
MUSINGS FROM THE OIL PATCH

October 26, 2010

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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 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

Curtain Being Pulled Back From The Oz Of Gas Shales

Will we next see Katy Couric or Brian Williams discussing the merits of 30-stage fracturing of horizontally drilled wells in the rock under Pennsylvania?

We were struck by the oddity of a detailed discussion about the industry debate over technical factors integral to predicting the decline rate of gas shale wells in a recent column in the *Financial Times*, a bastion of international finance news. Several weeks ago, as we were flying to Calgary to deliver a speech to a group of coiled tubing enthusiasts, we opened the *FT*, as it is better known in financial circles, and came across a column by John Dizard entitled “The rate of shale gas decline is causing a heated debate.” Wow, we thought! An esoteric, but tough, debate over the rate of decline of natural gas wells in America, and generally relegated to petroleum industry journals, has now reached the mainstream financial press. Will we next see Katy Couric or Brian Williams discussing the merits of 30-stage fracturing of horizontally drilled wells in the rock under Pennsylvania? We can envision that news story from an environmental perspective, but not one focusing on the economics of this type of drilling.

Gas is now so ubiquitous that we are considering not only burning it in every energy market but also exporting it to world energy markets in the form of LNG

Mr. Dizard’s column discussed technical natural gas exploitation issues but within the context of much broader philosophical and societal issues. The technical success in tapping natural gas shale formations has turned the perception of the role of gas in the future energy supply of the United States on its head. Where natural gas was once thought to be too valuable to be burned under boilers powering electric generation facilities, gas is now so ubiquitous that we are considering not only burning it in every energy market but also exporting it to world energy markets in the form of liquefied natural gas (LNG). The gas shale revolution has changed the American energy market, which can now be summed up as “from fasting to feasting.” But is that view certain?

Therein lays the heart of Mr. Dizard’s argument in his column. He

The technical argument revolves around the shape of the production decline curve

The people who believe in a hyperbolic decline rate expect gas shale wells to produce at a reasonably high rate, and therefore a low cost, over a long period of time

postulates that there is a serious disagreement among industry participants over the shape of the decline curve for these gas shale resources. The differing views lead to sharply divergent conclusions about the volume of gas that can come from these shale basins, which not only determines their economic attractiveness but also how long our economy can count on the supplies being available.

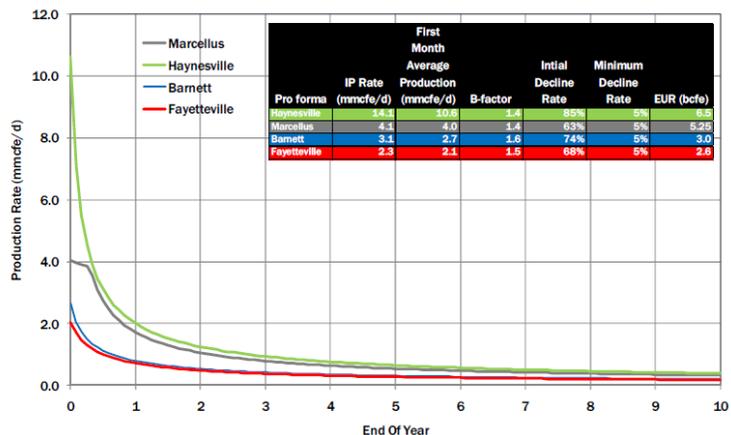
The technical argument revolves around the shape of the production decline curve that projects how long, and at what level, we can expect gas shale wells, and by implication the entire gas shale play, to produce. When you do the math – volume multiplied by time – you arrive at an estimate of the economic ultimate recovery (EUR) of the well. There are two schools of thought about the shape of the decline curve and they are defined by the value of the exponent “b” in the equations defining the curve’s shape. The equation includes the initial production rate, the initial rate of production decline and the degree that the initial decline rate flattens out over time.

The people who believe in a hyperbolic decline rate (b equal to or greater than 1.0) expect gas shale wells to produce at a reasonably high rate, and therefore a low cost, over a long period of time. The less optimistic people believe an exponential decline curve does a better job of plotting future production. Therefore, they believe the b exponent will have a value below 1.0 and closer to 0.5. Putting this debate into context, those who believe in the hyperbolic decline rate project EURs for gas shale wells in fields such as the Haynesville and Marcellus will be between 5.25 billion cubic feet (Bcf) and 6.5 Bcf, as postulated by Chesapeake Energy (CHK-NYSE) in its recent presentation to analysts. Those who believe in the exponential decline would put production for these same wells closer to 2.0 Bcf.

Exhibit 1. Chesapeake” View Of Gas Shale Economics

2010 Institutional Investor and Analyst Meeting

Natural Gas Shale Plays – Type Curves



Source: Chesapeake Energy

All these groups are essentially transferring the risk of failure to the general public

As they say, that gap in estimates is wide enough to drive a fleet of trucks through. And that gap becomes a problem because the risk of failure is great, but it is largely being ignored by energy companies, investors, utilities and energy policy makers who are rushing to throw money at gas shale plays. By ignoring the risk of the optimists being wrong, all these groups are essentially transferring the risk of failure to the general public.

The ultimate savior in this debate may be nuclear power, but that effort is struggling to move forward

What is the risk to our economy in the great gas shale debate? Increasingly natural gas is being touted as the fuel that will bridge our economy's energy needs from its heavy dependence on "dirty" fossil fuels to "clean" renewable fuels. One of the problems with the clean fuel dependence is that many of the fuels – solar and wind – are intermittent sources of energy so they require either back-up energy supply sources or technological breakthroughs in energy storage facilities. In many cases the planned back-up for renewable energy supplies are natural gas-fired combined cycle power plants. The ultimate savior in this debate may be nuclear power, but that effort is struggling to move forward.

He wonders what will happen to these investments if the conventional view of how much natural gas we have proves to be over-stated

Mr. Dizard pointed out that the U.S., Europe and now China are all making huge investments in natural gas-fired power plants to replace coal-fired plants. He wonders what will happen to these investments if the conventional view of how much natural gas we have proves to be over-stated. By implication Mr. Dizard is worried about the harm to countries, their economies and citizens, if they are wrong about their strategy for powering their future economies. We recognize that risk, but also remain optimistic that technological developments will find ways to boost gas recovery at lower costs, but more importantly to find ways to improve energy storage and efficiency among our existing power sources.

Iran Gaining Control Of Iraq Without Firing A Shot?

We suggested that maybe people should be scanning the horizon for the next industry Black Swan

In early July we wrote an article entitled "Middle East: Oil Industry's And World's Next Black Swan?" At that time all eyes in the oil industry and among American citizens were focused on the developments with BP's Gulf of Mexico Macondo well, which was then spewing oil and creating one of the world's worst environmental disasters. We suggested that maybe people should be scanning the horizon for the next industry Black Swan. We went on to offer our best guess on what that Black Swan might be – the Middle East. We said that many people wouldn't consider the Middle East to be a Black Swan – an unknowable and thus unanticipated event – but rather just an ignored developing trend. In that article we said: "A number of recent data points have emerged that suggest the Middle East may become a focal point of political and possibly military action before the end of the year, or maybe even earlier."

In July, the focus of Middle East developments was on when Iran

The buzz at that time among military and intelligence sources was that Israel was preparing an air strike to destroy Iran’s nuclear facilities

might be able to complete building a nuclear weapon. That timetable is dependent upon the country’s ability to produce enriched uranium, which is being done in one or maybe more nuclear facilities. The buzz at that time among military and intelligence sources was that Israel was preparing an air strike to destroy Iran’s nuclear facilities as it had done a number of years earlier. Supporting that view was Congressional testimony from Secretary of Defense Robert Gates and Central Intelligence Agency head Leon Panetta that Iran would be completing development of a nuclear weapon in one to two years time at the outside. Also revealed in Defense Secretary Gates’ testimony was that the U.S. had overhauled its NATO missile defense plans based on intelligence that Iran could fire “scores or hundreds” of missiles against Europe in salvos rather than one or two at a time. Sec. Gates did not mention Israel in his testimony but clearly that nation is considerably closer to Iran than most of Europe.

