
MUSINGS FROM THE OIL PATCH

November 20, 2012

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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

Canada, O Canada: What Direction For 2013 O&G Capex?

The highlight of the meeting was the presentation of the PSAC Canadian drilling activity forecast for 2013

A couple of weeks ago, we participated in the annual Petroleum Services Association of Canada (PSAC) drilling forecast outlook meeting in Calgary. I, along with a colleague, spoke about the outlook for the Canadian service industry, while other speakers discussed issues impacting the producing sector up north, but the highlight of the meeting was the presentation of the PSAC Canadian drilling activity forecast for 2013. To help set the stage for that forecast, besides the presentations mentioned, there was a 2013 outlook for the producing sector presented by a representative of the Canadian Association of Petroleum Producers (CAPP). In their respective presentations, both CAPP and PSAC gave estimates for 2013 capital spending by the Canadian petroleum industry.

“The capital spending drought in the Canadian oil patch looks headed for a second successive year, as weak commodity prices, shrinking cash flows and an uncertain future have oil executives set to tighten again in 2013”

That morning, and we assume in anticipation of the industry forecasting session, *The Globe and Mail's* business section had an article about petroleum capital spending for next year that carried the headline: “Austerity Hits Oil Patch’s Capital Spending Budgets.” The thrust of the article can be summed up in the one-sentence opening paragraph. It stated: “The capital spending drought in the Canadian oil patch looks headed for a second successive year, as weak commodity prices, shrinking cash flows and an uncertain future have oil executives set to tighten again in 2013.” The article was reinforced with comments from two financial economists who have concluded Canada’s petroleum industry capital spending will fall next year.

As we sat in the audience following our talk and listened to the CAPP and PSAC presentations, we were reminded by our colleague of a phrase one of our early bosses used to repeat frequently. “Hope is not a strategy.” With that as a backdrop, what should be expected for Canadian petroleum industry capital spending in 2013?

In 2011, the Canadian industry spent an estimated C\$16.2 billion on drilling and competing wells, which is projected to fall slightly to C\$15.6 billion this year but jump in 2013 to C\$17.3 billion

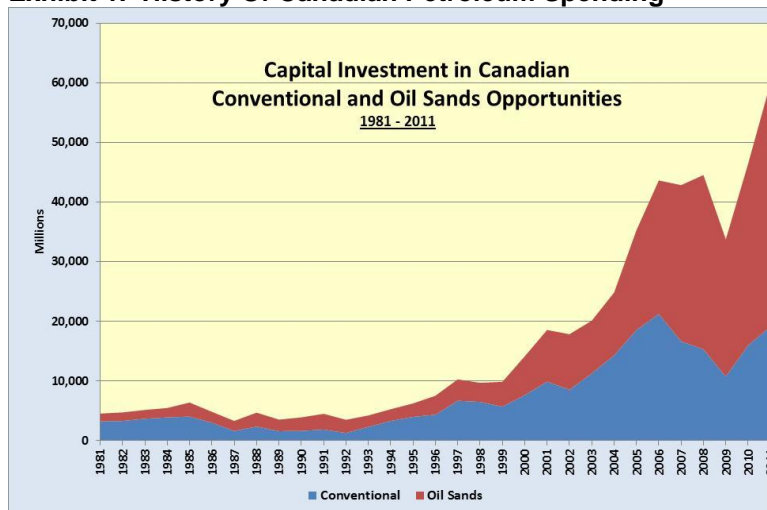
It appears Mr. Tertzakian and CAPP focus on the capital investment undertaken by all sectors of the Canadian petroleum industry – conventional oil and gas and oil sands operations – while PSAC looks exclusively at conventional drilling activities

The CAPP speaker presented a slide about industry capital spending showing actual spending by various geographic regions for 2011, an estimate of spending for 2012 and a 2013 spending forecast. According to the CAPP slide, the industry spent C\$62 billion in 2011 but trimmed this year's spending to an estimated C\$61 billion. Spending is forecasted to rise to C\$63 billion next year. PSAC also addressed industry spending plans, but focused on spending to drill and complete wells, which is most appropriate given their focus on drilling activity. According to PSAC, drilling and completion spending fell from C\$16.0 billion in 2008 to C\$8.8 billion in 2009, but then rebounded to C\$13.9 billion in 2010 as the financial crisis with its liquidity challenges and recessionary environment cut energy demand and limited producer spending. In 2011, the Canadian industry spent an estimated C\$16.2 billion on drilling and competing wells, which is projected to fall slightly to C\$15.6 billion this year but jump in 2013 to C\$17.3 billion.

So what we have between these two presentations is either a 3.3% or a 10.9% spending increase in 2013. This compares with *The Globe and Mail's* quoting Arc Financial's economist Peter Tertzakian's estimate of a "10 to 15 per cent" decline in industry spending in 2013. His forecast follows his estimated nearly 20% decline in industry capital spending for 2012. Is it possible to rationalize these conflicting outlooks? Part of the explanation relates to the definition of capital spending the various forecasters are using. It appears Mr. Tertzakian and CAPP focus on the capital investment undertaken by all sectors of the Canadian petroleum industry – conventional oil and gas and oil sands operations – while PSAC looks exclusively at conventional drilling activities.

To try to understand Canada's petroleum capital spending we went to CAPP's statistics and examined the spending history by category for both conventional oil and gas and oil sands. If we exclude spending on land and enhanced oil recovery investments, we arrived at an estimated industry spending total that was approximately equal to the estimate given by CAPP: C\$60 billion, our estimate, versus C\$62 billion, CAPP's estimate for 2011. Spending on land amounted to about C\$4.4 billion that year, which would make our estimated total spending nearly C\$2.5 billion more than CAPP's estimate. While we always like to get our numbers as accurate as possible, the important thing is to get close and to have an historical record. Our work allowed us to chart Canadian petroleum capital spending by conventional oil and gas activities and oil sands investments historically. (See Exhibit 1 on the next page.)

What we see in Exhibit 1 is that Canadian spending on oil sands projects has exploded in recent years in concert with the dramatic rise in global oil prices and the increased flow of investment funds, especially from foreign entrants, for new oil sands projects. With weakening oil prices and slowing oil demand growth in North America, coupled with rising operating and investment costs, the

Exhibit 1. History Of Canadian Petroleum Spending

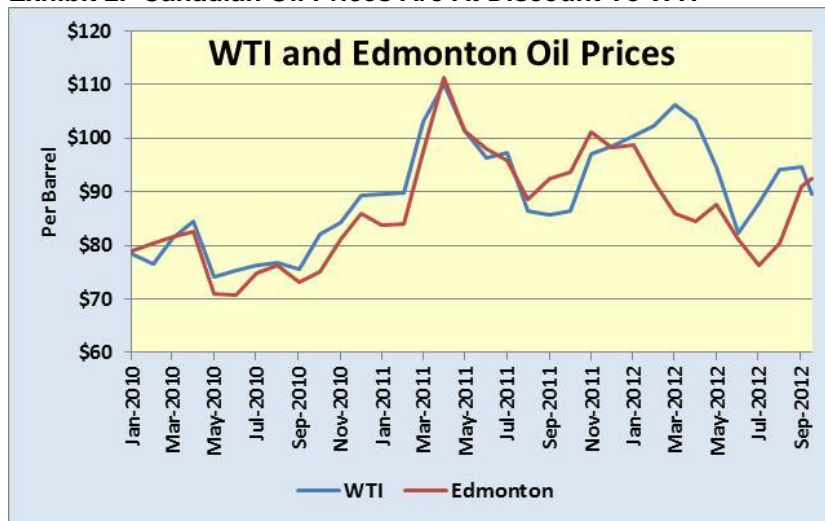
Source: CAPP, PPHB

Delays in sanctioning new oil sands projects will be a part of the industry investing environment for 2013

economics of new oil sands projects has deteriorated. We have seen several major Canadian oil and gas companies, including a leading oil sands producer, announce reductions in capital spending plans for the balance of this year and next. Delays in sanctioning new oil sands projects will be a part of the industry investing environment for 2013 that may create a transitory capital spending dip. Cuts in conventional exploration and development spending will also be a factor in 2013 due to low oil and gas prices in Canada.

