PPHB

ENERGY INVESTMENT BANKING

MUSINGS FROM THE OIL PATCH

August 14, 2012

Allen Brooks
Managing Director

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

Sierra Club Takes On Coal And Other Fossil Fuel Supporters

83% of Americans approve of renewable energy

The battle over clean energy continues to be waged and the proponents feel that they are unfairly being attacked at the Congressional and state levels and by "powerful, free-spending entities" when 83% of Americans approve of renewable energy. The Sierra Club recently issued a report, Clean Energy Under Siege: Following the Money Trail Behind the Attack on Renewable Energy. Their argument is that renewable fuels are now regarded as a key part of the solution to our energy problems, but the path to attaining this status was long, slow and challenging because these fuels had to fight against established energy sources that were never subjected to the same political challenges.

The opposition has used unfair tactics such as using "a poor decision to grant a single loan guarantee to Solyndra" in order to indict clean energy broadly

The Sierra Club's case for an unfair playing field in energy rests on the belief that the opposition has used a methodology for challenging the credibility of traditional scientific research and substituting the opposition's own scientific conclusions whether valid or not. They further believe that the opposition has used unfair tactics such as using "a poor decision to grant a single loan guarantee to Solyndra" in order to indict clean energy broadly. They go on to cite a litany of organizations that have attacked various clean energies and initiatives such as wind power, energy efficiency and renewable electricity standards while tolerating subsidies defined by the Sierra Club as "giveaways" to the oil and gas industry.

The basis for the report is that the Sierra Club sees clean energy at a critical crossroad in the development of the nation's energy policy. They see the impending retirement of coal plants in response to the Environmental Protection Agency (EPA) emission rules as creating a competitive playing field for clean energy. The challenge to clean energy comes from the growth in natural gas reserves from

unconventional drilling, the secret battleground. The Sierra Club sees the battle between clean energy and traditional fossil fuels revolving around the flow of money from fossil fuel interests into efforts to fight clean energy at all governmental levels. Only by exposing the fossil fuel purveyors funding anti-clean energy causes can they successfully battle them.

The problem is that Solyndra isn't just about the flawed economics underlying clean energy; it is also about "crony capitalism" as practiced by a dyed-in-the-wool Chicago politician, President Obama, and his administration

In Congress, the Sierra Club perceives the Solyndra loan guarantee as having provided a platform for these critics to chastise President Barrack Obama, a perceived champion of clean energy, and alter public perceptions of clean energy. The problem is that Solyndra isn't just about the flawed economics underlying clean energy; it is also about "crony capitalism" as practiced by a dyed-in-the-wool Chicago politician, President Obama, and his administration. Beyond the attack on Solyndra, the Sierra Club sees a broad-based attack designed to reduce or eliminate energy subsidies. They see legislation proposed by Mike Pompeo (R–Kansas) that was designed to eliminate energy subsidies as only attacking those that have little impact on the oil and gas industry but cut all renewable fuel subsidies. They also highlight the fact that the pass-through corporate structure, known as master limited partnerships, is available for oil and gas interests but not renewable energy developers. We would be very interested in seeing a MLP for intermittent wind farms or solar projects to assess investor appetite. We are sure there would be interest from socially responsible investment funds, but we are not confident there would be many other investors.

The Sierra Club report goes on to attack the various "think-tanks" that play a role in analyzing and writing about clean energy issues

The Sierra Club report goes on to attack the various "think-tanks" that play a role in analyzing and writing about clean energy issues. They targeted the oil and gas companies for lobbying government bodies and regulatory agencies to get or preserve special tax incentives and for funding the research that attacks on clean energy issued by these think-tanks. In the section dealing with money, the Sierra Club report states: "Following the trail of money in politics is often a difficult task. This section on money – that is, the funding behind a coordinated anti-renewable effort – naturally must rely heavily on publically available data. Nevertheless, the evidence does suggest such an effort, with funding links to big corporations, wealthy donors, 'free-market' cause-based organizations, and questionable citizens groups all coming into focus."

The one example the Sierra Club focuses on it's the Cape Wind project in Nantucket Sound

At the end of the section, the one example the Sierra Club focuses on is the Cape Wind project in Nantucket Sound. As one would expect, the entire case is built on the money donated by industrialist Bill Koch, co-owner of Koch Industries and Oxbow Corp., which are involved in the oil and gas industry along with other industrial businesses. The report presents a schematic drawing showing money flowing from Koch Industries to many think-tanks, political organizations and the Alliance for Nantucket Sound, which is the primary opponent of Cape Wind. Interestingly, there is no mention

of the opposition to Cape Wind from the late Massachusetts Senator Ted Kennedy, Senator John Kerry (D-Mass), Senator Scott Brown (R-Mass) and numerous state republican and democratic politicians. Noted broadcaster and liberal Walter Cronkite was initially opposed to Cape Wind but later was convinced to support it prior to his death.

Would a positive announcement on Cape Wind been offered as an offset to the Keystone rejection and the collapse of Solyndra?

As we wrote about in our last *Musings*, there now is a Congressional investigation about whether political pressure was brought to bear on officials in the Federal Aviation Administration to approve the permit for construction of the Cape Wind turbines. At the end of last week, emails produced under a records request from the Congressional committee heading the investigation showed that President Obama had been briefed late last summer on the need for Cape Wind to secure a $2 billion loan and that it would be requesting help from the Interior Department. Other emails show that high government officials wanted the loan approved quickly. The timing was interesting as the email suggested the loan approval was sought by the end of September. That would have been about the time President Obama was assuming decision-making authority over the construction permit approval for the Keystone pipeline and about the same time that Solyndra announced it was filing for bankruptcy. Would a positive announcement on Cape Wind been offered as an offset to the Keystone rejection and the collapse of Solyndra?

The report, however, demonstrates how far behind in the public relations battle the fossil fuel industry finds itself

The 20-page Sierra Club report is just one recent example of the war against fossil fuels and in defense of uneconomic renewable energy projects. With nearly three full pages of endnotes totaling 94 citations, the report appears to be a scholarly examination of the topic. In our view, it lacks any balance. The report, however, demonstrates how far behind in the public relations battle the fossil fuel industry finds itself. No matter how strong the case is for traditional fossil fuels, their recent safety record and environmental concerns dictate that the oil, gas and coal companies need to become more focused on making rational arguments as to why their fuels deserve not to be shackled by regulations and taxes for the good of the nation and its citizens. This is a challenging case to be made. It needs to be made, and the sooner the industry becomes motivated to do it the better.