So far nothing has happened based on the scenario suggested by the intelligence

There were also a number of Arab media reports that Saudi Arabia had granted permission for the Israeli Air Force to land helicopters in its country. The reports were that the Saudi government had offered the use of a base in the northwest part of the kingdom that could be used as a staging point for an aerial assault against Iran. So far nothing has happened based on the scenario suggested by the intelligence, but there have been other developments that are altering the picture.

Exhibit 2. Shia/Sunni Beliefs Divide Middle East



Source: Agora Finance

The Saudi air force may be preparing for a possible fight with Iran

Two of the most significant developments are a \$60 billion U.S. sale of defense equipment to Saudi Arabia that includes upgraded F-15 fighter planes, attack helicopters and missiles and bombs, including bunker-buster bombs. The last item would seem to suggest that the Saudi air force may be preparing for a possible fight with Iran and the need to attack its military and possibly nuclear facilities. The

Iran is populated predominantly by people from the Shia sect of Islam versus people from the Sunni sect that dominates Saudi Arabia

other development is the announcement that the United Arab Emirates (UAE) has opened a new port on the Arabian Sea. The port also has oil storage tanks. The port lies beyond the Strait of Hormuz and the oil storage facilities will be hooked up to a pipeline stretching from Abu Dhabi that is currently under construction.

In our earlier article we outlined a scenario that Saudi Arabia is concerned about the growing threat to its security from a more militant Iran. As we pointed out, the battle between those two countries - one with a large population and designs on ruling the Middle East and the other extremely wealthy but with a smallish population - is over their respective religious views. Iran is populated predominantly by people from the Shia sect of Islam versus people from the Sunni sect that dominates Saudi Arabia. This religious divide was part of the historical tensions between Iraq and Iran and contributed to periodic wars involving those two countries. Besides Iraq, the Shia sect is represented heavily in Kuwait with smaller contingents in Yemen and Syria. There are also pockets of Shia in Turkey, Pakistan and Afghanistan, with the latter increasingly important in today's geopolitical environment.

Exhibit 3. Yemen Incursions First Battleground



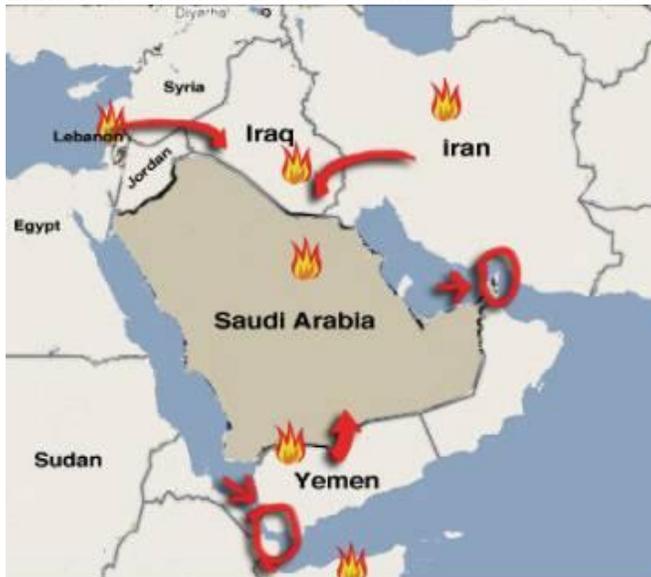
Source: Agora Finance

Thoughts were that Iran would use its potential stranglehold over the Strait of Hormuz to limit Saudi Arabian oil exports

The Middle East scenario that various intelligence agents have postulated is that the uprisings along the Yemen/Saudi Arabia border is part of an effort that could become the first step in a more significant attack against Saudi Arabia. To broaden the effort of a Shia-motivated overthrow of the Saudi Arabian royal family, Iran needs to attack Iraq and gain control over that country, which would provide it with an expanded border with the kingdom. Thoughts were that Iran would use its potential stranglehold over the Strait of Hormuz to limit Saudi Arabian oil exports while using allies from Lebanon and Syria to subdue Iraq before turning on the kingdom.

Recent developments may have drastically altered that scenario making it much easier for Iran to gain increased political leverage over Saudi Arabia.

Exhibit 4. Ultimate Battle For Middle East Control



Source: Agora Finance

The challenge Mr. al-Maliki faces, however, is trying to serve two masters, something that won't last for long or be successful if he wants to create a stable Iraqi government

Last week, Nouri al-Maliki, prime minister of Iraq, traveled to Iran seeking guidance on what he needed to do to create a coalition government in Iraq, something that has eluded him since the March elections. He was told by Iran's supreme leader, Ayatollah Ali Khamenei, to "get rid of America" and its 50,000 remaining troops in his country. The challenge Mr. al-Maliki faces, however, is trying to serve two masters, something that won't last for long or be successful if he wants to create a stable Iraqi government. Mr. al-Maliki lived in exile in Iran during Saddam Hussein's rule so he owes a certain amount of allegiance to Iran's theocratic government. At the same time, Mr. al-Maliki understands that he would never have become the Iraqi leader had the United States not invaded and overthrown the country's repressive leader. The decision on who to listen to is further complicated by Iran's action several weeks ago to convince another political faction, the Sadrists, in Iraq to back Mr. al-Maliki in his bid to remain prime minister. The United States insists that this faction be kept out of the coalition because it insists on the departure of U.S. troops.

Another interesting twist in the U.S.-Iran relationship was that a high-ranking Iranian diplomat attended the recent NATO meeting on the transition in Afghanistan, a country that Iran shares a long and porous border with. This was the NATO informational group's ninth meeting since being formed in April 2009 at the urging of President Barack Obama. The group includes 44 countries concerned with

The diplomat also attended a briefing by U.S. General David Patraeus on NATO's military strategy in Afghanistan

developments in Afghanistan and Pakistan.

The Iranian diplomat attended the group's meeting for the first time, even though initially in 2009 Iran had signaled its interest in participating in the group, but never participated. The diplomat also attended a briefing by U.S. General David Patraeus on NATO's military strategy in Afghanistan. The diplomat was quoted by media sources as being pleased with the degree of transparency with NATO's actions.

The involvement of Iran in this NATO gathering and strategic updating, coupled with its role in providing guidance to Mr. al-Maliki, raise questions about whether Iran is securing its expansionary goals without having to work very hard. Mr. al-Maliki is left with an interesting choice – he can side with Iran and form a stable government in Iraq, or he can side with the U.S. and continue the seven-month crisis and face escalating violence and economic harm at home. Assuming he takes the first option, Iran gains a strategic partner in its efforts to eventually unseat the Sunni theocracy in Saudi Arabia. That possibility will keep global oil markets on edge and oil prices volatile.

A better oil supply situation for Iran will strengthen the country to withstand sanctions and boost its military strength

There is another aspect to the oil equation, which relates to the large oil fields in Iraq that are planned to be developed through agreements with western oil companies. Reduced politically-motivated violence could speed up that development doing two things: 1) providing badly needed oil and refined products to Iran, and 2) bringing huge new global oil production on stream in a few years time putting oil prices under pressure. Neither of these options appears to be favorable to the U.S.'s most staunch political ally in the Middle East – Saudi Arabia. A better oil supply situation for Iran will strengthen the country to withstand sanctions and boost its military strength. Lower oil prices, at a time when Saudi Arabia is struggling with its rapid population growth and rising domestic oil consumption that is restricting growth in the country's oil exports and thus its income, could undermine the royal family's control of the country.

We will be watching closely to see what decision Mr. al-Maliki makes. The decision is likely to inject a new level of tension into the Middle East and, depending upon the strategy embraced, could lead to more volatile oil prices in the future. We could argue for both higher and lower future oil prices depending upon the decision. If we were a betting person, we would side with the Iranian support decision that will likely inject increased fear into the Saudi royal family. What steps it takes and how long before significant new oil flows emerge from Iraq remains to be seen. Maybe the \$60 billion defense purchase is the step. A spike in oil prices in 2011 is not out of the question but that could ultimately lead to lower prices in the longer term. Put that scenario into your capital spending models!

