PPHB
ENERGY INVESTMENT BANKING

MUSINGS FROM THE OIL PATCH

April 26, 2011

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

Natural Gas Is So 2010; Now It's All About Liquids-rich Shale

More production means the nation's economy need not import as much oil and gas from abroad

Last week the Baker Hughes U.S. active drilling rig count hit 1,800, up 1.6% from the prior week and up 21.5% over the past year. These were notable achievements. The increases reflect the exploration and development fever that is gripping oil and gas companies. This should be good news for the country's oilfield service industry, but maybe even better news for consumers as the increased drilling should lead to higher oil and gas production, and maybe lower fuel prices. More production means the nation's economy need not import as much oil and gas from abroad, which could have a significant impact on our balance of trade and payments, and the value of the dollar.

The first time in nearly 16 years, the oil and gas industry is employing more rigs targeting crude oil

The most notable bit of data about last week's rig count was that for the first time in nearly 16 years, the oil and gas industry is employing more rigs targeting crude oil prospects (913 rigs) than drilling for natural gas wells (878 rigs). Analysts and investors, keen to see higher natural gas prices, have seized on this switch in drilling focus as a signal that future gas production will soon stop climbing. Assuming that the nation's natural gas consumption continues to rise, the drilling switch portends a shrinking of the oversupply of natural gas. That should mean higher natural gas prices – the only question is when.

Their financial results suggest something different

Those E&P companies that are leading the charge into the gas shale plays around the country will be happy to see higher natural gas prices. They continue to claim that they can be profitable drilling these gas shale plays at natural gas prices in the $4.00 to $5.00 per thousand cubic feet (Mcf) of gas. Their financial results suggest something different. They still proclaim the success of the gas shale revolution, a movement that is beginning to spread globally.

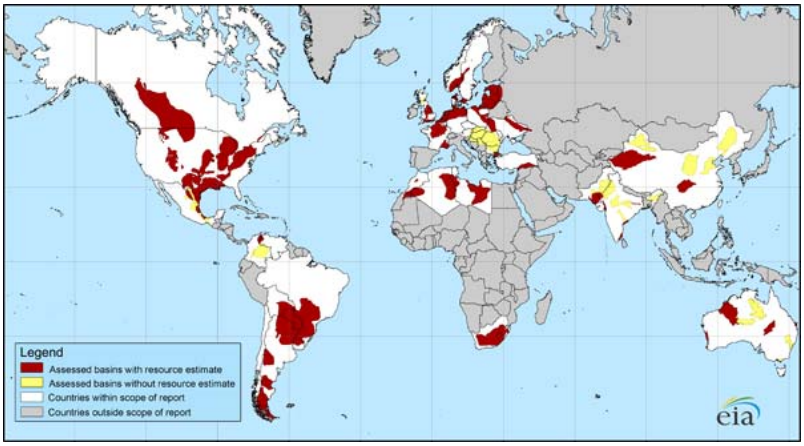
With the addition of the U.S. gas shale resources, the global total would swell to 6,622Tcf

Slightly over two weeks ago, the Energy Information Administration (EIA) released an analysis of gas shale resources around the world. It was clear from the report that the EIA believes the domestic gas shale revolution will be embraced globally. The EIA report estimates that 32 countries with known gas shale resources have added 5,760 trillion cubic feet (Tcf) of technically recoverable natural gas to the world's resources. With the addition of the U.S. gas shale resources, the global total would swell to 6,622Tcf. For comparison purposes, the world's proven natural gas reserves as of January 1, 2010, were 6,609Tcf. The world's total technically recoverable gas resources were 16,000Tcf as of the beginning of 2010, so with the new gas shale resources added in, the world now has over 22,000Tcf of gas resources.

France has announced it is considering banning the drilling of gas shale wells

The 32 countries with gas shale resources span the world and are likely to become energy-headline locations before long. Most people are familiar with the gas shale drilling underway in Poland and China, but those are only two of the 32 countries that span the globe. China leads the world with an estimated 1,275Tcf of gas shale resources. In Europe, Poland is in first place with an estimated 1,867Tcf of potential reserves, followed closely by France with 180Tcf. Interestingly, France has announced it is considering banning the drilling of gas shale wells until a study of possible water pollution problems associated with hydraulic fracturing are investigated and proven false. Equally surprisingly is that Norway has nearly half the gas shale resources of Poland and France.

Exhibit 1. Gas Shales Located Around The World



Source: EIA

Mexico has a huge potential

In South America, Argentina is highly prospective with nearly 90% of the total gas shale resources estimated to be in the United States. Brazil has about a third of the resources of Argentina with most of the potential resources located in the area close to some of the key manufacturing sites in the country. Surprisingly, Mexico has a huge potential with almost 80% of the estimated United States gas shale resources.

In Africa, the greatest potential source of natural gas from shales lies in South Africa, which has an estimated 485Tcf of resources. Libya, the site of the current civil war involving the country's crude oil reserves and production, has an estimated 290Tcf of gas shale resources. Algeria follows with nearly 80% of Libya's estimate.

According to the EIA, 2010's 4.87Tcf of gas shale production represents about 23% of total U.S. output

While the world has lots of gas shale resource potential, it is in North America, and primarily the United States, where the gas shale revolution is in high gear producing substantial volumes of new gas production. According to the EIA, 2010's 4.87Tcf of gas shale production represents about 23% of total U.S. output, but it is projected to account for 45% of the nation's gas supply by 2035. The huge potential of gas shales in this country was first highlighted by the 2009 report of the Potential Gas Committee (PGC) at the Colorado School of Mines. In that report, the PGC estimated that there was about 616Tcf of gas shale resource, or about a third of the country's total resource potential.

There is a Department of Energy study underway with a May release that will contain an estimate greater than ARI's estimate, likely putting it close to China's estimated 1,275Tcf of potential reserves

Recently, Ken Medlock, a professor at Rice University, delivered a presentation about the gas shale industry at the American Association of Petroleum Geologists (AAPG) annual meeting. In his presentation he listed a timeline of potential gas shale resource estimates beginning with the 2003 National Petroleum Council estimate of 38Tcf. Two years later the estimate was raised to 140 Tcf and then in 2008 Navigant, a consulting company, estimated there was 520Tcf of potential reserves. The next year came the PGC estimate of 616Tcf and last year, consultant ARI estimated gas shale resources of more than 1,000Tcf. Mr. Medlock said there is a Department of Energy study underway with a May release date that will contain an estimate greater than ARI's estimate, likely putting it close to China's estimated 1,275Tcf of potential reserves.

All this potential gas has led politicians, investment professionals and E&P company executives to announce that the United States has in excess of 100 years of natural gas supply. In his presentation at the AARP, Art Berman showed that by reading the PGC report it becomes clear that gas shale reserves will likely only supply about 20 years of demand at the current 23Tcf of annual consumption.

President Barack Obama has endorsed the huge potential gas supply mantra

Mr. Berman's pricking of the gas shale 100-year supply bubble should be having a greater impact, but instead the air is barely slipping out of the balloon. In fact, President Barack Obama has endorsed the huge potential gas supply mantra. In a recent presentation about the nation's energy situation, President Obama said, "We have a lot of natural gas here in this county." In doing so, however, he touched on the key issue now swirling around the gas shale revolution, which is the use of hydraulic fracturing to release the trapped gas from the formation President Obama's observation was, "The problem is…extracting it [shale gas] from the ground. The technologies aren't as developed as we'd like and so there are some concerns that it might create pollution in our groundwater, for

Exhibit 2. Gas Shale Reserves Less Than 100 Years

There never was 100 years of natural gas because of shale plays

- Potential Gas Committee (PGC) June 2009 Report misinterpreted.
- Technically recoverable resources are not reserves.
- Probable shale gas component is 147 tcf.
- That's a lot of gas but it is not 100-years of supply.

Potential Gas Committee 2009 Report	
	TCF
U.S. Technically Recoverable Resources	1,836
Shale Gas Component	616
"Probable" (P_2) Technically Recoverable Resources	441
Shale Gas Component	147

"There is clearly sufficient North American gas supply to last for a bunch of years; 50 years at least. And there is clearly no need for us to import LNG (liquefied natural gas) for multiple years to come."
--Mark Papa, EOG CEO, November 2010

Except that there are only 20 years of supply according to the PGC!

Proved U.S. Reserves (tcf)	Probable PGC Resources (tcf)	Possible PGC Reserves (50%)	Years of Gas @ 23 tcf/year
238	441	221	20

Labyrinth Consulting Services, Inc. AAPG Annual Convention & Exhibition Slide 4

Source: Art Berman

example. So we've got to make sure that if we're going to do it [fracking], we do it in a way that doesn't poison people." There is plenty of evidence to refute the President's observation, but it is having a hard time being recognized.

A recent article by Stephen Hayward of the American Enterprise Institute highlighted the two problems confronting gas shale development. First is the issue of the safety of hydraulic fracturing. The other issue is what to do about the gas bounty being developed. The gas shale revolution has put these issues on the front pages of the papers and has drawn into the discussion the one factor that can derail the revolution – politics, such as the views of the President.

