
MUSINGS FROM THE OIL PATCH

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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

What If We Are In A Black Swan Energy World?

The U.S. housing bust and the Eurozone debt crisis had demonstrated what can happen when long-held assumptions are proven wrong

Last month, *Wall Street Journal* writer Gregg Ip began his column about the financial pain being experienced in the U.S. economy due to China's slowing economy with a perspective on "cherished assumption[s] of investors and policy makers in the past decade," which he pointed out had driven trillions of dollars of investment and debt. He went on to list some of those assumptions: "National home prices never go down. Eurozone countries don't default. Saudi Arabia won't let the price of oil crash. China's demand for raw materials is infinite." He then pointed out that in recent years the U.S. housing bust and the Eurozone debt crisis had demonstrated what can happen when long-held assumptions are proven wrong. That made us think about the oil market and assumptions.

Certainly, sub-\$30 a barrel oil has disproven the assumption that Saudi Arabia will always act to prevent an oil price crash

Certainly, sub-\$30 a barrel oil has disproven the one that Saudi Arabia will always act to prevent an oil price crash. That assumption was based on the belief that the 1986 oil price crash had taught the Saudis that they had to fulfill the role of global oil market swing producer, or significant harm to the industry and themselves would result. One could argue that Saudi Arabia used that naive belief to its advantage when it shocked the world by electing not to orchestrate an OPEC production cut to defend high oil prices late in 2014. Now, the price of oil, and virtually every other commodity, has collapsed as global demand for raw materials is falling, largely driven by the slowdown in growth in the Chinese economy.

We could certainly list other economic and energy gospels that underpin our understanding of the workings of the global energy market that seem not to be functioning as everyone assumed. For example, it has been gospel that low oil prices drive gasoline pump prices down but that boosts consumer discretionary spending and ultimately stimulates the economy and higher pump prices down the

Consumers were thought to likely spend about two-thirds of the savings they gained from lower gasoline prices

road. While there has been some impact, it appears to be losing its power. The bigger question is: What if all our assumptions about the economy, energy and Saudi Arabia are wrong? Maybe we are in a Black Swann world. If so, how will we determine what might happen in the future? Maybe the future will look more like the present, and if so, that's a scary thought.

According to the EIA, the average U.S. household would spend \$1,962 in 2015 on gasoline, or \$550 less than it spent in 2014

In the fall of 2014, following the OPEC meeting at which Saudi Arabia threw up its hands and left oil prices to the market, the popular analysis was that collapsing oil prices would significantly boost consumer spending providing a strong uplift to the economy, which would spur a recovery in oil prices shortly. According to Mark Zandi of Moody's Analytics, consumers were likely spend about two-thirds of the savings they gained from lower gasoline prices. That meant the economy in 2015 would get an injection of \$40 billion in consumer spending for things other than gasoline.

As we neared the start of 2015, analysts at *GasBuddy.com* pointed to the Energy Information Administration (EIA) that had recently revised its estimate for the average gasoline retail price for 2015 to \$2.60 a gallon. That was down 23% from the 2014 average, and the lowest full-year gasoline price since 2009 when the nation was recovering from the Great Recession. According to the EIA, the average U.S. household would spend \$1,962 in 2015 on gasoline, or \$550 less than it spent in 2014. This would bring annual motor fuel expenditures to their lowest level in 11 years. Better fuel-efficiency autos also contributed to the \$550 annual savings. That extra money should really help the economy in 2015

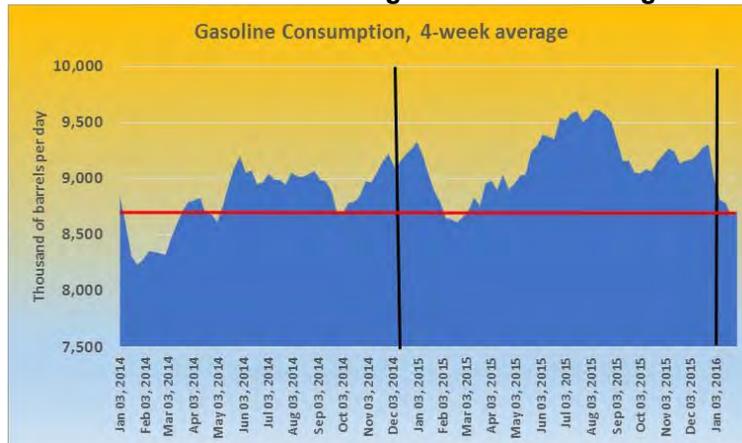
The most interesting aspect is that as oil prices fell during these periods and gasoline prices were plummeting, the personal savings rate was climbing

So what happened to gasoline demand during 2015? As shown in Exhibit 1 (page 3), gasoline consumption, based on a 4-week average of product supplied, rose to a peak early in the summer of 2015. Demand fell off during the fall and dropped again towards the end of 2015 and into 2016. Those two demand declines coincided with the rapid drop in oil prices. The periods were associated with growing concern that falling oil prices were associated with emerging U.S. and global economic weakness. The most interesting aspect is that as oil prices fell during these periods and gasoline prices were plummeting, the personal savings rate was climbing. The data suggests that people were saving more of those gasoline savings than anyone expected or has occurred in the past.

The BLS did not list spending on other goods and services as a use for some of the estimated annual savings

The U.S. Bureau of Labor Statistics (BLS) said that in October 2014, gasoline purchases represented 5.1% of consumer spending. The BLS went on to suggest that the savings from lower gasoline prices would allow customers to pay down debt and/or increase their savings. Interestingly, the BLS did not list spending on other goods and services as a use for some of the estimated annual savings. One wonders whether this was an oversight on the part of the BLS economists or merely overlooked by those Wall Street economists and consultants who were predicting more spending as a result of

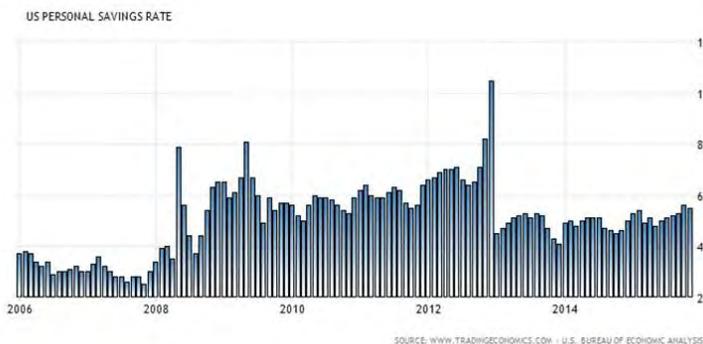
Exhibit 1. Gasoline Use Falling As Personal Savings Rise



Source: EIA, PPHB

the savings on gasoline. Their favored description was that the fall in oil prices was the equivalent of a tax reduction for American consumers, which Keynesian-trained economists conclude is a powerful stimulus for economic growth.