The “Green” Car Hype Is Officially Underway

The hype over these new vehicles is starting to mushroom

In the past few weeks more and more articles about the new “green” cars that will be hitting dealer showrooms this fall are appearing in the media. Now that the auto companies have sufficient supplies of these new models that they are preparing to introduce they can let auto writers test drive them. The hype over these new vehicles is starting to mushroom. We have read several reviews of road tests of the Nissan (NSANY.PK) Leaf electric vehicle (EV) that praise its pickup and handling AND its battery performance, although there seems to be a problem in getting the government to figure out how it will measure EV efficiency, which the Environmental Protection Agency (EPA) is mandated by law to calculate.

Part of this road show trip is designed to blunt some of the criticism of the car as being too expensive for a four-seater

While the Leaf is getting some rave reviews, the Chevrolet Volt is embroiled in a publicity flap about whether the car is truly an EV or merely a plug-in hybrid or some other class of alternative vehicle since it has a small gasoline engine that is used to sustain the battery charge until it can be properly recharged. The debate has arisen as Chevrolet embarked on a 12-city nationwide tour with the Volt to educate the local media, dealers and others about its selling points. Part of this road show trip is designed to blunt some of the criticism of the car as being too expensive for a four-seater (cost is \$41,000 before tax credits), needs premium fuel to power its gasoline engine, and is no larger than a Toyota (TM-NYSE) Corolla.

It has now been revealed that there is a second small electric motor

The Volt runs on pure battery power until the batteries are drained at which time the gasoline engine kicks in to generate electricity to power the big electric motor driving the vehicle’s front wheels. It has now been revealed that there is a second small electric motor that is also powered by the gasoline engine that through a series of gears can assist the big electric motor to drive the vehicle at highway speeds. As a result of this recent disclosure, the Volt has precipitated a controversy about exactly what kind of vehicle it really is as true-believers say it can’t be an all-electric vehicle.

The introduction of the second electric motor is designed to improve the vehicle’s efficiency. According to Pam Fletcher, global chief engineer for the Volt power train, the car can run up to 100 miles per hour (mph), its top-rated speed, on pure electric power, but by converting power from the gas engine to electricity it is less efficient than letting the gas engine help power the wheels. Doing that, she says, adds 10% to 15% more efficiency to the power train.

The reason this technological setup was never previously revealed was for competitive purposes

The reason this technological setup was never previously revealed was for competitive purposes. General Motors filed for a patent on the technology in September 2007, but didn’t want to disclose anything about the technology until now to prevent other car manufacturers from being able to copy it. So in trying to settle the heated debate about whether the Volt is an electric car or not, Ms. Fletcher points out that the car won’t run without the electric motor

He calls the Volt “arguably the most complex mainstream vehicle ever built by an American manufacturer”

but it can run without the gasoline motor. There is no direct driveshaft from the gas engine to the front wheels. So while the gas engine can help out the vehicle at high speeds, it is still an electric car.

Steven Cole Smith, the auto writer for *The Orlando Sentinel*, who drove a Volt recently and gave it very high marks, suggests that the car delivers everything Chevrolet says it would. He calls the Volt “arguably the most complex mainstream vehicle ever built by an American manufacturer.” Dan Neil, the auto writer for *The Wall Street Journal*, in his recent review of the Volt, which he highly praised, called the car “GM’s futuristic extended-range electric vehicle and the company’s most technologically significant car since the 1912 Cadillac.” Later he listed the Volt’s power train as a “range-extended electric vehicle/series hybrid.”

Mr. Smith says that there are six basic types of propulsion systems for current and future automobiles. These are: internal combustion power; full hybrid; partial hybrid; plug-in hybrid; electric vehicle; and extended-range electric vehicle. It is this latter category where both Messrs. Neil and Smith place the Volt.

As the joke about EVs goes: An EV will get you to your destination in eco-chic style but only get you home with the help of a tow-truck

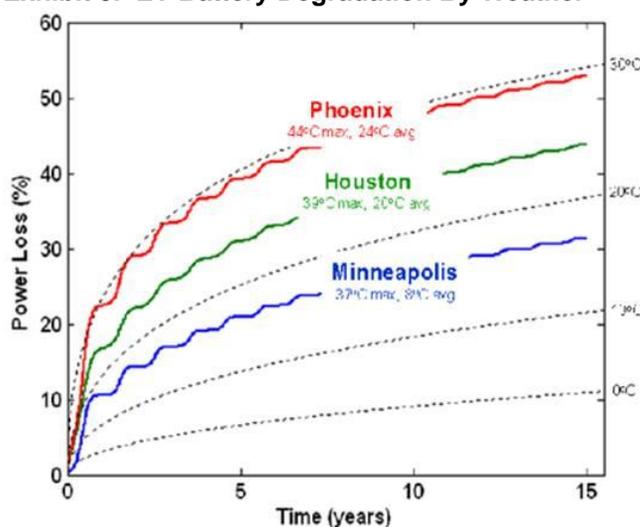
With the arrival of the EVs and the EV-hype, it brings into focus the debate about the economics of these vehicles. As drivers confront the real world of EVs, the issue of ‘range anxiety’ will move front and center. As the joke about EVs goes: An EV will get you to your destination in eco-chic style but only get you home with the help of a tow-truck. All the marketing hype about the range of EVs on a single charge may turn out to be like the early EPA vehicle fuel-efficiency ratings – something that looked impressive on the window sticker but was never attained in the real world. The reason was that the fuel-efficiency ratings were determined in a laboratory under ideal conditions – nothing like you and I have to contend with on Houston roads! Of course, the Volt hopes to dispel buyer concerns about range-anxiety with the use of its gasoline engine, but then again all hybrids are in the same situation.

In Minneapolis an EV-100 will become an EV-90 after one year and an EV-80 after five years

A recent National Renewable Energy Laboratory study examined the long-term effect of local weather conditions on power degradation in lithium-ion battery packs that are being used in the latest EVs, as opposed to hybrids. The chart in Exhibit 5 shows the degradation as a measure of power loss over 15 years, which is the reason the chart is upward sloping. What it shows is that in Minneapolis an EV-100 (miles of range) will become an EV-90 after one year and an EV-80 after five years. In Phoenix it will be an EV-80 after one year and an EV-60 after five. Houston does better than Phoenix, but not as well as Minneapolis.

There are other range-penalties that EV buyers may want to consider. While heat increases the rate of battery degradation, cold weather is also a killer, at least based on the experience of Mini-e

Exhibit 5. EV Battery Degradation By Weather



Source: SeekingAlpha.com

test drivers. If you live where freezing temperatures are a minor seasonal inconvenience, then you may experience a 10% reduction in range. If freezing weather is more of a routine, then buyers should expect a 20% range reduction.

According to Nissan, the Leaf's range will fall by 40% in 15-mph stop-and-go-traffic at low temperatures and by 50% in 6-mph stop-and-go-traffic at moderate temperatures

There are high hopes that bigger, better and cheaper battery packs are merely around the corner, but don't hold your breath

Hilly terrain can cost a driver between 5% and 10% of his expected EV's range. That is not too great a penalty, but it appears that the real range killer is stop-and-go-traffic. Here, stop-and-go-traffic can cost anywhere from 30% to 50% of the EV's range. According to Nissan, the Leaf's range will fall by 40% in 15-mph stop-and-go-traffic at low temperatures and by 50% in 6-mph stop-and-go-traffic at moderate temperatures. That range loss may explain why most EVs are planned to be introduced in warm or moderate temperature locales first.

The obvious solution to the degradation problem would appear to be to build bigger battery packs. The problem is that bigger battery packs add complexity to the car and add weight that impacts performance and cost. There are high hopes that bigger, better and cheaper battery packs are merely around the corner, but don't hold your breath. Since EV manufacturers are now providing 8-year battery warranties, even if a battery pack starts out at the factory costing \$400 per kilowatt-hour (kWh), the fully loaded cost to consumers given this lengthy warranty and a normal profit markup will likely put the retail cost of the battery pack in the range of \$750/kWh, a number Nissan has tagged for its Leaf.

