward claims that by running a scenario of full compliance with the then-proposed and now-enacted regulations through a climate change computer model, the difference in the forecasted temperature in the year 2100 would be maybe 0.02 degrees Celsius compared to doing nothing.

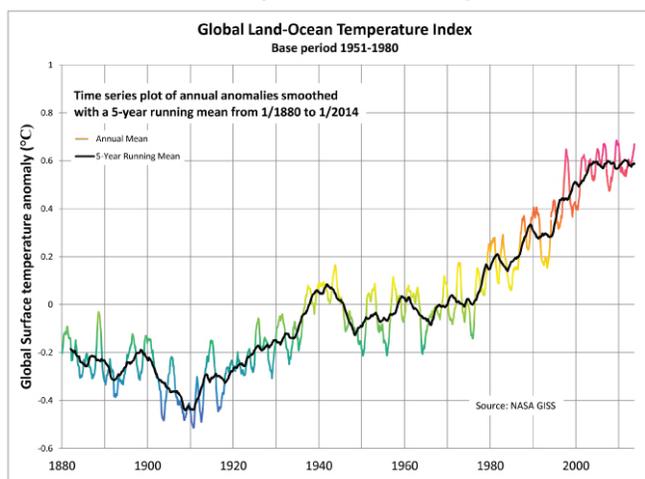
But possibly more astonishing is that this estimate is essentially the same degree of warming proposed by Swedish scientist Svante Arrhenius in 1896

Mr. Hayward's key point was that the real debate about climate change should be over the question of climate sensitivity. How much will the average global temperature increase from adding a given level of greenhouse gases to the atmosphere? He points to the most recent IPCC study that concludes that a doubling of greenhouse gases will lead to the planet becoming 1.1 to 4.8 degrees Celsius warmer a century from now. On the low end of this projected temperature increase, the impact is not only manageable but could also prove to be beneficial for humanity and its food stocks, although we recently read that the IPCC is backing away from this conclusion. At the high end of the temperature range, there would be significant problems requiring various responses.

Cities occupy 2% of the global land surface, hold 50% of the world's population and produce 70% of the planet's pollution and greenhouse gas emissions

The critical issue is to narrow the estimate of warming. Mr. Hayward points out that a number of the climate scenarios analyzed cluster around 2 degrees Celsius of warming, which is essentially the best guess of the IPCC reports going all the way back to 1990. But possibly more astonishing is that this estimate is essentially the same degree of warming proposed by Swedish scientist Svante Arrhenius in 1896. So after a century and a half of observation, temperature measurements, hot and cold periods, tons of carbon emissions, billions of dollars poured into climate change research, the development of hundreds of climate models and the running of thousands of climate projections, we have no better an idea about the planet's future temperature than the educated guess of a Swedish scientist.

Ms. Garriss pointed out that the planet has been warming overall since the 1800's. The current pause in warming is the third such pause in the warming trend – 1878 to 1907, 1945 to 1969 and 2001 to today. One of the major challenges in the global warming data is where the readings are taken. Most of our weather measurements come from cities and airports. Therefore, the temperature statistics have an urban bias. Why is that important? Cities occupy 2% of the global land surface, hold 50% of the world's population and produce 70% of the planet's pollution and greenhouse gas emissions. Projections show that by 2050 there will be more mega cities as a result of population migration. As a result, it is estimated that somewhere between 65% and 75% of the world's population will be living in these urban hotspots by mid-century.

Exhibit 4. The History Of Global Temperatures

Source: *Browning Newsletter*

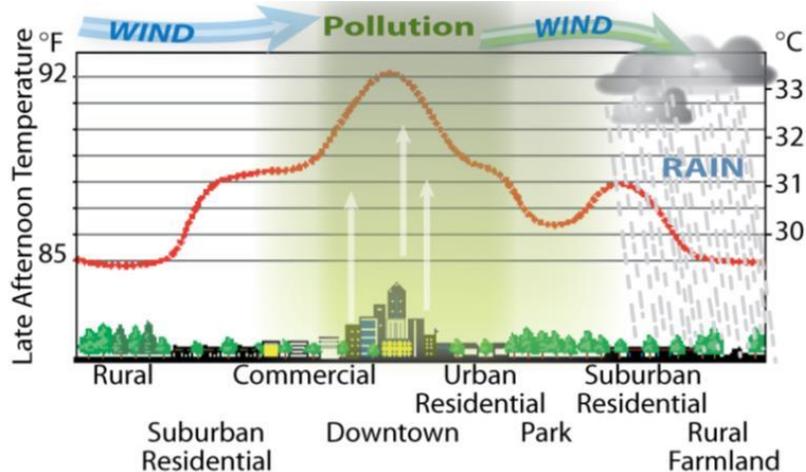
“EPA measurements show that the average city with a million people or more has an average temperature 1.8–5.4°F (1–3°C) warmer than its surroundings”