A summer article in *The Globe and Mail*, when the price gap was about \$20 per barrel, suggested the discount was costing Canadian producers about C\$50 million per day

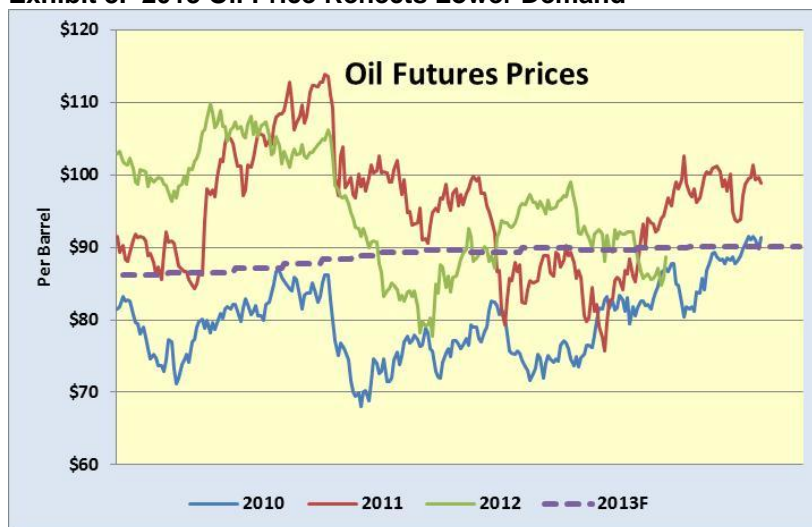
In *The Globe and Mail* article, Mr. Tertzakian said he based his forecast for a meaningful capital spending reduction next year on his view of future oil and gas prices. Not only is he projecting lower oil prices for 2013, but the widened price gap between western Canadian oil prices and West Texas Intermediate (WTI) prices in recent months has contributed to a significant loss of cash flow for Canadian producers. A summer article in *The Globe and Mail*, when the price gap was about \$20 per barrel, suggested the discount was costing Canadian producers about C\$50 million per day. That represents nearly C\$350 million of lost income per week, or about C\$1.4 billion per month. To see how this gap has developed, we plotted the average monthly price per barrel posted by three major Canadian producers in Western Canada against the average monthly price for WTI futures prices. As shown in Exhibit 2, there was a modest discount between Canadian and WTI oil prices in 2010 and early 2011. That gap closed during the first half of 2011, but for most of the second half Canadian oil prices actually exceeded WTI. Things changed dramatically in 2012 with Canadian oil prices falling to a wide discount from WTI, but the price gap closed in September and October. With rapid growth in U.S. crude oil production and only a modest demand increase, it is likely the Canadian oil price gap will re-open in 2013. It already appears to be widening here in November

Exhibit 2. Canadian Oil Prices Are At Discount To WTI

Source: CAPP, EIA, PPHB

For 2013, oil prices will be well below 2012's price trend meaning lower cash flows for the U.S. producing industry and even less for Canadian producers

Complicating the exercise in estimating Canadian producer cash flows is the expectation that in 2013 WTI oil prices will be well below the level of 2012 oil prices. Exhibit 3 shows WTI futures prices for 2010 through early November 2012. We have also plotted the WTI futures prices for December 2012 as of a week ago, and for all of 2013. As can be seen by observing the dotted line (purple) for 2013, oil prices will be well below 2012's price trend meaning lower cash flows for the U.S. producing industry and even less for Canadian producers if the price gap remains as wide as it currently is. This lost income from lower prices will not be offset by increased production next year.

Exhibit 3. 2013 Oil Price Reflects Lower Demand

Source: EIA, PPHB

We believe they will be very reluctant to step up spending beyond the winter drilling season

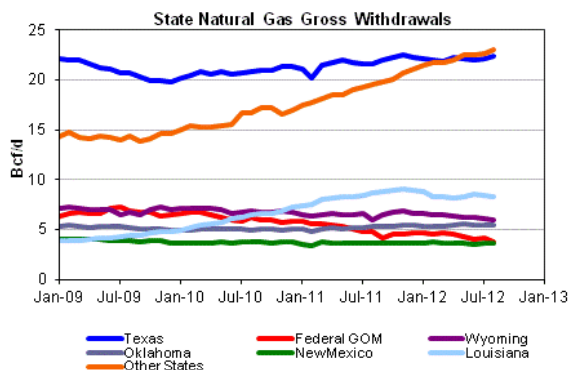
The conclusion we draw from this exercise is that we are more comfortable with the prospect of flat to lower Canadian petroleum industry capital spending in 2013. We don't know whether Canadian producers will announce large capital spending reductions when they outline their plans for next year, but we believe they will be very reluctant to step up spending beyond the winter drilling season. Spring break-up will provide producers an opportunity to reassess their outlook for oil and gas prices and economic demand. A sharply improved outlook some 5-6 months in the future could make the CAPP and PSAC forecasts come true, but at the moment we will take the "under" bet on those forecasts.

Is The Oilfield Service Industry Staring At The Up Escalator?

Texas accounted for 29.3% of the nation's total gas output in August

As shown in Exhibit 4, Texas is the number one natural gas producing state in America. According to the Form 914 monthly natural gas production survey for August (latest data available), Texas produced 22.41 billion cubic feet of gas a day. Texas accounted for 29.3% of the nation's total gas output in August, 30.9% of Lower 48 gross gas output, but importantly 32.6% of Lower 48 land gas production. As shown in the chart, Texas has only recently been surpassed in natural gas output by the collective production of all the remaining states in the U.S. except for Oklahoma, New Mexico, Wyoming and Louisiana, and the volume of gas coming from the Federal waters of the Gulf of Mexico.

Exhibit 4. Texas Most Important Gas Producer



Source: Energy Information Administration

Source: EIA

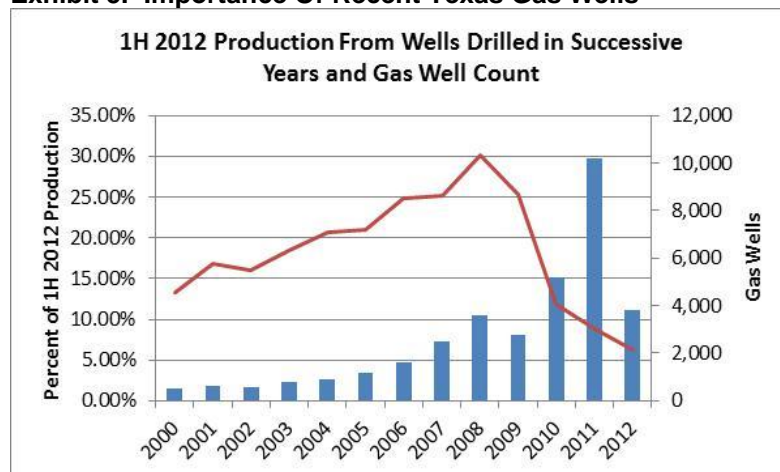
Some analyses have shown that unless the petroleum industry continues to add producing gas wells in shale basins, production from existing wells drops rapidly

As the gas shale revolution has swept the U.S., one concern has been the sustainability of gas output from shale wells. Some analyses have shown that unless the petroleum industry continues to add producing gas wells in shale basins, production from existing wells drops rapidly. Recently, consulting geologist Art Berman examined the production of gas wells in Texas, home to several important shale plays. Mr. Berman prepared a chart (Exhibit 5 on the next page) showing the percentage of first half of 2012's gas

Almost 30% of current Texas gas production comes from wells that first produced in 2011

output in Texas that came from wells drilled in the years since 2000. Since the column representing 2012 reflects only the output from the first half of the year, it is not surprising that it is only a fraction of the height of the column representing production from 2011 and 2010. As the chart shows, almost 30% of current Texas gas production comes from wells that first produced in 2011. Generally, what the chart demonstrates is an upward sloping curve of well contribution to current production as we move closer to the present. We decided to add a line (red) showing the annual number of natural gas wells drilled as reported by the Texas Railroad Commission web site. The peak in gas wells drilled occurred in 2008 while the peak in current gas output contribution was in 2011. This lag reflects the timing between drilling of wells and their completion and production. During 2008-2011 there was generally a shortage of hydraulic fracturing equipment meaning that wells typically had long waits between drilling and completion and production.