Despite the American oil industry getting its start in 1859 when Col. Drake drilled the first oil well in northwestern Pennsylvania, the region is not used to the intensity of drilling and producing activity experienced in regions such as the Southwest and Gulf Coast

The battle over the safety of hydraulic fracturing grew in intensity the closer gas shale drilling moved to the East Coast. The emergence of the Marcellus shale as probably the largest gas field in the United States brought drilling rigs and pressure pumping equipment into the hilly topography of New York, Pennsylvania, Ohio and West Virginia. Despite the American oil industry getting its start in 1859 when Col. Drake drilled the first oil well in northwestern Pennsylvania, the region is not used to the intensity of drilling and producing activity experienced in regions such as the Southwest and Gulf Coast. The lack of equipment and workers has created a huge in-migration of both, creating an unsettled feeling among the local population. New oilfield service company equipment bases, heavy traffic consisting of large trucks with loads of equipment and supplies driving through small towns and rural areas, and lots of temporary workers from foreign places such as Texas, Oklahoma, Louisiana and Canada is changing the pace of everyday living in the Northeast.

The low price of natural gas, combined with the high-efficiency gas

power plant designs, makes gas-fired power plants cheaper than coal-fired power plants. This has been the case for at least two decades, but due to the volatility of natural gas prices, these plants have been limited to peak electricity generating roles. Now it appears gas could be used for more baseload generation, replacing aging coal plants that are under pressure from costly new Environmental Protection Agency (EPA) clean air requirements and the long-standing environmental crusade against coal plants.

Cheap natural gas makes the favorite energy sources of environmentalists – wind and solar – that much less competitive

For the first time ever, natural gas producers and utilities have joined with environmentalists to alter the status quo over replacing coal-fired power plants with gas-fired ones. This alliance will not last for long, however, as cheap natural gas makes the favorite energy sources of environmentalists – wind and solar – that much less competitive. Environmentalists used to love natural gas so long as it was expensive and used merely as a backstop for "clean" wind and solar power. Now that it may displace their favorite fuels, they don't love natural gas as much.

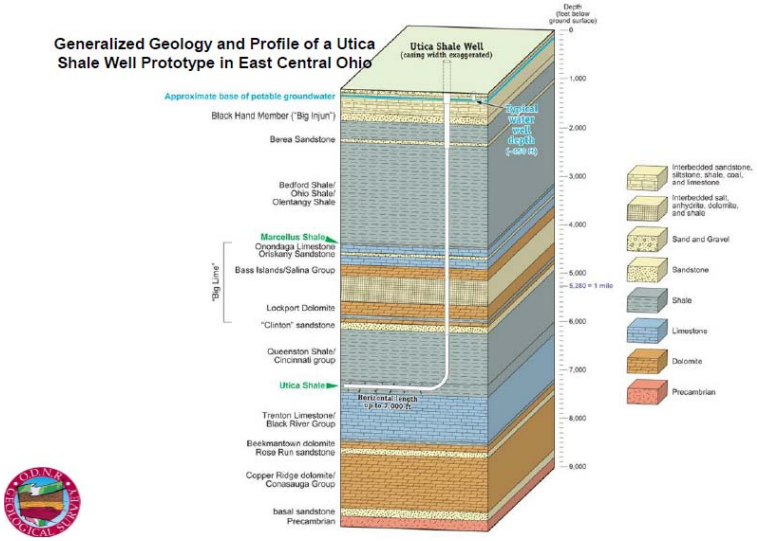
Mr. Hayward refers to this attitude about natural gas on the part of environmentalists as "the theorem of environmental duplicity: namely, there is no form of 'clean' or 'alternative' energy that environmentalists won't decide to oppose if it becomes practical and affordable on a large scale." Last week's Chesapeake Energy Corp. (CHK-NYSE) gas shale well blowout certainly gives more ammunition to the environmental movement to oppose the use of hydraulic fracturing. The Chesapeake well was plugged late last week and the company and state regulators are monitoring the pollution as well fluids were spilled and migrated across the land.

Every study conducted about hydraulic fracturing has found no problems

Environmental opposition to hydraulic fracturing has been helped along by a sympathetic media that writes "investigative" reports that often create false impressions about the safety of hydraulic fracturing and even the exploitation of gas shale formations. Every study conducted about hydraulic fracturing has found no problems. The reason is simple: the target shale formations are thousands of feet below the surface and thousands of feet below the aquifer. Both the distance and the nature of the rock that separates the formations prevent fracturing fluids from migrating to the aquifer, as demonstrated in Exhibit 3. What has been a problem in certain wells where natural gas has migrated into drinking water was the primary cement job for the surface pipe, which is designed to isolate the gas well from the ground water. Due to cement bond failures, it is possible for flowing natural gas to leak out and into the ground water, which then can flow to a homeowner's water faucets.

Other than gas migrating into ground water formations, water associated with gas shale activity has become a major challenge for the E&P industry. Water is needed for drilling and for hydraulic fracturing completions. As a result of the large volumes of water required in the completion process, huge volumes of contaminated

Exhibit 3. Gas Shale Wells Are Well Below Groundwater



Source: Ohio Department of Natural Resources

An alternative disposal method is to inject it into special disposal wells

water are returned in the initial well flow. This flow-back water needs to be disposed of either by cleaning it up to meet standards for dumping into local waste water disposal systems or by placing it into streams and rivers. An alternative disposal method is to inject it into special disposal wells. Because Pennsylvania has few disposal wells, flow-back water and water produced in association with oil and gas output is either cleaned up or hauled to disposal wells, many of which are located in neighboring Ohio.

When Mitchell Energy solved the key critical variables in unlocking natural gas trapped in the shale formation underlying the Barnett basin in Texas, they probably had little comprehension of the revolution they were starting

While water and hydraulic fracturing concerns are, and will continue to be, an ongoing issue, the more critical consideration is the economic viability of gas shale drilling. When Mitchell Energy solved the key critical variables in unlocking natural gas trapped in the shale formation underlying the Barnett basin in Texas, they probably had little comprehension of the revolution they were starting. That revolution was perceived to have certain characteristics that would unlock tremendous gas resources. Those characteristics included: uniform shale formations that blanketed the areas underlying oil and gas producing basins; that formations would yield significant gas volumes, which was directly correlated with the number of wells drilled and hydraulic fracturing treatments administered; that horizontal drilling exposed greater amounts of the shale formation helping release more of its trapped gas; and that all wells in shale formations would be equally productive enabling rapid drilling employing uniform drilling techniques producing low drilling costs. The combination of these characteristics was supposed to translate into large volumes of low-cost natural gas.

After about five years of active drilling in the oldest shale basins has begun to disprove certain of these characteristics and their implications on well economics. We have learned that gas shale

basins still need a trapping mechanism in order to be productive. Drilling has also shown that gas shale plays have "sweet" spots that produce higher well volumes than wells drilled outside of the "sweet" spots. These realizations have begun to dispel the manufacturing concept for how gas shale fields would be developed.

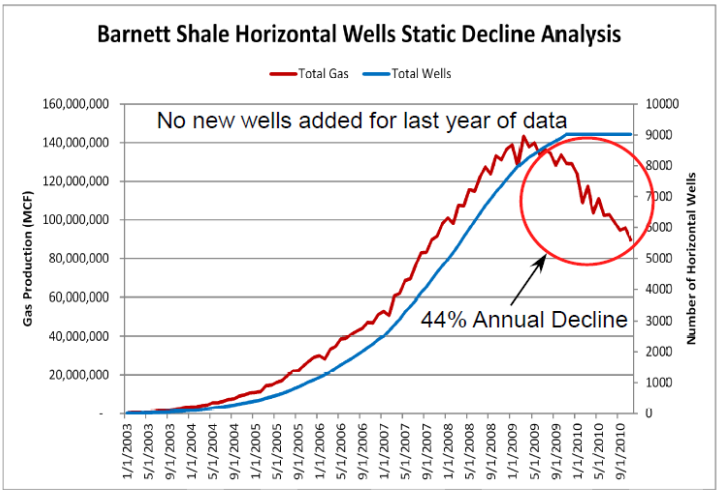
Since natural gas prices are so low due to growing gas production and weak gas demand, the economics of many gas shale wells have been called into question

We have learned that by drilling longer lateral sections and applying greater numbers of hydraulic fracturing treatments to wells, gas volumes can be maximized. The problem has been that the cost to secure the acreage to drill these gas shale wells and the drilling and completion costs are not particularly cheap. Since natural gas prices are so low due to growing gas production and weak gas demand, the economics of many gas shale wells have been called into question. We are also finding that many gas shale wells are not producing the volumes projected. This latter observation is highly contentious among participants within the oil and gas industry. However, the more data that is collected, the greater the confidence the critics of gas shale profitability have that these plays may not be the goldmines proponents claim.