A 2009 report for the Department of Energy by TIAX LLC put the current cost of commodity grade 18650 lithium-ion cells at \$200 to \$250 per kWh, which results in battery pack costs of \$400 to \$700 per kWh. Since there seem not be any economies of scale, when

Carlos Ghosan, CEO of Nissan, says that his company needs to sell one million EVs a year to bring down the cost to competitive levels without government subsidies

you add in warranty costs and automaker profits, end-user battery costs in the \$400 or even \$500 per kWh range cannot be achieved without some revolutionary technological change that would make lithium-ion batteries and the factories that make them obsolete.

The impact of battery costs on the price of EVs has bedeviled car manufacturers. Carlos Ghosan, CEO of Nissan, says that his company needs to sell one million EVs a year to bring down the cost to competitive levels without government subsidies. The U.S. version of the Leaf, which seats five people, will be priced at \$32,780. After the federal tax credit of \$7,500, the cost to the buyer is \$25,280. Nissan has allocated 20,000 Leafs to U.S. dealers next year. The company plans on ramping up production in its plants on three continents in 2012, but global production will only be 200,000 cars. It looks like it will be a long time before Nissan can sell a price-competitive vehicle in this country without government tax credits.

People’s expectation that electricity for an EV will cost the equivalent of \$1.20 per gallon of gasoline he says fails to account for other costs of ownership

Lawyer and battery company advisor John Petersen has analyzed EV battery costs and makes the following observations. People’s expectation that electricity for an EV will cost the equivalent of \$1.20 per gallon of gasoline he says fails to account for other costs of ownership. He prepared a table showing the “hope for the best” total cost of ownership. As shown in Exhibit 6, the annual cost for the battery pack for the Volt (40 miles) under this scenario would equate to gasoline priced at about \$1.50 a gallon. The Leaf with its 100-mile range would cost somewhat more than \$3.00 per gallon of gasoline.

Exhibit 6. Hope for the Best Case

EV Range	Battery Metrics		Annual Operating Costs				Equivalent
	Capacity	Pack Cost	Depreciation	Electricity	Maintenance	Total	Gas Price
40 Miles	10 kWh	\$6,000	\$600	\$300	(\$300)	\$600	\$1.50
80 Miles	20 kWh	\$12,000	\$1,200	\$300	(\$300)	\$1,200	\$3.00
160 Miles	40 kWh	\$24,000	\$2,400	\$300	(\$300)	\$2,400	\$6.00
320 Miles	80 kWh	\$48,000	\$4,800	\$300	(\$300)	\$4,800	\$12.00

Source: SeekingAlpha.com

In a different analysis, which Mr. Petersen called “plan for the worst,” he sees the total cost of battery ownership being nearly three times the gasoline-equivalent price in the “hope for the best” scenario.

Exhibit 7. Plan for the Worst Case

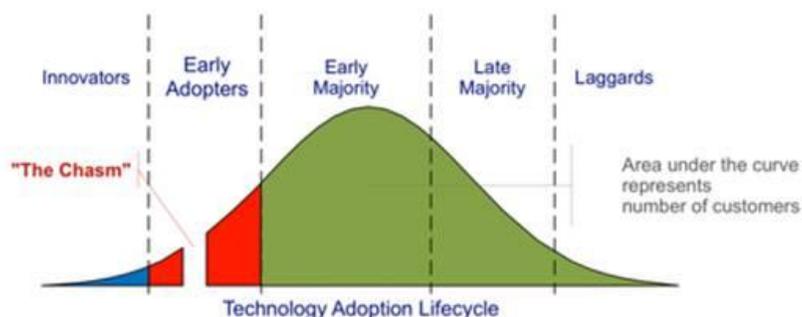
EV Range	Battery Metrics		Annual Operating Costs				Equivalent
	Capacity	Pack Cost	Depreciation	Electricity	Maintenance	Total	Gas Price
40 Miles	20 kWh	\$15,000	\$1,500	\$600	\$0	\$2,100	\$5.25
80 Miles	40 kWh	\$30,000	\$3,000	\$600	\$0	\$3,600	\$9.00
160 Miles	80 kWh	\$60,000	\$6,000	\$600	\$0	\$6,600	\$16.50
320 Miles	160 kWh	\$120,000	\$12,000	\$600	\$0	\$12,600	\$31.50

Source: SeekingAlpha.com

Could that angst be sufficient to set back the EV momentum and force the government to intervene and mandate EV purchases by Americans?

He believes the poor economics of EV batteries, coupled with the battery degradation issue that EV owners will only learn about after they drive off the dealer's lot, will create severe angst among early adopters of EV technology. Could that angst be sufficient to set back the EV momentum and force the government to intervene and mandate EV purchases by Americans? Since EVs have not bridged "The Chasm" in the lifecycle of adoption of new technologies, these two issues could go a long way to limiting the embrace of these new vehicles. That doesn't mean, however, that EVs won't be a meaningful part of the American auto fleet of the future because politicians and regulatory bureaucrats will have a lot to say in negating the workings of a free market.

Exhibit 8. The Phases Of Technology Adoption



Source: SeekingAlpha.com

“A business model that can't work without subsidies doesn't make sense”

As Mr. Petersen put it in his article, “Industrial revolutions arise from technologies that first prove their economic value in a free market and then seek subsidies to accelerate growth. A business model that can't work without subsidies doesn't make sense because the punch bowl always gets taken away too early, particularly if customers aren't happy. The green jobs myth of the EV revolution has already proven to be a mirage. The cost effective and reliable transportation myth will be the next to crumble.” This is a sobering message for those who are planning to build a “green” America on the foundation of EVs and lithium-ion batteries.

Population Demographics And Energy Consumption

We have been doing more research on the question of population aging and energy consumption because the world is certainly aging

In our last Musings we discussed the aging population challenge China's economy may be confronting and its possible ramifications on the country's future energy consumption. We have been doing more research on the question of population aging and energy consumption because the world is certainly aging, which is likely to impact energy needs globally, and especially in certain geographic regions. The challenge is finding research that has even attempted to isolate the impact of age from other variables impacting consumption such as income, household size and location of residence.

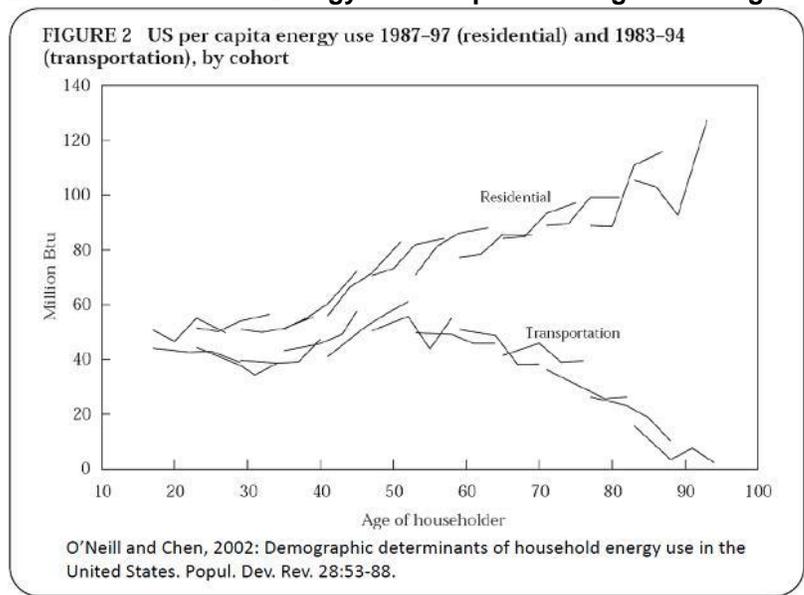
Many older individuals wind up as single-person households increasing the amount of energy used per household

Residential energy consumption rose with the age of the consumer while transportation energy consumed rose initially and then went into modest decline at about age 50 followed by a much sharper decline once consumers passed age 60. These conclusions were not surprising. The data for this 2002 study was from the United States in the 1980s and 1990s.