Exhibit 5. Importance Of Recent Texas Gas Wells

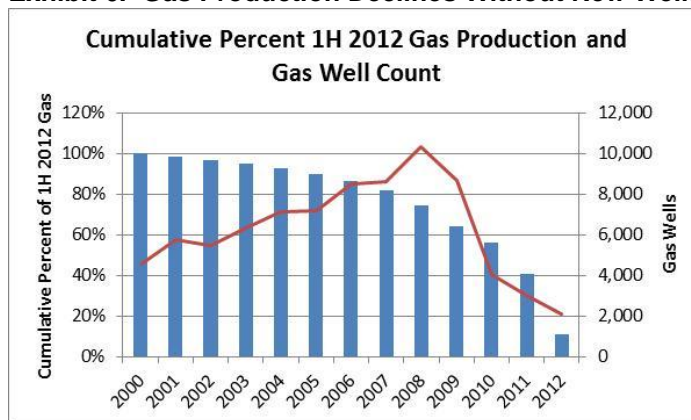


Source: Art Berman, PPHB

The significance of this analysis is that 56% of current Texas natural gas production comes from wells drilled in the last 30 months

Another way of looking at the data is by the cumulative percent by year of production that is represented in the first half of 2012 gas production volumes. (Exhibit 6.) The significance of this analysis is that 56% of current Texas natural gas production comes from wells drilled in the last 30 months. Fully 75% of total gas output comes from wells drilled in the last 54 months, and less than 20% comes from wells drilled before 2008. Increasingly, we are relying on gas output from new wells as older wells have declined to such low volumes that collectively they are becoming marginal contributors.

The significance of Mr. Berman's recent Texas gas production analysis, which he has supported with a similar analysis of the production performance of Barnett shale wells, is that it confirms observations he made two and a half years ago in a presentation. Not only does it confirm those projections, but the data shows the current situation to be worse than projected. We suspect what has

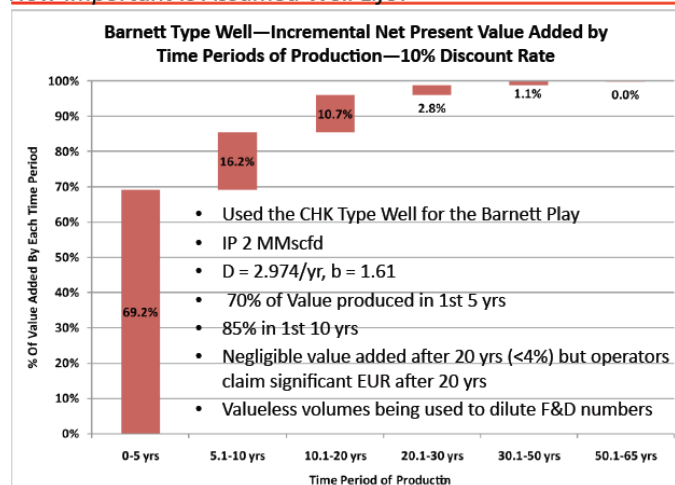
Exhibit 6. Gas Production Declines Without New Wells

Source: Art Berman, PPHB

made the current situation worse is that producers have embraced using more hydraulic fracture stages per well, which drains reserves faster leading to sharply lower future production volumes.

As the Texas data suggests, more than 75% of the production has come in the first five years with over 85% of it delivered within the first six and a half years

In Exhibit 7, we show a slide from Mr. Berman's SPEE presentation made in February 2010. We could have selected several of his well production graphs, but this chart summarizes his questions for the bullish view of gas shale production. A principle assumption is the long life of producing wells, even though they add little production and, based on the time value of money, little economic value for the play. As the notes on Mr. Berman's slide suggest, 70% of the value of gas shale wells is produced in the first five years with 85% is produced within ten years. As the Texas data suggests, more than 75% of the production has come in the first five years with over 85% of it delivered within the first six and a half years.

Exhibit 7. An Optimistic And Prescient Scenario
How Important Is Assumed Well Life?

Source: Art Berman, SPEE, Feb. 2010

Allowing production to fall and prices to rise will be the only way to re-educate gas buyers as to the rules of supply and demand, which many people think have been overturned

Based on this analysis, it is very likely that producers are facing the prospect they soon will have to step up their gas drilling efforts in order to sustain production levels. While they may not do that in the near term, opting instead to let production fall in order to drive up gas prices. The one bad thing for producers that has come from the American gas shale revolution is that consumers are beginning to institutionalize the concept of growing gas volumes with continued low gas prices. Allowing production to fall and prices to rise will be the only way to re-educate gas buyers as to the rules of supply and demand, which many people think have been overturned. The oilfield service industry is likely staring at the up escalator of future drilling and completion work, although they probably can't see it for the downward pressures of current activity declines and fierce price competition. Companies with liquefied natural gas (LNG) export terminal applications pending before the Federal Energy Regulatory Commission (FERC) may want to reconsider how much effort they spend on these soon-to-be white elephant facilities.

Demographics Dictate World's Future Economy Will Slow

The fiscal cliff impact could doom the U.S. economy to a third straight year of progressively slower growth

The Washington political world is attempting to thrash out a financial and economic plan that will allow the United States to avoid going over the "fiscal cliff" at year-end when virtually all our existing tax reductions end, some new taxes are imposed and mandatory military and non-defense spending reductions are implemented resulting in a \$607 billion hit to the economy. The official government forecasts for the economic impact of going over the cliff and not finding a solution are that GDP growth would be cut by 0.5% from the fourth quarter of 2012 to the fourth quarter of 2013. As a result, the unemployment rate would rise by more than a full percentage point from 7.9% now to 9.1% at the end of 2013. Due to the way the spending cuts and tax increases are phased in, the quarterly impact in the first part of 2013 will push the U.S. into a recession, which will further undermine economic growth expectations, which at the moment call for 2.0% growth in 2013. The fiscal cliff impact could doom the U.S. economy to a third straight year of progressively slower growth.

While the media two-weeks ago was focusing on the public statements of President Barack Obama and Speaker of the House of Representatives John Boehner (Rep-Ohio) about how to fix the fiscal cliff issue and the shocking news of the resignation of CIA Director David Petraeus, the Organization for Economic Cooperation and Development (OECD) issued a report on the long-term economic implications of a graying planet, and in turn their meaning for global energy markets. The OECD is an organization of 34 countries including all the major industrialized nations so what they conclude about their economic trajectory needs to be assessed.

According to the report, "Looking to 2060: Long-Term Global Growth Prospects," "Aging will be a drag on growth in many countries, while

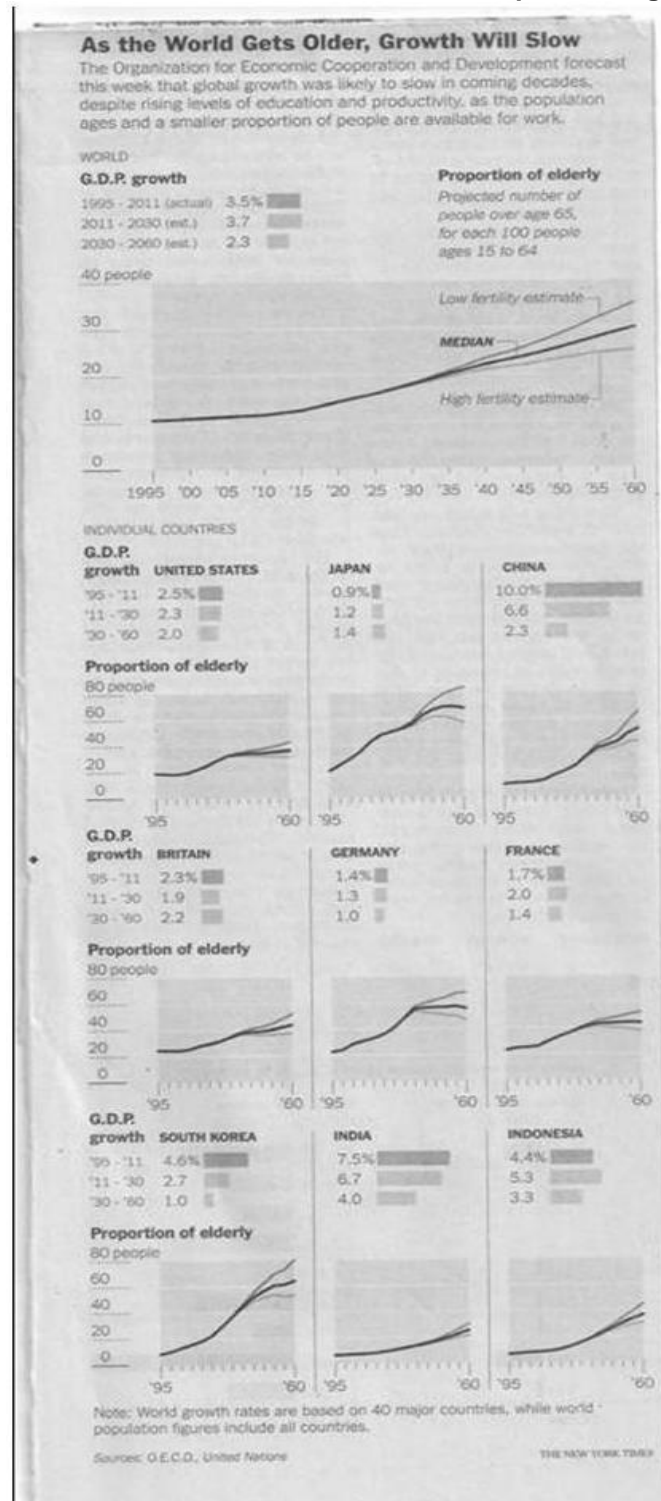
The forecasts suggest a re-ordering of the global economic powerhouses, but more importantly, the implications of the altered growth paths for various countries could have a meaningful impact on global immigration policy

