

GLOBAL BUSINESS REPORTS

INDUSTRY EXPLORATIONS

BRITISH COLUMBIA POWER 2014



*Economy | Hydropower | Independent Power Producers
Clean Energy | Conservation | Infrastructure*



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Dear Readers,

.....

Fifty years ago, BC Hydro built the backbone of our electricity system to power British Columbia's growing economy. Today, some major components of that system need to be repaired or replaced. B.C.'s economy is growing and so is our need for power. Over the next 20 years, B.C.'s population is expected to increase to nearly 5.7 million, and electricity demand is expected to grow by as much as 40 per cent.

As one of the largest electric utilities in Canada, BC Hydro serves two million customers by delivering safe, reliable electricity at competitive rates. The majority of BC Hydro's electricity is generated by hydroelectric facilities with significant reservoir storage, which provides a high degree of reliability and flexibility.

In November 2013, B.C. introduced its 10 Year Plan to strike a balance between keeping electricity rates as low as possible, while allowing BC Hydro to invest in aging assets and new infrastructure. Through new measures in the 10 Year Plan, BC Hydro is striving to keep B.C. residents paying the third lowest residential rates in North America, while also investing in important capital projects that will keep rates predictable for years to come. Several major projects recently began construction as part of the \$1.7 billion dollar capital investment fund. BC Hydro's job is to make sure that the power is there when we need it. Overall, this balance is aimed to support our growing population and economy.

BC Hydro has also created a 20-year plan to meet future electricity demand - the Integrated Resource Plan (IRP). Through investments in infrastructure, conservation and clean energy, the IRP provides a roadmap for updating the entire power system. More than two thirds of British Columbia's electricity demand growth will be met through conservation efforts and energy efficiency strategies.

B.C. has among the lowest industrial electricity rates in North America, making it an attractive investment environment for industrial customers. That being said, we recognize in order to maintain its competitive advantage, help our economy develop, and continue to attract industry to operate in our province, the 10 Year Plan provides industry with predictable rates for the long-term, and a commitment to look at rate design options for industrial customers. Projects like the Northwest Transmission Line (NTL) are powering new industrial development in B.C.'s north. The NTL will open up regions to world-class mineral deposits, new mines, and clean energy operations. An independent report estimated the NTL has the potential to attract more than \$15 billion in mining investment alone – creating up to 10,000 jobs and generating \$300 million in annual tax revenues.

B.C. is making long-term investments today to continue to lead in clean energy production. We are committed to providing the benefits of clean, reliable, and cost-effective power to all British Columbians for many years to come.

**Honorable Bill Bennett,
Minister of Energy and Mines and
Minister Responsible for Core Review
Province of British Columbia**



OVERVIEW

Harnessing Hydro

8. An Introduction to British Columbia
A brief overview of the province and economy
10. Interview with Ministry of Energy and Mines, British Columbia
Bill Bennett, Minister of Energy and Mines and Minister Responsible for Core Review
11. Interview with BC Hydro
Doug Little, Vice President, Energy Planning and Economic Development
12. Addressing the Old, Pursuing the New
Power in British Columbia
14. Interview with Fortis BC
Doug Stout, Vice President, Market Development and External Relations
15. Interview with Clean Energy BC
Paul Kariya, Executive Director
16. Expert Opinion by Servion Canada
17. Interview with Servion Canada
Helmut Herold, CEO North America
18. Interview with Ausenco
Peter Galbraith, Global Lead, Infrastructure, and Simon Davies, Senior Project Manager, Oil and Gas, Power
19. Interview with Hatch
David Daw, BC Regional Manager, Renewable Power and Shawn Smith, Senior Electrical Engineer, Renewable Power

MEETING FUTURE DEMAND

Site C and Independent Power Producers?

