

GLOBAL BUSINESS REPORTS

INDUSTRY EXPLORATIONS



ONTARIO POWER 2015



*Economy - Electricity - Feed-in Tariff - Wind - Solar
Hydroelectric - Nuclear - Thermal - Conservation - Microgrid*

SIEMENS



Spinning wind into energy.

Sustainability is more than a single technology. It's the philosophy behind everything Siemens does.

On the shores of Wolfe Island near Kingston, Ontario, the blades of a turbine turn slowly in the wind. This wind farm can generate electricity for up to 75,000 homes. It's a start. But Siemens creates more than wind turbines; our portfolio of environmental technologies is the broadest in the world, and we're building many of those technologies in Canada. The world is looking for answers that last. And they start here.

siemens.ca/answers

Dear Readers,



Canada's most populated province has come a long way in creating a sustainable, reliable energy matrix. Since 2003, more than \$20 billion has been invested in upgrading Ontario's transmission and distribution networks, and a further \$21 billion into cleaner generation. Ontario has taken the lead in phasing out coal-fired power plants, with the last plant closed in 2014. The province now boasts a cleaner energy mix with diverse sources of generation, including natural gas, hydro, wind and solar.

Yet Ontario has been criticized for its pursuit of private power contracts that add unnecessary supply and result in higher-than average energy costs. Through Ontario's Long-Term Energy Plan established in 2013, the province attempts to address the delicate equilibrium between surplus and demand reduction while planning for a cleaner future. Clear signs now point to changes in the market structure with the merger in December 2014 between the Ontario Power Authority (OPA) and Independent Electricity System Operator (IESO) and the revision of the Feed-in-Tariff (FIT) renewable energy contracts.

The province must currently plan for a lower than anticipated demand scenario and employ flexible options for energy conservation in order to maximize value for ratepayers. Microgrids, consumer demand response programs, storage technologies and smart meters will play a critical role in shaping Ontario's future energy needs.

Throughout our Industry Explorations, we will explore these issues in more detail by presenting the viewpoints of those on the ground, the movers and shakers of the industry with whom we met one-on-one in Ontario. This book is the culmination of months of preparation, research and interviews with the sector's top executives and policymakers, who generously donated their time and insights. Such a report would not be possible without their input, and we sincerely thank them for their support.

Gabrielle Morin
Senior Director



Angela Harmantas
Senior Journalist

Global Business Reports



Going Long on Ontario's Power Industry

- 8. Introducing Ontario: A Brief Political and Economic Overview
- 10. Interview with Ministry of Energy, Government of Ontario
- 12. Ontario's Long-Term Energy Plan in Action
- 14. Interview with Independent Electricity System Operator (IESO)
- 15. Interview with Siemens Canada
- 16. Interview with Samsung Renewable Energy
- 17. Interview with H.B. White Canada Corp.

Welcoming the Sun and the Wind: Ontario's Renewable Future

- 20. The Right Fit: The Evolution of Wind and Solar Power in Ontario
- 22. Interview with EDF EN Canada Inc.
- 23. Interview with First Canadian Title (FCT)
- 24. Interview with Mortenson Construction
- 26. Interview with GDF Suez Canada
- 27. Interview with REpower Senvion Canada Inc. (REpower)
- 28. Closing the Funding Gap: Financing Power in Ontario
- 30. Interview with CIT Corporate Finance, Canada, Energy and Infrastructure
- 31. Interview with Northland Power

Preserving Previous Assets: Nuclear, Hydro, Thermal, and Conservation

- 34. Refurbish and Revitalize for the Long-Term: Nuclear and Hydro in Ontario
- 36. Interview with Bruce Power
- 37. Interview with Organization of Canadian Nuclear Industries
- 38. Interview with Andritz Hydro
- 40. Interview with Voith Hydro Inc.
- 41. Filling Short-Term Supply: Thermal Energy in Ontario
- 42. Interview with Cummins Eastern Canada
- 43. Interview with Armour Valve
- 44. Interview with Aggreko
- 45. The Way Forward: Conservation First
- 46. Interview with Powerstream Inc.
- 47. Interview with GE Digital Energy
- 48. Interview with Hitachi Canada
- 49. Interview with Blackstone Energy Services Inc.

Into the Future

- 52. Final Thoughts
- 54. Company Index
- 55. Credits

This research has been conducted by Gabrielle Morin and Angela Harmentas.
Edited by John V. Bowlus
Graphic design by Gonzalo Da Cunha

A Global Business Reports Publication
For updated industry news from our on-the-ground teams around the world, please visit our website at gbreports.com, subscribe to our newsletter by signing up to our VIP list through our website, or follow us on Twitter: @GBReports.

Exclusive Interviews



Leading industry and government figures from all areas of Ontario's power sector discuss their business models and strategies in this mature but evolving market.

10, 14, 15, 26, 36

Editorial Analysis



Global Business Reports' journalists provide unique insights into Ontario's power industry by working on the ground for months and meeting face to face with industry leaders.

12, 20, 28, 34, 41, 45

Quantitative Data and Maps



Maps and quantitative data highlight and clarify the key trends in the circumpolar region in the six individual jurisdictions analyzed in this report.

8, 9, 13, 21, 34, 45

Ontario Province



Ontario is Canada's political and financial capital and largest province by population. GBR introduces readers to this dynamic and increasingly global jurisdiction.

8-9

Final Thoughts



Company leaders from production, distribution, and services companies to law firms and insurance brokers highlight trends that are likely to shape the future of the industry.

52-53





GOING LONG ON ONTARIO'S POWER INDUSTRY



“The approach that the Minister of Energy Bob Chiarelli has taken will ensure the longevity and long-term viability of demand side resources, moving away from government programs to a market-based system. Demand response has a significant future in Ontario because it provides flexibility, reliability and a very cost effective resource. Ontario businesses now have an opportunity to reduce their total cost of power by providing flexibility within their own system. It is a nice marriage between grid requirements and energy user capabilities.”

- Paul Grod,
CEO,
Rodan Energy Solutions



INTRODUCING ONTARIO

A Brief Political and Economic Overview

ONTARIO AT A GLANCE

Source: Statistics Canada, BC Stats, Ontario Ministry of Finance

Population: 13,678,1700 (2014)

Capital: Toronto

Premier: Kathleen Wynne, Ontario Liberal Party

GDP, Expenditure-Based: \$695.705 billion (2013)

GDP per Capita: \$34,957 (2013)

Economic Sector Breakdown: Services 77.5%, Goods 22.5%

Exports to Other Countries: \$ 353.289 billion (2013): motor vehicles & parts, precious metals & stones, mechanical equipment, electrical machinery, plastic products

Imports: \$ 350,095 billion (2013): motor vehicles & parts, mechanical equipment, electrical machinery, precious metals & stones, plastic products

Pacific Ocean

Whitehorse

NORT
TERRI

BRITISH COLUMBIA

ALBERTA

Edmont

Calgary

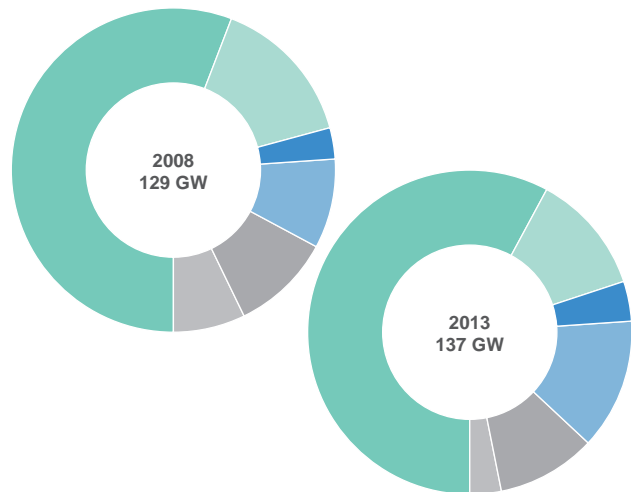
●●● The Province of Ontario can rightly be called the heart of Canada and is home to the country's political and financial capitol in Ottawa and Toronto, respectively. Ontario is Canada's largest province by population and its second largest by total land area, if the more northern and remote Northwest Territories and Nunavut are excluded.

Proximity to the American market has long generated trade and exchange of technology and industry. The economic motors of neighboring Detroit and Cleveland have stalled relative to their heydays in the twentieth century but remain accessible trade markets. The system of canals through the United States to the Atlantic Ocean has long afforded Ontario routes to world markets. Ontario is renowned for its manufacturing and many of its exports head to the United States and to Detroit's automobile industry. However, Ontario now surpasses Detroit in car production and is strong in producing steel, iron, machinery, and chemicals as a result of the province's abundant natural resources. The Quebec province to its east serves as another dynamic trading partner, as does the rest of the Canadian market.

Another major advantage for Ontario is Canada's prodigious energy supplies, but the recent decline in oil prices since the summer of 2014 may mitigate it. Politicians initially brushed off concerns about the price decline but have acknowledged that the revenues will be impacted and the budget constrained. Delays in developing the Alberta oil sands have added dark news to the energy landscape, but with the recent drop in oil prices, this may be a blessing in the long-term. Ontario is not blessed with hydrocarbons, but does contain a number of rivers that have afforded it clean, renewable hydroelectric energy. Niagara Falls alone provides a massive amount

CANADIAN INSTALLED CAPACITY BY FUEL SOURCE (2008 AND 2013)

Source: National Energy Board (Canada) Energy Market Assessment, March 2014

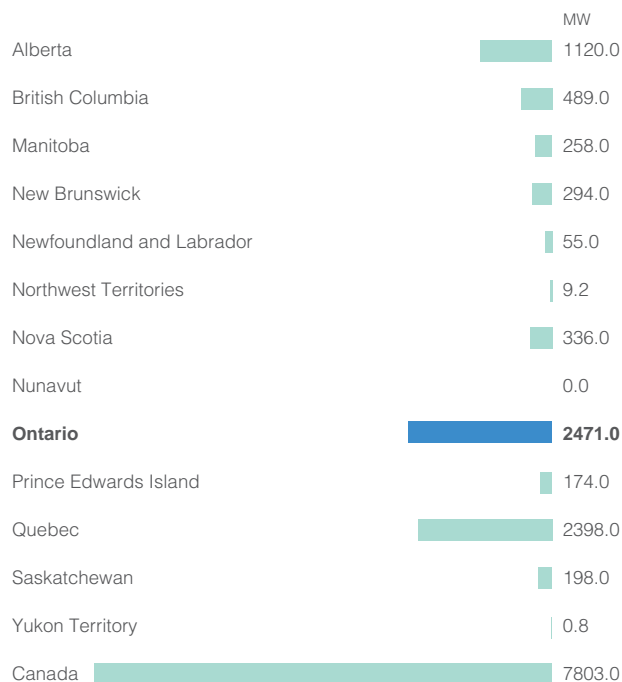


	2008	2013
● Hydro	56	58
● Natural Gas	15	12
● Oil & Diesel	3	4
● Coal & Coke	9	13
● Nuclear	10	10
● Solar & Biomass	7	3



CANADIAN INSTALLED WIND POWER CAPACITY BY PROVINCE

Source: National Energy Board (Canada) Energy Market Assessment, March 2014



of hydropower. Finally, Ontario also has the world’s largest nuclear power plant, the Bruce Nuclear Generating Station.

The political landscape in Ontario is varied, much like across Canada. There are three main parties: the Ontario Liberal Party, the Progressive Conservative Party of Ontario, and the social-democratic Ontario New Democratic Party (NDP). The Liberal Party has been in power since 2003 and was reelected in both 2007 and 2011, but its margin has been slipping. In the 2011 general election, in which it won 53 seats, gave it a minority mandate, as the Progressive Conservative Party won 37 and the NDP 17. In the 2011 federal election, however, the Conservative Party of Canada won 73 riding, the NDP 22, and the Liberals 11 in Ontario. The Liberal Party of Ontario shifted leadership in 2013 from Dalton McGuinty, which had led the party since 2003, to Kathleen Wynne in 2013 in a bid to rejuvenate the party’s prospects.

The security of reliable hydrocarbon, hydro, and nuclear power has allowed Ontario to make an aggressive leap forward in orienting its generation capacities towards other renewables, including wind, hydro and solar. The 2009 Green Energy and Green Economy Act jumpstarted these investment. Now, the 2013 Long-Term Energy Plan seeks to increase the supply mix for wind, hydro and solar to 35% by not electing to build new nuclear power stations, although it will refurbish two major plants. The province is also embracing state of the art technologies in conservation and smart grids to make generation more reliable and cost-effective. Governments around the world hoping to make similar increases in renewables and efficiency will follow the story of Ontario’s power generation closely, and this report provides insights into the challenges that the industry has faced along the way and what trends are shaping its future. •

Honorable Bob Chiarelli

●●●

Minister, Ministry of Energy
GOVERNMENT OF ONTARIO



●●● **The Liberal party was recently elected to a majority government in Ontario. With a secure platform to accomplish the objectives of the Long-Term Energy Plan (LTEP), what are the main priorities for the Ministry of Energy over the coming months?**

We want to continue to provide Ontarians with a clean, reliable, and affordable energy. To that end, our efforts in the coming months will focus on implementing the priorities outlined in the Long-Term Energy Plan (LTEP).

Increasing conservation and reducing demand is one of the best and most affordable options for our system.

We continue to bring clean, renewable power online and will refurbish our existing nuclear units at the Bruce and Darlington sites. Ontario is building a smarter grid through smart meters and smart grid technologies, and we will work to grid-connect our

remote First Nations communities in northern Ontario and supporting community-level energy planning.

One issue that has emerged since we drafted the LTEP is the emergence of energy challenges that cross multiple provincial borders. Ontario has been at the center of promoting the need for a national energy strategy.

The LTEP projects electricity rate increases of nearly 50% over the next five years. Why are these rate increases necessary?

In short, we need to invest in Ontario's electricity infrastructure to modernize it and make it cleaner and smarter while keeping supply reliable and rates affordable. The forecast for residential bills indicates an increase of 6.9 percent per year between 2014 and 2018, and 2.6% between 2014 and 2030.

Compared to LTEP 2010, residential consumers can expect to pay about \$8/month less on average between 2014 and 2018, and \$18/month less on average between 2014 and 2030. Similarly, a typical large industrial consumer can expect to pay about \$22 less per megawatt hour of consumption.

We have taken steps to achieve significant ratepayer savings. We have reduced FIT prices, phased out coal a year earlier, introduced new wind dispatch abilities, increased agency efficiency, amended the Samsung agreement and deferred new nuclear.

What were the main factors behind the government's decision not to build new nuclear facilities?

Nuclear generation will continue to be the backbone of Ontario's supply, and we have confirmed our commitment to nuclear with the refurbishment of the Bruce and Darlington generating stations.

Thanks to the province's strong supply situation and gains in conservation and efficiency, new nuclear capacity is not needed at this time. The deferral of the construction of new nuclear generating units will save up to \$15 billion in capital investments and enable us to make large investments only where they are needed. Containing costs continues to be a priority of this government, which is why we have worked hard to reduce rate increases and continue to secure efficiencies in the electricity sector to ease the pressure on Ontario consumers.

Given Ontario's falling energy demand scenario as laid out by the Independent Electricity System Operator, why is the province continuing to procure more generation projects?

As set out in the 2013 LTEP, Ontario trades with our neighbors when it is cost effective. Electricity trading provides additional grid reliability and is consistent with our goal of providing a clean reliable and affordable electricity system for all Ontarians. In 2013, the Independent Electricity System Operator (IESO) estimates that exports reduced costs for Ontarians by about \$300 million.

We are planning for a lower demand scenario, with the ability to adjust to potential demand changes.

While the province is currently in a very strong supply position, nuclear units at the Bruce and Darlington sites will soon be taken out of service for refurbishment and Pickering is expected to be retired in the next several years.

Investments in the electricity system must be made in advance of these planned outages and retirements to help ensure that Ontarians can continue to enjoy a reliable supply of electricity when the province proceeds with the refurbishment of the existing nuclear fleet.

What does the government hope to achieve with the 50 megawatts (MW) energy storage procurement process?

Energy storage is a very exciting emerging technology with the potential to not only change electricity generation and consumption, but also to revolutionize the energy system by improving efficiencies, lowering costs, and increasing reliability for consumers.

Unlike other forms of energy, electricity could not easily be stored in large quantities. As a result, the electricity system has historically operated on a "just-in-time" basis, with decisions about elec-

tricity production based on real-time demand and the availability of transmission to deliver it. Storage technology is changing all that.

While still in the early days, it is certainly within the realm of possibility that energy storage may one day help Ontario's electricity system to eliminate the challenge of peak times, maximize the usable potential of renewable generation, and create more off-grid electrification opportunities, especially in remote locations.

The IESO has procured 34 MWs of energy storage and the Ontario Power Authority is in the process of procuring the remaining 16 MW. The storage solutions will include battery, flywheel, hydrogen, and thermal technologies. The implementation of these solutions will help the IESO understand how storage can better manage the day-to-day operation of the power grid, and integrate storage into the electricity market.

Both Premier Wynne and Premier Couillard are eager to explore a national energy strategy with fellow premiers in Canada. What do you see as being Ontario's role within this strategy?

Ontario supports the development of a national energy strategy that reflects the priorities of all jurisdictions and addresses common energy challenges. Premiers Wynne and Couillard, for example, have recently reiterated their commitment to enhancing internal trade between Ontario and Québec and have agreed to explore opportunities such as the viability of expanding electricity trade between the two provinces.

At this year's annual conference of the Council of the Federation, provincial and territorial leaders reached a provisional Canadian Energy Strategy that addresses the issue of climate change with an emphasis on reducing greenhouse gas emissions. An accord is expected to be finalized next summer in Newfoundland.

Do you have a final message about Ontario's energy sector?

Ontario has made great strides in transforming its electricity system into one that is cleaner and more reliable.

This year, Ontario became the first jurisdiction—the single largest climate change initiative undertaken in North America, equivalent to taking up to 7 million cars off the roads—and, today, it is a world leader in energy technology, innovation, and smart grid solutions.

From a deficit of 3,800 MW in 2003 to a comfortable surplus in 2013, the province has moved into a strong supply position and now has a reliable foundation on which to build.

And as Ontario plans for its electricity needs for the next 20 years, conservation will be the first resource considered. It is the cleanest and most cost-effective energy resource and it offers consumers a way to reduce their electricity bills. We intend to ensure that conservation will be considered before building new generation and transmission facilities and will be the preferred choice wherever cost effective.

We are also working with our agencies and local distribution companies to improve efficiencies, enhance reliability, and maximize value for ratepayers. By continuing to build on our past accomplishments, we can achieve a better balance, so that Ontarians can continue to benefit from a clean, reliable, and affordable energy system both now and in the future. ●

ONTARIO'S LONG-TERM ENERGY PLAN IN ACTION

●●● In December 2013, the government of Ontario outlined a vision for the electricity market that has the potential to significantly alter the manner in which energy is procured and dispatched in Canada's most populous province. "Achieving Balance – Ontario's Long-Term Energy Plan" attempts to address the delicate equilibrium between supply surplus and demand reduction while planning for a cleaner future that includes controversial new sources of green energy. The success of this vision, or lack thereof, will have ramifications on other governments hoping to meet the dueling challenges of climate change and effective market planning.

