

## MUSINGS FROM THE OIL PATCH

September 28, 2010

Allen Brooks  
Managing Director

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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 oilfield service companies. The newsletter currently anticipates a semi-monthly publishing schedule, but periodically the event and news flow may dictate a more frequent schedule. As always, I welcome your comments and observations. Allen Brooks

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### Marcellus Shale: Good News Critique

**This deposit with its multiple shales is considered to be potentially the largest gas deposit in the United States**

**Pennsylvania has a long history of oil and gas having been the cradle of the U.S. oil business with the Drake well drilled in 1859**

In the last issue of the *Musings*, we wrote about good news and bad news for the development of the Marcellus gas shale deposit extending across New York, Pennsylvania, West Virginia and eastern Ohio. This deposit with its multiple shales is considered to be potentially the largest gas deposit in the United States. It's economics are challenging as the area is hilly, the road access is less than ideal, the land holdings are fractured and the public is not necessarily enamored with oil and gas drilling activities, especially hydraulic fracturing, which is key to the successful development of gas shale deposits. Low natural gas prices are potentially the biggest hurdle for Marcellus gas profitability.

Our article discussed the recently released 12-month natural gas production data for wells in the Pennsylvania portion of the Marcellus through June. The data showed average cumulative production for Marcellus horizontal wells in the 5-county core area of the North Central and Northeast part of Pennsylvania. The new data shows solid production results, and in fact, the average well's production slightly exceeded the expected production suggested by Chesapeake Energy (CHK-NYSE) in a 2008 investor presentation. That chart was presented to show the company's anticipated well economics for its foray into the region. Pennsylvania has a long history of oil and gas having been the cradle of the U.S. oil business with the Drake well drilled in 1859. Coal and oil and gas have a long history in the state and were key commodities that enabled the state to become a leader during the industrial revolution.

The better-than-expected gas shale production was the good news, the bad news was the Environmental Protection Agency's (EPA)

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**We pointed out that the professor compared the value of the gas production to the amount of investment gas producers made during the same 12-month period**

request for hydraulic fracturing data from nine oilfield service companies to support the Agency's investigation into whether the procedure should come under greater regulation. In the research for our article, we relied upon an article published in *The Scranton Times-Tribune* where the writer had interviewed Dr. Terry Engelder, professor of geosciences at Penn State University and a student of the Marcellus gas shale, about the significance of the production data. After commenting about how much better the production data was compared to Chesapeake's 2008 expectation, we pointed out that the professor compared the value of the gas production to the amount of investment gas producers made during the same 12-month period. Costs exceeded all gas revenues. We took the liberty to slide from this simple comparison of revenue to cost to point out that "It is these negative economics that are beginning to play havoc with the profitability of the E&P companies active in the gas shale formations."

**We want to make it clear that we fully understand the timing issue in determining the economics of oil and gas exploration and production efforts**

Our article was re-published by *RigZone.com* and it drew a response from Dr. Engelder pointing out the fact that well profitability is determined over an extended period of time and our broad-brush conclusion was inaccurate. *RigZone.com* wrote a follow-up article correcting our misstated conclusion. We want to make it clear that we fully understand the timing issue in determining the economics of oil and gas exploration and production efforts. Our point, which unfortunately is more complex and deserves greater explanation than our one-line observation, is that current low gas prices are nowhere near the prices producers had plugged into the economic models when beginning their leasing and drilling efforts in the region.

**A land rush of leasing has been underway which has created extraordinary pressure on the industry to drill the leases in order to hold the acreage by production**

For nearly two years, while natural gas prices were falling to below \$4 per thousand cubic feet (mcf) of production, but have recently rallied to slightly above that level, drilling and production in the Marcellus was ramping up. A land rush of leasing has been underway which has created extraordinary pressure on the industry to drill the leases in order to hold the acreage by production. Once wells are drilled and begin producing, the producer can choke back the rate of production or possibly suspend the well in response to the low gas price. As shown in a recent leasing report (although hard to read), in Tioga and Washington Counties in Pennsylvania, the most common lease bonus paid was \$2,000 per acre with royalty rates (at the wellhead price) ranging between 12.5% and 18.0% in Tioga County and 12.5% and 20.0% in Washington County. The lease terms were reported to be between three years on the low side and 10 years on the high. A large number of leases have been 3 + 2 (three years in length with an option for a two-year extension). Some producers have been trying to secure leases with 5 + 2 terms because of the long lead-times for drilling wells and getting them on production, especially in light of the pipeline bottlenecks for moving natural gas, and in some cases natural gas liquids, to market.

The Marcellus gas formation is an important new resource for this country. Dr. Engelder's estimate in 2009 was that the Marcellus formation contains 2,445 trillion cubic feet (Tcf) of gas in place and

**Exhibit 1. Recent Marcellus Shale Leasing Results**

U.S. LEASE PRICE REPORT March - April, 2010, Page 8. REGION #2 NORTHEAST cont'd.

State	County	Bonus in \$ per Acre			Royalty Range			Rental Range \$/acre/Yr.		Lease Term Years	
		Act	Low	High	Low%	High%	Low	High	Low	High	
PA	TIOGA	1000.00	2500.00	2000.00	12.50	16.00	PD-UP		3.00	10.00	
PA	VENANGO	5.00	50.00	25.00	12.50	12.50	1.00	5.00	1.00	10.00	
PA	WARREN	5.00	50.00	25.00	12.50	12.50	1.00	10.00	1.00	10.00	
PA	WASHINGTON	500.00	2000.00	2000.00	12.50	12.50	PD-UP		3.00	10.00	
PA	WAYNE	1.00	5.00	3.00	12.50	12.50	1.00	1.00	10.00	10.00	
PA	WESTMORELAND	500.00	2500.00	2000.00	12.50	20.00	PD-UP		3.00	10.00	
PA	WYOMING	250.00	2000.00	200.00	12.50	12.50	PD-UP		3.00	10.00	
VT	FRANKLIN	1.00	3.00	1.00	12.50	12.50	1.00	1.00	10.00	10.00	
VT	GRAND ISLE	1.00	3.00	1.00	12.50	12.50	1.00	1.00	10.00	10.00	
WV	BREWER	2.00	10.00	5.00	12.50	12.50	1.00	10.00	3.00	10.00	
WV	BERKELEY	1.00	1.00	1.00	12.50	12.50	1.00	1.00	10.00	10.00	
WV	BOONE	1.00	5.00	2.00	12.50	12.50	1.00	5.00	3.00	10.00	
WV	BRAKTON	3.00	10.00	5.00	12.50	12.50	3.00	10.00	1.00	5.00	
WV	BROCKTON	1.00	2.00	2.00	12.50	12.50	1.00	5.00	1.00	10.00	
WV	CABELL	2.00	5.00	5.00	12.50	12.50	3.00	7.00	2.00	5.00	
WV	CALHOUN	2.00	10.00	5.00	12.50	12.50	1.00	1.00	1.00	20.00	
WV	CLAY	4.00	7.00	5.00	12.50	12.50	2.00	11.00	1.00	10.00	
WV	DODDGE	25.00	250.00	50.00	12.50	12.50	1.00	5.00	1.00	10.00	
WV	FAHETTE	25.00	250.00	50.00	12.50	12.50	3.00	10.00	3.00	10.00	
WV	FAYETTE	2.00	5.00	5.00	12.50	12.50	1.00	5.00	1.00	10.00	
WV	GRANT	1.00	40.00	1.00	12.50	12.50	1.00	3.00	3.00	10.00	
WV	GREENBRIER	5.00	250.00	25.00	12.50	12.50	1.00	1.00	5.00	10.00	
WV	HAMPDEN	1.00	1.00	1.00	12.50	12.50	1.00	1.00	5.00	10.00	
WV	HANCOCK	10.00	50.00	25.00	12.50	12.50	1.00	2.00	5.00	10.00	
WV	HARDY	1.00	2.00	1.00	12.50	12.50	1.00	1.00	10.00	10.00	

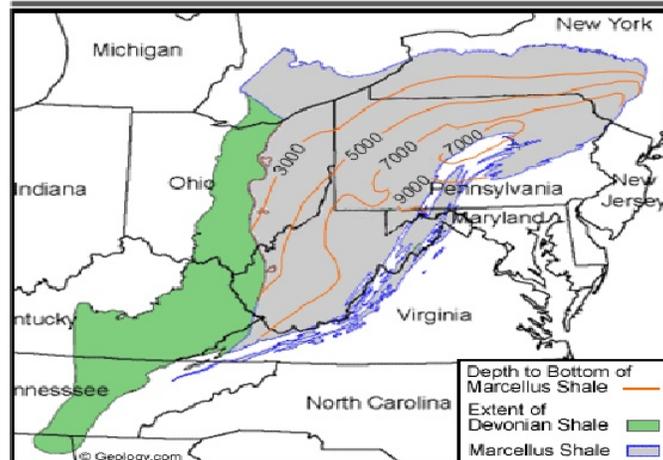
Source: AB Bernstein

about 489 Tcf can be recovered with today's technology. That recoverability estimate represents about 20% of the in-place gas, which is likely low given the industry's history of successful application of technology to gas shale production.