The greatest impact of these cities is that they are home to many of the policy makers, therefore, the growth in these heat islands will have a corresponding impact on government policies dealing with climate change and global warming

What do these urban heat islands with their concentrated energy use and heat production, as Ms. Garriss refers to them, mean for temperature measurements? “EPA measurements show that the average city with a million people or more has an average temperature 1.8–5.4°F (1–3°C) warmer than its surroundings. In the evening, the difference can be as high as 22°F (12°C). On a hot, sunny summer day, common exposed surfaces, such as roofs and pavement, are frequently 50–90°F (27–50°C) hotter than the air.” She goes on to explain what some of the factors are that cause these extreme temperatures. They include “heat from increased energy use, the surfaces of the buildings, pavements and roads absorb and retain heat, crowded tall buildings block cooling breezes, as well as trapping and intensifying the heat from solar radiation, and paved surfaces hold less water, so there is less cooling evaporation.” She goes on to point out that “While different cities have differing heat intensities, these effects are global, from Asia and Australia to Europe and the Americas. Satellite data shows that larger cities and cities that are more compact usually have the strongest heat islands. Cities located in forested regions, such as the northeastern United States, also have stronger heat islands than cities situated in grassy or desert environments.”

While some scientists dismiss the impact of these urban heat islands since they directly heat a relatively small portion of the globe, they are important because they are spread around the globe. With projected growth in these cities and the rise of many new ones, there will be an impact on energy use, air pollution, water quality and heat-related illnesses and mortality. But possibly the greatest impact of these cities is that they are home to many of the policy makers, therefore, the growth in these heat islands will have a corresponding impact on government policies dealing with climate change and global warming.

Exhibit 5. How Urban Heat Islands Work



Source: *Browning Newsletter*

“The national recognition of climate change in the last dozen years is akin to discovering that the sun rises in the east; proposals to stop it amount to requiring the sun to rise in the west.”

This summer, Patrick Barosh, a geologist who has researched crustal movements in New England for 44 years for federal agencies and as a research professor at Boston College, authored an op-ed in the *Providence Journal* dealing with the relationship between climate change and natural cycles. He pointed out that “the climate and sea level are always changing. This is a fundamental tenet of the science of geology.” Oops. Maybe we are getting too close to real science for the comfort of environmentalists. Mr. Barosh then wrote, “The national recognition of climate change in the last dozen years is akin to discovering that the sun rises in the east; proposals to stop it amount to requiring the sun to rise in the west.”

Our climate is shaped by the interactions of many factors and cycles such as the solar cycle and solar flares, polar wandering, continental plate movement, seas opening and closing, mountains rising and eroding, and volcanic eruptions

He talked about the “lively planet with an ever-changing climate” that we need to deal with. Our climate is shaped by the interactions of many factors and cycles such as the solar cycle and solar flares, polar wandering, continental plate movement, seas opening and closing, mountains rising and eroding, and volcanic eruptions, just to name a few. Mr. Barosh wrote about the Medieval warming period between 800 and 1300 AD when temperatures were higher than now. That period also experienced a calm Atlantic Ocean that allowed the Vikings to make coastal raids and establish settlements on Greenland, and possibly even in eastern Canada. That period saw grapes being grown in northern New England and better grass growth in Asia that helped Genghis Kahn’s cavalry travel through the region. The warming did, however, cause a severe drought in the U.S. Southwest that resulted in the abandonment of many pueblos, but it was offset by increased farming in the Mississippi Valley and the rise of Indian cities. Temperatures then turned cold and today we are still emerging from the “Little Ice Age” of the 19th Century in Europe, but we have yet to reach the high temperatures of many past warm periods.