Exhibit 2. Recent Savings Rate Rise Hurts Economy



Source: *tradingeconomics.com*

December’s savings rate rose to 5.5%, which made it the highest level since December 2012

The impact of the increased savings can be seen in Exhibit 2 by looking at the midpoint of the section of the chart starting with 2014 and ending at November 2015. The December 2015 monthly data was only just reported and is not incorporated in the chart. December’s savings rate rose to 5.5%, which made it the highest level since December 2012, a month impacted by massive dividend and bonus payments issued in anticipation of higher personal tax rates commencing January 1, 2013.

As incomes slowly rise, why are people saving so much of their gasoline windfall? One explanation is that consumers have been trained to react like Pavlov’s dog to the drop in oil prices. They have been trained to expect prices to rebound after a big pump price decline. They also know that when the pump prices rise, they do so

A simpler explanation is that falling oil prices have people scared

at a faster rate than when they dropped, and they usually go to higher levels than before. People have become trained not to commit their extra income to other expenditures when that money may be needed to pay for higher gasoline prices down the road or possibly for other rising expenses such as medical premiums and deductibles. A simpler explanation could be that falling oil prices have people scared since economic weakness means a recession is on the horizon with costly impacts on income and employment.

Some of this pattern change may be tied to the increasing retirements of baby-boomers

The EIA has offered other possible explanations for why gasoline demand has demonstrated less of a direct relationship to changes in gasoline prices in recent decades. They point to a slowing of the per-capita vehicle miles traveled trend, which began slowing in the 1990s, and even declined for a while in recent years. Some of this pattern change may be tied to the increasing retirements of baby-boomers. Retirees tend to drive less than the working-age population. The migration of the population to cities results in residents driving less than if they lived in the suburbs, largely because they have alternative transportation options. Another phenomenon impacting gasoline consumption is the decline in teenagers seeking driving licenses. Also, changes in social interaction and shopping patterns, especially among the younger population who favor electronic methods rather than driving to visit people or to shopping malls, hurts gasoline demand.

“What if a bunch of eras are ending all at once?”

Moving from lower to higher levels of gospel assumptions, a recent *New York Times* column authored by Tom Friedman asked “What if a bunch of eras are ending all at once?” His point was that the next president could face a very different world than today. The column discussed possible eras that might be ending: the 30-plus year era of high growth in China; the \$100-a-barrel oil price era; the E.U. era; and the era of Iranian isolation. He also pointed to the issue of the many countries in the world that were considered “average” and supported by either the United States or Russia. These countries can no longer count on their manufacturing sector to create significant jobs, especially since their products can no longer compete with Chinese goods. These countries are also “frail, artificial states” that don’t “correspond to any ethnic, cultural, linguistic or demographic realities.” As a result, in Mr. Friedman’s view, these countries are actually in the process of imploding or are candidates to do so. This means that the geopolitical stability that existed up until a few years ago in many areas of the world has disappeared. It makes governing, both politically and economically, a challenge in those regions, and potentially worldwide.

Mr. Friedman summed up the impact if it was possible that all these eras were ending with the following. “These what-ifs constitute the real policy landscape that will confront the next president. But here’s the worst ‘what if’: What if we’re having a presidential election but no one is even asking these questions, let alone ‘what if’ all of these tectonic plates move at once? How will we generate growth, jobs,

The lack of inflation due to the ending of the commodity super-cycle is bedeviling government and monetary policymakers

security and resilience?” The answer to that question is complicated by the apparent inability of governments to stimulate their economies through either monetary or fiscal policy. The lack of inflation due to the ending of the commodity super-cycle is bedeviling government and monetary policymakers. Can they ever get economies off the stimulus-nipple such that policymakers can raise interest rates, lift taxes and reduce government spending in order to reload their policy weapons for dealing with a possible recession later this year? Doesn't look likely to happen in 2015.

Socialism...is getting a second life with the candidacy of Vermont Senator Bernie Sanders

Confronting what's different in and about today's world is a challenge. We are seeing strange phenomena in this year's political presidential primary campaign. Peggy Noonan, an opinion columnist for *The Wall Street Journal* recently wrote about socialism, which she says is getting a second life with the candidacy of Vermont Senator Bernie Sanders. In dissecting the growing popularity of Sen. Sanders, Ms. Noonan discussed the evolution of the Democratic Party's economic policy and how it is confounding Hillary Clinton's candidacy. Ms. Noonan writes. "Surely it means something that Mr. Obama spent eight years insisting he was not a socialist, and Bernie Sanders is rising while saying he is one."

Ms. Noonan offered a poignant observation about economics in the Democratic Party, and possibly in America, when she wrote: "Socialism is an old idea to you if you're over 50 but a nice new idea if you're 25." She went on to comment, "Do you know what's old if you're 25? The free-market capitalist system that drove us into a ditch." Ms. Noonan believes that the rise of Sen. Sanders means some Democrats will leave the party over the rise of socialism, but she casts it in the context of "the great scrambling" underway this political year. History may not repeat, but it sure does rhyme.

If the global economy and the international oil and gas business are operating in a Black Swan world, what confidence does anyone have that history will be or can be a guide?

If socialism is new to Millennials, how about a 1980s-style oil bust? For many younger members of the energy business who escaped dramatically-forced adjustments in 2008-2009 due to the swiftness with which the episode passed, this downturn is a different world. Oilfield activity collapsed rapidly in 2015 and many oilfield workers were victims of the decline, but the initial phase of the oil price bust didn't touch many in the corporate offices. On the other hand, after a year of low, and now lower oil prices, the comfortable life in the oil patch is at risk as thousands of experienced and highly-skilled employees are now being shown the door as cost-cutting is going much deeper than anyone imagined when this decline began. The current environment seems to be a Black Swan. If the global economy and the international oil and gas business are operating in a Black Swan world, what confidence does anyone have that history will be or can be a guide?