**The Marcellus tends to be located at depths between 5,000-feet and 8,000-feet, which translates into lower drilling costs for wells**

To put into perspective the significance of the Marcellus, it spans a total area of about 95,000 square miles compared to the Barnett, the most successful of the shale plays, with only 5,000 square miles. The Barnett, after 17 years of development, produced 4.8 trillion cubic feet of gas in 2009. An additional positive for the Marcellus formation is that the gas is found at shallower depths than many of the other shale formations being exploited in the country now. The Marcellus tends to be located at depths between 5,000-feet and 8,000-feet, which translates into lower drilling costs for wells and potentially cheaper hydraulic fracturing costs due to the need for less horsepower to break up the shale rock.

**Exhibit 2. Marcellus Formation Is Shallow And Less Costly**



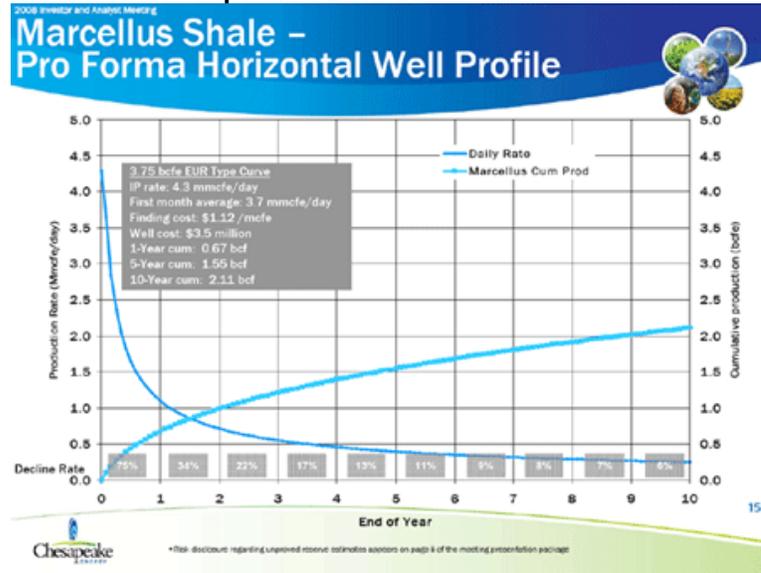
Source: NER

The challenge for Marcellus production (and many other gas shale basins) is the economics of drilling and completing wells. Compared to the anticipated well results presented by Chesapeake back in

**Whether the production data supports increases in the EUR reserves from a well is probably premature to assume**

2008, the gas production data provided by the Pennsylvania Department of Environmental Protection of daily production of about 1.95 million cubic feet per day (mmcf/d) or cumulative production of 0.71 billion cubic feet (Bcf) per well exceeds the Chesapeake target. Certainly the Pennsylvania data is good news. Whether the production data supports increases in the economically ultimately recoverable (EUR) reserves from a well is probably premature to assume. The shape of the well production decline has been a basis of disagreement among people involved in the industry. Is the decline curve parabolic or linear? Only the additional production history of these wells will clarify the decline curve shape.

**Exhibit 3. Chesapeake's 2008 View Of Marcellus Wells**



Source: Chesapeake Energy

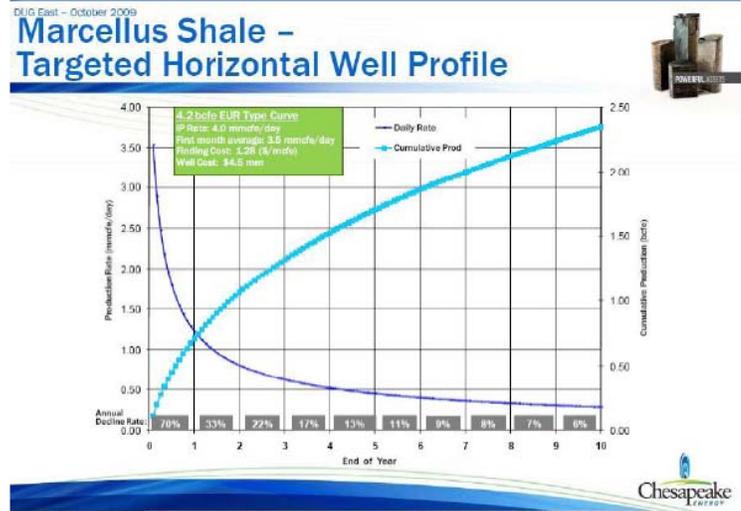
Above we have shown the 2008 chart that Chesapeake Energy presented to investors. As can be seen from the chart, Chesapeake anticipated cumulative production in the first year of 0.67 Bcf, so the current Pennsylvania production of 0.71 Bcf per well is certainly an over-achievement.

**In the 2009 chart, Chesapeake anticipated cumulative production of closer to 1.25 Bcf, which is more than 50% ahead of the actual Pennsylvania data**

We also found a chart from a 2009 presentation about the Marcellus that Chesapeake made to industry representatives and investors. In that chart, Chesapeake anticipated cumulative production of closer to 1.25 Bcf, which is more than 50% ahead of the actual Pennsylvania data and nearly twice what the company showed barely a year before. Possibly Chesapeake will say that this later year chart is based on “targeted” wells, so they may be focusing on the sweet spots in the Marcellus formation.

More interesting, however, is to compare some of the data parameters associated with the two charts. In 2008, the targeted EUR was 3.75 Bcf compared to the later estimate of 4.2 Bcf. The initial production of 4.3 per mmcf/d compares to the later year’s 4.0

**Exhibit 4. Chesapeake's 2009 Marcellus Well Expectation**

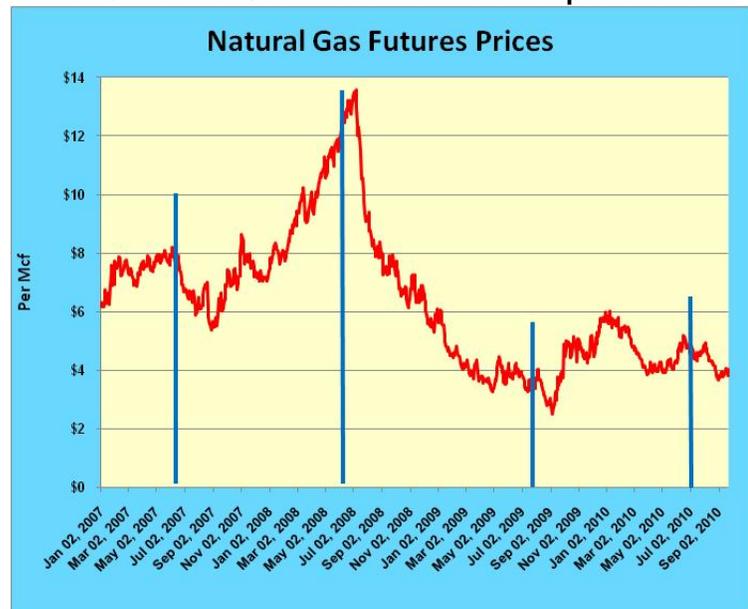


Source: Chesapeake Energy

**Despite the better EUR and 10-year cumulative production estimate, the finding cost estimate went from \$1.12 per mcf/d to \$1.28 in 2009**

mmcf/d estimate. The lower initial production rate in 2009 is associated with a greater 10-year cumulative production estimate (2.35 Bcf) versus the 2008 estimate (2.11 Bcf). Despite the better EUR and 10-year cumulative production estimate, the finding cost estimate went from \$1.12 per mcf/d to \$1.28 in 2009. That increase is probably a reflection of rising costs of doing business, one of which is drilling and completion costs. As a result of oilfield inflation, the cost estimate for the 2008 well of \$3.5 million increased to \$4.5 million in 2009.