He pointed out that these and other studies done at that time showed the same rate of rise in the previous century as is currently being measured by tidal gages

As a student of New England's geology, Mr. Barosh discussed the sea level rise that was accompanied by the glacial retreat in the region. He suggests that the Pilgrims would have learned about the rise from submerged tree stumps and trees along the shore. He cited the fact that a hundred years ago, deeply submerged Indian fishing weirs were found in subway construction in Boston. The rate of sea level rise was calculated and considered in the construction of the first Charles River Dam near Boston. He pointed out that these and other studies done at that time showed the same rate of rise in the previous century as is currently being measured by tidal gages. Sea level rises appear variable along the New England coast because the land is also moving in different ways, mostly downward, a factor not considered by many concerned about rising tides. Actually, Ms. Garriss has pointed out that drought conditions in the western half of the U.S. has led to that part of our continent rising. We have previously read studies about the tectonic plate the U.S. sits on tilting from west to east, something you will not see mentioned in the stories about the future drowning of New York City.

We acknowledge that there are many legitimate reasons for reducing our use of fossil fuels and striving to reduce our carbon emissions, but there is little justification for the radical (and dangerous) overhaul of our global economy with its huge costs and social impacts mandated by environmentalists with an agenda

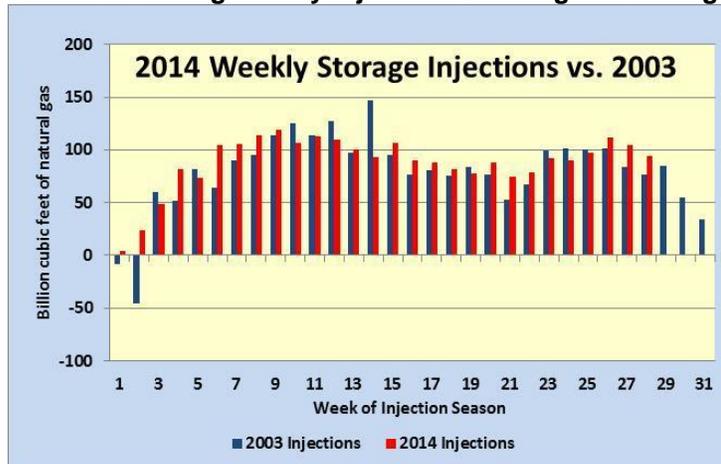
Climate change is a dynamic process. Early computer models presented mankind's impact on climate as a simple model of increased greenhouse gas emissions due directly from increased petrochemical use. As Ms. Garriss puts it, "Humanity's impact is not a general fever; it is a complex and localized combination of effects, stab wounds (urban heat islands), scrapes (land clearing) and coughs (anthropogenic gases and aerosols)." We know that natural factors are also having a significant impact, which is part of the reason for the warming pause. We acknowledge that there are many legitimate reasons for reducing our use of fossil fuels and striving to reduce our carbon emissions, but there is little justification for the radical (and dangerous) overhaul of our global economy with its huge costs and social impacts being mandated by environmentalists with a different agenda.

This Year's Gas Storage Saga – From Worst To First?

the nation is now on the cusp of reaching 3.5 Tcf of gas in storage by the end of October

Following another two weeks of strong natural gas storage injections, the nation is now on the cusp of reaching 3.5 trillion cubic feet (Tcf) of gas in storage by the end of October when the injection season ends. As shown in Exhibit 6, the past three weeks have shown meaningfully higher gas storage injections than experienced in comparable weeks during 2003, the year we modeled to prepare our estimate for storage volumes that would be available for the upcoming 2014-15 winter. Those overachieving weekly injection volumes still leave the U.S. approximately 10%-12% behind the volume of gas that was in storage at the end of each of the past two years, but considering how concerned the industry and the gas market was about how low gas storage volumes were at the end of last winter due to several polar vortex bitter-cold episodes, we are feeling increasingly comfortable about there being sufficient gas in storage to meet the upcoming winter's needs.

Exhibit 6. Strong Weekly Injections Building Gas Storage



Source: EIA, PPHB

To end the injection season after having injected possibly the largest volume of gas ever since 1994, will mark an outstanding achievement for the industry

