

MUSINGS FROM THE OIL PATCH

August 6, 2013

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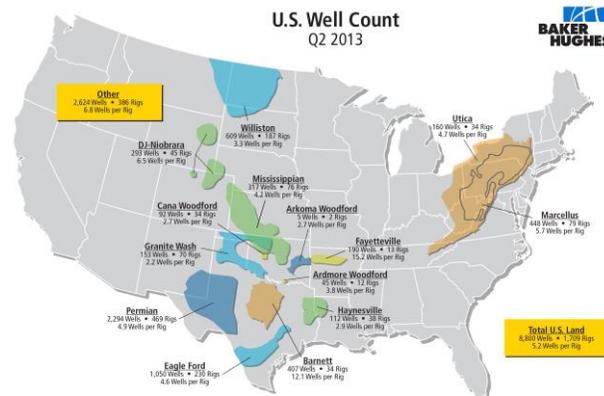
Note: *Musings from the Oil Patch* reflects an eclectic collection of stories and analyses dealing with issues and developments within the energy industry that I feel have potentially significant implications for executives operating and planning for the future. The newsletter is published every two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

Baker Hughes New Well Data Leads To Activity Questions

This is a welcomed data addition as it provides further insight into drilling activity dynamics while also helping forecasters better predict crude oil and natural gas output trends

Baker Hughes (BHI-NYSE) has recently introduced a new data marker – a quarterly count of wells drilled by each major producing basin in the United States and a total well count for the industry overall. Along with well counts, BHI also provides an average number of active drilling rigs, for each basin allowing a calculation of the average number of wells drilled per active rig during each quarter. The data released included historical information for each quarter of 2012 along with the data for the first two quarters of 2013. This is a welcomed data addition as it provides further insight into drilling activity dynamics while also helping forecasters better predict crude oil and natural gas output trends. The latter insight is important for those attempting to project the growth of oil and gas reserves and output and their likely trajectories. But as with all data, there are often questions to be resolved in order to optimally use the new data in conjunction with other similar industry data.

Exhibit 1. Where Rigs Are Working And Wells Drilled



Source: Baker Hughes Incorporated
Source: Baker Hughes

Unless producers boost their budgets soon, a greater than normal portion of fourth quarter drilling could be curtailed, impacting drilling-related service companies who would be facing idled rigs

These trends are compounding the debate over drilling rig efficiency and how that may impact the future demand for drilling rigs

In our analysis in the last *Musings* issue of the challenges confronting producers and service companies due to mushrooming shale development activity, we focused on the increased drilling efficiency demonstrated by the industry in recent years. As mentioned in that article, Nabors Industries (NBR-NYSE) pointed out in its earnings pre-release in July that increased drilling efficiency was consuming producers' drilling budgets at a significantly faster rate than traditionally seen, which may be signaling that these companies might exhaust their authorized capital budgets well before the end of the fourth quarter, which is the typical industry experience. Unless producers boost their budgets soon, a greater than normal portion of fourth quarter drilling could be curtailed, impacting drilling-related service companies who would be facing idled rigs. Completion service providers might fare slightly better in that environment as their work flow follows the drilling of wells. The greatest impact, however, might be on estimates for the pace of future production growth as a more substantial drop in the December rig count will translate into less output growth during the first part of 2014, at the least. While that scenario might prove a challenge for forecasters, reduced output growth might bolster oil and gas prices, at least in the short term.

The land drilling business has been wrestling with the changing nature of its market given the growth of shale drilling and the more recent growth in pad drilling. These trends are compounding the debate over drilling rig efficiency and how that may impact the future demand for drilling rigs and the types of rigs needed by the industry to efficiently drill the wells required to sustain and eventually grow oil and gas production. In our article we presented a chart from a report done by researchers at the Energy Information Administration (EIA) that examined various issues impacting their ability to forecast the growth rate for oil and gas reserves and their output. The chart is in Exhibit 2.

Exhibit 2. Drilling Rig Efficiency Has Risen



Source: EIA

From the beginning of the 1950s until the mid-1960s, drilling efficiency improved dramatically from under 20 wells per year per rig

The explosion in rig fleet additions strained the performance of drilling rig crews, many of whom were new entrants to this specialized sector of the industry's labor force

to nearly 30 wells. This period was marked by the introduction of larger, more powerful drilling rigs, more componentized rigs enabling faster moving and faster rig-up/rig-down times, improved drill bits and drilling fluids, and more capable drilling rig hardware and tools.

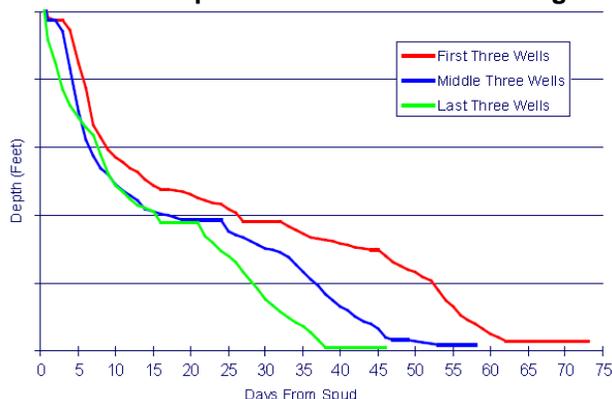
During the renaissance of the American oil and gas industry in the 1970s global oil prices soared due to the shift in oil pricing power from the United States to the Organization of Petroleum Exporting Countries (OPEC). The response of the petroleum industry to higher sustained oil prices and concern about the growing dependence on foreign sources of oil produced a huge rig building boom. The U.S. available rig fleet climbed from 1,859 in 1971 to 5,644 rigs by 1982. The explosion in rig fleet additions strained the performance of drilling rig crews, many of whom were new entrants to this specialized sector of the industry's labor force. Even though during this period while there were continued improvements in drilling equipment and tools and fluids, a shift in drilling focus - targeting deeper formations - along with these less-experienced drilling crews resulted in rig efficiency falling into the low to mid 20-wells per rig per year range during the period.

During that recovery period, the industry operated more drilling rigs and engaged in drilling more difficult wells

When global oil prices peaked in the early 80s and then collapsed in mid-decade, rig efficiency soared to over 40 wells per rig per year. That performance improvement reflected the cessation of drilling marginal wells and an increased industry focus on operating only the most efficient drilling rigs and targeting formations easier to reach given lower oil and gas prices that pressured companies to reduce finding and development costs. No sooner had the bottom in global oil prices been reached, however, than the industry began to recover – albeit slowly. During that recovery period, the industry operated more drilling rigs and engaged in drilling more difficult wells. These factors contributed to a subsequent decline in drilling rig efficiency as the wells-per-rig measure declined steadily from 40 to 30 by the early 90s.

New tools, drilling techniques and formation intelligence have contributed to improved drilling performance in recent years

Since the late 1990s, the rig efficiency rate has hovered in the low 30-wells-per-rig-per-year range, but then slid slowly lower during the 2000s as shale well drilling increased and new drilling challenges eroded drilling efficiency. Horizontal drilling created challenges for drilling crews and equipment to efficiently change direction from vertical to horizontal and then remain within the shale formation as the lateral length of the well was drilled. New tools, drilling techniques and formation intelligence have contributed to improved drilling performance in recent years. The EIA research paper pointed to a chart from a 2009 investor presentation by EXCO Resources (XCO-NYSE) showing how over time it was able to reduce the time needed to drill similar wells within the Haynesville shale formation in Northwest Louisiana and East Texas.

