



Energy & Utilities

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Utilities Research Report

Re-Evaluating Our Industry Outlook

Summary

After recently selling one of QUIC's oldest holdings, Fortis, the Energy team decided to perform a deep dive into the Utilities space. An often overlooked segment of our portfolio, we decided it would be prudent to do an in-depth overview of the important components of this space.

Value Chain

From generation to transmission and energy trading to retail, the utilities space covers a broad array of services each requiring its own unique investment approach

Geographical Analysis

In both Canada and the U.S., utilities are regulated at the state and provincial level, and as such, there are significant discrepancies between the policies of different regions

Sub-segments

While electricity is the most common utility, we felt it was necessary to consider investments in less researched areas within the sector

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QUIC Research Report

November 21, 2016

Utilities Primer



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The Utilities Value Chain

Both the Canadian and American utilities industries were traditionally made up of integrated companies until the 1990s, when companies were unbundled to encourage innovation and competition.

Since then, the utilities value chain has been divided into four supplier segments: generators, energy transmission networks, energy traders and marketers, and energy services providers and retailers. Many Canadian utilities companies are integrated across the value chain, including Canadian Utilities (TSX:CU), Fortis (TSX: FTS), Emera (TSX: EMA), and ATCO (TSX: ACO.X)

Generators

These operators create electrical power from a fuel source, which could be coal, nuclear power, natural gas, wind, or solar power. The generated electricity is supplied to the transmission lines after “stepping up” (increasing) the voltage, as this allows the electricity to be transferred more efficiently over long distances.

Generator costs depend on fuel supply, capital and depreciation expense, and the cost of running the power plants, meaning the best way to cut costs would be to improve overall operational efficiency. Considering that generators deal directly with fuel supply, they are the most exposed to commodity prices, translating into greater risk, meaning that hedging would also be an integral part of strategy.

In the U.S., PPL Corporation and Duke Energy are the largest generators, while Canadian generators are usually province/ municipality-owned or partnerships. Some provinces, such as Quebec, Alberta, and Ontario have deregulated their utilities, leading to the emergence of independent players, including Alberta's TransAlta (TSX: TA, NYSE: TAC), Capital Power Corp (TSX: CPX), and Quebec's Boralex (TSX: BLX)

Energy Transmission and Distribution Networks

Network operators move the electrical energy from the generating site to electrical substations through transmission networks. It is important to note that transmission networks are distinct from local wiring that connects substations to end users, which is the distribution network. The combined network of transmission and distribution lines are what is commonly referred to as “the grid.”

Electrical energy must be generated at the same rate at which it is consumed, and therefore a very sophisticated control system is required to ensure that power supply very closely matches demand. Any imbalances could cause generation plants and transmission equipment to automatically disconnect, resulting in major regional blackouts. As a result, network operators tend to be government-owned companies that act as natural monopolists, because of the significant investment and integration required for the system to work.

Grid operators, regional network operators, and distribution network operators generate revenue by selling access to their networks to retail service providers. Regulated transmission operators have a guaranteed ROE, while merchant transmission companies rely on long-term contracts for capacity, which has traditionally been allocated through a competitive bidding process. The most recent business model for transmission assets in the U.S. has been a REIT structure, after the IRS recognized transmission assets as real estate.

Energy Traders and Marketers

A megawatt of electricity is a commodity like any other, and can be traded on the wholesale market. These transactions are cleared and settled by the market operator, or a special purpose independent entity, being the Independent Electricity System Operator (IESO) in Ontario, and the Alberta Electric System Operator (AESO) in Alberta.

Participants do not need to own any generation or serve any end-use customers, and just like with any other commodity, there are individual traders. The process is as follows: the system operator predicts hourly electricity demand, and the generators offer a specific amount of generation capacity (supply) into the market at specific prices. Once the offers are made, the operator sorts the offers to determine how much supply is available at different price points. The "winning" bids are the lowest-priced combination of offers required to meet demand. Each generator that is dispatched is then paid the same price as what was paid to the last unit of electricity needed to meet total demand. This encourages generators to drive down operating costs to be the lowest bidder, and capture more profits.

The importance of understanding the wholesale market lies in the fact that retail electricity pricing depends heavily on what take place in wholesale markets. In a competitive market, electricity price is a factor of four things: energy, which is the actual commodity consumed by customers, capacity,

which is the service of making the energy available for dispatch, transmission congestion and losses, and any other ancillary costs.