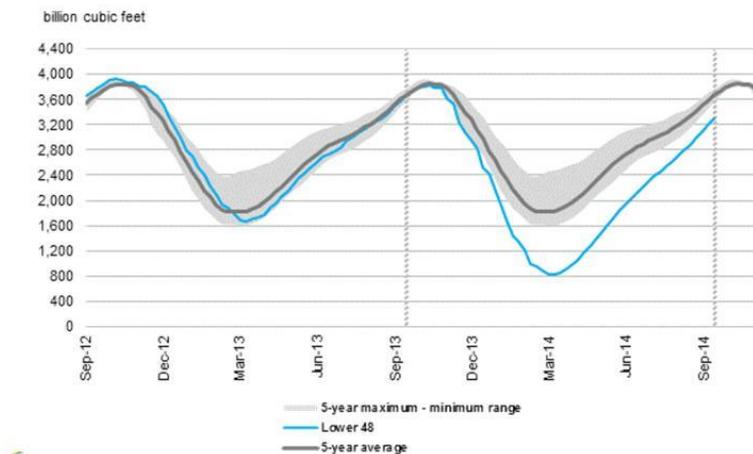
Higher gas prices were anticipated this year due to the size of the storage deficit the industry faced

As of last week’s gas injection estimate from the Energy Information Administration (EIA), the U.S. had 3.299 Tcf of gas in storage. Amazingly, the industry is now within 14 billion cubic feet (Bcf) of total gas injected into storage compared to the record seasonal injection rate of 2003. That year marked the highest volume injected during any injection season in 1994-2013. Importantly, 2003’s record storage injection season began with the record low volume of gas in storage experienced during 1994-2013. It was this injection performance that prompted us to use it as our model for forecasting gas storage growth during this injection season. The 2014 injection season began with the gas industry at the fourth lowest storage volume since 1994. To end the injection season after having injected possibly the largest volume of gas ever since 1994, will mark an outstanding achievement for the industry. This achievement reflects strong domestic gas production growth due to the shale revolution coupled with the absence of meaningful gas consumption for generating electricity due to a cool summer.

The downside to this record gas storage injection season is that output gains due to the pace of shale development at low prices demonstrates why the natural gas price continues struggling to reach the \$4 per thousand cubic feet (Mcf) level. Higher gas prices were anticipated this year due to the size of the storage deficit the industry faced. It was thought that higher prices were needed to stimulate drilling and gas production, and importantly the profits (cash flow) to fund that activity. The volume of gas storage injections suggest producers are either willing to accept very low returns for their efforts or that the cost of finding and developing these shale resources is low.

Exhibit 7. Gas Storage Build Closing Historic Gap

Working gas in underground storage compared with the 5-year maximum and minimum



Source: U.S. Energy Information Administration

Source: EIA

We are eagerly awaiting the earnings reports of the E&P companies and their disclosures about their cash flows and their balance sheet strength

So far, the recent drop in world oil prices has not impacted U.S. natural gas prices, but the overall impact of lower commodity prices on producers’ financial health is negative and will translate into reduced future capital spending – the magnitude of which we do not know yet – assuming prices remain down. We are eagerly awaiting the earnings reports of the E&P companies and their disclosures about their cash flows and their balance sheet strength, as those revelations will be an important indicator of the health of the producing industry, which is of critical importance for the future business and profitability for the oilfield service companies.

Exhibit 8. Producer Health Showing Mixed Outlook

SAMPLED E&P FREE CASH FLOW & DEBT COMPARISON						
	2014 FCF	2013 FCF	FCF DIFFERENCE	2014 DEBT	2013 DEBT	DEBT DIFFERENCE
OIL WEIGHTED	-5,129	-5,621	491	-84,720	-79,890	-4,829
GAS WEIGHTED	-8,264	-8,546	282	-84,269	-84,517	248
ALL	-13,393	-14,167	774	-168,989	-164,407	-4,582

Source: Courtesy of Art Berman

Gas-weighted producers reduced their debt outstanding slightly compared to 2013, while oil-weighted producers increased their total debt by approximately 6%

The cash flow and balance sheet data for a group of 51 domestic exploration and production companies, based on the research universe of the E&P analysts at Sanford Bernstein, shows that for the first six months of this year, both gas-weighted and oil-weighted producers improved their free cash flow generation compared to the same period in 2013. Gas-weighted producers reduced their debt outstanding slightly compared to 2013, while oil-weighted producers increased their total debt by approximately 6%. In light of the recent pullback in crude oil and condensate prices, producers assuming more debt signals that the economics of their shale and tight oil projects have not improved as much as some analysts contend. We understand that those analysts will make the argument that the increased debt load reflects the expansion of tight and shale oil

development plays. Since there are few virgin shale plays around, much of the recent increase in activity is related to producers buying shale acreage from other producers, likely at high prices, and then increasing their drilling efforts. At the end of the day, producers need to begin generating significant free cash flow to repay their debt if this industry sector is going to avoid a financial calamity.