The most interesting research we found came from work associated with understanding the drivers of carbon emissions (global warming) and how the amount of emissions might be impacted by specific government actions. The paper was initiated by the authors in response to a view that by merely multiplying energy use per capita by the growth in future population, one could easily ascertain the likely amount of carbon emissions from increased fossil fuel usage. The study's authors suggested that the variables mentioned above were worthy of further research, but they concluded that the most important impact on energy consumption was the size of households. While this factor will certainly impact the amount of energy consumed, it too is impacted by aging populations as many older individuals wind up as single-person households increasing the amount of energy used per household.

Included in the study was some research on the amount of residential energy and transportation energy used by consumers by their age. What the results of a series of historical surveys showed was that residential energy consumption rose with the age of the consumer while transportation energy consumed rose initially and then went into modest decline at about age 50 followed by a much sharper decline once consumers passed age 60. These conclusions were not surprising. The data for this 2002 study was from the United States in the 1980s and 1990s.

Exhibit 9. American Energy Consumption Changes With Age



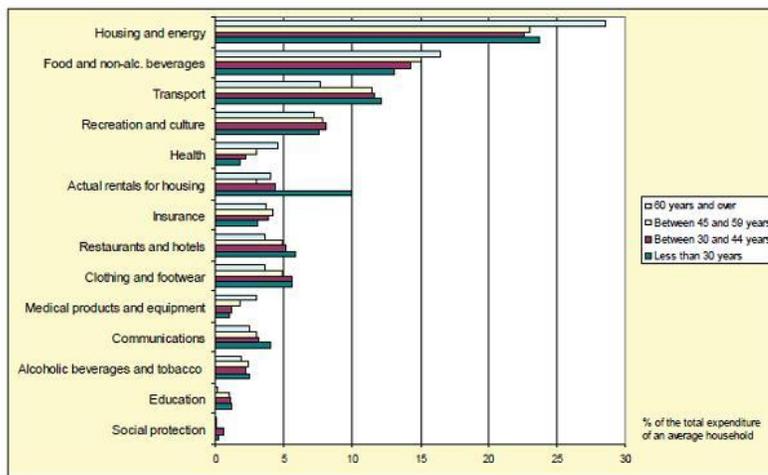
Source: *Population Development Review*

A 2009 study on consumer spending by age group conducted by the United Nations Economic Commission for Europe essentially confirmed the results from the earlier U.S. study. The spending on housing and residential energy shows that people over age 60 spent

the largest amount of their total spending on this category. What we can't tell is how the spending is divided between housing and residential energy. It is also possible that the expenditure percentage is influenced by reduced spending in other categories such as communications, education, recreation and clothing, for example.

Exhibit 10. Residential Energy Consumption Rises With Age

Figure 4: Consumption Expenditure by Age for Selected Commodity Groups in EU-27 (COICOP niv2/per 1000)



Source: EUROSTAT (2008): Living conditions and social protection. Database. http://epp.eurostat.ec.europa.eu/portal/page/portal/living_conditions_and_social_protection/data/database

Source: UN Economic Commission for Europe

Once an American driver reaches 60 years old, the number of miles he drives falls steadily

What we also see in the UN study is that transportation spending drops with age. That conclusion is supported by data from the U.S. Federal Highway Administration showing miles driven by the age of the primary driver. According to the data, once an American driver reaches 60 years old, the number of miles he drives falls steadily with further aging. Importantly, upon reaching age 60 the number of

Exhibit 11. Miles Driven By Americans Fall With Age

Figure 3.8 Residential Vehicle-Miles Traveled per Vehicle by Age of Primary Driver,



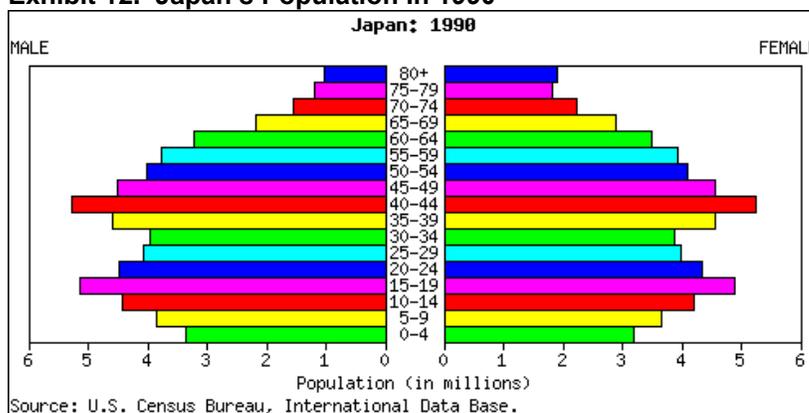
Source: U.S. Federal Highway Administration

We find it interesting to compare the age pyramid of China with that of Japan

miles driven by this older driver falls below the miles driven by early teenage drivers. This is not surprising as both the skills and needs of an older driver declines with age.

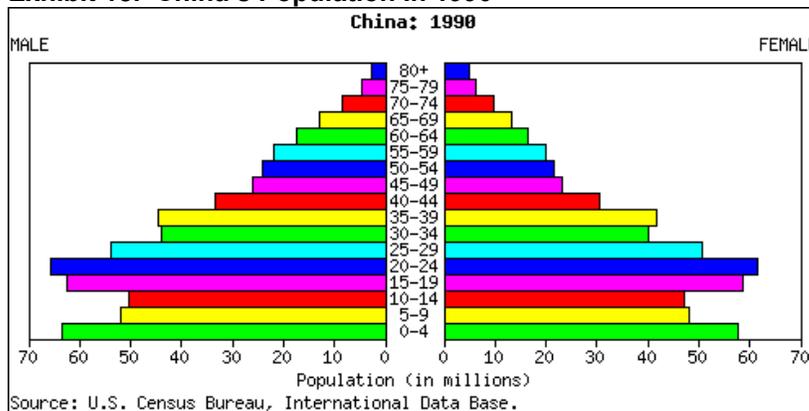
The impact of this aging phenomenon on energy consumption in China was highlighted in the last Musings issue. We find it interesting to compare the age pyramid of China with that of Japan in the past, currently and as projected by the end of the next decade. As one scrolls through the exhibits and the collective charts reflecting movement of age groups within the population pyramids, it becomes clear the aging trend that has been ongoing in Japan and is starting to flow through the Chinese population.