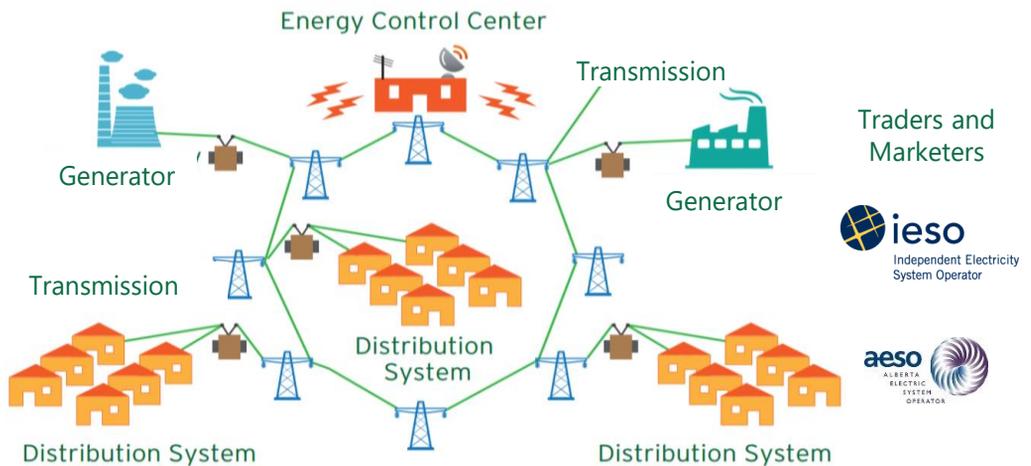
Energy Services Providers and Retailers

Energy service providers and retailers oversee the final sale of power from a provider to an end-use customer. Supply for end-use customers is obtained through the aforementioned wholesale market, from utility-owned rate-based generation if retail competition is not allowed, or some combination of the two. Retail suppliers serve customers much like a mutual fund, having a portfolio of long, medium, and short term contracts, as well as spot market supply.

In Ontario, these companies need to be licensed by the Ontario Energy Board, but their prices are not regulated. Many retailers bundle electricity with gas and water, and revenue is generate by charging a monthly service fee based on electrical energy (in kWh) consumed that month.

EXHIBIT I

Utilities Value Chain



Source: Cognizant

Key Terms and Definitions

| | |
|---|--|
| <p>Megawatt Hour</p> | <p>A megawatt hour is the basic industrial unit for pricing electricity. A megawatt hour, or MWh, is equal to one thousand kilowatts of power continuously supplied for one hour. One kWh equals one-thousand watt hours. In perspective, one kWh = 3.306 cubic feet of natural gas and an average household uses 0.8-1.3 MWh/month.</p> |
| <p>Load</p> | <p>Load refers to the amount of electricity delivered at any specific point or points on an electrical system. Load management refers to utility companies attempting to regulate and shift load within an electrical system to maximize delivery efficiency.</p> |
| <p>Interprovincial Trade</p> | <p>Interprovincial trade is the transport of electricity between different provinces. This is distinct from intraprovincial trade and international trade, which is within a province and between countries respectively. The vast majority of trade in Canada is intraprovincial or international, whereas the majority of U.S. trade is Interstate. In Canada, interprovincial and international trade is governed by the NEB, and intraprovincial is governed by the provincial government within each specific province.</p> |
| <p>National Energy Board (NEB)</p> | <p>The National Energy Board is an independent Canadian economic regulatory board. The board is tasked with the regulation and approval of energy and gas pipelines, tolls and tariffs, and national power lines. Much like the FERC, this regulatory body's approval is critical in utility developments and the performance of Canadian utility companies.</p> |
| <p>Federal Energy Regulatory Commission (FERC)</p> | <p>The FERC regulates the U.S electricity industry. This governing organization oversees the rates at which electricity is provided to consumers, monitors national service standards, and oversees interstate power transition. In addition to monitoring quality standards, the FERC also acts as the central governing body for issuing licenses to new electricity developments, and reviewing certain merger and acquisition transactions between electricity companies.</p> |

Overview of Regulated Provincial Utilities Systems

In Canada, much of utility market regulations are determined by individual provinces. As a result, there are variety of systems in place in different markets around the country.

British Columbia

B.C.'s electricity market has not been deregulated, and most of the province's power is generated by B.C. Hydro, a provincial corporation. The company operates 31 hydroelectric facilities and two thermal generating plants, with the bulk of power generation coming from dams on the Peace and Columbia River systems. In 2015, the province generated 98% of our electricity from clean and renewable sources.

