
MUSINGS FROM THE OIL PATCH

August 2, 2011

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Managing Director

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

Gas Shale Debate May Be Moving To Next Higher Stage

The columns bothered certain managements of producers who were totally committed to gas shale developments

For the past 18-24 months, the debate about the economic performance of the gas shale revolution has been ongoing deep in the industry's trenches. Questions were originally raised by geologist Art Berman about the performance of natural gas shale wells writing in a column in an industry trade magazine, *World Oil*. The columns bothered certain managements of producers who were totally committed to gas shale developments. As additional critical columns appeared using acceptable industry data analysis of the results of producing gas shale wells, these unhappy producers voiced their criticism to the publisher of *World Oil*. The pressure on Mr. Berman to drop the topic increased to the point that he elected to stop writing his column. *World Oil's* editor also left due to the pressure on Mr. Berman.

Many of the participants in the email chains were long-time students of the E&P industry and are aware of the history of producers destroying capital through poor management decisions

In late June, *The New York Times* published an article based on a number of emails between industry, government and investment professions discussing the latest gas shale data. Those exchanges focused on whether there might be a risk that the abundant volumes of natural gas trapped in the shales would not be developed because the cost of extracting them was actually far in excess of the current or even near-term future gas price and that producers were misleading investors about gas shale economics. If E&P companies were attracting the necessary investor funds to finance their gas shale developments predicated on assumptions that later proved overly optimistic, substantial financial losses could be experienced. Many of the participants in the email chains were long-time students of the E&P industry and are aware of the history of producers destroying capital through poor management decisions.

It is important to understand that the gas shale critics have never questioned the existence of the potential gas volumes contained in

The debate has always been about the profitability of extracting the gas

the shales and documented by many industry and government agencies. The debate has always been about the profitability of extracting the gas. A side note to this concern about capital destruction is the realization that environmentalists are increasing their opposition to shale development even though natural gas is environmentally superior to coal and oil. The least dirty fossil fuel is now the target of environmentalists because its volume growth has depressed gas prices, which have undercut the growth of renewable fuels, their preferred “green” alternative.

The SEC has served subpoenas on a number of gas shale producers

We have recently learned in a client alert from Fulbright & Jaworski L.L.P. that the Securities and Exchange Commission (SEC) has served subpoenas on a number of gas shale producers. According to the law firm, the subpoenas seek documents and information regarding the actual performance of shale gas wells against forecasted or projected performance, the propriety of decline curves used for the wells, and the calculation and public disclosure of full-cycle margins. The subpoenas have been issued in response to the wave of recent reports on the business, in particular *The New York Times* June article.

This development will shift the gas shale debate away from personal attacks on the critics to one based on gas shale well production data and the quality of the company disclosure of this data. Given the amount of investment written off by producers heavily involved in gas shales over the past few years may provide fodder for the regulators and certainly for the class action securities lawyers who clearly have been alerted by the disclosure of the subpoenas.

According to an article in *The New York Times* on Saturday, an industry consultant said he had been invited to the Ft. Worth regional office of the SEC in June. He said the line of questioning was about the production data and margins producers reported to the government compared to data they disclosed in investor presentations.

The SEC recently asked a gas shale producer involved in the registration process for an IPO to disclose the volume of fracturing fluids used per well

It may be an interesting coincidence that the SEC recently asked a gas shale producer involved in the registration process for an initial public offering (IPO) to disclose the volume of fracturing fluids used per well. They also requested information on the “additional chemicals” present in the fracturing fluids used. These questions were in the SEC’s comment letter on the required risk section of the S-1 registration document. The lawyers involved indicated that the producer was not planning on disclosing any of this information, but what the lawyers worried about is why the SEC would be asking these questions. There is no federal disclosure requirement about hydraulic fracturing chemicals so who is behind this request? The belief is that the Environmental Protection Agency (EPA) is encouraging the SEC’s inquiry, but that is only speculation. That belief is based on the fact that the EPA asked Chesapeake Energy (CHK-NYSE) to supply information about the chemicals in the

The gas shale industry is not likely to face a moratorium on hydraulic fracturing such as the Gulf of Mexico experienced after the Macondo well disaster last year

fracturing fluid involved in a spill in Pennsylvania that the agency is investigating.

The concern about the EPA and SEC inquiries is that the federal government, spurred by environmental critics of shale developments is that they might impact the pace of their development and the growth of future gas supply in the United States. The gas shale industry is not likely to face a moratorium on hydraulic fracturing such as the Gulf of Mexico experienced after the Macondo well disaster last year. The likelihood is, however, that the cost of developing gas shale resources will rise. To what level will restrictions on gas shale development rise, and how long before we know? No one knows. Might the pace of development slow as a result of the uncertainty of increased regulation? Yes, especially given the legal risks associated with possible violations. Many people have called gas shales a “game changer” but regulation could change that game in ways we haven’t contemplated. Stay tuned.

Marcellus Impact Study Rests On Some Shaky Assumptions

“Marcellus economic activity could support over 250,000 jobs and generate \$2 billion in annual state and local tax revenues”

The latest study of the impact of the Marcellus shale formation on the economy of Pennsylvania continues the theme of prior reports by concluding that “...the development of the Pennsylvania Marcellus increased domestic energy production, creates jobs, and reduces government deficits.” Earlier in its report, titled “The Pennsylvania Marcellus Natural Gas Industry: Status, Economic Impacts and Future Potential,” the authors made the determination that if natural gas prices do not fall significantly in the future, “Marcellus economic activity could support over 250,000 jobs and generate \$2 billion in annual state and local tax revenues.” In a state beset by financial difficulties from a weak economy and lucrative state and local worker pension benefits, the prospect of a pot of \$2 billion in new revenues has to be viewed positively.

The Marcellus is considered one of the two hottest gas shale plays in the U.S.

This report, commissioned by the Marcellus Shale Coalition, is the third annual report a team of three energy-focused professors currently or formerly associated with Pennsylvania State University (PSU), have issued on the impact of the Marcellus shale on the state’s economy. The Marcellus is considered one of the two hottest gas shale plays in the U.S., with the other the Eagle Ford shale in south Texas. In the PSU team’s first assessment in 2009 when the Marcellus was early in its development, the professors compared the potential for the Pennsylvania resource to the largest gas shale basin, the Ft. Worth Basin’s Barnett shale in north central Texas. While the Barnett shale is still arguably the largest gas field in the United States, it will soon, if not already, relinquish the title to the Haynesville shale in Arkansas and Louisiana.

The 2009 report contained a graphic showing how small the Barnett

Pennsylvania has now become a gas-exporting state

shale is compared to the Marcellus. The geographic spread of the Marcellus combined with its prolific wells led the PSU team to project it becoming the largest gas field in the country. As current production in Pennsylvania now exceeds local gas consumption, Pennsylvania has now become a gas-exporting state. And based on current drilling and completion activity, it would appear that this shift will not be reversed at any time in the foreseeable future, barring a total collapse of drilling.