Exhibit 12. Japan's Population In 1990



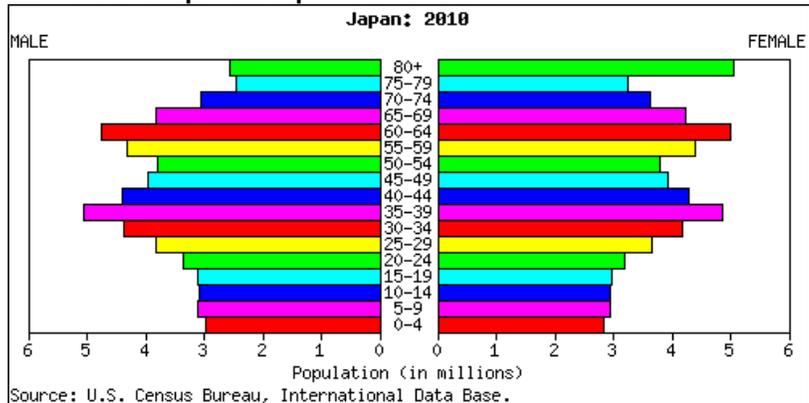
Source: U.S. Census Bureau

Exhibit 13. China's Population In 1990



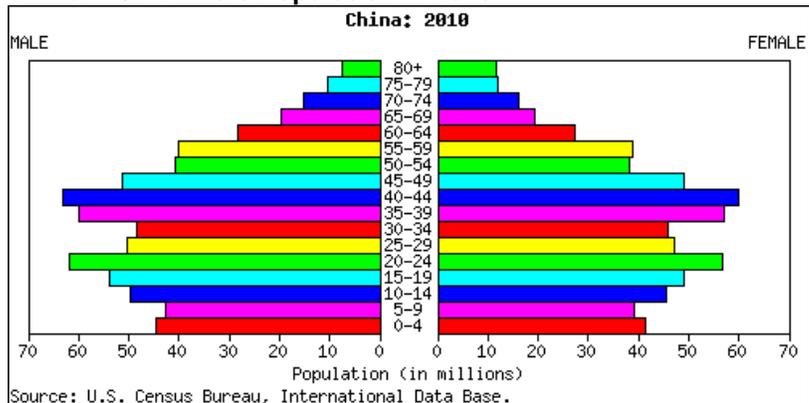
Source: U.S. Census Bureau

Exhibit 14. Japan's Population In 2010



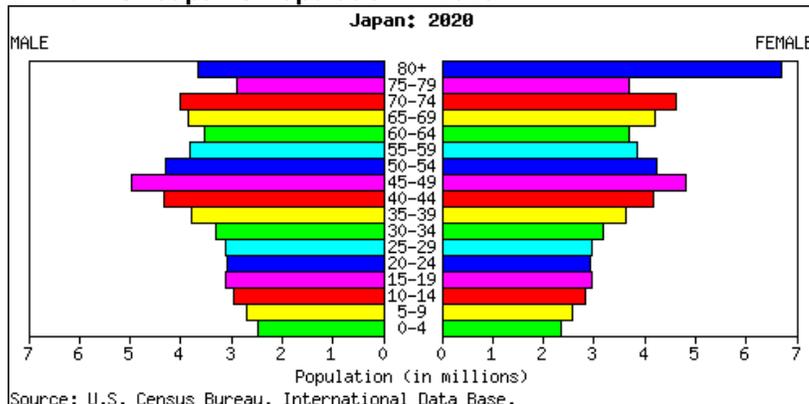
Source: U.S. Census Bureau

Exhibit 15. China's Population In 2010



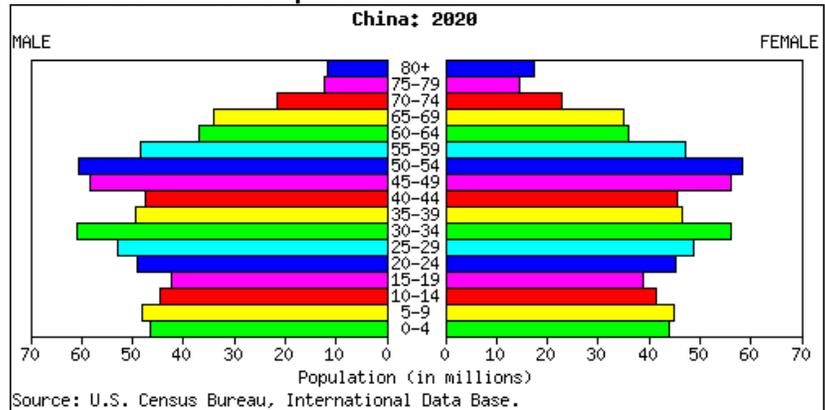
Source: U.S. Census Bureau

Exhibit 16. Japan's Population In 2020



Source: U.S. Census Bureau

Exhibit 17. China's Population In 2020



Source: U.S. Census Bureau

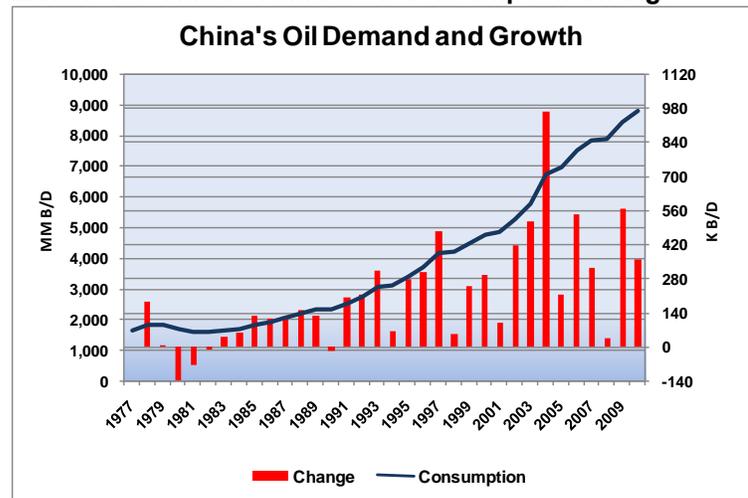
It becomes possible to link population aging and reduced oil consumption

This is a dynamic about China's future economy and its energy needs that we believe many analysts may be missing

When one compares the population changes that have occurred in Japan and views them in the context of Exhibit 19, which contains a chart showing annual oil consumption changes for the country over the past 33 years, it becomes possible to link population aging and reduced oil consumption. The most important aspect of this relationship is the period since the middle 1990s, which show little (mostly negative) oil consumption growth as Japan's population aged significantly and the country's economy struggled to grow.

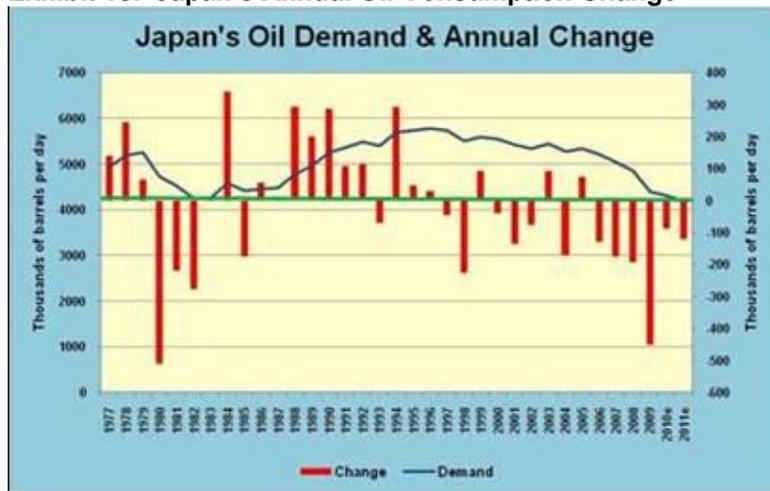
In contrast, China's energy demand growth has remained strong as its economy benefitted from strong export driven demand, a growing population, increased urbanization and an expanding middle class. The Chinese economy has also been a primary beneficiary of a large, productive youth population – the age group that is now aging. This is a dynamic about China's future economy and its energy needs that we believe many analysts may be missing.

Exhibit 18. China's Annual Oil Consumption Change



Source: BP, IEA, PPHB

Exhibit 19. Japan's Annual Oil Consumption Change



Source: BP, IEA, PPHB

We believe the relationship between aging populations and slowing oil consumption is likely to be replicated in a rapidly aging China

Natural gas may play a greater role in China's future energy consumption as it displaces coal in response to carbon emission reduction pressures

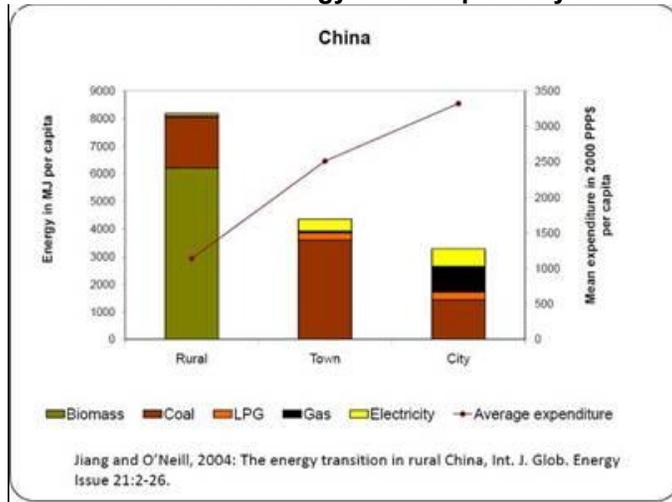
The urbanization percentage is projected to climb above 50% in the next couple of years possibly reaching 65% by 2020

We believe the relationship between aging populations and slowing oil consumption is likely to be replicated in a rapidly aging China. This view is not the conventional wisdom as most forecasters focus on absolute population growth and increased oil consumption. Unfortunately, the forecasting models show China's population growth ending within the next 5-10 years. Increased oil consumption could come from a rising standard of living, but that depends a lot on how China's economy develops in the future.