Saskatchewan

Like British Columbia, the market in Saskatchewan has not been deregulated and the province's primary power supplier is SaskPower, a provincially owned vertically integrated company. The company is hoping to generate 50% renewable energy by 2030.

Manitoba

The Manitoba market has also not been deregulated. Manitoba Hydro is the provincially owned corporation in charge of electricity generation, transmission and distribution in Manitoba. Its power is generated at 15 hydroelectricity generation stations on the Nelson, Saskatchewan, Laurie and the Winnipeg Rivers.

Quebec

The market in Quebec has not been deregulated and most of the power system in the province is owned and operated by Hydro Quebec, a publicly-owned, vertically integrated utility. The province relies heavily on hydroelectricity for power, 99% of the province's electricity is generated by water.

New Brunswick

New Brunswick Energy and Utilities is the state owned power generator for the province. To generate electric power, the company employs a mix of fossil fuel, hydroelectric and nuclear capacity. Currently, the company has 12 hydro, coal, oil and diesel-powered generating stations that can generate upwards of 2,853 MW of power.

Newfoundland and Labrador

Newfoundland and Labrador Hydro has a generating capacity of 7289 MW and is the fourth largest of all utility companies in Canada. The province mainly relies primarily on hydroelectricity for its power needs, supplemented by a small amount of thermal energy capacity.

Nova Scotia

Nova Scotia Power Inc. is the public utility in charge of the generation, transmission and distribution of electricity in Nova Scotia. Unlike other provinces, NSP is a privately held company. However, as they operate as a near monopoly, they are highly regulated and operate in nearly the same manner as state owned utilities in other markets. The company has 2,293 MW of capacity drawn from 5 thermal plants fired with a mix of coal, petroleum coke, fuel oil and natural gas.

Prince Edward Island

Maritime Electric, a Fortis company, is the public utility which serves most of the province. Unlike other provinces, PEI relies heavily on imported power and much of their electricity is generated in New Brunswick. As a result they pay some of the highest electricity rates in the country.

Market Structure of Ontario

Historically, Ontario followed the model of other provinces and utilised a state-owned utility to provide its residents with power. Over time, this company accumulated billions of dollars of debt and the system had to be reorganized. In the late 1990s the provincial electricity system began to be restructured to introduce market competition.

Today, Ontario's power supply comes from a hybrid of government and privately owned sources. Since 2005, the sale of electricity has been open to competition. This allows customers to choose among a range of providers, offering the possibility of savings on the energy bill and/or of supporting a certain electricity type (e.g. renewables).

The price of electricity is controlled by the Independent Electricity System Operator (IESO). The IESO is in charge of balancing the supply of and demand for electricity throughout the province. It directs the flow of power across the province's transmission lines in order to deliver power to customers.

EXHIBIT II

Ontario Power Sources

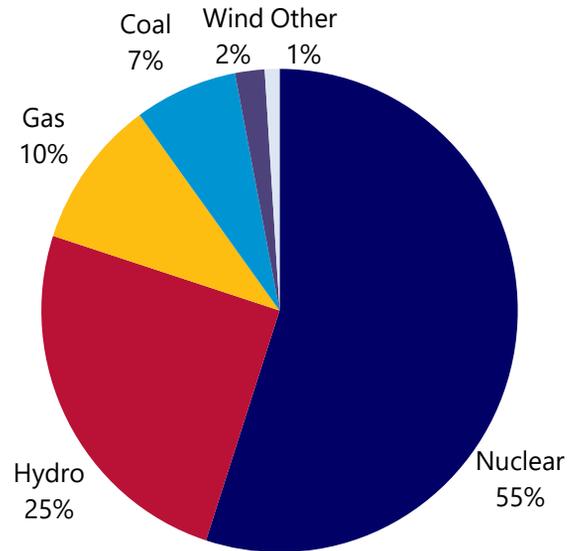
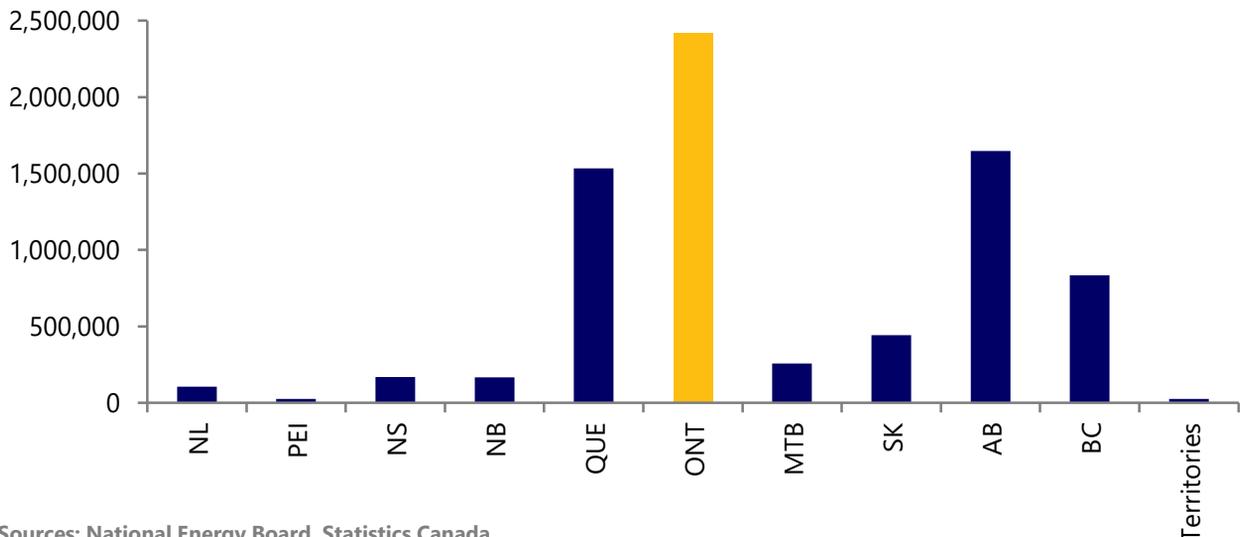