Every other country shows that its long-term pace will trail its historical growth record

improvements in education will sustain it.” Floyd Norris of *The New York Times* examined the report in a recent column and concluded that the forecasts suggest a re-ordering of the global economic powerhouses, but more importantly, the implications of the altered growth paths for various countries could have a meaningful impact on global immigration policy. The issue of aging, which is an aspect of the study of demographics, focuses on a variable we have discussed in the past because a nation’s population represents one of its key resources and, in turn, helps dictate how a country may grow. In the Author’s Note to his book, *The Next 100 Years*, George Friedman, the head of strategy consultant *Stratfor*, made the point that in his book he was trying to “transmit a sense of the future.” He admits that he will get many details wrong in his forecasts, especially as the reader demands greater detail about events or trends further into the future. He went on to say, however, “...the goal is to identify the major tendencies – geopolitical, technological, demographic, cultural, military – in their broadest sense, and to define the major events that might take place.” It is interesting to note how much demographics play in the multiple scenarios for the future that Mr. Friedman sets forth, supporting the idea that a nation’s current and future population will drive government policy and actions.

Mr. Norris’s *New York Times* article was accompanied by a series of charts (see Exhibit 8 on the next page) showing the overall growth of the population based on three different birth-rate projections for a select group of important countries that play strategic roles in various geopolitical regions. The charts show their economic history (1995-2001) for these countries and their projected GDP growth rates for two future periods – 2011-2030 and 2030-2060. Of all the countries, only Japan shows a steadily increasing, albeit weak, economic growth rate for the entire forecast period, but that comes after what must be considered an abysmal 15-year economic growth record for 1995-2011. Every other country shows that its long-term pace will trail its historical growth record.

Exhibit 8. Global Growth To Slow As Population Ages

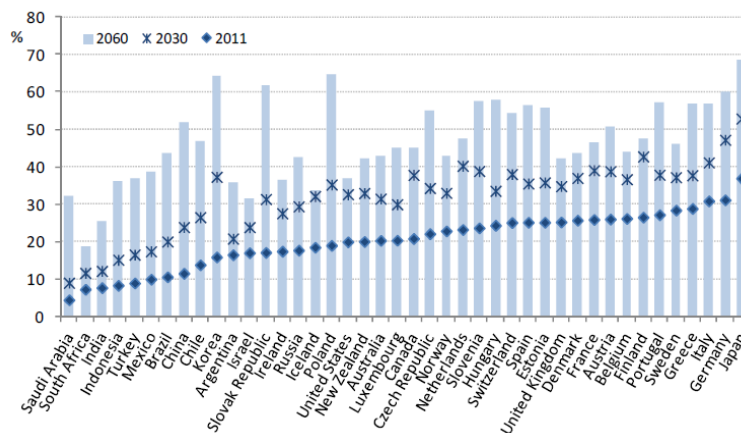
Source: *The New York Times*

The United States has the eighth youngest population by 2060 after starting out in 18th place in 2011

In concluding that the United States will be the major winner in the global struggles that will dominate this century, Mr. Friedman believes a key strength is our relatively younger population compared with our primary economic and political counterparts. That reality can be seen in a chart from the OECD report. (Exhibit 9.) The chart calculates the per cent of a nation's population older than 65 as a share of its population aged 15-64. In other words, how will the burden of an aging population weigh on a country's economic future? The three countries with the oldest populations in 2011 were Japan, Germany and Italy, and they are the three columns on the very right edge of the chart. The chart's far right side is dominated by European countries. By 2030, Japan and Germany remain the oldest of the 34 populations. By 2060, Germany falls to fifth oldest after Japan, Poland, Korea and the Slovak Republic. Interestingly, the United States (the column immediately to the right of Poland) has the eighth youngest population by 2060 after starting out in 18th place in 2011. A young population, coupled with an abundance of natural resources and geographic protection by ocean borders, should ensure a bright long-term outlook for our nation.

Exhibit 9. Aging Populations Drive Economic Performance

Per cent of the population older than 65 as a share of population aged 15-64



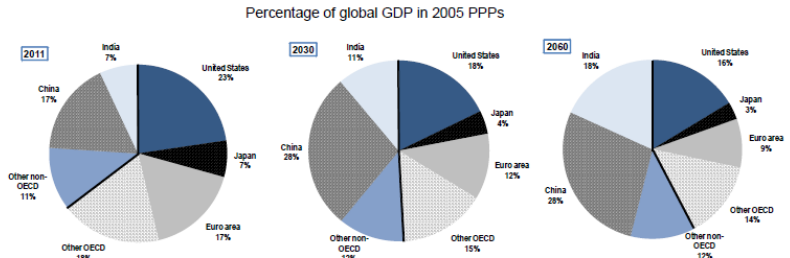
Source: OECD

China's old-age dependence ratio, which is the number calculated from the age chart, goes from 11.3 in 2011 to 39 in 2060, which is almost exactly the ratio in the UK and above the 34.6 ratio of the United States at that point

A country like China, which is younger than the United States now and will continue to be in 2030, that becomes significantly older by 2060 will still have an economy that represents a significant share of global GDP. Mr. Norris points out that China's old-age dependence ratio, which is the number calculated from the age chart, goes from 11.3 in 2011 to 39 in 2060, which is almost exactly the ratio in the UK and above the 34.6 ratio of the United States at that point. But when we look at the trajectory of economic contribution, China is the big winner. From 17% of global GDP in 2011, China's share rises to 28% by 2030 and remains at that level in 2060. The major economic winner, however, is India, which increases its share of global GDP from 7% to 18% by 2060. The U.S., Europe and Japan

all lose market share to the developing nations, falling collectively from 47% of the global economy in 2011 to only 28% by 2060.

Exhibit 10. India Is Big Economic Winner



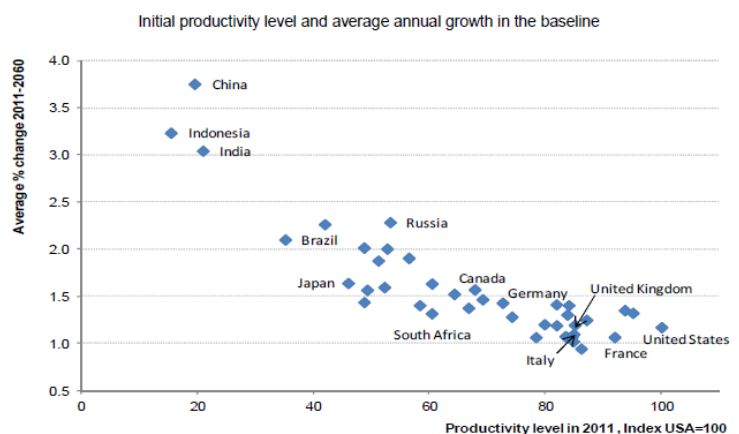
1. Global GDP is taken as sum of GDP for 34 OECD and 8 non-OECD G20 countries.