22. The Last in a Legacy's Line
The Push for Site C
24. Expert Opinion by Stantec
25. Interview with Stantec
Graham McTavish, Vice President, Power, Canada
26. Expert Opinion by Gowling Lafleur Henderson LLP
27. Interview with Gowling Lafleur Henderson LLP
G. Henry Ellis, Partner
28. Waxing or Waning?
The Role of IPPs
30. Interview with Travelers Power Corporation
Mark Bohn, Managing Partner

31. Interview with Kawa Engineering
Glen Ichikawa, President
32. Interview with Tetra Tech EBA
Jason Jones, Vice President, Power Transmission and Distribution Sector, Environment Practice
33. Interview with Rakia Recruiting
Amir Marciano, Managing Partner
34. Expert Opinion by Schneider Electric Canada
35. Interview with Schneider Electric Canada
Susan Uthayakumar, Vice President, Partner Business

THE 20-YEAR HORIZON

The Integrated Resource Plan

38. Upgrade and Conserve
The Long-Term Trajectory of Power Generation in British Columbia
41. Interview with Corfinance International Limited (CFI)
Christopher Ball, Executive Vice President
42. Interview with Lex Engineering
Guy Lemieux, President
43. Interview with Amix Heavy Lift
Clarke Longmuir, President
44. Interview with Apex Industrial Movers
David Stroud, John Brise, and Doug Elliot
46. Interview with Gygax Engineering Associates (GEA)
Adrian Gygax, Principal
48. Interview with Knight Piésold
Sam Mottram, Managing Principal, Power Services

APPENDIX

Into the Future

50. Final Thoughts
51. Company Index and Credits

This research has been conducted by Katie Bromley, Andrew Mason and Anita Kruger.
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Exclusive Interviews

Major players in British Columbia's power sector talk to Global Business Reports about their businesses, the market, and global economic forces. Featuring BC Hydro, the Ministry of Energy and Mines, and many more.

10, 11



Analysis

GBR's on-the-ground journalists provide editorial analysis and research on all facets of B.C.'s power industry. There is no substitute for face-to-face interaction with industry leaders as well as government officials.

**8-9, 12-13,
22-23, 28-29,
38-40**



Maps and Quantitative Data

For more background on the economic fundamentals of the province and power market, GBR's maps and quantitative data allow readers to place anecdotal company intelligence in the political and economic context of British Columbia.

8-9, 13



Expert Opinions

Gowling Lafleur Henderson LLP, Schneider, Senvion, and Stantec provide expert opinion articles that help readers take a step back and conceptualize the broad factors impacting power generation, transmission, and distribution in British Columbia, Canada, and the world.

16, 24, 26, 34



Final Thoughts

Leading business figures provide some final thoughts on the future potential of the power industry in British Columbia, the challenges it faces, and the opportunities present for those willing to create innovative solutions and apply new technologies.

50-51







Harnessing Hydro: An Introduction to British Columbia and its Power Sector

“Many of the electrical utilities in North America, including BC Hydro, are undergoing large capital spending to expand their grid to support residential and industrial growth. At the same time these utilities have to upgrade their existing transmission and distribution systems due to aging infrastructure, and many of the large transmission lines built in the 1950s and 1960s are now starting to go through upgrades. With this need for capital spend the utilities are struggling to keep rates down and lower their overhead costs, and as a result they are turning to outside consulting firms to help support their workforce.”

- Graham McTavish, Vice President,
Power, Canada,
Stantec

“The beauty of these hydropower projects is that they last almost forever, hence the term ‘heritage assets’. These projects were built in the 1960s and 1970s and at that time people were concerned about their costs. We now know that they have been a good source of development for the province and have allowed the province to maintain a competitive edge in attracting new businesses. However, the upgrade of the province’s infrastructure is essential, especially looking at how congested the transmission lines are in some areas. The transmission of energy and upgrade of this system may open new opportunities for Innergex to build projects and create interconnection capacity on BC Hydro’s grid.”

- Richard Blanchet, Senior Vice
President, Western Region,
Innergex Renewable Energy Inc.

An Introduction to British Columbia

A brief overview of the province and economy



\$219.94 billion

GDP
Expenditure-Based 2012
Source: CIA World Factbook

2.0%

GROWTH RATE
2013
Source: CIA World Factbook

\$45,993

GDP PER CAPITA
2012
Source: CIA World Factbook

In a country full of natural beauty, British Columbia may be Canada's richest province. In addition to stunning interior landscapes, British Columbia, or B.C., is home to gorgeous coastlines with multitudes of islands and marine life. In addition to natural beauty, B.C. is also blessed with natural resources. The country's massive river systems have provided the country with bountiful, cheap hydroelectric power for decades. Electricity rates are set to rise because of the expected increase in demand and the need for new infrastructure, and politicians will feel pressure from citizens, but, from an outside perspective, the province is truly blessed.

