Executive Summary

Globally, the way that power is generated and delivered is changing. Centralized systems are evolving into more integrated networks. Distributed technologies, in which power is generated at or near its point of use, are playing an increasingly important role within these networks. These technologies include reciprocating engines, gas turbines, and renewables such as small wind turbines, solar panels, fuel cells, small hydro and biomass. Additional technologies, such as microgrid controllers (for optimizing remote off-grid power transmission and distribution), and energy storage systems (for equilibrating the intermittent power load of renewables) support the full integration of generation assets within the distributed power system.

In Canada, implementation of optimal distributed technologies is essential to ensure long-term, affordable power for its citizens, and to drive growth and economic prosperity within Canada’s remote yet resource-rich regions.

Distributed power technologies are proven and established, and their increasing use versus centralized solutions is becoming even more attractive in response to global drivers such as climate change, the Age of Gas, and the Industrial Internet. Ongoing technological innovation provides another plus. As a result, distributed power technologies are becoming more compact, more accessible, more efficient, and more affordable today than they were just a decade ago. Additional benefits include reduced risks for project financing, more rapid construction and deployment, a greater operational flexibility in working alone or in tandem with other systems, greater reliability, and the ability to customize distributed power solutions to meet specific local needs.
Within Canada, the country’s vast territory and relatively small population mean that many remote and rural communities already depend on distributed power for their energy needs. Canada’s economic growth is fueled by its natural resources sector, which is primarily comprised of remote oil sands, oil and gas production and mine sites which in turn are highly reliant on distributed power infrastructure to power its substantial energy needs. However, Canada’s unique regional factors, which include geography, climate, population, regulatory structure and energy mix, combine to create highly diverse and distinct environments which impact the development and propagation of distributed power technologies. The specific nature of many Canadian applications will ultimately require customized, creative solutions that are anchored around robust and proven technologies.

Canada’s thriving oil and gas sector is one area where distributed power solutions are already being developed and implemented. “Virtual pipelines”—a collection of technologies designed to move natural gas from the end of the pipeline to remote uses—are closing the gap in natural gas fueling and are becoming a stronger alternative to remote diesel power generation, potentially reducing power costs and emissions. Combined heat and power (CHP) plants are well established in the oil sands and continue to enable production growth. Gas-fired distributed power technologies are offsetting diesel use in oilfield power generation, converting field gas into power for applications such as drill rigs, artificial lifts, pump-jacks, and worker camps. Distributed power solutions are being developed and implemented for flare gas recovery, driven by increased regulation within oil-producing provinces such as Alberta, and Saskatchewan. Lastly, gas compression technologies are being applied at remote gas storage sites, or to move gas through Canada’s extensive natural gas pipeline network.

Introduction

Globally, the way that power is generated and delivered is changing. Centralized systems are evolving into more integrated networks through the increasing adoption of distributed technologies. This is also true within Canada, a country which faces a unique set of regional challenges in the development of its power infrastructure. Although ongoing technology innovation continues to facilitate the use of distributed systems by making them smaller, smarter, and more interconnected, the exceptional nature of many Canadian applications will ultimately require creative solutions anchored around robust and proven technologies that exist today. This paper examines the Canadian context for distributed power and several solutions currently being implemented.

What is Distributed Power?

Distributed power is defined as power generated at or near its point of use. Distributed power technologies can be mobile or stationary, and include technologies that supply not only electrical and mechanical power, but also torque to move liquids (such as gas compression or liquid pumping technologies) and objects (such as propulsion systems for boats or trains). The potential output of a distributed power system is typically expressed in terms of its electrical capacity (kilowatts (kW) or megawatts (MW)), or horsepower (hp). Although there is no standard definition, the size of distributed power systems is often below 100 MW and typically below 50 MW.¹

Technologies and Benefits

Distributed power generation technologies include diesel and gas reciprocating engines and gas turbines, as well as renewables such as small wind turbines, solar panels, fuel cells, small hydro and biomass. Additional technologies, such as microgrid controllers (for optimizing remote, off-grid
power transmission and distribution) and energy storage systems (for equilibrating the intermittent power load of renewables) support the full integration of generation assets within the distributed power system.