Unlike its provincial neighbors, Ontario has a hybrid electricity market structure that mixes elements of a centrally planned system with a competitive rate-based approach. Since the 2003 dissolution of Ontario Hydro, the province's publicly owned utility, the electricity system is governed by two separate regulatory bodies: the Ontario Power Authority (OPA), which is responsible for the long-term planning of Ontario's energy needs, and the Independent Electricity System Operator (IESO), which balances the supply and demand ratio on an 18-month basis.

Ontario Power Generation is the province's largest utility, responsible for over 19,000 megawatts (MW) of electricity generation, while Hydro One largely controls the transmission and dispatch of energy to consumers.

There are clear signs in Ontario that point to more changes in its market structure, such as appointing a council to review the possibility of selling both Ontario Power Generation and Hydro One, with a decision expected at the end of 2014. Secondly, a merger between the OPA and IESO seems a foregone conclusion. As it stands, the IESO is already exploring the possibility of introducing a capacity market as an alternative to the resource acquisition strategy in place by the OPA.

The centralization of the two regulatory bodies responsible for energy procurement and demand forecasting is significant given that energy demand has decreased faster than the IESO's projections, leading to an oversupply of power that has to be exported to neighboring jurisdictions at a much cheaper rate than it costs to produce. The decrease in demand has, however, helped the province to remove nearly 25% of its 2003 energy capacity in the form of coal-fired power plants – the largest climate change initiative in North America.

"Ontario has made great strides in transforming its electricity system into one that is cleaner and more reliable," said Bob Chiarelli,

Ontario's Minister of Energy. "From a deficit of 3,800 MW in 2003 to a comfortable surplus in 2013, the province has moved into a strong supply position and now has a reliable foundation on which to build."

●●● Long-Term Energy Plan

Minister Chiarelli and his Liberal party have the benefit of commanding a majority government with which to implement its vision, which is comprised of a supply mix where wind, hydro and solar energy account for 35% of electricity generation at the expense of nuclear energy, which has long been the backbone of Ontario's supply. While the decision not to build new nuclear facilities may not have been a huge surprise, it puts a vibrant service sector highly dependent on a domestic market at risk. Currently only Ontario and New Brunswick are generating nuclear energy in Canada.

The LTEP does, however, contain novel approaches to foster the development of renewable energy sources made attractive by the passing of the Green Energy Act in 2009, such as energy storage and demand response targets. The government directed the OPA to procure 50 MW of energy storage by the end of 2014. Already, a number of Ontario-based companies are advancing energy storage technologies in the province; NRStor and Temporal Power are operating a 2-MW flywheel storage facility, and Hydrogenics is working with natural gas giant Enbridge on a power-to-gas system that captures surplus energy from renewables and converts it to natural gas using electrolysis.

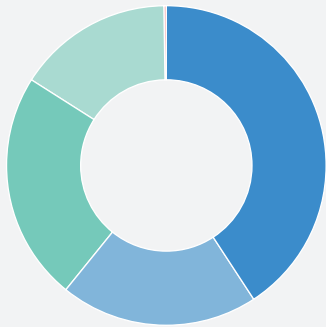
These policy changes have been met with both applause and controversy. "We have a small window of time when we are not facing a major turnover in technology, but we know there are issues on the horizon that we will have to address," said Bruce Campbell, president and CEO of the IESO.

On May 14, 2009, Ontario's provincial government ushered into law the Green Energy and Green Economy Act with one of the most innovative feed-in tariff (FIT) programs of its kind. As the program reaches its fifth year in operation, Ontario's regulatory bodies are drastically revamping the procurement process and requirements for participation.

The main distinguishing feature of the Act was its scale of implementation. It outlined dual programs: the FIT program, which was suited for utility-scale renewable energy projects over 10

OPG CAPACITY (DECEMBER 2013)

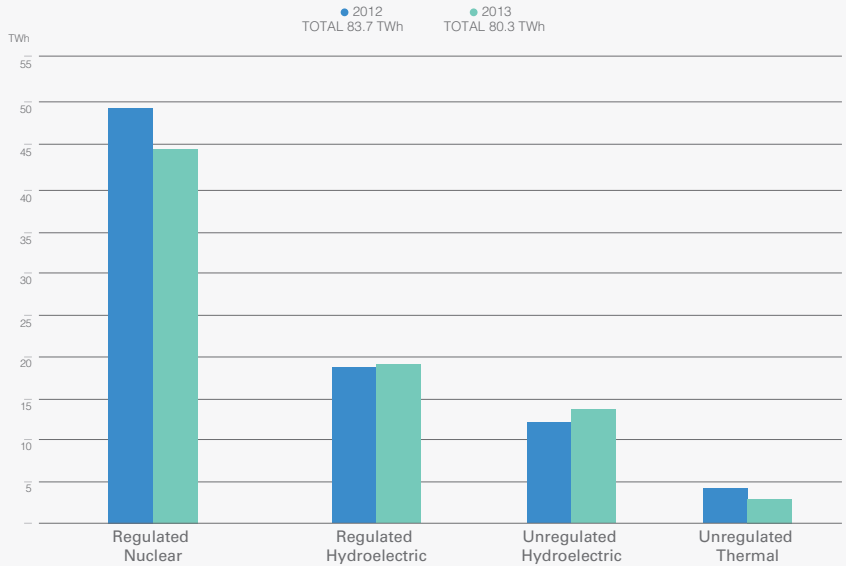
Source: Ontario Power Generation



	MW	%
Regulated Nuclear	6,606	41%
Regulated Hydroelectric	3,321	20%
Unregulated Hydroelectric	3,683	23%
Unregulated Thermal	2,617	16%
Other	2	0%
TOTAL	16,229	

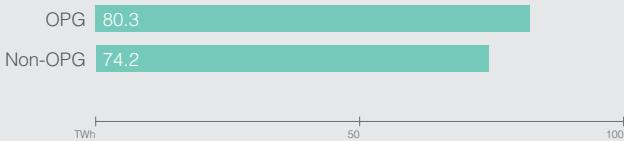
OPG GENERATION (2012 AND 2013)

Source: Ontario Power Generation



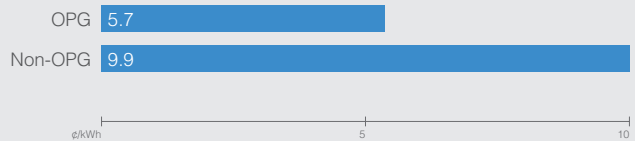
ELECTRICITY GENERATION IN ONTARIO, TWH (2013)

Source: Ontario Power Generation



AVERAGE ONTARIO ELECTRICITY PRICE, ¢/KWH (2013)

Source: Ontario Power Generation



kilowatts (kW), and the smaller micro FIT program for projects generating under 10 kW, such as rooftop solar. “The Green Energy and Green Economy Act was about reducing our carbon footprint and job stimulation during the global recession,” said David Butters, president of the Association of Power Producers of Ontario. “Ontario has a lot of renewables in our system already and more coming, which will pose challenges to our operator.”

The domestic content requirement was the first article of the Green Energy Act to be challenged. Although the Act was passed with the promise to create over 10,000 jobs in the province, both Japan and the European Union labeled the provision as uncompetitive. In May 2013, the World Trade Organization found Ontario’s domestic content law to be protectionist, and the clause will be removed from forthcoming contracts.

Greg Duke, director of business development at H. B. White Canada Corporation, believes there will be much more importation of labor and equipment once the clause is removed. “The principle behind the domestic content was admirable but it created a market that was unfortunately not sustainable because there was no longevity,” he said. H. B. White Canada Corporation has constructed more than 1,000 MW of wind and 400 MW of solar projects in Canada, including Ontario’s first large-scale wind farm, Erie Shores.

The changes in requirements pose a challenge to the strategy of international companies that invested in manufacturing facilities in Ontario, such as Siemens, Vestas, Senvion and Enercon. According to Jacob Andersen, vice president, head of wind power at Siemens Canada, the company has always treated its Ontario headquarters as a global knowledge base. “When we established our manufacturing presence in Tillsonburg it was with the intention of making it a globally competitive factory. It is a fully operational plant that can supply blades to a global market,” he said. Siemens is currently producing 55 meter-long blades for EDP Renewable’s 30-MW South Branch Wind Farm in Ontario, the first 3.0 113 turbine to be installed in the Americas. The company is also working with Samsung Renewable Energy and Pattern Energy to supply 140 Siemens SWT-2.3-101 turbines to the 270-MW K2 Wind Power Project in Ontario.

Despite the removal of domestic content requirements in the next round of contracts, Siemens Canada’s Greg Thrasher, manager, sales and strategy explained how it is still cheaper for the company to manufacture locally. “If you consider the landed cost of a blade produced in Ontario, it is cost competitive to manufacture in the province because transportation of wind turbine components is a huge factor in the total cost of a blade when considering an import solution,” he said. ●



Bruce Campbell

President and CEO
**INDEPENDENT ELECTRICITY
 SYSTEM OPERATOR (IESO)**

●●● Can you describe the role of the IESO in Ontario's power system?

The IESO operates the power system and the wholesale electricity market in Ontario. We have had a dramatic change in the makeup of the power system in Ontario over the last several years, with the closure of the province's coal plants. The IESO has been planning for, absorbing, and managing this change. Today we have much more natural gas generation, as well as large and growing amounts of wind and solar. Wind and solar have added variability to the system and in anticipation of this, we instituted a full integration of wind into our five minute dispatch last year. We have made a big investment into the forecasting of variable resources and developed good visibility of renewable generation over five megawatts that is within the local distribution companies (LDC) boundaries. In our operations planning, we have built greater levels of flexi-

bility and resiliency within the system and worked with more participants within the market.

How will the planned merger between the IESO and the Ontario Power Authority (OPA) benefit Ontario ratepayers and the province's electricity system?

The IESO and the OPA have always worked hard to ensure that our functions are complementary and not overlapping. When it comes to planning we are responsible for the operational timeframe while the OPA does the planning and resource acquisition for the longer term. Having everyone in the same building will lead to simplified communications and exchanges of information and, over time, create efficiencies and provide employees in both organizations with opportunities for development.

Why has energy demand declined in Ontario over the past two to three years?

The decline in demand is a reflection of economic conditions and the OPA's conservation and demand response programs. We are also seeing increasing levels of local energy needs being met by generation located within the service territories of LDCs. While current supplies are adequate, the province will need to refurbish the nuclear units at Bruce and Darlington, and the units at Pickering will be ending their service lives in the early 2020s. The load will be flat for several years, which will allow us to prepare for a period of nuclear refurbishment.

What will the introduction of a capacity market in Ontario mean for supply and demand procurement?

The capacity market is an additional tool for procurement and will be dealing primarily with incremental capacity. It will also allow us to tailor those additions to particular circumstances on a rolling three to five year timeframe. We are looking to foster a competitive market alternative that will function over the long-term. When long-term utility generation contracts expire, we would like to have a mature capacity mechanism. We are working with the OPA and will move into stakeholder discussions this fall around the design elements of a capacity market.

Considering the abundance of supply and the export of energy from the province, why does Ontario face higher electricity costs than its neighbors?

The IESO recently published a review of price formation in our market, which found that we are getting market results that are consistent with our design and are comparable to jurisdictions around us. The issue has always been, both in Ontario and other markets, getting funds for additional investment. Fewer than 10 years ago, Ontario was experiencing supply shortages. Through the OPA, the province completed the contracting necessary to ensure that we had resources to meet reliability needs while eliminating our dependence on coal and also implementing the policy to green the power system through investments in renewables. It has come at a cost, but these critical investments in transmission and generation result in the province now having one of the lowest carbon electricity systems in North America.

How is the IESO advancing demand response programs?

Demand response programs were administered through contracts by the OPA, but are being transitioned into a more market-based system. We have been dealing with aggregators and demand response customers to transition off contracts and develop market rules and will be running auctions in 2015. Currently, we are working to increase the coordination of demand response with the needs of the system, adding more flexibility into the administration of demand response by tying it more closely to market conditions.

Going forward what are some of the main initiatives on the IESO's agenda?

The IESO wants to ensure that the market provides the very best opportunities possible. We would like to see the IESO operations and those of the province's over 70 LDCs become more complementary. The IESO and the LDCs can capitalize on demand response and distributed generation for both our purposes. Through our Smart Grid Forum and the investments that the province has made in smart meters, we are trying to better engage with customers and with the LDCs. Another area of focus will be reducing the barriers for technology change, such as micro grids and distributed generation, to enter the market. •



JA



GT

Jacob Andersen & Greg Thrasher

●●●

JA: Vice President, Wind Power
GT: Manager, Sales and Strategy

SIEMENS CANADA

●●● Siemens invested over \$20 million to build a blade manufacturing facility in Tillsonburg, Ontario. What have been some of the significant milestones for the company in Ontario?

GT: Wind power has experienced quite an evolution in Ontario over the past few years. Siemens achieved a significant milestone in July 2013 when we delivered our first blade to Samsung and Pattern Energy's South Kent project. Siemens also introduced our 55-meter blade mould to accommodate the manufacturing of our direct drive technology; the first of which was delivered to EDP Renewable's South Branch project. This was the first direct-drive installation for Siemens in Canada and the first 3.0 113 turbine to be installed in the Americas. We have also established Ontario's first service and maintenance distribution and training center where we house commonly used parts to support our installed fleet regionally.

JA: Our Tillsonburg facility is very busy

producing blades for the Canadian market. We have created a good foundation in Ontario and want to expand our footprint in Canada. We currently have a significant backlog of orders in Ontario.

Can you elaborate on Siemens' direct drive technology and how it is suited to Ontario's wind conditions?

GT: Siemens' direct drive technology is a good fit for the wind conditions in Ontario, which is usually medium to low speeds. It also has a modular technology across the platforms, meaning that it is essentially a "plug and play" turbine.

JA: The main factors that developers consider when choosing a turbine is wind speed and turbulence conditions at their site. Wind farms have evolved from being located in high-wind areas to lower-wind areas and longer, more efficient blades are necessary to capture the wind resources.

The upcoming Large Renewable Procurement (LRP) program in Ontario is expected to procure 300 MW of wind energy, a far cry from the thousands of megawatts that were offered in the previous FIT programs. What effect does this have on Siemens' growth strategy?

GT: Wind power will always have a significant part to play in Ontario's energy mix. The LRP process shows the government's commitment to renewable energy, and Siemens aims to provide the best wind turbines to keep the cost of wind energy competitive.

JA: It is difficult to speculate about the future, but the Green Energy Act's created jobs and accelerated renewable energy in Ontario. The momentum will continue but not at the same speed as in recent years. Siemens also takes into account the demand for wind energy on a global level, not just in Ontario. We have a supply chain that can support the wind power market worldwide.

Can wind energy be cost competitive?

JA: Blade design is a key factor in keeping the price of wind energy competitive. Over the last decade, the design and efficiency of blades have improved exponentially. However, the industry needs to do a better job of maximizing efficiencies throughout the supply chain. We have not seen the same level of innovation in infrastructure as we have in turbine design, and this will

continue to be an issue as wind farms are developed in more remote locations.

How does the removal of Ontario's domestic content requirements from forthcoming energy projects affect Siemens' manufacturing and supply chain strategy?

GT: If you consider the landed cost of a blade produced in Ontario, it is cost competitive to manufacture in the province because transportation of wind turbine components is a huge factor in the total cost of a blade when considering an import solution.

JA: The Canadian wind industry will continue to grow; the country's electrical infrastructure needs to be updated, and wind energy should play a role; however, policy stability will be essential if wind energy is to grow.

What does the future hold for Siemens in Ontario?

GT: The main goal for Siemens is to expand in regions outside of Ontario and continue to diversify our business. Siemens is currently delving deeper into storage technologies to see how they can be effectively paired with renewable sources of energy. Regionally, our partners are participating in Hydro Quebec's tendering process, while also looking to other provinces in Canada.

JA: Innovation will continue to be at the core of what we do. The industry has already surpassed what it thought were the limits of wind technology: we are transporting 75-meter blades in Europe and building 6-MW turbines, which were previously thought impossible. We are even exceeding assumptions about the extent of wind in a region's energy supply mix: people thought that wind would never account for more than one tenth of a generation matrix. However, there needs to be a market to drive this development. The industry will do its part to build on existing capacity but there needs to be support for wind energy on a public and private level. ●



Tim Smitheman

●●●
 Manager, Communications,
 Government and Public Relations
**SAMSUNG RENEWABLE
 ENERGY**

●●● **Samsung Renewable Energy's contract with the Ontario government is a very significant investment on the company's part: a \$5-billion commitment to generate 1369 megawatts (MW) of clean energy and create 900 jobs. What attracted Samsung Renewable Energy to Ontario initially?**

Samsung Renewable Energy was first attracted to Ontario by the passage of the Green Energy Act in 2009, which demonstrated the provincial government's commitment to develop green energy projects alongside a strong industrial base in Ontario, which had been hit very hard by the economic recession in 2008. Samsung was able to leverage our partnerships with Siemens and CS Wind in other areas of the world here in Ontario to help with that goal.

In 2013, Samsung Renewable Energy and the provincial government renegotiated the initial contract signed in 2010.

What are Samsung's commitments under the new terms?

The revised contract contains three phases instead of five. We just opened the South Kent wind farm with our partners Pattern Energy, who are partnering with us on all of our wind projects. South Kent is currently Canada's largest wind farm at 270 MW. We also have another 870 MW of wind projects in development. Phase Three of our portfolio will comprise 200 MW of wind projects and 100 MW of solar projects.

One of the reasons for the renegotiated contract put forth by Minister of Energy Bob Chiarelli is that Samsung struggled to meet its deadlines. Why was this the case? Admittedly, the regulatory process was longer than we anticipated. At the Haldimand project for example, it took us four years to develop and solidify our partnership with the Six Nations council, who now have a 10% equity stake in the project. However, the main reason behind the delay was the decreasing demand scenario in the province since 2010, and both parties recognized the need to reduce the amount of MW involved in the contract. Today, Samsung Renewable Energy has a base in Mississauga, Ontario, and Pattern Energy has an office in Toronto. All of our products come from our four manufacturing centers in the province: CS Wind manufactures our towers in Windsor and employs over 600 Ontarians; we use blades manufactured by Siemens at its plant in Tillsonburg, which has 300 employees; over 200 employees work at Canadian Solar in London; and over 60 work at SMA in Toronto. At the moment, we employ over 500 construction workers at our Haldimand wind and solar project.

Samsung's contract with the government was the most significant deal as part of the Green Energy and Green Economy Act. Five years on from its enactment, how would you assess its implementation?

The Green Energy Act has been very successful in meeting its stated objectives. Samsung alone opened four manufacturing facilities in the province and hired nearly 1,200 workers, which is 300 more than our revised objective of 900 jobs. We are also employing more than 1,500 workers on our Haldimand, Kingston and K2 sites, which are yearlong construction

projects. These projects are benefitting the entire supply chain from the concrete industry to cabling. While there was a lot of opposition towards the deal at the early stages, much has dissipated. In the last provincial election, renewable energy was barely a topic of discussion and the Samsung deal was scarcely mentioned at all. The conversation has shifted as these renewable projects are being put into operation, and municipalities are realizing that these projects are an important facet of their communities.

What have been some of the issues tabled at your community liaison meetings?