Exhibit 3. Companies Have Reduced Drilling Time

Source: EXCO Resources via EIA

The unanswered question about these improvements is whether the gains reflect benefits from the short-term “learning curve” at the company or play level, or if they mark true drilling efficiency gains across the industry due to improved technology and techniques

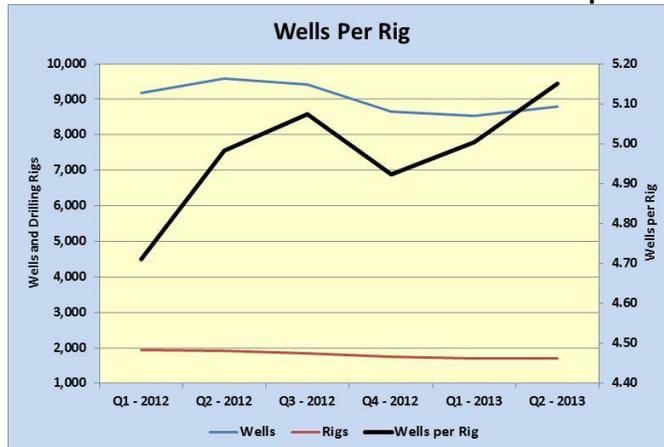
Other companies drilling shale wells were also able to affect significant drilling-efficiencies in specific formations. For example, Southwestern Energy (SWN-NYSE) reduced the time needed to drill a well in the Fayetteville shale from 20 days in the first quarter 2007 to 11 days by the second quarter of 2009. That improvement enabled the number of wells drilled by a rig in a year to increase from 18 to 33. Likewise, Petrohawk Energy Corporation decreased drilling days in the Haynesville shale from 69 days in the first quarter of 2009 to 52 days by the fourth quarter of 2009, or a 25% improvement. The unanswered question about these improvements is whether the gains reflect benefits from the short-term “learning curve” at the company or play level, or if they mark true drilling efficiency gains across the industry due to improved technology and techniques.

This industry history brings us back to our examination of the BHI wells drilled and rigs working data. In Exhibit 4 (next page), based on the BHI data, we see that over the past six quarters the average number of wells drilled per rig has ranged between 4.71 and 5.15, which when annualized puts the annual wells-per-rig performance in the range of 18.8-20.6, or well below the 30-well-per-rig annual average exhibited by other industry data for the period from the early 1990s through 2008., the last year reported in the EIA study. Does this mean that there has been a dramatic decline in drilling rig efficiency in the most recent years, or is there something about the BHI data that makes it not comparable to other wells-drilled data?

The annualized rates show dramatic improvements such as the Barnett going from 36.27 to 48.45 wells per rig, a 33% increase

We were also struck in the BHI data by the dramatic differences between the annualized wells-per-rig numbers for the geographic basins. In Exhibit 5 (next page), we show the quarterly and annualized wells-per-rig numbers by basin for the first quarter of 2012 compared to the second quarter of 2013. The annualized rates show dramatic improvements such as the Barnett going from 36.27 to 48.45 wells per rig, a 33% increase. During the same period, the DJ-Niobrara performance declined by 43% from 45.92 to

Exhibit 4. New Well Data Offers Different Perspective



Source: Baker Hughes, PPHB

The individual basin performance gains, with a few exceptions, came at the same time the Others category only increased from 26.68 to 27.18 wells per rig, a mere 1.9% improvement

26.07 wells per rig. The Fayetteville formation witnessed an explosion in improved drilling performance as the wells-per-rig count nearly doubled from 31.37 to 60.73 over the 18 month period. The Marcellus formation, one of the two hottest shale plays in America currently, experienced a drilling performance improvement from 16.04 to 22.82 annualized wells per rig. The individual basin performance gains, with a few exceptions, came at the same time the Others category only increased from 26.68 to 27.18 wells per rig, a mere 1.9% improvement, and the overall industry's performance advanced by 9.3% from 18.85 to 20.60 wells per rig.

Exhibit 5. Wide Disparity In Basin Well Performance

Basin	Wells Drilled Per Rig			
	2Q - 2013	Annualized	1Q - 2012	Annualized
Ardmore Woodford	3.78	15.10	4.00	16.00
Arkoma Woodford	2.67	10.67	2.20	8.79
Barnett	12.11	48.45	9.07	36.27
Cana Woodford	2.68	10.73	1.62	6.49
DJ-Niobrara	6.52	26.07	11.48	45.92
Eagle Ford	4.56	18.25	3.74	14.96
Fayetteville	15.18	60.73	7.84	31.37
Granite Wash	2.19	8.75	1.85	7.40
Haynesville	2.92	11.68	2.02	8.09
Marcellus	5.71	22.82	4.01	16.04
Mississippian	4.15	16.59	4.21	16.84
Permian	4.89	19.57	4.77	19.09
Utica	4.74	18.95	5.52	22.08
Williston	3.25	13.00	2.46	9.84
Others	6.80	27.18	6.67	26.68
Total Wells U.S.Land	5.15	20.60	4.71	18.85

Source: Baker Hughes, PPHB

We are sure that there will be further information about and investigation of the drilling performance trends suggested by the BHI well data. It will be interesting to see how the EIA utilizes the BHI data series in its estimates of petroleum industry performance.

The performance of the BHI rig count against estimated increases in natural gas and crude oil reserves and production would imply we will need fewer rigs in the future

We will continue examining and monitoring the BHI data, but at the moment there appears to be a discrepancy between this information and the long history of wells drilled and drilling efficiency measures. For the oilfield service industry, and in particular the contract drilling companies, the implications of whether rigs are capable of drilling 30 wells a year or only 20 may prove significant. Do we have too many rigs, or possibly not enough? The performance of the BHI rig count against estimated increases in natural gas and crude oil reserves and production would imply we will need fewer rigs in the future. Maybe the focus on drilling efficiency statistics will turn out to be a waste of time.

Tapping The Petroleum Industry's Money Pot

In Pennsylvania, politicians are struggling over whether to institute a severance tax on natural gas production rather than stick with the current impact fee as a way to generate greater tax revenues

The bankruptcy of Detroit has highlighted the financial dilemma facing many municipalities, especially those in the older sections of the country. It is therefore no surprise that municipal, county and state governments are seeking new sources of tax revenues. In Pennsylvania, politicians are struggling over whether to institute a severance tax on natural gas production rather than stick with the current impact fee as a way to generate greater tax revenues. This attempt to extract more revenues from the gas producers drilling in the northeast part of the state comes despite the fact these companies are being hailed for their substantial positive contribution to the welfare of the local area. According to an examination of the Pennsylvania Department of Transportation (PennDOT) records for three counties in the area (Susquehanna, Wyoming and Wayne) by a local newspaper, the natural gas companies actively drilling in the area have repaired or are fixing 413 miles of county roads.

Since the shale boom began in Pennsylvania, natural gas producers have spent over \$500 million on the repair of roads in the area according to officials with the Marcellus Shale Coalition. That money is in addition to the \$406.7 million in impact fees that the Pennsylvania Public Utilities Commission says the industry will pay to the counties.

“In the end, I think we will have - in most cases, not all cases – a better roadway system than before they [the natural gas companies] got here.”