Source: OECD

The Chinese and Indian economies began the forecast period with about 20% of the productivity of the U.S. economy, but their average annual rate of productivity increase is expected to be three to three and a half times that of the U.S. over the next 50 years

One of the reasons the economic outlook is different than that implied by the progression in the aging of populations is the impact of labor force productivity. The OECD report contained an interesting chart (Exhibit 11.) showing how all the countries compared versus the United States over 2011-2060. To understand how the Chinese and Indian economies can increase their global GDP share, one only needs to look at their relative productivity rating compared to that of the United States. These two developing economies began the forecast period with about 20% of the productivity of the U.S. economy, but their average annual rate of productivity increase is expected to be three to three and a half times that of the U.S. over the next 50 years. As a result, China and India should grow their economies significantly faster than the U.S. and, as a result, gain a substantially greater share of the world's GDP.

Exhibit 11. Productivity Growth Boosts China And India



1. PMR regulations are hypothetically eased in restrictive countries to gradually reach the current OECD average.

Source: OECD

He carries that theme further by suggesting increased immigration from less developed economies around the world to the well-developed European, U.S. and even Japanese economies could alter the growth trajectory of those latter countries

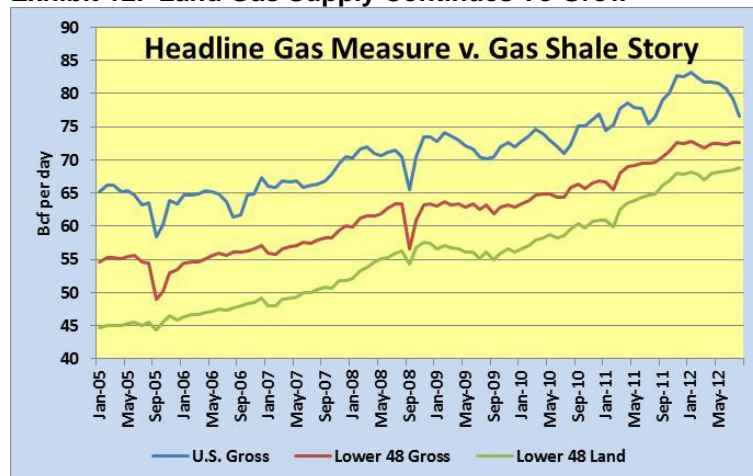
Mr. Norris points out that the one thing that could make these forecasts wrong is an increase in immigration. As he puts it, "For South Korea, which now seems to be on course to rival Japan as one of the oldest – and slowest-growing – countries in the world by late in this century, an obvious source of new workers would be the much younger North Korea, if politics ever made that possible." He carries that theme further by suggesting increased immigration from less developed economies around the world to the well-developed European, U.S. and even Japanese economies could alter the growth trajectory of those latter countries. He concludes with an observation that has a growing relevance given today's debate over the political and economic impacts of our immigration policy, "Perhaps the politics of that [changing the immigration policy] will change someday, as young immigrants are viewed not as competitors for limited employment opportunities but as sources of tax revenue to help support aging populations." If that sentiment is embraced by citizens in the U.S., then possibly the slow-growth economy currently envisioned for the foreseeable future will prove an overly conservative forecast, meaning that energy demand in this country will grow faster than presently anticipated.

Natural Gas Industry May Give Up Waiting For Godot

The latest Form 914 gas production survey showed a significant reduction in gross U.S. natural gas production for August

The latest Form 914 gas production survey conducted monthly by the Energy Information Administration (EIA) showed a significant reduction in gross U.S. natural gas production for August. Initially this was viewed positively by gas industry participants who have been waiting for a meaningful decline in production following the dramatic decline in gas-oriented drilling that began just over a year ago. The headline gas numbers demonstrate how important it is to look below the surface (no pun intended) to find out what is really happening with natural gas production.

Exhibit 12. Land Gas Supply Continues To Grow

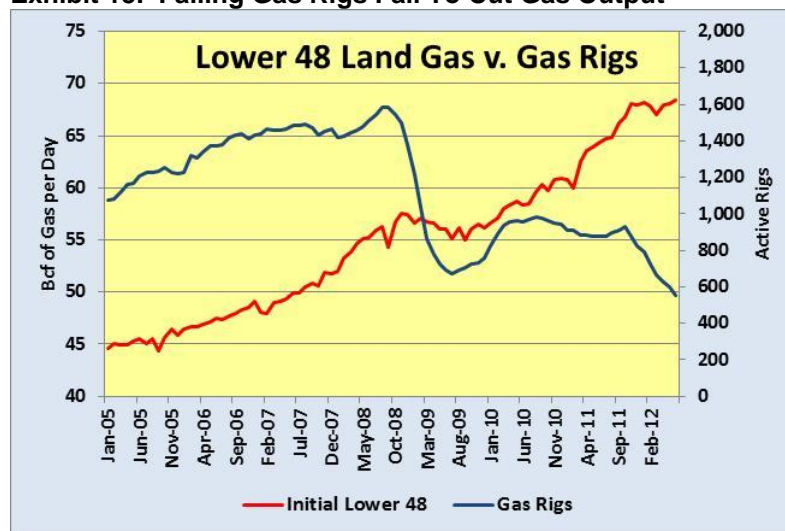


Source: EIA, PPHB

The total U.S. gas production decline reflected a fall in Alaskan natural gas output in August

As shown in Exhibit 12, if one only paid attention to the natural gas production for the entire United States, then he would think the decline in dry gas drilling has finally produced the desired effect of cutting production. Between July and August based on the initial monthly production estimate, total U.S. gas output declined by 2.64 billion cubic feet a day (Bcf/d). If we look, however, at just the Lower 48 states production, there was virtually no decline between the two months. That means the total U.S. gas production decline reflected a fall in Alaskan natural gas output. In fact, Alaskan production did fall by 2.63 Bcf/d.

Exhibit 13. Falling Gas Rigs Fail To Cut Gas Output



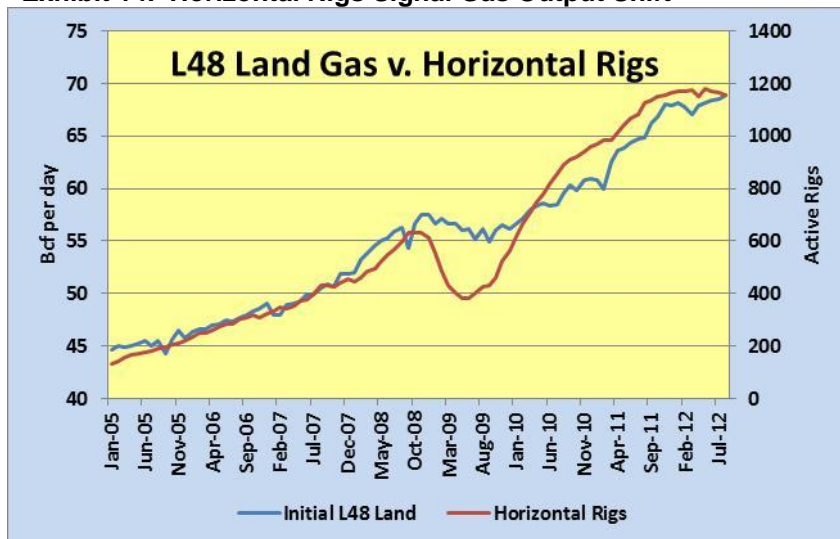
Source: EIA, Baker Hughes, PPHB

Lower 48 land gas output actually rose in August by 0.3 Bcf/d, signaling that associated gas output from the industry's focus on crude oil and wet gas liquids has actually boosted total gas volumes

For those gas industry folks who have been waiting for the gas-oriented drilling cutbacks to stop gas production from growing, their wait will continue. As the figures show, Lower 48 gas production barely fell in August, declining by only 0.02 Bcf/d. That decline was attributable to lower Gulf of Mexico production as Lower 48 land gas output actually rose in August by 0.3 Bcf/d, signaling that associated gas output from the industry's focus on crude oil and wet gas liquids has actually boosted total gas volumes. The decline in dry gas-oriented drilling shows no signs of stopping the growth of gas production as shown by the chart in Exhibit 13, meaning we will probably need a cut in oil drilling before the natural gas market can become healthier.