The Chinese Are Coming! The Chinese Are Coming!

The C$27.50 per share purchase price represented a 61% premium to the closing share price of the prior Friday

In a bold move on Monday, July 23rd, the China National Oil Company, CNOOC, announced an agreement to purchase Canadian-based explorer Nexen (NXY-NYSE) for $15.1 billion in cash. The C$27.50 per share purchase price represented a 61% premium to the closing share price of the prior Friday. The news of the transaction sent Nexen's share price soaring, but it failed to trade at a premium to the purchase price signaling that Wall Street and Bay Street investors believed there might be another buyer who

Investor speculation shifted to the question of which Canadian oil company might become the next acquisition target

would try to compete with CNOOC. Rather, investor speculation shifted to the question of which Canadian oil company might become the next acquisition target of either Chinese or other aggressive buyers. As expected, however, along with the speculation about foreign buyers of Canadian oil and gas companies was outspoken nationalistic protest against any deal involving important Canadian energy assets.

The debate of the day was whether foreign-controlled oil companies should be allowed to buy leading players in another country's energy business

As the dust surrounding the deal's initial announcement settled, the focus shifted from surprise to concern over whether this was a proper transaction and in the best interests of Canada. Clearly the deal was in the best interests of shareholders who stood to walk away with a substantial profit that likely wouldn't have been realized by a rising share price anytime soon given weak natural gas prices, lower crude oil and natural gas liquids prices, and cash flow challenges. The debate of the day was whether foreign-controlled oil companies should be allowed to buy leading players in another country's energy business – an industry considered critical to the development of every economy. The corollary question is how does a transaction of this type fit into a capitalistic economy? Within hours of the CNOOC/Nexen deal's announcement, the politicians and mainstream media waded into the debate.

Some citizens questioned whether the Nexen deal would be a long-term strategic positive for Canada or merely the latest version of the infamous Japanese global investment wave of the 1980s?

Some Canadians were outspoken that the federal government should not approve the deal because it would guarantee that the development of domestic resources would be controlled by a country that might have different goals and objectives than the private company's bosses. And certainly those objectives might differ from the goals of Canadian citizens and their leaders, although the current Prime Minister, Stephen Harper, has been an advocate that the country needs to develop other non-North American markets for its oil and gas output. Some citizens questioned whether the Nexen deal would be a long-term strategic positive for Canada or merely the latest version of the infamous Japanese global investment wave of the 1980s? People may not remember but during that decade of Japanese economic ascendancy its companies bought up many high-profile businesses and iconic assets, especially in North America, only to find to their regret that they grossly overpaid and couldn't turn around structurally flawed companies. It was a costly and disruptive experience.

On the other hand, some Canadians viewed the CNOOC/Nexen transaction as merely the logical extension of the flood of foreign money that has been coming into Canada's natural resources industries, with oil and gas being the most recent beneficiary. Shortly before the Nexen deal, Petronas, the Malaysian national oil and gas company agreed to purchase Canadian-based Progress Energy Resources Corp. (PRQ-TO) at C$20.45 per share in a C$5.5 billion transaction. That deal rewarded investors with a 77% premium over the June 27th closing price on the Toronto Stock Exchange. The purchase will bring Petronas exposure to oil and

gas assets in British Colombia and Alberta, with a particularly strong position in the Montney trend. The wave of foreign investment began a few years ago and was initially focused on mining companies with attractive assets but in need of capital to develop the mines and export infrastructure. That effort peaked with the high profile and controversial offer by Australian miner BHP Billiton (BHP-NYSE) to purchase Canada's Potash Corporation (POT-NYSE) for C$39 billion in late 2010.

Potash had a major presence in Saskatchewan and the announcement of the offer set the province's premier off on a major lobbying effort to get the deal killed

The Potash deal tested the resolve of political leaders in Canada as they wrestled with the economic implications of the transaction. Under the Canada Investment Act, the federal government must determine whether any proposed acquisition is in the best interests of Canada – its people and its economy. Potash had a major presence in Saskatchewan and the announcement of the offer set the province's premier off on a major lobbying effort to get the deal killed. Business columnist Eric Reguly of Toronto's *Globe and Mail*, wrote an article "The Real Story Behind Ottawa's Potash Rejection," in which he wrote, "Saskatchewan faced losing billions in revenue because of perfectly legal tax and royalty avoidance under the BHP ownership scenario, and possibly declining potash prices because of its vow to dismantle Canpotex, the international potash marketing and sales cartel that Potash Corp. sponsors." Given that Prime Minister Harper was leading a minority government, he wanted to avoid angering his western Canada supporters. For the second time ever under the investment law, a foreign transaction was rejected.

Proving that a takeover will be a "net benefit" for Canada would now face a higher bar than before

The conclusion from the BHP/Potash rejection was that foreign takeover deals for Canadian companies would no longer be a slam dunk. Proving that a takeover will be a "net benefit" for Canada would now face a higher bar than before. But that lesson has not been lost on CNOOC and others who are investing in Canadian natural resource industries. Moreover, the wave of foreign capital flowing into the Canadian energy sector in the past couple of years has been welcomed by the industry along with local and federal governments and the Canadian mainstream because substantial investment capital needs is required to develop the country's oil sands deposits and its unconventional oil and gas resources. This is probably the primary difference between the Chinese and Asian investments and BHP's proposed deal. The latter's target was not really in need of capital infusion and Potash had a proven track record of successfully raising capital.

"The Chinese are coming! The Chinese are coming!"

South of the 54th parallel there was a different reaction. New York's Senator Chuck Schumer (D-NY) and Massachusetts' Representative Edward Markey (D-Mass) auditioned for the roles of Paul Revere and William Dawes by racing to the microphones to proclaim: "The Chinese are coming! The Chinese are coming!" Here was an opportunity to use the deal struck north of our border to attack the Chinese government over its trade practices with the United States. Plus, the deal offered an opportunity to go after the missing royalties

This "oversight" involved about 1,000 leases approved by federal officials during the Clinton administration

Nexen isn't paying on oil and gas production from leases acquired in 1998 and 1999 that omitted the requirement to pay royalties on production when crude oil prices exceeded $34 a barrel. This "oversight" involved about 1,000 leases approved by federal officials during the Clinton administration. These leases were signed by the successful bidders in the sale, and the Bush administration tried to convince them to pay the royalties but without any legal authority. These missing royalties have been used repeatedly by Democratic politicians to berate the oil and gas industry whenever possible with the aim of shaming the companies into voluntarily paying the royalty toll on moral grounds.