Exhibit 1. Barnett Shale Compared To Marcellus

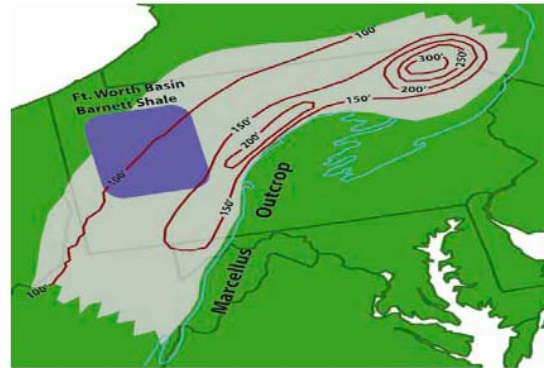
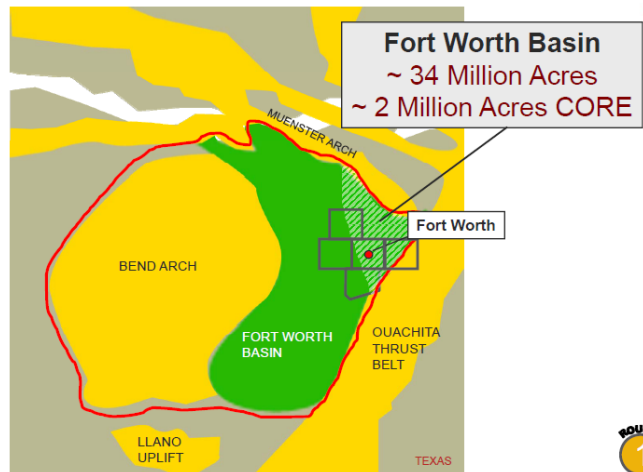


Figure 1: Extent of Marcellus Compared with Barnett Shale Formation
 Source: Marcellus Shale Coalition

The issue is whether all these millions of core acres in the Marcellus are truly core

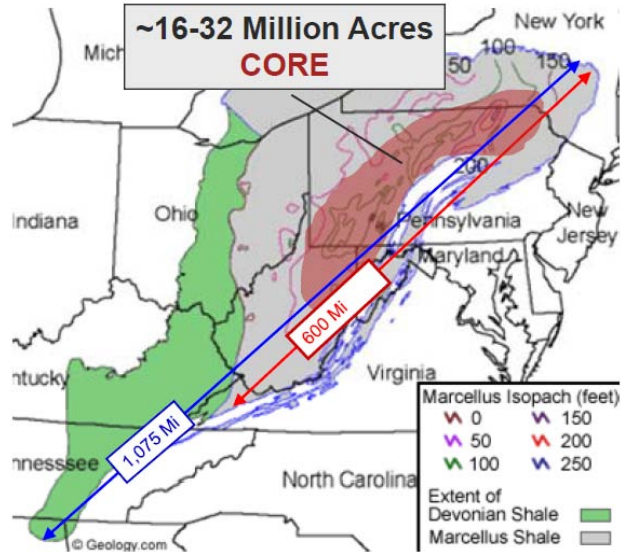
According to a 2009 XTO Energy investor presentation contrasting the similarities and differences between the Barnett and Marcellus shale formations there are 34 million acres in the Barnett with just two million of them in the core area of the basin. This contrasts with somewhere between 16 million and 32 million core acres in the Marcellus formation. The issue is whether all these millions of core acres in the Marcellus are truly core.

Exhibit 2. Successful Barnett Is Small Area



Source: XTO Investor Presentation

Exhibit 3. Core Marcellus Area Larger Than Barnett

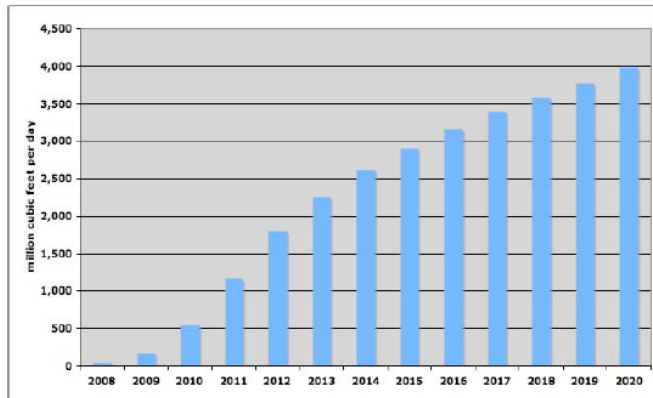


Source: XTO Investor Presentation

It is in the forecasting of drilling activity and well performance, both of which are responsive to estimates of future natural gas prices, where we begin questioning the gas production forecast in this latest report

It is within the forecasting of drilling activity and well performance, both of which are responsive to estimates of future natural gas prices, where we begin questioning the gas production forecast in this latest report. In the 2009 report, the professors used natural gas price forecasts of \$5.40 per thousand cubic feet (Mcf) for 2009 and then rising to \$6.70 per Mcf in 2010 and thereafter gradually increasing until they reach \$7.50 per Mcf by 2020. Under that scenario and using a typical production decline curve from the Barnett shale, the study projected gas production rising from 170 million cubic feet per day (MMcf/d) to 550 MMcf/d in 2010. They further saw the industry making Pennsylvania self-sufficient in gas supply by 2012 with production of 1,800 MMcf/d. By 2015, production was projected to reach 2,900 MMcf/d and almost 4,000 MMcf/d in 2020.

Exhibit 4. 2009 Marcellus Shale Production Forecast

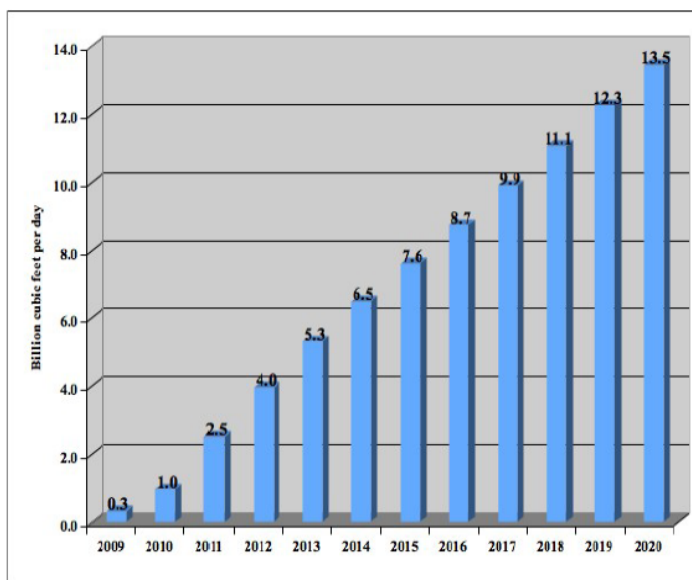


Source: Marcellus Shale Coalition

The projected 2010 price assumptions called for an average annual real rate of increase of two percent

In the 2010 report, the gas price assumptions changed to \$5.41 per Mcf for 2010 and then increasing to over \$6.00 per Mcf by 2020, nearly \$1.50 below the previous year's target. The projected 2010 price assumptions called for an average annual real rate of increase of two percent. This projected price scenario would support an increase in drilling from an estimated 2,500 wells in 2012 to 3,500 per year by 2020. As a result of this activity outlook and the assumption of an economical ultimate recovery (EUR) per well of 2.8 billion cubic feet (Bcf), Marcellus gas production was projected to potentially exceed 2.5 Bcf per day in 2011, going over 7.0 Bcf per day in 2015 and reaching 13.0 Bcf per day by 2020.