When the production from newly drilled wells during the last 12 months is excluded, gas production declined at a 44% annual rate

In Art Berman's AAPG presentation, he presented the chart in Exhibit 4 showing that within the Barnett Shale play, when the production from newly drilled wells during the last 12 months is excluded, gas production declined at a 44% annual rate. The importance of this static well analysis is that it highlights the need for producers to continually drill new wells in order to grow production, or maybe merely to offset production declines. The significance of the analysis is that the E&P industry is on a treadmill of new well drilling with the likelihood that the slope of drilling activity is rising with cost implications unknown.

Exhibit 4. Without Drilling Production Falls Rapidly



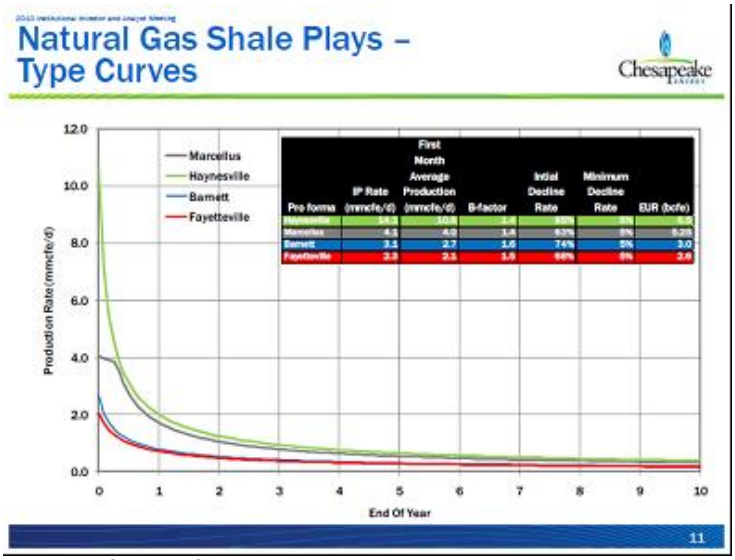
Source: Art Berman

If any of the assumptions is wrong, the profitability calculation can be way off

Another analysis of the Barnett Shale play shows how the wells are not producing the necessary volumes of natural gas to support the Economically Ultimately Recoverability (EUR) reserve estimates being used by producers. In determining profitability, producers estimate the total number of reserves they will produce from their wells and divide that figure into the total cost estimate for finding, developing and producing the reserves. The resulting cost per Mcf of gas produced is amortized against the revenue earned from its sale. If any of the assumptions is wrong, the profitability calculation can be way off.

If we examine two slides from Chesapeake's 2010 institutional investor and analyst meeting in October 2010, we can see how the EUR and well costs interact to impact profitability of gas shale developments. The first chart (Exhibit 5) shows the decline curves and basic data about the four major gas shale plays in which Chesapeake is involved. The data on this chart shows that Chesapeake expects the EUR for its Barnett Shale wells to be 3.0 billion cubic feet (Bcf).

Exhibit 5. 3Bcf EUR Estimated For Barnett Shale



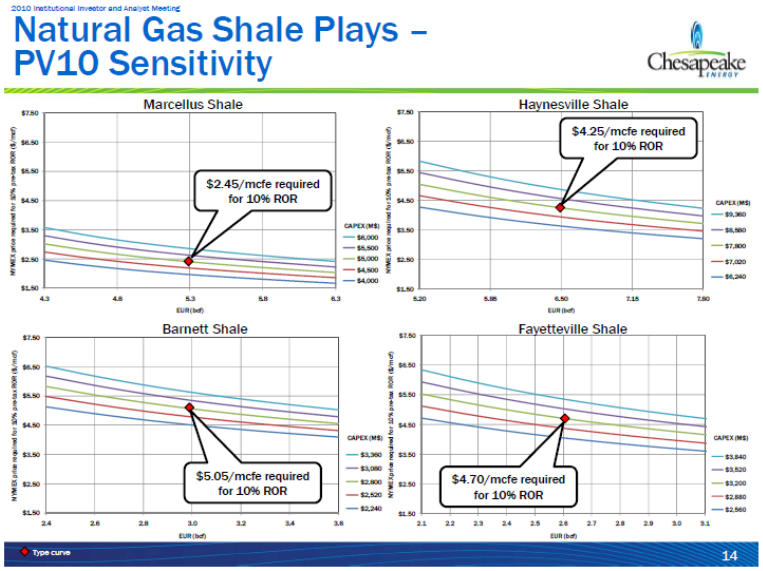
Source: Chesapeake Energy

Chesapeake believes that with a EUR of 3.0 Bcf and a price of $5.05/Mcf, the company will earn a 10% rate of return

The next chart (Exhibit 6) shows the sensitivity of its profitability to the price of natural gas and the EUR. As the data for the Barnett Shale shows, Chesapeake believes that with a EUR of 3.0 Bcf and a price of $5.05/Mcf, the company will earn a 10% rate of return. By moving along the green curve on the chart, one can see that a smaller EUR needs a much higher natural gas price to achieve the same 10% rate of return.

An analysis of the Barnett Shale field shows how production from 1992 through November 2010 has climbed. The chart (Exhibit 7)

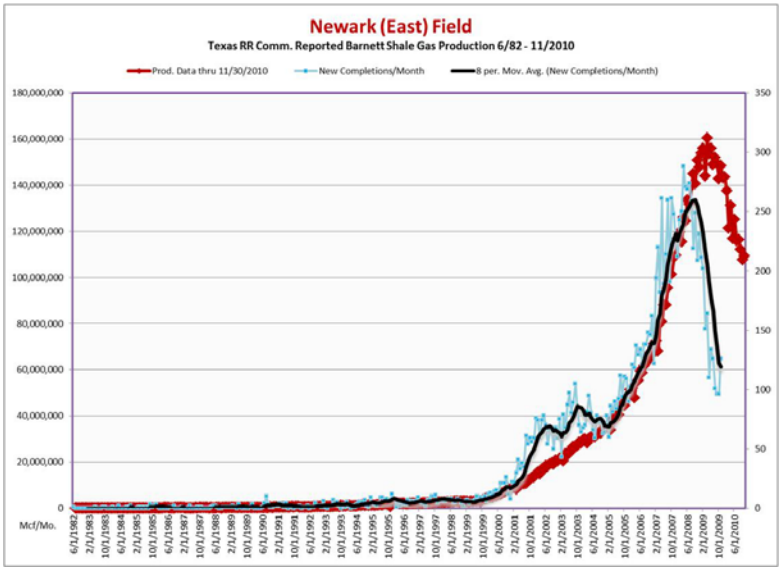
Exhibit 6. Economics Of Gas Shale Plays



Source: Chesapeake Energy

shows that the number of new well completions has decline sharply in the past two years with a corresponding decline in natural gas output.

Exhibit 7. Barnett Shale Gas Production

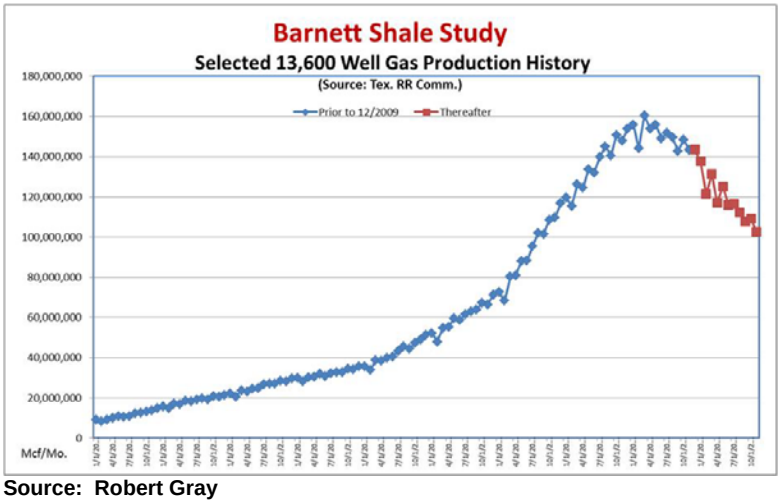


Source: Robert Gray

This analysis, prepared by Robert Gray, an associate of Art Berman's, focused on examining the performance of a static universe of producing wells in the Barnett Shale. In Exhibit 8, he tracked the production from a universe of wells that he stopped

growing in November 2009. One can see the historic gas production in blue, which had begun to decline prior to 2009, and the monthly gas production subsequent to creating the static well universe.