The chart in Exhibit 3 on the next page comes from a Goldman Sachs research report and shows an overlay of the track of oil prices since 2005 with the real oil price for 1976-1989. The point of the

Exhibit 3. If History Repeats, We Have More Oil Pain Ahead



Source: *Business Insider*

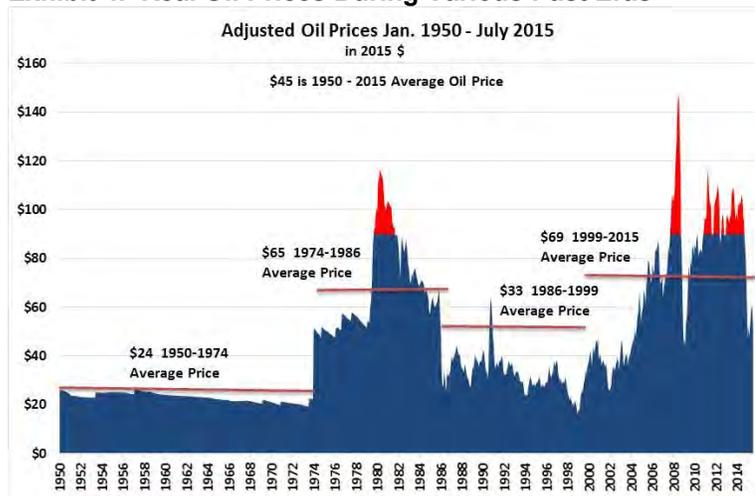
chart is that the oil industry between 2005 and 2011 was in a multi-year investment phase, during which time oil prices peaked in June 2008 just prior to the collapse of the global financial system that was highlighted by bankruptcies and sales of multiple prestigious Wall Street brokerage firms. Disruption to the oil business was brief. The 1980s period didn't have such an economic and financial shock as 2008-2009. Since the recovery in 2011, oil prices in the two eras have essentially tracked closely. If that pattern continues, then the current oil industry recovery is destined to remain volatile and relatively depressed until 2019.

If we are in a Black Swan period, what happens if oil does stay in a range of \$30-\$40 a barrel for the next ten years?

While some analysts stop their analysis of the earlier period bust with the end of the 1980s, the reality is that the oil industry really didn't recover until the 1990s. As shown in Exhibit 4 (page 7), the 1986-1999 inflation-adjusted price of oil was \$33 a barrel, essentially about where current oil prices are trading. Importantly, the oil price during this 13 year period was about half what oil averaged during the 1970s boom and half of what oil averaged during the next boom. At this point in time, there are virtually no forecasts suggesting that oil prices will remain depressed, i.e., where they are trading now, for another decade. If we are in a Black Swan period, what happens if oil does stay in a range of \$30-\$40 a barrel for the next ten years?

The point of our analysis is that in a Black Swan world, everything you think you know about how the economy, energy markets and geopolitical events are supposed to work might be wrong. In

Exhibit 4. Real Oil Prices During Various Past Eras



Source: WSJ, BEA, PPHB

This is not a time for bravado – too much is at stake

response, one should stop and think through alternative scenarios based on the exact opposite of what conventional wisdom says will happen. That doesn't mean it will, but the "thought exercise" may lead to insights about the future that you haven't considered. However, you will be prepared if trends starts going in a different way than universally expected. This is not a time for bravado – too much is at stake – so we will continue to examine these issues.

Low Prices And Liberal Politics Change Canada's Energy Biz

The stress from managing companies in a low commodity price environment has been exacerbated by the altered political landscape

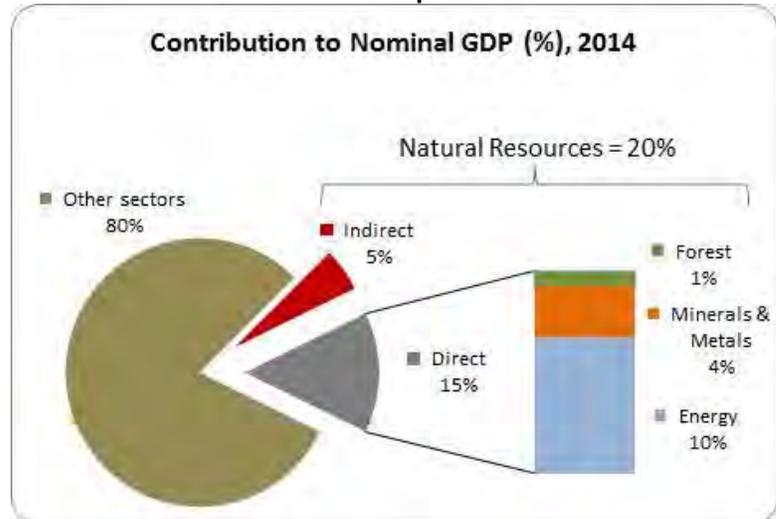
Natural resources play a significant role in Canada's economy, especially in its Western provinces where most resources are located. As a result, the ending of the commodity super-cycle has dealt a devastating blow to the Canadian economy. For companies in the crude oil and natural gas sectors, dealing with low oil and gas prices has become a harrowing experience forcing substantial capital spending cuts, massive layoffs and financial devastation. The stress from managing companies in a low commodity price environment has been exacerbated by the altered political landscape, first in Alberta, and now nationally following the election of Justin Trudeau's Liberal Party. This last power shift has placed the junior Trudeau in control of the economic policies of Canada. Prime Minister Trudeau entered the leadership office after having campaigned on a platform calling for more environmentally-friendly energy policies. That shift, which includes policies driven by climate change concerns, are now being unveiled. Energy company chief executive officers are confronting new challenges as they plot strategies for survival and eventually growth.

According to estimates from Natural Resources Canada, based on data from Statistics Canada, in 2014 the activity of natural resources

The natural resource sector accounts for 10% of the nation's employment

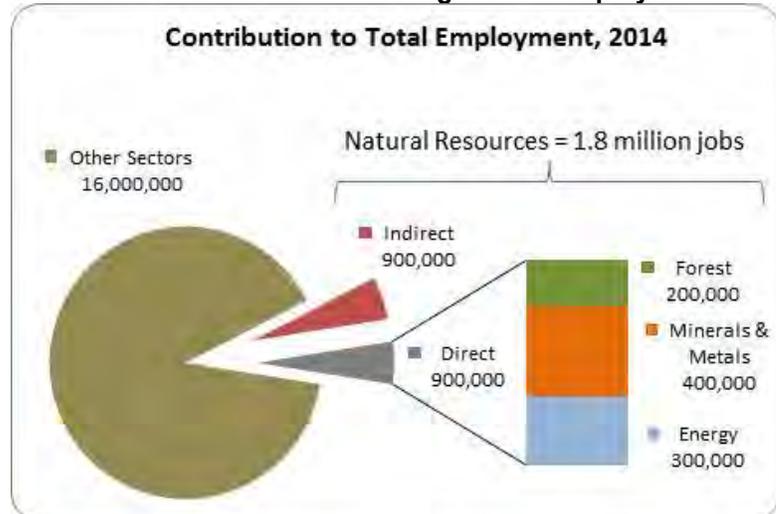
industries contributed 20% to the country's gross domestic output, both directly and indirectly. The direct contribution was estimated at 15%, with the energy component accounting for two-thirds of the total. Equally important, the natural resource sector accounts for 10% of the nation's employment, and the jobs the industry creates are well-paying ones. Therefore, the commodity business downturn may be taking an early and meaningful bite out of Canada's economic growth.