There may be some hope on the horizon for the gas market when we look at the trend in active horizontal drilling rigs and Lower 48 land gas output (Exhibit 14 on the next page). Through August, there has been a noticeable flattening in the trend of active horizontal rigs and actually a small decline in the count during the summer. Since August, the average monthly number of active horizontal drilling rigs has declined every month suggesting that we

Exhibit 14. Horizontal Rigs Signal Gas Output Shift



Source: EIA, Baker Hughes, PPHB

A production decline arriving now would be a very welcome event

may be on the cusp of a gas production decline this fall. A production decline arriving now would be a very welcome event as it would coincide with rising seasonal gas demand as we head into the winter heating season, suggesting meaningfully higher natural gas prices over the next few months. Is it possible Godot arrived and no one recognized him?

If You Believe The IEA, Our Energy Worries Are Over

The IEA published a study suggesting that by 2015 the United States will become the world's largest gas producer and by 2017 the largest oil producer if one includes crude oil, natural gas liquids and biofuels

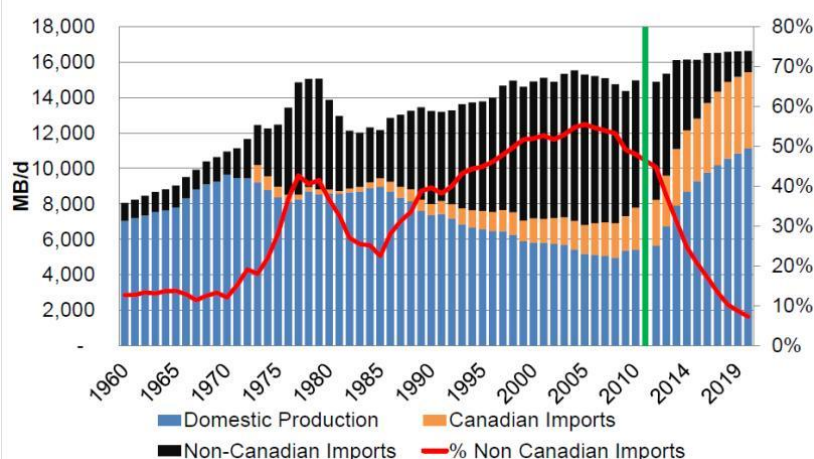
While their forecast only goes out to 2020, it shows that oil imports to North America will have declined sharply

Earlier this month, as part of its annual energy outlook, the International Energy Agency (IEA) published a study suggesting that by 2015 the United States will become the world's largest gas producer and by 2017 the largest oil producer if one includes crude oil, natural gas liquids and biofuels. That status, however, will be short-lived as Saudi Arabia is projected by the IEA to regain its number one oil producer position by about the mid 2020s. Given the growth in U.S. and Canadian hydrocarbon production in recent years, coupled with slowing demand growth, energy imports will fall until eventually North America becomes a net oil exporter about 2030 and the U.S. becomes nearly energy self-sufficient by 2035.

The idea that North America has entered a new Golden Age of petroleum production has been growing over the past year with numerous studies attempting to define the implications of this development. Exhibit 15 on the next page shows BENTEK Energy's take on how the squeeze on non-North American oil imports will unfold. While their forecast only goes out to 2020, it shows that oil imports to North America will have declined sharply. One assumption in this forecast, and we assume in the EIA's, also, is that Canadian oil sands output has unfettered access to U.S. oil markets.

Exhibit 15. Oil Shale, Oil Sands Squeeze Other Imports

Oil Imports Get Squeezed out of N. America



Source: BENTKEEnergy.com

Without a change in the federal law restricting the export of U.S. oil production, by blending the two oils, Keystone's volumes cannot be exported

He warned that the geology and reservoir performance of the oil shales were "poorly known"

The first test of that assumption will come early next year when the Obama administration will be presented with a request to approve the permit to construct the Keystone XL pipeline and allow more oil sands bitumen to enter the U.S.

There are a number of people suggesting the Keystone project will get a green light to move forward. They are assuming President Barack Obama will not support his environmental friends by stopping the importation of more "dirty" oil sands output. Supporters of Keystone have to assume this oil will be used by the Gulf Coast refineries, which means that heavy oil volumes currently imported from Venezuela and Mexico will be cut and replaced with Canadian bitumen. That assumption is due to TransCanada's (TRP-NYSE) plans to mix the bitumen with Bakken light crude produced in Montana and North Dakota. Without a change in the federal law restricting the export of U.S. oil production, by blending the two oils, Keystone's volumes cannot be exported. If the refineries utilizing Venezuelan and Mexican heavy oil don't want to change suppliers, then the existing Gulf Coast refining complex will have too much heavy oil to be processed. That means the refining industry will have to revamp facilities to use more heavy and less light oil.

Fatih Birol, the IEA's chief economist, said his agency's forecasts to 2017 were based on data about existing reserves and production. He warned that the geology and reservoir performance of the oil shales were "poorly known," and he said it was unclear whether new reserves would be found to sustain production levels, let alone grow them. This is a critical consideration that underlies all the bullish forecasts for a new petroleum age for North America.

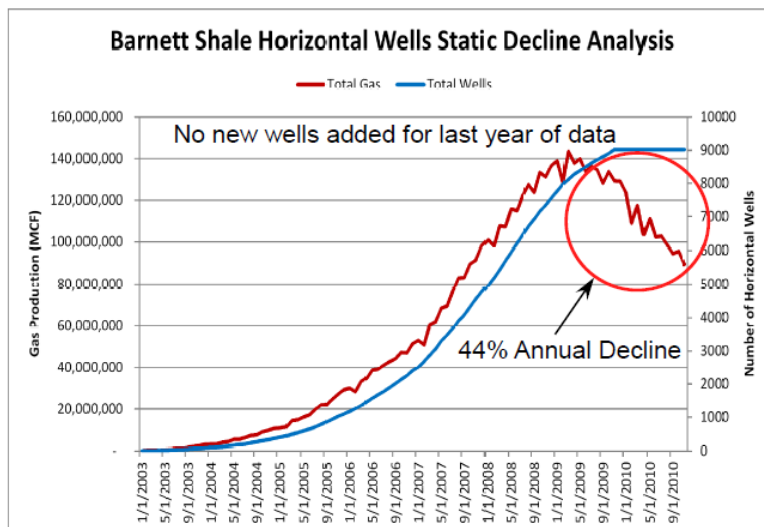
Increased gas demand is seen as the remedy for low natural gas prices

A key aspect of this glorious new world of abundant petroleum is the growth in natural gas production that has led to very low prices and boosted its use in generating electric power at the expense of coal. While natural gas has been cheaper than coal, the fact that gas creates about half the volume of carbon emissions than coal has spurred its use in power plants subject to increased environmental regulation. The natural gas industry is working feverishly to try to gain a greater foothold in the transportation fuels market with the hope that market will further boost natural gas demand thereby lifting prices. Increased gas demand is seen as the remedy for low natural gas prices. In the meantime, U.S. producers are continuing their shift in shale drilling from dry natural gas basins to those with higher liquids content and crude oil. An unfortunate side benefit of this drilling shift has been large volumes of associated natural gas being produced further adding to the abundance of gas and depressing any recovery in gas prices.

A static gas basin analysis performed by Art Berman shows that when the industry stops drilling new wells, the decline rate of existing gas production is very steep

What we do know about the shale basins is that the wells have very high initial production rates that then decline rapidly. There is much debate about the shape of the decline curves and their meaning in projecting the economic ultimate recovery (EUR) volumes. A static gas basin analysis performed by Art Berman (Exhibit 16) shows that when the industry stops drilling new wells, the decline rate of existing gas production is very steep. A question yet to be investigated is whether this phenomenon exists, and if so how strong, in tight oil basins. This is essentially the point raised by Mr. Birol above, and it certainly has implications for the long-term forecasts for oil output in North America, which has emerged as the gas shale capital of the world.

Exhibit 16. Static Analysis Signals Future Drilling Treadmill



Source: Art Berman

There are enough qualifiers to the assumptions underlying this long-term forecast to cast doubt on how firmly to embrace the report's conclusions

While the IEA study received significant attention from the mainstream media, most reporters do not understand the dynamics of oil reservoirs to ask the right questions and point out the possible weaknesses in the study. The IEA has conducted extensive research into oilfield decline rates in the past, but we sense little of that research was brought to bear in this study. It seems from reading the summary of the report prepared by the IEA that there are enough qualifiers to the assumptions underlying this long-term forecast to cast doubt on how firmly to embrace the report's conclusions. At this point, we plan to use the study as just one possible scenario for how the industry might evolve in the future. We are less inclined to embrace it than many others. What we worry about is that our policy makers do embrace the report and its conclusions and begin instituting policies and investments designed to capitalize on its projected outcomes. If those outcomes fail to materialize, we will be faced with having to make numerous mid-course corrections with unknown, and potentially significant, economic and social costs.