EXHIBIT III

Total Energy Demand By Province (Terrajoules)



Sources: National Energy Board, Statistics Canada

Development of the Alberta Electricity Market

Unlike most provinces, Alberta's power market was never controlled by a single government owned entity. Instead, the majority of the province's power assets were either municipally or investor owned and those entities have now either been taken over or evolved into one of the major players in the market.

By 1995, on the generation side, the market was dominated by three large vertically-integrated utilities, being TransAlta, ATCO, and EPCOR. Collectively, these companies generated 90% of Alberta's then 8,600 MW of power.

In 2001 the Alberta government opened the electricity market to competition. Currently, they are the only province in which the market determines the price of power. Despite this, citizens pay average prices for power. Because much of the province's power is based on fossil fuels, the market price of power tends to follow the price of oil and gas and is much more volatile than in other provinces.

EXHIBIT IV

Alberta Emissions Profile

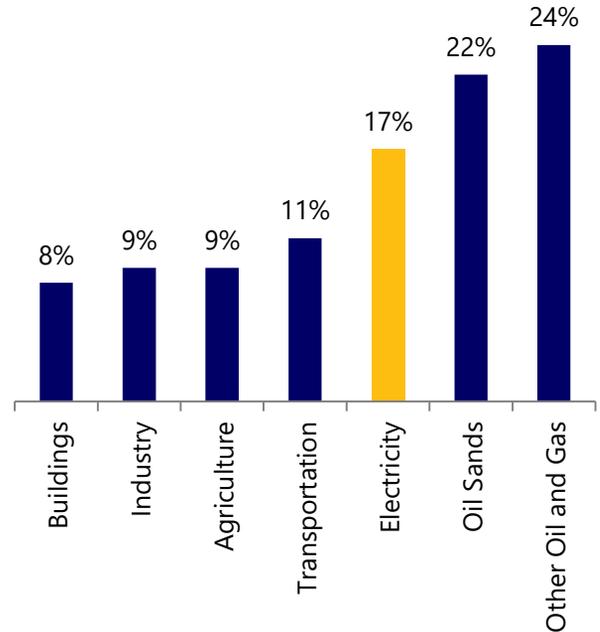
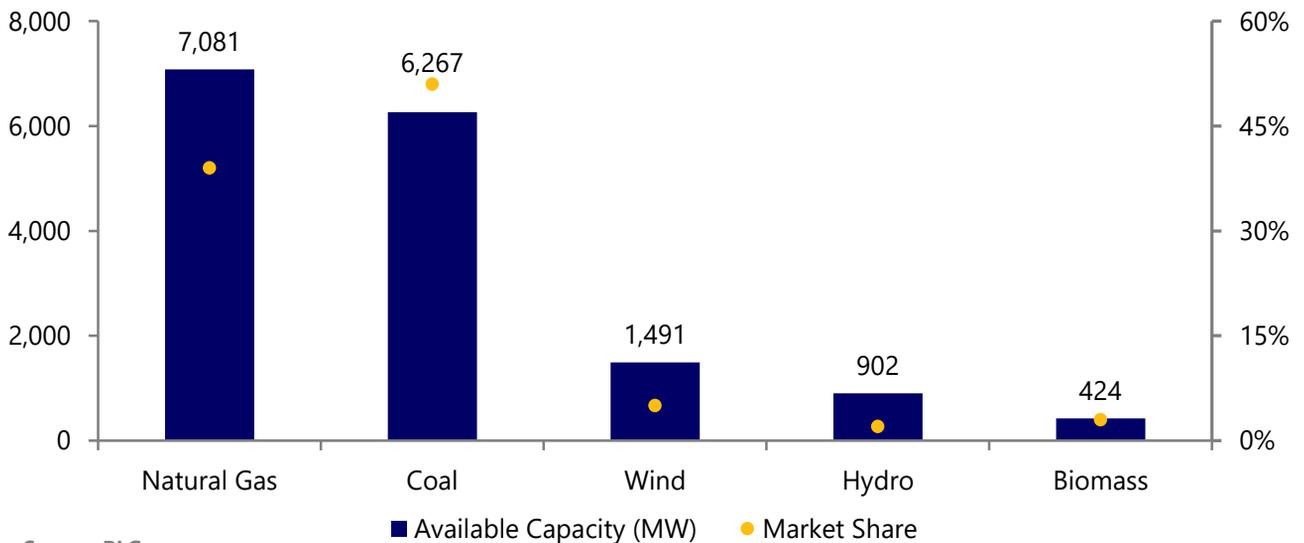