Exhibit 1. "Listen my children and you shall hear…"

Source: 1776web.com

Unlike Messrs. Revere and Dawes who were captured by the British before they completed their rides on the fateful April evening, no one has been able to stop Messrs. Markey and Schumer from threatening to derail the CNOOC/Nexen deal

Let's not bother with the minor detail that the United States government signed a valid contract with the oil companies before they were allowed to start exploration and development activity. But the political party of which Messrs. Markey and Schumer are leaders, recently tried to prevent the Republican-controlled House of Representatives from correcting a bill where the modifier "un" was omitted from the final legislation about limiting federal spending that was tied to the "employment" rate, rather than the "unemployment" rate as originally conceived. Unlike Messrs. Revere and Dawes who were captured by the British before they completed their rides on the fateful April evening, no one has been able to stop Messrs. Markey and Schumer from threatening to derail the CNOOC/Nexen deal.

What may ease the deal for the Canadians is that Nexen has oil sands and unconventional assets that require substantial investment

After CNOOC's unsuccessful attempt to acquire on an unfriendly basis America oil company Unocal in 2005, Chinese oil companies began aggressive investment in oil and gas assets around the globe, but primarily where the government could create a receptive environment. The Unocal deal was the reflection of the Chinese government's desire to gain a stepping stone for greater involvement in the U.S. oil and gas industry. The attempt created a huge backlash of American nationalism, which ultimately resulted in Chevron purchasing Unocal. In this Canadian deal, Nexen does have a U.S. subsidiary that has allowed it to acquire and operate oil and gas leases in the United States. What may ease the deal for the Canadians is that Nexen has oil sands and unconventional assets that require substantial investment. The rest of the company's assets are located outside of Canada, which offers the Chinese an interesting oil and gas investment portfolio.

Exhibit 2. Nexen Offers Global O&G Portfolio

Source: ***Agora Financial***

That outcome might embolden CNOOC to make sure that none of its Canadian and Nexen oil and gas production winds up in the United States

The bigger problem, which Messrs. Markey and Schumer seem not to understand, is that by attacking CNOOC via its potential U.S. holdings through Nexen they may force the Chinese company to exit the U.S. properties. That outcome might embolden CNOOC to make sure that none of its Canadian and Nexen oil and gas production winds up in the United States. That would seem to satisfy an objective of the Harper government to see that export pipelines and ports are built to send Canadian oil sands output, along with other conventional and unconventional hydrocarbon production, to non-North American markets. Over time this move could mean that Canada, currently the U.S.'s largest oil supplier, might see its contribution shrink. It is already shrinking due to the robust increases in American crude oil and natural gas production coupled with weak demand. Today, many would say that is not a problem, but there is no assurance that the computer models showing the United States ultimately becoming self-sufficient in oil and gas will be right. If these models are wrong, or the production growth is not as robust as projected, this attack by Democratic politicians could ensure that the U.S. in the future will become

hostage to oil and gas supplies from governments that have no love for us.

Exhibit 3. Multiple Riders Thwarted The British Mission

Source: How Stuff Works

Messrs. Markey and Schumer may have a similar impact, but the outcome of their warning may not be as favorable for the long-term future of America

Paul Revere and his cohorts in their midnight ride thwarted the key objective the British government wanted to achieve in its march from Boston, which was the capture of military supplies stored in Concord. The secondary objective of the British of capturing John Hancock and Samuel Adams who were staying in Lexington was also thwarted. Without that midnight warning, the British might have changed the course of American and British history. Messrs. Markey and Schumer may have a similar impact, but the outcome of their warning may not be as favorable for the long-term future of America.

Auto Sales Holding Up But Forecasts Starting To Be Cut

The recovery in the domestic automobile industry was perceived as an omen of a recovering economy on its way to a faster pace of economic activity

We historically have focused on the health of the automobile and housing industries as our measure of how strongly or weakly the economy is performing. Starting last year, the recovery in the domestic automobile industry was perceived as an omen of a recovering economy on its way to a faster pace of economic activity. That belief soon faded as the U.S. economy slumped. Part of the strength of the U.S. auto manufacturers was that they had regained market share lost to foreign car manufacturers due to their more competitive position as a result of their restructuring as mandated by

Due to the damage to facilities and the loss of electricity, Japanese auto manufacturers were unable to produce and ship cars

the auto bailout. What may have been lost on some of those who were making auto sales forecasts, however, was the impact the Japanese earthquake and tsunami had on the Japanese auto companies with U.S. manufacturing plants. Due to the damage to facilities and the loss of electricity, Japanese auto manufacturers were unable to produce and ship cars, but more importantly they couldn't produce parts needed for building vehicles in the United States.

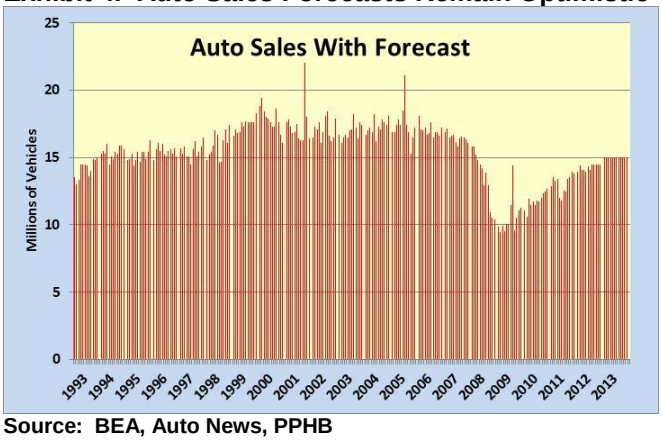
The slowdown in auto purchases has contributed to the average age of U.S. autos increasing to 11 years, a modern record

While the Japanese auto companies struggled with their supply problems, domestic auto companies were able to ramp up their production to meet the rising demand. Following the 2008 financial crisis and the 2009 recession, new car purchases fell off from the record-setting rates of the early 2000s. The slowdown in auto purchases has contributed to the average age of U.S. autos increasing to 11 years, a modern record. The aging of the domestic auto fleet reflected a pent up demand for new cars. Last year, forecasters predicted that auto sales would average well above 14 million units in 2012 and then increase by at least one million additional units each year thereafter until the industry was producing upwards of 18-20 million cars a year.