Still, there are major political challenges that are connected to power and energy and that have local and international con-

APPROVED OR PROPOSED ELECTRICITY RATE CHANGES SINCE JANUARY 2013 IN SELECT CANADIAN PROVINCES

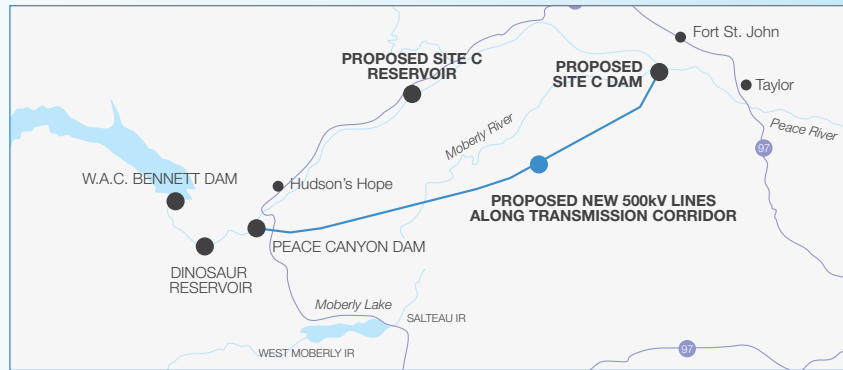
Source: National Energy Board of Canada

PROVINCE OR TERRITORY	UTILITY	RATE INCREASE (PER CENT)	EFFECTIVE DATE
British Columbia	BC Hydro	1.44*	April 1, 2013
Manitoba	Manitoba Hydro	3.5	May 1, 2013
New Brunswick	NB Power	2.0	October 1, 2013
Nova Scotia	Nova Scotia Power	3.0	January 1, 2013
Nova Scotia	Nova Scotia Power	3.0	January 1, 2014
Quebec	Hydro Québec	2.4	April 1, 2013
Quebec	Hydro Québec	5.8	April 1, 2014 (Decision Pending)
Saskatchewan	SaskPower	4.9	January 1, 2013

*(Deferral Account Rate Rider set at 5 per cent up from 2.5 per cent)

SITE C MAP

Source: Site C Clean Energy Project



sequences. Christina Joan "Christy" Clark of the British Columbia Liberal Party is B.C. second female premier and has been in power since March 2011. The Liberal Party won reelection in 2013, although Clark lost her seat in the legislature and had to win a by-election in a different jurisdiction to reassume her post in the premiership. The center-right Liberal Party has enjoyed considerable success in recent years, although it often comes under attack for being too pro-business. Political opposition to new projects in the power and energy sectors will shape in the form of popular rejection of business-friendly policies.

In early August 2014, the tailings pond at the Mount Polley mine in the Cariboo region was breached, releasing toxic mud and water into the Polley Lake. Though

the full extent of the damage to the water and wildlife is unknown, the level of the lake has risen 1.5 meters, and it appears that the company, Imperial Metals, did not have an emergency plan in place. The government has announced two separate reviews of the spill and will likely institute more stringent monitoring requirements as a result. This disaster may actually force the two sides into greater agreement if such measures are adopted.

Another reflection of the province's politics can be seen in the existence of a carbon tax. Instituted in 2008, British Columbia became the only jurisdiction in North America to tax its citizens for fossil-fuel consumption. This electorally popular initiative is championed for having lowered consumption, but business and government leaders decry the lack



of competitiveness and the loss tax revenue, respectively.

On the international stage, B.C. plays an important role. The province is fortunate to be neighbors with Alberta, whose future oil production can provide B.C. with cheap and affordable fuel as well as the opportunity to gain revenues from transporting the tar sands oil by pipeline. The Alberta tar sands already provide over 50% of Canada's daily production of oil, a figure that could rise to 75% in 2030, according the Canadian Association of Petroleum Producers. Environmental concerns after the potential despoiling of B.C.'s natural beauty as well as ways of life of First Nations communities have been raised. It is still unclear whether the government will approve the Northern Gateway pipeline system, which

will transport Alberta oil to the British Columbian Pacific coast. This pipeline system has international consequences and has resulted from the lack of approval for the Keystone X Pipeline in the United States. Cultivating Chinese oil imports will certainly create further foreign investment from China and other Asian trading partners.