Exhibit 5. 2010 Marcellus Shale Production Forecast



Source: Marcellus Shale Coalition

The professors raised their EUR to 3.6 Bcf and then increasing it steadily over the forecast period to 4.6 Bcf by 2020 to reflect industry advances in recovery technology

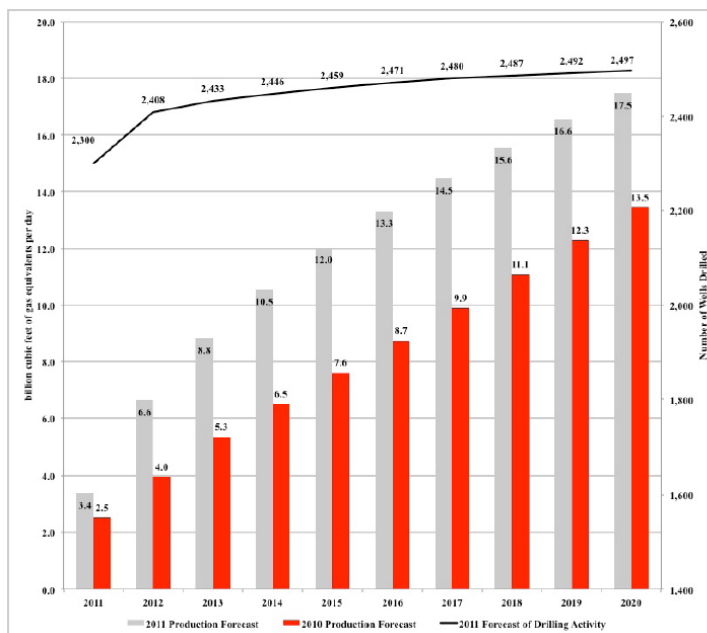
In examining the assumptions underlying the 2011 forecast, we find that the professors used inflation-adjusted prices in 2010 dollars that yield a price of \$4.58 per Mcf in 2012 and gradually rising to \$5.30 per Mcf in 2020, more than \$2.00 per Mcf below the value forecast in 2009. As a result of the lower price forecast, drilling activity was lowered to an estimated 2,300 wells to be drilled in 2011 increasing slowly to just below 2,500 wells in 2020. While the new well forecast has moderated, the professors raised their EUR to 3.6 Bcf and then increasing it steadily over the forecast period to 4.6 Bcf by 2020 to reflect industry advances in recovery technology. The net result of these revised forecast assumptions is that gas production is estimated to grow more rapidly – from 3.4 Bcf per day in 2011 to 12.0 Bcf per day in 2015 and further to 17.5 Bcf per day in 2020.

When we consider all three forecasts we note that 2020's targeted production increased from 3.5 Bcf per day in the 2009 study to 4.0 Bcf per day in the 2010 one and now to 17.5 Bcf per day. That is

The professors start with a EUR estimate that is nearly 30% greater than the EUR employed in their 2010 forecast

essentially a five-fold increase in 2020 production, which is largely driven by assumed technological advances in completing wells that boosts the EUR. The fact that the projected production did not increase significantly between the 2009 and 2010 studies, even though the latter study used an EUR of 2.8 Bcf per day, we have to assume that the professors were using an EUR of closer to 2.5 in the 2009 study. For the 2011 study, the professors escalate the EUR from 3.6 Bcf per day to 4.6 Bcf per day over the next decade. But they start with a EUR estimate that is nearly 30% greater than the EUR employed in their 2010 forecast. Does the data support that change? It is interesting that consulting firm, Rystad Energy, forecasts Marcellus production in 2020 of only 7.9 Bcf per day or 45% of what the professors' project. The correctness of each forecast will have a profound effect on natural gas markets and prices, producer profits and the economy of Pennsylvania.

Exhibit 6. 2011 Marcellus Production Forecast



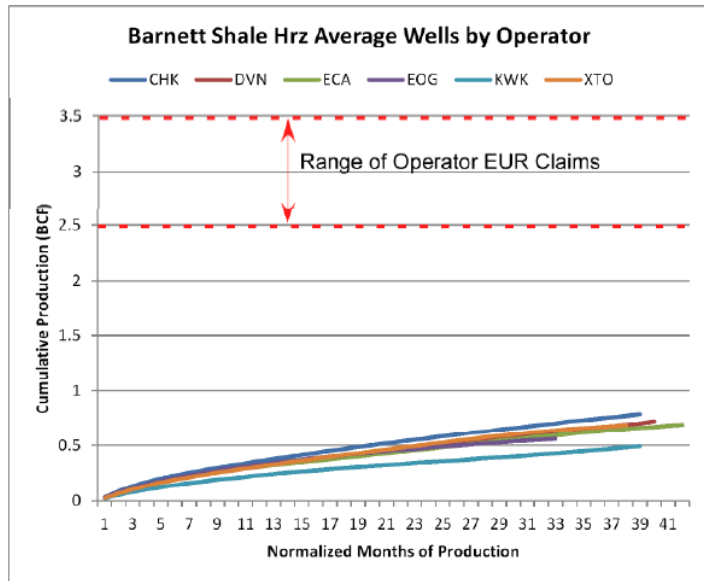
Source: Marcellus Shale Coalition

The data doesn't seem to support the claims of gas shale producers

If we look at estimates of the EURs suggested by producers active in the Barnett shale versus the cumulative production data from wells, there is no close correlation. (Exhibit 7 below.) This comparative data has been collected by Art Berman, a critic of the economic analysis underlying gas shale development, but the data doesn't seem to support the claims of gas shale producers.

To understand the significance of this data, one should examine production from the Barnett based on historic wells and not including newly drilled wells. As the chart in Exhibit 8 shows, if one excludes Barnett wells drilled in the past 12 months, total gas production

Exhibit 7. Well Production Not Supporting EUR Claims

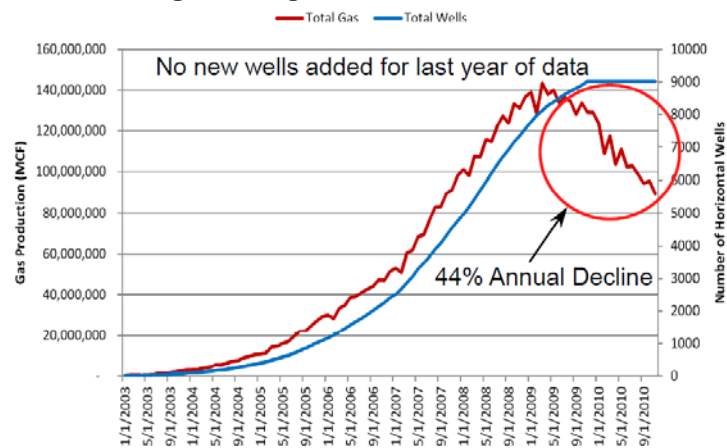


Source: Art Berman

The rate of decline highlights the problem gas shale producers will face when and if they slow down drilling new wells

declines at a 44% annual rate. That decline rate is consistent with gas shale well production profiles, but the rate of decline highlights the problem gas shale producers will face when and if they slow down drilling new wells in the basin. Without significant new well drilling, gas production is at risk, but the flip side of that risk is a higher natural gas price.