New Englanders Better Pray For A Super-warm Winter

More weather forecasters are beginning to fall in line with the very cold and snowy winter forecast offered by the *Old Farmers' Almanac*

The meteorological arm of the National Ocean and Atmospheric Administration (NOAA) is forecasting that the upcoming winter will be considerably warmer than last year. However, more weather forecasters are beginning to fall in line with the very cold and snowy winter forecast offered by the *Old Farmers' Almanac*. Considering the number of heating degree days projected by the Energy Information Administration (EIA) based on the NOAA winter weather forecast, this year will be nearly 11% warmer than last year and about 1.5% warmer than the winter of 2012-13. The upcoming winter is projected to be about 13.6% colder than the winter of 2011-

12. Overall, the winter of 2014-15 is projected to be 2.3% warmer than the average of all winters for the past ten years. New Englanders better hope the NOAA winter weather forecast along with the EIA's heating degree days projection are on the mark since the region's utilities are preparing to sock it to the residents with huge electric rate hikes.

It says that the reason for the sizable rate hike is directly due to the high price of buying power from generating plants primarily due to the rising cost of natural gas

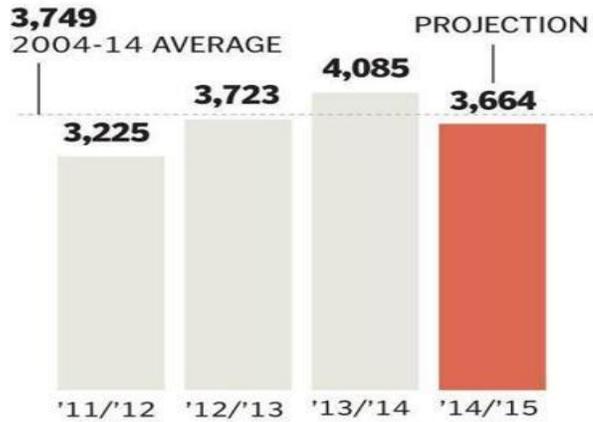
National Grid (NGG-NYSE), one of the two dominant electricity providers in Massachusetts, recently announced it was increasing winter rates by 37% over those charged last winter. Other utilities such as NStar and Western Massachusetts Electric, both owned by Northeast Utilities (NU-NYSE), have stated that their rates will increase sharply, but they haven't determined exactly how high since they don't have to file the new rates with the regulators until November since their winter rates only take effect in January. National Grid supplies electricity to about 1.3 million residential and business customers in Massachusetts. It says that the reason for the sizable rate hike is directly due to the high price of buying power from generating plants primarily due to the rising cost of natural gas. The company claims that the cost of power has jumped to the highest level in decades. This cost increase will be devastating on the poor and the one in ten residences that still heats with electricity. National Grid has also told residents of Rhode Island, where the company is the dominant utility, that its rates there will be going up by a similar amount starting January 1, 2015.

About two-thirds of the electricity used in Massachusetts today is generated from natural gas

National Grid blames the cost of power on the volatile nature of natural gas, which has increasingly gained market share in the region's power generation business. About two-thirds of the electricity used in Massachusetts today is generated from natural gas, up from about 40% just six years ago. The average household

**Exhibit 9. Nation To Gain Energy Relief This Winter?
Heating-degree days**

The upcoming winter is not expected to be as cold as last season.



SOURCE: US Energy Information Administration

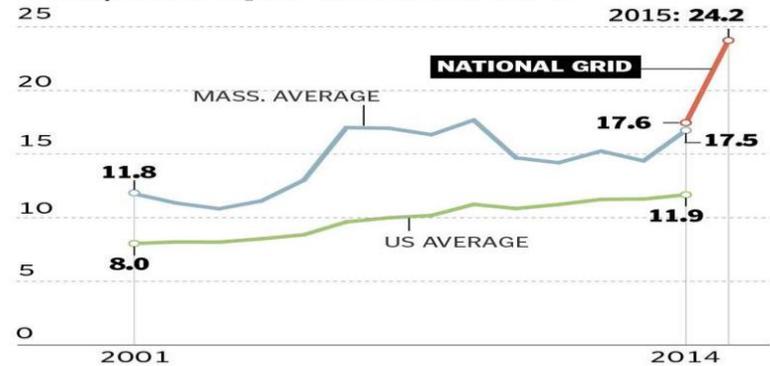
LUKE KNOX/GLOBE STAFF

Source: *Boston Globe*

About two-thirds of the cost of power comes from the purchase of electricity

in Massachusetts uses about 630 kilowatts of electricity a month, according to the most recent US government data. With National Grid's new winter rate of 24.24 cents per kilowatt-hour, a typical monthly residential bill would run slightly more than \$150, an increase of about \$30 per month over the cost last winter. According to National Grid, about two-thirds of the cost of power comes from the purchase of electricity from power plants, compared to just over half last winter.