It will be important to monitor the government's decision about approval for Site C, a long-proposed 1,100-megawatts (MW) project on the Peace River, and to develop substantial gas reserves through the construction of electricity-intensive liquefied natural gas (LNG) export facilities. Local elections will be held in the fall 2014 and issues relating to power, energy, electricity, and the environment will likely be debated. •

BRITISH COLUMBIA AT A GLANCE

Source: Statistics Canada, BC Stats, British Columbia Ministry of Finance

Population: 4,581,978 (2013 estimate)

Capital: Victoria

Chief of State: Premier, Christy Clark, British Columbia Liberal Party

GDP, Expenditure-Based: \$219.994 billion (2012)

Growth Rate: 2.0% (2013)

GDP per Capita: \$45,993 (2012)

Economic Sector Breakdown: Services 61%, Goods 24.3%, Other 14.7% (2012)

Exports to Other Countries: \$47.337 billion (2012): coal,

lumber, machinery, copper, pulp, natural gas, agriculture

Exports to Other Provinces: \$37.008 billion (2012)

Imports from Other Countries: \$59.458 billion (2012):

motor vehicle parts, crude oil, metals, chemicals, machinery, electronics

Imports from Other Provinces: \$48.437 billion (2012)

Major International Trade Partners: United States, China, Japan, South Korea

Honorable Bill Bennett

Minister of Energy and Mines and
Minister Responsible for Core Review
**PROVINCE OF BRITISH
COLUMBIA**



How will the 10 Year Plan tackle the aging infrastructure in British Columbia?

The 10 Year Plan is an integrated plan that will improve infrastructure and reduce costs. We have allocated C\$1.7 billion per annum to invest in infrastructure. The cost of infrastructure is the main driving factor in determining rates, but it is not the only factor that drives rates up. The Rates Plan will bring certainty to electricity rates for the residential, commercial and industrial consumers of British Columbia. Through the Deputy Minister's Review of BC Hydro, we found almost C\$400 million of savings over the next three years and have worked with BC Hydro to keep executive compensation in line. Additionally, within BC Hydro's regulatory accounts there is currently C\$4 billion in debt that we are working to pay off under the plan.

British Columbia's rates fell throughout the 1990s, but have risen over the last few years and will continue to rise. How much of a connection is there between investment in infrastructure and rates?

There is a direct, unassailable connection between investment in infrastructure and rates. During the WAC Bennett government in the 1980s, rates in some cases went up over 100%. This rise was simultaneous with the investment in the Peace River Dams and Columbia River Dams. During the 1990s, rates did not rise because the NDP government chose not to invest in infrastructure and made it policy to avoid rate increases. We are catching up from this policy.

The 10 Year Plan also reduces and eventually calls for the elimination of the dividend that BC Hydro pays to the government. Why was this necessary?

The formula for calculating the dividend was created in 1992, and at that time the acceptable debt/equity ratio was set at 80/20. After taking a look at the regulatory accounts, I concluded that the growth in the deferral accounts versus the growth in the debt equity ratio was not sustainable. As part of the 10 Year Plan, we are aiming for a 60/40 debt/equity ratio, we will not quite pay off the deferral accounts in 10 years, but we will be close. People have said that BC Hydro is close to bankruptcy, but this is not true. Nonetheless, government has probably been taking too much from BC Hydro in dividends and net income.

Why is now the correct time to go ahead with the long-proposed Site C project?

When the decision was made to restart Site C planning, British Columbia's economy was booming, and demand for electricity was considerably higher than it is today. Now, BC Hydro is actually selling less electricity than was sold in 2008. With the Integrated Resource Plan (IRP) we know that the province will need new generation. If we do not have adequate demand side management we will probably need new generation in six to seven years and if there is adequate demand side management, we will not need it for at least 10 years. Site C will take a long time to design and build. If we decide to go ahead with the project in the next year or two, it would still take close to

10 years to get it to the point where it will generate electricity. Conditions have changed, and I would not classify myself as an advocate of the [Site C] project. Over the last several months, I have been trying to develop alternative packages of ideas, combinations of generation that I can take to the Cabinet and let it choose whether to pursue Site C or another option.

If Site C goes ahead, will there be room for the independent power producers (IPPs)?