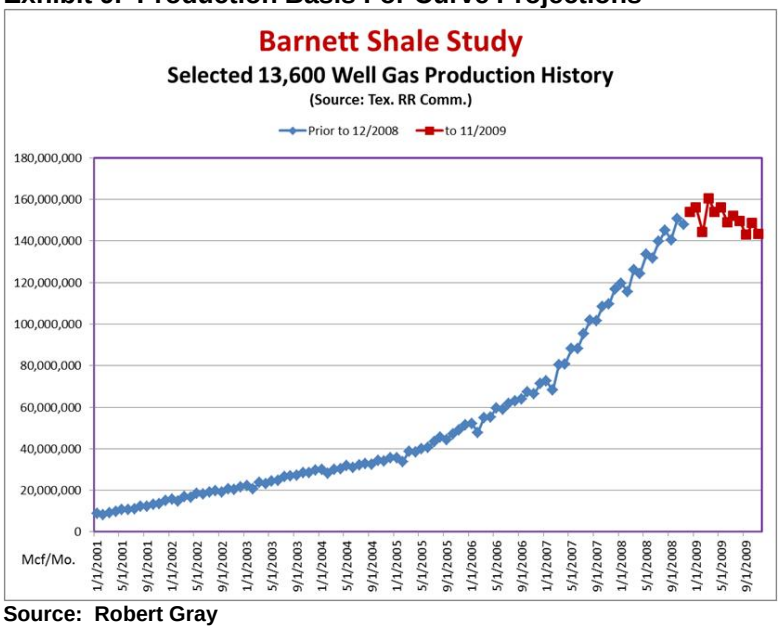
Exhibit 8. Barnett Shale Static Well Production



Source: Robert Gray

By using the production data through November 2009, Mr. Gray was able to generate models for predicting the future decline rates, which, over the remaining production life of the wells, produces an estimate of the EURs for the wells.

Exhibit 9. Production Basis For Curve Projections

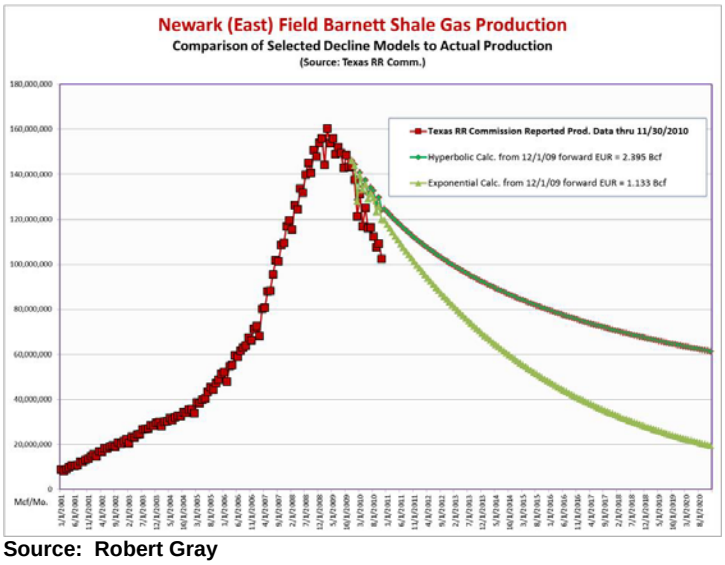


Source: Robert Gray

Shown in Exhibit 10 are the two type curves – hyperbolic and exponential – calculated from the historic data as of November

2009. Under the hyperbolic curve, the estimated EUR per well is 2.395 Bcf. The exponential curve shows a future EUR of only 1.133 Bcf. Both of these EUR estimates are well below the EUR projected by Chesapeake for its wells in this field.

Exhibit 10. 2009 Production Decline Curves

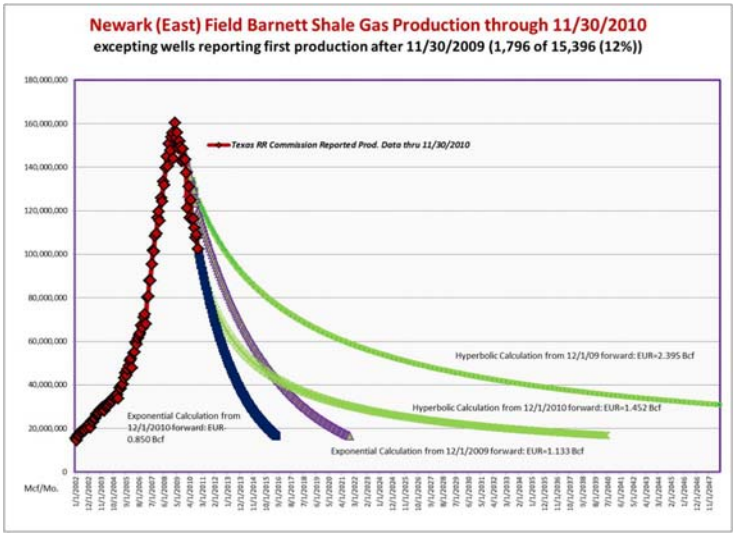


Source: Robert Gray

The new 2010 hyperbolic and exponential curves fall below those estimated from the 2009 data

Now that we have an additional year's worth of production data, Mr. Gray was able to estimate new decline curves incorporating that information. As seen in Exhibit 11, the new 2010 hyperbolic and exponential curves fall below those estimated from the 2009 data. We now have EUR estimates of 1.452 Bcf for the hyperbolic curve and only 0.850 Bcf for the exponential curve.

Exhibit 11. 2010 EUR Curves Well Below Estimates

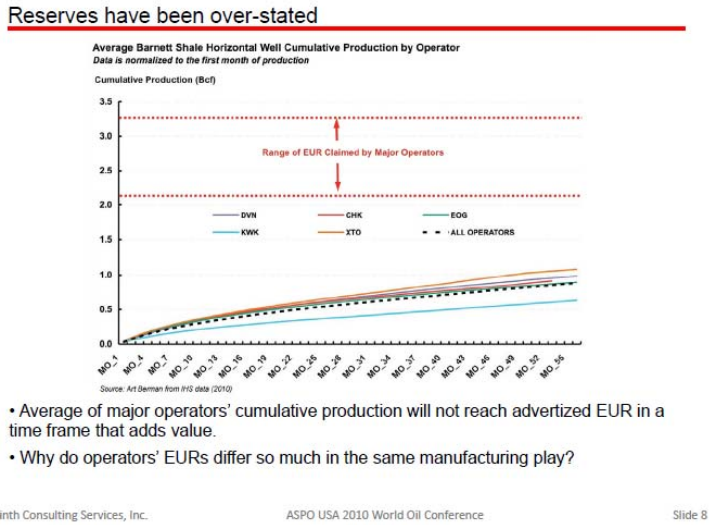


Source: Robert Gray

Our guess is that a producer will need a gas price somewhere around $7/Mcf to achieve a modest return on investment given the exponential EUR Mr. Gray has calculated

If we go back to the rate of return chart from the Chesapeake presentation, it does not show what gas price is required for EURs smaller than 2.4 Bcf. Even at that EUR, the 10% rate of return requires a gas price slightly below $6.00/Mcf. Our guess is that a producer will need a gas price somewhere around $7/Mcf to achieve a modest return on investment given the exponential EUR Mr. Gray has calculated. In a more recent update, Mr. Gray has increased his exponential EUR estimate to about 1.0 Bcf. Even that increased estimate is still only a third of Chesapeake's EUR estimate.

Exhibit 12. Well Production Short Of EUR Estimates



Source: Art Berman

The data shows how production does not seem to be coming anywhere close to the estimated EURs

In prior presentations, Mr. Berman has shown the chart in Exhibit 12. It presents the range of EURs claimed in investor presentations by the major producers in the Barnett Shale plotted against their cumulative production. The data shows how production does not seem to be coming anywhere close to the estimated EURs. Quite possibly this helps to explain why 16 significant E&P companies active in the gas shale plays have written off goodwill and the value of their reserves to the tune of $67 billion over 2008-2010. If producers acted in a more rational manner and cut back their drilling, the rapid decline in gas shale production as demonstrated by Mr. Berman's chart should lead to higher natural gas prices. Therein lays the conundrum for the gas market – drill to grow and satisfy Wall Street or cut back, secure higher prices and stop destroying shareholders' capital.

Never Fear, Your Governments Is Here To Protect You!

Gasoline and diesel pump prices are climbing and consumers are unhappy. Should that be a surprise? No. Neither should you be surprised that governments are reacting in their typical manner –

verbally chastising the oil companies, investigating them, and even sending in the police, as happened in China last week.

Pump prices are rapidly approaching the all-time high of $4.104 reached during the week of July 14, 2008, as crude oil prices were peaking at $147 a barrel

According to the Energy Information Administration (EIA) as of April 18th, the average price for a gallon of gasoline in the U.S. was $3.844, up $0.984 in the past year. Media reports at the end of last week pointed out that gasoline prices increased every day over the last 30 days. In Washington, D.C., pump prices are close to $5 a gallon as evidenced by the picture below. Pump prices are rapidly approaching the all-time high of $4.104 reached during the week of July 14, 2008, as crude oil prices were peaking at $147 a barrel.

Exhibit 13. High Gasoline Prices In Washington, D.C.