EXHIBIT V

Current Market Dynamics



Source: BLG

Regulatory Changes and Market Impact

In 2015, Albertans ended a long run of provincial conservative leadership when they elected Premier Rachel Notley and the NDP to lead the provincial government. One of the core tenants of her government's platform was to combat climate change and "green" the province that has been built mainly on an oil and gas carbon-based economy.

One of the first actions taken by the newly elected government was to create a panel to advise the province on measures needed to reduce Alberta's greenhouse gas emissions. The panel eventually targeted the province's electricity market, given that electricity generation is the second largest emitter in Alberta and accounts for 17% of the province's greenhouse gas emissions. Alberta is also responsible for 65% of the country's coal related emissions, and was seen as an easy target for widespread emission reductions.

Based on the panel's recommendations, the provincial government adopted the following

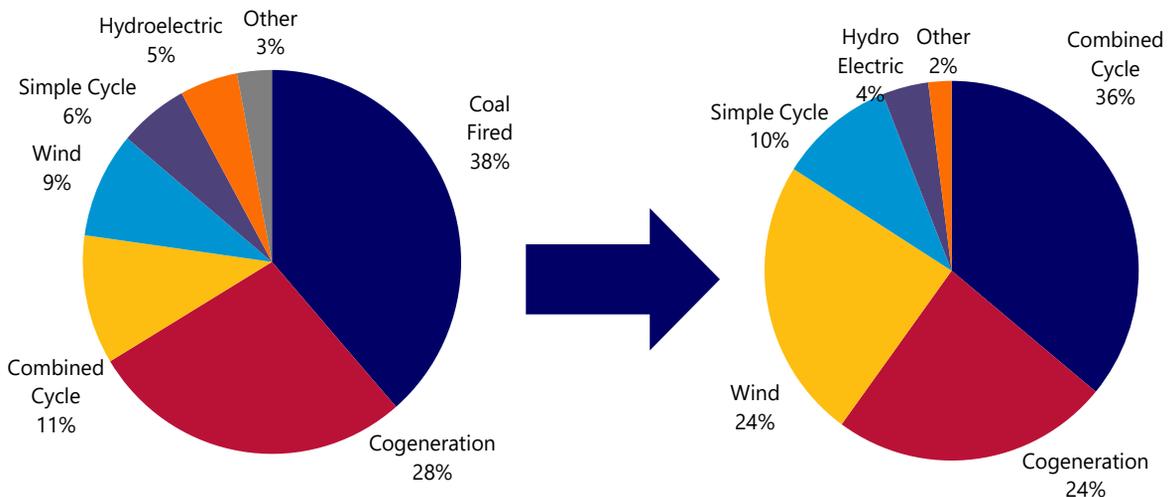
measures:

1. There will be no pollution from coal-fired power generation in Alberta by 2030
2. All coal-fired plants will be phased out and replaced by natural gas and renewable power generation
3. Two-thirds of the coal-generating capacity (4,200 MW) will be replaced by renewable energy, and one-third (2,100 MW) by natural gas
4. Beginning in 2018, all coal generators will pay \$30 per tonne of CO₂ on emissions above what Alberta's cleanest gas plant would emit to generate the same amount
5. Renewable resources will account for 30% of Alberta's total operating generating capacity by 2030

These changes are expected to significantly impact the overall market in Alberta, and will present opportunities for new players to emerge in the industry.