Exhibit 5. Natural Resources Importance To Canada



Source: Natural Resources Canada, Statistics Canada

Exhibit 6. Natural Resources A Significant Employer In Canada



Source: Natural Resources Canada, Statistics Canada

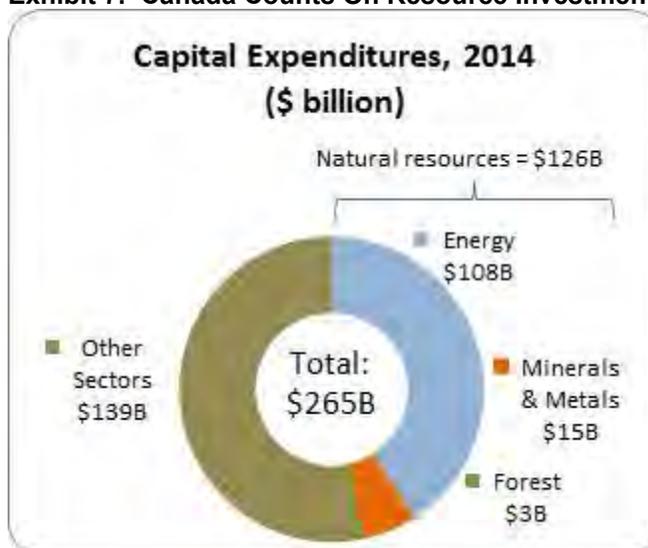
The epicenter of the natural resources pain is Alberta. There the broad economic outlook is deteriorating. The latest economic statistics show that the province's unemployment rate is up to 7%

New vehicle sales were also lower by double-digit percentages

and average weekly earnings are down. People are leaving the province as jobs are no longer available. The housing sector is suffering as starts, new building permits and existing house sales are all lower by double-digit percentages as of November 2015 compared to the same month in 2014. New vehicle sales were also lower by double-digit percentages.

Further to the importance of the natural resource industry to Canada's economy, in 2014, the industry invested C\$126 billion (US\$90.6 billion), or 47.5% of the nation's total capital expenditures. The energy sector's capital expenditures of C\$108 billion (US\$77.7 billion) represented nearly 86% of the natural resource total and nearly 41% of total expenditures for Canada.

Exhibit 7. Canada Counts On Resource Investments



Source: Natural Resources Canada

That means there will be a meaningful slowdown in future investment, which will create a drag on Canada's economy

Another analysis prepared by Natural Resources Canada shows the value of major new projects both planned and under construction. Given the substantial decline in commodity prices and the poor price outlook, the bulk of projects listed as of 2014 as planned are likely to be delayed or cancelled. That means there will be a meaningful slowdown in future investment, which will create a drag on Canada's economy, and quite possibly send it into a recession.

For energy companies, not only are managers dealing with low commodity prices but they now have less support from local and national politicians. In Alberta, the political shift happened with the provincial election last May that propelled the New Democratic Party (NDP) into power. The newly elected NDP legislators elevated Rachel Notley, the head of their party, to be premier for the province. Shortly after assuming control of the provincial government, the NDP raised corporate and personal taxes. Premier Notley also

Exhibit 8. Potential Price Paid For Low Oil Prices

Source: Natural Resources Canada

The NDP charged that the people of the province were not receiving their 'fair share'

announced she would appoint a commission to review the province's royalty structure that had last been examined in 2007. The NDP charged that the people of the province were not receiving their 'fair share' of the income from the natural resources industries. The NDP's election platform also emphasized that it would redirect the provinces' policies with regards to climate change.

People in the oil and gas industry became convinced that the examination would lead to higher royalty payments

Because the watchwords behind the royalty review was 'the province's fair share,' the people in the oil and gas industry became convinced that the examination would lead to higher royalty payments. This review came just as the energy world began experiencing sharply lower prices. At the time of the campaign and election, oil prices were higher than currently and industry forecasters held out hopes that a recovery leading to higher prices might occur before the end of 2015. However, energy executives feared higher royalties could derail the impending industry recovery.

Last week, the commission appointed to review the royalty structure delivered its report. It concluded that the province was being paid its fair share based on current prices. As Ms. Notley told CBC Radio in an interview, "If we were still in a \$100-a-barrel environment, I would suggest that perhaps we could have done better as a province. But the fact of the matter is that what we're dealing with now is fundamentally different." For the oil and gas industry, Ms. Notley's observations were welcomed.

The existing conventional oil and gas well royalty structure will remain in place for ten years

As a result of the commission's review, royalties for oil and gas in Alberta will be changed, but the changes will only be for conventional oil and gas wells drilled beginning in 2017. The existing conventional oil and gas well royalty structure will remain in place for ten years. The extension through the end of 2016 of the existing royalty structure has the potential to cause an acceleration in the pace of any industry recovery whenever commodity prices begin recovering as producers rush to lock in the existing royalty rate. That scenario assumes operators develop confidence that any increase in oil and gas prices is likely to be sustained and that the operator has the money to pay for the drilling the wells.

The royalty rate for conventional oil and gas wells will be 5% of revenues until the cost of the well has been recovered

What operators know from the commission report is that the new royalty rate structure to be introduced in 2017 will, if adopted by the government later this spring, reflect a different concept about how royalties should be established. As the report states, "There will be new royalty rates under the [modernized royalty framework]. However, the new rates will be calibrated to match the industry returns and Albertans' share of value that are achieved under the current royalty framework." Establishing this rate structure will adhere to the doctrine of 'fairness for the residents of Alberta,' but it will also provide an incentive for operators to become more efficient. The royalty rate for conventional oil and gas wells will be 5% of revenues until the cost of the well has been recovered. This should reward the most efficient drillers.

The oil sands business already contributes the most royalty income to the province

The commission also concluded that the oil sands royalty structure put in place in 2009 that encouraged significant investments in new facilities will provide sufficient royalty income to the Alberta government without needing to adjust the rates. The oil sands business already contributes the most royalty income to the province, which makes the question of fairness moot. The recommendation to maintain existing royalty rates in the future is certainly welcomed by the oil sands producers as low bitumen prices have significantly squeezed their profitability, and given the current global oil oversupply, this condition is not likely to be remedied soon.

The plan is designed to support construction of two to three new facilities that would use propane or methane

The day after the release of the royalty review, Deron Bilous, minister for economic development and trade for Alberta announced the Petrochemicals Diversification Program. The program provides up to C\$500 (US\$357) million in royalty credits designed to attract investment in new petrochemical plants in the province. The plan is designed to support construction of two to three new facilities that would use propane or methane, both components of natural gas, as feedstocks to produce products such as plastics, detergents and textiles. As Minister Bilous stated, the plan is designed to help offset the high cost of construction in Alberta. He believes this may attract C\$3-C\$5 (US\$2.2 - US\$3.6) billion in investment and create more than 4,000 jobs.