One of the leading auto industry consulting firms, LMC Automotive, reduced its 2012 and 2013 sales forecasts by roughly 200,000 units each year

The weak gross domestic production (GDP) performance of the U.S. economy in the first half of this year has not been reflected in the monthly auto sales figures. While the monthly sales figures have bounced around a little, for the first seven months of this year the industry has averaged a monthly sales rate at a seasonally adjusted annual rate of about 14.1 million units. The challenge for the industry is that a number of forecasts called for higher sales. At an auto trade show last week, one of the leading auto industry consulting firms, LMC Automotive, reduced its 2012 and 2013 sales forecasts by roughly 200,000 units each year. Their new forecast is for the industry to sell 14.3 million units in 2012 and 15.0 million units in 2013. We have presented the record of annualized monthly sales since 1993 in Exhibit 4. In order for the industry to reach a

Exhibit 4. Auto Sales Forecasts Remain Optimistic



Source: BEA, Auto News, PPHB

If the industry can attain the 15.0 million annual sales estimate in 2013, it would be the highest annual sales rate since 2007

14.3 million unit-sales-year in 2012, the industry will need to sell monthly at an average seasonally-adjusted, annual rate of 14.5 million units for the balance of the year. Unfortunately, the highest monthly rate so far this year was a 14.4 million annual rate, with several months reaching only a 13.9 million unit rate. If the industry can attain the 15.0 million annual sales estimate in 2013, it would be the highest annual sales rate since 2007, or immediately prior to the financial crisis.

Auto manufacturers are interested in creating a future supply of gently-used cars, thus the low monthly lease rates in order to induce buyers to lease cars instead

With the economy slowing and unemployment remaining high, one has to question just how willing Americans will be to step up to buy new cars. A recent *New York Times Magazine* article focused on the oddity of very cheap monthly leasing rates for new cars. The article's author assumed initially that the low rate reflected that the auto industry was doing poorly. He subsequently learned that because of the relatively strong new car sales in the prior year and a half, consumers looking for gently-used cars have been confronting very high prices. These high used-car prices are the result of the high average age of cars being replaced by newly purchased vehicles. Those older cars are not attractive for dealers to sell to customers. As a result of this supply imbalance, auto manufacturers are interested in creating a future supply of gently-used cars, thus the low monthly lease rates in order to induce buyers to lease cars instead. In some cases, consumers can get a new vehicle they otherwise couldn't afford to purchase. The financial impact for the auto companies from the low monthly lease cost presumably will be offset by a much stronger used car market that boosts residual values in the future. That strategy may prove successful, especially if the U.S. economy continues to underperform its natural growth rate as more buyers will opt for cheaper vehicles.

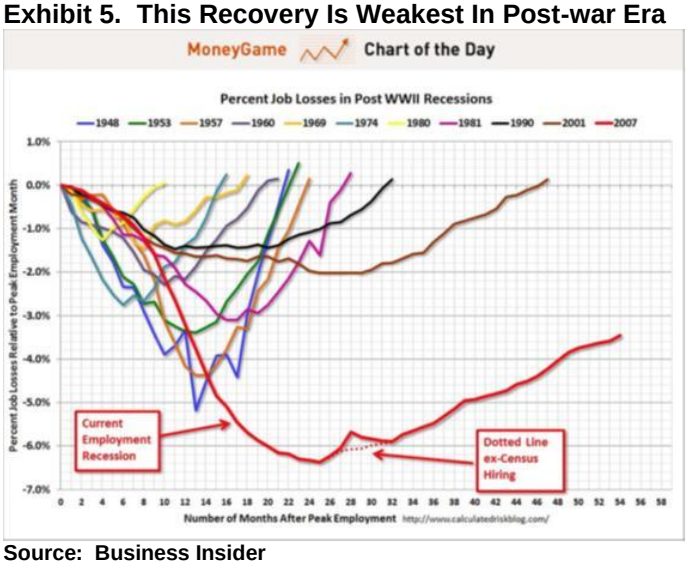
As the German auto manufacturers are now mounting a market share battle with the Japanese companies, the American manufacturers may lose even more market share

What we have learned about the auto industry is that it now only represents about three percent of the domestic economy, which would suggest that it alone cannot have much impact on the overall economy's performance. That may be a disappointment because the Obama administration has based much of its economic strategy on rebuilding the auto industry. Last year, the recovery of the domestic auto companies was helped by the Japanese situation. What we have seen in the past several months is that the Japanese auto manufacturers have restored their supply chains and productive capacity. As a result, they have regained the market share they lost to the American auto companies, and will battle to take more share in the future. As the German auto manufacturers are now mounting a market share battle with the Japanese companies, the American manufacturers may lose even more market share. That is not a particularly positive situation for unemployed workers.

Most readers are aware of the very poor condition of the U.S. labor market. It has been, and will continue to be, impossible to avoid knowing how bad the labor market is given the campaigning for the upcoming presidential election. What we know about the labor

market is that the economic recovery since the 2009 recession has been the weakest in terms of employment gains in the past 75 years. The chart in Exhibit 5 demonstrates just how this recovery ranks in terms of job losses compared to all other recoveries since the end of World War II.

Exhibit 5. This Recovery Is Weakest In Post-war Era



Source: Business Insider

We expect the future auto industry to be able to match the peak output of the pre-financial crisis period with fewer workers

During the boom period of the 2000s, the U.S. auto industry employed about 11 million workers. Today, after the financial crisis and the recession and economic stimulus effort, the industry employs only 7.5 million workers. Is it possible that those missing 3.5 million auto manufacturing jobs will be restored if the industry is able to get back on the growth trend some forecasters are predicting? Time will ultimately tell, but we have to believe the reconstituted domestic auto industry and the newly-built manufacturing plants of the Japanese, Korean and German auto companies will be more efficient than manufacturing plants of the past. Therefore, we expect the future auto industry to be able to match the peak output of the pre-financial crisis period with fewer workers. That means we will need to find other jobs in the recovering economy to employ those former auto workers who have seen their jobs permanently lost. The economic and financial policies of the current administration are not conducive to meeting that goal.