Exhibit 8. High Drilling Needed To Sustain Production



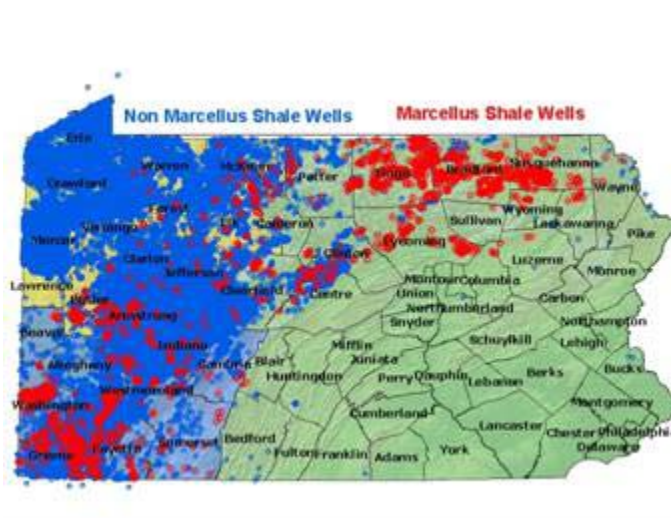
Source: Art Berman; Robert Gray

Coupled with the increasing EUR and a slightly increasing new well count in the professors' latest forecast, is the belief that gas shale wells can be drilled throughout the basin. That assumption ignores the growing reality that the Marcellus formation, despite being extensive, is not equally productive throughout the region. The map

There are essentially two areas of the state with above-average well production

of producing wells in Pennsylvania demonstrates that there are essentially two areas of the state with above-average well production – the first area is the three northeast counties of Tioga, Bradford and Susquehanna, and then there are the two southwest counties of Washington and Greene. But it is also interesting to note the large number and the concentration of non-Marcellus wells in the western region of the state.

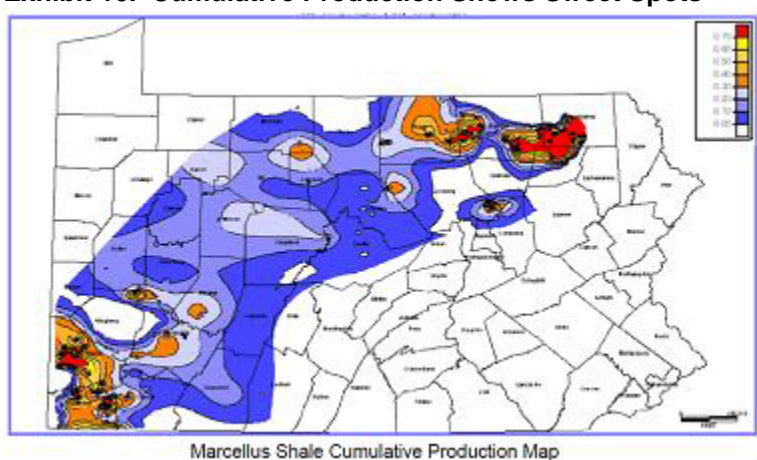
Exhibit 9. Marcellus Wells Centered In Two Areas



Source: PA Dept. of Environmental Protection

This sweet spot nature of the Marcellus formation is borne out in the following two charts. One shows the cumulative production of Marcellus wells, which substantiates the prominence for the state's gas shale industry of the five counties of Pennsylvania mentioned above. (Preparing these charts is a challenge because the data is not reported by Pennsylvania regulators on a monthly basis.)

Exhibit 10. Cumulative Production Shows Sweet Spots

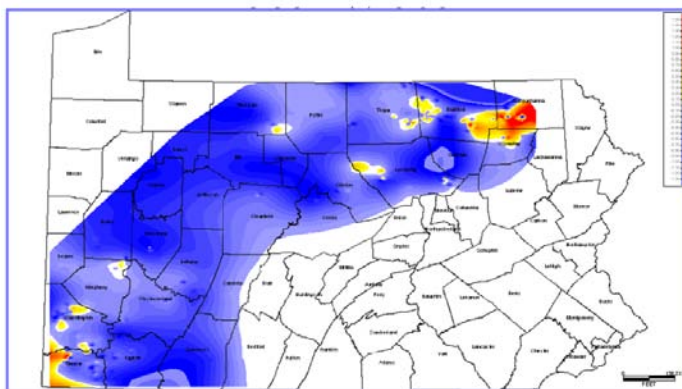


Source: Art Berman; Lynn Pittinger

The wells are more concentrated in two of the three northeastern and one of the two southwestern counties

The shape of the chart in Exhibit 10 is further supported by data used to construct the chart in Exhibit 11. In this latter chart, the production history of Marcellus wells taken from the Pennsylvania Department of Environmental Protection is compared against the estimated monthly production that fits a decline curve designed to yield a EUR of 4.2 Bcf. What it shows is that wells this prolific are not only concentrated in those five counties, but actually are more concentrated in two of the three northeastern and one of the two southwestern counties.

Exhibit 11. Well Performance Supports Sweet Spots



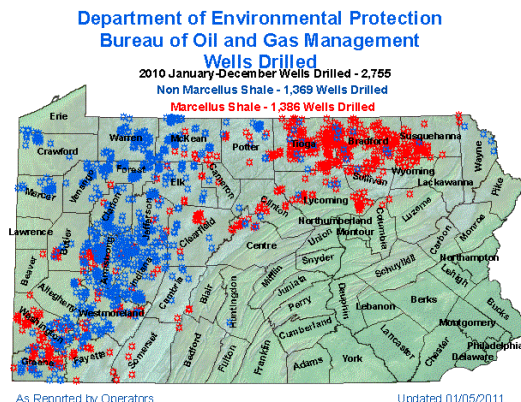
Marcellus Shale Well Performance Map
 Dark colors underperform type curve,
 White is neutral,
 Yellows and reds overperform

Source: Art Berman; Lynn Pittinger

For the first half of 2011, the ratio was 70/30 in favor of Marcellus wells

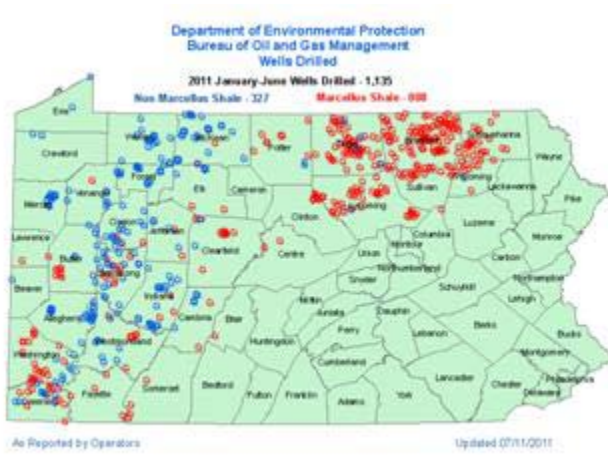
The next three charts show the wells that have been drilled in Pennsylvania in 2010 and in the first half of 2011 differentiated by Marcellus and non-Marcellus classification. In 2010, the well split was essentially 50/50, but for the first half of 2011, the ratio was 70/30 in favor of Marcellus wells.

Exhibit 12. 2010 PA Wells Drilled By Well Type



Source: PA Dept. of Environmental Protection

Exhibit 13. 2011 PA Wells Drilled By Well Type

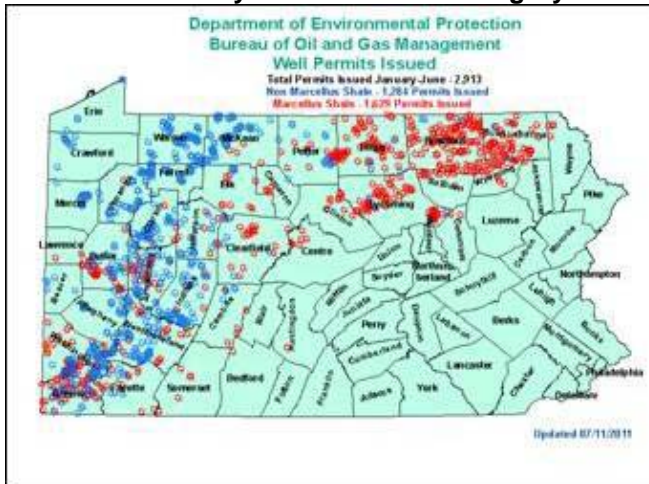


Source: PA Dept. of Environmental Protection

The permitting is also focused in the core areas

When we look at the well permitting activity in the first half of 2011, Marcellus wells exceed non-Marcellus wells by a ratio of 55/45. The permitting is also focused in the core areas where Marcellus and non-Marcellus production has been established.