This program is being initiated in response to one of the recommendations of the royalty review commission that the province adopt a strategy of processing its natural gas into higher-value products. This would be consistent with what other oil and gas exporting countries have done, which is to try to upgrade the raw material produced in their countries into higher-value products.

Royalty credits will be awarded once projects are completed and start processing natural gas feedstocks

Builders of these new plants will be able to apply to the Alberta government for royalty credits worth up to C\$200 (US\$143.9) million for a single facility. Royalty credits will be awarded once projects are completed and start processing natural gas feedstocks. Since petrochemical companies do not pay royalties, these credits can be traded or sold to oil and/or natural gas producers who can use them

Inefficient allocations of capital in building these plants would be expensive for the petrochemical industry at a time when competitive pressures are growing

to reduce royalty payments to the Alberta government. We are unclear whether the payment mechanism for the credits could trigger a race to build petrochemical plants and get them into service in order to secure the credits before others. That scenario is somewhat scary as it could lead to over-investment in new petrochemical plants, with those plants at the end of the parade failing to secure any royalty credits. As a result, any plants that fail to gain royalty credits would be destined to operate at a competitive disadvantage to the royalty-advantaged plants because of the difference in the level of investment. Inefficient allocations of capital in building these plants would be expensive for the petrochemical industry at a time when competitive pressures are growing.

The fact that the NDP is not increasing the government's share of royalties may be tough for the party's supporters to accept

Despite potential concerns about the mechanics of the Petrochemical Diversification Program, the general structure of the royalty program review was praised by the oil and gas industry. "The grandfathering of existing projects, the fact that the new rules will only apply to projects starting in 2017 and maintaining the oil sands royalty regime are signals that the government is serious about encouraging investment in Alberta at this difficult time," wrote Tim McMillan, president of the Canadian Association of Petroleum Producers, in a statement. The fact that the NDP is not increasing the government's share of royalties may be tough for the party's supporters to accept, but in light of the decline in oil prices and the impact on the economic and employment health of Alberta, it still represents a good deal. The royalty review commission also suggested that a capital cost index for oil and gas wells should be published annually in addition to information about each of the oil sands projects including their costs and royalties paid.

It will now require these pipeline projects to pass a more stringent environmental review, including a climate test to determine how the pipeline would affect greenhouse gas emissions

As the Alberta oil and gas industry breathes a sigh of relief following the release of the royalty review report, the industry is now stressed by the recent announcement of new criteria for evaluating pipeline projects in the country. Two weeks ago, in a joint announcement by Environmental Minister Catherine McKenna and Natural Resources Minister Jim Carr, the government amended the criteria by which major pipeline projects are judged. It will now require these pipeline projects to pass a more stringent environmental review, including a climate test to determine how the pipeline would affect greenhouse gas emissions. This marks a major shift in Canada's environmental policy after the nearly decade-long Conservative rule under Prime Minister Stephen Harper that emphasized making Canada an 'energy superpower.'

The touchpoint in this new environmental mandate is TransCanada Inc.'s (TRP-NYSE) Energy East pipeline project. This project is a 2,827-mile pipeline to deliver 1.1 million barrels of oil a day from Alberta and Saskatchewan, through Quebec and onto a deepwater marine terminal in New Brunswick for export to the United States and/or Europe. This pipeline, which was initially conceived as a supplement to the Keystone XL pipeline for exporting western

It is supported by most politicians in Western Canada, but not those in the East

Canadian oil, has now become the prime pipeline export project. TransCanada has hopes the project will be approved in time for construction to commence in 2017. The company says the pipeline's construction will create 14,000 full-time jobs and generate billions in tax revenue. It is supported by most politicians in Western Canada, but not those in the East.

The new climate test will take into account not only the emissions created during the construction of the pipeline but also those from the process of extracting oil or gas once a pipeline is built and operating

The new rules are an interim fix to deal with pipeline projects already proposed while the Trudeau government develops a major overhaul of how energy projects are approved and regulated. The new climate test will take into account not only the emissions created during the construction of the pipeline but also those from the process of extracting oil or gas once a pipeline is built and operating. Next month, the government will provide more details on the acceptable level of emissions. The more interesting issue with this test is that the government says it will base its decisions not just on science but also on the traditional knowledge of indigenous peoples "and other relevant evidence." Exactly what that evidence is was not spelled out.

If Prime Minister Trudeau follows President Obama's lead, Energy East is in trouble

In the case of greenhouse gas emissions, the Ontario Energy Board commissioned research that calculates that Energy East will increase carbon emissions in Canada by less than 2%. Will the Trudeau government apply a similar standard of no increase in carbon emissions from the operation of a pipeline such as President Barack Obama did when evaluating the construction permit application for Keystone? In that case, the U.S. State Department environmental review concluded there would be no increase in carbon emissions, yet Mr. Obama still rejected the application, mostly on political grounds. If Prime Minister Trudeau follows President Obama's lead, Energy East is in trouble.

While approvals are likely to still be earned, the bargaining power of the First Nations has been increased, meaning that the price to gain their approvals has increased significantly

The decision to revise the approval standards to include greater input from indigenous peoples will further compound the approval hurdles for pipelines in Canada. Some of the leaders of First Nations from British Columbia, Manitoba and Quebec have already criticized the Trudeau proposal as "modest." These leaders stressed that the federal government needs to be prepared for rejections of pipeline proposals that cross the lands of these aboriginal people. While approvals are likely to still be earned, the bargaining power of the First Nations has been increased, meaning that the price to gain their approvals has increased significantly, probably lengthening the time needed to negotiate agreements.

Canada's economy may slip into a recession this year as a result of the drop in natural resource prices and the resulting impact on the health of these industries. Nearly a year ago, the election of the NDP in Alberta created significant concern about the damage that could be done to the oil and gas business by the increase in corporate taxes and a royalty review that was anticipated to raise these rates. The decision not to raise rates now but only when the

This new policy could condemn Canada's economy to a low-growth future

industry is projected to be in recovery and the rates are to be established to match profitability has been welcomed by the oil and gas industry. To some degree, the fact that the government is local and can see the condition of the industry may have shaped the royalty review outcome. With the Trudeau government half a continent away from Alberta and more concerned with its liberal agenda, the new pipeline review standards are destined to delay and possibly derail many pipeline and energy projects. This new policy could condemn Canada's economy to a low-growth future. There will be a price paid by the Canadian people, but those who voted for the Liberal Party may not realize for a long time how painful their future may become, and then after it is too late to easily correct these policy mistakes.