**Exhibit 5. Natural Gas Prices Well Below Expectations**



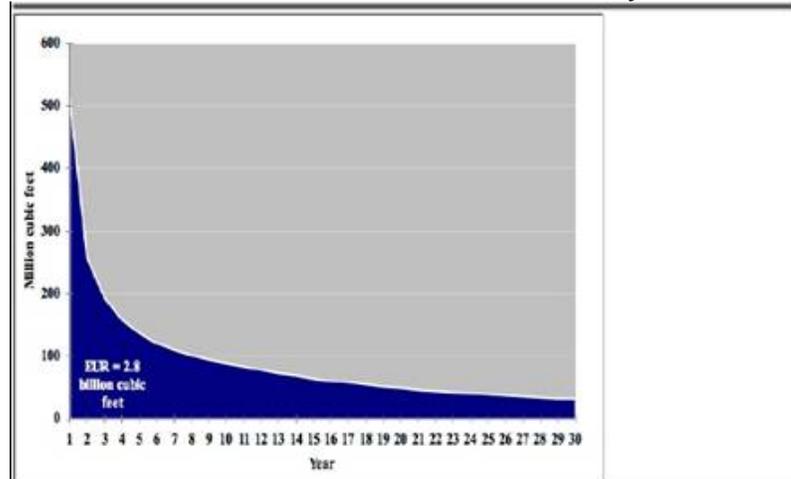
Source: EIA, PPHB

**Current gas futures prices are barely over \$4 per mcf, which is a half or a third of the price when the Marcellus leasing rush was underway**

The other side of the economic equation is the price of natural gas. When companies were initially targeting the Marcellus, natural gas prices, as represented by the futures market, were in the \$8 per mcf in mid 2007 and over \$12 in mid 2008. By mid 2009, the futures price had fallen to under \$4 but rallied to nearly \$4.50 in mid 2010. Current gas futures prices are barely over \$4 per mcf, which is a half or a third of the price when the Marcellus leasing rush was underway.

A July report prepared by Dr. Timothy J. Considine of Natural Resource Economics, Inc. for the American Petroleum Institute entitled "The Economic Impacts of the Marcellus Shale: Implications for New York, Pennsylvania and West Virginia" sets forth an analysis based on a slightly different set of well-production assumptions. The study presented its well decline curve and production assumptions, which we have shown below.

#### Exhibit 6. Marcellus Well Decline Curve For Study



Source: NRE

**“Most companies are finding their production decline curve models fit early actual production from Marcellus wells reasonably well”**

The report stated the following: “Industry experience using modern technology for shale gas production in the Barnett now extends 17 years. Companies have estimated production decline curves from actual well experience. While translating experience from one shale play to another may not be entirely accurate, most companies are finding their production decline curve models fit early actual production from Marcellus wells reasonably well. In any play, there is a great deal of variation in the rates of initial production and the rates of decline.”

The report went on to say: “This [decline] curve is on the low end of publicly available decline curve information released by five major Marcellus Shale operators during the second half of 2009. The estimated production over the first 30 years is 2.8 billion cubic feet, after 50 years the yield is 3.5 Bcf. With this decline curve, average annual production from a Marcellus horizontal well is over 500 million cubic feet (mmcf) during the first year and about 250 mmcf

during the second. After 8 years annual production is about 100 mmcf, and roughly 30 mmcf per year after 30 years of production. Vertical wells have similarly shaped decline curve but substantially lower output. This study assumes that annual production from a vertical Marcellus well is slightly less than 30 percent of the output from a horizontal well.” What was not commented on was the impact of the discounted value of production beyond 10 years which has little value on the economics of wells.

**In 2008 total industry spending in Pennsylvania was \$3.2 billion that increased to \$4.5 billion in 2009**

As can be seen, the assumed production profile used in the study is considerably below the assumptions used by Chesapeake and is lower than the recently released production data for Pennsylvania Marcellus wells. What can we conclude about the economics of the wells? What we have seen, based on data collected by National Resource Economics, Inc. (NRE), is that in 2008 total spending in Pennsylvania was \$3.2 billion and increased to \$4.5 billion in 2009. This compares with the \$720 million of revenue from gas production. Within that spending total, lease expenditures actually declined to \$1.7 billion in 2009 from \$1.8 billion the prior year. Drilling and completion expenditures nearly doubled in 2009 to \$1.7 billion, up from barely \$0.9 billion spent in 2008. Pipeline and processing investments increased significantly from \$0.3 billion in 2008 to \$0.7 billion in 2009, and are likely to go higher in the next few years as NGL processing and pipelines and new gas pipelines are built.

An interesting aspect of the spending data is that Pennsylvania expenditures are climbing while those in West Virginia are declining. The author believes this spending disparity may reflect the absence of a severance tax in Pennsylvania, but one cannot rule out the impact of low gas prices and higher liquids content in Pennsylvania wells making their economics more attractive. Pennsylvania is working to put a severance tax in place by October 1.

**Discounted cash flow analyses of individual Marcellus wells suggest strong rates of return given drilling and gathering costs and, of course, market price**

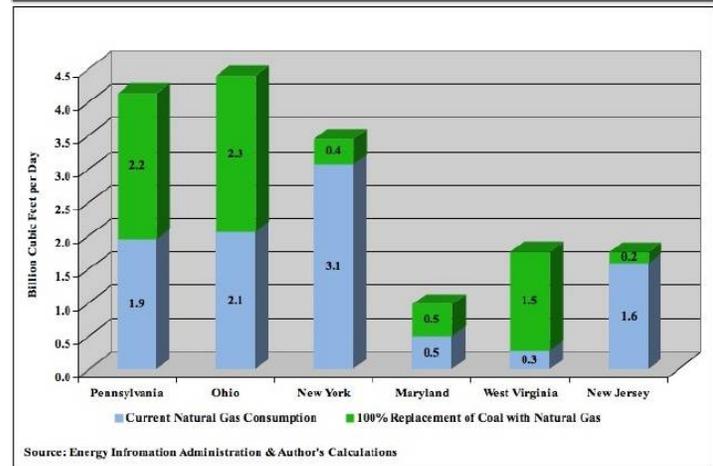
Dr. Considine’s report addressed the profitability of Marcellus gas production activity. “It is very difficult to empirically estimate average and marginal extraction costs for the Marcellus industry when the companies have negative cash flow during the early phase of development as wells gradually get connected to pipeline systems and produce marketable gas. Nevertheless, discounted cash flow analyses of individual Marcellus wells suggest strong rates of return given drilling and gathering costs and, of course, market price, which is a key factor affecting the development of the Marcellus. Since natural gas prices are volatile, gas drillers may lock in a price with a futures contract.” We didn’t see any mention of leasing and overhead costs in the economic analysis statement.

Because of the potentially large Marcellus gas shale resource certain factors offer potentially significant economic advantages relative to other supply sources. For example, the reserves have an important location advantage in providing access to a large natural gas consuming market that could grow significantly depending upon government environmental actions in the future. Pennsylvania and its five bordering states currently consume 9.5 Bcf/d of natural gas.

**There is the potential for a 16 Bcf/d gas consuming market within 200 miles of Marcellus production**

These states also have a large number of coal-fired electric power plants. If all the coal-fired generating capacity were replaced with natural gas-fired capacity, daily consumption would grow by 7 Bcf/d. Thus, there is the potential for a 16 Bcf/d gas consuming market within 200 miles of Marcellus production.

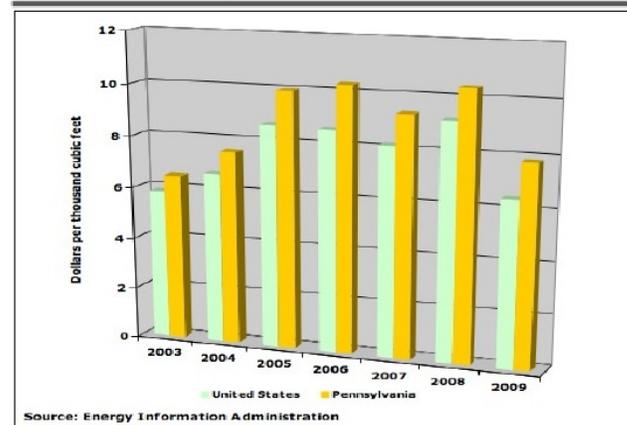
**Exhibit 7. Large And Growing Market For Marcellus Gas**



Source: NRE

The proximity to a large gas consuming market also translates into better gas prices. The distance the gas needs to be transported is considerably less than competing supplies from the Gulf Coast or Southwest, let alone gas from the Rocky Mountains. Over 2002-2009, Pennsylvania city gate prices have averaged 14.5% more than the national average.

**Exhibit 8. PA City Gate Gas Prices At Premium**



Source: NRE

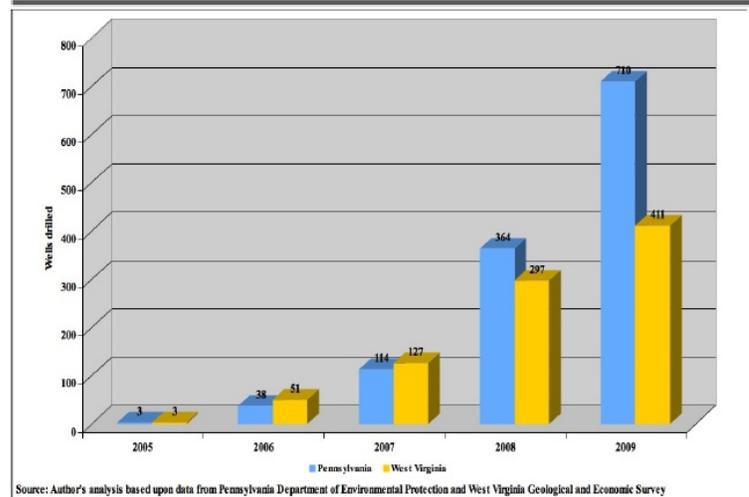
An additional aspect of Marcellus natural gas pricing is its liquid content. Natural gas liquids (NGLs) are priced at a discount to crude oil, but given oil's high price, presently, the value of the gas stream is boosted improving production economics significantly. On the flip

**There needs to be investments in these facilities and the timing could impact future production**

side, these liquids require processing facilities and separate pipelines to reach markets. There needs to be investments in these facilities and the timing could impact future production. Likewise, as we add this stream of NGLs into the national market, there are questions about what might happen to the pricing of certain liquids and whether it might erode Marcellus gas producer economics.