Exhibit 14. Pennsylvania Well Permitting By Well Type



Source: PA Dept. of Environmental Protection

The professors appear to have become extremely optimistic in this latest version

After having been more conservative in their 2009 and 2010 studies of the Marcellus, the professors appear to have become extremely optimistic in this latest version. The emergence of a limited number of highly concentrated sweet spots demonstrating superior well performance raises questions about the professors' assumptions of high and growing EURs coupled with high initial production rates for all wells projected to be drilled in the future. If those assumptions are not achieved, the Marcellus may not become as significant a gas

producer as projected. That doesn't mean the Marcellus won't become a significant gas field, but maybe it won't meet the aspirations of producers, politicians and planners who are counting on a bonanza from this field to dramatically alter the long-term future of the Northeast/Mid-Atlantic natural gas market.

Are You Smarter Than A GPS?

There are various route options available in driving between Houston and Charlestown, Rhode Island

On the morning of Saturday, July 16th, we piled into our car and began the trek home from Rhode Island to hot, humid Houston. Little did we appreciate that we were escaping an impending heat wave that subsequently engulfed the Midwest, Mid-Atlantic and Northeast states with searing heat rivaling the peak temperatures of the 1930s. As we started our trip, we plugged our home destination into our car's GPS system and began following the suggested route. There are various route options available in driving between Houston and Charlestown, Rhode Island, and we have driven virtually every one of them during the years we have made these trips. On our way up this past spring, we followed the suggested route laid out by AAA, even though it didn't match the route suggested by our GPS when we reached Pennsylvania.

Traffic heading north was much heavier, but it appeared to be largely people heading to New England beaches and vacations

So, with high hopes for an easy drive home, we selected the GPS option of "quickest" route. Traffic down I-95 that hugs the coastline through Connecticut and New York State was relatively light, something we attributed to it being a Saturday morning. Traffic heading north was much heavier, but it appeared to be largely people heading to New England beaches and vacations. Heading south, traffic came to a screeching halt as we approached the George Washington Bridge over the Hudson River. We had encountered heavy traffic crossing the bridge one night in mid-May as we headed to Rhode Island, but that proved to be due to the combination of road construction and a broken-down truck in a center traffic lane that required stopping all traffic to maneuver a rescue truck in order to tow the vehicle out of the way.

Now we knew – the infamous Jersey shore traffic!

After crossing the GW Bridge, we continued south on the New Jersey Turnpike (also I-95) past Newark Airport. Right about there is an alternate route if one wants to turn west onto I-78 that heads into Pennsylvania, but our GPS instructed us to keep heading south. After about ten miles that instruction became a bad call. Traffic began backing up and after about ten more miles we were in stop-and-go traffic. It must be construction or an accident causing the back-up we thought. The problem was we never saw any of the construction equipment parked along the road operating or any construction workers so we assumed it had to be an accident. Ah ha, a car stopped in the center lane was our problem, or so we thought. But about a half a mile further on, we were back in stop-and-go traffic. It continued that way for about 20 miles until we saw the Exit 7 signs that had the designation: Trenton and Shore Points. Now we knew – the infamous Jersey shore traffic! It has been the

We continued speculating on when the GPS would tell us to get off I-95 and start heading west toward Virginia

topic of numerous newspaper articles we have read and television news stories we have seen, but we never identified with exactly where it was or exactly how BAD it was.

Just below Exit 7, is another escape exit west into Pennsylvania – a direct connection to the Pennsylvania Turnpike. That assumes you want to go west before you head further south. But our GPS voice told us to keep going south on I-95. So we headed across the Delaware River and on towards Baltimore. We continued speculating on when the GPS would tell us to get off I-95 and start heading west toward Virginia. We thought that point would be at the intersection with I-695 that detours around Baltimore and connects to I-70 that runs through Pennsylvania. Checking the GPS turn list suggested we were right.

The directions were completely backward

As we approached the intersection, the friendly voice of our GPS announced, “I-695 is on your left.” The blue lane lines marked on the GPS showing the route confirmed we needed to stay in the left lanes. WRONG! The directions were completely backward. Unfortunately, we couldn’t correct our (the GPS’s) mistake quick enough. Since there were no signs of new construction that might have changed the route connection, we kept wondering how the GPS got it so wrong.

As we drove along I-495, we noticed all the new office buildings and new road construction

As we headed toward Washington, D.C. we knew the GPS would send us onto I-495 around the city and to I-66 that heads through northern Virginia and takes you to I-81, which then takes you south through the Shenandoah Valley and into Tennessee and eventually home to Houston. As we drove along I-495, we noticed all the new office buildings and new road construction. That confirmed what we had learned merely a few days earlier that Washington, D.C. was the only major city in the country where the housing industry was showing growth. The power of bureaucracy!

Truck traffic was very light and even the numerous truck stops we passed weren’t full

Other than these few traffic issues, our two-day drive home was extremely easy. Absent those time-consuming traffic delays we likely would have set a record for the drive home. Truck traffic was very light and even the numerous truck stops we passed weren’t full. We don’t know how much the light truck traffic was due to it being a weekend, but as we have made almost every trip home on weekends, this one was extremely devoid of trucks. Is this a sign of the weaker economy?

Another traffic feature of our typical summer trips home that was missing this time was travel-trailers and motor homes

Another traffic feature of our typical summer trips home that was missing this time was travel-trailers and motor homes. It was surprising that during the height of the summer vacation season there were so few traveling-accommodation units. The majority of those that we did see were on the stretch of highway from the border of Tennessee and Virginia south to the Gulf Coast. There were almost none on the road between Rhode Island and Tennessee and only a few on the I-12 and I-10 stretch. Was that another sign of the

We had read earlier that week that Cracker Barrel had cut workers due to soft business conditions

state of the economy, along with healthy gasoline prices even though they were below the levels experienced earlier this year?

Another sign of a soft economy, or at least reduced vacationers, was the absence of any lines or even crowded dining rooms at the Cracker Barrel (CBRL-Nasdaq) restaurants we stopped at. Then again, we had read earlier that week that Cracker Barrel had cut workers due to soft business conditions. On the other hand, we had a difficult time finding a hotel room in southern Virginia, but we attribute that to a large craft fair in the area and the proximity to the Bristol, Virginia raceway. We wound up with a room in Kingsport, Tennessee, which is not too far from the birthplace of Davy Crockett. The next morning as we drove south we passed the Davy Crockett Travel Center, the Davy Crockett rest stop, and signs to the Davy Crockett birthplace and his tavern. As we saw all this, we couldn't get the image of Fess Parker in his leather outfit and coonskin cap out of our mind. At the same time, the refrain to the Ballad of Davy Crockett from the Disney movie, "Davy, Davy Crockett, King of the wild frontier" kept echoing in our head. Musings readers of a certain age will identify with these images.

The trip confirmed for us that the economy remains trapped in a soft patch. When and how we get out of it is not clear. The other thing we learned was: Don't blindly follow your GPS – reading highway signs are equally important.

Thoughts About The Changing Future Of Gas Shales

Is it a coincidence that these reports are arriving at the same time Captain America is debuting in the summer movie?