There will be [room for IPPs] at a minimal level. When I first received the IRP Draft last summer, it contained almost nothing about IPPs, so we worked with BC Hydro to keep the door open for future investment by the renewable industry. There is now a seven-page section in the IRP on IPPs. We also increased the size of projects allowed under the Standing Offer Program (SOP) from 10 megawatts (MW) to 15 MW. It is a smaller program overall, but the SOP has never been subscribed to the level that it should be. The government is reviewing the SOP at the moment to understand why it has not been fully subscribed in the past.

IPPs are also still in the game because no one knows what is going to happen with the economy. If it grows as it did [before the recession] or huge liquefied natural gas (LNG) investments are made, demand could change. On the LNG side, preliminary signals indicate that they will use natural gas to drive their compressors inside the fence. There is also a good chance that they will want to buy ancillary power from the grid. A standard four-train LNG facility will need 150 to 160 MW of ancillary electricity. It only takes one company to move forward with a plan like this to change demand significantly. The third variable is Site C. There would obviously be opportunity for the IPP industry if we decide to seek 1100 MW of generation from elsewhere. •

Doug Little

Vice President, Energy Planning and
Economic Development
BC HYDRO



Over the last decade and a half the British Columbian government and BC Hydro have deferred Site C. Why is now the correct time to move ahead with this long-proposed project?

As we have outlined in the Integrated Resource Plan (IRP) and the environmental impact statement application submissions, our long-term portfolios that include Site C are the best way to meet the energy demands of the province. Site C is the right project to build. It will provide the province with 100 years of energy supply, and it is the right time to bring this project forward.

Many of the independent power producers (IPPs) have disputed the claim that Site C is the most cost effective way to meet British Columbia's energy needs. In your view why is moving forward with Site C the most cost effective way?

Our portfolio analysis shows that Site C is more cost-effective, particularly when you consider the quality of the electricity that will be produced. Site C is dispatchable and produces 1100 megawatts of firm capacity, which is higher quality than run of river or wind, which are both intermittent resources.

Many IPPs are worried that the development of Site C will negate the demand for future independent power production. If Site C moves forward will it displace IPP developments?

While our heritage assets provide the majority power, IPPs help us close the gap between what our existing assets can provide and what is required. Independent power producers have been supplying clean electricity to British Columbia for more than 20 years and generate about 20 per cent of BC Hydro's electricity supply.

Over the next five years, we expect to renew many IPP contracts. We will also continue procuring energy through our Standing Offer Program, through which we will enter into new contracts for smaller projects. There continues to be good opportunities for IPPs in the province.

The provincial government's own 10 Year Plan as well as BC Hydro's Integrated Resource Plan were officially launched in late 2013. What is BC Hydro doing to ensure these long-term plans get off the ground?

The Integrated Resource Plan (IRP) is a flexible, long-term strategic plan to meet British Columbia's growth in electricity demand over the next 20 years. It focuses on making prudent investments in conservation and clean energy and on keeping future electricity supply options available.

We are already moving forward with a number of actions laid out in the IRP. One of these actions is to develop the Site C project. Site C is undergoing a cooperative federal-provincial environmental assessment, including a Joint Review Panel process, which is rigorous and independent. Construction of Site C is subject to the project receiving environmental certification and other regulatory permits and approvals.

On the procurement side, we have committed to increase the volume under the Standing Offer Program and consult with First Nations to get them more involved with the program. This has already started. Our Net Metering Program application to increase the size of projects in the program was filed with the BC Utilities Commission in February. So, we are moving ahead full speed on

implementing the various actions in the IRP.

Forecasting load demand in the future is a difficult task. What would be BC Hydro's plan of action if future load demand exceeds your expectations?

We acknowledge that there is uncertainty in our load forecast, largely in the industrial sector due to the potential development of the liquefied natural gas industry and the upstream natural gas sector. One of the action items we have in the IRP is to be ready with a Request for Proposals from the IPP sector if needed. We are following the load growth very closely and if it looks like load is increasing faster than expected, we will be ready to launch a new procurement exercise.

In addition, we will provide an update to the IRP in 2015. Normally, our cycle is every four to five years with these plans. This two-year window is a reflection of the uncertainty we currently see in the market, which should largely be resolved after two years.

British Columbia is a net exporter of electricity to the United States and neighboring provinces. How attractive are these markets at the moment?

How important will power exports be to British Columbia moving forward?

BC Hydro has traded with the United States and Alberta for over 20 years. Since 2003, our trading subsidiary Powerex has earned \$1.7 billion in revenues to help keep rates low in BC. Selling power is important to us, and we will continue it.