Super Storm Sandy And The Great Global Warming Debate

"Would this kind of storm happen without climate change? Yes. Fueled by many factors."

A recent issue of *Bloomberg Businessweek* had a red cover with the title "It's Global Warming, Stupid" in progressively larger, bold black letters for each line of text. The lead article's author used comments from different people to substantiate the belief that Sandy, the super-storm that hit the East Coast a couple of weeks ago causing extensive damage to the New Jersey coast line, lower Manhattan and parts of Long Island, was as devastating because it was caused by global warming. One quote the author used was an October 29th tweet from Jonathan Foley, director of the Institute on the Environment at the University of Minnesota. The tweet stated: "Would this kind of storm happen without climate change? Yes. Fueled by many factors. Is storm stronger because of climate change? Yes."

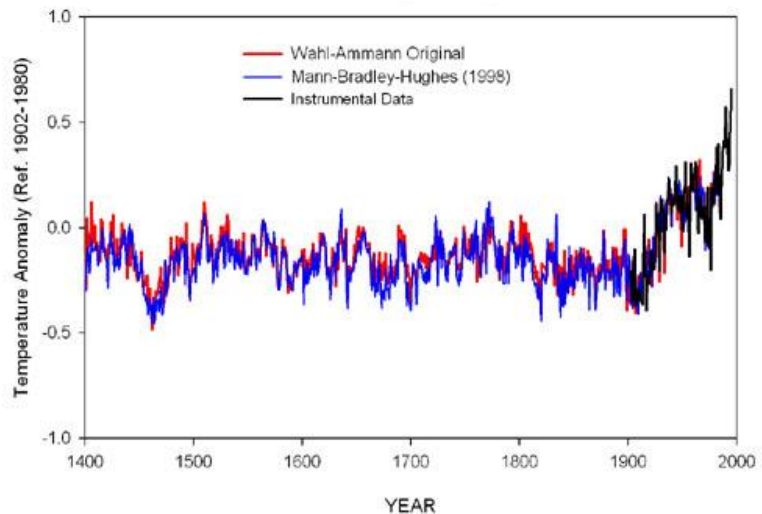
The author then turned to a blog post by Mark Fischetti of *Scientific American* on October 30. The blog said, "Climate change amps up other basic factors that contribute to big storms. For example, the oceans have warmed, providing more energy for storms. And the Earth's atmosphere has warmed, so it retains more moisture, which is drawn into storms and is then dumped on us." The *Bloomberg* writer said this description helps the "science-phobic" people understand what happened with Sandy.

The IPCC study concluded that escalating carbon emissions were dooming the planet to a sharply warmer environment

So much of the climate change argument traces its roots to the Intergovernmental Panel on Climate Change (IPCC) study released in 2001 that concluded that escalating carbon emissions were dooming the planet to a sharply warmer environment by the end of this century with catastrophic implications for civilization. The IPCC based its conclusion and recommendations for environmental action on the global warming work of Dr. Michael Mann at the University of

Virginia and some associates. Dr. Mann is the acknowledged creator of the famous “hockey-stick” temperature graph, which was published in a 1998 journal. That chart was made famous by former vice-president Al Gore in his documentary, “An Inconvenient Truth” dealing with the calamity awaiting the planet and its population unless governments around the world embarked on a radical program to control carbon emissions.

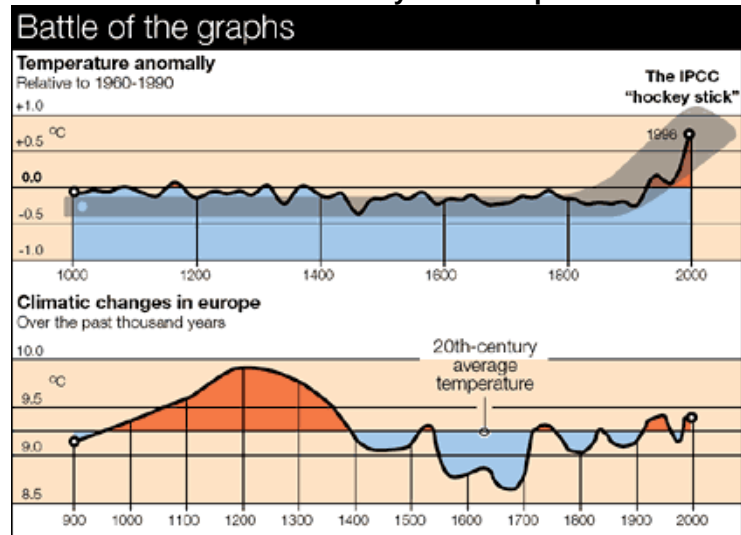
Exhibit 17. Mann’s 1998 Hockey-Stick Temperature Graph



Source: ucar.edu

The statistical challenges mounted by Mr. McIntyre to Dr. Mann’s work continued for a number of years as Dr. Mann refused to release the raw data he used in creating his hockey-stick graph

Almost immediately after the hockey-stick graph was unveiled, its conclusions were challenged by retired Canadian statistician Steve McIntyre. At the heart of his challenge was the creative statistical techniques employed by Dr. Mann with the proxy data he used to reconstruct the history of global temperatures. The result was that Dr. Mann’s work eliminated two historical temperature periods – the Medieval Warming (1000-1400) and the Little Ice Age (1500-1800). Those periods are seen in the chart in Exhibit 18 on the next page that shows the conventional temperature history for Europe along with a chart of Dr. Mann’s work. The statistical challenges mounted by Mr. McIntyre to Dr. Mann’s work continued for a number of years as Dr. Mann refused to release the raw data he used in creating his hockey-stick graph. The purloined emails from the University of East Anglia’ Climate Change Research Center showed a conspiracy among certain climate scientists, including Dr. Mann, to discredit global warming skeptics and to restrict their ability to have their peer-reviewed articles critical of the conventional global warming view accepted for publications by leading climate journals. (If there is ever an interesting perspective on how government research grants have corrupted the foundation of the scientific method, which dictates that studies should be able to be replicated by other researchers, the battle surrounding the hockey-stick graph demonstrates it.)

Exhibit 18. The Broken Hockey-Stick Graph

Source: susanrennison.com

He concluded that these studies cast serious doubt on the IPCC's conclusion that the northern hemispheric temperatures during the Medieval Warming period were not as warm as now

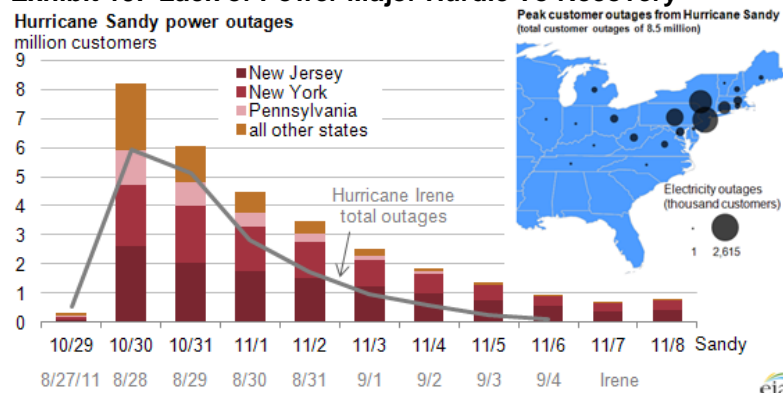
Recently, Matt Ridley, a scientist, businessman, journalist and author and a global warming believer, wrote in his *Wall Street Journal* column about various studies dealing with the hockey-stick temperature graph and what they might mean for the average man. He had been convinced about global warming by the hockey-stick graph but now appears to be more skeptical of the work of Dr. Mann based on all the other studies he has researched. His column examined (briefly) the evolution of the hockey-stick graph and the criticisms of its statistical techniques. Mr. Ridley went on to look at four more recent studies that tried to support the hockey-stick pattern by examining the proxy temperature data and their flaws. He concluded that these studies cast serious doubt on the IPCC's conclusion that the northern hemispheric temperatures during the Medieval Warming period were not as warm as now. The studies that attempt to answer the question of whether the Medieval Warming period was confined to the Northern Hemisphere remain inconclusive, but tend to support the global nature of the warming. He does conclude, however, that today's warming may be different from that experienced during the Medieval Warming. He cites the possibility that summers might have been warmer in the past than today, but that winters might be warmer now than in the past. He says that pattern would be logical if today's warming is caused by carbon dioxide, but that still needs more research to confirm. The concluding comment in Mr. Ridley's column is, "Nonetheless, the evidence increasingly vindicates the scientists who first discovered the Medieval Warm Period." In effect, he comes down on the side of those scientists who attacked Dr. Mann's research and conclusions.