Obviously this past spring was a time for researchers to prepare reports about the future of the gas shale business. Two recent reports landed in our inbox recently. In one case, the report focused on the impact of the Marcellus shale on the economy of Pennsylvania, while the other focused on the national security impact for the nation of gas shale development. Is it a coincidence that these reports are arriving at the same time Captain America is debuting in the summer movie, *Captain America, The First Avenger*?

Captain America was the alter ego of Steve Rogers, a sickly young man who was enhanced to the peak of human perfection by an experimental serum in order to aid the United States war effort

So just who is Captain America? Quoting from the Wikipedia entry for the comic book hero we learn that: "Captain America is a fictional character, a superhero that appears in comic books published by Marvel Comics. The character first appeared in *Captain America Comics* #1 (March 1941), from Marvel Comics' 1940s predecessor, Timely Comics, and was created by Joe Simon and Jack Kirby. Over the years, an estimated 210 million copies of "Captain America" comic books have been sold in a total of 75 countries. For nearly all of the character's publication history, Captain America was the alter ego of Steve Rogers, a sickly young man who was enhanced to the peak of human perfection by an experimental serum in order to aid the United States war effort. Captain America wears a costume that bears an American flag motif, and is armed with an indestructible shield that can be thrown as a weapon."

Just as Captain America emerged as a transformed sickly Steve Rogers, gas shales have gone from a junk zone drillers hated to encounter into a huge source of new natural gas at a reportedly incredibly low cost

According to the article, Captain America was the most popular Marvel Comics character during the 1940s. But after the end of World War II, his popularity waned and Captain America completely disappeared by the early 1950s except for one revival issue in 1953. It wasn't until 1964 when the character of Captain America was resurrected by the Avenger team and has become the leader of its group since.

It is interesting to draw the analogy of gas shales to Captain America. Both were born out of periods of distressful outlooks – for gas shales it was high natural gas prices and a nation struggling to meet its energy and environmental commitments, while for Captain America it was the gloom of conflict in Europe and the impending World War II. Just as Captain America emerged as a transformed sickly Steve Rogers, gas shales have gone from a junk zone drillers hated to encounter into a huge source of new natural gas at a reportedly incredibly low cost. The powers of Captain America enabled the U.S. to overcome Germany and Japan just as gas shales will solve the domestic energy problems of the U.S. and break the energy backs of Russia and Iran.

Exhibit 15. Shale = Captain America?



Source: [the mightyshield.com](http://themightyshield.com)

If we think about how gas shales emerged from obscurity (sickly) to peak performance, it was achieved by employing “new” drilling and completion technologies (experimental serum)

Additionally, if we think about how gas shales emerged from obscurity (sickly) to peak performance, it was achieved by employing “new” drilling and completion technologies (experimental serum). We're taking some literary license since horizontal drilling and hydraulic fracturing technologies have been around for a long time in the oil patch, but it was their joint use that is recognized as being the key to unlocking the mystery of gas shales.

With the keys to the gas shale kingdom in their pockets, E&P companies embarked on a land grab to lock up all the prospective shale acreage possible in order to insure their financial success for

Explorationists are possibly dismissing some of these cracks in the gas shale façade

many years into the future. Unfortunately, some of the tenets that underlay this grand success have begun to falter. Explorationists are possibly dismissing some of these cracks in the gas shale façade because the long-term rewards of pursuing the Holy Grail would well outweigh the near-term costs of the pursuit.

In that regard, we were intrigued by a paragraph in Schlumberger Ltd.'s second quarter earnings press release about a commercial success by one of the units of the company. Oilfield service companies developing new drilling and completion technologies such as Schlumberger often tout these commercial successes as a form of advertising because their message goes to a broader audience. Financial press releases often are read by the senior managers of target customers (oil and gas companies) rather than the engineers in the bowels of the company who may not be passing on knowledge of these new products and services since they don't appreciate the overall impact on the company.

A reservoir characterization study based on Schlumberger measurements allowed Ultra Petroleum to determine that well locations, rather than completion techniques, was the major contributor to variable well performance

The paragraph stated: "In the Marcellus shale, a Data & Consulting Services reservoir characterization study based on Schlumberger measurements allowed Ultra Petroleum to determine that well locations, rather than completion techniques, was the major contributor to variable well performance and enabled Ultra to prioritize its drilling and completion plans for several wells. The study was performed by integrating 3D surface seismic with EcoScope*† and SonicVision* logging-while-drilling data on 19 laterals, and ECS*, FMI* and SonicScanner* data on seven vertical pilot wells. The results highlighted sweet spot areas with better reservoir quality where wells produce superior results compared to average levels previously seen in the field. This study has helped Ultra establish criteria that will reduce risk as it continues development of its Marcellus acreage."

We were intrigued by the mention of 3D seismic as a key factor in this process

This announcement acknowledges that gas shales have sweet spots, a fact that has emerged over the past year or so, and provides a death-knell to the "manufacturing" development process. Moreover, the Schlumberger effort suggests that other disciplines besides just horizontal drilling and hydraulic fracturing are important for the success of gas shales. We were intrigued by the mention of 3D seismic as a key factor in this process. We have had that statement confirmed by others in the seismic business. This announcement also reminded us of a conversation we had following a presentation we made four years ago to an audience of seismic technologists in which we mentioned seismic as a beneficiary of the gas shale revolution. We were told that since these were blanket formations, seismic would play only a minor role in gas shale development. That is just another of the tenants that is crumbling.

Along those lines, we know gas shale producers have been working to improve their recoverability from wells by trying to find any natural fractures that might exist in the shale before applying a hydraulic

We are officially designating “gurgling” as the scientific term to describe the sound these listening devices are attempting to hear

fracture treatment. The idea is that greater production may be obtained if the fracturing is done in a way to widen the natural fractures in the formations. Possibly one way of finding these natural fractures is listening for gas moving in the formation and plotting their direction. Passive listening to the noise in the subsurface rock entails inserting seismic cables into formation to try to hear the “gurgling” sound of the gas moving along the natural fractures. We are officially designating “gurgling” as the scientific term to describe the sound these listening devices are attempting to hear. What we don’t know is whether “gurgling” is the politically correct name for the gas movements – we can think of other descriptive terms but probably not for use in mixed company.

Technology could lead to fewer wells being needed to develop fields

What the Schlumberger announcement suggests to us is that gas shales are going to have more technology applied to them than merely the brute force of hydraulic fracturing. It also suggests that well costs could be heading higher. On the other hand, technology could lead to fewer wells being needed to develop fields. These will be interesting trends to watch evolve as they may have long-run implications for oilfield service companies and their producer customers.

Is RFK Jr.’s Attack On Mass. Wind Farm Act of Desperation?

Mr. Kennedy resorted to economics to attack Cape Wind – what a novel concept!

We were somewhat shocked to read an Op-ed in *The Wall Street Journal* authored by environmental lawyer and president of the environmental group Waterkeeper Alliance Robert F. Kennedy, Jr. that attacked the Cape Wind project in Nantucket Sound. RFK Jr. is the son of the late Senator Robert F. Kennedy, the nephew of the late President John F. Kennedy and Senator Edward M. Kennedy, the latter a long-time critic of Cape Wind. The Kennedy family has criticized the offshore wind farm project that can be seen from the Kennedy family’s compound in Hyannis, Massachusetts because it would disrupt recreation tourism. Senator Ted Kennedy was an active protester against the project, along with other high profile local and national politicians and wealthy businessmen, many of whom spend time at their summer homes on Martha’s Vineyard, which is also within eyesight of the future whirling turbines. It appears from reading the Op-ed and having followed the nearly decade-long battle against constructing this first-of-a-kind in America wind farm that the critics have run out of legal grounds for attacking the project. Therefore, Mr. Kennedy resorted to economics to attack Cape Wind – what a novel concept!