Given the long-term attractiveness of the Marcellus formation, Dr. Considine's study projected the amount of drilling and production that might occur in this region. The study begins with the recognition of the activity that has recently occurred. The following series of exhibits show the trend in wells drilled in Pennsylvania and West Virginia over the 2005-2009 period and the growth in natural gas production. All the trends are positive.

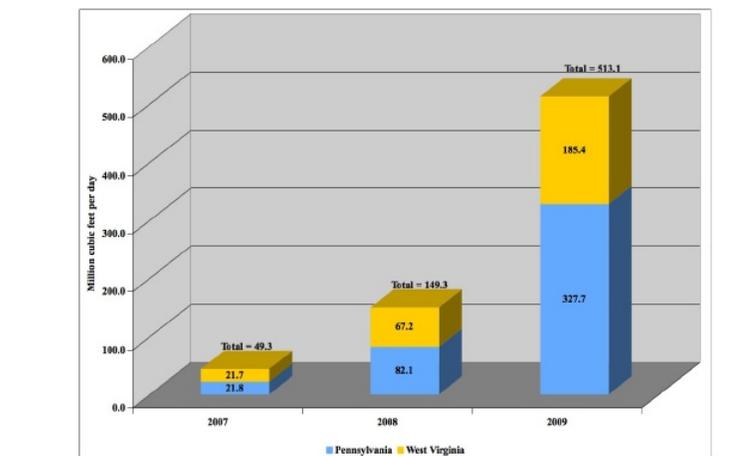
**Exhibit 9. Drilling In Marcellus On Sharp Ramp Up**



Source: Author's analysis based upon data from Pennsylvania Department of Environmental Protection and West Virginia Geological and Economic Survey

Source: NRE

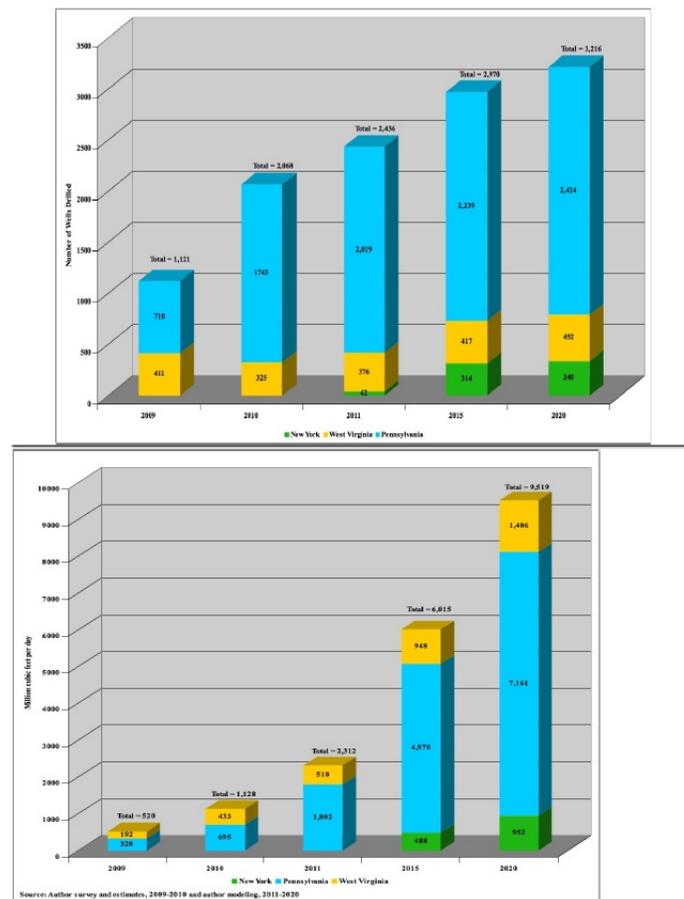
**Exhibit 10. Marcellus Gas Production Climbing**



Source: NRE

Employing the well production profile outlined above, the professor produced a forecast for 2010-2020 for drilling and gas production in the Marcellus formation. In the study, he also prepared an analysis of the potential for activity in New York State that currently has significant restrictions on activity until studies are completed on the risks from hydraulic fracturing activity. The forecast for wells drilled and daily gas production are contained in the exhibit below.

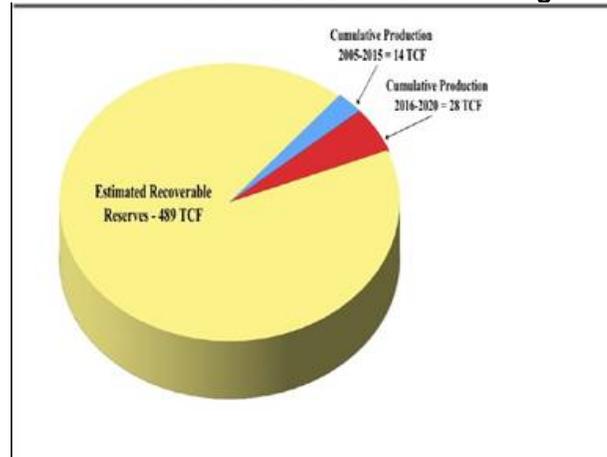
**Exhibit 11. Forecasted Wells And Gas Production Higher**



Source: NRE

**Marcellus wells drilled grow from 1,121 wells in only two states in 2009 to 3,216 wells in three states by 2020**

The study sees total Marcellus wells drilled growing from 1,121 wells in only two states in 2009 to 3,216 wells in three states by 2020. New York drilling is estimated to account for roughly 10.5% of wells drilled in 2015 and 2020. The gas production ramp up is much steeper as it is forecast to climb from 520 mmcf/d to 9,519 mmcf/d in 2020. By 2020, New York gas production is estimated to account for about 10% of the total for the region. The forecast suggests an attractive long-term outlook for the Marcellus. Given the resource potential, it is an attractive prospective resource.

**Exhibit 12. Marcellus Gas Is Potential Large Resource**

Source: NRE

**For those who have been around the energy investment business for a long time, we have seen highly touted exploration plays destroyed by poor economics in the past**

Should we be concerned about the economics of the Marcellus gas shale given its long-term outlook? For those who have been around the energy investment business for a long time, we have seen highly touted exploration plays destroyed by poor economics in the past. These plays such as the Deep Anadarko, the Austin Chalk and Bright Spots all ran into similar problems – optimistic production assumptions, expectations of higher oil and gas prices, well-managed drilling and producing costs and unlimited capital. If anyone of these assumptions proves wrong, even for only a few years, the economics underlying the projects can be destroyed.

The gas shale plays in this country have prompted leasing rushes with accompanying drilling booms. That phenomenon has driven not only the domestic gas rig count higher than expected in light of low gas prices, but it has produced an increase in gas production. Without a commensurate growth in natural gas consumption, ignoring the volatile temperature related demand, storage inventories continue to grow putting further downward pressure on gas prices. These conditions have forced gas shale producers to resort to extreme measures such as borrowing substantial sums, selling non-shale assets (suddenly considered to be non-core), forming joint ventures with well-capitalized companies seeking representation in the gas shale plays and who generally have different investment rate of return criteria, and even selling parts of their plays. We even see that a handful of gas shale producers are for sale.

**These critics recognize that many producers, especially the publicly-traded companies, are being pressured to engage in group-think by institutional investors**

Are Marcellus gas producers all lemmings looking for a cliff? A number of people are beginning to seriously question the gas shale phenomenon given the continuing, and projected to continue, low gas price outlook. These critics recognize that many producers, especially the publicly-traded companies, are being pressured to engage in group-think by institutional investors. In fact, several friends have compiled a list of reasons why this group-think exists and we list them below. The authors of the list suggest it does not

include all rationales and welcome any additions.

1. Bravely defend the leases
2. Add reserves
3. Grow production and be a good employee
4. Grow production to prolong the illusion that this is profitable
5. Grow your bonus and the value of your stock options
6. They made me do it (the investment bankers)
7. An investment in the future when gas prices are higher
8. Technology will save the day
9. Optionality
10. The land is the play
11. Greater fool theory: live another day to flip the company
12. Cash flow to pay debt service
13. Playing God: I think I'm flying
14. I can't admit that I was wrong
15. No better ideas
16. Charles Prince at the Dance
17. Market share
18. Relatively low rate of dry holes (makes field operators look good)
19. Fear of litigation when the whole game ends
20. Continued access to capital
21. Peer pressure
22. Vast number of enablers (bankers, analysts, accountants, service companies, etc.). This is similar to "they made me do it", but different in my mind
23. They have not yet run out of scenes for the moving circus (still more shales to declare "great")
24. Government encouragement (allowance); seem as source of tax revenue, jobs
25. "I am an E&P company"; what else would you expect?"