Road use agreements from a council level are always extremely important, and we make sure that we are able to return the roads to their previous conditions. Another example of infrastructure improvement is hydro lines: at Haldimand, we have had to do a significant amount of work underground, so we have helped out Haldimand Hydro by putting hydro lines in simultaneously and upgrading their existing infrastructure, which would not have happened had we not been developing projects in the region.

Where would you like to see Samsung Renewable Energy positioned in the future?

Samsung Renewable Energy is starting to look at other regions in Canada to develop wind and solar projects. The United States is starting to move away from coal-fired generation, so it also will likely become a more interesting region for us, but not in the immediate future. Our sister company Samsung SDI is focusing on energy storage, as there are opportunities to use the same technologies that we use in our mobile phones. Samsung SDI already has a 12-MW project in England and a couple smaller projects in Europe and is looking to participate in the 50-MW energy storage program commissioned by the Ontario government in the near future. Samsung Renewable Energy is proud of its work in Ontario. We had very little presence before the Green Investment Act but have gained a great degree of experience operating in Ontario's renewable sector. We will continue to be a significant player in the province's energy sector for many years. •

Greg Duke

●●●

Vice President of Business of Development

H.B. WHITE CANADA CORP.

●●● **Can you give us a brief introduction to White Construction's work in the energy sector and in Ontario?**

White Construction traces its roots back to Clinton, Indiana 67 years ago, when the company first started working in the hauling business. Over time the company migrated into larger-scale opportunities that included concrete, bridgework, and highways. In the 1980s, the company began to work in the power sector. By the 1990s and early 2000s, White Construction was working in the gas turbine industry, but this market was shut down for a period of time starting in 2002 due to the Enron scandal. White Construction was already working in other markets such as pharmaceuticals and petrochemicals, but wanted to stay engaged in power. Combining all of the company's offerings tied in perfectly for the construction of wind farms, which required roads, concrete, steel and heavy lift. We entered this space in 2004 and in 2005 opened the subsidiary company H.B. White in Canada. The Ontario government was indicating that there would be a coal phase-out and we positioned ourselves in the marketplace in spite of its volatility in the early years. By the time that the FIT program was evolving, we had already built relationships with different stakeholders and organizations. White Construction has had the good fortune of being in Ontario since day one and has since leveraged this experience in Canada to contribute to 1000 megawatts (MW) of wind and 400 MW of solar.

As the boom days of Ontario's renewable sector end and we enter the new Large Renewable Procurement (LRP) phase, how do you see White Construction participating?

White Construction has spent the several years looking at where the next opportunities will be and leveraging other areas of our business that we have not deployed fully yet, such as civil infrastructure, roads, bridges, and exterior utilities. We plan to participate in the federal and provincial incentives for upgrading infrastructure. We also have an engineering arm that we have deployed in Ontario and will look for opportunities within our service offerings for both EPC and balance of plant work.

With nearly 1000 MW of wind and 400 MW of solar built in Canada, can you give us an example of a project that illustrates White Construction's niche approach?

White Construction was very fortunate to participate in the first large-scale wind farm in Ontario, Erie Shores, constructing roads, foundations and concrete, and turbine erection. This was a groundbreaking opportunity and many naysayers in the marketplace did not think the project would be built. What distinguishes us is that we are self-performing contractors. We do not build our projects completely utilizing subcontractors. We do have high-voltage partners that we utilize, but otherwise we hire locally from the union halls. We use extremely talented people who are working in their own community for their own benefit. While developers have spent years and dollars developing their wind and solar facilities, it is the local tradespeople who take ownership of the projects going forward.

Do you have a final message about White Construction in Ontario?

White Construction is blessed to have been received in the marketplace as we have, both by municipalities and the province as a whole. We have entrenched ourselves in local communities and support their economies. We have met wonderful communities from Lake Erie to Cochrane who have welcomed us. We hope to be in Ontario for a long time supporting the infrastructure and energy needs within the province. ●

Discover the POWER of our EPC Team



White Construction is committed to building infrastructure and energy related projects across North America. Our team provides a range of traditional, design-build EPC / BOP services for renewable energy, thermal power, petrochemical, industrial and civil infrastructure related projects.



www.whiteconstruction.com





WELCOMING THE SUN AND THE WIND ONTARIO'S RENEWABLE FUTURE



"The Long-Term Energy Plan calls for renewables to be 46% of Ontario's energy mix by 2025. Solar is set to contribute 8% to Ontario's energy supply. The OPA is currently managing about 2 GW of solar, and there is the opportunity that as Ontario begins to learn the benefits of solar, this number will continue to creep up."

- Robert Leah,
Vice President of Development,
East Region, Recurrent Energy

THE RIGHT FIT

The Evolution of Wind and Solar Power in Ontario

Ontario’s wind and solar industries have evolved dramatically over the past five years. Nearly 10,000 megawatts (MW) of wind and solar energy has been contracted by the OPA since 2009, with multinational independent power producers (IPPs) such as EDF EN, NextEra, Samsung Renewable Energy and EDP Renewables developing multi-megawatts projects.

The subsidy program for large renewables is soon to end in Ontario. Colin Andersen, CEO of the Ontario Power Authority (OPA), explains: “We have taken the large wind and

solar projects out of the FIT program and we are currently running a competitive process for them under our Large Renewable Procurement (LRP). In the meantime we have run a window on the FIT program that it is now under 500 KW. Later this year we will allocate up to 100 MW more after a price review and there will be another window in 2015.”

According to Jon Kieran, director, development at EDF EN Canada Inc., Ontario’s FIT program has achieved many goals. “A feed-in-tariff creates the one condition that

a nascent industry needs, which is bankability,” he said. “However, it is a different climate for the industry today than five years ago, as costs have decreased so significantly that there are parts of North American where wind and solar compete without any incentives at all. Having said that, it is important to remember that the FIT program accelerated the replacement of supply in order to remove 6,000 MW of highly polluting coal-fired generation.”

EDF EN is Ontario’s largest operations and maintenance company for ground mounted solar, with 70 MW in its portfolio, and recently opened Canada’s largest wind farm in Alberta.

Samsung Renewable Energy’s 1,369 MW-portfolio represents a \$5 billion investment that includes Ontario’s largest wind farm, the 270-MW South Kent Wind project developed with partners Pattern Energy. While the controversial Samsung deal with the provincial government had to be renegotiated from its initial \$9 billion, 2,500 MW commitments, the company has another 870 MW of wind and solar energy in development.

One of the reasons for the renegotiated contract put forth by Minister of Energy Bob Chiarelli is that Samsung struggled to meet its deadlines. Tim Smitheman, manager of communications, government and public relations at Samsung, admitted that the regulatory process was longer than anticipated when the deal was signed in 2010. “At the Haldimand project, it took us about four years to develop and solidify our partnership with the Six Nations council, which now has a 10% equity stake in the project. However, the main reason behind the delay was the decreasing demand scenario in the province since 2010,” he said.

By law, wind and solar projects must obtain a Renewable Energy Approval (REA)

edf
energies nouvelles

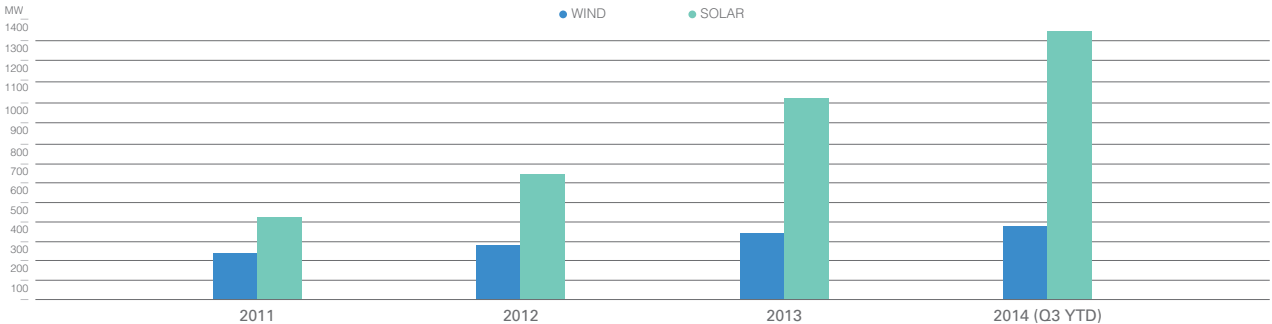
**TRUSTED LEADER
IN PROJECT
DEVELOPMENT
AND OPERATIONS &
MAINTENANCE**

EDF EN Canada
Ontario: 416.363.8380
Québec: 514.397.9997
www.edf-en.ca

EDF Renewable Services
858.521.3575
O&Mbusdev@edf-re.com
www.edf-renewable-services.com

ONTARIO'S DISTRIBUTION SYSTEM

Source: Ontario Power Generation



from the Ontario government, a lengthy process that has caused headaches throughout the supply chain. To date, only one large project, EDP Renewable's 30-MW South Branch Wind Farm, has not been appealed.

The revised REA process promised a six-month turnaround guarantee once applications were submitted. In reality, the process begat new obstacles such as archaeological studies and zoning issues. For companies that were present in the province prior to the introduction of the REA, it has proved a frustrating transition.

"It is a much more difficult industry to work in than it was five years ago," said Brent Bergland, general manager, Canada, at Mortenson Construction, which established a base in Ontario in 2005. "While this is likely true of other energy technologies, it is particularly hard on wind when projects become delayed through the environmental review tribunal appeals process. Nearly every project that goes through the process will be appealed. This has unfortunately had a negative impact on the industry by delaying projects from going ahead, and while ultimately these projects will be built, they are being constructed in a much tighter timeframe."

One of the major facets of the REA process is to increase consultation with local communities. In the past, Ontario developers faced backlash from communities who objected to renewable energy projects close to residential areas. "The main challenge to developers is overcoming the 'not in my backyard' perception that exists in Ontario," said Paul Miron, senior title counsel at First Canadian Title (FCT), a title insurer in Canada. "It is not a huge issue with solar installation, but is not limited to wind farms; any type of gas, biomass or nuclear plant can face community resistance as well. This challenge is not something that affects a title insurance policy, since we get involved only after the developer receives the permits. However, a number of projects have hit roadblocks that have slowed their development."

One of the key elements of the Large Renewable Procurement process is the ability for the developer to demonstrate support from the local municipality before the provincial government will approve the project. According to Mortenson's Brent Bergland, this will likely change the scale of the projects yet to be built. "Individual projects will more likely be in the 25 MW to 50 MW range, with the most being around 100 MW," he said.

With a crowded market and less megawatts on offer in the new Large Renewable Procurement program, it remains to be seen whether there will be enough opportunity for developers and manufacturers to sustain a vibrant wind and solar industry in Ontario. According to Mark Gilmore, director of operations, North America wind power

and solar generation at GDF SUEZ Canada, when the competitive procurement process begins, there will still be a need for larger players to develop the industry through their expertise and technology. The fact that there are fewer megawatts for wind energy on offer will certainly present a challenge for the province to sustain a manufacturing base for renewable energy. "We have yet to see who will be able to adapt to these changing requirements, and it might not be enough to sustain every manufacturer in Ontario," said Helmut Harold, CEO North America at Senvion Canada Inc. "My hope is that there will be projects that did not get approval or faced serious delays in previous procurement programs which get recycled, so that we will have more than 300 MW per year to work with in the future." ●



SIMPLIFY. MITIGATE. PROTECT.

Powerful insurance solutions from FCT

With protection against a host of title and off-title related risks, you can rest easy knowing your commercial energy development is secure with FCT. Our superior customized coverage ensures your deal will close with less risk, simply and conveniently as planned.

Feel the power of
partnership with commercial
title insurance solutions
from FCT.



► FCT.ca

Commercial Solutions

Insurance provided jointly by FCT Insurance Company Ltd. and First American Title Insurance Company. Services by First Canadian Title Company Limited. The services company does not provide insurance products. This material is intended to provide general information only. For specific coverage and exclusions, refer to the applicable policy. Copies are available upon request. Some products/services may vary by province. Prices and products/services offered are subject to change without notice.

® Registered Trademark of First American Financial Corporation.



Jon Kieran

●●● Director, Development
EDF EN CANADA INC.

●●● Having invested over \$300 million in Ontario, what have been the fruits of these investments for EDF EN?

EDF EN Canada continues to be active in Ontario. Our first initiatives were focused on solar development beginning in 2008. We have constructed six projects, each one approximately 12 megawatts (MW) of direct current, and all six are currently in service. One of the gratifying aspects of being a pioneer in solar ground mount is that we have learned from our mistakes much earlier than others. Based on EDF EN's early acquisition of solar operating expertise for its own projects, we have become one of the largest operations and maintenance (O&M) service providers to ground-mount solar assets in Ontario. The same principle applies to our wind operations, which date back to the early 1990s in the United States. There's simply no substitute for operating experience!

We are far along in the implementation of our plans to install 1,000 MW of wind

capacity in Quebec. More than 500 MW have been placed in operation, and the remaining projects are under construction. We have been building on our strengths as a large, financially strong and experienced renewable developer. In the spring of 2013, EDF EN Canada acquired a wind project opportunity in Alberta called Blackspring Ridge, which is a 300 MW project near Lethbridge. We concluded the transaction in April 2013 and finished construction in May 2014, which was quite a feat when you consider the size and complexity of the project.

After building the largest wind project in western Canada in Alberta, where does EDF see opportunity in Ontario?

There is terrific opportunity for wind in Ontario now that the Liberal government has followed through on its promise to shut down all coal-fired power plants. The removal of 6,000 MW of coal capacity from the power system has opened up large opportunities for renewables, which are now further strengthened by the uncertain timing of nuclear refurbishment, questions about demand side management, and wires congestion in southern Ontario.

Building more renewable supply and integrating it into the grid can be costly. As a developer, what is your role in keeping costs and overhead low?

The global renewable industry has a remarkable story to tell of dramatic cost reduction, improved product performance and shorter implementation schedules. The cost of installed solar has fallen 40% to 60% in recent years, and wind has seen significant improvements in turbine efficiency. We can do more, however, on procurement logistics, program management, equipment downtime, installation productivity, construction scheduling, preventative maintenance, etc.

The Ontario government's investment in renewable energy and new supply were controversial in the 2012 election, largely due to cost concerns, but renewable procurement did not materialize as an election issue more recently. This may be due to two factors: people are beginning to see evidence that renewables are increasingly more competitive than conventional sources of supply. Also, people appreciate that any new supply is more expensive than the generation it replaces. Our task is to position the benefits of new renewable

capacity against the practical alternatives available, not against the nostalgia of how plentiful and cheap electricity was a few generations ago.

In our 2010 Canada Power report, you spoke about how Ontario's FIT program will create opportunities for developers. How would you assess the program's implementation?

By creating bankability, the FIT program has achieved its key goal: to kick-start private investment in clean, renewable and fuel-free energy. However, it is a different climate for the industry today than five years ago, as costs have decreased so significantly that there are parts of North America where wind and solar compete without any incentives at all. Having said that, it is important to remember that the FIT program accelerated the replacement of supply in order to remove 6,000 MW of highly polluting coal-fired generation.

Have you experienced opposition from communities against wind projects?

As the largest provider of O&M services to the wind industry in North America, we see ourselves fundamentally as a neighbor in the communities in which we live and work. The culture we have acquired as an operator has changed our approach as a developer. EDF EN is committed to fostering open, constructive dialogue with communities. Perhaps there are instances where members of the wind industry must agree to disagree with local opponents, but it is always a good idea to share facts, offer reliable information sources, encourage communication and listen to your neighbors. As a matter of process, and of principle, we engage in extensive conversations with neighbours, community members, municipal councils, Aboriginal Nation and NGOs to understand their preferences and concerns.

What is EDF EN's long-term vision for the company in Ontario?

EDF EN's long-term vision is a larger, more robust, more customer-centric renewable energy industry, which operates cost effectively and in harmony with the changing Ontario power system. Renewable energy will not be perceived as a politically divisive issue separated from the market price of electricity but will be seen as an efficient, environmentally responsible way of achieving balanced supply in the best interest of customers and communities. •



Paul Miron

Senior Title Counsel
FIRST CANADIAN TITLE (FCT)

●●● What are the focus areas for FCT when it comes to renewable energy in the province of Ontario?

As the largest title insurer in the country, solar and wind energy are a big part of FCT's commercial portfolio. Currently, there are more opportunities created by the wind energy sector in Ontario over solar, so we tend to focus on those renewable energy projects more frequently than any other.

Ontario's land title system is much different than that of Quebec, for example, because the province uses the Torrens system. This is a land title system that is guaranteed by the government, making title searches much easier to undertake.

In what way does title insurance play a role in helping to streamline a renewable energy project?

A title insurer introduces a third-party risk taker to a transaction and plays a key role in developing renewable energy projects.

A wind farm, for example, can stretch over a number of different lots with numerous owners, and a developer has to enter into agreements with each individual owner, which can be very time-consuming. Title insurance can streamline the process because a title insurer requires less due diligence to issue a policy, and the client then saves money in legal billing fees. Interestingly, title insurance also plays a role in smaller projects such as rooftop solar: though the amount of land is smaller, the insurer confirms that the space is available to be leased for such a project, and that there are no competing interests that might interfere, such as cell phone towers.

Would you say that title insurance is a priority for stakeholders who are developing energy projects in Ontario?

Although title insurance is not mandated in Canada, like it is south of the border, it is still a high priority for key stakeholders in Ontario such as lenders, developers and their lawyers. With the increased complexity of energy projects, we bring significant value to these transactions by reducing risk to the major stakeholders of a project.

From an insurance perspective, what are some of the main risks associated with developing renewable energy projects, and who shoulders the risk?

There are a number of different risks associated with developing renewable energy projects, most of which are not necessarily specific to Ontario. A large wind farm with numerous turbines poses the risk of contiguity, or the ability to transfer power from one turbine to the next; if there is a gap somewhere, it can be costly to fix. Most of the time it is the developer who shoulders the burden of risk, at least before a title insurance policy is in place.

The main challenge to developers is overcoming the "not in my backyard" perception that exists in Ontario when it comes to building energy projects. It is not a huge issue with solar installation, but is not limited to wind farms: any type of gas, biomass or nuclear plant can face community resistance as well. This challenge is not something that affects a title insurance policy, since we get involved only after the developer receives the permits. However, a number of projects have hit roadblocks that have slowed their development.

Where does title insurance play a role in other forms of non-renewable energy?

There are opportunities to title insure gas plants or other facilities, but these transactions are not quite as complex as renewable projects because they are single-site transactions. The complexity comes from the amount of land required in a project.

What are some of the key differences in insuring an energy project in northern Ontario, where the population is sparse and the land package is much bigger?

FCT has title insured both wind and run-of-river projects in northern Ontario. There is not a marked technical difference in insuring projects in northern Ontario, but one major difference is that we deal with native landowners, which can add another level of complexity. Oftentimes a native group is itself involved in the project's development, which can help to facilitate the insurance process.

One area of opportunity in northern Ontario is the development associated with the Ring of Fire mining projects. The area is very remote and will need a lot of generation to support heavy mining activities.

What are the main growth areas for FCT in Canada?