Before drillers can put their heavy trucks on the county roads, they must purchase insurance policies against road damage. These policies cost an estimated \$12,500 per mile of road to be insured. The PennDot conducts weekly inspections of the bonded roads to see if they have been damaged by the natural gas companies' use of heavy trucks. Where damage is determined, the companies are notified and then must submit maintenance and repair plans to the PennDOT and then they pay contractors to fix the damaged road. Terry McHenry, a PennDOT district inspection manager, was quoted saying, “In the end, I think we will have - in most cases, not all cases – a better roadway system than before they [the natural gas companies] got here.” It is somewhat surprising that a state official would acknowledge that the petroleum industry was actually leaving

The study estimated that a 4% severance tax would generate \$434 million to \$490 million in fiscal 2013-2014, or nearly twice the estimated \$228-\$229 million to be generated from the impact fee

Given the industry's mantra that the Marcellus shale formation is one of the highest rate-of-return shale plays in the nation, even at currently distressed gas prices, the industry is not in a position to threaten massive drilling cutbacks to protest the tax hike

President Obama questioned the number of jobs the construction and operation of the pipeline would generate

the area better than when they first arrived, although that is the basic tenant for drilling and producing wells.

The key question being debated is whether the state should shift its petroleum revenue generating scheme from the current impact feet to a severance tax in order to raise additional tax revenue. Pennsylvania is the only state with substantial natural gas production that does not have a severance tax. Neighboring states such as West Virginia have severance taxes in the 3% to 4% range. Pennsylvania's current impact fee is the equivalent of about a 1% tax on oil and gas revenues. A study conducted by the Pennsylvania Budget and Policy Center examined the issue of the impact fee versus a severance tax. The report pointed out that between the second half of 2010 to the second half of 2012, the value of Pennsylvania's natural gas production, despite low gas prices, increased from \$1.6 billion to \$3.9 billion. During the same period, the impact fee income generated remained essentially flat. The study estimated that a 4% severance tax would generate \$434 million to \$490 million in fiscal 2013-2014, or nearly twice the estimated \$228-\$229 million to be generated from the impact fee.

There is no doubt that the difference in the amount of tax revenue generated from a severance tax versus the impact fee is being coveted by taxing authorities. Of course, raising taxes on the petroleum industry may have the effect of reducing some drilling activity. Given the industry's mantra that the Marcellus shale formation is one of the highest rate-of-return shale plays in the nation, even at currently distressed gas prices, the industry is not in a position to threaten massive drilling cutbacks to protest the tax hike. One can only imagine the intensity of the campaign for a severance tax should natural gas prices begin climbing toward the \$4.50-\$5.00 per thousand cubic foot (Mcf) range from today's \$3.45/Mcf level. Higher taxes on producers will become yet one more reason why they will exert greater pressure on their service company vendors to reduce the costs of finding, developing and producing natural gas. The profit squeeze goes on.

President Obama, Keystone XL And Unhelpful Canada

The game of trying to decipher the intentions of President Barack Obama with regard to the approval or rejection of the construction permit for the Keystone XL pipeline's northern leg becomes more confusing by the week. In an interview with two reporters for *The New York Times* that took place nearly two weeks ago, but was only released just over a week ago, President Obama questioned the number of jobs the construction and operation of the pipeline would generate. According to the interview transcript, Mr. Obama stated, "Republicans have said that this would be a big jobs generator." But he then went on to say, "There is no evidence that that's true. The most realistic estimates are this might create maybe 2,000 jobs during the construction of the pipeline, which might take a year or

As critics of the President have pointed out, in an economy with a 7.4% reported unemployment rate and a realistic rate in double digits, sneering at 2,000 high-paying construction jobs even if only for a couple of years is shocking

Since the southern leg of Keystone XL pipeline, which is nearing completion, created jobs for 4,000 workers, to think that an estimate of 2,000 workers to construct the northern leg of the project is unrealistic is false

If the test was whether the pipeline project would emit more carbon, that was a given as identified in the new DEIS

two, and then after that we're talking about somewhere between 50 and 100 jobs in an economy of 150 million working people." In a subsequent political rally, the President even mocked in a jocular manner the few jobs to be created.

As critics of the President have pointed out, in an economy with a 7.4% reported unemployment rate and a realistic rate in double digits, sneering at 2,000 high-paying construction jobs even if only for a couple of years is shocking. What we know is that the estimates of the number of jobs to be created from building the pipeline have been bandied about for several years. At the time TransCanada (TRP-NYSE) was making its initial push to secure the Presidential construction permit approval, company officials testified that the project would generate 12,000 construction jobs. When queried about that number, the company officials pointed to their employment records from building the first Keystone pipeline in the United States that required 10,000 individual workers for two years. Since Keystone XL was going to be slightly longer and have several additional pumping stations, the incremental employment assessment seemed quite consistent. The most recent Draft Environmental Impact Statement (DEIS) prepared by the Department of State, the agency responsible for reviewing and determining whether the pipeline is in the nation's best interest, estimates that the construction of the Keystone pipeline will create 42,500 direct and indirect jobs for the next two years.

The consultants and economists who have looked at the pipeline are consistent in their view that there will be thousands of workers needed, although since the pipeline has been split into two sections with the southern route nearly completed, the total number of workers to be employed in building the northern section will, by necessity, be reduced from the initial estimates. The problem with the job creation numbers is that they became a political issue and were used to batter the President's lack of a serious focus on job creation. By doing so, politicians have tended to look for and repeat the most optimistic estimates of direct and indirect employment to be generated from building the pipeline and pumping stations. Since the southern leg of Keystone XL pipeline, which is nearing completion, created jobs for 4,000 workers, to think that an estimate of 2,000 workers to construct the northern leg of the project is unrealistic is false.

The potentially greater problem for reading the approval tea leaves was the President's comments dealing with what will be the determining variable in the decision – the amount of pollution associated with the pipeline. In a prior article about the Keystone approval factors following President Obama's climate speech at Georgetown University at the end of June, we wrote that if the test was whether the pipeline project would emit more carbon, that was a given as identified in the new DEIS. But if the test was going to be whether the carbon pollution released from the extraction, shipping,

“And there is no doubt that Canada at the source in those tar sands could potentially be doing more to mitigate carbon release.”

refining and consumption of the output of the Canadian bitumen from the oil sands to be shipped by Keystone, then it will be a much tougher call since the test should be the net difference between the total pollution from the oil hauled by Keystone and that emitted from the heavy oils we import from Venezuela, Mexico and Saudi Arabia.

But now we may need a little more clarity on the pollution standard the President plans to use, or what the State Department will consider when it makes its final recommendation about approving or rejecting the Keystone construction permit. In the *NYT* interview, Mr. Obama said, "Now, having said that, there is a potential benefit for us integrating further with a reliable ally to the north our energy supplies. But I meant what I said; I'm going to evaluate this based on whether or not this is going to significantly contribute to carbon in our atmosphere. And there is no doubt that Canada at the source in those tar sands could potentially be doing more to mitigate carbon release." Oops. We have now established that if President Obama decides to reject the Keystone XL application it will likely be because Canada hasn't done enough to curtail emissions from its oil sands operations. This new hurdle is consistent with Mr. Obama's style of governing – it's always somebody else's fault.

It's all Stephen Harper's fault

We wonder how Canada's Prime Minister Stephen Harper feels being tossed into the same camp as former President George W. Bush. Forget the fact that carbon emissions from the oil sands mining are only 6.5% of Canada's total emissions, and that Canada's total emissions represent only 1.82% of global emissions. If President Obama rejects Keystone, it won't be because he made a reasoned determination that the extra oil and jobs were not in the national interest, it will be because Canada is uncooperative. It's all Stephen Harper's fault. I'll bet former President Bush is happy not to share the blame for Keystone because he once was an oil man. Oops, maybe the President will find that out before he makes his decision. What a way to run a country!

Death Of The Father Of Fracking – Changing The Industry

Mr. Mitchell was not only a visionary in the oil and gas exploration business but he was also a visionary about economic development trends for Houston

A week ago last Friday, George Mitchell, the iconic oil man acknowledged by all in the oil and gas industry as the Father of Fracking, died of natural causes at his home in Galveston, Texas at the age of 94. Mr. Mitchell was not only a visionary in the oil and gas exploration business but he was also a visionary about economic development trends for Houston and its surrounding area along with being a long-time optimist about the sustainability of his hometown of Galveston.