**If gas prices stay at current levels, a fraction of the levels that existed when gas shale investments were accelerating, something has to give**

Maybe the gas shale phenomenon will "muddle through" as we seem to be doing with our economy. Unfortunately, the oil and gas business has a record of booms and busts – not always driven by poor investment decisions as economic downturns have often undercut demand just when long-lead-time supplies arrive at the market destroying prices and producer economics. The troubling longer term economic outlook doesn't hold how much hope for any sharp or near-term recovery in natural gas prices. We go back to the chart on natural gas prices and focus on the level of pricing when the gas shale phenomenon got underway. If gas prices stay at current levels, a fraction of the levels that existed when gas shale investments were accelerating, something has to give. Will technology bail out poor economics? Will gas shale producers become fodder for the largest oil and gas companies in the industry? Maybe producers will finally decide to stop drilling. We could easily spend many days spelling out various scenarios of how the gas shale phenomenon ends – many of them bad but some of them good! As an investment analyst and trained to be critical, we can only offer words of caution at the present time.

## Climate Change Battle Being Waged Over Sunspots

**The French Academy of Sciences finally produced a statement following a full day of debate on climate change**

Last Tuesday, the French Academy of Sciences finally produced a statement following a full day of debate on climate change held the prior day that had been shrouded in secrecy. The debate was ordered by Education and Research Minister Valérie Pécresse in April after more than 600 scientists signed a petition alleging that they had been denigrated by former research minister Claude Allègre in his book, *L'imposure climatique* (The Climate Fraud), and asked her to disavow it.

On the weekend prior to the debate, the French newspaper, *Le Monde*, in a front page editorial lambasted the total blackout on the debate, the identity of the participants and their submissions. The paper asked, "What is it (that the Academy is) afraid of." The paper went on to say that the information blackout "arouses suspicion."

**The climate models used by the Intergovernmental Panel on Climate Change (IPCC) ignore the impact of clouds, largely because they cannot model cloud activity**

It has finally come out that there were 93 Academy members in attendance, including Allègre, and 24 outsiders. According to the Academy's statement, participants in the debate concluded that links between solar radiation variations and the earth's orbit are not contested – but they said that the jury is still out on the importance of the impact of solar activity cycles. The participants also agreed that there was a consensus on the direct impact of carbon dioxide and other greenhouse gases produced by human activity, but that their indirect effects are still controversial. They also agreed that one of the ways towards better understanding of climate patterns is the physiochemistry of clouds. As we know, the climate models used by the Intergovernmental Panel on Climate Change (IPCC) ignore the impact of clouds, largely because they cannot model cloud activity. Many climate warming critics point to clouds as playing a significant role in the globe's climate feedback mechanism and that they may mitigate most of the concerns about rising temperatures.

*Le Monde* argued that the need to publicize the details of this debate was the result of Climategate and the pirated emails and errors in the IPCC report. The paper argued that since the supporters of global warming were subjected to investigations (although some would question the rigor of those inquiries) the critics of the conventional view should equally be challenged.

**"the occurrence of prolonged periods with no sunspots is important to climate studies, since the Maunder Minimum was shown to correspond with the reduced average global temperatures on the Earth"**

Adding to the debate are the conclusions from a new paper authored by two scientists at the National Solar Observatory in Tucson, Arizona. The two scientists, William Livingston and Matthew Penn, published a paper two years ago saying that "the occurrence of prolonged periods with no sunspots is important to climate studies, since the Maunder Minimum was shown to correspond with the reduced average global temperatures on the Earth." The Maunder Minimum lasted approximately 70 years, from about 1645 to 1715, and was marked by bitter cold, widespread crop failures and severe human privation.

**They believe Cycle 24 could have half the number of sunspots as the recently completed Cycle 23, and there could be “virtually no sunspots in Cycle 25.”**

**Virtually no research has investigated the consequences of the potential that global temperatures might fall**

The authors had ended their 2008 paper by remarking that observations of periods of no sunspot activity during the onset of the next sunspot cycle will be critical for determining whether these trends continue. We are now in the onset of that next sunspot cycle, called Cycle 24. Sunspot cycles typically last 11 years. The two scientists state in their new paper that “we are now seeing far fewer sunspots than we saw in the preceding cycle. Solar Cycle 24 is producing an anomalously low number of dark spots and pores,” they report.

In the new paper, Long-term Evolution of Sunspot Magnetic Fields, the authors say that their conclusions could have dramatic implications for climate. They believe Cycle 24 could have half the number of sunspots as the recently completed Cycle 23, and there could be “virtually no sunspots in Cycle 25.” They admit that their study is based on the assumption that trends will continue that could be proven false. However, the implications of their conclusions is that the world could be headed toward another little ice age and thus the reason they published their study’s conclusions as a warning to society at large.

Certainly this new study adds to the ammunition of the climate warming skeptics, and especially the French Academy members who believe in the significant role sunspots play in determining our climate. Over the past 20 years, some \$80 billion has been spent by governments on research dominated by the assumption that global temperatures will rise. Virtually no research has investigated the consequences of the potential that global temperatures might fall. Investigating that possibility and its implications for the future is warranted.

## **Global Warming Dead; Now It’s Global Climate Disruption**

**Dr. Holdren made the claim that the term global warming is a “misnomer” because it is too simple and fails to grasp the enormity of the global climate challenge**

Barely two weeks ago, the White House Advisor to President Obama for Science and Technology, John P. Holdren, spoke at a conference in Oslo, Norway and promoted the case for global warming. It is interesting that he was out there trying to make the case for why governments and their citizens need to act to control carbon emissions as the Obama administration failed to fight for the cap-and-trade bill passed by the House of Representatives designed to do just that. In his presentation, Dr. Holdren made the claim that the term global warming is a “misnomer” because it is too simple and fails to grasp the enormity of the global climate challenge. Instead, Dr. Holdren believes the phrase “global climate disruption” is a much more descriptive term of the phenomenon underway.

This administration has a habit of changing the terminology of topics and issues they can’t, or won’t, deal with as a way of diverting attention from their failures. Most recently, following the shooting of individuals on a military base by an Army officer, the government began referring to “terrorism” as “man-caused disaster.” Before that the Obama administration created a firestorm by rebranding the “war

**Many countries that were leading the charge on carbon emissions regulations are backing away from their commitments due to the cost of the efforts and their sagging economies**

on terror,” adopted shortly after the September 11<sup>th</sup> attacks on this country, as “overseas contingency operations.” Interestingly, most of the public had missed the change in designation of the war on terror by the Bush administration in 2005 to “global struggle against violent extremism.” Maybe the public missed that shift because we do not remember President Bush ever using that official name when talking about the issue.

So, after Climategate, which exposed the lack of intellectual honesty on the part of a number of leading climate change promoters, and the recent admonition of the chairman of the Intergovernmental Panel on Climate Change (IPCC) and its report by the UN’s Inter-Academy Council for failure to support many of its conclusions, we now see that the Obama administration wants to change the climate debate terminology. This probably signals an attempt to restart the debate over environmental regulation after the failure of the cap and trade legislation to be embraced by Congress and the sinking support for the Copenhagen climate agreement. In fact, many countries that were leading the charge on carbon emissions regulations are backing away from their commitments due to the cost of the efforts and their sagging economies.

The justification for the change in global warming terminology was laid out by Dr. Holdren in an earlier speech at the John F. Kennedy, Jr. Forum at the Kennedy School last November. In that speech he said: “Global warming is a misnomer.” He went on to explain that “It implies something gradual, uniform, and benign. What we’re experiencing is none of these.” In two slides in his latest presentation, Dr. Holdren sets forth his rationale for the new terminology.

#### **Exhibit 13. Why We Need To Change Terms**

##### **“Global warming” is a (dangerous) misnomer**

That term implies something...

- uniform across the planet,
- mainly about temperature,
- gradual,
- quite possibly benign.

What’s actually happening is...