With our policies offering over 10 covered risks for the owner and 14 for the lender number of covered title risks, title insurance is a highly versatile product and can add value to any transaction; residential or commercial. From a commercial energy perspective, we have title insured the majority of wind and solar projects for developers and lenders in Ontario and look to get further involved in projects in western provinces of Alberta and British Columbia and eastern provinces of Nova Scotia and New Brunswick. We are currently working on a number of projects in northern British Columbia that involve native lands. •

Brent Bergland

●●●

General Manager, Canada Group

MORTENSON CONSTRUCTION

●●● **Mortenson opened its Canadian headquarters in Mississauga in 2010. What is the strategic importance of Ontario to Mortenson's work in the energy sector?**

Mortenson has historically been involved in a variety of energy sectors dating back to the 1960s. As one of the pioneers of the wind industry, we built our first wind project in 1995 and entered the Canadian market in 2004. We built our first Canadian wind project in 2005. Since then, we have completed construction on nine wind projects in the country, four of which were built in Ontario, with another two currently under construction in Canada. To date we have built a total of 127 wind projects throughout North America with nine additional projects currently under construction.

While we have continued to maintain a strong footprint of experience within the entire country, Ontario is a very consistent market for us. Most of the developers and financial firms are based in the province. Also, the requirements for domestic content as part of the Feed-in-Tariff (FIT) contracts meant that the vast majority of our team members had to be Ontarians.

Mortenson was active in Ontario before the Green Energy Act and the Feed-in Tariff program was introduced in 2009. What has been the biggest shift in the energy market from the company's perspective?

The biggest shift in the energy sector after the Green Energy Act has been in how projects are permitted and approved and the way in which they receive official sanction from the government and local communities prior to going ahead. It is a much more difficult industry to work in than it was five years ago. While this is

likely true of other energy technologies, it is particularly hard in wind when projects become delayed through the environmental review tribunal appeals process. Nearly every project that goes through the process will be appealed. This has unfortunately had a negative impact on the industry by delaying projects from going ahead. And, while ultimately these projects will be built, they are being constructed in a much tighter timeframe. Mortenson would also like to see the Canadian market energize 1,000 megawatts (MW) per year on a year-to-year basis. We have exceeded that value in previous years, but right now policies across Canada do not support these targets. However, on a more positive note, the industry has matured in Ontario. There are businesses that focus exclusively on the wind sector, allowing them to dedicate resources to wind energy for a sustainable marketplace.

Looking at some of the projects that Mortenson has built in Ontario, the 166-MW Comber wind farm is interesting in that it was a very large project that was built at the early stages of the wind industry in Ontario. How was Mortenson able to build its supply chain and comply with domestic content requirements?

Comber was the fourth wind project that we built in Ontario, having previously constructed Prince I and II, as well as Gosfield. We were able to leverage our past experience in the province and benefitted from having a good reputation, which helped us to attract the top-tier engineering and construction firms as partners. It also helped that Comber was our fourth project with Brookfield Renewable Energy. Comber was a unique project in that it was able to get approved outside of the Renewable Energy Approval

process. It had received certain approvals prior to the REA legislation being enacted and was not subject to the revised permitting requirements, although everything complied with the regulatory requirements. Also, the turbine supplier, Siemens, had invested considerable time and effort into the Ontario market and knew the landscape very well. When you have top-tier companies all working together on a project, it usually ends up as a success. The domestic content requirements also created the opportunity for Mortenson to create relationships with engineering firms in Ontario that we had not had before. Had there been no domestic content requirements, we would not have found one of our preferred engineering partners.

Recently Mortenson completed construction on the 300-MW Blackspring Ridge project in Alberta. What type of opportunities exists here in Ontario for these large-scale projects?

Blackspring Ridge is the largest wind farm in western Canada, and we are very pleased at how smoothly it was constructed. It was a true milestone in solidifying our presence in the west. However, it will be difficult for projects of this scale to be developed in Ontario going forward. The new Large Renewable Procurement process in Ontario has one key element: the developer must demonstrate support from the local municipality before it can be approved by the provincial government which will likely change the scale of the projects yet to be built. Individual projects will more likely be in the 25 MW to 50 MW range.

Where do you hope to see Mortenson's business in Canada positioned in the future?

Even though our Canadian headquarters are based in Ontario, Mortenson is always examining ways to increase our presence throughout Canada. We are no longer simply a renewable energy contractor; we are also making significant investments in high-voltage electrical infrastructure across the country. If the 1000-MW target for wind energy in Canada does not come to fruition, we have other growth plans in place to address the potential downturn in wind opportunities. We are also supporting efforts to incorporate energy storage technologies into the grid. •



ENERGY PROJECTS MOVED SMOOTHLY THROUGH DESERTS,
MOUNTAINS, BOARDROOMS AND TOWN HALLS.



MOVING ENERGY FORWARD. As a pioneer in wind energy, we know what's coming next because we've been there before. Finding new ways to deliver energy projects and new innovations with which to deliver them. We're ready to push the envelope and break some conventions. Are you? Your project begins at Mortenson.com.





Mark Gilmore

●●● Director of Operations, North America
Wind Power and Solar Generation
GDF SUEZ CANADA

●●● **Can you give us a brief introduction to the role that GDF SUEZ plays in Ontario's energy sector?**

GDF SUEZ is the largest independent power producer in the world since the company's 2011 merger with International Power. International Power had acquired a large wind developer (AIM Power Gen) in Ontario in 2009, which became part of GDF SUEZ's portfolio with the merger. Today, GDF SUEZ operates 350 megawatts (MW) of wind projects, a 115-MW cogeneration facility in Windsor and 20 MW of solar projects in Ontario. Within our wind portfolio, GDF SUEZ operates two significant projects in Ontario, the Erieau and East Lake projects, which are 99 MW each. Over the last few years, we have built and are now operating a significant number of wind projects, but are transitioning our development focus towards distributed solar.

GDF SUEZ is building its solar capacity in Ontario with two new 10-MW plants

commissioned over the past two years. What role does solar energy play in its Ontario portfolio?

Having operated hydro and wind projects for many years, GDF SUEZ more recently began investing in solar energy in North America. We built a small pilot project in Massachusetts a few years ago, then started on the 10-MW Brockville solar project in Ontario, which went into commercial operation in 2013. Brockville was a great learning experience in terms of solar: it runs very well, with high capacity and good availability. The Beckwith project is an extension of our positive experience with Brockville. We anticipate that solar will play a major role in GDF SUEZ's renewable portfolio going forward. Globally the company has a vision to achieve a 50% increase by 2015 in its overall renewable energy capacity compared to its 2009 portfolio.

On a utility scale, we will be bidding for several solar projects. Rooftop solar is the next progression in the solar industry, as panels and equipment prices have dropped significantly. Going forward, we see more of a distributed generation-type system throughout North America, as strategic, smaller assets within the footprint of the transmission and distribution system become more appealing. Since communities by and large do not want large solar plants within populated areas, and we would have to build costly transmission lines to connect them to the grid, if we can strategically place smaller plants within the existing system, it benefits everyone.

The Ontario government is ending subsidies for large-scale renewables and establishing a competitive market. What implications might this new process have for GDF SUEZ?

The FIT program was put in place to jumpstart development and operations of renewables, and the competitive process is a natural extension of its implementation. GDF SUEZ has participated in a number of similar competitive markets. When the competitive procurement process begins, we may see a higher number of small companies participating. However, there will still be a need for larger players to participate through their expertise and technology. There are still large opportunities in the renewables sector in Ontario: the province's goal is to have 50% of its energy supplied

by renewables by 2025, and the province is at nearly 5000 MW at the moment, which is only about one-third of that target.

As a multinational company, how did GDF SUEZ approach the domestic content requirements of the initial FIT contracts?

GDF SUEZ sought out suppliers of equipment in Ontario so that we would be in full compliance with domestic content requirements. Initially, suppliers had to make long-term commitments in Ontario to be able to meet the targets set by the government; these are the suppliers with whom we want to work in order to continue that effort. While the domestic content requirements were essential to create a homegrown industry, as a company, GDF SUEZ regularly works with local suppliers to support our facilities around the world.

Recently a number of developers have encountered strong anti-wind sentiments from communities in Ontario. What has been GDF SUEZ's experience?

Typically, communities situated around our wind farms have been very favorable to development. We are ingrained in the community and contribute revenue to the municipalities where we build, through property taxes and a significant amount of equipment and services purchased. From our perspective, we have not encountered many disputes or negative feedback on our projects. The majority of citizens are favorable towards renewable energy projects, especially when compared to other energy sources like nuclear or coal.

GDF SUEZ also operates a 115-MW gas-fired power plant in Windsor, Ontario. Will gas be an area of focus for GDF SUEZ in the province?

GDF SUEZ is looking at developing new gas projects in Ontario; historically, we have done very well in gas. Again, we see a trend towards smaller projects in the 10-20 MW range in strategic locations. As we see more renewables being integrated into Ontario's energy supply, gas can provide the province with a stable source of energy. ●



Helmut Herold

CEO North America
**REPOWER SENVION
 CANADA INC. (REPOWER)**

- **While Senvion's initial point of entry into the Canadian market was through Quebec, the company has a significant presence in Ontario. What are some of the key milestones for Senvion in Ontario?**

Ontario has always played a significant role in Senvion's strategy in Canada. Although we began our Canadian operations in Quebec, Senvion quietly established a satellite office in Ontario in 2009. We always knew that Ontario would play an important role in the Canadian wind industry and wanted to be a part of it. In 2011, we solidified our presence in the province by opening a larger office in downtown Toronto, but our most significant milestone was when we began producing blades last year from our factory in Welland, Ontario. Today, we are manufacturing components for a 300-megawatts (MW) portfolio of projects, largely from project developer WPD and Capstone.

What are some of the specificities of the Ontario wind sector, and how has Senvion adapted to these characteristics?

One of the differentiators in Ontario is the lower wind speeds than in neighboring regions such as Quebec. Low wind speeds require turbines with a longer rotor to harvest wind energy in a better, more efficient way. Senvion's solution to that is our new 3-MW platform that we are introducing in Ontario. In Europe, the 3-MW platform accounts for over 80% of our sales. Interestingly, both Ontario and Germany have developed wind farms in densely populated areas, as opposed to a market such as Texas, where there are open tracts of land. A wind farm in a densely populated area necessitates a more powerful turbine, so Ontario is well suited to the larger designs coming from Europe.

Now that Ontario's domestic content requirements have been lifted for future procurement programs, how will Senvion's manufacturing strategy be affected?

While the Green Energy Act mandated companies to source their supplies within Ontario, the volume of work was so high that it was advantageous to manufacture locally. We are seeing great improvements in cycle times and capabilities in our Ontario plant. However, in order to maintain these facilities, we need a strong domestic market that will complement our projects outside of Ontario. While we are looking to supply components for other regional markets, we need a strong domestic pipeline to ensure continuity of production.

How does the landed cost of an Ontario-produced turbine or blade compare to that of a component manufactured outside the province?

The total cost of a turbine depends on the location to which it is headed, as well as the type of blade. We would like to have one major order to allow us to kick start production of 3-MW turbines in Ontario; with that, we will have a platform that uses blades that are 50 meters or longer. Longer blades are much cheaper to manufacture locally because the transportation costs are so high.

The Ontario Power Authority is scaling back on its wind procurement program

in the upcoming Large Renewable Procurement process. With around 300 MW to be procured, are there enough domestic opportunities to sustain a manufacturing base?

The fact that there are fewer megawatts for wind energy on offer will certainly present a challenge for the province to sustain a manufacturing base for renewable energy. We have yet to see who will be able to adapt to these changing requirements, and it might not be enough to sustain every manufacturer in Ontario. My hope is that there will be projects that did not get approval or faced serious delays in previous procurement programs get recycled, so that we will have more than 300 MW per year to work with.

Ontario's anti-wind backlash is usually based on community concerns surrounding noise emissions and other environmental issues. How much of that is the manufacturer's responsibility to address? What is Senvion doing to address some of these concerns in its design process?

From our home base in Germany, we have learned that noise emission is a critical factor in wind farm development, and Senvion has developed turbines with some of the lowest noise values in the industry. In any case, there always has to be cooperation between developers and manufacturers when it comes to addressing these issues. For example, Senvion is involved in a unique project called Gunn's Hill in Ontario with Prowind, a wind developer; the project is co-owned by the Oxford Community Energy Co-op and will allow its members to directly benefit from the wind farm's revenues.

What role do you see wind energy playing in Ontario in the future?

Wind can be a great contributor to Ontario's energy mix in the future. Of course, it cannot be the only source of energy, but in conjunction with other sources it can be a very secure form of energy. The production costs of wind are low because it is essentially a free resource, and the maintenance of wind farms will provide long-term jobs. This is especially true in Ontario, where the phase out of coal-fired power plants will need to be substituted by other forms of green energy. •

CLOSING THE FUNDING GAP

Financing Power in Ontario

●●● Ontario’s renewable energy sector has undergone an intense ramp-up period, and other facets of the province’s economy are beginning to familiarize themselves with what this development could represent in terms of investment opportunities. Despite this degree of unfamiliarity, renewable energy developers have a few domestic options for financing their projects.

Sean Durfy, president and chief development officer at Northland Power, one of the province’s largest independent power producers (IPPs), believes the key aspect is to have long-term power producer agreements (PPAs) attached to your asset. “With 17 projects and 26 years of experience, the banks are very comfortable with us as an IPP developer. There is a lot of appetite by the banks and equity to get involved in projects with the right company,” he said.

While Northland Power is a well-known IPP, the financing environment for smaller-scale developers is more restrictive. Banks and pension funds show little interest in solar and small wind farms, leaving smaller lenders to fill the investment gap.

CIT Corporate Finance, Canada, Energy and Infrastructure has been involved with the financing of over 15 renewable energy projects and

directly lent several hundred million dollars to projects that have borrowed upwards of \$1 billion. “Given the PPAs that underlie these projects from what is essentially a government agency, we see that returns are there,” explained Terry Parco, managing director at CIT. “The economics of the energy market in Ontario is driving the pricing down on these contracts. As the industry develops and becomes much more efficient, the price paid in the contracts is declining so people have to become more efficient in driving their projects in order to get more financing.”

The company recently underwrote the 10-megawatt (MW) Silvercreek Solar Park in Ontario. Corpfinance International (CFI) has been providing both financing and financial advisory services to independent power producers for more than two decades. “The appetite of Canadian lenders continues to grow in wind and solar financings as their experience increases,” said Christopher Ball, executive vice president at CFI. “With respect to solar, the industry has seen some recent maturation in Canada through reduced equipment costs and increased reliability. Both factors along with more operating experience have provided lenders comfort in providing financing to this sector.” •



CIT
Put Knowledge to Work®

Providing customer focused financing solutions for the middle market, including renewable energy businesses.

cit.ca

CIT Corporate Finance, Energy & Infrastructure

Contact:
Terry Parco **Murray Eastwood**
 416.507.5015 416.507.5083
terry.parco@cit.com murray.eastwood@cit.com

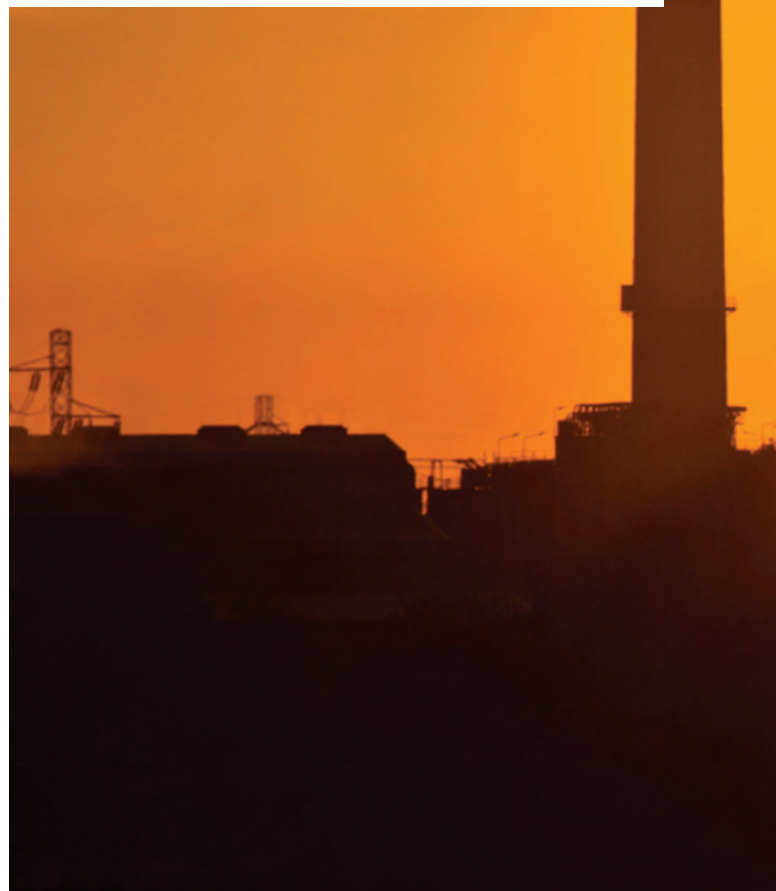




Image: Armour Valve



TP



ME

Terry Parco & Murray Eastwood

TP: Managing Director
ME: Senior Director

**CIT CORPORATE FINANCE,
CANADA, ENERGY AND
INFRASTRUCTURE
DE AUTOPARTES (INA)**

●●● **Can we begin with a brief overview of CIT Corporate Finance, Canada and your work in energy and infrastructure?**

TP: CIT Corporate Finance, Canada is involved in many different spaces. We look at broad range of project financing within the Canadian marketplace, and traditionally have focused on energy and infrastructure. Historically, CIT was more active in infrastructure as an advisor and arranger of debt, but more recently with the reduction in number of DBFM projects and continued strong competition we have carved our own niche in the renewable energy space.

TP: In the renewable energy space, we have found that small and medium-scale projects do not attract larger lending institutions yet are still high-quality projects in need of financing. Since the Green Energy Act came into effect in 2009, we have been involved in the financing of over 15 projects. We have directly lent

several hundred million dollars to projects that have borrowed upwards of \$1 billion. On very large projects, we tend to act as a participant but have also arranged club transactions. Our real strength lies with projects that we can finance on our own in the range of \$10-\$30 million.

Can you give us an example of a successful project in Ontario that CIT financed itself?

ME: For the Silvercreek project, which is a 10-megawatts (MW) solar farm, its developer had very limited experience in developing this type of project. The individual partnered with an experienced engineering group, formed an equity group, and canvassed the market for construction and term financing. CIT fully underwrote the construction and term of the project. Silvercreek is currently in construction and we have syndicated part of the exposure. The project was a great opportunity because it was in the midmarket range.

As wind and solar are still a very small portion of Ontario's generation matrix, what are some of the challenges associated with participating in these projects at this early stage?

TP: There are enough projects worldwide to demonstrate that the technology works and the projects can deliver. Given the PPAs that underlie these projects in Ontario are from what is essentially a government agency, they deliver acceptable risk-adjusted returns. The economics of the energy market in Ontario is driving the pricing down on these contracts.

Renewables have high costs upfront. Will these costs decrease over time?

ME: The high upfront costs relate mainly to the structure. For nonrecourse debt, lenders are reliant on the project, which requires a lot of costly due diligence and thoughtful structuring. Private placements tend to have lower upfront costs but less flexibility in terms of refinancing. Then there is an ebb and flow of the bank market depending on how aggressive bank lenders want to be.