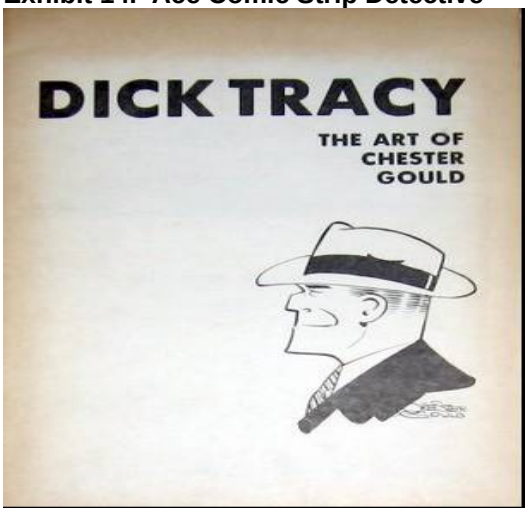
Source: ***Agence France-Presse***

Speculators once again are the target – even though the President has no evidence to present that they are responsible for the rise in prices

In response to the sharp rise in gasoline prices, and the corresponding decline in President Barack Obama's popularity ratings, he has asked the Justice Department to launch an investigation of the fuel markets. Speculators once again are the target – even though the President has no evidence to present that they are responsible for the rise in prices. In a town hall meeting at a renewable energy company in Nevada last Thursday, President Obama stated, "The attorney general is putting together a team whose job it is to root out any cases of fraud or manipulation in the oil markets that might affect gas prices, and that includes the role of traders and speculators." Of course, he failed to mention that the members of the team have as one of their current job responsibilities doing exactly what they are now being asked to do.

Here we go again. Where is that master police detective, Dick Tracy, when we need him? It seems every time pump prices shoot up, the response of politicians is to rail against the big, bad oil companies and those nefarious speculators who are out to make money off the misery of the common man. It would be funny, if it weren't so sad, that every investigation of fraud and manipulation of

Exhibit 14. Ace Comic Strip Detective



Source: Mike Lynch Cartoons

the gasoline market has found no evidence of wrong-doing. That does not mean that there isn't the occasional service station operator who tries to take advantage of rising prices to gouge his consumers, but state and local laws invariably catch these characters and punish them.

The Obama administration's anti-fossil fuel attitudes have contributed to the rise in oil prices

What is sad in this case is that the Obama administration's anti-fossil fuel attitudes have contributed to the rise in oil prices through their restrictive rules governing access to federal lands and the extended Gulf of Mexico permit moratorium. He is merely doing what he campaigned he would do.

Probably the greater problem for oil prices is the out-of-control spending by the federal government and the financing of the resulting deficits by the Federal Reserve. The latest run-up in oil prices, and in turn diesel and gasoline prices, is related to the fall in the value of the U.S. dollar that makes crude oil more expensive on the world market.

The price of diesel fuel in China is about US$0.97 a liter, which is cheaper than the equivalent volume in the United States and about half the price in Europe

While the government is seeking to investigate and chastise people involved in our nation's fuel markets, the issue of rising crude oil prices is creating problems in other parts of the world. A couple of weeks ago, the Chinese government, who controls gasoline and diesel fuel prices, raised them by about 5% to help offset the sharp rise in global crude oil prices. The government has increased fuel prices repeatedly this year, but the increases have always trailed the rise in crude oil prices. According to a report from Nomura Securities Company, the price of diesel fuel in China is about US$0.97 a liter, which is cheaper than the equivalent volume in the United States and about half the price in Europe. The last time fuel protests broke out in China was 2007, which produced a set of new subsidies for groups hurt by higher fuel prices such as taxis.

Exhibit 15. Protesting Trucker Carted Away By Police

Source: ***Reuters***

As the Chinese government knows, the social media – the Internet, Facebook, Twitter, etc. – can become a vehicle for fomenting civil unrest rapidly unless cut off quickly

This time, the government moved in with police to deal with striking truckers in Shanghai. There were media reports of other protests in and around the Shanghai port region, but they could not be confirmed. Part of the problem in China is that the government's censorship of the internet prevents photos and stories about protests from remaining on web sites. As the Chinese government knows, the social media – the Internet, Facebook, Twitter, etc. – can become a vehicle for fomenting civil unrest rapidly unless cut off quickly. This realization was behind the Egyptian government's effort to shut down the Internet during the protests last January. The protestors quickly found avenues around the blocked Internet to maintain the flow of information about the protests.

The Chinese protest over rising fuel prices and increased port fees was tied to accelerating inflation. Chinese inflation in March rose to 5.4%, the highest level in 32 months. The sharp rise was driven by a 12% increase in food costs. While the government says that restraining inflation is its top priority this year. City governments have boosted minimum wages by 10% to 20% this year but the increase has failed to keep up with inflation.

In a population of 1.3 billion people, the middle class represents less than 5% of the total population, and the majority of them live in the coastal region or in Beijing

The concern is that the Shanghai protest may merely be the leading edge of greater future unrest that could develop in China. Food inflation was the root of the protests in North Africa that began in Tunisia in December and that spread throughout the region and into the Middle East. George Friedman, the founder of the intelligence firm, Stratfor, and the author of The Next Decade, has written about China's fragile social and economic order. According to the People's Bank of China, 60 million people live in middle class households, those earning more than $20,000 a year. But in a population of 1.3 billion people, the middle class represents less than 5% of the total population, and the majority of them live in the coastal region or in Beijing. Some 600 million Chinese live in

80% of China's population lives in conditions comparable to the poverty of sub-Saharan Africa

households earning less than $1,000 a year. Another 440 million Chinese live in households earnings between $1,000 and $2,000 a year, or $3 to $6 a day. Mr. Friedman points out that this means that 80% of China's population lives in conditions comparable to the poverty of sub-Saharan Africa. Mr. Friedman goes on in more detail to highlight the differences in this income inequality, the heavy concentration of wealth along China's coast and how these conditions are similar to the fault line that marked the fragmentation of China in the nineteenth century. He believes it is possible China may fragment along these lines in the future.

China is certainly not a Black Swan, but it sure is a gray one

While the U.S. hasn't experienced civil unrest over rising food and fuel prices, one wonders how long people will tolerate cosmetic political responses in the form of government panels investigating the fuel market looking for people to punish over gouging and manipulation. Hopefully we will not experience scenes such as in Exhibit 15. That picture, however, should offer pause to those forecasters who assume that China's insatiable energy appetite will drive energy and mineral prices inexorably higher. China is certainly not a Black Swan, but it sure is a gray one.

Ever Wonder Why Wind Power Needs To Be Offshore?

As part of the offshore development plan, no activity would have occurred within 50 miles of the coast

At the recent annual meeting of the National Ocean Industries Association (NOIA) held in Washington, D.C., Bob McDonnell, governor of the Commonwealth of Virginia spoke about his state's push to develop its offshore energy resources – crude oil, natural gas and wind. Virginia was targeted to be the first state to hold an offshore oil and gas lease sale under plans that have since been scraped due to the Deepwater Horizon accident and resulting oil spill from BP Ltd.'s (BP-NYSE) Macondo well. As part of the offshore development plan, no activity would have occurred within 50 miles of the coast. This distance, while much greater than the curvature of the earth, assured residents that nothing associated with resource development could be seen from the shore. Out of sight; out of mind.

But 'slow and steady,' which is supposed to win the day is not acceptable to President Barack Obama

Increasingly the Obama administration wants to push for greater development of "green" energy sources such as wind and solar, but is frustrated by the regulatory hurdles that developers need to clear. That is one reason why Secretary of the Interior Salazar has moved to reduce some of the requirements in order to speed up the permit approval time. His actions are often cited as the proper governmental response to the nine-year and counting road the Massachusetts Cape Wind power project has been traveling between initial license application and breaking ground for construction. Of course, long lead times for large energy projects, especially for those destined to be located in either challenging conditions and/or environmentally sensitive areas is nothing new. But 'slow and steady,' which is supposed to win the day is not acceptable to President Barack Obama who wants things approved

quickly before opposition can muster strength and/or the economic weaknesses of the concept can be uncovered.

There will be no visual pollution if the turbines are positioned more than 13 miles offshore, which is over the horizon

The key argument for putting wind power offshore is that the wind blows stronger and steadier there, along with the fact that there will be no visual pollution if the turbines are positioned more than 13 miles offshore, which is over the horizon. Onshore wind turbines increasingly are coming under attack, not only for their visual pollution but also for their noise and pinwheel light patterns impacting the neighbors.

The promises of wind energy were sold to the public without much understanding of how the turbine towers would change the landscape

In researching our story in the last issue of the *Musings* dealing with the recent report on Scotland's wind power business sponsored by the John Muir Trust in the UK, one of the sources of wind turbine data came from the Braes O'Doune wind farm. This is a 36-turbine wind farm that began operation in February 2007 but like most in Scotland barely achieves anywhere close to the 30% of capacity performance over the course of a year wind energy proponents tout. The problem is that the promises of wind energy were sold to the public without much understanding of how the turbine towers would change the landscape.