New York And New Jersey Revisit 1970s With Gas Rationing

**A day after Sandy came ashore
8.2 million customers were
without power in the Northeast**

Super storm Sandy came ashore in New Jersey on October 29th with winds just slightly below hurricane strength. That didn't stop the storm from wrecking significant havoc along the East Coast shoreline and coastal areas before heading on to Western Pennsylvania and Ohio before turning north into New England and Eastern Canada. A day after Sandy came ashore 8.2 million customers were without power in the Northeast. Because Sandy's track was so well projected, the local utility companies in the region were able to seek for assistance from power companies in other parts of the United States and to have the crews pre-positioned to start repairs shortly after the storm passed through. By Veteran's Day, a week after Sandy landed, the New York/New Jersey metropolitan area only had about 167,000 customers without power with most of them in population pockets in the region. The total, however, does ignore the 90,000 residential and businesses locations that were destroyed or damaged so severely that power could not be turned back on.

Exhibit 19. Lack of Power Major Hurdle To Recovery



**In the early days of the storm's
aftermath, the absence of power
caught many by surprise who
discovered that power doesn't
just come from a wall plug**

One of the unintended outcomes of the power loss was the inability to provide gasoline to citizens. In the early days of the storm's aftermath, the absence of power caught many by surprise who discovered that power doesn't just come from a wall plug. They also found out that without power, gasoline pumps do not work. As a result, drivers were forced to line up for gasoline, and in some cases they were waiting in line for hours. As expected, tempers flared as driver frustration levels rose when service stations ran out of gasoline. In some cases, the frustration escalated into violence requiring the police to be summoned. With dwindling supplies of gasoline and home heating oil, Governor Chris Christie (Rep-NJ) moved to institute gasoline rationing in his state.

Even though the federal government had moved to relax the mandate that oxygenated gasoline, used to reduce carbon

Probably the greatest problem was that the fuel loading facilities for trucks that deliver the gasoline to the retail outlets in the area were without power or damaged by the storm meaning they could not load trucks

emissions during many months of the year, be sold and had lifted the Jones Act restrictions on ships allowing foreign-flag tankers to bring crude oil and refined products to the region, gasoline remained in short supply. The supply problem was aggravated by concern about power availability and led the few local refineries in the region to cease operation out of safety concerns. The Colonial pipeline that hauls refined product from the Gulf Coast to the Northeast shut down its last section into the region to protect it from any storm-related damage. But probably the greatest problem was that the fuel loading facilities for trucks that deliver the gasoline to the retail outlets in the area were without power or damaged by the storm meaning they could not load trucks. This lack of power also plagued retail outlets forcing customers to seek out those stations that did have power. That contributed to the miles-long lines of cars at filling stations that drained outlets causing patron tempers to flare and the need to call the police to manage the situation.

The net effect of a gasoline buying panic is that service station inventories are transferred to customer vehicles

Given concerns about station personnel safety, New Jersey implemented odd/even gasoline rationing. That meant you could only get gasoline if the last digit of your vehicle's license plate, whether odd or even, matched the odd or even date. Effectively, this system cuts the potential demand for gasoline in half as presumably 50% of vehicles have odd and the other 50% have even digits on their license plates. More importantly, the system gives people confidence that the panic mode gripping the region's fuel supply will ease. The net effect of a gasoline buying panic is that service station inventories are transferred to customer vehicles. Studies have shown that most Americans operate their vehicles until they have less than half a tank of gasoline, and actually closer to one-quarter full. When they panic, they never want to let their tanks go below half full, and many stop at three-quarters full. That swing in operating philosophy can mean an average of eight gallons per vehicle is shifted from below-ground storage tanks at gas stations to vehicle fuel tanks.

Guess what happened – long lines of vehicles, flaring tempers and violence necessitating sending in the police

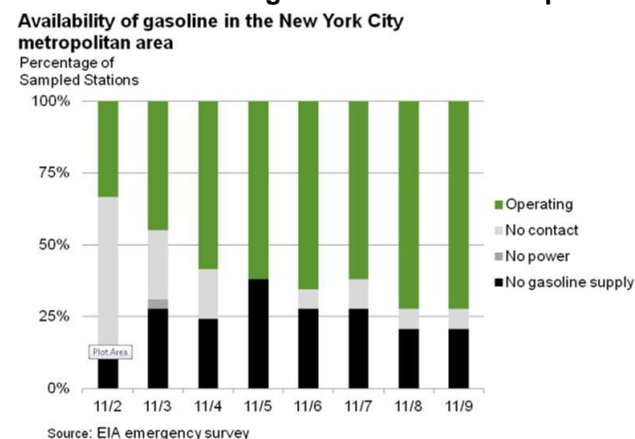
What was most interesting was to read that the day before New Jersey instituted odd/even rationing, New York Governor Cuomo and his staff debated for hours instituting the same thing in his state. Despite hours of debate, they could not agree this was the correct course of action. Instead, they opted to have the Federal Emergency Management Administration (FEMA) arrange for the army to bring in tank trucks full of gasoline, park them in areas without power, and give away 10 gallons of fuel to each driver who arrived. Guess what happened – long lines of vehicles, flaring tempers and violence necessitating sending in the police. After a week and many areas still without power, New York instituted odd/even gasoline rationing.

The Energy Information Administration (EIA) attempted to survey the gasoline supply situation in New York City daily and publish the results. The chart in Exhibit 20 on the next page shows the pace of

Fully 11 days following the storm, the New York City region still had about 25% of its gas stations without fuel or power

the recovery in the gasoline market beginning a few days after Sandy landed in the area. Fully 11 days following the storm, the New York City region still had about 25% of its gas stations either without fuel or they did not respond to the survey call probably because they didn't have power. Interestingly, New York started rationing fuel the day before New Jersey stopped.

Exhibit 20. Rationing Due To Lack of Pumps



Source: EIA

Finally, you prepare a rationing plan that can be implemented almost immediately after a storm, if needed, in order to prevent the panic mentality setting in

Having lived through storm related episodes such as this, including the Great New England ice storm of December 1973 where neighboring towns in Connecticut were without power for well over a week, we understand the need for preparation. Lessons we learned from the ice storm experience included not sending fuel trucks out at night to refill service stations without verifying they have power. Second, you must anticipate losing power at fuel-truck loading depots and install backup generators. Third, you try to pre-position barges and tankers loaded with fuel close to the target region, but out of harm's way so they can move in after the storm has passed. Finally, you prepare a rationing plan that can be implemented almost immediately after a storm, if needed, in order to prevent the panic mentality setting in. The existence of a plan should be publicized prior to the storm. That is particularly important for people who might be transiting the region and might need gasoline so they can avoid traveling through the region. As drivers found out in New Jersey, if you were on the highway and needed gasoline, you were still subject to the odd/even rationing, which in one case forced a couple to have to wait overnight in order to fill up and continue their journey.

There was a lot of praise handed out to FEMA and the first responders shortly after Sandy passed the East Coast, but increasingly it looks like parts of the region are mired in Katrina-like problems. Various neighborhoods are struggling to recover due to the extent of their damage and the lack of power and emergency services. Even though there was plenty of warning about Sandy's

Free-market believers would argue that states should just allow gasoline prices to rise to clear the market, but that solution, while economically efficient, is not politically acceptable

path, it seems there still wasn't adequate planning done beforehand. Gasoline rationing should have been an easy option, even though it seems extreme. Free-market believers would argue that states should just allow gasoline prices to rise to clear the market, but that solution, while economically efficient, is not politically acceptable. Rationing is the quickest and easiest to implement, and its psychological impact cannot be under-estimated, and it needs to be in place for a short time. New Jersey reached that conclusion quicker than New York, so is Gov. Christie smarter than Gov. Cuomo and Mayor Michael Bloomberg? Maybe Northeasterners will have a greater appreciation for what Gulf Coast residents experience and prepare for annually when hurricane season rolls around.

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