TP: A lot of the projects that we have done have been long-term fixed rate debt, a portion of which we may syndicate to institutional lenders. We also have a floating rate product that we can swap to fixed rate with the borrowers to provide them inter-

est rate protection, yet results in a lower overall interest rate and greater flexibility to refinance.

What type of investor appetite exists for renewable energy projects in Ontario?

TP: There is not a very large public market for these activities. Some funds on the equity side are actively pursuing the larger scale projects, while on the debt side it is primarily private placement activity.

ME: We have seen one large solar project that was debt rated by Dominion Bond Rating Service. If the debt is rated, there is a pretty active market for that investment. This market was developed in the PPP world where ratings were added to pure private placements, making investors much more comfortable.

What trends are you paying attention to in the renewable energy space in Ontario?

TP: In Ontario, the size and number of projects are declining. Although the province has committed to issuing about 200 MW a year of renewable energy contracts, we are seeing fewer, large-scale 10-MW projects and more aggregation of smaller projects. This plays to our strength with smaller projects.

ME: Another trend we are seeing that is causing some concern is the complexity of ownership. The introduction of community ownership, involving cooperatives with little to no experience developing financing or the inclusion of First Nations, has implications for financing. Community ownership has been the basis of contract awarding by the OPA.

TP: Often with community ownership requirements, cooperatives do not have the capital necessary to develop the project. For several projects, we have introduced these groups to an experienced developer that we have worked with who knows how to raise financing.

What role do you anticipate the company playing in energy and infrastructure going forward?

TP: CIT's shorter-term focus will continue to be renewable energy in Ontario. We would like to expand that beyond solar and wind and look at alternative energy sources like waste wood energy, biomass, and small-scale hydro. •



Sean Durfy

President and Chief Development Officer
NORTHLAND POWER

●●● Can you give us a brief overview of your operating projects in Ontario?

As Northland, we are very proud that we provide clean and green energy and always have. For over 26 years, we have developed expertise in taking complex problems and providing solutions in a socially responsible way. The majority of Northland's portfolio in Ontario is thermal gas and complex thermal with five sites, several solar projects and a new wind project on Manitoulin Island.

Northland's projects in development mirror the province-wide shift from cheaper sources of generation to renewables. Will this shift be a priority for Northland going forward?

The three technologies that we will deploy strategically for the foreseeable future are thermal gas, wind and solar. We are also developing a pumped hydro storage project in Marmora Ontario, which is a peaking

plant. In order to build out these types of technologies, there needs to be an economic incentive until the technologies achieve grid parity. Wind is not grid parity and costs more to deliver. Its capacity to create electricity is only 28% to 35% efficient – it only works when the blows. However, there are financial incentives to renewable power, particularly in terms of not putting an economic strain on the environment like coal. In Ontario, there is discussion around whether wind is the right way to increase electricity supply. The long-term effects of nuclear and coal on the system massively outweigh the cost to economically endorse wind. Solar is much more efficient in southern destinations, like Chile and Mexico, where land and sunshine are abundant. As the cost of solar technology decreases, it becomes more economical over the volatility and variability of wind. While solar and wind are never going to become 100% of the province's portfolio, they can be 10% to 13%. However, the government has to have the mandate and the fortitude to continue its support from an economic perspective.

Northland recently closed a \$240-million financing deal with a consortium of foreign companies. How would you characterize the types of financing options available to IPPs in Ontario?

Northland, unlike a utility building out renewable plants, uses non-recourse project financing for all of our projects, meaning that they are financed based on the credibility of the project versus the balance sheet of an entire company. There is an exceptional amount of diligence, understanding and confidence that goes into these projects. For example, Northland's Gemini project in the North Sea was the world's largest, non-recourse project financed renewable project with a capital cost of approximately CAD\$4.3 billion. For Northland's ground-mount solar program, the four clusters were financed in two tranches of equity and debt in the amounts of \$379 million and \$240 million.

What type of appetite exists among the Canadian investment community for renewables?

Northland has never had a problem financing its projects, nor have its competitors. The key aspect is to have long-term PPAs or power off-take commitments attached to

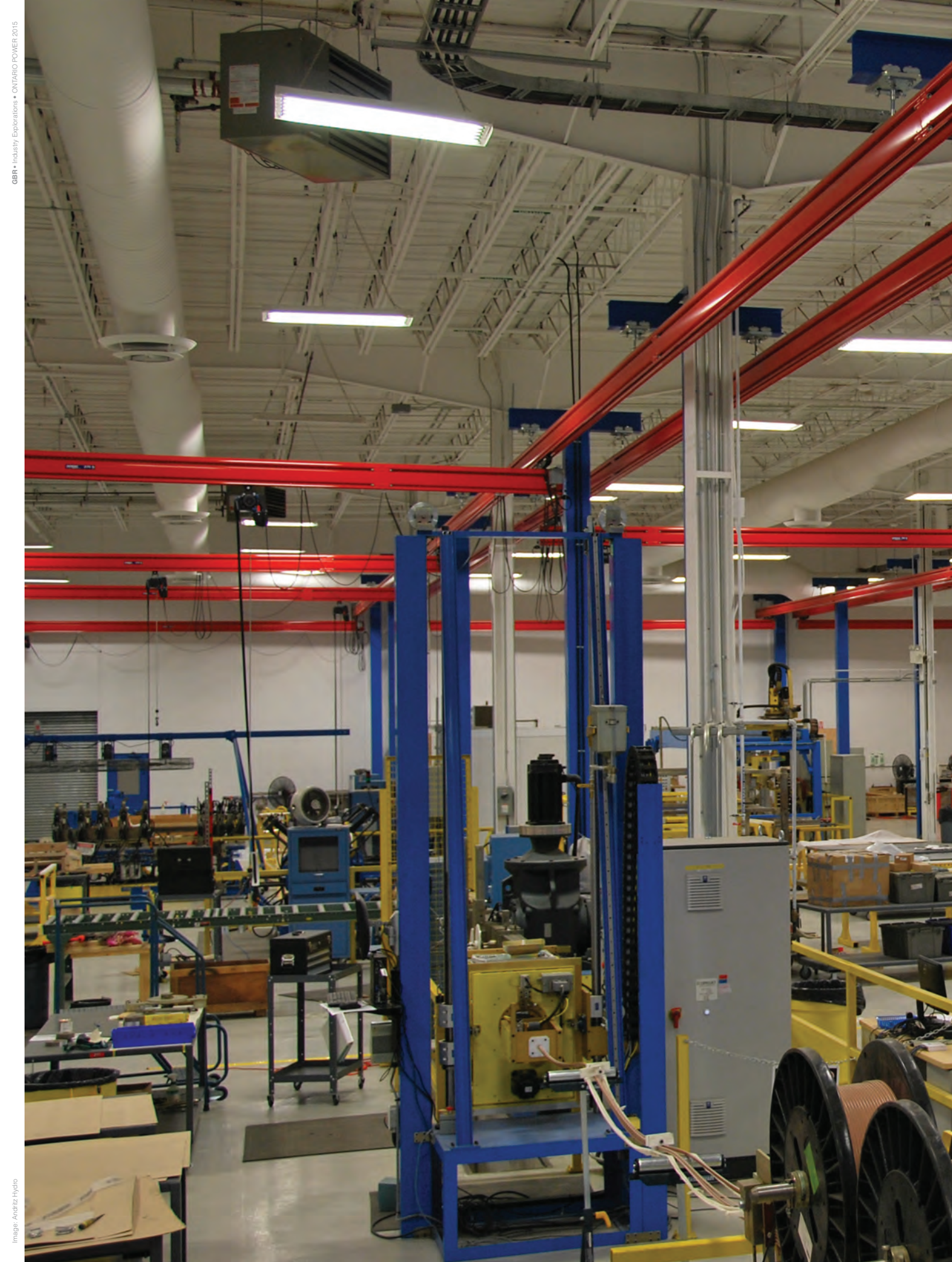
your asset. With 17 projects and 26 years of experience, the banks are very comfortable with Northland as a power developer. There is tremendous appetite by the banks and equity participants for renewable power projects.

What role should wind and solar play in Ontario's electricity mix?

In the next decade, Ontario will refurbish its nuclear plants, which will tighten supply. We need to have a balance of renewable projects with gas and nuclear. Wind and solar cannot be baseload, but other types of power are needed to supplement the grid. For example, in Marmora, Northland is developing a pumped storage project out of an old open-pit mine as a peaking load facility. In the event of a shortage, this is an actual renewable water solution that the system administrator can call online in minutes and be modulated with a four-hour capacity. It is also located in an area of Ontario where there is an electricity constriction during certain times of the day. The Marmora project has attracted international interest because it could be applied to old mine sites.

What are Northland Power's hopes in Ontario for the next two to three years?

Our Grand Bend wind farm is a 100-MW project that we have pioneered as a 50-50 partnership with First Nations. This type of partnership with First Nations or municipalities is going to become table stakes in Ontario. In the northwestern part of Ontario, increased mining activities and infrastructure changes are going to increase energy needs and we want to be the go to power developer in this region. We also hope to see traction on Marmora, which would add a new peaking plant in a renewable fashion. We are additionally looking at a combined heat and energy project on the lakeshore in Toronto, as well as completing construction on our solar portfolio next year, so the entire plant is in commercial production. We are very busy here in our home province, where it all began for Northland Power 26 years ago by world class entrepreneur Jim Temerty! •





PRESERVING PREVIOUS ASSETS NUCLEAR, HYDRO, THERMAL, AND CONSERVATION



“It remains to be seen how many new gas-fired power stations will be built. Hydro still holds potential for development. Also, we cannot discount the possibility of new nuclear builds, as new technologies not based on enriched uranium might appear. The energy surplus in eastern Canada means that we may not see many new builds in the near-term, and the loss of coal can be easily replaced by excess hydropower from Quebec, as the provinces move towards an interconnected grid.”

- Frédéric Schenk,
Group Vice President/Business Manager, Industrial Services,
SGS Canada Inc.

REFURBISH AND REVITALIZE FOR THE LONG-TERM

Nuclear and Hydro in Ontario

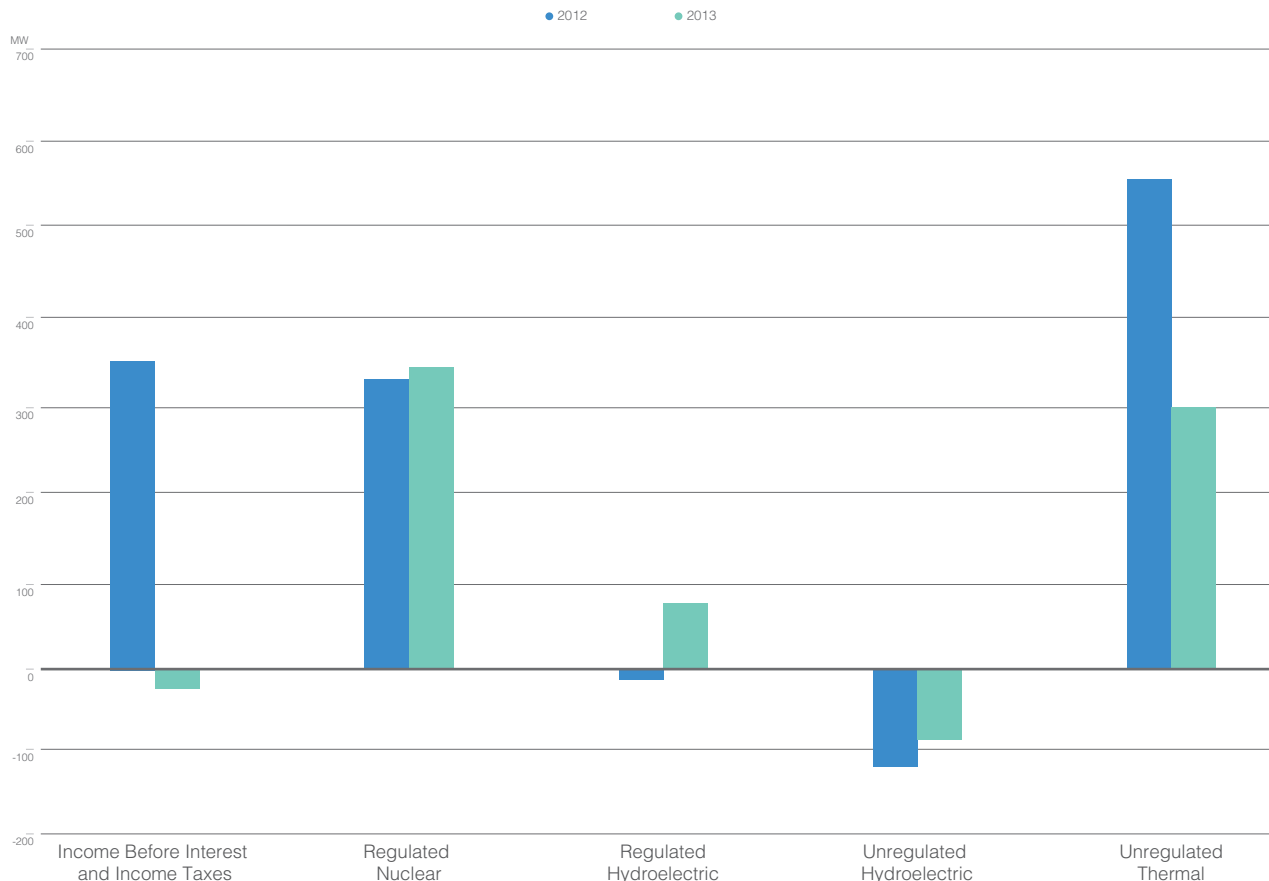
●●● Ontario may not be building new nuclear facilities, but the Long Term Energy Plan did include plans to refurbish two of the province’s three nuclear generating stations in 2016: the 6,300-megawatts (MW), Bruce Power generating station and the 3,512-MW Darlington station. The remaining station, Pickering, will likely go offline by 2020.

Both Ontario Power Generation and Bruce Power face public scrutiny during refurbishment, which has a troubled history in Ontario. Previous refurbishments at Pickering cost \$2.6 billion, or double the target cost of \$1.3 billion. The Bruce Power station also experienced cost overruns during its last refurbishment.

James Scongack, vice president, corporate affairs at Bruce Power, is confident that the company has learned lessons from past projects. “When we refurbished Units 1 and 2, they had been out of operation for 20 years with no expectation of being put back into service,” he said. “The remaining units at the Bruce site are all operating units – we are very familiar

ONTARIO POWER GENERATION'S REVENUES (2013 AND 2012) \$ MILLIONS

Source: Ontario Power Generation, 2013 Annual Report Association



with them and have invested in their maintenance.”

While the specifics and time frames of the refurbishment projects are still being decided, the province’s investment in the two nuclear facilities is welcome news to the domestic service and supply sector. “We would have liked to see a new build in the Long-Term Energy Plan, but we understand the province is facing high debt as well as lower demand for power because of the recession,” said Dr. Ron Oberth, president of the Organization of Canadian Nuclear Industries. “We recognize that the number one priority was to invest in its existing assets.”

Longer-term, nuclear supply and service companies are looking to export their expertise to countries that are investing heavily in nuclear energy. Candu Energy Inc., which manufactures a unique heavy water reactor, recently signed a \$1.5-billion deal with China Nuclear Power Engineering Company Ltd. to build two reactors in Romania. AREVA Canada Ltd.’s Ontario office is working in Romania on a filtered venting system, a niche technology from the light water market and imported to the heavy water market.

The sector is receiving support from the provincial and federal governments in the form of trade missions overseas.

●●● Hydroelectricity

Accounting for 22% of Ontario’s energy supply mix, hydroelectricity has provided clean power to the province since the 1890s. According to the Long-Term Energy Plan, Ontario’s hydroelectricity portfolio will comprise 9,300 MW by 2025. The bulk of this capacity will be from the 440-MW Lower Mattagami River project, a \$2.6 billion investment from Ontario Power Generation (OPG) in Northern Ontario.

OPG owns a fleet of 65 hydroelectric stations, half of which have been in service for over 80 years. Infrastructure modernization represents a significant opportunity for Ontario’s hydro service sector. Voith Hydro Inc. worked with OPG to supply components to the utility’s DeCew Falls 1 hydroelectric station, as it had in 1904 as the original turbine manufacturer. “Projects like DeCew Falls

1 involving older units, both Turbine and Generator, are a very large part of Voith Hydro’s activity in Ontario,” said John Peden, vice president, sales and marketing at Voith Hydro.

At Lower Mattagami, six new units will be added; three at existing stations, with the remainder to be new units. Andritz Hydro is supplying three propeller turbines to three of Lower Mattagami’s new plants, but the company is expecting to see more refurbishment activity in the future. “The hydro market is shifting more towards service and rehabilitation as there are fewer large-scale hydro projects being commissioned,” said Yves Bourget, general manager, service and rehabilitation at Andritz Hydro. “Canada alone is generating nearly 80,000 MW of hydroelectricity with a large, aging fleet. We see huge opportunities for service and rehabilitation going forward, not only in Canada but also globally.”

Both Voith and Andritz have opened facilities in Ontario to manufacture hydropower coils for the domestic

and international markets. “Before we established a manufacturing presence in Peterborough we had no choice but to procure our coils from our facilities in Brazil,” said Andritz’s Bourget. “The new coil shop is already in operation, producing two sets of coils for two different customers. In 2015, we plan on implementing our bar manufacturing in Peterborough, making Ontario our North American center for generators.”

Another avenue being explored by Northland Power is in the form of pumped hydro storage. The Marmora Pumped Hydro Storage project, currently under development, is the first of its kind in Ontario. Pumped storage projects generate energy by moving water between two reservoirs at different elevations. “Pumped storage is a great solution for grid reliability and stability, providing one of the few large scale, long-term proven and affordable means of deploying electricity,” said John Peden of Voith Hydro Inc. There are over 140 gigawatts of pumped storage in operation globally. ●



The wise use of power – electrifying.

Hydropower makes up a considerable share of the global energy generation mix. To use this renewable resource to an optimum, Voith Hydro offers you more than just products, services and solutions. We combine our experience and expertise with the latest patented innovations in energy generation from water. But we go even further: we believe that hydropower must be part of the solution of global energy demand and must be done in a technologically, environmentally and socially sustainable way. We pursue this beyond our technological innovativeness, taking your business where it belongs – to the leading edge – for the wise use of power.

www.voith.com

A Voith and Siemens Company

VOITH
Engineered Reliability



James
Scongack

●●●
Vice President, Corporate Affairs
BRUCE POWER

●●● **The refurbishment of Ontario's nuclear reactors is an integral component of Ontario's December 2013 Long-Term Energy Plan. What are the priorities for Bruce Power in the near term when it comes to refurbishing the Bruce facility?**

The Ontario government's revised Long-Term Energy Plan clearly articulates a role for the refurbishment of the remaining six units on the Bruce site. This is an important policy position on the government's part, as it outlines its vision for Ontario's nuclear future. It is now our responsibility to put this policy into action as we work to put arrangements in place, starting with Ontario Power Authority (OPA).

Nuclear refurbishment projects have had a somewhat turbulent history in the province, with delays and cost overruns hampering the process. How does Bruce Power envision itself remaining on track and on budget as much as possible?