Every household in Scotland, however, is subsidizing the electricity generated by these turbines through charges on their monthly electricity bills

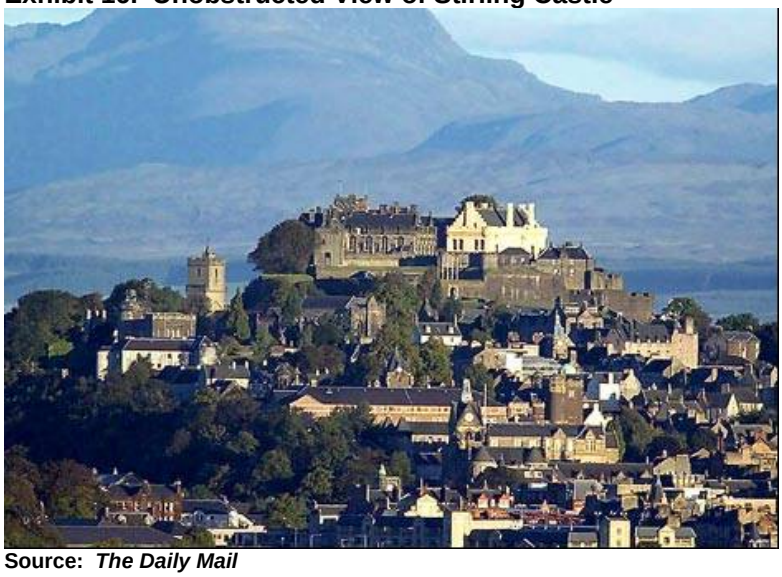
When the Braes O'Doune wind farm began generating electricity, the performance of the wind power initiative of Scotland's Renewable Obligations Certificates scheme was praised by then Trade and Industry Secretary Alistair Darling who said, "This is a major landmark. Over the last 20 months, we have doubled the amount of wind-generated electricity we have." The wind farm was constructed at a cost of £72 million ($119 million), generated 150 construction jobs and produces 72 megawatts of power, enough to supply 45,000 homes in the area. Every household in Scotland, however, is subsidizing the electricity generated by these turbines through charges on their monthly electricity bills. The real tragedy is the visual damage done by the 328-foot tall turbines.

He went on to state that the 'industrialized development' was located in one of the "most stunning parts of the country" and it ruins the views of Stirling Castle

The Braes O'Doune wind farm is located at the gateway to the Highlands that had become a tourist hotspot in recent years. Part of the attraction was the presence of one of the country's most historic sites, Stirling Castle. John Digney of the Scottish Wild Land Group, said, "There was a lot of opposition at the time, but the planning for this went through very quickly. People were genuinely shocked when they realized just how conspicuous it was. It is an eyesore. As you approach the city, this is your first glimpse of the Highlands and these turbines detract from the whole scene." He went on to state that the 'industrialized development' was located in one of the "most stunning parts of the country" and it ruins the views of Stirling Castle.

Stirling Castle was home to Mary, Queen of Scots, and is one of the largest and most important castles in Scotland. It is perched some 250 feet atop an extinct volcano, and was a favorite residence of the

Exhibit 16. Unobstructed View of Stirling Castle



Source: ***The Daily Mail***

Besides being the site of the crowning of Mary in 1543, it also offers views of some of Scotland's key battlefields

Stuart monarchs who ruled Scotland and England. Besides being the site of the crowning of Mary in 1543, it also offers views of some of Scotland's key battlefields, including Stirling Bridge, where William Wallace defeated the English in 1297, and Bannockburn, where Robert the Bruce dealt Scotland's southern neighbors a similar blow in 1314. The castle was last besieged in 1746, when Charles Edward Stuart, known as "Bonnie Prince Charlie", tried unsuccessfully to seize the castle.

Exhibit 17. Stirling Castle With View of 36 Wind Turbines

Source: ***The Daily Mail***

As one would expect, the British Wind Energy Association (BWEA) does not find any problem with the wind farm, and defends it by

citing the construction jobs and power output. A BWEA spokesman stated, "We don't agree that the wind turbines are an eyesore. They are a feat of engineering and do not spoil the landscape. Wind energy will play a key role not only in mitigating the effect of climate change, but also in securing the energy future of this country." We'll let you be the judge from the pictures above.

Climate Change Debate Becoming Harder On Supporters

People are beginning to realize that the science behind climate change is not as solid as first thought

Concern about climate change has been trumped since 2009's recession by greater concerns over the health of the economy and its impact on the everyday lives of citizens. People are beginning to realize that the science behind climate change is not as solid as first thought. That conclusion hit home after the Climategate email scandal erupted in late 2009 and it became clear that scientists controlling the temperature data were willing to manipulate it in order to strengthen their case for global warming while at the same time acting in concert with others to insure that their peers could not publish articles questioning that case.

That was an admission that climate change deniers may actually be knowledgeable about the issue

A series of interesting events involving climate change and global warming promoters have occurred recently highlighting the problem they are having in making their case. One event involved Andrew Revkin, the former environmental writer for *The New York Times* and now the editor of its environmental blog, *Dot Earth*. At the end of a mid-April blog entitled "Climate, Communication and the 'Nerd Loop'" he listed several sources for additional reading. Following the last of the three listings, Mr. Revkin wrote, "The last link is particularly important, given that it shows, among other things, that those dismissing human-driven global warming tend to have a more accurate picture of the basic science than those alarmed by it." That was an admission that climate change deniers may actually be knowledgeable about the issue.

Later the blog was edited with the following text:

"10:46pm/Updated I've removed a line I'd tacked on here that gave too simplistic a summary of the Six Americas [sic] study."

Mr. Revkin's initial statement was picking up on a point from the executive summary of the Yale Report on Climate Change Communication entitled "Knowledge of Climate Change Across Global Warming's Six Americas." The most recent study was compiled from a survey of a representative group of Americans conducted during the period June 24 – July 22, 2010 and released last January. In an earlier report, the Yale group discovered it needed additional granularity to measure the knowledge and attitudes of American citizens. This led to the creation of six groups. Those are:

"**Alarmed**" – Americans who are the most convinced that global warming is happening, caused by humans, and a serious and urgent threat;

"**Concerned**" – Americans who believe global warming is a serious problem and support an active national response, but are less personally involved;

"**Cautious**" – Americans who believe global warming is a problem, but not urgent, and are unsure whether it is human caused;

"**Disengaged**" – Americans who do not know much about global warming or whether it is happening, and have not thought much about it;

"**Doubtful**" – Americans who are not sure whether global warming is happening, but believe that, if it is, it is natural and a distant threat; and

"**Dismissive**" – Americans who believe global warming is not happening and probably a hoax.

The percentage of Alarmed has dropped to 10% from 18% in 2008

The most recent survey showed that the percentage of Alarmed has dropped to 10% from 18% in 2008. On the other end of the spectrum, the percentage of Dismissive has more than doubled since 2008 to 16% of the American public. There was movement in every category with the Cautious growing and the Disengaged shrinking. The Concerned have declined while the Doubtful grew.

On the other hand, a majority of Americans incorrectly believed the opposite – that the Earth's climate is now warmer than it has ever been before

It is interesting to look at some of the past reports to see the trends. In the 2009 report, a conclusion was that 73% of Americans correctly understood that current conditions are not colder than ever before in Earth's history. On the other hand, a majority of Americans incorrectly believed the opposite – that the Earth's climate is now warmer than it has ever been before. As the authors of the report noted in parenthesis this belief is false because "global temperatures have been warmer than current conditions many times in the past."

We have extracted several questions about global warming from the most recent report based on the mid 2010 survey data. They show a sharp division in views held by Americans.

Exhibit 18. Is Global Warming Happening?

Q1. Recently, you may have noticed that global warming has been getting some attention in the news. Global warming refers to the idea that the world's average temperature has been increasing over the past 150 years, may be increasing more in the future, and that the world's climate may change as a result. What do you think? Do you think that global warming is happening?

	Nat'l Average	Alarmed (14%)	Concerned (31%)	Cautious (23%)	Disengaged (10%)	Doubtful (12%)	Dismissive (11%)
Yes (√)	**63**	98	91	58	36	28	12
No	**19**	1	0	13	12	52	75
Don't Know	**19**	1	9	30	52	20	14

Source: ***Six Americas***

Exhibit 19. Who's Causing Global Warming

Q4. Assuming global warming is happening, do you think it is…

	Nat'l Average	Alarmed (14%)	Concerned (31%)	Cautious (23%)	Disengaged (10%)	Doubtful (12%)	Dismissive (11%)
Caused mostly by human activities (V)	**50**	87	76	43	37	6	3
Caused by both human activities and natural changes (vol.)	**6**	5	9	7	5	3	0
Caused mostly by natural changes in the environment	**35**	8	15	45	41	79	55
None of the above because global warming isn't happening	7	0	0	4	11	10	36
Other	**2**	1	1	1	2	2	6
Don't know (vol.)	**1**	0	0	0	4	0	1

Source: ***Six Americas***

Exhibit 20. Are Humans The Cause?