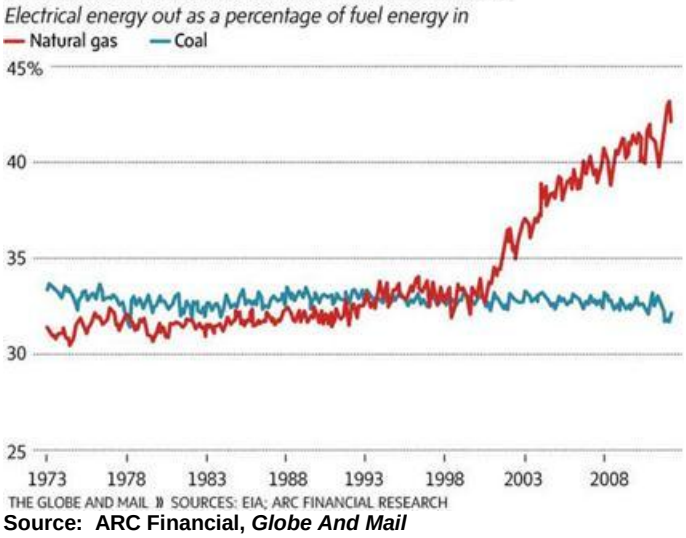
Natural Gas Combined-Cycle Plants Boost Energy Efficiency

Peter Tertzakian, an economist for ARC Financial Corp., a Calgary-based private equity firm focused on energy investments, writes a weekly column for *The Globe And Mail*. In a recent column, he focused on the fact that natural gas is winning the race for energy efficiency in power plants in the United States. The chart

The dramatic improvement in efficiency in gas-powered plants since 2000 is rather amazing

in Exhibit 6 accompanied his column. When we first looked at the chart, which shows the average efficiency of power plants that burn coal or natural gas from 1973 to 2011, our first impression was that it didn't seem right. The dramatic improvement in efficiency in gas-powered plants since 2000 is rather amazing, making one wonder what shift in technology drove the step-change in efficiency.

Exhibit 6. Coal Efficiency Flat While Gas Soars

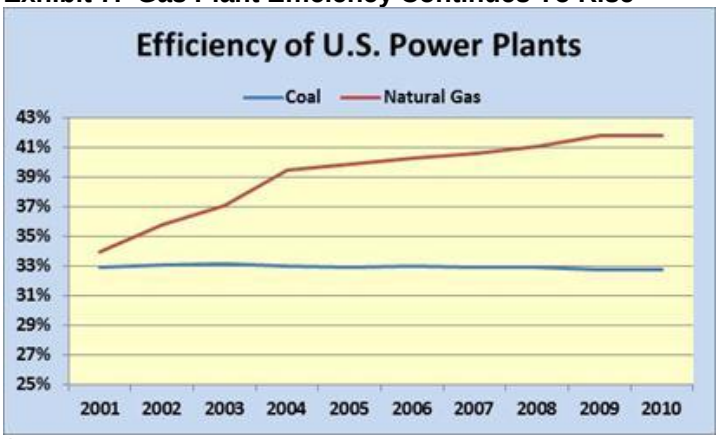


Source: ARC Financial, *Globe And Mail*

We attribute that slight decline to the impact of the installation of carbon emissions capture equipment

As the chart shows, power plants fueled with coal have shown little change in average efficiency, and in fact appear to have lost some efficiency in recent years. We attribute that slight decline to the impact of the installation of carbon emissions capture equipment. On the other hand, natural gas-powered plants have shown a steady upward trend in average efficiency, although the rate of improvement has slowed in the past few years.

Exhibit 7. Gas Plant Efficiency Continues To Rise

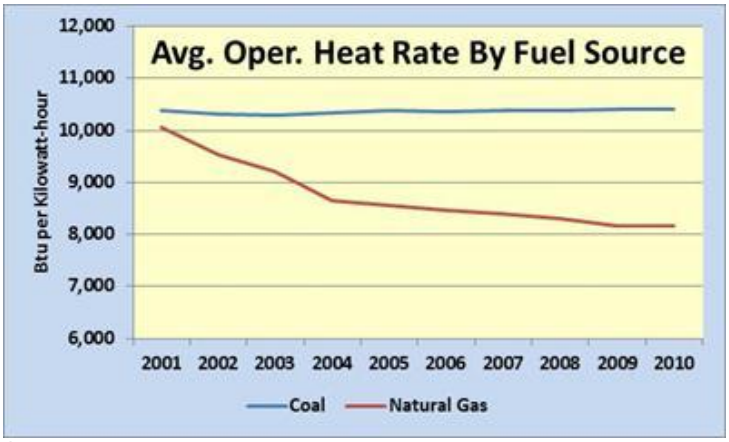


Source: EIA, PPHB

Net generation is the amount of electricity a power plant supplies to the grid after accounting for all the electricity the power plant consumes itself

One measure of the efficiency of power plants that convert a fuel into electricity and heat is the heat rate, or the amount of energy used by the plant to generate one kilowatt-hour (kWh) of electricity. The heat rate is expressed in British thermal units (Btu) per net kWh generated. Net generation is the amount of electricity a power plant supplies to the grid after accounting for all the electricity the power plant consumes itself to operate the generator and other equipment such as fuel feeding systems, boiler water pumps, cooling equipment and pollution control devices.

Exhibit 8. Heat Rates Of Gas And Coal Plants



Source: EIA, PPHB

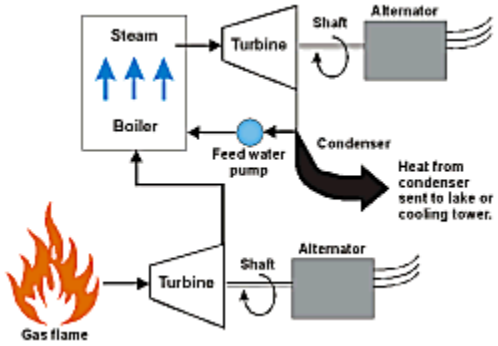
The average heat rate for natural gas-powered plants has declined from slightly over 10,000 Btu per kWh in 2001 to 8,185 Btu per kWh in 2010

As Exhibit 8 demonstrates, the average operating heat rate for coal plants has remained very stable at around 10,350 Btu per kWh. On the other hand, the average heat rate for natural gas-powered plants has declined from slightly over 10,000 Btu per kWh in 2001 to 8,185 Btu per kWh in 2010. One would think that with the average heat rate for gas-fired power plants declining, its efficiency would have declined. However, in order to calculate the efficiency of a power plant as a percentage, one divides the equivalent Btu content of a kWh of electricity (which is 3,412 Btu) by the heat rate. When that calculation is done, declining average heat rates for natural gas translate into increasing power plant efficiency (Exhibits 7 and 8).