System-wide advances have resulted in distributed power technologies becoming more compact, more accessible, more efficient, and more affordable today than they were just a decade ago. This has allowed distributed power systems to overcome many of the constraints that typically inhibit the development of large capital projects for power generation and delivery. Key benefits are summarized as follows:

- **Efficiency.** Distributed generation is more energy-efficient, as point-of-use utilization minimizes waste from transmission losses, and allows for both electricity and thermal energy to be employed in combined heat and power (CHP) or district heating applications.

- **Cost-Effectiveness.** The smaller scale of distributed power technologies translates into lower investment hurdles and lower overall construction and operating costs, reducing risk as well as capital requirements for project financing. The International Energy Agency has estimated that these cost savings, combined with reduced transmission line losses, translate into tens of billions of dollars for Canada alone. In remote areas which are completely dependent on diesel fuel for power generation, the significant power cost creates an economic opportunity for renewables and natural gas, if the logistical and technological challenges can be overcome.

- **Speed.** Distributed power systems can be installed quickly and in some cases do not require the lengthy siting, permitting and review procedures that often plague large infrastructure projects. System start-up and response times are also faster, allowing distributed systems to bridge power gaps more rapidly during energy shortages, natural disasters or large-scale events.

- **Flexibility.** The small size of distributed power technologies enables energy providers to more effectively match supply and demand levels through smaller, incremental adjustments. Furthermore, distributed systems can either stand alone or work together within a network of integrated technologies to meet the needs of both large and small energy users.

- **Localization.** Localizing distributed generation at or near its consumers enables the monitoring, operation and maintenance of these systems to be customized to meet specific local needs. Smaller regional power systems also promote local job creation and facilitate greater community engagement and understanding of power system choices.

- **Reliability.** Decentralized elements within a weak or unreliable central grid allow for more rapid regional power restoration following an outage or natural disaster. Distributed generation also helps bring dependable power to remote and rural communities, and brings power reliability through independent or backup generation to industrial and commercial operators.
Driving Forces

Several global market forces are driving the transformation of distributed power. These forces include climate change; the increasing adoption of natural gas as a global fuel; and the emerging Industrial Internet. Each is discussed in more detail below.

• **Climate Change.** The inevitable momentum for Greenhouse Gas (GHG) mitigation is a key driver for more efficient technologies such as combined heat and power, and cleaner alternatives such as natural gas (where this replaces diesel fuel or coal) or renewables. Combined heat and power applications have high potential in large energy-consuming industries such as the oil sands, Liquefied Natural Gas (LNG) production, pulp and paper mills, and petrochemicals. Spurred by technological innovation, renewables are finding increasing application in many areas to reduce the effects of climate change. Natural gas is an important bridge to cleaner energy where it replaces oil or coal, and also works synergistically with renewables such as wind power.

• **Age of Gas.** Within North America, the recent growth in unconventional gas production through horizontal drilling and hydraulic fracturing techniques has resulted in more affordable and widely available natural gas. Both the low price of gas and its abundance of supply are expected to continue until at least 2025, ushering in a new “Age of Gas” which was discussed by GE and the IEA in previous reports. Although diesel fuel’s entrenched and well-established supply networks continue to secure its place within mobile and off-grid distributed power applications, the widening price differential between diesel and natural gas favourably positions natural gas to capture a larger share of future energy demand. While the emergence of “virtual pipelines”—a collection of technologies designed to move natural gas from the end of the pipeline to remote uses—has the potential to accelerate the adoption of gas-fired distributed power technologies, dual fuel technologies (which can operate on diesel, natural gas, or blended combinations of these fuels) are helping to smooth the transition to natural gas as it becomes increasingly available.

• **Industrial Internet.** The integration of increasingly “intelligent” machines, Internet-enabled networks and advanced analytics promises to revolutionize all aspects of industrial productivity by meshing the digital world with the world of machines. Within distributed power generation, these advances will enable operators to remotely optimize operations and minimize costs in ways that were not previously possible. One concept under development is that of a virtual power plant, where a combination of different distributed power technologies are aggregated and operated collectively through a centralized control system. This enables groups of grid-connected plants to deliver electricity to the transmission network in unison during peak demand periods.

The Canadian Context

In Canada, a unique set of regional factors combine to create highly diverse and distinct environments which impact the development and propagation of distributed power technologies. These factors are discussed in more detail in the following section.