Some analysts believe that energy consumption will continue to grow as China's population ages because older people will continue to demand the same lifestyle they had when they were younger. We believe this trend may hold and could actually lead to China's total energy demand continuing to rise despite an increasingly aging population. The issue is whether the residential energy consumption represents primarily electricity consumption rather than oil consumption. Natural gas may play a greater role in China's future energy consumption as it displaces coal in response to carbon emission reduction pressures. Crude oil demand is tied to transportation needs and the trend to fewer miles driven and reduced travel with increasing age support the conclusion that China's oil consumption growth rate will slow in the future. That conclusion is also supported by the trend to greater urbanization in China.

The latest report from China's National Bureau of Statistics shows that a little over 46% of the country's population lives in urban areas. The urbanization percentage is projected to climb above 50% in the next couple of years possibly reaching 65% by 2020. Of course that will depend on the evolution of China's economy and the government's success in relocating people from rural to urban areas, something that may become a problem if economic growth slows.

Exhibit 20. China's Energy Consumption By Locale

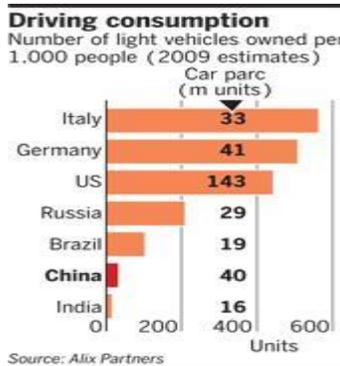


Source: *International Journal of Global Energy*

From an energy market perspective, urban energy demand growth is more important because all of that energy comes from hydrocarbons in one form or another

A 2004 study on energy consumption per capita in China split amongst locations shows an interesting trend. What the figures show is that rural energy consumption per capita is the highest of any location in China but that much of that energy consumption is represented by biomass. The least amount of energy consumed per capita is in urban areas. The major difference between these two extremes is the total cost of energy – rural being the lowest cost with urban the highest. From an energy market perspective, urban energy demand growth is more important because all of that energy comes from hydrocarbons in one form or another. In contrast, the large amount of biomass consumed in rural locations represents “green” energy and is non-fossil-fuel-based. The message from this study is that as China’s urbanization effort continues, there is an underlying demand growth for energy, and primarily fossil fuel energy. To the extent that China can develop alternative power sources – nuclear, wind and solar – to produce electricity, the country could slow its electricity and energy demand growth rate.

Exhibit 21. Auto Penetration



Source: *Financial Times*

China's automobile sales have grown at more than a 30% compounded annual rate for the past decade, helping to make it the largest car market in the world

The key to a stronger economy, and hence increased oil consumption, is increased penetration by automobiles. A recent article in the *Financial Times*, which utilized the chart in Exhibit 21 showing the low auto penetration rate in China compared to other emerging markets such as Brazil and Russia, questioned whether the auto penetration growth rate of the past decade would continue. China's automobile sales have grown at more than a 30% compounded annual rate for the past decade, helping to make it the largest car market in the world. In the past year, China's auto sales grew at a 40% rate boosted somewhat by government stimulus actions including tax cuts. With the government attempting to shift China's economy from one dependent on exports and investments to one driven by domestic consumption, the case can be made that auto sales should remain strong. Estimates are that the increase in the number of households crossing the threshold of incomes that can afford car purchases has been a prime driver of new vehicle demand. The number of households projected to cross that income threshold should rise from 35 million to 70 million in the next five years. It is this growth in the number of middle class households that underlies auto industry forecasts for more than 18 million cars being sold in China this year and that the number of cars sold will increase each year during the next five years.

The traffic jam problems of China are related more to poor urban planning than growth of the automobile fleet

We remain puzzled, however, by the lack of commensurate growth in gasoline consumption and the repeated news stories about horrendous traffic jams. A recent column in *Automotive News* says that the traffic jam problems of China are related more to poor urban planning than growth of the automobile fleet. The column points out that originally Beijing planned on its population being below 18 million by 2020. Given the government's desire to grow its local economy, it has allowed its population to grow by five million people in each of the past three years. At the end of 2009, Beijing's population stood at 17.6 million people, nearly the target for 2020. Moreover, Beijing has grown in areal extent from 305 square miles in 2000 to 801 square miles in 2007.

Only 40% of Beijing's population uses public transportation

Importantly, only 40% of Beijing's population uses public transportation. In response, the auto fleet grew by 345,000 units in the first half of 2010, bringing the fleet to 4.4 million vehicles. If that vehicle growth rate continues, the fleet will increase to seven million units by 2015. The same population and poor urban planning issues exist in Shanghai. In 2009, that city added 330,000 people bringing its total population to 19.2 million and its auto fleet and traffic jams have grown commensurately.

We believe that anyone looking to project China's oil consumption growth needs to pay attention to the nation's aging population

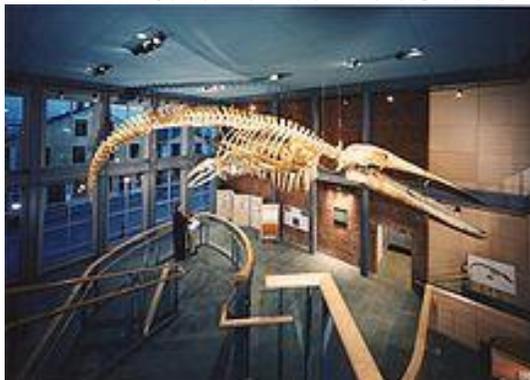
Our guess is that China's oil demand growth will remain relatively strong for the foreseeable future, unless there is a serious disruption of its economic trajectory. We also believe that anyone looking to project China's oil consumption growth needs to pay attention to the nation's aging population and the structural changes underway in the economy. As *The Wilson Quarterly* asks on the cover of its 2010 Autumn edition: What If China Fails?

“Watch Out That The Oil Doesn’t Drop On You!”

We were wondering around the lobby area looking at some exhibits on the wall when we glanced up to see the skeletons of two whales suspended from the two story ceiling

Several weeks ago on our way back to our home in Rhode Island from a weekend reunion of old oil and oil service Wall Street analysts on Cape Cod, we stopped at the New Bedford Whaling Museum for a quick visit. After paying our admission fee, we were wondering around the lobby area looking at some exhibits on the wall when we glanced up to see the skeletons of two whales suspended from the two story ceiling. As we were standing there looking up, an older gentleman, and a volunteer at the museum, walked over and said, “Watch out that the oil doesn’t drop on you!” We sort of laughed and then noticed a couple of oil spots on the floor. At that point the gentleman pointed out the tube running from the head of one of the suspended whale skeletons to a container in a corner of the lobby.

Exhibit 22. Juvenile Blue Whale Skeleton



Source: New Bedford Whaling Museum

The right whale skeleton, which had only been put up a few months earlier, had not been totally de-oiled so it leaked

The volunteer explained to us that the right whale skeleton, which had only been put up a few months earlier, had not been totally de-oiled so it leaked – the reason for the jury-rigged drainage system. We got into a discussion with the volunteer about the two whale skeletons and how they came to be displayed at the museum. The skeleton pictured in Exhibit 22 shows a juvenile blue whale. Not pictured due to its recent arrival is the right whale that had beached and died on Cape Cod. But why the oil problem, we asked?

According to the volunteer, any future whale bodies the museum receives will be cleaned the ‘old way’

It seems that the body of the blue whale was suspended in the ocean allowing micro-organisms to devour whatever flesh and oil remained before it was hung up. The right whale was done differently. The museum took the body to the town landfill and buried it under waste and straw from the elephant house at the local zoo. The micro-organisms ate all the flesh but apparently didn’t do as complete a job on the oil in the skeleton. It wasn’t until they had suspended the right whale skeleton that the museum learned of the incomplete cleaning job. According to the volunteer, any future whale bodies the museum receives will be cleaned the ‘old way.’