It is important to note that, while there are a number of lessons that we can learn from previous refurbishments, there are also successes that we can build on. One of the unique aspects of the nuclear industry is how extensively we focus on lessons learned in our core operations. For example, in 2011 Bruce Power launched a project on our Unit 3 reactor called West Shift Plus where we carried out maintenance activities on each of the 480 fuel channels on the reactor, extending their lifespan by nearly a decade. It was a 6-month, \$300-million life extension outage that we delivered on time and within budget. Moving forward, all of the work that we must undertake in the refurbishment process is that which we have already achieved in other projects in our 13 years of operation. When we refurbished Units 1 and 2, they had been out of operation for 20 years with no expectation of being put back into service. The remaining units at the Bruce site are all operating units – we are very familiar with them and have invested in their maintenance to this point. One of the communications challenges faced by the nuclear industry is that our investment programs are usually in the realm of hundreds of millions of dollars, which can leave people with the impression that this will lead to a high cost of power. Even taking into account the capital requirements on nuclear plants, the cost

of nuclear power is still competitive because it operates very reliably over a long period of time and produces large volumes of electricity.

As one of two nuclear power producers in the province, can you comment on the government's decision to defer new nuclear builds?

Our focus is 100% on the safe, reliable operation and life extension of our units. As outlined in the LTEP, the next step for us in Ontario is to successfully deliver on the refurbishment of existing units at Bruce and Darlington. This mandate is not influenced by the government's decision not to build any new reactors in the foreseeable future.

In February 2014 Bruce Power launched Ontario's Nuclear Advantage, an initiative that aims to highlight the strength and benefits of Ontario's nuclear industry. What do you hope to achieve with regards to communicating the role that nuclear energy plays in the province?

Bruce Power's approach to communication is a simple one: we want to be able to provide factual information to the public about the role that we play in Ontario's energy system. There are still a number of myths about nuclear power. For example, people may not be aware that we fund our waste management and decommissioning costs internally without passing these costs along to ratepayers, which is often one of the primary objections to nuclear power. Based on our experience, we find that the public reacts more favorably to nuclear energy if it has a better understanding of the facts.

What is the long-term outlook for Bruce Power in Ontario?

When Bruce Power was formed in 2001, we were the first private operator of a nuclear facility in Canada. We inherited a site that had a short lifespan and was not operating at full capacity. At the same time, we began Canada's largest public-private partnership by operating an asset owned by the people of Ontario. Over the last 13 years, we have invested over \$7 billion in the assets and built a reputation that we are very proud of. As we look forward to the decades to come, we have established a firm foundation from which we can continue to innovate on the nuclear side while remaining a leader in the province. •



Ron Oberth

●●●
President

THE ORGANIZATION OF CANADIAN NUCLEAR INDUSTRIES (OCI)

●●● **Can you give us a background to the OCI and its role within Ontario's energy industry?**

The OCI is an industry trade association with over 190 members who are suppliers of equipment and services to the Canadian nuclear industry as well as offshore nuclear markets. Most of our members are based in Ontario, the heartland of the Canadian nuclear industry. We also have some international members who are interested in serving the Canadian nuclear market.

Our organization has three main mandates. First, we support our companies in offshore markets by organizing trade missions to countries such as the United States, India and China. Second, we assist our members in making connections within and better understanding the domestic market. We organize trade shows at nuclear sites, as well as workshops and discussion groups to give our members an opportunity to interface with their customers. Third, we

advocate across the province on issues that affect the nuclear industry. OCI also works closely with other associations such as the Ontario Energy Association and the Canadian Nuclear Association.

What have been some of the key issues on the agenda for OCI in the past six months?

The Long-Term Energy Plan (LTE Plan) was a big issue. OCI made a very thoughtful and well-researched submission to the plan using our research to show that continued reliance on nuclear power would result in about \$60 billion in economic benefits over 20 years, creating more than 100,000 high-quality jobs and reducing greenhouse gas emissions by over 100,000 tons. We are also happy that the province has made the decision to proceed with the refurbishment of 10 units. We would have liked to see a new build in the LTE Plan, but the province is facing high debt as well as lower demand for power because of the recession. The decision for refurbishment came with a caveat that the first two projects had to be on time and on budget, and we are working effectively to ensure this is the case.

What was your reaction to the government's decision not to build new nuclear in the LTE Plan?

The province's top priority was to invest in its existing assets. Bruce and Darlington are good assets, and we are pleased that they are going to be refurbished. Building new reactors would have been attractive, but has been deferred due to soft demand for power. The license to prepare the site for the construction new units at Darlington was granted to OPG by the Canadian Nuclear Safety Commission in 2013. This Site Preparation License will be retained and can be reactivated at a point in the future when our economy begins to generate more demand for power. This was an economically prudent decision. OCI's submission to the Long-Term Energy Plan was that we should retain nuclear as a large portion of the supply mix. Right now nuclear produces 50% of the energy in the province, but is forecast to decrease to 40% with the addition of new wind and gas generating plants.

What supply mix ratio can we expect to see when the Pickering station comes

offline in 2020?

Nuclear will drop from about 12,000 MW to roughly 9,000 MW. We are losing market share in terms of capacity but our energy production ration will remain high because nuclear runs all the time. We currently produce more than 50% of the electrical energy although nuclear power represents only about 35% of the province's installed capacity. We think the Long-Term Energy Plan is prudent; however, our concern about gas is that it is currently relatively cheap but has historically had volatile prices. The price of North American natural gas will rise in the future. Considering current severe weather patterns, our global climate is changing in a negative way. While gas is more efficient than coal, gas is a source of greenhouse gases and threatens our planet.

Within Ontario how strong is the anti-nuclear movement and how can the industry respond to these concerns?

The Clean Air Alliance is one group advocates for shutting down nuclear and importing power from Quebec, but this would relinquish some of our energy sovereignty and export jobs to Quebec. The nuclear sector creates sustainable high-value jobs in the province and the decision to refurbish existing assets is good for the economy. Other anti-nuclear groups advocate for an increased reliance on solar and wind.

In a post-Fukushima world, how do you see nuclear energy playing a role on a global level?

Whereas Ontario will be investing in nuclear modestly, countries like China and India are rapidly investing in nuclear. Right now there are 435 operating or operable reactors globally, as well as 71 reactors under construction, and another 172 power plants planned, including 57 in China, 22 in India, and 31 in Russia. Germany on the other hand has walked away from nuclear and is taking a big risk that wind and solar energy can sustain a highly industrialized country. ●

Keith Pomeroy, Yves Bourget & Dave Ballantyne



KP



YB

●●●
 KP: Vice President, Sales and Marketing
 YB: General Manager, Service and Rehabilitation
 DB: Senior Vice President

ANDRITZ HYDRO

●●● **Andritz Hydro has been actively investing in Ontario over the past few years, with the acquisition of AFI Hydro in 2014 and the opening of a coil manufacturing facility in Peterborough. What is the strategic importance of Ontario to the company?**

KP: The Ontario market is one of the top five hydroelectric generating provinces in Canada. Andritz Hydro's acquisition of GE's hydro assets allowed us to build on GE's hundred-year legacy in Ontario. The technology for generators is a key component of Andritz Hydro's North American market. We have decades of engineering expertise built up in Ontario and are keen to exploit this expertise on a global level.

YB: One of Andritz Hydro's key accounts is Ontario Power Generation (OPG), which has a large fleet of existing equipment. OPG has a large tactical investment program over the upcoming years to rehabilitate their hydro installations and we are very involved in this process as sometimes the original equipment manufacturer. Our

recent acquisition of AFI Hydro creates synergies to enlarge our product and service offering, especially in gate equipment. Recently, Andritz Hydro also completed two generator rewind projects for Brookfield Renewable Energy at Aubrey Falls and Wells Generating Stations both located in Ontario. Brookfield is another key client for Andritz Hydro's Service and Rehabilitation division and we have enjoyed a successful relationship with them for quite some time.

DB: AFI Hydro began in the early 1990s as a custom steel fabricator. We entered the hydro market in 1994 and completed our first project with OPG in 1996, becoming their exclusive gate supplier. Andritz's acquisition of AFI Hydro gives us the resources to expand beyond Ontario into the rest of North America.

What is unique about the coil manufacturing facility in Peterborough and how does it help to strengthen Andritz Hydro's presence in eastern Canada?

KP: The essence of our business on the turbine and generator side is our expertise; in Peterborough, we employ nearly 50 engineering and technical staff, which is the core of our North American Generator Centre. Our older facility was not suitable for expansion and far from this engineering center so, Andritz decided to build on that existing engineering expertise by adding generator coil manufacturing capabilities.

YB: Since our 2008 acquisition of GE Hydro, Andritz has enlarged its product and service offering in terms of large hydro machines. Before we established a manufacturing presence in Peterborough – even though our generator-engineering group was based to this location – we had no choice but to procure our coils from Andritz's facilities in Brazil. We were at a slight disadvantage compared to our competitors in terms of delivery. The best way for us to proceed was to implement a coil manufacturing shop close to our engineering base in Peterborough. The new coil shop has been in operation since spring

2014 and has already produced coils for different customers. In 2015, we plan on implementing a new stator bar production line again in Peterborough, making Ontario the base of our North American Generator Centre.

Andritz Hydro is supplying three propeller turbines and generators to OPG's Lower Mattagami project in Ontario. Why are propeller turbines best suited to this project as opposed to Kaplan turbines?

KP: The Lower Mattagami project is comprised of four distinct plants, and Andritz Hydro was contracted to supply one additional machine for three of these plants. The machine is a diagonal runner design, which can achieve a high peak efficiency. By adding an additional machine to the existing plants, the site now has the ability to produce more power when needed.

What potential do you see in Ontario for small hydro development?

KP: There are a number of small hydro sites in Ontario that have been developed, although they may not be high on the public's radar. For example, there have been a number of recent developments on the Trent-Severn Waterway where there is an existing navigation dam and lock but no generation facility. A number of private developers have acquired rights beside the existing dams and installed smaller machines, and Andritz has worked with these developers to supply a particularly efficient machine called an ECObulb. Also, we recently signed a contract for a redevelopment project at Chaudière Falls in Ottawa, one of the oldest plants in Canada. DB: While we do work closely with OPG, we also work with a number of smaller utilities in Ontario. There is a small run-of-river project in St. Catharines, Ontario where the utility is installing a four unit station. Andritz was recently awarded the contract, which consists of four spillway gates and four wheel gates.

Ontario's Long Term Energy Plan anticipates hydro generation capacity to remain relatively flat over the longer term. What type of opportunities does Andritz see in Ontario going forward?

KP: While we do not see a potential for large new machines in Ontario, Andritz's service and rehabilitation division is ex-

pected to be very active in the refurbishment and upgrading of existing hydro plants. There are several hundred hydro plants in Ontario, and most are operated by our two main clients: OPG and Brookfield Renewable Energy. We are now able to assist in the refurbishment of the plants themselves as well as the gates.

YB: The hydro market is shifting more towards service and rehabilitation as there are fewer large-scale hydro projects being

commissioned. Canada alone is generating nearly 80,000 megawatts of hydroelectricity with a large, aging fleet. We see huge opportunities for service and rehabilitation going forward.

DB: The gate business will also be very strong over the coming years as AFI Hydro incorporates the resources that Andritz can provide us. Most of our market share will come from rehabilitation over the next ten to fifteen years. •



Your partner

for renewable and clean energy






Water is generally a source of fascination and inspiration. But to us at ANDRITZ HYDRO, it means even more because it represents a constant challenge to create up-to-date technological innovations.

Utility companies from all over the world value our know-how and commitment, and trust in the safety and reliability of our tailor-made energy generation solutions. From equipment for new, turnkey hydropower plants, and the refurbishing and overhaul of existing installations, to comprehensive automation solutions.

We focus on the best solution – from water to wire.

ANDRITZ HYDRO Canada Inc.
 keith.pomeroy@andritz.com
 Phone: 514-428 6935
 Fax: 514 428-6710
www.andritz.com



John G. Peden

●●● Vice-President, Sales and Marketing
VOITH HYDRO INC.

●●● **Voith Hydro's history in Ontario dates back over 100 years. What are some of Voith's main accomplishments in the province?**

Voith Hydro's history in Ontario dates to 1898 with the installation of the first turbines at Decew Falls, which is now the longest continually operated station in Canada. In addition, Voith Hydro supplied turbines to the Ontario Power Co. station at the base of the Niagara's Horseshoe Falls. Since those early days in Ontario's Hydro history Voith Hydro has established a world class location in Mississauga with the acquisition of the previous Westinghouse Hydro Generation Service facility, which has a long history of generator service and modernization dating back more than 40 years.

The combination of the Voith Hydro Turbine technology and the Westinghouse Generator technology has placed Voith Hydro in a unique position in the industry in. This development accompanies the overall global strategy of Voith Hydro to serve the market

as a full-line supplier for hydropower plant equipment by covering the entire life cycle and all components of large and small hydropower plants: from generators, turbines, pumps, electrical and mechanical power plant equipment and automation systems to services including spare parts deliveries and maintenance work.

What is the strategic importance of Ontario to Voith's national and international growth objectives?

First, the LTEP estimated that 46 percent of the province's electricity production will come from renewables in 2025, and hydroelectricity is the main contributor to Ontario's renewable energy portfolio. The planned addition will increase the province hydroelectric portfolio to 9,300 megawatts (MW) compared today to 8,400 MW. Secondly, like for the rest of Canada, the hydro fleet in Ontario is aging and will need to be modernized, which is a special capability of Voith. Thirdly, it is clear that Ontario is looking at its neighbors as a cheaper alternative to new construction or modernization of nuclear powerhouse for a long-term electricity supply. Ontario would benefit from its large interconnection capacity with its neighbors.

And finally, Voith has developed a new technology called StreamDiver®, which is a compact and modular turbine-generator unit developed to tap the hydroelectric potential of low head site. This technology provides hydro developers with the opportunities to develop projects within Ontario's FIT (Feed-in-Tariff) program. In fact, until recently, low head sites were regarded as uneconomical and therefore remained untapped. With the StreamDiver®, Voith Hydro offers an attractive solution that meets all ecological requirements for such locations and is suitable for sites where hydropower generation was estimated to be uneconomical so far.

Why did Voith Hydro decide to locate its Centre of Excellence for Coil Manufacturing in Mississauga, Ontario?

The decision was made for many reasons. The facility in Mississauga has been in operation in three locations in the Toronto area with a steady growth curve for over 40 years. The in house skills and experience needed for the construction of high quality coils was already located in Mississauga as well as the required support functions such as engineering and field service. The coils

produced in Mississauga are a key component in the rehabilitation of Hydro Generators as well as the construction of new generators. Finally, it facilitates the ability to offer a full range of products and service solutions from one integrated location.

Voith Hydro recently installed a 784-MW turbine generator unit at the Xiluodu dam in China. How close are we to achieving a 1-gigawatt (GW) unit and what will this mean for the efficiency of hydroelectric power?

With a rated output of 855.6 megavolt-ampere, the Xiluodu power unit is producing more power than comparable Voith machines such as Guri, Itaipu or Three Gorges. Since Voith engineers have been able to improve every detail of the turbines' and generators' components, they also increased the machines' efficiency by applying sophisticated insights into technological methods. Using hi-tech insulation systems of coils and bars, inventing better materials, and executing a highly precise assembly are many small steps towards the one aim: to break the "1-GW wall". There is high probability that the first 1-GW machine will go into operation in China, as current projects with identical capacity are underway in the country.

When Xiluodu hydropower plant was fully connected to the grid in June 2014, it started with a nominal capacity of 13.86 GW. The plant will help to reduce air pollution thanks to the renewable electricity production, and the annual consumption of coal will be reduced by 41 million tons. In addition, exhaust gas emissions will be reduced by nearly 150 million tons of carbon dioxide, 480,000 tons of nitrogen dioxide and 850,000 tons of sulfur dioxide per year.

Xiluodu can also deliver base load power in large quantity, as much as 14 large thermal or nuclear power plants working around the clock. As a matter of fact, hydropower technology can both meet the enormous future demand for electricity and meet the emission targets that our societies have committed themselves to.

Do you have a final message?

The ongoing modernization and uprating of the existing fleet in conjunction to the installation of new developments are both key opportunities for Voith Hydro in Ontario and will play a key role in supplanting fossil fuel power generation. •

FILLING SHORT-TERM SUPPLY

Thermal energy in Ontario

- Gas-fired generation is expected to comprise most of the province's short-term supply in the wake of Ontario's retirement of coal-fired power plants and the integration of renewables. However, the role of gas in the longer term is likely to decrease. The province's existing natural gas utilities currently provide 1,200 megawatts (MW) of electricity; the contracts for 75% of that capacity will expire by the end of 2018.

According to the Long-Term Energy Plan (LTEP), it is in Ontario's best interest not to depend too heavily on natural gas in order to hedge against price volatility. Instead, the Ontario Power Authority (OPA) has put forth the Combined Heat and Power Standard Offer Program to facilitate the development of cogeneration facilities up to 20 MW in size. Armour Valve, an Ontario supplier of components to the power generation industry, is working with a number of smaller cogeneration plants. "NOVA Chemicals, one of our larger customers in Ontario, is engaged in a study for a cogeneration plant that could represent significant opportunity for us," said Bernie Mletzko, area sales manager, Ontario north at Armour Valve. "The OPA is demanding that plants have greater operating flexibility and be available on a peak-demand basis. Most plants are required to have the capacity to cycle daily and this has taken a heavy toll on equipment reliability."

While there is interest in advancing cogeneration in Ontario, the market has not yet taken hold as expected. As Daniel Pearce, branch manager, power generation at Cummins Eastern Canada LP, explained: "The spark spread – the difference between the market price of electricity and its cost of production – in Ontario is so advantageous yet cogeneration has not taken off at an accelerated rate in the province. The OPA does provide incentives but the timelines associated with them are too short."

Thermal energy production in Ontario is not limited to combined cycle power plants. Ontario Power Generation (OPG) recently completed a project to convert its former coal-fired plant, Atikokan Generating Station, to a 100% biomass-fueled power station, the largest in North America.

The LTEP's emphasis on renewables poses challenges for energy-intensive industries in Ontario. The intermittency of renewable energy means that sectors like mining or data centers must have sufficient backup generation.

Aggreko Canada provides backup power to the mining industry in Ontario, and though the decline in commodity prices has affected production levels, the company continues to work closely with mining clients. "We are very interested in continuing to find

ways of driving down operational costs for our customers," said Asterios Satrazemis, president, Americas at Aggreko.

Ontario has also emerged as a preeminent destination for data centers, an energy-hungry industry that requires colder climates and political stability to host sensitive user information. Cogeco Data Services recently built a state-of-the-art data centre in Barrie with a secure backup power system in place. "All of our generators are N+1, and we have dual power to each rack, so we have full redundancy for both path distribution and supporting architecture if we want to take one offline," said Jeff Edward, vice president of data centers and operations at Cogeco Data Services. •



Avoid costly
valve replacement

Conval^{ING}
In-line repairable

Supplying Ontario's power producers for more than 40 years

1-800-268-3508
sales@armourvalve.com **Armour Valve**



BP

Benoit Parent & Daniel Pearce

●●●

BP: Executive Director, Power Generation Division and Nuclear Operations
 DP: Branch Manager, Power Generation
CUMMINS EASTERN CANADA

●●● Can you give us a brief introduction to Cummins Power Generation in Ontario?