Population

Canada’s vast territory and its relatively small population highlight its need for distributed power. Canada is divided into ten provinces and three territories, and is the world’s second largest country
after Russia, with a total area of 9,984,670 square kilometres (3,855,100 square miles). Canada is also slightly larger than the United States, but only has 35 million inhabitants, or a tenth of the US population. The majority (81%) of Canadian citizens live in urban areas, and 72% are concentrated within 150 kilometres (93 miles) of the US border. This leaves the remainder of Canada’s population scattered across a vast and sparsely populated region. These remote and rural communities very often depend on distributed power systems for their energy needs.

**Climate**

Because of its size, Canada has many different climates, and weather patterns vary significantly by season and region. Temperature differences between northern and southern regions vary by over 20°C year-round, and northern communities within the Arctic circle can experience up to four months a year without sunlight. The extreme conditions in remote northern regions complicate the use of renewables such as solar or wind power (for example, cold weather may cause turbine blade icing), and may also affect gas engine and turbine efficiency. Consequently, remote northern solutions for distributed power must be robust and proven, and must be easily maintained.

**Natural Resources**

Canada’s plentiful natural resources are typically located in remote areas and therefore often require distributed technologies to power on-site extraction operations. Canada is one of the world’s largest producers of minerals and metals: in 2012, mining contributed $52.6 billion to Canada’s GDP and accounted for 20.4% of Canadian exports. Canada also remained the world’s top destination for mining exploration in 2012, accounting for 16% of global investment, most of it in Canada’s North. In fact, the Mining Association of Canada estimates capital expenditures of $157.3 billion for mining projects in Canada, despite the global downturn in commodities. Most of these mining sites are remote yet require a substantial amount of power—one report for off-grid mines in Newfoundland and Labrador showed an average power requirement of 10 MW per mine. However, the lack of accessible or reliable power significantly impacts economic development in many remote regions. Renewable natural resources such as wind, small hydro or biomass are often available, and renewable distributed power systems are capable of replacing all or partial diesel power generation in these locations.

Distributed power technologies can also play a significant role within Alberta’s oil sands, located around Fort McMurray in the northeastern part of the province, as well as the Cold Lake region east of Edmonton and the Peace River area in northwestern Alberta. The oil sands comprise the vast majority (169 billion barrels) of Alberta’s remaining proven oil reserves, and almost 13% of total global oil reserves. This region will drive the majority of Canadian oil production growth, with overall oil sands project spending up by over 30% in 2012 to almost $11 billion, and capital expenditures projected to be $218 billion over the next 25 years. This growth requires power, and CHP—already used extensively in the oil sands, continues to be a central power platform.

**Regulatory Environment**

In Canada, electricity generation and delivery is largely under provincial jurisdiction, with legislatures acting through provincial Crown corporations and regulatory agencies which operate as regulated monopolies. Alberta and Ontario are exceptions—both provinces have deregulated their electricity sectors to different degrees and both operate electricity markets. Alberta operates a competitive “merchant” generation market but still regulates transmission and distribution, while Ontario has a hybrid regulation and competition
(planned/market approach) model. These highly regulated structures are critical to consider in the development of distributed power projects and are central in the development of provincial distributed power networks.

**Regional Energy Mix**

Canada generates its electricity from a diversified mix of sources, and the generation profile of each province highly depends on regionally available resources such as hydropower, coal, and natural gas (see Figure 1). The dominant generation technologies across Canada are hydropower (58%), fossil fuels such as coal, natural gas, and diesel (28%), and nuclear power (10%). The substantial infrastructure investment spanning the 1960’s to the 1980’s across many Canadian jurisdictions\(^1\) has resulted in a network which primarily consists of large, centralized power plants located near the resources they require for generation. In the case of hydroelectric or coal-fired generating stations,

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**Source:** General Electric.
these are usually remote (fast-flowing water sources and reservoirs, or coal mines), so the stations require expansive transmission systems to transport the electricity to urban consumers. Canada’s nuclear generating stations, on the other hand, require access to water bodies such as lakes for cooling tower water and are often co-located near water bodies in urban centres.