George Phydias Mitchell was the son of a Greek immigrant father, Savvas Paraskevopoulos, who tended goats before arriving in the U.S. in 1901 via Ellis Island in New York City. He worked for various railroads and gradually moved west. Supposedly a paymaster at one of the railroads threatened to fire him because he was tired of

He finished first in his class of 1940 with degrees in petrochemical engineering and geology, and he captained the tennis team

writing his Greek name, so he adopted the name of the paymaster, Mike Mitchell. He settled in Galveston some years after the devastating hurricane of 1900 that wiped the city off the map. Mike Mitchell ran a cleaning, pressing and shoeshine business in Galveston. George Mitchell was born in 1919 and graduated from high school at 16. Because no college would accept him at that young age, he spent an additional year in high school perfecting his mathematics skills before enrolling at Texas A&M in College Station, Texas. With money for tuition tight, Mr. Mitchell supported himself by running a tailoring and laundry business and selling candy and gold-embossed stationery to his fellow students. He finished first in his class of 1940 with degrees in petrochemical engineering and geology, and he captained the tennis team. After spending four years in the Army Corps of Engineers during World War II, he struck out with his brother, John, and another partner in an oil and gas wildcatting operation.

Mr. Mitchell is credited with drilling over 1,000 wildcat wells and finding over 200 oil and 350 natural gas fields

Over time, the wildcatting partnership morphed into a company owned primarily by George and his brother. Over his career, Mr. Mitchell participated in drilling 10,000 wells with a success rate of 35% to 40%, an incredible record in an industry known for one in ten successful wells. Mr. Mitchell is credited with drilling over 1,000 wildcat wells and finding over 200 oil and 350 natural gas fields. One of the company's core geographic areas was the Barnett basin, an area north of Fort Worth and known as "the wildcatting graveyard." Mr. Mitchell was offered an initial stake in the area from a Chicago bookie. The company went on to drill 13 straight successful wells and then doubled down by buying 300,000 additional acres, making the Barnett its principle focus.

The effort commenced in 1981 and required 17 years to successfully resolve the challenge of producing gas from what was known as a "junk" zone that drillers worked to drill through rapidly in order to avoid encountering well problems

In the 1960s, Mitchell Energy & Development, the company headed by Mr. Mitchell diversified by buying 66,000 acres of undeveloped real estate within a 50 mile radius of Houston and in 1974, with help from a \$50 million loan from the Department of Housing and Urban Development, commenced development of the 27,000 acre Woodlands, now home to over 100,000 Houstonians and the home to Anadarko Petroleum Company (APC-NYSE) and a neighbor to the new U.S. campus home of Exxon Mobil Corporation (XOM-NYSE).

Mr. Mitchell is famous for having worked to marry two old oilfield technologies – horizontal drilling and hydraulic fracturing – to overcome the challenge of extracting natural gas from the Barnett Shale formation that underlay the company's primary producing properties near Fort Worth. The effort commenced in 1981 and required 17 years to successfully resolve the challenge of producing gas from what was known as a "junk" zone that drillers worked to drill through rapidly in order to avoid encountering well problems. The shale was believed to not only hold gas resources but to be the source of the hydrocarbons found in the basin. The effort by Mr. Mitchell is cited as representative of not only his vision, but also his

We first met Mr. Mitchell early in the summer of 1974 while standing in line for lunch at a local barbecue restaurant in downtown Houston

tenacity. But the effort had its roots in the need for Mitchell Energy to develop additional natural gas resources to meet a gas supply contract the company had entered into during the late 1970s. Necessity became the mother of the invention of fracking shale formations.

We first met Mr. Mitchell early in the summer of 1974 while standing in line for lunch at a local barbecue restaurant in downtown Houston. Our office was in the Houston Club Building and kitty corner from Steve's Barbecue. This favorite lunch site was often frequented by Mr. Mitchell, his brother and other employees in his company that had its offices in the Shell Building around the corner. Mr. Mitchell was attracted to Steve's not only because it was good barbecue but because its proprietor was a fellow Greek.

In those days, one could often encounter prominent oil and gas executives such as Mr. Mitchell in line at lunch spots such as Steve's, James Coney Island, known for its chili hotdogs and the lunch counter at the pharmacy in the bottom of the Bank of the Southwest Building. Sometimes you had to go to River Oaks Country Club, the Bayou Club, or downtown to the Houston Club, Petroleum Club or Ramada Club to meet the movers and shakers of Houston's energy and financial businesses. At the Ramada Club you would see the likes of George Brown (Brown & Root, one of the founding units of the global Halliburton Company) or Judge Elkins, the founder of First City Bank, or his son Jim who ran it. At the Houston Club you would often run into Ben Love, the mover behind Texas Commerce Bank or you might stop at the round table in the corner of the Men's Grill where the entire senior management of Hughes Tool Company ate lunch every day. If you were really lucky and were invited to lunch at the Tejas Club, atop the old Continental Oil Building, you knew your host was one of only 100 members who supported this exclusive lunch site by anteing up money at the start of the year and then settling up the entire club's expenses at the end if there was a shortage. Who does business that way anymore?

While George Mitchell was a visionary, he wasn't considered in those days as being in the same league as George Brown, Judge Elkins or the other civic and business leaders who helped engineer the development of Houston

While George Mitchell was a visionary, he wasn't considered in those days as being in the same league as George Brown, Judge Elkins or the other civic and business leaders who helped engineer the development of Houston. An example of their vision was the 1960s purchase of a substantial acreage spread north of the city that is now home to the George Bush Intercontinental Airport. But George Mitchell's vision for extracting natural gas, and now tight oil, from shale formations is having as much or maybe even a greater impact on America's future than the men who conceived and built Houston – its banks, energy companies, medical center and oil-oriented manufacturing and service businesses.

Over the years we continued to run into Mr. Mitchell, who always recognized us, even after he became a billionaire and a philanthropist. But we will never forget those times we sate eating

lunch at a table adjacent to Mr. Mitchell and his crew and talked about the fortunes of the oil and gas business. The conversation was great, and the barbecue was outstanding.

India Addresses Wind's Flaw While Europe And U.S. Ignore It

India is aggressively addressing one of the fundamental problems of wind

In the United States, the issue of extending renewable energy subsidies is bubbling up again, and that means a battle over wind power's production credit. In Europe, depending on where you are, wind energy is doing well – the UK – or not – Germany. Germans are starting to rebel against more and bigger wind turbines, and there is a mild undertone of dissatisfaction emerging in the UK. However, India is aggressively addressing one of the fundamental problems of wind, which the utilities say will make the power source uneconomic. That issue is wind's intermittent output.

Most of the country's business centers were not impacted by the blackout, but when 10% of the world's population is deprived of power that enables them to work, travel and live beyond a subsistence level, there is a serious issue

Following last year's two-day massive power outage, the Indian government continues to struggle to provide sufficient electricity for its citizens. At the end of July 2012, over 670 million Indians were thrust into the dark as a large portion of the country's electric power grid failed. Most of the country's business centers were not impacted by the blackout, but when 10% of the world's population is deprived of power that enables them to work, travel and live beyond a subsistence level, there is a serious issue. Some observers believe India's power outage was the result of a lack of monsoon rains that limited hydroelectric power generation and resulted in farmers having to employ pumps to extract underground water supplies to grow their crops. When power demand surges beyond capacity, the rickety power grid forces electric utilities to institute rolling blackouts by switching off customers who are overdrawing their power allotment. These customers are cut off by switching off circuit breakers manually, but when humans cannot move fast enough the grid is at risk of failing as happened last year.