EXHIBIT VI

Projected Market Changes (2016 – 2030)



Sources: BLG, Altacorp

Sub-Segment Analysis : Electric

Key Drivers

Demand is driven by commercial, government, and residential needs for electrical power, which depend mainly on economic activity and population growth.

Supply is largely driven by environmental regulations and advances in technology. Many regulations like equivalency requirements, which are being instituted in many provinces in Canada, favour low or non-greenhouse gas (GHG) emitting sources, like hydro. Similarly, renewable technologies are a determinant of type of supply, with advances in smaller segments like biopower potentially being the most disruptive.

Market Outlook

Electricity is the world's fastest-growing form of end-use energy consumption, and has been for the last several decades. The IEA expects electricity to make up 25% of final energy consumption by 2040. Developing countries will account for the bulk of this growth, with India seeing annual consumption increases of 3.2% per year, and China forecasted to grow by 2.1% annually.

Considering that type of supply is driven by regulation, it is worth noting that while Canada as a whole is well-poised to meet environmental requirements, with 63% of electricity coming from hydro, this figure does not account for the variety of provincial generation mixes. Alberta, Nova Scotia, and Saskatchewan rely on coal-fired generating stations, meaning that those utilities are more adversely affected by regulatory changes in the future, like carbon taxes instituted in 2015 in Alberta. While the hydro segment is still expected to remain dominant through to 2040, the wind power segment is expected to account for 11% of total generation.

Level of Regulation

In general, electric power is heavily regulated,

considering that it is viewed as a natural monopoly. Even after the deregulation and unbundling of many utilities around the world in the 1990s, governments remain involved, often by requiring retailers to obtain a license, and report on their pricing practices annually.

Electricity in Canada is primarily governed by provinces, but because Canada is the second largest exporter of electricity in the world, international powerlines and electricity exports are governed by the National Energy Board.

Level of Competition

In the deregulated electric market, large companies naturally have an advantage in negotiating contracts and being able to pass on the costs of implementing regulations onto consumers. Smaller companies can compete by exploiting market niches, like green power.

However, the industry as a whole remains highly concentrated across North America, with the 50 largest companies accounting for 85% of revenues.

Largest North American Players

| Rank | Company | Revenue (2015, \$MM) |
|--|----------------------------|----------------------|
| U.S. | | |
| 1 | Pacific Gas and Electric | 16,833 |
| 2 | Southern California Edison | 11,485 |
| 3 | Consolidated Edison | 11,170 |
| Canada (excluding government owned utilities) | | |
| 1 | Hydro One | 6,538 |
| 2 | TransAlta | 2,267 |
| 3 | ATCO | 923 |

Sub-Segment Analysis: Gas

Key Drivers

Similar to the other sub-segments, the main source of demand for natural gas derives from the population's need for natural gas with regards to residential purposes. With that in mind, the key drivers of this demand are the population growth, natural gas use as a % of consumer's total energy consumption (in 2011 it accounted for 45% according to Statistics Canada), and weather, as during colder winters, natural gas becomes a more prominent source of consumers' energy.

In contrast, the supply side of the equation is far less determined by market forces, and instead features high levels of government regulation given the "natural monopoly" state of the industry. Essentially, when certain characteristics of a market structure make a monopoly the most efficient structure for a certain industry, the industry is deemed to be a "natural monopoly". With regards to the natural gas delivery industry, its high need for capital intensity (building a line to each of the consumers) give the industry significant economies of scale and therefore give preference to a

monopoly structure. Because of this industry organization, the government has naturally intervened in order to protect consumers. The supply side along the transportation segment (essentially mid-stream energy component) is not nearly as regulated, and our thoughts on this sector can be found in recent PM Sheet updates.