More recently, the momentum around centralized power generation has been slowing. In 2013, the federal Canadian government enacted a timeline to phase out coal-fired generation with the goal of reducing greenhouse gas (GHG) emissions. New coal-fired power plants cannot be constructed after July 1, 2015; plants built before 1975 must close by 2020; and those built after 1975 have to close by 2030, unless the plants are equipped with carbon capture and storage technology. Ontario remains on track to phase out all coal-fired generation by the end of 2014, and Alberta, Saskatchewan and Nova Scotia are following suit. For nuclear-fired power generation, only Ontario and New Brunswick still have operating nuclear capability, as nuclear power was phased out in Quebec with the closure of Gentilly 2 in December 2012. Furthermore, Ontario has decided to forgo constructing new nuclear reactors, instead proceeding with refurbishment as well as closures of existing reactors. Large hydropower projects continue to be developed in several parts of Canada, but even hydropower has faced challenges, both from impacted communities and cost pressures.

The nature of power generation within remote and maritime communities is also changing. According to Natural Resources Canada, there are currently 293 remote communities with a total population of 195,335, many of them in Canada’s North. Many of these sites are completely reliant on diesel power—within Nunavut, for example, the entire population of 35,591 people rely on 27 stand-alone diesel plants in 25 communities to generate 50 MW of power. Although diesel is a flexible fuel...
for distributed power generation, it is becoming increasingly expensive, and jurisdictions such as the Yukon\textsuperscript{31} and Northwest Territories\textsuperscript{32} are evaluating fuel alternatives such as LNG. Maritime provinces are also actively moving to reduce their reliance on diesel, with Nova Scotia working with Newfoundland to capture 20\% of the planned Muskrat Falls hydroelectric project through a subsea cable,\textsuperscript{33} and Prince Edward Island and Nova Scotia are expanding wind generation.\textsuperscript{34}

Declining coal and nuclear-powered generation, the move away from diesel for remote communities, and the rise of natural gas networks has resulted in an expectation that renewables such as wind and natural-gas will increasingly fill the gaps in Canada’s power generation.\textsuperscript{35} These technologies are an ideal fit for distributed power generation and naturally complement each other, with gas-fired generation smoothing out the intermittency of wind-powered generation.

Supply/Demand Dynamics

Regional electricity supply and demand also affects the need for distributed power. A graph of electricity demand growth for Canadian provinces and territories is shown in Figure 2. Alberta and Saskatchewan lead Canada’s growth due to their resource extraction activities; for Alberta, its high industrial load generates 60\% of the province’s electricity demand, which is projected to grow at 2.5\% annually to 2020.\textsuperscript{36} Canada’s northern territories also have a small but growing demand base, again fueled by the natural resources industry. Ontario, on the other hand, has a low demand growth rate combined with an oversupply of power, and currently meets its base load power demand through existing nuclear and hydroelectric power generation. That being said, industrial power prices in the province are among the highest in North America, and are set to rise by 33\% over the next 5 years and 55\% by 2032,\textsuperscript{37} due to a combination of coal plant closings, overdue infrastructure investments, and government policy concerning creating a renewables industry in the province. This is prompting many industrial customers to consider “inside the fence” distributed power generation options.

Developing Solutions

Canada’s oil and gas industry continues to be a key driver of the country’s growth, and is a natural fit for the implementation of distributed power solutions, both because of the availability and access to fuel, as well as availability of capital for project development. Several examples are discussed in the following section.

Virtual Pipeline / Last Mile Fueling

The virtual pipeline concept, which bridges the “last mile” gap between where natural gas fuel is located and the often remote locations where it is needed, is gaining momentum within Canada. This solution, in which natural gas is compressed or liquefied and shipped by truck to industrial customers or communities, essentially creates a turnkey natural gas fueling solution and requires both technology and logistics capabilities. GE is focused on implementing this solution globally and has already partnered in the US with Calgary-based Canadian gas logistics company Ferus\textsuperscript{18}. In this partnership, Ferus provides the fuel transport, operations management, and demand planning, while GE is the compression/liquefaction technology provider. Developing solutions such as the virtual pipeline enables more consistent and reliable gas supply networks to “last mile” end users, potentially offsetting diesel fuel use and reducing both fuel costs for power generation and emissions.

Combined Heat & Power (CHP)

Distributed power is well established in the oil sands. Larger CHP plants, consisting of gas turbine generators with heat recovery to produce steam,
are integral to many oil sands facilities within the Fort McMurray and Cold Lake area. The Frame 7EA gas turbine, a nominal 85 MW unit, generates recoverable exhaust heat volumes which are well-aligned with the demands of both mining and in-situ oil sands projects, and consequently has been successfully deployed in this application over the past decade. Installations include Syncrude Aurora, Albion Sands Muskeg River, Suncor Firebag and Imperial Oil Cold Lake.  