Exhibit 6. Area Impacted By Blackout



Source: Wikipedia

That oil consumption surge caught global energy forecasters such as the International Energy Agency (IEA) flatfooted

India depends on coal-fired plants for over 50% of its electricity, but the nation at times has failed to bring in sufficient coal supplies leaving power plants often without fuel. A result of the unstable electric power grid is that Indians have resorted to using portable generators to provide power, reminiscent of the 2004 experience in China. For those who may not remember, 2004 was the year China experienced a surge in oil use as its citizens turned to portable power generators since much of the nation's electricity was usurped by the government as it struggled to build the venues and support facilities for the Olympics and a significant number of airports, highways and train tracks in order to handle the visitors for the Games who would be interested in traveling around to see the rest of China. That oil consumption surge caught global energy forecasters such as the International Energy Agency (IEA) flatfooted. As their forecasting model failed to anticipate the oil demand growth, the IEA became convinced it was permanently underestimating global energy demand, setting off a wave of concern about a global shortage of oil supplies and an explosion in global oil prices. In hindsight, the IEA's concern has proven overblown as virtually every year since 2004 the agency has had to reduce its initial forecast for oil consumption growth.

But it only generates roughly 1.6% of the nation's electricity output

For India, a solution for its power shortage has been to build wind farms. Up until the spring of 2012, the government provided subsidies to wind farm developers in the form of accelerated depreciation or a fee for power provided to the grid. When those subsidies expired, new wind power installations plummeted by an estimated 47%. Pressure is on to reinstate subsidies in some form to restart wind and solar installations.

On January 31, 2013, India had 19,564 megawatts (MW) of installed wind power generating capacity, ranking the country fifth in the world. That installed capacity represents about 8.5% of India's total installed electricity generating capacity, but it only generates roughly 1.6% of the nation's electricity output.

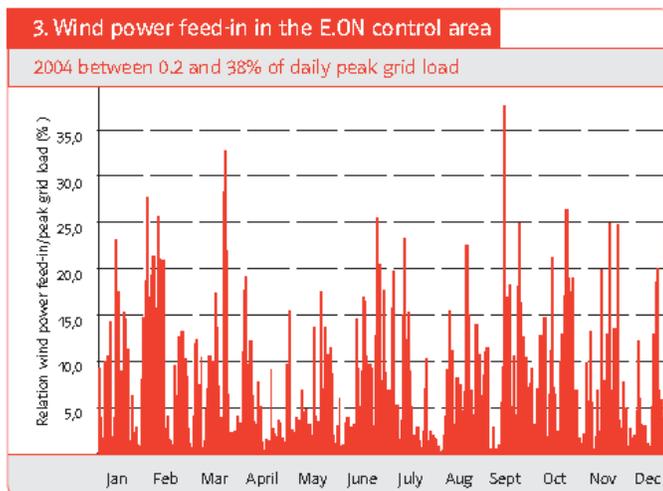
The power companies who own and operate wind farms are complaining that the fines will wipe out their profitability and limit the attractiveness of building additional generating capacity

At mid-July, the Central Electricity Regulatory Commission of India began instituting a system of fines for wind power operators who fall 30% or more below their projection for the amount of power their turbines would be supplying the next day. Wind farms of 10 megawatts or greater capacity must forecast in 15-minute blocks for the next day the amount of power they will provide to the grid. Missing their target can result in fines. This is one way grid operators are attempting to deal with wind power's variable output. As wind power's installed generating capacity has doubled in India over the past five years, its variability has increased the challenge for grid operators to manage the electricity supply in order to ensure there won't be a repeat of the massive blackouts of last year. The power companies who own and operate wind farms are complaining that the fines will wipe out their profitability and limit the attractiveness of building additional generating capacity.

The chart shows that the electricity output from these 7,000 turbines ranged between 0.2% and 38% of the daily peak grid load

Given the massive amount of installed wind generating capacity already in place, managing this day-ahead power forecasting should not be an onerous task. But if one examines the chart in Exhibit 7 showing wind power supply fed into Germany's power grid in 2004 from 7,000 wind turbines, it becomes clear that there is no consistent pattern to be modeled. This chart was included in the annual report of the grid operator. The chart shows that the electricity output from these 7,000 turbines ranged between 0.2% and 38% of the daily peak grid load. But more importantly, even with 7,000 turbines the variability is not reduced. According to E.ON Netz GmbH, the largest grid operator in Germany, as reported in its Wind Report 2005, "Wind energy cannot replace conventional power stations to any significant extent...The more wind power capacity [on] the grid, the lower the percentage of traditional generation it can replace."

Exhibit 7. Wind Variability Creates Grid Problems



Source: E.ON

The reliance on increased wind and solar power, given the subsidies paid to these power suppliers, has made German electricity costs among the highest in Europe, penalizing the country's manufacturing sector and reducing its competitive position

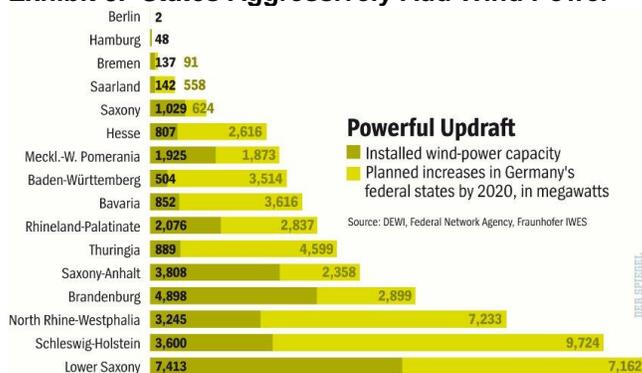
Germany's current power problems are the result of its government's rash decision following the 2011 Fukushima Daiichi nuclear power plant accident in Japan to rush to shut down the German nuclear power industry and replace that power with renewables. The reliance on increased wind and solar power, given the subsidies paid to these power suppliers, has made German electricity costs among the highest in Europe, penalizing the country's manufacturing sector and reducing its competitive position. Manufacturing, and especially exports, has been the one sector providing consistent strength to Germany's economy, but that strength is being eroded by the high power costs.

To meet power needs, rather than turning to natural gas to power new electricity generating facilities, Germany has turned to coal-fired plants. Cheap coal from the United States, driven out by cheap shale gas, is now powering much of this new generating capacity,

Germany is aggressively pushing to expand its wind power sector in what may prove to be an ill-advised move

but it has restrained the advance in power costs. However, Germany is now struggling with carbon emissions that have increased for two consecutive years, putting the country at odds with the European Union's goal of reducing pollution by 80% below 1990's level. Attempting to counter these problems, Germany is aggressively pushing to expand its wind power sector in what may prove to be an ill-advised move.