The Earth's climate has changed naturally in the past, therefore humans are not the cause of global warming. (F)

	Nat'l Average	Alarmed (14%)	Concerned (31%)	Cautious (23%)	Disengaged (10%)	Doubtful (12%)	Dismissive (11%)
Definitely true	**9**	7	2	6	2	19	34
Probably true	**24**	6	11	36	10	53	43
Probably false	**29**	24	45	36	12	14	4
Definitely false	**20**	63	29	7	4	0	6
Don't know	**18**	1	14	16	73	14	13

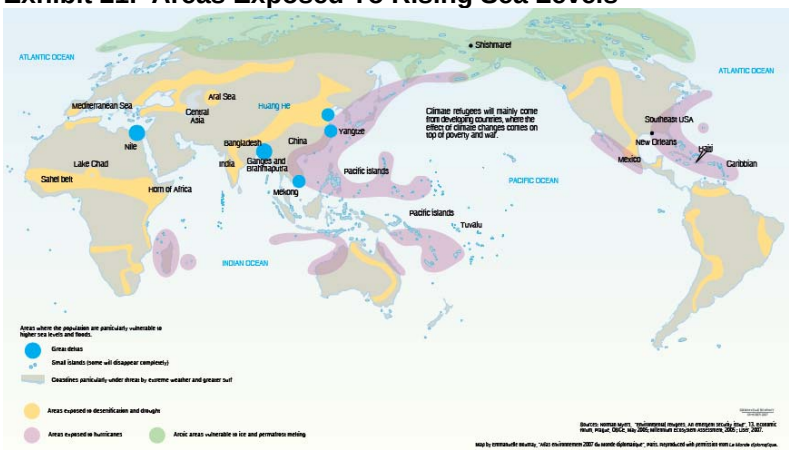
Source: ***Six Americas***

In 2005, the United Nations Environmental Program (UNEP) predicted that climate change would create 50 million 'climate refugees' by 2010

Attitudes about climate change and global warming may change more in the future as people come to understand that many of the dire predictions prove false. The most recent example involves a United Nations claim about the impact of climate change on the world's population. In 2005, the United Nations Environmental Program (UNEP) predicted that climate change would create 50 million 'climate refugees' by 2010. These climate refugees would be fleeing the ravages of rising sea levels, an increasing number and intensity of hurricanes and disruption to food production. UNEP even produced a map showing the places in the world most at risk from climate change.

On the map, those areas most at risk fall within the pink swaths and primarily include the islands of the world and certain coastal regions. Other areas at risk of environmental damage that will drive population to migrate are in yellow where desertification will occur. It was interesting reading comments attached to the blog. People who are very familiar with the topography of some of the areas that fall within both the pink and yellow swaths find serious problems with their inclusion since they do not have low coastlines or are mountainous areas.

Exhibit 21. Areas Exposed To Rising Sea Levels



Source: UNEP

Anthony Watts who discovered the scandal points out that the UN has wiped the forecast and map from its web site. He pointed out that the UN failed to account for Google Cache when it wiped its web site clean. Once published, an article is always out there. The controversy began when a reporter for the *Asian Correspondent* posed the question: "What happened to the climate refugees?" The reporter began citing the latest census data for a number of islands that fall in the pink swath and were destined to be the source of climate refugees. Bermuda, St. Lucia, the Seychelles and Solomon Islands have all had recent censuses that showed the population of everyone them grow rather than shrink over 2000 to 2010.

The controversy began when a reporter for the *Asian Correspondent* posed the question: "What happened to the climate refugees?"

After the story was reported by the *Asian Correspondent*, it was picked up my many media outlets. The story rapidly evolved from a review of the now bogus forecast to one about the UN's bungled attempt to wipe the story from its web site. As commentators pointed out, the UN people were either unaware of the ability of researchers to retrieve cached web pages or they were in such a hurry to rid their site they failed to learn how to erase information properly.

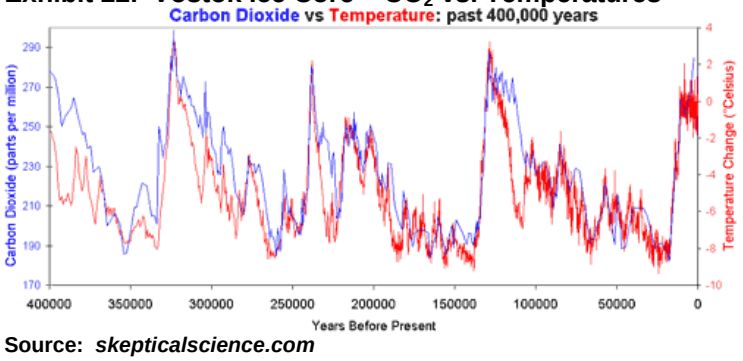
The amazing thing was that in February, University of California, Los Angeles professor Cristina Tirado spoke at a meeting of the American Association for the Advancement of Science (AAAS) saying that there would be 50 million environmental refugees by 2020. This projection supposedly was reported widely by the media in the blogosphere. Mr. Watts emailed Professor Tirado asking upon what basis she made her forecast in light of the failure of the same forecast to materialize in the past. He further questioned whether, in light of the UN's repudiation of the original forecast [by removing it from its web site], she was prepared to issue a retraction. So far there has been no response.

Mr. Watts emailed Professor Tirado asking upon what basis she made her forecast in light of the failure of the same forecast to materialize in the past

The global warming case continues to weaken as ice core data

shows that the increased concentration of CO_2 follows temperature changes rather than leads them.

Exhibit 22. Vostok Ice Core – CO_2 vs. Temperatures

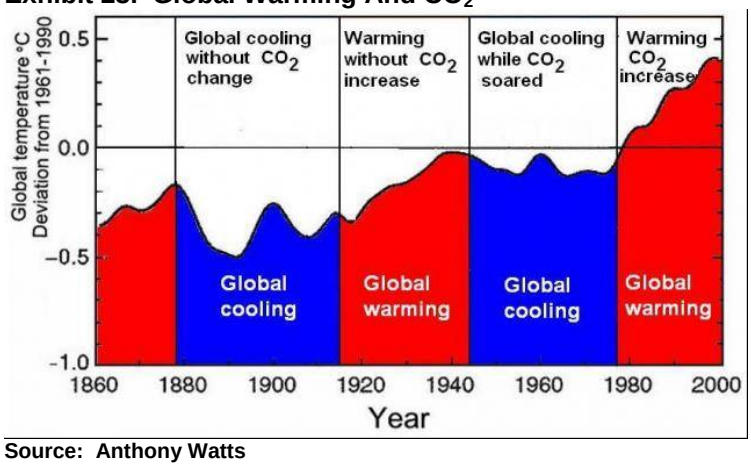


Source: ***skepticalscience.com***

Although the lag between CO_2 and temperature changes is about 600 years plus or minus 200 years, many scientists continue to support the case that the timing is so close as to be actually related. Moreover, these scientists link the two variables into a causal relationship, or a feedback loop. According to other scientists, temperature variations are due to changes in the path of the Earth around the Sun.

According to other scientists, temperature variations are due to changes in the path of the Earth around the Sun

Exhibit 23. Global Warming And CO_2



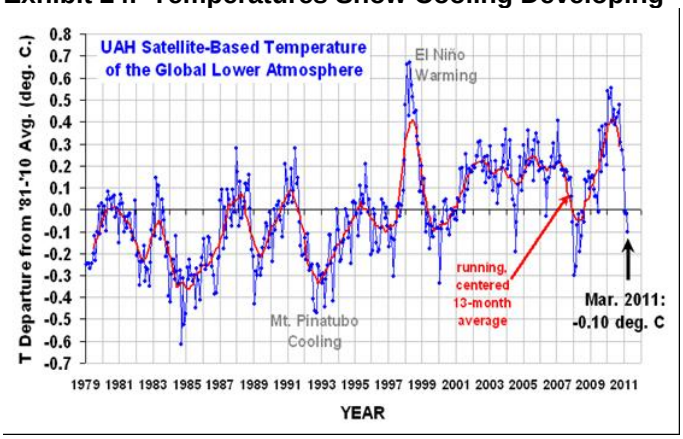
Source: Anthony Watts

A shorter time chart of temperature changes versus CO_2 is in Exhibit 23. It shows that in recent times there have been several periods marked by conflicting trends between temperature changes and levels of CO_2 concentration. While these relationships are difficult to comprehend, looking at recent temperature data is quite interesting, especially as the time examined lengthens.

In recent times there have been several periods marked by conflicting trends between temperature changes and levels of CO_2 concentration

The chart in Exhibit 24 shows that atmospheric temperatures are now falling and have for a sufficient length of time that the 13-month moving average is also now in a down trend. The March monthly

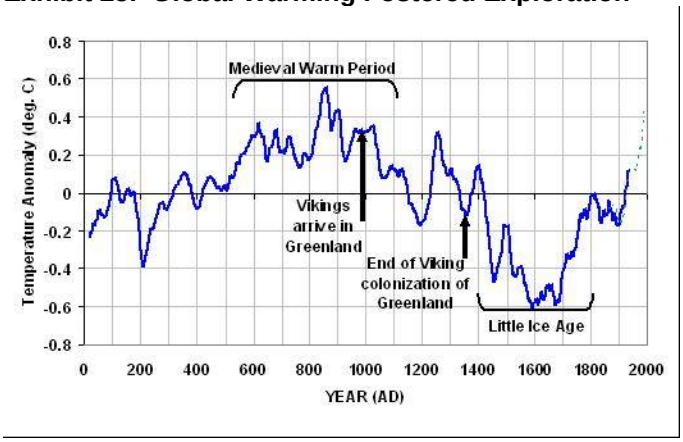
Exhibit 24. Temperatures Show Cooling Developing



Source: Roy Spencer

temperature is now below the long-term average temperature. So is the Earth moving into a cooling period?