Seeking Insights Into Saudi Arabia Oil Industry Thinking

Last week we attended a presentation by Ashraf Al-Tahini, Research and Development Director for Aramco Services Company, an arm of Saudi Arabia's national oil company. Mr. Al-Tahini oversees the three U.S.-based research centers of the company that have been opened in the past 18 months. They join six other research centers scattered across the globe as Saudi Aramco strives to gain increased technological knowledge about core activities within the oil and gas industry.

That objective is to move Saudi Aramco from being a technology consumer to becoming a technology provider

The three U.S. centers are located in Houston, Texas, Boston, Massachusetts, and Detroit, Michigan. Each focuses on different technology areas within the energy business, but they all have a common objective. That objective is to move Saudi Aramco from being a technology consumer to becoming a technology provider. That shift would be significant because it would position Saudi Aramco as almost unique among national oil companies (NOCs).

Now most of the globe's oil and natural gas resources are owned and controlled by governments who assign the management of these resources to the country's NOC

Since the 1980s, after the rise in market power of the Organization of Petroleum Exporting Countries (OPEC) following the 1973 Arab oil embargo, the international oil industry structure has evolved. Now most of the globe's oil and natural gas resources are owned and controlled by governments who assign the management of these resources to the country's NOC. Often they partner with international oil companies (IOCs) to operate oil and natural gas fields in the country. Those partnerships can be true sharing arrangements or they can be contractual management contracts. Oftentimes, the NOCs own and operate refineries and petrochemical plants in the country, but often the fields are operated by the IOCs with the technological skills to maximize the extraction of the reserves.

Over time, these NOC/IOC arrangements evolved into relationships where the IOCs provided the technological expertise for exploiting the NOCs' reserves. To counter to the growing importance of IOCs and their expertise to the NOCs, they began leaning on the oilfield

Over time, the role and power of the service industry grew, especially as IOCs cut back their technology research and development activity

service contractors for help and expertise in the drilling and producing of the resources. In effect, the oilfield service companies became a counter to the growing power of IOCs. The service companies realized that by exploiting their technology capabilities and expanding the scope of that expertise, they could become key advisors to the NOCs and gain the highly prized work associated with the advice.

Over time, the role and power of the service industry grew, especially as IOCs cut back their technology research and development activity after the industry downturns in the 1990s and 2000s. The service companies also were perceived to be better judges of the competing technologies offered by IOCs via licenses to the energy business. The net result of the oilfield technology evolution was that NOCs became technology consumers, relying on the offerings of IOCs or oilfield service companies.

Saudi Aramco also believes it can focus its technology resources on those conditions unique to the oil and gas fields of Saudi Arabia

Saudi Aramco has decided for various reasons that it wants to become a leading technology provider to the industry. It wants to be recognized as a technology leader, which it believes will help it become an employer of choice among skilled workers. Saudi Aramco also believes it can focus its technology resources on those conditions unique to the oil and gas fields of Saudi Arabia, thereby improving the sustainable development of the country's resources. These technologies can also more easily be integrated across the company's entire value chain.

As an example of how these goals can work, Saudi Arabia as a country is fresh-water challenged. Therefore, the country relies on a network of extensive seawater desalination plants to meet its needs. This fresh water is very expensive water. That cost impacts the economics of performing hydraulic fracturing operations in the kingdom, which it expects to be doing more of in the future. By developing technology to overcome the problems of scale associated with seawater in fracturing operations, Saudi Aramco could reduce its operating costs by not needing to treat the water but rather it use it directly from the ocean.

Its focus is fuel technology and improved engines, but also strategic transport analysis

One aspect of the presentation we found interesting as a sign of Saudi Arabia's thinking about the long-term outlook for the oil business was a discussion of research efforts underway at the company's newest research center located in Detroit. That facility was opened last November. Its focus is fuel technology and improved engines, but also strategic transport analysis. The latter effort involves scenario analysis of future transportation markets including ultimately issuing white papers on the topic.

With respect to their core technology focus, they are targeting passenger and commercial fuels and engine technologies. From descriptions of some of their research efforts, it seems they are focused on autonomous vehicle development, although that term

at some point in the past, Saudi Arabian officials began considering the forces at work reshaping the transportation business

was never used. Mr. Al-Tahini said that the over-arching research goal is to produce the most fuel-efficient vehicle with the lowest emissions.

Our take-away from that part of the presentation was that at some point in the past, Saudi Arabian officials began considering the forces at work reshaping the transportation business, a market dominated by crude oil. One broad trend impacting that market is demographics, but there is little Saudi Arabia can do to change the impact. Understanding these trends and their impact on the market is critical for long-term planning.

In recent years, the environmental movement has aggressively targeted the fossil fuel industry, which has resulted in a tightening of fuel-efficiency and carbon emission standards, the elimination of fuel subsidies in a growing number of countries around the world, and a strong push to urbanize the population and increase transportation alternatives. All of these forces will impact the growth of the transportation fuels market.

we have concluded that Saudi Arabia believes that oil demand may be closer to a peak than previously thought

Given those forces, we have concluded that Saudi Arabia believes that oil demand may be closer to a peak than previously thought. This does not mean that the oil industry is going out of business anytime soon, but rather that its growth will slow in the future. Market share growth for Saudi Arabia will need to come from someone else's share, which means increased price competition. It also means trying to slow the development of alternative energy sources. Knocking out future oil sands and deepwater oil output as well as marginally shrinking shale oil opportunities will all benefit Saudi Arabia's long-term market potential. Any negative impact on the oil output of other significant producers such as Russia, Iran and Iraq, coupled with boosting demand would all help Saudi Arabia. Lastly, technological developments that enable Saudi Arabia to reduce the cost and extend the life of its oil fields would also help the kingdom's future. While none of this is new to our thinking, Mr. Al-Tahini's presentation provided confirmation of what we think is motivating Saudi Arabia's actions.

A Reminder Of How Cheap Our Energy Really Is

We owe a tip of our hat to our son for forwarding this graphic showing the cost per barrel of everyday consumer goods. Always an important reality check, especially when a barrel of oil is selling for barely over \$30!

Exhibit 9. Consumer Products Priced By The Barrel



Source: Cody Rome

Threat Of Obama's 21st Century Clean Transportation System

The phrase most people remember is "Houston, we have a problem."

On April 13, 1970, Apollo 13 Commander James Lovell told NASA ground control, "Houston, we've had a problem." He was referring to an explosion on the spacecraft damaging the power and oxygen systems of the main capsule and forcing the three astronauts to use the Lunar Module to complete the mission's journey to the moon and back. Commander Lovell's statement was altered slightly, but immortalized, in the 1995 Ron Howard movie, *Apollo 13* starring Tom Hanks. Thus, the phrase most people remember is "Houston, we have a problem." Well, Houston felt that way last Thursday when President Barack Obama proposed a \$10 a barrel tax on oil consumed in the United States as part of his upcoming budget. This tax will fund \$32 billion in future transportation spending.