BP: Cummins Inc. operates five different business lines in Canada, one of which is the Power Generation division. It builds generator sets using a Cummins engine and alternator. Cummins' power generation division is largely focused on working with data centers, for which Canada is a naturally fitting environment; other industries of focus are water and wastewater, large-scale construction, hospitals and utilities. Our work with utilities also encompasses the nuclear industry, where Cummins is involved in bidding on refurbishment or new build projects.

DP: Cummins' energy solutions business, which is part of the Power Generation division, is involved in cogeneration type applications in Ontario. The Ontario Power Authority (OPA) has a program to advance cogeneration technologies; however, the timeframes are difficult for any design-build company to meet. The utilities

sector is provincially funded, so the business opportunities come and go in conjunction with the level of funding available. The only public projects are end of life refurbishments. Large-scale construction and mining are other industries where we have been particularly active. In the mining sector, Cummins can add value in installing prime power systems.

Data centers are a large user of energy, and one of the market sectors that Cummins has defined as a major growth area. What is the significance of this market to Cummins?

DP: A data center can take different forms, especially when it comes to ownership. A user can either own a data center outright, rent the facility or use a cloud-based system, where data can be stored in various different locations. Cummins participates in all three segments.

BP: Users are increasingly turning their data over to third party operators. Also, many of the newer data centers are modular, or containerized, which are particularly helpful when a company needs to increase its speed to market or is operating in a remote location. These systems use shipping/marine containers to house the server and genset. Within the sector we see a certain amount of centralization of data, in which scenario, it is critical to have a backup site.

In a recent presentation, you described Canada as being a natural fit for data centers. Why is this the case?

BP: Canada is a natural fit for data centers by virtue of its geography: as uninterrupted power supplies and servers generate heat. Being located in northern climates means that users do not have to run air conditioning to cool the system as much. Another reason is electricity rates, which are substantially lower than in the United States. While other locations have cold climates and low electricity rates, Canada's other major advantage is that the government is stable, which is critical when dealing with the sensitive information housed in data centers. Canada also offers a very diverse electrical energy supply, generated from natural gas, hydro and nuclear sources.

How would you characterize Cummins' relationship to the nuclear industry in Ontario?

BP: Cummins is involved in the electrical refurbishment of nuclear power plants. We are a member of the Organization of Canadian Nuclear Industries and participate in numerous conferences on issues related to the industry, such as redundancy and safety. We have a highly specialized team that will do generator work. We are hoping to participate in the refurbishment plans of the Ontario plants. We are witnessing the rebirth of nuclear energy in Canada. We might see the same size of reactors, like the 1000 megawatts, and small modular reactors as well.

The Ontario government is updating its Combined Heat and Power Standard Offer Program with the goal of helping businesses to reduce energy costs by installing a cogeneration system. Is this a growth area for Cummins?

DP: It is surprising that cogeneration has not taken off at an accelerated rate; however, a number of factors inhibit the end user from installing a combined heat and power (CHP) system. First, the OPA does provide incentives but the timelines associated with the incentives are too short. Also, the most prospective market for CHP facilities in Canada is hospitals, but they receive an annual budget that can put limits on long-term spending for capital allocation. Hospitals would be the biggest benefactor of CHP systems. There is more potential to be found in the agriculture industry by installing them in greenhouses.

Where would you like to see Cummins Power Generation positioned in Ontario?

DP: In addition to the data center market, Cummins will be heavily involved in the construction and infrastructure sectors going forward. We would also like to expand into cogeneration, but every manufacturer faces similar challenges with the current market conditions, as the end user faces barriers in getting these projects off the ground.

BP: Cummins can bring a lot to the table from a safety and reliability perspective. When a customer purchases a Cummins unit, they are also benefitting from the company's service and support team. ●



LM



BM



NG

Liz McBeth, Bernie Mletzko & Natalie Ganesh



LM: Manager, Business Systems and Marketing

BM: Area Sales Manager, Ontario North

NG: Inside Sales Supervisor and Customer Care Coordinator

ARMOUR VALVE

●●● Would you mind giving us a little bit of background on your company and its operations in Ontario?

LM: Armour Valve was founded in 1971 as a small Quebec based company called Bro-Tek Inc. In 1977 the company changed its name to Armour Valve and, shortly thereafter, relocated its headquarters to Toronto. We also have a branch office with stocking capability in Calgary, with close proximity to major oil and gas industry interests. We supply valves and specialty equipment used in high-pressure, high-temperature, abrasive, corrosive, erosive, cryogenic, and other severe service conditions. We have been ISO certified continuously since 1997 and have a dedicated team of twenty seven employees in place to ensure the quality of both our products and services. The power industry represents a large part of our business in Ontario, including major power producers.

Can you tell us about your power cus-

tomers in Ontario?

BM: We maintain regular contact with the combined-cycle power plants and have, in the past, done a lot of work with Ontario Power Generation (OPG) in its coal-fired plants. A number of OPG's northern plants are being converted to biomass fuel and will continue to offer opportunity for our products. We also monitor activity at cogeneration facilities. NOVA Chemicals, one of our larger customers in Ontario, is engaged in a study for a cogeneration plant that could represent significant opportunity for us. We support pulp and paper customers in northwestern Ontario that, having suffered under higher energy rates, installed cogeneration steam turbines to make mill operations less grid-dependent. We are also hoping to do more in the area of hydroelectric generation with new products, as this is a form of cogeneration that we have not yet addressed in northern industry.

While new builds have decreased, we are seeing a lot of work done in retrofitting existing plants. What kinds of retrofitting are you seeing and how is Armour Valve involved?

BM: We have seen the most retrofit activity in combined cycle power plants. The OPA is demanding that plants have greater operating flexibility and be available on a peak-demand basis. Most plants are required to have the capacity to cycle daily and this has taken a heavy toll on equipment reliability. In response, these plants must update their systems with better quality components to withstand the rigors of thermal and pressure cycling. As an example, we have been working on a project with the TransAlta Ottawa plant and a St. Catharines-based power-engineering firm which resulted in the supply of a large package of valves for this type of retrofit. We continue to monitor similar projects and are focused on retrofitting valve and instrument components in combined cycle plants in Ontario.

Can you offer us a clearer idea of the specifications for your valve products?

BM: Our valves are used for many different applications. Some types are used to allow pipeline conveyance in an on-off capacity while others are designed to modulate flow or reduce system pressure. Still others reduce both pressure and tem-

perature. We support a range of products that meet these needs. One of our most simple and effective valves is the Conval Clampseal Valve™. This is a high-pressure globe valve with a hardened seat and disk, designed to handle the rigors of feedwater and steam applications. When a valve is opened or closed with a high differential pressure, instantaneous velocities across sealing surfaces become very high. In some cases involving hot condensate, the high-temperature liquid passing through the valve will flash, meaning that it experiences a change in state from a liquid to a gas. When this happens, fine water droplets are propelled at extreme velocities with the potential for causing severe damage to the valve and downstream piping. To ensure equipment protection, we help customers in proper valve sizing and selection to minimize wear resulting from normal operation and consequently, reducing their maintenance.

NG: Conval valves are forged, rather than cast, which represents a significant advantage. Conval valves also feature the Integral Gland Wrench, which allows the packing to be tightened in response to any leakage. Despite being a slightly higher cost initially, they are easy to repair in-line over a long service life, which saves in cost on replacement and maintenance. Ultimately users benefit from a lower total cost of ownership.

What other areas have you been working in?

LM: Where power is concerned, we are beginning to see a more distributed system of microgrids – industrial, commercial, and residential power users generating their own supply that may or may not feed back into the power grid. For industrial customers looking to control energy costs, greener, more efficient options are often attractive and can include combined heat and power efficiency initiatives, hydro, or biomass. Mining facilities across Canada, for example, are taking advantage of nearby natural resources like hydro or biomass to satisfy power demand. •



Asterios Satrazemis

●●●
 President (Americas)
AGGREKO

●●● **Aggreko recently celebrated its 50th anniversary in Canada. What is the strategic importance of the Ontario market to Aggreko?**

In Ontario, Aggreko deals with four major areas in terms of our work with utilities: (1) we assist in wind-farm conditioning; (2) we provide quick-response remote area power supply work for utilities; (3) through Aggreko Process Services, which is an engineering team within Aggreko that designs solutions to help improve operations and address environmental concerns of customers, we provide complex, custom-designed cooling packages for construction and refurbishment work at nuclear facilities; and (4) we also provide supplemental power during high-usage period for various utilities, which helps to address supply-side generation issues.

Aggreko has several locations in Ontario. The market is consistent the North American markets. For us, this includes the sectors of utilities, refining, events and

construction. Additionally, being a mining hub, Ontario is an important place for our work with mining operations and mining corporate offices.

Ontario has two nuclear plants undergoing refurbishment. Can you provide a little more detail about how Aggreko would be involved in those projects?

We often provide redundant power and bespoke cooling systems, which are often very interesting for our customers. Our cooling systems are able to provide much more rapid cooling of specific areas within a plant, which allows for a much more efficient maintenance package.

Aggreko has identified Eastern Canada as a growth region for the company. What are some of the key factors that have driven Aggreko's strategic focus on Eastern Canada specifically and what are some of the growth segments?

One factor that has contributed to our focus on Eastern Canada is the growth of natural gas as a valuable opportunity. We have added more natural gas than diesel units this past year, and in the year to come and we see that as a growth market. For example, we recently deployed four, 200-kilowatts, natural gas sets to assist a client of ours with overcoming some emission constraints that they were having issues addressing. As we see the market shifting toward more environmentally conscious applications, we are seeing an increase in activity in the Eastern Canada market.

Fuel sources play a large role in reliability. Would you expand on the types of fuel sources that Aggreko is currently using and is considering using?

When it comes to reliability, Aggreko can assist our customers with remote monitoring. We have dedicated technicians who are monitoring the systems remotely to identify potential issues in advance. As an example, if we see variable load issues, we are able to advise our customers of the issue so that it can be addressed quickly and without any problems in supply.

As far as fuel sources, the key thing is the advent of gas. In the North American market, we will buy more gas than diesel generators in 2014 and 2015. We work not only with gas pipeline customers, but also with liquid natural gas and compressed natural gas supply for those that do not

have direct pipeline access. We will continue to see a focus on natural gas in Ontario for many years to come.

Are you seeing an increase in the use and duration of temporary power sources, both in emerging markets and here in Ontario?

We are finding that, as the cost of power continues to rise, temporary supplies are something that customers are utilizing for much longer periods. For example, there are operations of ours that have moved from supplemental generation for power producers to consistent supply to transmission companies. Given the supply of natural gas available, we anticipate an increased use of temporary-to-permanent power sources both in Ontario and worldwide. Also, our ability to supply off-grid operations in remote communities during the development stages is a high-value service we provide. We are able to supply these operations with the extra capacity they need before they make the decision to commit by transitioning to more permanent power solutions. We are able to establish micro-grids for these customers, which distribute their power needs across the area of their operations without requiring them to provide individual generators at each of the powered elements of their operation.

Where would you like to see the company positioned in Ontario and Eastern Canada over the medium term?

We expect a great deal of growth in renewables, and Aggreko is strongly invested in meeting the needs of our customers in that market. We are also focused heavily on the efficient use of clean fuels for generation and expect that to be a key issue in the future. In markets like Ontario, natural gas generation will outstrip diesel generation. We expect to continue working on efficiencies within the mining industry, oil and gas, and utilities, and want to find ways of driving down operational costs for our customers. Ultimately, Aggreko's goal is to support its customers with innovative and cost-effective power and temperature control solutions. We look forward to being long-term partners with our clients in both up-cycles and down-cycles. ●

THE WAY FORWARD

Conservation First

●● One of the most interesting elements of Ontario’s Long-Term Energy Plan (LTEP) is the evolving relationship between grid operators and energy users. An aggressive conservation-based approach coupled with an expected increase in off-grid solutions could lead to a very different electricity system in the near future. PowerStream, one of the largest electricity distributors in Ontario, is developing a microgrid project in conjunction with GE and several other partners. The microgrid will draw electricity from existing assets – a solar array, a wind turbine, a soon-to-be installed natural-gas generator, a lead acid battery and a lithium battery – in order to provide electricity. The energy generated will also be used to power the company’s electric vehicle charging stations and to maintain a steady charge in the microgrid’s storage batteries.

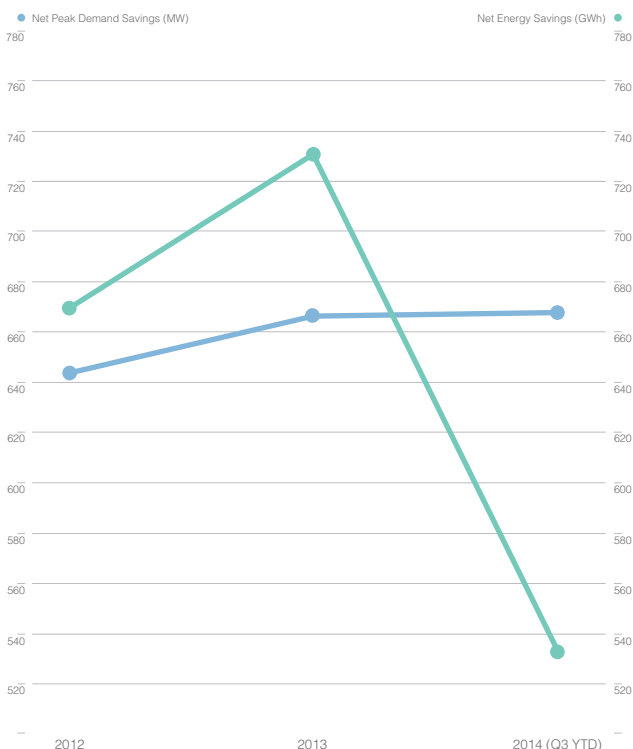
Logic would suggest that the project might run counter to a distributor’s business model, but Brian Bentz, president and CEO of PowerStream, views microgrids as the future of energy usage in Ontario. “PowerStream’s philosophy is to learn about how consumers produce and use their electricity in a commercial environment and integrate these principles with the grid,” he said. “The microgrid project is designed to find a suitable equilibrium between a centralized grid and off-grid solutions.”

GE is providing its automated Grid IQ Microgrid Control System to validate the use case for the technology. “Microgrids give consumers the ability to achieve energy independence, and local distribution companies are examining ways to incorporate microgrids, enabling more cost effective delivery,” said Juan Macias, general manager, grid automation at GE Digital Energy. Another factor that is changing the relationship between grid operators and end users as outlined in the LTEP is demand response. Ontario is aiming to use demand response initiatives to meet 10% of peak demand by 2025, the equivalent of nearly 2,400 megawatts under current forecast conditions. “Demand response has a significant future in Ontario because it provides flexibility, reliability and a very cost effective resource,” said Paul Grod, president and CEO of Rodan Energy Solutions. “Ontario businesses will be able to reduce their total cost of power by providing flexibility within their own system.”

With a conservation-based approach and ambitious targets for procurement, Ontario’s Long-Term Energy Plan attempts to address universal challenges associated with energy planning for the future. Time will tell what impact its success or failure will have on other governments looking to model its aggressive approach. ●

NET PEAK DEMAND AND NET ENERGY SAVINGS (2012-2014)

Source: Ontario Power Authority



PowerStream

THE FUTURE OF SMARTER ELECTRICITY

RENEWABLES DISTRIBUTED GENERATION

SMART GRID

MANTO GRIDS MICRO GRIDS

VEHICLE-TO-GRID

ELECTRIC VEHICLES ENERGY STORAGE

www.PowerStream.ca

Revolutionizing the way we use electricity

[@PowerStreamNews](#)
[@BkgPowerStream.ca](#)
[PowerStreamTV](#)
[PowerStreamInc](#)
[PowerStreamPage](#)
[PowerStream](#)



Brian Bentz

President and CEO
POWERSTREAM INC.

increasingly adopting energy efficiency measures in their homes, and coupled with the trend towards distributed generation and time-of-use rate implementation, the playing field has changed significantly for distribution companies.

How is PowerStream responding to these changes in the distribution sector?

PowerStream is still focused on its primary strategy of managing and building electricity infrastructure in a safe, efficient way, but is also exploring off-grid solutions. This is a different paradigm: grid solutions are rate-regulated and cost-based, while the off-grid solutions are competitive and price-based. In this new competitive playing field, we are investing heavily in innovation, partnerships and scale. We want to move from a “poles and wires” business model into becoming an integrated energy services provider. Five years ago, PowerStream entered the solar market after the (Feed-in-Tariff) FIT program was launched in Ontario. Solar has the most potential for cost reductions and efficiency gains, and can be deployed on a larger scale for residential and commercial consumers. At the end of 2015 we will have approximately 30 megawatts (MW) of installed capacity in rooftop solar and are looking at opportunities to expand into areas such as net metering. We are also involved in sub metering through PowerStream Energy Services, our non-regulated affiliate that was launched in November 2013; since then, we have signed over 15,000 customers. We are also exploring joint venture relationships with developers to advance micro generation technologies in multi-unit, high-rise buildings.

PowerStream recently launched a microgrid demonstration project with GE and six other stakeholders. What does PowerStream hope to achieve?

At PowerStream, the grid of the future is an integrated, participatory network where consumers are passively using energy, producing their own energy and interacting with the grid in a more economic manner. Our microgrid project is designed to familiarize ourselves with new technologies and energy dynamics in cooperation with partners such as GE. We are also looking at how we can interact with the IESO-controlled grid, such as day-ahead demand response-type dispatch functions. The

project is being tested at our 92,000-square foot facility in Vaughan, Ontario.

Logic would suggest that a microgrid would run counter to the objectives of an electricity distributor. Why is this an area that PowerStream is pursuing?

PowerStream’s philosophy is to learn how consumers produce and use their electricity in a commercial environment and integrate these principles with the grid system; this is the future of energy usage in Ontario. There is a point of equilibrium between a centralized grid and off-grid solutions, but we do not yet know its center. The microgrid project is designed to find it.

In 2012, the Ministry of Energy the Ontario Distribution Sector Review Panel, which encouraged more consolidation in the province’s distribution sector. What is PowerStream’s position on consolidation in the distribution sector?

There are certainly benefits to the consolidation model – PowerStream itself is an amalgamation of 15 different utilities. We have driven the benefits of consolidation in our jurisdictions, from 16% in Barrie to 33% in Aurora. We have also saved \$14 million in perpetuity in operating costs that ultimately benefits consumers. We are going to pursue consolidation on a regional basis; utilities have to be larger in scale in order to adapt to the new reality. Larger utilities also have more capacity to invest in infrastructure and reduce rates. PowerStream’s initial target was to reach 300,000 to 500,000 customers; we are now at 370,000 customers, but see further potential to reach more than 500,000.

What is your vision for the future of PowerStream’s business?

PowerStream has a set of reachable goals that will drive our business in the future. We want to integrate the on-grid and off-grid world, innovate and leverage technology, achieve a manageable scale, utilize our strategic partners, raise our profile and reposition the company to be seen as the trusted energy advisor and provider in the eyes of our customers. Consumers will determine whether or not we are successful but if we can innovate to provide integrated energy solutions for them, we will achieve success. •

●●● As an electricity distributor, PowerStream services some of the highest-density areas in Ontario. How would you characterize the distribution sector?