Exhibit 8. States Aggressively Add Wind Power



Source: *Der Spiegel*

Many of these sites are on mountain tops and in forests, which has generated pushback from residents who see their landscapes being destroyed

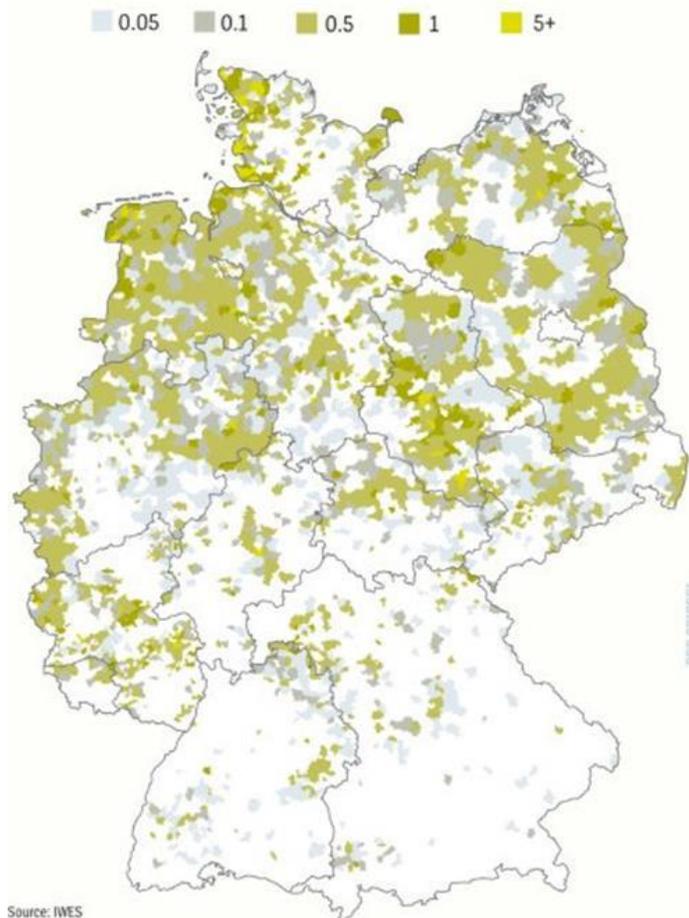
These planned wind power turbines are heavily concentrated in certain states in Germany. The lack of new sites for coastal sites and the expense of offshore wind turbines are forcing wind farm developers to seek onshore locations. Many of these sites are on mountain tops and in forests, which has generated pushback from residents who see their landscapes being destroyed. The decision to not build offshore wind farms because of their costs may be misguided. Offshore, wind turbines can achieve 4,500 full-load hours a year, while for coastal turbines the figure is 3,000 hours. An inland site is considered good if it produces 1,800 full-load hours of generating capacity.

The industry must also expand the power grid and add distribution lines to gather and transmit power to homes and businesses

There are other issues from the explosion of new wind turbines. Plans call for the construction of nearly 60,000 of them. The industry must also expand the power grid and add distribution lines to gather and transmit power to homes and businesses. Around 2,800 kilometers (1,740 miles) of new extra-high voltage lines are needed, plus 7,000 kilometers (4,350 miles) of distribution networks. Estimates are these new lines will cost between €10 billion (\$13.3 billion) and €20 billion (\$26.6 billion). What will this expenditure add to local German power bills?

**Exhibit 9. Location Of German Wind Turbines
The Rotor Republic**

The distribution of onshore wind turbines throughout Germany, measured by output density per square kilometer in megawatts (2012)



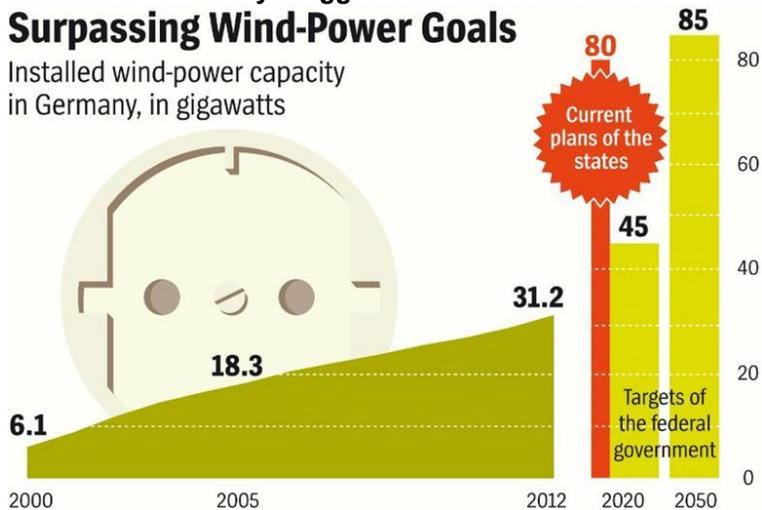
Source: IWES
Source: *Der Spiegel*

If all the proposed wind turbines are built, the country will have nearly twice the federal target of installed generating capacity by 2020 and almost as much capacity as the government plans for 2050

Germany's aggressive plan to add wind power by 2020 is shown in Exhibit 10 on the next page. The plans of the various states are extremely aggressive when compared to the goals for wind power set forth by the German government. If all the proposed wind turbines are built, the country will have nearly twice the federal target of installed generating capacity by 2020 and almost as much capacity as the government plans for 2050. The aggressiveness of the federal states is shown by the fact that the northeastern state of Brandenburg plans to set aside 2% of its land for wind farms. The western state of Rhineland-Palatinate intends to more than double the amount of wind power it generates, and North Rhine-Westphalia, its neighbor to the north, is planning an increase of more than 300%.

Exhibit 10. Germany's Aggressive Wind Power Plans Surpassing Wind-Power Goals

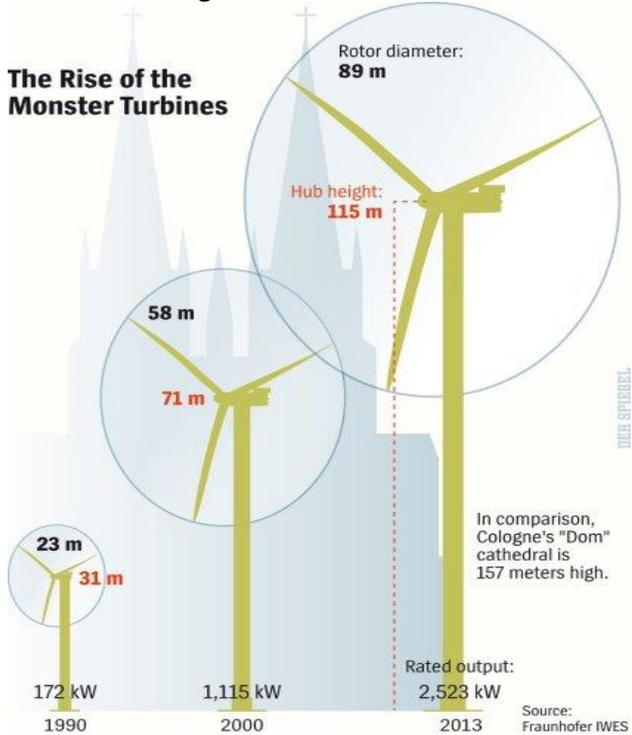
Installed wind-power capacity in Germany, in gigawatts



Source: *Der Spiegel*

One of the reasons for citizen pushback to the expansion of wind power is the move by the companies to install significantly larger wind turbines than previously used. This is happening not only with respect to new wind farms but also with existing wind farms when the turbines need to be replaced.

Exhibit 11. Larger Turbines Incite Ire Of Citizens



Source: *Der Spiegel*

In Germany, which is more densely populated than the UK, local planners place turbines much closer to homes

German citizens are also being asked to make sacrifices to meet the ambitious goals of the country's new energy policy. In England, large wind turbines must be situated at least 3,000 meters (9,843 feet) away from houses in residential areas. In Germany, which is more densely populated than the UK, local planners place turbines much closer to homes. In the southern state of Bavaria, for example, the minimum separation is 500 meters (1,640 feet), while it's just 300 meters (984 feet) in the eastern state of Saxony. This nearness has contributed to health problems of residents who are now taking the companies to court over the turbine placement and their noise level. While it has been difficult to win many cases, the courts are beginning to accept more pleas.