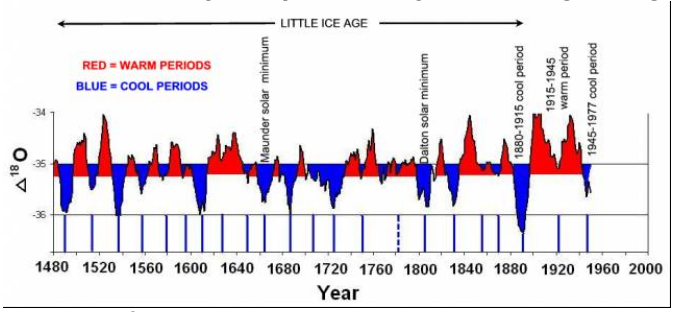
Exhibit 25. Global Warming Fostered Exploration



Source: Roy Spencer

The March temperature deviation is -0.1°C, which puts it into the territory of temperature deviations experienced during much of the

Exhibit 26. Many Temperature Cycles During Ice Age



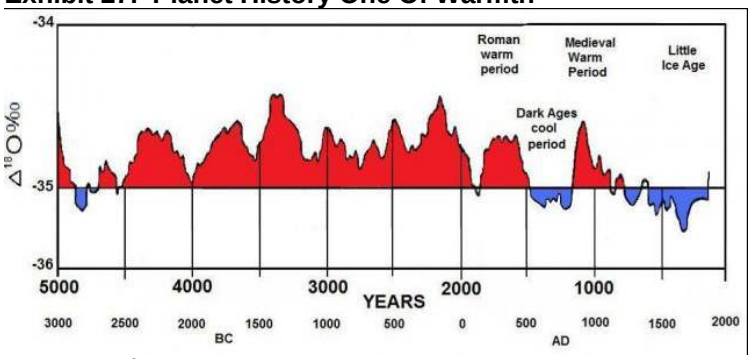
Source: Anthony Watts

1800s. But as seen in Exhibit 25, the temperature deviation went significantly lower during the period referred to as the Little Ice Age, extending from the 1400s to the 1800s.

Temperature variations were very frequent during the Little Ice Age

The interesting observation is that temperature variations were very frequent during the Little Ice Age. In fact, there were about 40 shifts between warming and cooling periods during this extremely lengthy cold temperature period.

Exhibit 27. Planet History One Of Warmth

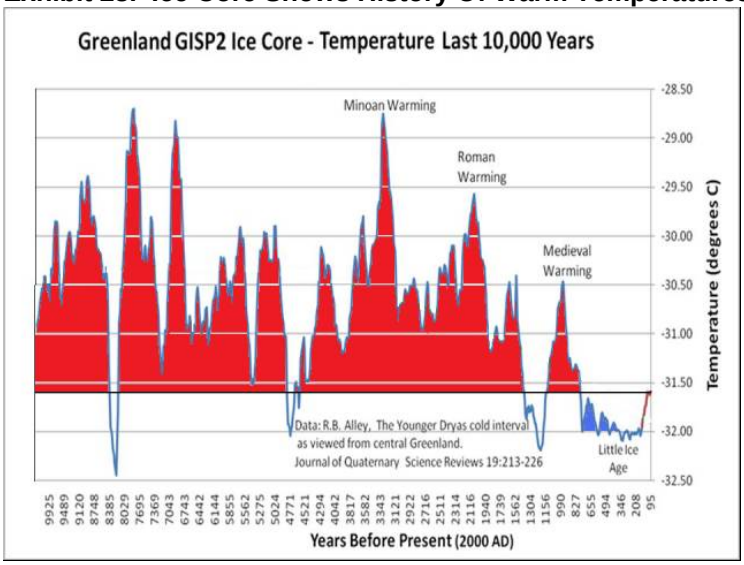


Source: Anthony Watts

These warm temperatures existed without high concentrations of carbon dioxide associated with the burning of fossil fuels

What becomes very interesting is that when one looks at temperatures over a much longer period – 5,000 years – it becomes evident that warmer temperatures were the Earth's norm. As we know, these warm temperatures existed without high concentrations of carbon dioxide associated with the burning of fossil fuels.

Exhibit 28. Ice Core Shows History Of Warm Temperatures



Source: Roy Spencer

The history of the Earth's temperatures for the past 10,000 years

shows that for most of that time, at least as measured by the ice core taken from Greenland, the planet was warm.

Dr. Spencer wrote: "The idea that government-funded climate research is unbiased is laughable"

Since the Climategate emails were released, the link between funding for climate change research and the outcome of the research has become more apparent. In a paper authored by Roy Spencer, a PhD in meteorology and the principal research scientist at the University of Alabama at Huntsville, he said that he knows of zero studies funded by oil and coal companies, which is a favorite charge of climate change proponents. Dr. Spencer wrote: "The idea that government-funded climate research is unbiased is laughable. The push for ever increasing levels of government regulation and legislation, the desire of government managers to grow their programs, the dependence of congressional funding of a problem on the existence of a 'problem' to begin with, and the United Nations' desire to find reasons to move toward global governance, all lead to inherent bias in climate research." Funding for research into the climate problem is facing increasing challenges from budget-cutters in Congress. Continued economic problems will have a greater impact on the public's attitudes about future risks from global warming or climate change. Contrary to former Vice President Al Gore, the debate isn't over – largely because the climate change proponents are being forced to retreat.

Water Concerns Trump Climate Change – Gallup Poll

Americans are much more concerned with issues of water as compared to climate change

In preparation for Earth Day, the Gallup organization conducted a poll of Americans in early March to understand their views toward a series of environmental issues. The results were somewhat surprising, but reflect an underlying shift in environmental concerns among Americans. The poll showed that by a wide margin, Americans are much more concerned with issues of water as compared to climate change.

Gallup's 2011 Environmental poll shows that three in four Americans worry a great deal or a fair amount about contamination of soil and water by toxic waste, pollution of rivers, lakes and reservoirs, pollution of drinking water and the maintenance of the nation's supply of fresh water for household needs. Air pollution concerns ranked nearly as high as water, but only just over half the people surveyed were concerned about climate change.

Americans are less worried today than they were 10 years ago about all eight issues Gallup measured in 2001

As the poll was conducted during March 3-6, prior to the emergence of the earthquake- and tsunami-generated nuclear crisis in Japan that has raised Americans' concerns about nuclear power. Despite the recent concern over nuclear power, the poll also showed that Americans are less worried today than they were 10 years ago about all eight issues Gallup measured in 2001.

Exhibit 29. Water Concerns Greater Than Climate Change

Degree to Which American Worry About Environmental Problems, 2011 vs. 2001
% Great deal/Fair Amount

	March 2001 %	March 2011 %	Change Pct. Pts.
Pollution of drinking water	88	77	-11
Pollution of rivers/lakes/reservoirs	87	79	-8
Contamination of soil/water from toxic waste	85	79	-6
Air pollution	82	72	-10
Loss of tropical rain forests	76	63	-13
Species extinction	73	64	-9
Urban sprawl and loss of open space	69	57	-12
Global warming^	63	51	-12

^2001 wording: "the greenhouse effect or global warming"

Source: Gallup, PPHB

Exhibit 30. Environmental Concerns In Decline

Degree to Which Americans Worry About Environmental Problems
I'm going to read you a list of environmental problems, As I read each one, please tell me if you personally worry about this problem a great deal, a fair amount, only a little, or not at all.

	Great deal/ Fair amount %	Not much/ Not at all %
Contamination of soil and water by toxic waste	79	20
Pollution of rivers, lakes, and reservoirs	79	22
Pollution of drinking water	77	23
Maintenance of the nation's supply of fresh water for household needs	75	24
Air pollution	72	28
Extinction of plant and animal species	64	36
The loss of tropical rain forests	63	35
Urban sprawl and loss of open spaces	57	42
Global warming	51	48

March 3-6, 2011

Source: Gallup, PPHB

Global warming surprisingly was the lowest ranked environmental concern of the eight measured by Gallup

Global warming surprisingly was the lowest ranked environmental concern of the eight measured by Gallup in 2001 with only slightly over six in ten Americans worrying a great deal or a fair amount. As more and more evidence emerges of the questionable use of climate data and the repeated failures of dire societal and environmental forecasts, we expect that future Earth Day celebrations will show further declines in American concerns about those issues. .

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