Combined cycle plants in some cases are able to reach efficiency rates of 80%

What is the explanation for this dramatic improvement in gas-powered plants? It is the use of combined cycle power plants rather than building plants that employ just steam turbines or just gas turbines. In a combined cycle plant, the natural gas burns and turns a turbine that generates power. The heat from the turbine's exhaust is captured and used as boiler fuel to heat steam that turns another turbine to generate electricity. In effect you have one power source fueled by gas and another fueled by the waste heat from burning the gas. Combined cycle plants in some cases are able to reach efficiency rates of 80%.

Exhibit 9. Combined Cycle Gas Plant Layout



Source: EIA

A combined cycle gas plant has the lowest average heat rate

Natural gas has proven to be a more flexible fuel in the power generation market. Coal and nuclear power plants heat steam in a boiler that powers a generator that produces the electricity. The average heat rates for coal and nuclear steam turbines are about equal. A gas-powered steam turbine is in the same average heat range as the other powered steam turbines. As shown in Exhibit 10, a gas turbine has a meaningfully higher average heat rate but a combined cycle gas plant has the lowest average heat rate.

Exhibit 10. Avg. Heat Rate By Prime Mover and Fuel

	Coal	Natural Gas*	Nuclear
Steam Turbine	10,142	10,416	10,452
Gas Turbine**	-	11,590	-
Internal Combustion	-	9,917	-
Combined Cycle	W	7,619	-

Notes: W = withheld to protect company identity.
* = includes a small number of generators for which heat is the primary energy source.
** = includes binary turbines.

Source: EIA, PPHB

The main drivers for increased natural gas-powered generation capacity are their low construction cost and their reduced carbon emissions

According to the Energy Information Administration (EIA), of the 52 gigawatts of new power generation capacity to be constructed between now and 2015, half will be powered by natural gas. That will be ten times the amount of new generating capacity to be powered by coal. Coal has fallen into fourth place behind solar and wind power as a fuel of choice. Importantly, natural gas plants are being helped by low natural gas prices. But the main drivers for increased natural gas-powered generation capacity are their low construction cost and their reduced carbon emissions. According to the EIA's Annual Energy Outlook 2011, the cost per kWh for a coal plant is $2,844 compared to a combined cycle gas plant at $978. Surprisingly, nuclear power is not the most expensive plant to build. A new nuclear power plant is estimated to cost $5,339/kWh, but

offshore wind is estimated to cost $5,975/kWh. Offshore wind is just slightly over twice the cost of onshore wind ($2,438/kWh). Solar thermal and photovoltaic are estimated to cost $4,692/kWh and $4,755/kWh, respectively.

Until there is a step-change increase in natural gas prices we expect gas-powered plants will remain the preferred choice for generating electricity

The answer to how the average efficiency of gas-fired power plants can be so high is that these plants are favored by their low capital cost, their low energy cost (at least for the present time) and their reduced carbon emissions. Gas-powered plants require less time to construct and they are very flexible in operation. These latter characteristics explain why significant amounts of gas-powered combined cycle generating capacity is being constructed, often as backup for intermittent wind and solar powered plants since gas plants can be switched on and off quickly without sacrificing significant operating efficiency. Until there is a step-change increase in natural gas prices we expect gas-powered plants will remain the preferred choice for generating electricity. That will be good for gas producers and for our climate.

McKinsey Predicts Significant Reduction In EV Battery Costs

The research projects battery prices, which they estimate are currently in the $500 to $600/kWh range, could decline to $200/kWh by 2020 and to $160/kWh by 2025 providing EVs with an improved outlook

An article in the latest quarterly publication of consultants McKinsey & Co. discusses new research the firm has conducted that concludes that the price of lithium-ion automobile batteries could fall dramatically by 2020 boosting the outlook for electric vehicles (EV). The research is based on a bottom-up “should cost” model of how automobile lithium-ion battery prices could evolve through 2025. The research projects battery prices, which they estimate are currently in the $500 to $600 per kilowatt-hour (kWh) range, could decline to $200/kWh by 2020 and to $160/kWh by 2025 providing EVs with an improved outlook. If gasoline prices remain at $3.50 per gallon or higher, EVs will become fully competitive with internal combustion engines (ICE) on a total-cost-of-ownership basis should battery prices average below $250/kWh. Can battery prices actually get to this low level?

This timing will be dependent on the investment auto manufacturers make in batteries and EVs, and the power-train portfolio strategies of the companies

The McKinsey researchers believe the adoption of EVs hinges on a range of factors along with the level of battery prices. Those non-price factors include macroeconomic variables, regulatory issues, EV performance and reliability, and customer preferences. Predicting the impact any of these variables might have on the acceptance by American drivers of EVs is difficult. Further compounding the prediction timing is that the pace of improvement in battery prices could vary by anywhere from three to five years, or the length of the typical auto product development cycle. This timing will be dependent on the investment auto manufacturers make in batteries and EVs, and the power-train portfolio strategies of the companies. As the researchers see it, cheaper batteries could also spur innovation in other areas of internal combustion engines.

Exhibit 11. Chevy Volt Battery Pack Is Expensive

Source: McKinsey

They believe new manufacturing plants will be more productive than those built in 2010-2011

The McKinsey study identified three factors that could accelerate the day when EVs become a more compelling alternative to gasoline-powered vehicles. First is the ability to produce batteries on a larger scale. The researchers believe that one-third of the price reduction projected by 2025 could mostly be captured by 2015. This will involve improving the manufacturing process through steps such as standardizing the equipment along with spreading fixed costs over greater volumes. Additionally, they believe new manufacturing plants will be more productive than those built in 2010-2011.