As a result of the case, the wind turbine now must operate at a reduced speed between 10 p.m. and 6 a.m., which renders it unprofitable

In a case that might just upset Germany's entire energy revolution, a woman from Marxheim, a town in western Bavaria, whose home was situated 850 meters (2,789 feet) from an Enercon E-82 turbine, claimed that the sound waves boomed "across field and forest" to where she lived. The case documents talk of "hissing," "whizzing" and "puffing noises." A specialist in acoustics recorded a volume of 42.8 decibels, adding a further 3 decibels to this number because of what is known as the "impulsiveness" of the noise. As a result of the case, the wind turbine now must operate at a reduced speed between 10 p.m. and 6 a.m., which renders it unprofitable. Enercon is appealing to the Federal Administrative Court, but its chances of winning look slim. Hundreds of turbines are located in the zone that has now been deemed forbidden.

When one reads the executive summary of the report it becomes evident this report is a promotional effort to overcome the growing skepticism of the economics and value of offshore wind in addressing the country's goal of reducing emissions

In other countries, the wind power business is being praised. For example, in the UK, a press release from RenewableUK about a report from the Institute for Public Policy Research praises its compelling case for offshore wind energy. Unfortunately, when one reads the executive summary of the report it becomes evident this report is a promotional effort to overcome the growing skepticism of the economics and value of offshore wind in addressing the country's goal of reducing emissions. The report highlights the various UK governmental actions that should be undertaken to provide greater certainty about regulation and subsidies for wind farm operators that presumably will lead to long-term benefits for England's job creation efforts and its energy supply balance.

The report highlighted that the UK's Department of Energy and Climate Change (DECC) has set forth a role for offshore wind power. The report sees three opportunities from this push. First is the impact on reviving the country's manufacturing sector that will create jobs in both construction and manufacturing businesses. Secondly, this manufacturing revival will contribute to a rebalancing of England's economy as many of the jobs will be created in currently depressed regional areas. Lastly, because the UK is a windy island, there is an excellent opportunity to capitalize on it to reduce energy costs.

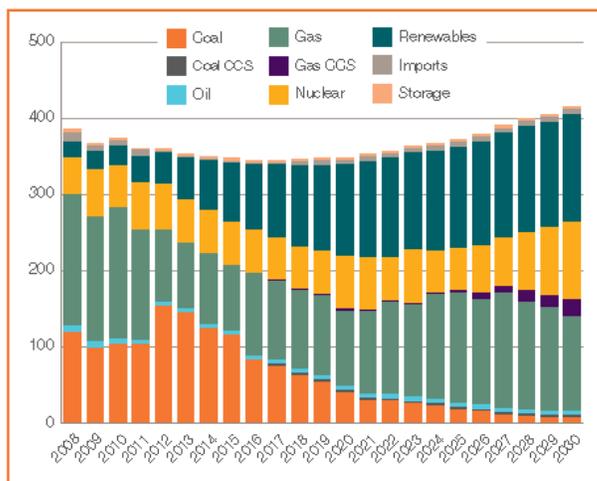
Wind is only expected to be competitive with natural gas in 2030, but will continue to be more expensive than onshore wind and nuclear

The last opportunity is actually also one of the two significant challenges for wind. Offshore wind is currently more expensive than alternative power sources such as natural gas, onshore wind or nuclear. The report acknowledges that even with the rapid expected decline in the cost of offshore wind, it will still be more expensive than the alternatives in 2020. Wind is only expected to be competitive with natural gas in 2030, but will continue to be more expensive than onshore wind and nuclear. The government has set the ambitious goal of reducing the cost to generate offshore wind to £100 per megawatt-hour (\$152.86/MWh) by 2020 in order to make it cost-competitive with the alternative energy sources. There are numerous studies showing how offshore wind power will cost less in the future, but so far those cost reductions have been considerably less than promised.

The big loser initially is natural gas, which reflects the decline in UK North Sea production, which has made the country a net gas importer

The report presents two charts from the DECC showing how the UK's sources of electricity generation will change in the future if the government adopts the report's recommendations. One chart (Exhibit 12) shows the mix of energy generation sources from 2008 to 2030. The second chart (Exhibit 13 on the next page) shows the growth in new power generation by fuel source over 2012-2030. What you see in the first chart is that the share of total electricity generated by renewables was quite small in 2008-2010, but it has subsequently grown sharply. Projections are for its market share to continue expanding until it reaches a peak somewhere around 2020. From that point forward, the market share of renewables appears to be fairly stable through 2030. The big loser initially is natural gas, which reflects the decline in UK North Sea production, which has made the country a net gas importer. With liquefied natural gas (LNG) being so expensive, it is easier to reduce gas consumption and replace it with increased coal-fired electricity generation and greater use of renewables.

Exhibit 12. Renewable Power Sources Gain Market Share

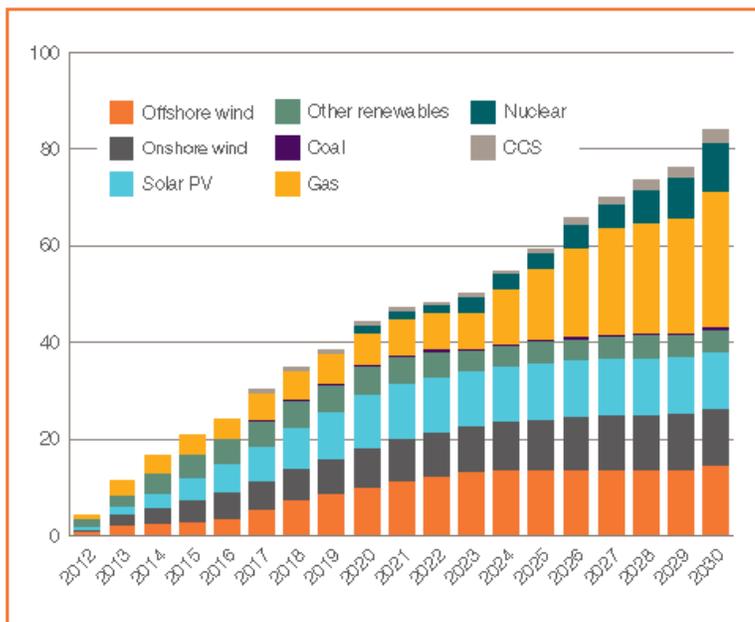


Source: DECC, IPPR

Starting in 2013 and continuing until about 2025, the primary sources of new generating capacity will be fueled by wind – either onshore or offshore – and solar power

The second chart, showing the growth of new generating capacity by fuel source, demonstrates how almost all energy supplies will contribute to meeting the UK’s future electricity needs. Not surprisingly, starting in 2013 and continuing until about 2025, the primary sources of new generating capacity will be fueled by wind – either onshore or offshore – and solar power. Starting in 2018, offshore wind will make a greater contribution than onshore wind for new electricity generating capacity. As we get closer to 2030, natural gas, likely to come in the form of increased LNG shipments, will become the greatest source of new power generation capacity.