Like most liberal tax proposals, this one is being presented as an "investment" in the American economy that will produce a 21st century clean transportation system that will "reduce carbon pollution," "strengthen the economy, drive innovation and create new jobs." Wow! Isn't this what everyone in America wants?

This tax plan, which is likely dead on arrival on Capitol Hill due to Republican control of both Houses of Congress

This tax plan, which is likely dead on arrival on Capitol Hill due to Republican control of both Houses of Congress, represents the Obama administration's plan to drastically overhaul the U.S. transportation system in an effort to create a carbonless economy. Remember, President Obama has already gotten his Environmental Protection Agency (EPA) to create its Clean Power Plan that would drastically restrict the use of coal to power already existing electricity generating facilities in this country. The Clean Power Plan is under

This is the single largest U.S. energy sector dominated by oil

attack in the federal courts, as the majority of the states are fighting the plan's mandate, even though the EPA plan appeared to have been crafted in a way to make it appear that every state has significant freedom to develop its own plan to de-carbonize its electricity system. The reality may be quite different.

This time the attack is on the U.S. transportation system because, as the White House states, "our transportation sector accounts for 30 percent of U.S. greenhouse gas emissions." This is the single largest U.S. energy sector dominated by oil. Yes, we have a few vehicles that run on one or another form of natural gas and some that are powered by electricity, or more correctly batteries, but the overwhelming number of transportation vehicles in the U.S. are powered by gasoline or diesel fuel – both derived from crude oil.

To the Obama administration, if the oil industry is complaining about low oil prices, we will happily raise the price!

The outcome of this plan would be a slightly distorted play on the words of Vladimir Lenin, a key architect of the October Revolution in Russia and Soviet Russia's first leader. Mr. Lenin proclaimed, "The Capitalists will sell us the rope with which we will hang them." To the Obama administration, if the oil industry is complaining about low oil prices, we will happily raise the price! What do you mean that they are not happy with higher oil prices?

I'm sure we all remember those "shovel-ready" jobs, electric vehicle tax credits and loans to Solyndra

Forget that this proposal is going nowhere. Its announcement signals that the oil and gas industries will be under relentless assault for the remainder of President Obama's term as President. This plan is being marketed off the euphoria of the Paris climate change agreement, which the administration will presumably be signing in March. This plan is also being pitched as a continuation of the vision and success of the American Recovery and Re-investment Act of 2009. I'm sure we all remember those "shovel-ready" jobs, electric vehicle tax credits and loans to Solyndra, among other assorted tax credits and subsidies that filled that nearly \$1 billion stimulus legislation.

All this can be achieved for a mere 33% increase in the current price of a barrel of oil!

We are being told that we need to make this investment because the nation needs to build a transportation system to meet the needs of our 21st century economy, as the Obama administration has determined we have outgrown our nation's transportation system that was "built around President Eisenhower's vision of interstate highways connecting 20th century America." Mr. Obama claims that Americans are suffering from a "hidden tax through congestion, which every year costs families \$160 billion and businesses almost \$30 billion." We are told that we can solve this hidden tax problem, provide people with a "smarter, cleaner and more resilient transportation system," "accelerate the safe integration of autonomous vehicles, low-carbon technologies and intelligent transportation systems into our infrastructure" while at the same time cutting our pollution. All this can be achieved for a mere 33% increase in the current price of a barrel of oil!

The oil tax increase is proposed to pay for the long-term investments

At the end of the White House fact sheet on this proposal we find some of the technical details of how this plan will actually be funded. First, the \$10 a barrel tax is to be phased in over five years – suggesting that we are likely to get only \$2 a barrel per year hikes. In the interim, however, the plan calls for utilizing one-time revenues from business tax reform, presumably something the White House and Republicans will agree on, in order to fund the surge in investment mandated by the plan. The oil tax increase is proposed to pay for the long-term investments. Lastly, there would be extra money set aside to “provide assistance to families to help relieve energy cost burdens, including a focus on supporting households in the Northeast as they transition from fuel oil for heating to cleaner forms of energy.”

Preventing climate change proponents from barring the construction of new natural gas pipelines and expansion of existing ones in the region would allow clean energy supplies to increase

Certainly low-income families would be adversely impacted by petroleum prices jumping in response to each tax levy. Helping Northeast homeowners transition away from heating oil is somewhat laughable since the Obama plan fails to address the energy infrastructure challenge in the region. Preventing climate change proponents from barring the construction of new natural gas pipelines and expansion of existing ones in the region would allow clean energy supplies to increase. Increased gas supply would encourage local gas distribution companies to extend their supply networks to more communities, easily facilitating the shift away from heating oil at little cost. The reality of that plan is that it doesn't require federal money to achieve – merely resolve and time.

This is a political environment that energy company executives have never experienced before and they need to find ways to more articulately educate the public about the social benefits of fossil fuels, and how the industry is reducing carbon emissions

Just as in 1970 when Commander Lovell spoke his famous words – Houston does have a problem. The town and industry are abuzz about this \$10 a barrel tax plan. The plan, while masquerading as an investment in a new, clean transportation system for the country, is really just another attack on fossil fuels. Yes, Houston, those of us involved in the fossil fuel business should understand that the Obama administration's plan is adding to the growing attack on the use of fossil fuels to better mankind. This is a political environment that energy company executives have never experienced before and they need to find ways to more articulately educate the public about the social benefits of fossil fuels, and how the industry is reducing carbon emissions. Without a more enlightened approach to the climate change debate, Houston will see part of its economy suffer a fate similar to that of the dinosaurs who created the fossil fuel business. The future for the industry will be much more challenging than executives currently anticipate.

Another Energy Transition Underway – LEDs In, CFLs Out

General Electric (GE-NYSE) announced it was phasing out the manufacturing of CFLs

Last week, General Electric (GE-NYSE) announced it was phasing out the manufacturing of compact fluorescent lightbulbs (CFLs) and will replace them with light emitting diode (LED) bulbs. This shift marks another stage in the government mandated transition in lighting in an effort to reduce energy consumption and limit the

The legislation killed the manufacture and importing of most of the then current incandescent light bulbs

amount of carbon dioxide emitted into the atmosphere by generating electricity. The GE move to shift its electric light bulb output solely to LEDs is in response both to tightened energy-efficiency standards and the fight for shelf space in retail stores.