**Exhibit 10. Electricity Costs Are Soaring In New England
Cost, cents per kilowatt hour**



SOURCES: National Grid, US Energy Information Administration

LUKE KNOX/GLOBE STAFF

Source: *Boston Globe*

Last winter, due to the lack of gas pipeline capacity during the polar vortex episode in December, the shortage drove wholesale electric prices to \$1,290 per megawatt hour, compared with an average price of \$36

The cost of power in New England has been impacted by the growth in natural gas use as coal and nuclear power plants have been, or are being, shut down and others are being converted to burning gas. Last winter, due to the lack of gas pipeline capacity during the polar vortex episode in December, the shortage drove wholesale electric prices to \$1,290 per megawatt hour, compared with an average price of \$36, according to information from ISO New England, the region's grid operator. Power generators were also forced to burn coal and expensive fuel oil to meet power needs. These higher costs are eventually passed on to consumers.

Due to their intermittent nature, renewable power sources require utilities to maintain backup generating capacity that today is almost always fired by natural gas further increasing gas demand in the region

While there are several pipeline expansion proposals and new pipeline projects proposed to help alleviate the gas shortage in New England, environmental groups are aggressively fighting them. Even if the projects are approved in the near future, it will take several years before the gas supply will be expanded. Even following these expansions, given the growth in gas demand, the region may still be short of supply, especially during winter months.

For the entire United States, residential electric rates increased by 3.5% over that period

Another aspect of the New England power market that influences the price of electricity is the push to expand renewable fuel mandates. States such as Massachusetts, Connecticut and Rhode Island have been pushing expanded state renewable mandates and forcing local utilities to purchase these clean, intermittent fuels at premium prices to alternative renewable fuel supplies available in the region and at significant premiums to power generated by natural gas. Due to their intermittent nature, renewable power sources require utilities to maintain backup generating capacity that today is almost always fired by natural gas further increasing gas demand in the region. These high cost alternative fuel supplies further push up electricity costs.

The New England region stands out with its 9.5% annual increase, about two and half times the nation's average increase

To gain an understanding of the impact of these mandates on regional fuel costs, we examined the price of residential electricity rates for July 2014 versus the rates charged in July 2013. This rate comparison eliminates the impact of high-cost energy during winter months. July 2014 is the latest monthly data available from the EIA. The EIA divides the nation into ten regions for comparison, which provides an interesting picture of rate increases over the past 12 months. For the entire United States, residential electric rates increased by 3.5% over that period. Four of the ten regions saw rate increases of between 5.0% and 5.6%, while five regions experienced considerably lower percentage increases, including two regions with only 2.0% annual increases.

The New England region stands out with its 9.5% annual increase, about two and half times the nation's average increase! Rhode Island electric rates jumped 19.1% while Connecticut's increased 12.4%. Massachusetts experienced only a 7.6% rate increase over the past year, but given the upcoming winter rate hikes that moderate pace of increase will change. Excluding the remote states

High power costs are strangling the New England region's economy with little relief in sight

of Alaska and Hawaii, New York has the highest electricity rate in the nation at 20.31 cents per kilowatt-hour with Connecticut second at 19.45 cents. The average rate for the six New England states is 17.17 cents, the highest of the nine contiguous state regions.

It is becoming increasingly clear that the impact of the environmental movement to close down less-costly power sources – coal and nuclear – in New England along with a lack of pipeline capacity to bring adequate clean natural gas supplies into the region, coupled with growing mandates for high-cost renewable fuels, has pushed electricity rates to the highest in the nation. These rate increases are pushing more New England families into energy poverty, defined by having to devote more than 20% of income to pay utility bills. In addition, these states are lagging the nation in economic growth and several of the New England states rank among those with the highest unemployment rates. High power costs are strangling the New England region's economy with little relief in sight.

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