- highly nonuniform,
- not just about temperature,
- rapid compared to capacities for adjustment
- harmful for most places and times

**We should call it “global climate disruption”.**

Source: White House web site

**“So, in answer to the question, the warming rates for all 4 periods[1860-1880; 1910-1940; 1975-1998; and 1975-2009] are similar and not statistically significantly different from each other”**

**He argues that the phenomenon is really rapid compared to capacities for adjustment, but without a stated time period, it is impossible to disprove that statement**

In the first slide, Dr. Holdren sets forth a “straw man” description of global warming so he can try to show its shortcomings and the need for a more descriptive term. This is a favorite debating strategy of President Obama and his administration. In this case, he argues that global warming is not uniform. I guess that’s because we have seasons in the two hemispheres and weather patterns vary daily by region. The fact that the problem, as he sees it, is not just about temperature is an acknowledgment that global warming supporters, especially Dr. Michael Mann of Penn State University, couldn’t back up the “hockey stick” global temperature chart. In fact, Dr. Phil Jones, the director of the Climatic Research Unit (CRU) at the University of East Anglia in the UK, the center of the Climategate email scandal last year, said in response to a question from the British Broadcasting Company’s (BBC) environment analyst, “So, in answer to the question, the warming rates for all 4 periods[1860-1880; 1910-1940; 1975-1998; and 1975-2009] are similar and not statistically significantly different from each other.” When asked later whether from 1995 to the present there had been no statistically-significant global warming, he answered “Yes, but only just so.”

Dr. Holdren also is concerned that global warming is thought to be gradual and possibly benign. He argues that the phenomenon is really rapid compared to capacities for adjustment, but without a stated time period, it is impossible to disprove that statement. My yard floods when we get heavy thunderstorms in Houston. Of course, it all drains away given time. If we are dealing with floods that is one thing, but if we are dealing with the level of the oceans rising by 20 centimeters (7.8 inches) over the balance of this century, there is plenty of time to adapt. There are certainly solid grounds to debate how much future development should be allowed on our coasts, but that can be addressed through the cost of insurance and local land use and building codes.

#### **Exhibit 14. Really, It Isn’t About Temperatures?**

##### **Why average temperature isn’t the whole story**

Climate = weather patterns, meaning averages, extremes, timing, spatial distribution of...

- hot & cold
- cloudy & clear
- humid & dry
- drizzles & downpours
- snowfall, snowpack, & snowmelt
- breezes, blizzards, tornadoes, & typhoons

Climate change means disruption of the patterns.

Global average temperature is just an index of the state of the global climate as expressed in these patterns. Small changes in the index → big changes in the patterns.

Source: White House web site

**Who determines which of these climate patterns is acceptable and which ones are not?**

**It seems that global warming supporters only want to emphasize the hot weather and not the cold winters**

When Dr. Holdren goes on to explain why the average temperature isn't the whole story, he essentially describes weather. According to him, climate change means disruption of the patterns, but isn't that happening all the time? Who determines which of these climate patterns is acceptable and which ones are not? If it is hot and dry, I might welcome a downpour as long as it doesn't last for 30 days.

After years of global warming supporters admonishing people not to confuse weather with global climate trends, it seems like Dr. Holdren now wants us to accept any change in weather to be climate change. Trying to understand the impact of weather patterns on climate change is difficult. It seems that global warming supporters only want to emphasize the hot weather and not the cold winters, especially this year in the eastern half of the United States. Yes, the eastern U.S. had record heat this summer, but the region also had significant cold weather and snow last winter. Additionally, this summer, as the East Coast was experiencing hot temperatures, California and the rest of the West Coast had one of its coldest summers in decades.

#### **Exhibit 15. Obama's Climate Change Legion**

##### **Some key climate-related appointments**

- DOE: Secretary Chu
- Interior: Secretary Salazar
- NOAA: Administrator Lubchenco
- EPA: Administrator Jackson
- USGS: Director McNutt
- USAID: Administrator Shah
- CEQ: Chair Sutley
- OECC: Director Browner
- OSTP: Director Holdren
- PCAST: Drs Bierbaum, Molina, Moniz, Schrag

Source: White House web site

**What this lineup demonstrates is that the Obama administration can move forward with many of its climate initiatives without having to get them approved by elected officials**

Dr. Holdren talked about the Obama administration's commitment to implementing climate change policies. He followed with a slide showing the leading administration players in this arena. As the slide shows, of the 13 climate-related officials, less than half had to be approved by the Congress. What this lineup demonstrates is that the Obama administration can move forward with many of its climate initiatives without having to get them approved by elected officials. The power to control industries and citizen actions by regulatory fiat can be a more effective way of changing behavior and achieving desired objectives because the only recourse is the courts and that is a long and slow process.

**Exhibit 16. Why We Need To Regulate Energy****The essence of the challenge**

- Without energy there is no economy
- Without climate there is no environment
- Without economy and environment there is no material well-being, no civil society, no personal or national security

The problem is that the world is getting most of the energy its economies need in ways that are wrecking the climate its environment needs.

Source: White House web site

**The energy business is in the crosshairs of the Obama administration**

The energy business is in the crosshairs of the Obama administration. Rallying the world to enact legislation and policies to manage global climate disruption is a crucial step in seizing control over the energy industry. Climate is merely a side show. If it weren't, we wouldn't need to change the terminology to reposition the debate. Now, weather is a reflection of global climate disruption problems. That means that every day we will be berated with the problems caused by global warming and the need to act to make our weather perfect. Gee, does that mean like Hawaii's?

**Isn't weather all about change?**

What we've always known about the weather was best summed up by comedian Will Rodgers. "If you don't like the weather in Oklahoma, wait a minute and it'll change." Isn't weather all about change? Doesn't change equal disruption of climate patterns? Does adopting global climate disruption mean we should accept the weather? I guess I'm confused, but that's probably what the White House wants by changing the global warming terminology. While I'm trying to figure out the weather issue, I won't be focused on the Obama administration's actions to control the energy business.

**Obese Americans Challenge Vehicle Fuel Savings Needs**

**Between 2007 and 2009, the number of obese Americans increased by 1.1%, or 2.4 million people**

First Lady Michelle Obama has made childhood obesity her key policy issue. As a result of the recent media attention to America's obesity problem, a number of past studies on the impact of passenger weight gain on gasoline consumption have been revived. In August, the government's Center for Disease Control and Prevention unveiled a report on U.S. obesity showing that between 2007 and 2009, the number of obese Americans increased by 1.1%, or 2.4 million people. The Center reported that the number of states with more than 30% of its residents classified as obese increased threefold to nine states. In 2000 there were no states with this designation.

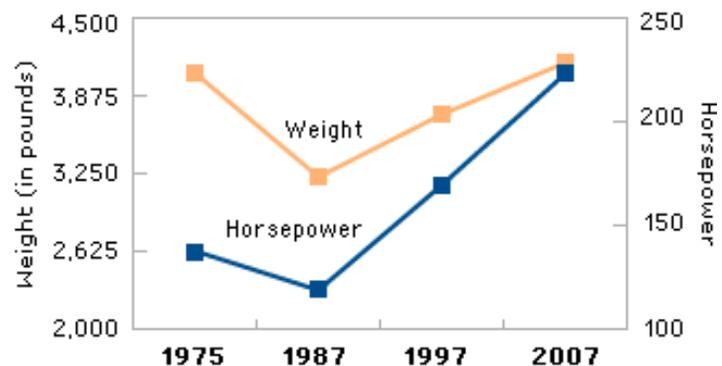
**The average weight of men and women rose by 25 pounds over the period since 1960**

**Another study in 2009 showed that over 1999-2005 there was a 10% increase in overweight and obese drivers that reduced fuel economy of new vehicles by 2.5%**

An earlier study of the American population showed that over 1987-2003 the obesity rate of U.S. adults rose from 15% to 30%. The average weight of men and women rose by 25 pounds over the period since 1960. The average weight of a man had risen to 191 pounds while that of a woman was up to 164 pounds. These trends carry a negative implication for the United States' effort to reduce its fuel consumption as larger Americans are inclined to buy larger, less fuel-efficient vehicles and the amount of fuel used increases as more weight is hauled around.

According to a 2006 study reported by *Entrepreneur.com*, the additional weight from the rising obesity trend has contributed to about one billion additional gallons of gasoline consumed over the period 1960-2002 due to increased passenger weight in non-commercial vehicles. This annual fuel increase is small, only 0.7% of total fuel used, but it is a trend that continues to grow. Another study conducted by Resources for the Future in 2009 showed that over 1999-2005 there was a 10% increase in overweight and obese drivers that reduced fuel economy of new vehicles by 2.5% as the percentage of vans, SUVs and pickup trucks increased. These vehicles increased their share of the total new vehicle sales mix from 15% in the early 1970s to more than 40% in 2005. Of course there were other factors contributing to the growth of this segment of vehicles and that trend has been reversed in recent years.

#### Exhibit 17. Technology Key To Meeting CAFE Rules Characteristics of Light Duty Vehicles by Model Year



Source: *WardsAuto.com*

**Obese riders seem to use seatbelts less because they do not fit as well and are uncomfortable**

There is another vehicle aspect of obese drivers and passengers and that is their role in crashes. Because of their size, obese riders seem to use seatbelts less because they do not fit as well and are uncomfortable. Additionally, air bags are not designed to protect passengers who are outside of a rather narrow body mass index (BMI) range. While these issues do not impact vehicle fuel consumption, they carry a societal cost of greater injury and increased deaths due to the lack of seatbelt use and a mismatch with other safety features.