In 2007, legislation was enacted that required roughly a 25% improvement in light bulb efficiency to be phased in from 2012 through 2014. The legislation killed the manufacture and importing of most of the then current incandescent light bulbs. People may remember the public outrage over this banning of incandescent light bulbs. Stores experienced runs on their inventory as many consumers were determined to stock up on these less-efficient but more popular lightbulbs.

What caused consumers angst about CFL lightbulbs was their light quality, poor lifetime performance and the Mercury they contained. The poor lifetimes for many of the early CFL lightbulbs was due to many cheaply manufactured bulbs being imported. As these cheap CFLs failed to deliver anywhere near the advertised longevity claims versus incandescent bulbs, people became very upset. As the major lightbulb manufacturers stepped up their output, the quality of CFLs improved and the lifetime issue seemed to disappear.

The new softer white (often referred to as cool) CFL lightbulbs have begun to placate the unhappiness about the quality of the light output, but that comes at a cost in bulb life and power consumption

On the other hand, the quality of the light produced by CFLs remains an issue. If one is considering purchasing CFLs he will often find an array of them with different amounts of light output and light quality. What we have learned from reading about CFLs, there are energy-efficiency trade-offs in the various competitive light output models. The new softer white (often referred to as cool) CFL lightbulbs have begun to placate the unhappiness about the quality of the light output, but that comes at a cost in bulb life and power consumption. The risk of Mercury contamination from a broken CFL, on the other hand, remains a sore point for many consumers. The government warns that broken CFL lightbulbs should be treated as a hazardous waste clean-up exercise with directions supplied by the Environmental Protection Agency. That made people angry. As CFL lightbulbs made their way into the mainstream of home use, the publicity about the Mercury risk in the bulbs diminished.

The lightbulb manufacturers found that their CFL bulbs were being squeezed for shelf space

Under the legislation that ushered CFL lightbulbs into mainstream use called for a timetable for them to replace the 60-watt and 100-watt incandescent light bulbs. Other size incandescent lightbulbs were still allowed to be manufactured, imported and sold. Those bulbs that remained legal included various specialty bulbs, including appliance bulbs, "rough service" bulbs, colored lights, plant lights, and 3-way bulbs, as well as light bulbs of less than 40 watts or more than 150 watts. The rules further exempted stage lighting and landscape lighting. As a result, the lightbulb manufacturers found that their CFL bulbs were being squeezed for shelf space. As John Strainic, chief operating officer of GE Lighting, put it, "You end up with a shelf that has (halogen) incandescents on one side and your

Therein lies the key to the increased acceptance of LEDs – they no longer sell at a significant premium to the other energy-efficient bulbs while delivering improved performance

energy-saving, longer-life LEDs on the other, and the CFLs in the middle get squeezed." He said. "It's already happening." We agree based on our most recent visit to our local home improvement store.

Two developments with LEDs have helped them gain increased popularity among consumers. First, their cost has decreased, and second, their quality has improved. Mr. Strainic described the issue with CFLs that has helped drive consumers to LEDs. "CFL's kind of been the light bulb that everybody loves to hate," he explained. The historical user complaints centered about CFL dimmer compatibility, brightness delay, and quality of light, which left CFL lightbulbs with the perception of inferior performance, an image that continues to linger. As Mr. Strainic stated, "Ultimately, LED offers a better solution at a comparable price." Therein lies the key to the increased acceptance of LEDs – they no longer sell at a significant premium to the other energy-efficient bulbs while delivering improved performance.

Exhibit 10. Comparison Of Lightbulb Types

			
	Light Emitting Diodes (LEDs)	Incandescent Light Bulbs	Compact Fluorescents (CFLs)
Energy Efficiency & Energy Costs			
Life Span (average)	50,000 hours	1,200 hours	8,000 hours
Watts of Electricity used (equivalent to 60 watt bulb)	6 - 8 watts	60 watts	13 - 15 watts
Kilowatts of Electricity used (30 Incandescent Bulbs per year equivalent)	329 KWh/yr.	3,285 KWh/yr.	767 KWh/yr.
Annual Operating Cost (30 Incandescent Bulbs per year equivalent)	\$32.85/yr.	\$328.59/yr.	\$76.65/yr.
Environmental Impact			
Contains the TOXIC Mercury	No	No	Yes - Mercury is very toxic to your health and the environment
RoHS Compliant	Yes	Yes	No - contains 1mg-5mg of Mercury and is a major risk to the environment
Carbon Dioxide Emissions (30 bulbs per year)	451 pounds/year	4,500 pounds/year	1,051 pounds/year
Sensitivity to low temperatures	None	Some	Yes - may not work under negative 10 degrees Fahrenheit or over 120 degrees Fahrenheit
Sensitivity to humidity	No	Some	Yes
On/off Cycling	No Effect	Some	Yes - can reduce lifespan drastically
Turns on instantly	Yes	Yes	No - takes time to warm up
Durability	Very Durable - LEDs can handle jarring and bumping	Not Very Durable - glass or filament can break easily	Not Very Durable - glass can break easily
Heat Emitted	3.4 btu's/hour	85 btu's/hour	30 btu's/hour
Failure Modes	Not typical	Some	Yes - may catch on fire, smoke, or omit an odor
Light Output			
Lumens	Watts	Watts	Watts
450	4-5	40	9-13
800	6-8	60	13-15
1,100	9-13	75	18-25
1,600	16-20	100	23-30
2,600	25-28	150	30-55

Source: designrecycleinc.com

in 2017, Energy Star's efficiency standards are set to increase to 80 lumens per watt

Another important market consideration that will drive greater focus on LEDs is the increase in efficiency standards required by the 2007 law and the Energy Star designation. By 2020, the law requires a roughly 200% greater efficiency for lightbulbs than they were achieving in 2007. Before that 2020 date, in 2017, Energy Star's efficiency standards are set to increase to 80 lumens per watt. When that occurs, most CFLs will no longer qualify for utility company rebates to consumers. The vast majority of those rebate dollars will shift to LEDs helping them to become even more competitive in the marketplace.

According to the National Electrical Manufacturers Association, the sale of LED lightbulbs in 2014 and 2015 increased by 237%, accounting for 15% of all the lightbulb shipments in the third quarter of 2015

According to the National Electrical Manufacturers Association, the sale of LED lightbulbs in 2014 and 2015 increased by 237%, accounting for 15% of all the lightbulb shipments in the third quarter of 2015. We expect that this sales growth will continue at a high level given the economics and energy-efficiency standard increases. Our own experience with LED lightbulbs has been mixed. Several LED spot lights high up on the side of our house in Rhode Island have worked well. Of three LED carriage lightbulbs, however, one failed within two months while the remaining two have functioned perfectly for over a year. Our biggest complaint about these bulbs is that they are not as attractive as the incandescent bulbs. So when do aesthetics over-ride economics?

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