Ongoing growth in oil sands power demand will continue to drive industrial CHP growth, but the potential also exists to develop CHP solutions for the rapidly growing Fort McMurray community itself, where population could double in the next fifteen years. This alternative may be considered because the main electrical transmission line from central Alberta is nearing capacity and the implementation of a planned 500 MW expansion faces potential regulatory delays, which may result in a potential near-term gap in power supply.

Oilfield Power Generation

Canada’s oilfield and natural gas operations are often remotely located without access to power infrastructure, yet typically have access to field gas which is generated onsite. Distributed power technologies such as fuel-flexible gas engines can often be used to convert this unprocessed field gas into power for use in applications such as drill rigs, artificial lifts, pump-jacks, and worker camps. These technologies have the potential to reduce emissions from oilfield power generation by 95%. Heat recovery units can often generate an additional 100 kW per unit of electricity from the waste heat of a 1.5 MW gas engine, with no additional fuel required or additional emissions generated.

Flare Gas Recovery

Distributed power solutions are also beginning to be developed in Canada for the recovery and use of flare gas for wellfield compression and power generation. During oil extraction, the associated gas, or natural gas recovered with crude oil and bitumen, is sometimes flared to dispose of it because the quantities produced are either too small or the wells too remote to economically process or sell the gas.

There is strong potential to recover flare gas for power generation in Canada. In 2007, total associated gas production for Canada was 23.7 billion cubic metres (or 840.1 billion cubic feet), of which almost 94% was utilized. Alberta, which produces 68% of total Canadian associated gas, flared or vented 1.14 billion cubic metres (40.23 billion cubic feet) of associated gas in 2008, and has been a global leader in flare reduction. However, its utilization rate has decreased to 94.5% in 2011 from a high of 96.3% in 2005, primarily due to lower gas prices and increased drilling in remote areas. Saskatchewan’s associated gas production is smaller (2.46 billion cubic metres, or 86.8 billion cubic feet in 2011), but the province flares or vents a much higher percentage of this gas (550 million cubic metres, or 1.94 billion cubic feet in 2011, which was 22% of the total). Converting all of Alberta and Saskatchewan’s flare gas into electricity could potentially generate 65 MW of power and would yield significant economic benefit.

Recent provincial legislation is helping to promote flare gas recovery. Alberta’s Draft Directive 060, released in November 2011 and revised in October 2013, regulates flaring at all upstream petroleum industry wells and facilities in the province. British Columbia released a similar Flaring and Venting Reduction Guideline in October 2011.
Saskatchewan introduced both Directive S-10\textsuperscript{50} regulating flare gas reduction, and Directive S-20,\textsuperscript{51} regulating flare performance, in July 2011. The province also recently rolled out a Flare Gas Power Generation program for small- to-medium-sized oil producers, offering 20-year power generation contracts for 100 kW–1 MW projects converting flare gas to electricity.\textsuperscript{52}

“\textit{There is strong potential to recover flare gas for power generation in Canada.}”

\textbf{Gas Compression}

The Canadian gas compression industry is another growing sector where solutions using existing distributed power technologies may be deployed. This activity is concentrated in the Horn River basin in northeastern British Columbia and the Montney Field on the northern Alberta/British Columbia border. Gas engine-driven mechanical drive compressors manage gas flow and compress gas at the wellhead, gather gas from multiple wells, and send it through pipelines to gas processing facilities. As mentioned previously, gas collected at the wellpad can also be compressed and sent to other drilling areas to generate power.

To keep the gas moving and productivity and profitability high, a dependable gas engine-driven compressor system that operates efficiently is essential. Waukesha gas engines have proven experience in this application, with roughly 70% of the engines sold utilized for gas compression, and a further 20% used to generate oil field power.\textsuperscript{53} Several Waukesha gas engines have already been employed at a Horn River Basin gas production site in Northeast British Columbia,\textsuperscript{54} where the ability to operate successfully on fuels with heating values as low as 600 Btu/ft\textsuperscript{3} figured prominently in the decision to ultimately select them for the application.