**If cars didn't crash, how would you design a car?**

In examining this topic we came across an interesting interview with Lawrence Burns, the former head of General Motors' research and development department. Since his retirement from GM, he has focused on the future of automobiles for cities where 50% of the world's population lives today and an increasing percentage will live in the future. In the interview he said that in 2003, he asked GM's research engineers: If cars didn't crash, how would you design a car? No one knew how to do it. He said, they all responded, "Oh my gosh, we haven't thought about that." As Mr. Burns put it, it changes a lot of things about how you would design a car.

**By making cars that don't crash, you can take vehicle mass from 3,000 to 4,000 pounds down to below 1,000 pounds**

The two biggest changes are the size, or mass, of the vehicle, and the way it's controlled or driven. As he pointed out, much of the mass built into modern vehicles is to protect the passenger in the rare situation of crashes at pretty high speeds and to enable the car to go fast. Looking at the trend in where the world's population is living and how the average speed of vehicles in cities is much lower, you can begin to make significant changes in the design of urban vehicles. By making cars that don't crash, you can take vehicle mass from 3,000 to 4,000 pounds down to below 1,000 pounds he said. Also, if the average speed is 20 miles per hour (mph), you can design urban vehicles with top speeds of 35 mph. At that point, according to Mr. Burns, you can start looking at how many parts and mass can be removed. You then find that less mass requires even less mass and you begin chasing it down. Auto designers can begin to think about the minimum machine that can meet the requirements of moving around and interacting in cities in a better way than we have today.

Some of the thinking that comes from this revelation is already appearing in our new vehicles. As Mr. Burns pointed out, with vehicles being equipped with sophisticated GPS systems, vehicles can begin to determine their proximity to each other within about three feet of distance. (We already see this in warning systems for parking, etc.) With the knowledge of proximity, and if you share the data from the vehicle's stability control system, you can predict where each car will be within the next 20 milliseconds. Once you do that, you can program the cars' systems to prevent them from running into each other. Mr. Burns and his team's vision is incorporated in GM's Xiao EN-V concept car (see exhibit below) shown recently at the 2010 World's Fair held in Shanghai, China.

**The country's future will likely be characterized by fewer total vehicles, a growing proportion with alternate power trains, and some with radically different styles**

America's focus on reducing the population's obesity trend and the application of technology and radical thinking to design new urban vehicles are trends that may impact this country's fuel consumption. While not the most economical solution, electric vehicles will become a part of that mix. In any case, the country's future will likely be characterized by fewer total vehicles, a growing proportion with alternate power trains, and some with radically different styles. Vehicle fuel consumption is headed down not up in this country. The big questions are how many of the above cited trends will spread globally and how might they impact gasoline and diesel fuel consumption trends?

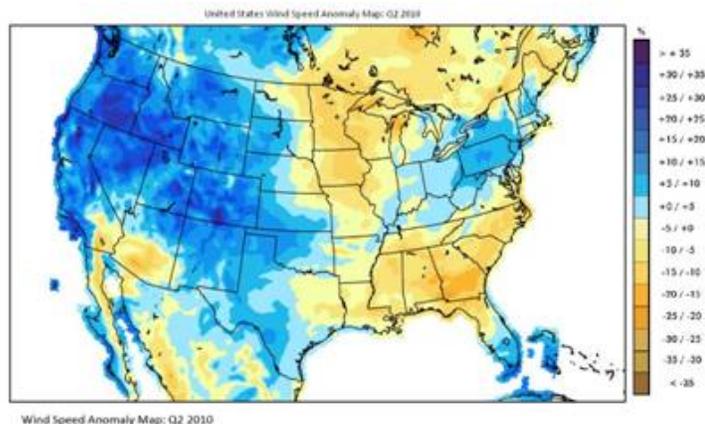
**Exhibit 18. GM's Vision Of The Urban, Anti-Crash Car**

Source: General Motors

**US and Europe Hit By Low-Wind – Challenge For Wind Power**

**Because of this counter-demand pattern for wind power, much has been made of the need for improving battery technology**

Wind is notorious for blowing at the wrong times for it to become a significant factor in meeting baseload power needs for generating electricity. It tends to blow strongest at night when electric demand is low. It also tends to blow more during the winter than in the heat of summer when electricity demand is high due to air conditioning needs. Because of this counter-demand pattern for wind power, much has been made of the need for improving battery technology to enable storing wind-generated electricity for use during high demand periods when the wind fails to blow.

**Exhibit 19. Second Quarter 2010 Shows Windier Conditions**

Source: AWS Truepower LLC

We are now learning that there are other considerations about wind – annual wind power trends. A recent press release reporting on the conclusions contained in AWS Truepower's *windTrends Bulletin* for the second quarter of 2010 called attention to the latest 12-month wind power being lower than normal both in the United States and

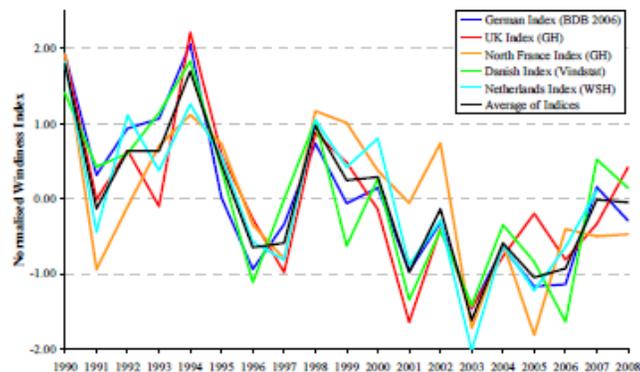
**The data showed that northern Europe had below-normal winds while southern Europe was windier**

**A 2009 study conducted by Gerrad Hassan and Partners Ltd. firm, shows that average wind speeds across the region have been declining since the early 1990s**

northern Europe. The report said that the second quarter wind power demonstrated generally windier conditions in the United States, but northern Europe experienced below-average winds. While these two regions experienced divergent trends, the net results for the 12-month periods ending with the second quarter were consistent. The data showed that northern Europe had below-normal winds while southern Europe was windier. In the United States, the windier second quarter failed to offset the low winds of the rest of the year, meaning that the full 12-month period experienced below-normal winds. This was in contrast to the prior 12-month period when 90% of the United States experienced at or above-average wind speeds.

Given the significant commitment to wind power being made both by the U.S. and the countries of northern Europe, finding out that wind may experience a cyclical pattern is disturbing. Many of the wind farms that have been or are being built, or those that are being planned, were based on historical wind data. A 2009 study conducted by three consultants of the Gerrad Hassan and Partners Ltd. firm, the largest renewable energy consulting company in Europe, shows that average wind speeds across the region have been declining since the early 1990s.

#### Exhibit 20. Less Wind In Europe In Past Decade



*Figure 1 – Windiness Indices in Northern Europe*

Source: Gerrad Hassan and Partners Ltd.

**All the indices support the observation that average wind speeds in northwest Europe were higher in the early 1990s than during the past five or ten years**

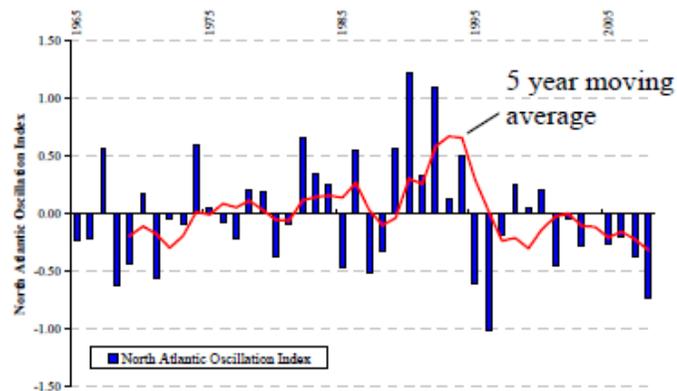
The study looked at wind power indexes for five northern European countries and the average of them. The authors normalized the indices by dividing the annual index anomalies by the standard deviation for the period 1990-2008. It is interesting that the five country wind indexes show a reasonable correlation. The average coefficient of determination,  $R^2$  value, is 0.65. All the indices support the observation that average wind speeds in northwest Europe were higher in the early 1990s than during the past five or ten years.

This performance raises a question of why average wind speeds in northern Europe are dropping. Is it due to a regional effect? Is that

**A positive NAO index is associated with windier, warmer and wetter winters in northern Europe**

regional effect due to global warming? That was a hypothesis that the study's authors decided to test. They realized that the amount of consistent and quality wind data is limited to the past 20 or 30 years at most. Therefore, the authors looked at numerous alternative wind measures with longer, and hopefully consistent, quality data. The study focused on one measure – the North Atlantic Oscillation (NAO) measure. The NAO measures the difference in normalized pressure between a weather station in the Azores Islands and one in Iceland. During the year, there are differences between the two pressure readings. The differences have a particularly dominant effect on the climate during winter months. A positive NAO index is associated with windier, warmer and wetter winters in northern Europe. Likewise, a negative NAO usually means a less windy, colder and drier winter.