The final factor is technological improvements that boost battery capacity

The second factor driving the pace of EV competitiveness is lower component prices. The reduced prices will be a direct result of increased competition that will put pressure on typical EBIT (earnings before interest and taxes) margins reducing them in half from today's margins of 20-40%. McKinsey believes this could account for 25% of the projected savings and be mostly achieved by 2020. The final factor is technological improvements that boost battery capacity. Technology advances in cathodes, anodes and electrolytes will increase the capacity of batteries by 80% to 110% by 2025. These improvements should account for 40-45% of the price savings.

The industry is incorporating layered structures that offer the potential to eliminate dead zones and improve cell capacity by 40%

The industry is working on various technological advances. In the area of battery cathode technology, the industry is incorporating layered structures that offer the potential to eliminate dead zones and improve cell capacity by 40%. It is also working with high-capacity silicon anodes that could increase cell capacity by 30% over today's graphite anodes. Lastly, the industry is developing cathode-electrolyte pairs that could increase cell voltage to 4.2 volts from 3.6 volts by 2025. This would represent a 17% increase in voltage, and the industry believes it might be able to boost voltage even higher.

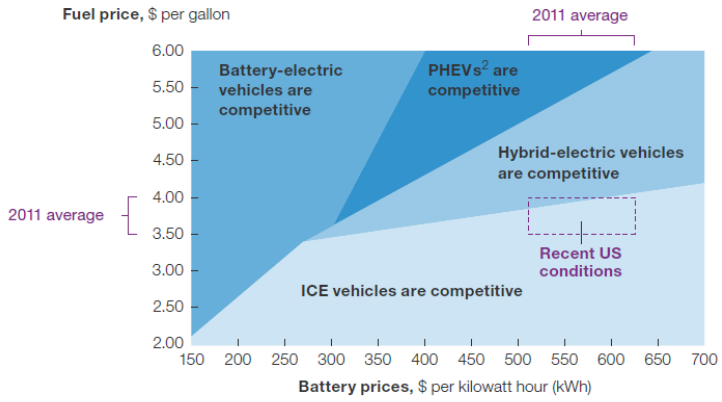
When we consider where the battery technology and cost profiles are today compared to where they might be in 2020 and 2025, the chart in Exhibit 12 shows how EVs can become highly competitive

it is clear the McKinsey researchers are not predicting that this scenario will occur

against conventionally-powered vehicles. The chart demonstrates the price point of $3.50 per gallon of gasoline and $250/kWh or less for batteries at which EVs become competitive. In reading the summary of the report, it is clear the McKinsey researchers are not predicting that this scenario will occur or that if it does EVs will clearly become more competitive than traditional ICE engines.

Exhibit 12. Lower Battery Costs Key To EV Success

Electrified vehicles' projected competitiveness with internal-combustion-engine (ICE) vehicles, based on total cost of ownership[1] (US example)



[1]Assumes 240 watt hours per mile (as may be achieved with lightweight, efficient air conditioning) compared with today's 305–322 watt hours per mile.
[2]Plug-in hybrid-electric vehicles.

Source: US Energy Information Administration; McKinsey analysis

Source: McKinsey

One reader wondered what the impact of this scenario would be on lithium carbonate prices

What was particularly interesting was reading the comments from readers following the McKinsey article. One reader, a marketing manager for an industrial minerals company in Greece, wondered what the impact of this scenario would be on lithium carbonate prices since the sources of this material are relatively limited and controlled by a few companies. The question often posed to EV promoters is: Won't we just be substituting one monopoly raw material supplier – China – for another – OPEC?

He concluded by suggesting that "unless there is dramatic rise in overall conversion efficiency, battery-operated vehicles will remain an unsustainable concept"

Another comment was offered by S. K. Ray, Senior Executive Vice President, Reliance Industries Ltd. (RIL.BO), in Mumbai, India. He wrote, "A more holistic approach would be to assess the efficiency of energy conversion for rotating the wheels. Battery-operated cars need electricity, which is derived predominantly from coal, fuel oil, and natural gas. The cost efficiency of generating traction energy in the car through alternative routes needs thorough evaluation. Today's cars follow the energy conversion model of crude oil to gasoline to energy for traction in ICE. For battery-operated vehicles we have an extra step: crude oil to fuel oil to electricity, which is converted to traction energy." He concluded by suggesting that "unless there is dramatic rise in overall conversion efficiency, battery-operated vehicles will remain an unsustainable concept."

Klaus Beccu, Director, Ing Battelle-Geneva R&D Center, Geneva, Switzerland, suggested there were still some critical technological issues to be resolved with batteries plus he questioned the battery cost estimates. He wrote, "The major problem with Li-ion batteries is always put aside: the rechargeable capacity loss. According to a 2011 DOE report conducted with major battery manufacturers, the batteries lose 20% capacity in 12 months (40°C) which means that in 3 to 4 years, a new battery is required. Also, the cited cost of 600 $/kWh may be only valid for automotive companies purchasing big quantities. Private people pay easily 800 to 900 $/kWh today. The projected price evolution down to 200 or even 160 $/kWh is for us pure speculation since it is based on significant increase of specific energy density, as mentioned."

Competing vehicle technologies could cause public interest in EVs to wane, which would undercut one of the key assumptions in the price reduction scenario, i.e., manufacturing scale

The McKinsey report suggests that EV battery costs could drop dramatically over the next 8-13 years, but that progress depends on many factors, not all of them within the envelope of existing technology. Moreover, competing vehicle technologies could cause public interest in EVs to wane, which would undercut one of the key assumptions in the price reduction scenario, i.e., manufacturing scale. The chairman of General Motors (GM-NYSE) has indicated that his company has invested in a new battery technology company that he believes might be able to allow an EV to go 100 miles on a single charge, or maybe as many as 200 miles. He believes if this technology breakthrough can be achieved it will be a "game changer" for EVs. He also said it might not happen for two to four years. The reality is that EVs are burdened with high costs due to expensive batteries and range limitations that restrict them to specific and limited use. One day these promises of technological breakthroughs will occur, but we aren't holding on to the projections in the McKinsey report.