Exhibit 13. New Power To Come From Offshore Wind And Gas



Source: DECC, IPPR

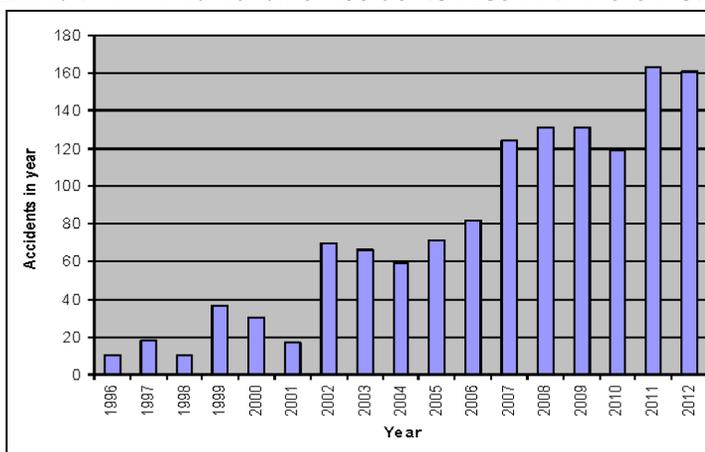
We assume the absence of the economic discussion reflects the lack of solid evidence that the utopia of cheap offshore wind power will ever be achieved

We found it somewhat surprising that there wasn’t greater attention paid to the economics of wind, and especially of offshore wind, as the entire thrust of the report was why this would have such a positive impact on England’s economy. We assume the absence of the economic discussion reflects the lack of solid evidence that the utopia of cheap offshore wind power will ever be achieved. Besides the economics, there was no mention of the other operational problems for wind – accidents. In December 2011, following several spectacular wind turbine disasters, figures released by the industry’s trade organization, RenewableUK, for the five-year period 2006-2011, claimed a total of 1,500 accidents, or nearly one per day. Included in those accidents were four deaths and some 300 injuries. The rest of the accidents represented events such as rotor blades falling off or being blown off, turbine motors catching fire or being destroyed by high winds and towers being blown over, all of which created damage.

They were shocked when RenewableUK released the 1,500 accident figure for the UK industry as Caithness had documented only 9% of that number

Another wind accident data source, Caithness Windfarm Information Forum 2013, presented the wind industry’s accident record through 2012. Their data confirms the relationship that as more wind turbines are installed the frequency of accidents increases. As Caithness points out, the average number of accidents was eight for 1993-1997, 33 for 1998-2002, 80 for 2003-2007 and 141 for 2008-2012. These accidents are documented by Caithness from public sources worldwide. They were shocked when RenewableUK released the 1,500 accident figure for the UK industry as Caithness had documented only 9% of that number, which supports their qualifying statement that they believe their data records only represent the tip of the iceberg with respect to wind turbine accidents globally.

Exhibit 14. Wind Turbine Accidents Rise With More Installed



Source: www.caithnesswindfarms.co.uk

Wind energy proponents claim that theirs is the power source of the future since it is cheap (no fuel cost) and has no emissions

Wind energy proponents claim that theirs is the power source of the future since it is cheap (no fuel cost) and has no emissions. What they fail to acknowledge is that without government subsidies their power is among the most expensive sources available, and for all the cost reduction progress, remains so. Installing thousands of wind turbines has not improved wind’s economics, and in some cases they have contributed to serious problems for power grid operations due to wind output’s high variability. The huge number of wind turbine accidents now acknowledged by officials and the deaths of thousands of birds and bats, coupled with destruction of forests and scenic vistas and noise pollution creating health issues for neighbors have all contributed to the growing opposition to this power source.

TransCanada’s Energy East Line – Answer For Keystone?

Last Thursday, TransCanada announced it was going ahead with a major oil pipeline linking Western Canada with refineries and export terminals in Eastern Canada. The pipeline is designed to open up

TransCanada is hoping to provide producers with access to more profitable markets than the glutted U.S. Midwest

new export markets for Canada's growing oil sands output and potential new tight oil supplies. By shipping oil to three refineries in Quebec and New Brunswick and to export terminals from which oil could be shipped to global markets, TransCanada is hoping to provide producers with access to more profitable markets than the glutted U.S. Midwest. There is also speculation TransCanada's announcement is designed to boost chances for winning approval for the Keystone XL pipeline.

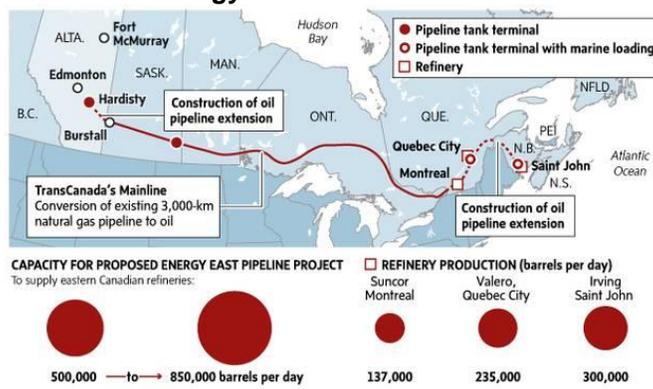
The company is hopeful it can deliver oil to tanker loading facilities in Quebec City and Saint John, including partnering with the Irving family of New Brunswick to build a \$300 million oil export terminal there

The pipeline plan involves converting an idle natural gas pipeline to carrying crude oil and bitumen from a newly constructed storage facility at Hardisty, Alberta to the Ontario/Quebec border, some 3,000 kilometers (1,864 miles). A new 1,400 kilometer (870 miles) oil pipeline would need to be built to move the oil to Quebec City, Quebec and then on to Saint John, New Brunswick. TransCanada owns most of the right-of-way where the new pipeline would need to be constructed, but it will still need permits. The company is hopeful it can deliver oil to tanker loading facilities in Quebec City and Saint John, including partnering with the Irving family of New Brunswick to build a \$300 million oil export terminal there. By delivering oil to Quebec City, TransCanada is hopeful provincial officials will not oppose the pipeline's construction, which would have been more likely if the pipeline merely passed through the province in order to move the oil exclusively to New Brunswick. The pipeline initially was designed to carry 850,000 barrels a day, but nominations this June totaled 1.1 million barrels a day. The first leg of the line to Quebec City should be ready by 2017, while the New Brunswick leg will not be ready until 2018.

The cost to move a barrel of oil from Alberta to the West Coast of Canada is about \$3.40 while it is only \$7 to haul it to the East Coast

The Energy East pipeline has always been TransCanada's Plan B if the Keystone XL pipeline permit is rejected by President Barack Obama. There is speculation that this announcement will put pressure on the President to approve Keystone because it will be obvious that Canada's oil sands output will find its way to global markets even if Keystone is rejected. The cost to move a barrel of oil from Alberta to the West Coast of Canada is about \$3.40 while it is only \$7 to haul it to the East Coast. Moreover, shipping it by rail to the East Coast is twice the cost of pipeline transportation. If the Keystone pipeline is rejected and Enbridge Inc.'s (ENB-NYSE) Northern Gateway line to the West Coast fails to move forward, rail will become the only option to move the projected increased oil sands output. Kinder Morgan, Inc. (KMI-NYSE) has just announced plans for a joint venture railcar loading facility just outside of Edmonton. With Canada's plan to expand its oil output from 3.2 million barrels a day in 2012 to five million barrels a day by 2020, pipeline expansions are the preferred option.

Exhibit 15. Energy East Best Outlet For Canada Oil



Note: Exact pipeline route will only be determined after public and regulatory review
THE GLOBE AND MAIL. SOURCES: TRANSCANADA PIPELINE, CAPP

Source: The Globe And Mail

Canada’s petroleum industry may be on the cusp of a more profitable era than it has experienced since the late 1990s

While President Obama may criticize Canada for not doing enough on climate change as he contemplates the fate of Keystone, he may be driving Canada’s petroleum industry and its government to develop outlets to global markets that circumvent the United States. We have argued since last year that without new export outlets for Canada’s oil and gas output, it will be difficult for the nation’s petroleum industry to partake in global oil and gas prices that are better than current domestic prices. Canada’s petroleum industry may be on the cusp of a more profitable era than it has experienced since the late 1990s. It can’t come soon enough for many in the industry.

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