Market Outlook

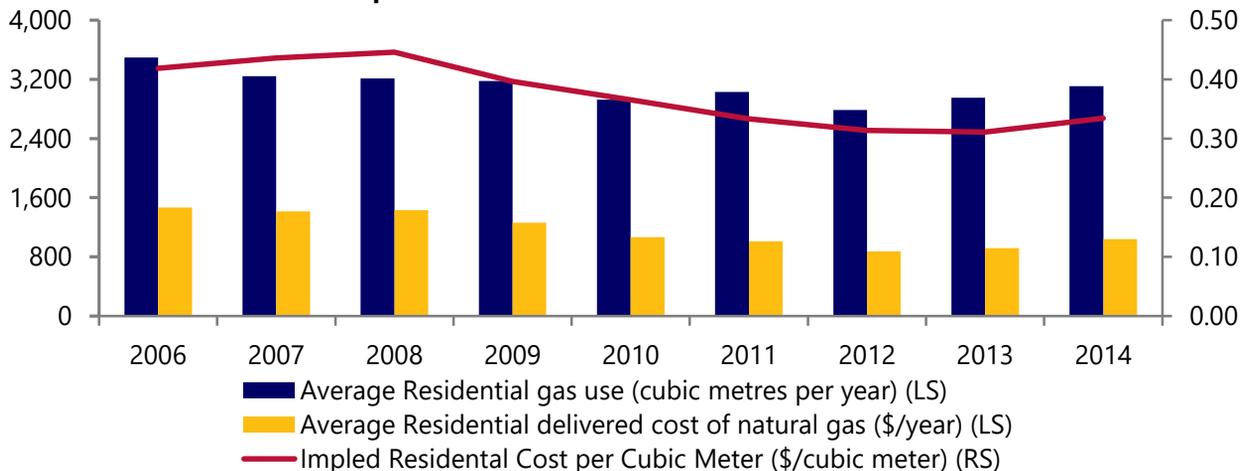
The distribution component has little room left for growth, with most of the country already covered and as the leading source of power, the gas segment's only real source of growth is that of the populations. The supply side is also stagnant with no notable developments anywhere along the supply chain.

Level of Competition

Competition is rather low due to the geographically isolated monopoly set up of the industry, and government regulation prohibits business from enjoying the luxuries of this, having a pre-determined ROE.

EXHIBIT VII

Canadian Natural Gas Consumption Statistics



Source: Canadian Gas Association

Sub-Segment Analysis: Renewables

Key Drivers

While natural gas serves as both a primary resource that is converted into electricity, as well as a heating and power source, renewable energy is almost entirely converted to electricity.

Demand is driven by increases in electricity consumption and supply is brought online by governmental organizations, as well as large public companies such as Brookfield Renewable Partners (TSX:BEP.UN).

Market Outlook

In Canada, the majority of renewable power is derived from hydropower sources, however, this industry is currently fighting a difficult battle. On the one side, the Liberal federal government is making a strong push towards renewable energy sources. That being said, hydropower faces significant headwinds due to its large ecological

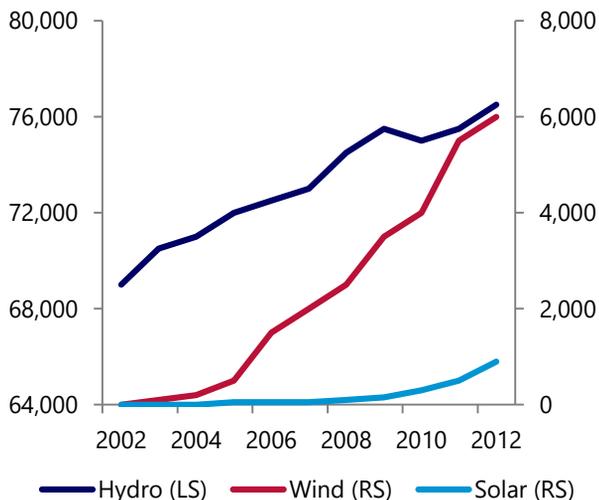
footprint. Despite these difficulties, we believe that the Canadian government will be pro-hydropower given the recent approval for the Site C dam and the potential for them to subsidize Albertan renewable energy. As a result, we believe the space has positive tailwinds and an attractive market outlook.

Level of Competition

Like all utilities, renewable power generation has both public and private players. In this industry, the scale of the public players (governments) and the scale of the projects often make it difficult for private players to compete. However, as certain provincial markets continue to push for deregulation, there is potential for the private players such as Brookfield to continue to grow capacity. Furthermore, there is little risk of new companies entering the space due to the significant capital constraints.