Over the years, the critics of the Cape Wind project built their case on its transgressions on historic Native American burial sites and hallowed Indian lands along with infringing on their worship rituals. Critics also tried to make the case that the turbines would interfere with ships navigating the waters of Nantucket Sound, fishermen trolling the waters for catches, recreational sailors, and radar signals important for the operation of our military and civilian aviation.

Cape Wind eventually was able to secure a license this spring from the Department of the Interior to proceed with the project

NSTAR has resisted Cape Wind's overtures because it judged the cost of the offshore energy as being too expensive compared to alternative "green" energy sources

As each objection made and roadblock erected by the critics was overcome and fell by the wayside, Cape Wind eventually was able to secure a license this spring from the Department of the Interior to proceed with the project. That set the stage for Cape Wind to enter into contracts to sell its power output, a process that was helped by the requirement of the Commonwealth of Massachusetts that utilities purchase 3.5% of their power from "green" sources.

Cape Wind secured a purchase power agreement (PPA) with National Grid (NGG-NYSE) for half its projected output. It has been actively seeking a buyer for the remaining output. It held extensive discussions with another local utility, NSTAR (NST-NYSE), which has an agreement to merge with Northeast Utilities (NU-NYSE), and is seeking approval for the combination from the Massachusetts Public Utilities Commission (PUC). NSTAR has resisted Cape Wind's overtures because it judged the cost of the offshore energy as being too expensive compared to alternative "green" energy sources. Now it appears that the PUC may be holding the NSTAR-Northeast Utilities merger approval hostage unless the two electric companies agree to buy Cape Wind's remaining output.

It is this melodrama that prompted Mr. Kennedy to write his Op-ed titled "Nantucket's Wind Power Rip-off." Suddenly, Mr. Kennedy, a die-hard environmentalist, is concerned about the cost of electricity for citizens of Massachusetts that is generated from "green" energy. He has recently been in the forefront of fighting coal mining in West Virginia, and especially fighting the coal mining process that blasts the tops of mountains off to enable easier extraction of the coal. This comes some 40 years after his father led the fight against strip mining in Appalachia. Mr. Kennedy appeared in a new documentary focused on efforts to stop this mountaintop removal process called "The Last Mountain."

Exhibit 16. Onshore Wind Is Ok; Not Offshore Wind



Source: Solid Ground Films

Mr. Kennedy, in an interview associated with the opening of the movie on Memorial Day, touted alternative energy sources such as

Mr. Kennedy touted solar and wind as being more cost efficient and environmentally friendly than coal

Solar and wind per unit of electricity generated were the most heavily subsidized fuel supplies behind refined (clean) coal

solar and wind as being more cost efficient and environmentally friendly than coal. He cited a major solar project being built by BrightSource Energy Inc. in the Mojave Desert of California. (Mr. Kennedy is a partner in VantagePoint Venture, a major funder for BrightSource.) He commented, “We’re building it in three years. It takes at least 10 years to build a coal plant and 30 years to build a nuclear plant. And we’re building it at a fifth of the cost of a nuke plant. Also, once you built a coal plant, your big costs are just beginning. You’ve got to cut down mountains, ship coal across the country, burn the coal, poison fish and pollute the air. Once you build a solar plant, you’ve got free energy forever.”

Of course, Mr. Kennedy failed to note the magnitude of federal subsidies for wind and solar electricity. According to a study by the Energy Information Administration (EIA) published in 2008 and based on data for 2007, solar and wind per unit of electricity generated were the most heavily subsidized fuel supplies behind refined (clean) coal. Conventional coal was the third least subsidized fuel, and slightly ahead of natural gas and petroleum liquids and municipal waste.

Exhibit 17. Solar And Wind Among Most Subsidized

Table 35. Subsidies and Support to Electricity Production: Alternative Measures

Fuel/End Use	FY 2007 Net Generation (billion kilowatthours)	Alternative Measures of Subsidy and Support	
		Subsidy and Support Value 2007 (million dollars)	Subsidy and Support Per unit of Production (dollars/megawatthours)
Coal	1,946	854	0.44
Refined Coal	72	2,156	29.81
Natural Gas and Petroleum Liquids	919	227	0.25
Nuclear	794	1,267	1.59
Biomass (and Biofuels)	40	36	0.89
Geothermal	15	14	0.92
Hydroelectric	258	174	0.67
Solar ¹	1	14	24.34
Wind	31	724	23.37
Landfill Gas	6	8	1.37
Municipal Solid Waste	9	1	0.13
Unallocated Renewables	NM	37	NM
Renewables (subtotal)	360	1,008	2.80
Transmission and Distribution	NM	1,235	NM
Total	4,091	6,747	1.65

NOTES: Total may not equal sum of components due to independent rounding.

Unallocated renewables include projects funded under Clean Renewable Energy Bonds and the Renewable Energy Production Incentive.

NM = Not meaningful.

¹Net generation rounded to the nearest whole number. The actual value is 583 million kilowatthours.

Sources: Energy Information Administration, Forms EIA-906, “Power Plant Report;” Form EIA-920, “Combined Heat and Power Plant Report;” October 2006-September 2007.

Source: EIA

At the heart of Mr. Kennedy’s argument against Cape Wind is that the cost of its power is way too expensive for financially-strapped ratepayers

At the heart of Mr. Kennedy’s argument against Cape Wind is that the cost of its power is way too expensive for financially-strapped ratepayers, especially when there are cheaper “green” energy alternatives available. In addition, he sees Cape Wind as a boondoggle needing to be stopped to prevent federal, state and ratepayer dollars from being invested in a project for the benefit of a private company using public assets (the waters of Nantucket Sound) when cheaper power sources are available. Mr. Kennedy

Cape Wind's power will cost National Grid's ratepayers well over \$1 billion above market average costs

cited a 25-cents per kilowatt-hour (kWh) figure for Cape Wind's power under its PPA with National Grid as much too high compared to a 6-cents per kWh price for wind-generated power provided by HydroQuebec that could be available to citizens of Massachusetts. (The negotiated PPA price is 18.7-cents per kWh.) NSTAR has contracted with several land-based wind-power generators at a much lower cost than the Cape Wind price. Mr. Kennedy says that over the 15-year standard contract period, NSTAR's contracts will come in \$111 million below market average costs for power while Cape Wind's power will cost National Grid's ratepayers well over \$1 billion above market average costs.

We are guessing that Mr. Kennedy may have just figured out that his extended family will be paying a lot for electricity to sustain their lifestyle on Cape Cod if the wind project goes forward. Without the lucrative National Grid PPA and hopes that another power buyer can be cajoled into paying a similarly high price for electricity, Cape Wind might not be able to secure financing for the turbine farm. Already there has been talk about Cape Wind's project having to possibly downsize in order to raise the necessary funds to move forward.

Without large and continued subsidies, many of these "green" energy fuels would never make it in the real world, and even after the subsidies, they still may not make sense

This epiphany by an avowed environmentalist is surprising, but in tough economic times it would seem to make sense that the cost of electricity, something every American needs and consumes voluminously, would be considered when making investment decisions about new power generation facilities. On the other hand, numerous writers of letters to the editors of *The Wall Street Journal* questioned Mr. Kennedy's motive in writing the Op-ed. Could it have something to do with low-cost natural gas some wondered? We're not sure, but we'd rather believe that when it comes to personal pocketbook issues, even environmentalists have to concede that the high cost of their preferred "green" energy sources may be an impediment to them gaining market share and not something they want to pay for. Without large and continued subsidies, many of these "green" energy fuels would never make it in the real world, and even after the subsidies, they still may not make sense. Turning our energy cost structure upside down as has happened in Europe may not be the smartest economic strategy. These huge power costs and now the inability of governments to continue the subsidies is part of the economic stranglehold on populations in many European countries and is contributing to the growing social unrest evident there. Let's hope the U.S. can avoid making those same mistakes for the future of our children and grandchildren.