Export opportunities are not as great now for a couple of reasons: 1) low natural gas prices in the United States have reduced generation costs there, and 2) tax subsidies from the U.S. government have created an overabundance of wind and solar generation that has depressed prices.

We will continue to buy energy on the market when it is of lower value and save the water in our reservoirs to produce electricity at periods of higher value. Given these dynamics, this robust trade between British Columbia and its neighbors will continue for the long term. •

Addressing the Old, Pursuing the New, Power in British Columbia

Government and British Columbia

British Columbia, with its abundant hydro reserves, has long enjoyed some of the lowest electricity costs in North America. According to a study from Hydro Quebec, Vancouver, the province's most populous metro area, ranks as the second lowest retail electricity price for large and medium customers and third lowest for small and residential customers in Canada. However, the market appears set to change. In August 2013, a draft was leaked of the B.C. Rates Plan, which proposed a 26% rate increase by 2016. The rate increase was met with such a backlash of protest that the government was forced to reconsider the proposal.

Unlike its deregulated neighbor Alberta, B.C.'s power sector is regulated and dominated by BC Hydro, a crown-corporation accounting for 80% of the province's generation capacity. Additionally, BC Hydro controls most of the province's major transmission and distribution channels to the province's 4.6 million inhabitants. The exception to this is Fortis BC, a division of Newfoundland-based Fortis Inc., which controls electricity generation, transmission and distribution, as well as gas distri-

bution for 1.1 million customers in southwest B.C.

Over the last two years, the Liberal government and BC Hydro have worked together to plan B.C.'s energy future as the province's demand for electricity is expected to rise by 40% over the next 20 years. The culmination of this work was announced at the end of 2013: the government's 10 Year Plan and BC Hydro's complementary Integrated Resource Plan (IRP), which called for extensive new investments and upgrades to infrastructure but simultaneously sought to stem the inevitable tide of rate increases for customers. The plans fail, however, to clarify two very important issues: the upcoming final decision whether to approve BC Hydro's Site C, a long-proposed 1,100-megawatts (MW) project on the Peace River, and to develop substantial gas reserves through the construction of electricity-intensive liquefied natural gas (LNG) export facilities.

Under its current plans, BC Hydro plans to spend C\$1.7 billion per year over the next 10 years on capital improvements, while rates are expected to rise by 28% by 2019. "There is a direct, unassailable connection between investment in infrastructure and rates," said Bill Bennett, B.C.'s Minister of Energy and Mines. "The cost of infrastructure is the main driving factor in determining rates. The Rates Plan was brought about to bring certainty to electricity rates for the residential, commercial and industrial consumers of B.C."

The provincial government's attempt to plan for B.C.'s energy future is admirable, but the 10 Year Plan outlines only a piece of the story, according to Paul Kariya, executive director of Clean Energy BC; "I would say the plan is not a full provincial

electricity plan, but rather a plan for the power utility BC Hydro. Looking at the activities of BC Hydro from a long-term view they have one last legacy project to complete, Site C. The government's 10 Year Plan is oriented to assist BC Hydro's Integrated Resource Plan and ensure Site C is completed."

BC's energy future will also be affected by how Site C's development will impact the province's independent power producers (IPPs) and what direct and indirect effects the province's burgeoning, power-intensive gas sector will have on electricity

“

Making multibillion-dollar investments, like those called for under the Integrated Resource Plan, require complex environmental information with very extensive special-temporal data analysis. To truly understand how to best optimize the use of British Columbia's renewable energy resources and to minimizing adverse environmental impacts requires the evaluation of decades of hydrological data, the development of sophisticated weather forecasts (including rainfall-runoff catchment modeling), flood frequency analysis, and the evaluation of alternative river and watershed system simulations.

- Ed Quilty, President and CEO, Aquatic Informatics

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BC HYDRO'S FACILITIES

Source: BC Hydro

Peace Region:

Total capacity: 3,430 MW, 32% of BC Hydro's capacity.
Facilities: 2 hydroelectric generation stations, completed in 1968 and 1980; Site C Pending approval (2014) would provide 1,100 MW.