The energy sector in Ontario is transforming and there are fundamental factors that are redefining our business and informing our strategy, such as changes in consumer behavior and technological advances. When it comes to consumer behavior, studies show that the number of customers in Ontario is increasing, but energy intensity is dropping dramatically. For example, forecasts for energy consumption per residential customer over the next ten years show a figure of 600 kilowatt hours (kWh) per month, down from 900 kWh in the early 1990s. This decrease is not a function of having more commercial or residential customers; the mix is the same across all rate classes from commercial to residential. As a result, there are fewer kWh being transmitted through a grid designed for a certain power flow. Consumers are



Juan Macias

General Manager
GE Grid Automation
GE DIGITAL ENERGY

●●● What are GE's main lines of business in Ontario in the energy sector?

Within the world of GE, the Grid Automation division encompasses a few different lines of business. Protection and control focuses on substation automation equipment that both utilities and industrial companies use to protect, control and automate their systems. We also have a communication business, wireless and wireline communications that are used for mission critical applications such as electrical transmission and distribution. Finally we have monitoring and diagnostics such as power transformer equipment where we do live sampling of transformer oil to determine the condition to allow customers to do preemptive maintenance on transformers. Markham, Ontario is the headquarters for Grid Automation. It is one of our largest sites, although nearly 90% of our work is directed towards the global marketplace.

In 2011, GE Canada invested \$40 million

in its Markham facilities to establish the GE Grid IQ™ Innovation Centre to develop smart grid products and services not just in Ontario but globally. Why did GE decide to do this in Ontario?

In the mid-1990s, GE acquired the Ontario-based startup company Multilin, which was at the forefront of digital relaying. When GE acquired the business we conducted a reverse integration and moved everything up to Markham. Since then, Ontario has been a good fit for GE for a number of reasons. Its utilities are very progressive, and GE partners closely with them, not only in supply but also in developing new technologies. Also, a number of market dynamics have been a great backdrop to grow our business: the talent pool in Ontario is outstanding, and its proximity to the North American market is important. Overall Ontario's energy policy over the last few years has pushed the envelope and made it very interesting for us to be a part of the sector's transformation.

You mentioned that Ontario utilities are very progressive. Why is this the case?

The progressive attitude of Ontario's utilities can be traced back to the province's energy policy. The Feed-in-Tariff (FIT) program, for example, has driven a lot of change in the distribution system and created a necessity for Hydro One and other local distribution companies to adapt, as large amounts of distributed resources come onto the system, and find ways to modernize their systems to ensure reliability.

GE has partnered with Ontario utility PowerStream to launch a microgrid demonstration project using GE's Grid IQ™ Microgrid Control System. What are its key features?

Four years ago, GE developed the idea of a microgrid controller as part of a demonstration project at a remote site in British Columbia. Our original goal was to create an automated system using algorithms to allow the user to optimize and dispatch in order to save on diesel, and we have deployed this same technology in a number of microgrid systems at U.S. military bases. Our project with PowerStream is similar: taking a variety of different resources and automating the dispatch by optimizing a particular resource, cost or availability. The PowerStream project will help us to validate the use cases with this technology.

Microgrids can have a very broad definition, so the variety of use cases are very important, whether you are incorporating different types of storage or incorporating new resources.

What are the main advantages of a microgrid system?

Microgrids give consumers the ability to achieve energy independence, and local distribution companies are examining how they can make delivery more cost effective. Microgrids are still at an exploratory stage in Ontario, and it remains to be seen how this will play out in terms of system performance.

The ongoing integration of renewable energy sources in Ontario requires solutions for large-scale energy storage. How is GE able to address this need?

GE has a variety of solutions and control systems geared towards energy storage. We have grid control systems used in the transmission and distribution management systems that utilities use to control distribution. At the distribution control system level, we have capabilities in the area of voltage control, which is key as more distributed generation comes online. We are also participating in Hydro One's Advanced Distribution System project to design a more modern grid; GE is the design and engineering partner in piloting the project.

What does the distribution system of the future look like?

Future distribution systems will have advanced capabilities to deal with two-way power flow, which requires more dynamic protection and control systems. There are new investments being funneled into delivering voltage regulation on a distributed basis in an economic manner.

What are the main priorities for Grid Automation going forward?

The communication system around a distribution system is a key area of focus for Grid Automation. We are also heavily focused on the cyber security of the transmission and distribution system. We will continue to invest in products geared towards the challenges faced by our customers, such as voltage management and the cost efficiency of automating large parts of the distribution system. ●



Paul Eric Marko

●●●
 Manager,
 Instrumentation and Control Systems
HITACHI CANADA

●●● **Can you give us an introduction to Hitachi Canada and its strategy in the province?**

Hitachi Canada is a branch of Hitachi America, Ltd. Hitachi's vision in Canada is centered upon the integration of technologies and big data. Our focus is on developing technology to improve people's quality of life, which is essentially the backbone of our One Hitachi strategy. Technology is becoming more connected to allow societies to function and economies to improve. We focus on social infrastructure such as water, energy and transport, and making them into integrated systems to allow them to add value to society.

What is Hitachi Canada's relationship to the nuclear industry in Ontario?

Hitachi Canada works in partnership with CANDU Energy, both in Ontario as well as globally. We are involved in CANDU's new builds on the Balance-of-Plant (BOP) side, and Hitachi is a preferred supplier for control systems in the nuclear steam plant. CANDU was one of the first companies to develop a completely automated nuclear plant back when the company was still known as AECL; Hitachi provided some control systems as well as the turbine-generator set for the Balance-of-Plant (BOP) for the twin CANDU6 nuclear plants at Qinshan, China. We have worked with AECL and CANDU for over ten years on both the technology and systems engineering fronts.

CANDU's design is a pressurized heavy water reactor, whereas Hitachi has constructed a number of advanced boiling water reactors. What are the main points of comparison from a control systems perspective?

There are differences between the overall control systems and architecture of the respective designs, but most vendors are following international standards for control systems many of which issued by the International Electrotechnical Commission (IEC). There is a certain amount of convergence, because the technologies are very similar and clients do not expect every vendor to have their own standard. The hardware of the control system we would use in a CANDU plant is similar to or the same as what we would use in our own advanced boiling water reactors (ABWRs).

What was your reaction to the Ontario government's decision to defer new nuclear builds in the province?

The government's decision not to build new nuclear facilities in Ontario was a disappointment to the industry. Everyone would like to see new projects on the horizon and in the nuclear business, these projects have a long horizon. However, the Long Term Energy Plan makes it clear that nuclear energy will still have a role to play in Ontario's electricity sector for years to come. The good news is that the government clearly acknowledges nuclear's key role as a base load power source. We are also keeping a close eye on the opportunities presented through the nuclear refurbishment process, which is critical to base load power and hugely important to the supply chain in Ontario. We also hope that new build will be a reality in the future.

Does Hitachi anticipate playing a role in the nuclear refurbishment process? If so, how?

At the moment, the refurbishment project is centered upon the reactors themselves. Longer term, the control systems at these plants will need to be upgraded, and Hitachi is a preferred supplier of control systems to CANDU. Hitachi has upgraded a number of control systems at reactors in Japan; even though the reactors may be a few decades old, the control systems have been consistently upgraded. However, our focus for the moment is designing control systems for new builds.

The December 2013 release of the updated Long Term Energy Plan contained a very different vision for the province's power sector, specifically a lessened role for nuclear energy and a higher proportion of renewable energy. Within this changing paradigm, where does Hitachi Canada see the most opportunities in Ontario?

As far as new opportunities, Hitachi is expecting to play a role in the ongoing automation of the electricity grid as smart metering and the integration of renewable energy continues. Hitachi is also involved in demand management initiatives, which are a key feature of the Long Term Energy Plan. The One Hitachi concept is to view these opportunities as a part of an integrated system designed to benefit social infrastructure. •



Ryan
Duffy



President

BLACKSTONE ENERGY SERVICES INC.

- **Blackstone Energy Services Inc. has been in business for 11 years managing energy portfolios for large energy users. Can you give us a brief background on the company and its niche in Ontario?**

Blackstone Energy Services Inc. (“Blackstone”) initially had a big focus in Ontario; however, as our business and client base has grown, we found ourselves servicing national and North American client needs. Our work has also taken us down to the Caribbean. Our team came together in the clouded post-Enron marketplace so that we could provide clients with better direction and clarity in terms of energy regulation, commodities and consumption. We focus on the public sector, specifically the municipalities, universities, hospitals and schools (“MUSH”) segment, as well as industrial and commercial clients. Within the public sector we deal with many hospitals in Ontario, all of whom have a growing need for conservation plans to be built and acted upon as budgets decrease and

energy expenses increase. Blackstone has spent a lot of time in the last year helping our MUSH clients build out their five-year conservation plans.

What kind of strategies does Blackstone employ to assist clients in building out and implementing conservation plans?

The first strategy is to use energy informatics to understand how and when a client uses energy. Over the last eight years Blackstone has been the lead advocate for energy informatics. As the demand and use of the technology has grown, the cost to implement these programs has dramatically decreased. To show budget reductions it comes down to integration and understanding how to use the technology. When a finance team asks for a budget reduction at a well-run facility, the only next step is investment. Our clients need help putting those business cases together in order to show realistic energy savings and good returns to a finance committee.

Overall, demand in Ontario has decreased in recent years. What consumption trends are you seeing with large energy users?

Demand has decreased due to the economy and weather, as well as efficiency initiatives. Many clients have made investments into their process and examined their profiles to try to do as much as possible without spending that much money outside of normal operating expenses. Some would even like to avoid buying power from the grid if possible. The two largest aspects to a client electricity bill are the commodity and the global adjustment. Over the last 24 months, the global adjustment has been greater than the commodity cost. People are looking for ways to avoid those costs by installing cogeneration and the like. However, if massive cogeneration happens and large participants are not paying their portion of global adjustment, those costs still need to be paid and will fall on homeowners. The global adjustment cost could escalate quickly if a dramatic chunk of the participants are no longer paying.

Based on your experiences in other jurisdictions, what kind of incentives should be established in Ontario?

There are more proven energy savings technologies available today than ever. Many businesses or end users are resisting

the investment because they lack the confidence or experience of building a proper business case for an energy capital investment. A simple incentive that does or, has existed to a small degree, that would help bridge this gap is the subsidizing of energy studies. If the government paves the way for studies on energy efficiency, entities can decide whether they can make that investment on their own or whether they need help.

In terms of conservation, what products and strategies lead the market?

There is a lot to still be done in lighting for most companies as new products continue to enter the market. With interesting technology coming out for variable speed drives and hybrid cogeneration, many projects can stand on their own without incentives. The average end user knows that they can probably save but they do not know how. The government helping them verify what those savings could be would give them more confidence to make the investment.

What is your outlook for the Ontario power market in the medium-term?

Everyone in the market is getting pushed to be more nimble and mindful of how they use energy. The utilities and government will continue to seek the ability to reward those that are efficient. For people to arm themselves with that knowledge, whether at home or at the office, is critical. The tools to do so are becoming more readily available and we are seeing this as a growing trend among all market participants.

Do you have a final message for our readers?

Blackstone was formed to help clients gain clarity of their energy budgets. Today our mission has expanded to provide customers with locally-relevant, inventive, unbiased thinking that proves how we embrace their business issues as our own business issues. By the end of this fiscal year, we will have almost \$2 billion in annual energy spend under management for our clients. We are excited about the future. ●





INTO THE FUTURE FINAL THOUGHTS, COMPANY INDEX, AND CREDITS



“Nuclear energy will remain one of the world’s major power sources. As coal becomes less and less acceptable and electricity demand grows, nuclear is a clean option. We have solutions to deal with the waste and a new generation within the industry is bringing change. The entire industry is more focused on communities.”

- Jean-François Béland,
Executive Vice President,
Areva Canada Inc.

“There has been an evolution in the products within the power sector, and now we are developing products for a different style of transmission connectors. For example, we have moved from AAC conductor connectors into ACSR designs, and today have ACSS products in our test laboratory. We also have a full EHV line for extra-high voltage substations, typically 345 kilovolts and above. We are always paying attention to changes in the transmission and substations market to see where we can offer new products.”

- Ed Cox, Vice President, Sales,
DMC Power



“The technological advances in power generation [in Ontario] have allowed a much wider array of operations to begin to generate their own energy, even down to sizes as small as fifty kilowatts, which in the past would have been unthinkable. Additionally, the Ontario power grid has become much more receptive to distributed generation. We would like to use these opportunities to further develop our reputation as the engineering team in Canada most capable of providing robust, reliable designs and in-depth insight and advice.”

- Paul Doherty, Principal,
Doherty Engineering



“In Ontario, as with many jurisdictions that establish FIT programs, one sees a substantial increase in entrepreneurial activity. Many of these companies, however, lack the financial or technical resources to get their project beyond its early stages. We identified that as an opportunity here in Ontario, where we were able to develop relationships with a number of individuals and were thus able to aggregate a number of attractive portfolios. That experience translates very well to our projects in developing markets, where you have very similar structures in place.”

- Christian Wray, CEO,
JCM Capital



“The United States has designated nuclear waste disposal sites, whereas in Canada there are none; EnergySolutions owns a disposal site in Clive, Utah. In Canada there is no true disposal but rather long-term storage. There are plans for future disposal in the deep geological repositories (DGR). Canada has not approved nuclear waste disposal sites as of yet and there are a number of regulatory barriers to overcome. This is what makes volume reduction much more important in Canada because it can be a space-saving measure.”

- Ron Leblond, Vice President,
EnergySolutions Canada



“In the past, our primary markets have been hydroelectric power and thermal, but that landscape is changing. We have recently done four projects with SNC Lavalin in Saskatchewan for gas turbine fired generating units. Gas turbine production is a rising element in the power generation landscape and we expect to see a significant increase in that in the future. Hydroelectric power has always been a major component of our work and we expect that to continue. We are Manitoba Power’s largest supplier of inverter UPS systems and have worked with them extensively on a wide range of projects.”

- Roland Hase, Principal Sales Engineer,
Staticon Ltd.

“At Cogeco Data Services’ facilities in Barrie and Kirkland (Montreal), we have designed the facility to exceed Tier III standards as they relate to concurrent maintainability. This means that no matter what we do we can take a piece of gear offline, service it and not interrupt power to any rack. From a client perspective we are always on. We exceed this standard in all cases by being fault tolerant. For any kind of fault there is no manual intervention required to make sure that all power is protected.

This is a market differentiator for us.”

- Jeff Edward, Vice President of Data Centers and Operations,
Cogeco Data Services

“The demand for insurance services in the renewables sector has seen consistent growth, particularly over the last few years as projects are starting to be realized. Our practice has generated about \$2 million in premiums in the last two years, largely related to renewable energy. We did do a lot of work in the warranty space on behalf of stakeholders in the renewable energy space and specifically for manufacturers in performance guarantees. However, we found that in Canada the capacity for global insurance players providing warranty has become much slimmer in the last number of years.”

- Jen Aitchison, Partner, Jones Brown

“Smaller modular reactors are the future of nuclear reactors. They are much more manageable than large-scale nuclear and can be strategically placed to manage demand and the capabilities of the energy grid or even lack if it. Nuclear power is among the cleanest technologies available and represents the highest value in energy production. A long-term sustained commitment to this technology is the ideal path forward for energy production.”

- Mark Zimny, President,
Promation



GOVERNMENT AND ASSOCIATIONS

ASSOCIATION OF POWER PRODUCERS OF ONTARIO	13, 55
INDEPENDENT ELECTRICITY SYSTEMS OPERATOR (IESO)	11, 12, 14, 46, 55
MARS DISCOVERY PROJECT	55
ONTARIO ENERGY ASSOCIATION	37, 55
ONTARIO SUSTAINABLE ENERGY ASSOCIATION	55
ORGANIZATION OF CANADIAN NUCLEAR INDUSTRIES (OCI)	35, 37

PRODUCTION, SERVICE AND DISTRIBUTION

AGGREKO	41, 44
ANDRITZ HYDRO	32, 35, 38, 39
AREVA CANADA INC.	36, 51
ARMOUR VALVE	41, 43
BLACKSTONE ENERGY SERVICES INC.	49
BRUCE POWER	9, 11, 34, 36
CAPSTONE INFRASTRUCTURE	27
COGECO DATA SERVICES	41, 53
CUMMINS EASTERN CANADA	41, 42
DMC POWER	52
EDF EN CANADA	20, 22
EDP RENEWABLES	13, 15, 20, 21
ENERGYSOLUTIONS CANADA	52
GDF SUEZ CANADA	21, 26
GE DIGITAL ENERGY	47
HB WHITE CANADA CORP.	13, 17
HITACHI CANADA	48
HYDROGENICS	12
MORTENSON CONSTRUCTION	21, 24, 25
NORTHLAND POWER	28, 31, 35
NRSTOR INC.	12
POWERSTREAM INC.	45, 46, 47
PROMATION	53
RECURRENT ENERGY	19
RODAN ENERGY SOLUTIONS	7, 45
RE POWER SENVION CANADA INC. (REPOWER)	6, 13, 18, 21, 27, 50
SAMSUNG RENEWABLE ENERGY	13, 15, 16, 20
SGS CANADA INC	33
SIEMENS CANADA	2, 13, 15, 16, 25
STATICON LTD.	53
TEMPORAL POWER	12
VOITH HYDRO	35, 40

ENGINEERING, FINANCIAL, INSURANCE AND LEGAL

CIT CORPORATE FINANCE, CANADA, ENERGY AND INFRASTRUCTURE	28, 30
DOHERTY ENGINEERING	52
FIRST CANADIAN TITLE (FCT)	21, 23
JCM CAPITAL	52
JONES BROWN	53

EDITORIAL AND MANAGEMENT TEAM

Senior Project Director: Gabrielle Morin (gmorin@gbreports.com)
Senior Journalist: Angela Harmantas (aharmantas@gbreports.com)
Media Relations Coordinator: Ty Jeevaratnam (montrealoffice@gbreports.com)

Regional Director, EMEA: Sharon Saylor (ssaylor@gbreports.com)
General Manager: Agostina Da Cunha (agostina@gbreports.com)

Executive Editor: John V. Bowlus (jbowlus@gbreports.com)
Graphic Designer: Gonzalo Da Cunha (gdc@d-signa.com)

For updated industry news from our on-the-ground teams around the world, please visit our website at gbreports.com, subscribe to our newsletter by signing up to our VIP list through our website, or follow us on Twitter: @GBReports.

Additional copies of this book can be ordered through Elif Ozturk (elif@gbreports.com).



THANK YOU

We would also like to sincerely thank all the governments, associations, and companies that took the time to give their insights into the market and share their experience and knowledge.

ASSOCIATION OF POWER PRODUCERS OF ONTARIO
www.appro.org

MARS DISCOVERY DISTRICT
www.marsdd.com

IESO (INDEPENDENT ELECTRICITY SYSTEMS OPERATOR)
www.ieso.ca

ONTARIO ENERGY ASSOCIATION
www.energyontario.ca

ONTARIO SUSTAINABLE ENERGY ASSOCIATION
www.ontario-sea.org



GLOBAL BUSINESS REPORTS