GE gas-engine compression has also been used at gas storage sites such as Aitken Creek in British Columbia.\textsuperscript{55} Aitken Creek accepts and stores gas from processing plants throughout northeast British Columbia, then pumps it down the Westcoast Pipeline to Vancouver and the northwestern United States during the high-demand fall and winter periods. The facility operates continuously for 24 hours a day and 365 days a year, moving natural gas into storage or pumping it into the pipeline. Operating conditions are very difficult for gas engines, with temperatures routinely dropping to \(-40^\circ\text{C} (\text{-40}^\circ\text{F})\). Seven of the ten on-site single-stage reciprocating compressors are driven by Waukesha engines, which run at 2,650 bhp and 1,000 rpm. Each compressor can move as much as 2 million cubic metres (70 million cubic feet) of gas per day during peak demand periods. Operator confidence in the Waukesha engine’s performance is high with engines often continuously operating at 102% of their rated load.

Gas engines and turbines are used to transport gas through local, regional and national pipeline networks, and a key Canadian growth application involves delivering natural gas from British Columbia’s gas fields to proposed liquefied natural gas (LNG) export facilities on the West Coast. Several pipelines, including Coastal Gaslink, the Pacific Trails Pipeline, the Prince Rupert Transmission Project and the Westcoast Connector Gas Transmission Project\textsuperscript{56} are currently under consideration, at least two of which will employ 30 MW gas turbines to power the compressors.\textsuperscript{57,58}

Gas turbines are also used for compression within much of Canada’s existing gas pipeline infrastructure and GE’s LM (Land & Marine) units are popular for this application. Canadian pipeline company TransCanada and its sister company TransCanada Energy have a fleet of almost 40 GE LM gas turbines, consisting of 28 operating LM1600’s (and 7 spare engines), 11 LM2500’s (with 3 spares) and 8 LM2500+ gas turbines (with 2 spares).\textsuperscript{59}
TransCanada employs these gas turbines at various pipeline compressor stations within Canada.

Conclusion

The way power is generated and delivered is changing, which presents new opportunities and challenges.

The opportunities include providing increased energy efficiency through CHP—not just within industrial sectors like the oil sands, but also in urban centres. Lower-cost and lower-emission fueling solutions are now available, not just to remote sites through virtual pipelines, but also within other upstream and midstream oil and gas applications, through the displacement of diesel by cleaner natural gas- and renewable-powered technologies. The ongoing implementation of distributed power technologies and solutions is essential to ensure affordable power for all citizens and to spur growth and economic prosperity within Canada’s remote, yet resource-rich, regions. However, a unique combination of population, geographical, and climactic factors within the country continues to create challenges in the development of distributed power infrastructure.

“*The ongoing implementation of distributed power technologies and solutions is essential to ensure affordable power.*”

To successfully overcome the challenges, creative distributed power solutions anchored to existing and proven technologies must be deployed. These solutions must be adapted to address the unique situational requirements of each application, and should incorporate not only the best available technologies, but also innovative business models including strong project partnerships and financing. This in turn requires established infrastructure providers who not only have expertise in technology and research and development, but who are also well-versed in regional policy and government, and who can leverage local and global relationships with EPC’s and other industry partners.

GE Canada is working hard to develop comprehensive solutions to advance distributed power throughout the country. The company has demonstrated technology expertise that encompasses a wide spectrum of distributed power applications, including both renewable and conventional fuels. Further benefits in infrastructure project development may be realized by leveraging local market understanding with GE’s global expertise and scale. This includes the ability to access profound research and product development capabilities to facilitate technology solutions on any scale, an intimate knowledge of capital markets to create innovative financing, and lastly, established, collaborative networks to convert multiple stakeholders, including governments, engineering firms, and end-users, into robust project partnerships and consortia.

The combination of all these capabilities can overcome the challenges of distributed power and present exciting opportunities for Canadians.


5. EIA “Golden Age of Gas”: http://www.worldenergyoutlook.org/goldenageofgas/

6. Marco Annunziata and Peter C. Evans, “The Industrial Internet@Work” (Oct. 2013).


8. Employment & Social Development Canada: http://www4.hrsdc.gc.ca/3ndic.1t.4r%40-eng.jsp?id=34


17. http://oilsands.alberta.ca/economicinvestment.html


36. IHS CERA, Alberta Power Market Profile, August 2013.