EXHIBIT VIII

Renewable Power Growth (MW)



Source: Natural Resources Canada

EXHIBIT IX

Major Hydropower Players in Canada

| Rank | Company | MW |
|------|--------------------------|--------|
| #1 | Hydro Quebec | 36,370 |
| #2 | B.C. Hydro | 13,205 |
| #3 | Ontario Power Generation | 7,438 |
| #4 | Brookfield Renewable | 1,360 |

Sources: Brookfield Renewable, OPG, Statistics Canada

Historical Utility Performance

Utilities have historically been a defensive play. Many sub-segments operate with capped ROEs and the most predictable of business models. Due to high levels of regulation, utilities are one of the safest and least volatile equities in financial markets, let alone in our investable universe.

As is evident from the formula below, utilities are heavily influenced by interest rate fluctuations. Specifically, the new capped ROE, which applies to any monopolistic utility, is derived from the previous ROE and the change in 3 months and 12 months interest rates.

Despite the possibility of increasing rates in the

United States, it is unlikely that we will see an increase in the Canadian overnight rate in the near term. In fact, the only way that an increase is likely to occur is if oil prices significantly rise, which would be positive for our portfolio. Effectively, the utility segment of our portfolio acts as a hedge against fluctuating oil prices. Since we as a team do not believe in making a call on short term oil price fluctuations, it is important that we maintain a utilities component moving forward.

As a result, the Energy team will be looking to pitch a utilities company in the near future in an effort to remain close to market weight within the segment.

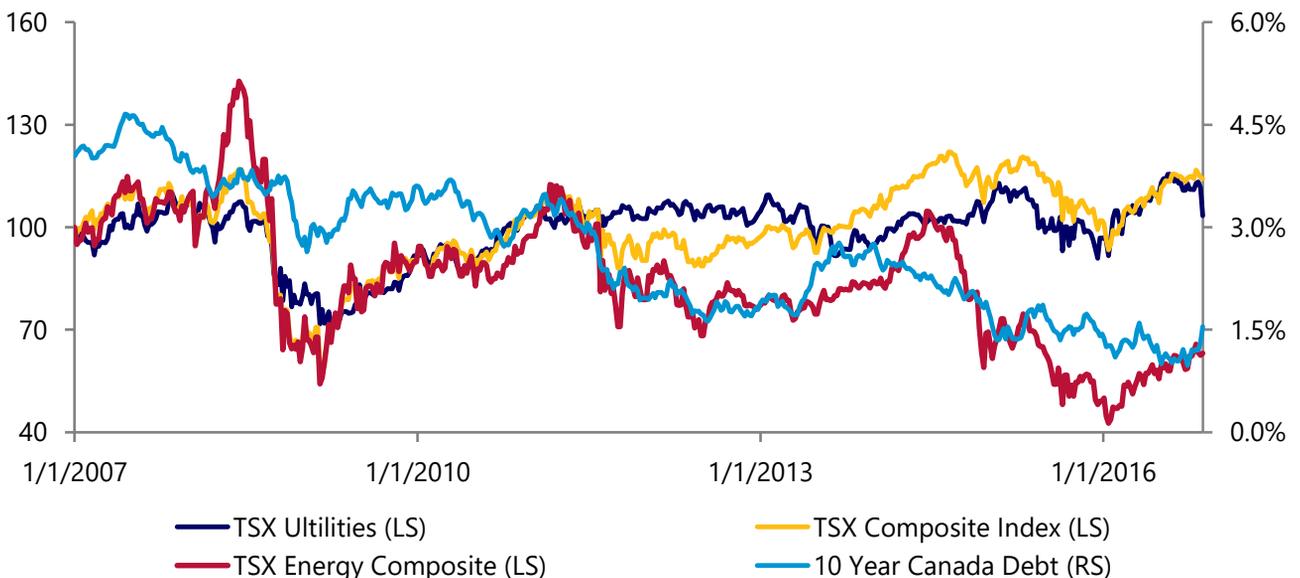
EXHIBIT X

Return on Equity Formula

$$ROE_T = ROE_{T-1} + C(E(i)_T - E(i)_{T-1}) ; C \leq 1$$

EXHIBIT XI

Utility Performance vs TSX, Energy and Interest Rates



Source: S&P Capital IQ

Sources

1. Statistics Canada
2. Canadian Gas Association
3. British Columbia Utilities Commission
4. NaturalGas.org
5. GasProcessing.com
6. S&P Capital IQ
7. OPG
8. Canadian Hydro Association