Shell U.S. President Warns Of Environmental Lawsuit Danger

Last Thursday, Marvin Odum, President of Shell Oil Company (U.S.), spoke to the U.S. Chamber of Commerce in Washington, D.C. His talk focused on defining the clear and distinct roles for government and for business and how together the two can work to solve America's current economic problems. One area Mr. Odum

Since the volume of that spill exceeded the worst case environmental damage case contained in the original EIS, the plaintiffs argue the government is obligated to prepare an updated assessment before it can issue drilling permits on blocks leased in the sales held under that plan

“This suit has the potential to virtually halt exploration in the Gulf, serving as a back-door moratorium”

cited was regulation, which he compared to the old arcade game of “whack-a-mole.” He equated the need to quickly react to moles popping up in the game to the government’s regulatory system – reactionary; often overburdened; and despite the validity of an issue is often more concerned with batting down rather than lifting up possible solutions.

In the talk Mr. Odum referenced the June 9th lawsuits by several environmental groups against the Bureau of Energy Management, Regulation and Enforcement (BOEMRE) for failing to update its Environmental Impact Statement (EIS) prepared as part of the process for developing the five-year Outer Continental Leasing program for 2007-2012 given the new data available as a result of the Macondo well spill. Since the volume of that spill exceeded the worst case environmental damage case contained in the original EIS, the plaintiffs argue the government is obligated to prepare an updated assessment before it can issue drilling permits on blocks leased in the sales held under that plan. That is what BOEMRE did not do prior to issuing a permit to Shell for its Cardamoms project. (You can read more about this issue in the June 21, 2011, article titled “Environmentalists Hit BOEMRE With Suit Over Gulf Permits” on page 7 of *Musings From the Oil Patch*.)

As Mr. Odum told the Chamber, “This suit has the potential to virtually halt exploration in the Gulf, serving as a back-door moratorium.” A senior Shell explorationist made the same dire observation at an industry conference last fall. Shell has petitioned the court to allow it to join BOEMRE in defense against the lawsuit, but we suspect they will be denied as this is a procedural question under the rules and regulations that the regulators must observe. If the government loses, it will need to prepare an updated EIS that could take another year or more and prevent awarding of other permits. The key point in this lawsuit becomes another hurdle, and a high one, the U.S. oil and gas industry must clear in order to fulfill its objective of finding and developing sufficient low-cost energy to power the American economy, something everyone wants to see happen, sooner rather than later.

The Innovators In The Oilfield Service Industry Identified

They identified those companies that are consistently innovative and determined the skills that set their managers apart

A recent issue of *Forbes* magazine carried an article by three business school professors who have studied the world’s most innovative companies for the past eight years, which is the subject of their book, [The Innovator’s DNA](#). The professors’ efforts were directed to trying to identify those companies that are consistently innovative and to determine the particular skills that set their managers apart from the rest of the corporate world.

The five skills of disruptive innovators that were identified by this effort were summarized in the article and we quote them below.

There is a significant stock market premium assigned to companies identified as the most innovative companies

- “• **Questioning** allows innovators to challenge the status quo and consider new possibilities;
- **Observing** helps innovators detect small details – in the activities of customers, suppliers and other companies – that suggest new ways of doing things;
- **Networking** permits innovators to gain radically different perspectives from individuals with diverse backgrounds;
- **Experimenting** prompts innovators to relentlessly try out new experiences, take things apart and test new ideas;
- **Associated thinking** – drawing connections among questions, problems or ideas from unrelated fields – is triggered by questioning, observing, networking and experimenting and is the catalyst for creative ideas.”

What the professors observed is that there is a significant stock market premium assigned to companies identified as the most innovative companies. The professors worked with the people at HOLT, a subsidiary of Credit Suisse (CS-NYSE) to identify and measure this premium. The innovation premium is the value investors assign to a company’s stock market valuation that reflects their belief that the company will launch new offerings and enter new markets that will generate even bigger income streams in the future.

The innovation premium is calculated by projecting a company’s income (cash flows in this case) from its existing businesses, plus anticipated growth from those businesses, and looks to the net present value (NPV) of those cash flows. Then the NPV is compared to the company’s current market capitalization. Companies that have a current market capitalization greater than the NPV of its cash flows have an innovation premium built in to its valuation. The professors were quick to point out that this valuation method does not correlate with substantial investor returns, so just because a company is one of the best innovators doesn’t mean that Wall Street necessarily agrees.

The rating method adopted by the professors relies on investors who buy and sell stocks to identify those companies they expect to be innovative today and tomorrow

The professors go on to point out that their method of determining the innovation premium contrasts with conventional reports that draw on surveys of corporate managers asking them to name the companies they consider to be the most innovative. The rating method adopted by the professors relies on investors who buy and sell stocks to identify those companies they expect to be innovative today and tomorrow. Within that context, it was interesting to see that the oilfield service industry accounted for six of the top 100 companies.

Included in the group of leading innovative oilfield service companies are the two largest companies in the industry – Schlumberger and Halliburton – and two of the leading drilling equipment companies – FMC Technologies and Cameron International. The remaining two companies among this cadre were foreign companies – China Oilfield Services and Tenaris SA. The first two companies are not

We suspect these latter two companies may be more beneficiaries of investment funds trying to participate in the China and European energy markets

surprising since they possess probably the broadest range of drilling and completion products and services and they are known for their R&D efforts to develop new oilfield products. The second pair of companies represents the preeminent developers of new drilling hardware for use both on- and offshore, but they are best known for their offshore equipment. The last companies on the list are somewhat surprising since Tenaris' tubular business is known more as a commodity business than for new technology. China Oilfield Services is also a surprising selection since it provides a range of services offshore China, but they are not particularly innovative. We suspect these latter two companies may be more beneficiaries of investment funds trying to participate in the China and European energy markets through these foreign-based companies than rewarding them for their innovative DNA.

Exhibit 18. Top Innovative Oilfield Service Companies

Company/Ticker	5-Year Avg.	5-year Avg.	Enterprise Value (\$bil)	Innovation	Rank
	Sales Growth (%)	Net Income Growth (%)		Premium (\$bil)	
FMC Technologies (FMC-N)	13.5%	31.7%	10.9	36.0	18
Schlumberger Ltd. (SLB-N)	11.8%	8.5%	126.7	32.7	27
China Oilfield Services (CHOLY.PK)	29.7%	38.1%	14.5	30.0	40
Cameron International (CAM-N)	17.6%	23.3%	12.0	18.1	85
Tenaris SA (TS-N)	1.4%	-3.7%	26.3	16.8	92
Halliburton (HAL-N)	10.3%	-7.3%	50.6	16.1	97

Source: *Forbes*; PPHB

It is possible to utilize the five key characteristics identified by the professors to look for future innovative winning companies

Since companies had to have a market capitalization of \$10 billion or greater to be included in the analysis, many of the more dynamic and innovative companies in the oilfield service industry were excluded because they were too small. Despite their exclusion, it is possible to utilize the five key characteristics identified by the professors to look for future innovative winning companies.

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