This time the Charles W. Morgan was lifted onshore for the restoration including areas previously underwater that have never been renovated since the ship was built in the 1840s

The New Bedford Whaling Museum is chocked full of whaling memorabilia, scrimshaw, ship models, harpoons, paintings and much more. The museum also records some of the history of New Bedford, which was the center of the American whaling industry for many years. In fact, the museum is in the center of an historical district preserving buildings from the whaling era of the 1800s.

We were very impressed with many of the exhibits at the museum including a room with a half-scale model of the whaling bark Lagoda. While kids will find the ship the right size, adults will need to duck in many parts of the model. In a nearby room there is a full-scale model of a ship's forecastle. These are interesting exhibits for people who can't make the trip to Connecticut's Mystic Seaport, the home of the last U.S. whaling ship, the Charles W. Morgan. This summer my brother-in-law and I attended a wooden boat show at the Seaport and took a tour of the Morgan that is currently being restored. The ship has been restored in the past, but always while it remained in the water. This time it was lifted onshore for the restoration including areas previously underwater that have never been renovated since the ship was built in the 1840s. There was an article about the restoration effort in *The New York Times* in late summer. Having been on the Morgan many times in the past, it was quite an experience seeing it out of the water. While we may not return to see the Morgan, we do plan on revisiting the New Bedford Whaling Museum.

Renewable Energy Is Nice But Few Willing To Pay Cost

The poll also showed that the support is dependent upon not asking the supporters to pay much more for the electricity

Last week a new *Financial Times/Harris* poll in the United States and five of the largest European countries confirmed strong support among citizens for increasing some renewable energy sources, in particular wind power. The problem is the poll also showed that the support is dependent upon not asking the supporters to pay much more for the electricity generated by these renewable power sources than they are paying now. The poll was conducted between September 15th and the 21st. The poll was taken of 6,255 adults aged 16-64 within France, Germany, Great Britain, Spain, and the United States, and among adults aged 18-64 in Italy.

Majorities in all six countries favor building more wind farms in their various countries

The main findings of the poll were that majorities in all six countries favor building more wind farms in their various countries. The support ranged from 90% in Spain and 87% in the U.S. to 77% in France. Equally impressive was the support for governments giving financial subsidies for the use of biofuels, with 77% of respondents in Italy favoring the strategy, 76% in Spain and 60% in the U.S. Support for biofuels, however, was sharply lower in Spain with 34% backing the proposal and only 13% supporting it in Great Britain.

The more telling result from the survey was the response to the question among those who pay electricity bills when they were

Nuclear power is substantially opposed by 77% in Germany, 63% in Spain and 60% in Italy

A recent poll of Massachusetts ratepayers showed that an overwhelming majority want the state to pull the plug on the wind farm project

When they learn the truth about the cost people are quick to switch from supporting to opposing the offshore wind farm project

asked how much more they would be willing to pay for renewable energy. Most respondents in all six countries said either no more or only 5% more. There was some support for paying more than 5%, but the highest level of support was 32% in the U.S. followed by 31% in Italy but only 17% in Spain and 20% in France.

When asked if they would be willing to pay \$220 more each month, the amount estimated by the European Union as the cost to cut greenhouse gas emissions by the use of renewable energy sources, large majorities in all the countries except Italy said they would not pay. The rejection rate was 77% in France and 76% in Great Britain while it was 65% opposed in Germany.

The poll also queried citizen views about building nuclear power plants as an alternative solution. The public appears about equally divided in the U.S., Great Britain and France. But nuclear power is substantially opposed by 77% in Germany, 63% in Spain and 60% in Italy. According to *Financial Times/Harris*, the results of the poll were broadly similar to those from a poll taken in 2008 with the exception of the opposition to nuclear power plants, which has grown in Italy and Germany in recent years.

While the results of this poll are not particularly surprising, the public outrage at proposed electric power costs associated with what is likely to be this nation's first offshore wind farm, Cape Wind, is growing in Massachusetts and has become a political issue in the current gubernatorial election. Massachusetts Governor Deval Patrick (Dem-MA) is staunchly behind Cape Wind while his Republican challenger is opposed. A recent poll of Massachusetts ratepayers showed that an overwhelming majority want the state to pull the plug on the wind farm project. The poll conducted by Bennett Research showed that 70% of respondents not only opposed the Cape Wind project but also said the state should reject the power contract entirely when informed that cheaper alternative renewable power sources were available. Some 81% of poll respondents said the state should have the project power contract rebid to ensure competitive prices.

One outcome from the poll was recognition that there is a widespread misunderstanding of the impact of Cape Wind on electricity bills. Among National Grid (NGG-NYSE) ratepayers (the Massachusetts utility that has agreed to purchase half the surplus power from Cape Wind), a staggering 63% still believe the project will either lower their monthly electricity bills or at least leave them unchanged. The perception is that the positive statements from the governor's office about the impact of Cape Wind on regional power costs is swaying people into believing their electricity costs will be reduced. When they learn the truth about the cost – residential ratepayers will pay about \$1.25 more per month, or about 2.5% more for the typical monthly electric bill and that the cost is programmed to escalate every year – people are quick to switch from supporting to opposing the offshore wind farm project.

It appears that the cost to build the wind farm is rising sharply – now about \$2.5 billion, up almost a \$1 billion since the project was originally conceived nine years ago

Cape Wind says the project will provide about 600 to 1,000 construction jobs and eventually 50 permanent positions

“It was the fastest and most efficient way to comply with renewable-energy quotas” under the Massachusetts energy law

National Grid has estimated that commercial and industrial customers will pay 1.9% to 2.3% more for the Cape Wind power. Large businesses will be hit the hardest. According to National Grid, a small grocery store will see its electricity bill rise by about \$100 per month. A typical supermarket will pay about \$500 more per month while a medium-size suburban hospital will see its bill rise by about \$2,500. In the large industrial category, the *Boston Herald* reported that a business that uses 3.8 million kilowatts of electricity per month will see its bill jump by \$9,500.

The current power purchase agreement (PPA) between National Grid and Cape Wind is currently under review by the state. This follows an agreement to reduce the originally proposed rate to compensate for perceived cost savings in constructing the wind farm. However, it appears that the cost to build the wind farm is rising sharply – now about \$2.5 billion, up almost a \$1 billion since the project was originally conceived nine years ago. That is one reason why there has been talk about the wind farm being downsized somewhat, but in turn that is likely to boost the per kilowatt-hour price already negotiated.

Another issue that has become the focus of the governor’s race is the impact of Cape Wind on the employment picture in Massachusetts. The state’s current unemployment rate is 8.4%, which is down significantly in September. Cape Wind says the project will provide about 600 to 1,000 construction jobs and eventually 50 permanent positions. That seems like a paltry number of jobs for a \$2.5 billion investment that will likely last only 15-20 years before having to be replaced.

These high power costs and minimal employment benefits come when cheaper renewable power alternatives are available in the region. In particular, people have focused on the wind farm developed in Maine by TransCanada (TRP-NYSE) that has offered to supply power for 41% less than Cape Wind’s 18.7-cents per kilowatt-hour estimated cost in 2013 when the project starts up. A Cape Wind spokesman points out that the TransCanada Kibby Wind Farm can produce only 132 megawatts compared to Cape Wind’s 468 megawatts and that there is insufficient infrastructure to bring the power to Massachusetts during peak demand times. Lastly, Cape Wind would produce jobs, which Kibby Wind Farm would not.

The most telling statement in this offshore wind power debate was the comment by a National Grid executive during the public utility commission hearing seeking approval of the PPA, when he said, “it was the fastest and most efficient way to comply with renewable-energy quotas” under the Massachusetts energy law. That requirement is now the focus of significant legal challenges in neighboring Rhode Island with its high-cost offshore wind power project and a similar state renewable power law. The Massachusetts statement and the Rhode Island litigation show the

problem with government mandates of uneconomic businesses.

One day we will stop writing about offshore wind development in New England, but so far the story continues to evolve and is important as an indicator of trends and issues that other regions of the country will encounter in the future.

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