Early Active Storm Season Means Forecasts Had To Increase

In those earlier forecasts the theme underlying them was that the development of El Niño and cooling sea surface temperatures in the Atlantic basin would limit the formation and strengthening of tropical storms

The 2012 tropical storm season began before June 1st, the traditional kick-off to the season, and has remained more active than virtually all forecasters had expected when they introduced their initial forecasts. In those earlier forecasts the theme underlying them was that the development of El Niño and cooling sea surface temperatures (SST) in the Atlantic basin would limit the formation and strengthening of tropical storms. In their April forecast, Phil Klotzbach and William Gray, the forecasting team at Colorado State University (CSU), said the climate dynamics would lead to "reduced activity." At the start of June when the CSU team issued its updated forecast, it still characterized the 2012 storm season as having "below average activity" although it had increased the projected number of named storms, hurricanes and storm days.

In the CSU's August forecast update, they wrote, "We anticipate a slightly-below average remainder of the hurricane season this year due to an anticipated weak El Niño event and a tropical Atlantic that

NOAA stated its new forecast still indicates a 50% chance of a near-normal season, but they increased the chance of an above-normal season to 35% and decreased the chance of a below-normal season to 15%

is less favorable than in the past two years. This forecast is a slight increase from activity predicted in early June, due to a slower-than-anticipated onset of El Niño and a somewhat more favorable tropical Atlantic than observed earlier this year. We expect a slightly below-average probability of United States and Caribbean major hurricane landfall." This view was echoed by the recently revised 2012 hurricane forecast issued by the National Oceanic and Atmospheric Administration (NOAA) last week. While they increased their projected number of storms for 2012, NOAA stated its new forecast still indicates a 50% chance of a near-normal season, but they increased the chance of an above-normal season to 35% and decreased the chance of a below-normal season to 15%.

Exhibit 13. 2012 Storm Forecast Increased

ATLANTIC BASIN SEASONAL HURRICANE FORECAST FOR 2012

Forecast Parameter and 1981-2010 Median (in parentheses)	Issue Date 4 April 2012	Issue Date 1 June 2012	Observed Activity Through July 2012	Forecast Activity After 31 July	Total Seasonal Forecast
Named Storms (NS) (12.0)	10	13	4	10	14
Named Storm Days (NSD) (60.1)	40	50	14.75	37.25	52
Hurricanes (H) (6.5)	4	5	1	5	6
Hurricane Days (HD) (21.3)	16	18	0.75	19.25	20
Major Hurricanes (MH) (2.0)	2	2	0	2	2
Major Hurricane Days (MHD) (3.9)	3	4	0	5	5
Accumulated Cyclone Energy (ACE) (92)	70	80	14	85	99
Net Tropical Cyclone Activity (NTC) (103%)	75	90	15	90	105

Source: CSU

If we look at these changed forecasts, we find they have only marginally increased their estimates

So far this year, the Atlantic basin has had six named storms with one becoming a category one hurricane immediately before making landfall on Mexico's Yucatan peninsula. As of last Saturday morning, a seventh tropical depression had formed in the Atlantic but had not grown beyond that status. If we look at these changed forecasts, we find they have only marginally increased their estimates, largely to reflect the greater number of early season storms and the possibility that El Niño, a limiting force for tropical storms, may not develop quite as early in the storm season as originally anticipated.

The greater increase in the CSU storm activity forecast occurred between its April and June projections

The latest CSU forecast calls for one additional named storm and hurricane. The greater increase in their storm activity forecast occurred between their April and June projections. NOAA has boosted its forecast to a range of 12 to 17 named storms, five to eight hurricanes and two to three major hurricanes. The primary increase in the NOAA forecast was for the number of named storms going from 9-15 to 12-17. The agency only boosted the bottom of its forecast range for hurricanes and major hurricanes by one.

CSU is the lone forecasting team that has a model to predict the odds of tropical storms making landfall on the U.S. coastline and in the Caribbean islands. For the post July 31st time period, the CSU team projects the odds of landfall anywhere on the U.S. coastline are 48% compared to the historical average of 52%. Landfall odds for the East Coast, including the Florida peninsula, are 28% (31%) and the Gulf Coast odds are 28% (30%). The August forecast report issued by CSU contained a table, which we have produced in Exhibit

The primary states at risk of being hit by a hurricane or major hurricane are Florida, Texas, Louisiana and North Carolina

14, showing the landfall probabilities for each coastal state for the balance of the 2012 season. The primary states at risk of being hit by a hurricane or major hurricane are Florida, Texas, Louisiana and North Carolina. These states are not a surprise as they are the primary targets each and every tropical storm season.

Exhibit 14. Four Coastal States Are At Great Risk

POST-31 JULY HURRICANE IMPACT PROBABILITIES FOR 2012 (NUMBERS IN PARENTHESES ARE LONG-PERIOD FULL SEASON AVERAGES)

State	Hurricane	Major Hurricane
Texas	30% (33%)	11% (12%)
Louisiana	28% (30%)	11% (12%)
Mississippi	10% (11%)	4% (4%)
Alabama	14% (16%)	2% (3%)
Florida	47% (51%)	19% (21%)
Georgia	10% (11%)	1% (1%)
South Carolina	16% (17%)	3% (4%)
North Carolina	26% (28%)	7% (8%)
Virginia	6% (6%)	1% (1%)
Maryland	1% (1%)	<1% (<1%)
Delaware	1% (1%)	<1% (<1%)
New Jersey	1% (1%)	<1% (<1%)
New York	7% (8%)	3% (3%)
Connecticut	6% (7%)	2% (2%)
Rhode Island	5% (6%)	2% (3%)
Massachusetts	6% (7%)	2% (2%)
New Hampshire	1% (1%)	<1% (<1%)
Maine	3% (4%)	<1% (<1%)

Source: CSU

While focusing on the various tropical storm forecasts is interesting, one can never lose sight of the fact that it takes only one storm, and it doesn't have to be a hurricane or even a major hurricane, for people to experience significant damage and personal loss. Both the CSU team and NOAA make that point and it is probably the most important point to come from these forecasts.

Correction:

In the July 31, 2012, issue of the *Musings* we wrote about George Mitchell and his views on hydraulic fracturing. In the article we mentioned another Texas wildcatter, but unfortunately misspelled his name. That wildcatter was Joe Walter. We regret the error and thank one of our readers for catching our mistake.

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

PPHB is an independent investment banking firm providing financial advisory services, including merger and acquisition and capital raising assistance, exclusively to clients in the energy service industry.