#### Exhibit 21. NAO Shows Early 1990s Wind Anomaly



*Figure 2 – North Atlantic Oscillation Index*

Source: Gerrad Hassan and Partners Ltd.

**While wind power supporters harp on the clean energy aspect of their fuel, they conveniently ignore the intermittent nature of the energy source**

Looking at the 43-year history of the NAO and the 5-year moving average of the data, we see that the early 1990s demonstrated stronger wind conditions than either the years before or after. How many wind farms were postulated on wind data collected during the early 1990s? While wind power supporters harp on the clean energy aspect of their fuel, they conveniently ignore the intermittent nature of the energy source and maybe now the fact that in more normal wind periods the efficiency of wind turbines will not meet the historical estimates because they were based on an anomalous wind period. Is this another case of the public being sold a bad bill of goods?

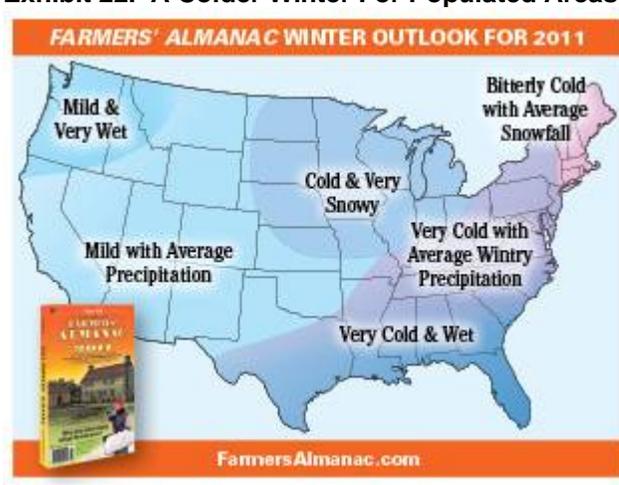
## Battle Over Winter Weather Forecasts Starts

The *Farmer's Almanac (FA)* recently released its forecast for the upcoming winter that stands in sharp contrast to that of the National Oceanic and Atmospheric Association (NOAA) and even a number of private weather forecasters. The *FA*, which began publishing in

**According to the *FA*, the eastern one-third of the nation including from New England to Florida and west as far as the lower Ohio and Mississippi River Valleys will experience colder-than-normal winter temperatures**

1792 and claims to be the longest continuing publishing magazine in the country, said it expects this winter to have a “split personality” meaning that different parts of the country will have sharply different weather. According to the *FA*, the eastern one-third of the nation including from New England to Florida and west as far as the lower Ohio and Mississippi River Valleys will experience colder-than-normal winter temperatures. In the west, the forecast calls for milder-than-normal temperatures while the midsection of the country should experience near normal winter temperatures. The *FA* believes that New England could experience a “cold slap in the face” from the Canadian Clippers sailing down through the Midwest and into the Northeast.

#### Exhibit 22. A Colder Winter For Populated Areas



Source: *Old Farmers' Almanac*

Overall, the *FA* forecast represents a “kinder and gentler” winter compared to last year. It won’t be as frigid as last year and less snowy, as 49 states saw snow last year. That may be significant as last February the Mid-Atlantic and Northeast suffered from severe blizzard weather that paralyzed most of the region several times. The blizzard conditions in Washington, D.C. led President Obama to refer to the storm as Snowmagadden while chastising the population because his daughters thought they should have gone to school as they would have back in Chicago.

**The *AccuWeather.com* forecast suggests that the energy business may not get a lot of help from the winter weather**

Much has been made of the NOAA forecast calling for a warmer-than-normal winter based on the effect of La Nina in the Pacific Ocean. *AccuWeather.com* believes the same trend will impact its winter forecast. As a result, they see the worst winter weather impacting the regions with the least number of people. The *AccuWeather.com* forecast suggests that the energy business may not get a lot of help from the winter weather.

What differentiates the two forecasting schools? Primarily it revolves around the role of the sunspot cycle and its effects on the oceans. These effects tend to correlate with climate change.

Exhibit 23. A More Conventional Winter Forecast

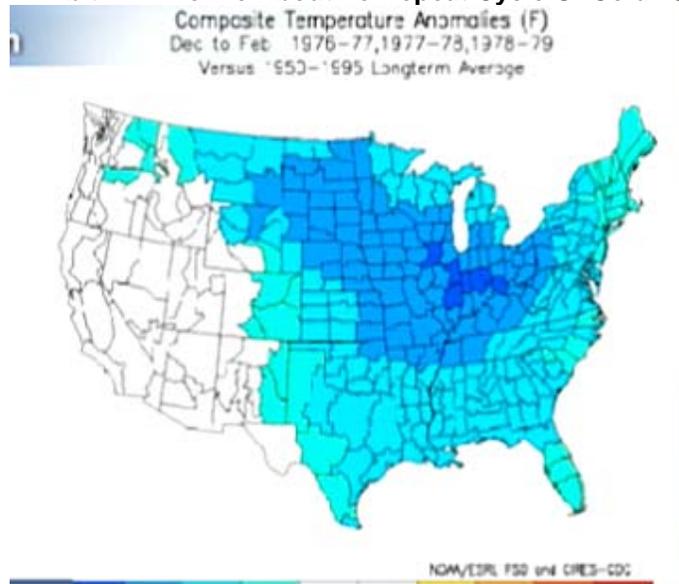


Source: *AccuWeather.com*

**The last time we experienced a similar pattern was in the late 1970s when the U.S. was hit by a series of record cold winters**

According to Joseph D'Aleo, a meteorologist and climatologist at *FA*, the state of the sunspot cycle probably means a “cold, not warm, climate may be our future.” We thought that was an interesting observation until we saw a video of Joe Bastardi, the extreme weather forecaster for *AccuWeather.com*, in which he talked about an extended period of colder and snowier winters for three seasons beginning in 2012. His forecast is based on the developing pattern of weather influencing factors including experiencing a cold Pacific Ocean (due to the Pacific Decadal Oscillation) and the cycle of La Niña, El Niño, and then a stronger La Niña. The last time we experienced a similar pattern was in the late 1970s when the U.S. was hit by a series of record cold winters.

Exhibit 24. Are We About To Repeat Cycle Of Cold 1970s?



Source: *AccuWeather.com*

**Natural gas pipeline companies came perilously close to having no gas supply beyond their line-pack and were within a few hours of having to call governors of some of the states they served to tell them to declare emergencies and shut down schools and businesses to try to avert a human disaster**

Those abnormally cold winters created serious energy problems. As cold and ice spread across the oil and gas producing regions just as Arctic temperatures descended on the major population centers in the eastern half of the country, natural gas supplies were seriously impacted. The gas shortage nearly crippled the Southeast and Mid-Atlantic regions. The cold and ice in the producing region caused natural gas wells to shut down as moisture emitted from wellhead equipment froze choking off the gas flow. As producing wells were inadvertently shut down at the same time gas demand was soaring due to the cold temperatures, gas storage supplies were taxed until they became dangerously close to being depleted. Natural gas pipeline companies came perilously close to having no gas supply beyond their line-pack and were within a few hours of having to call governors of some of the states they served to tell them to declare emergencies and shut down schools and businesses to try to avert a human disaster. Fortunately, temperatures warmed and the wells came back on stream and the crisis, thankfully, was averted.

We used to tell energy investors to watch the famous weather chart contained in *USA Today* that depicts local temperatures in color. We would tell them that if the Northeast and Midwest were white along with Texas, Oklahoma and Louisiana the nation had a BIG problem. As they say, one picture equals a thousand words.

While Mr. Bastardi's winter forecast is not extreme, he believes the country's weather cycle is in a transition phase. The heat of the past nine months due to El Niño will soon disappear. Besides the cold Pacific and El Niño/La Niña pattern, Mr. Bastardi also is looking at sunspot and volcanic activity. "The last time we had arctic volcanoes go off, in 1912 - similar to what we had two winters ago - the winters three years removed got very bad across the United States," Mr. Bastardi said. That would translate into the winters of 2012-13, 2013-14 and 2014-2015 being colder than expected.

**It was the start of that historical period of severely cold winters that prompted the June 24, 1974, *Time* magazine cover featuring the question "A New Ice Age?"**

Longer term, this is all part of a cyclical pattern that Mr. Bastardi believes will return the earth's temperatures by 2030 back to where they were in the late 1970s. It was the start of that historical period of severely cold winters that prompted the June 24, 1974, *Time* magazine cover featuring the question "A New Ice Age?" The prospect of a return to super cold winters contrasts sharply with the recent press releases from NOAA trumping that this summer has been the warmest on record since 1998, the hottest year in the past 150 year history of government weather recordkeeping.

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

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