Columbia Region:

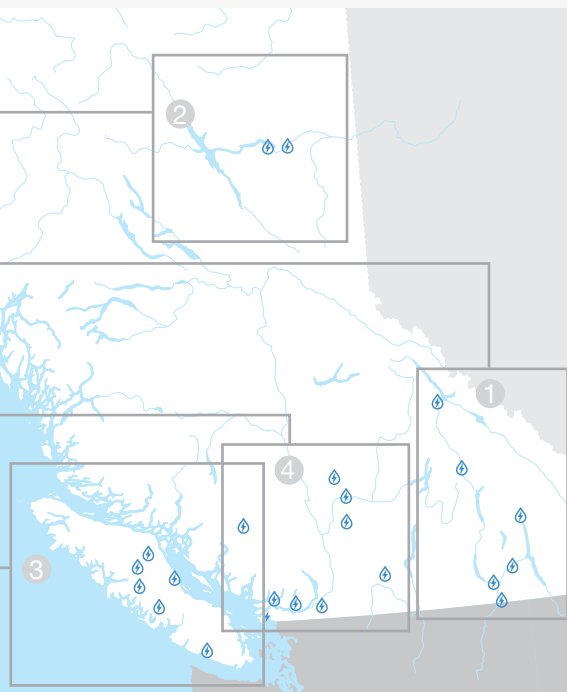
Total capacity: 5,200 MW, 49% of BC Hydro's capacity
Facilities: 4 major hydroelectric dams, all built before 1984; 2 water storage dams that don't generate power; and 7 smaller hydroelectric dams.

Lower Mainland and Coast:

Total capacity: 976 MW, 9% of BC Hydro's capacity.
Facilities: 11 hydroelectric facilities, originally built between 1911 and 1960; 1 thermal plant, not used for generating power.

Vancouver Island:

Total capacity: 458 MW, 4% of BC Hydro's capacity.
Facilities: 4 hydroelectric systems, with 6 generating stations, built between 1911 and 1971.



demand. Although most indicators point towards Site C's approval in the coming months, there are still some hurdles to overcome. "In the joint federal-provincial environmental review, BC Hydro has to demonstrate to regulators that Site C is necessary and the only source of electricity to meet British Columbia's needs," said Kariya.

Despite long-term demand projections and its argument in favor of Site C, BC Hydro sees a short-term glut in generation capacity. In the early 2000s, the province looked towards IPPs to meet future generation demands, which enabled private sector players to make a significant impact in the market for the first time. In 2008, 27 power purchase agreements

were awarded to IPPs, but of these 27, only 14 are expected to come online in the near future. Luckily for BC Hydro there has been some attrition in the private sector, as almost half of the awarded contracts appear to have stalled. At the Canadian Institute's BC Power Symposium in last week, Doug Little, vice president of energy planning and economic development for BC Hydro commented: "Our best view of our requirements over the next five to seven years shows us with a fairly significant long position. If those projects come online, we will have to take electricity produced at \$100 megawatts per hour (MWh) or \$125 MWh and sell it on the export market. Export markets are very unattractive right now. By deferring

or terminating by mutual agreement some of these contracts, we are looking to resolve this issue."

Site C, if approved, has an expected completion date of 2024. The 1,100 MW of generation capacity that this project would add would likely crowd out the need for more new IPPs for some time, but the project is not a death knell for them either. Under current provincial law, Site C is the last major project BC Hydro is permitted to construct and the government has given no indication that it will change this regime. In the event Site C is not approved or severely delayed, IPPs will have an unprecedented opportunity to fill a huge void in the British Columbian market. •



Doug Stout

Vice President, Market Development and External Relations
FORTIS BC



What were some of the reasons Fortis Inc. decided to become involved in British Columbia in 2004 through its purchase of Aquila's assets?

In 2004, Aquila Networks owned generation and distribution assets in both Alberta and British Columbia, and Fortis Inc. believed that these assets were a growth opportunity for the company and complemented the other assets that Fortis Inc. owned. We saw this as a timely opportunity, as the economy was growing and both Aquila's networks in British Columbia and Alberta had some older assets that we could refurbish, revitalize and put a different management philosophy in place.

Fortis Inc. is our holding company in Newfoundland and each division of Fortis runs autonomously, with its own respective board of directors. This allows us to focus more closely on our customers in each particular region.

The assets in the West Kootenay power system you purchased in 2004 were characterized as "terrible" in terms of their reliability. What were some of your priorities in upgrading the assets over the last decade?

Fortis BC has upgraded the main transmission backbone, replaced and added a number of substations to improve reliability, and have been upgrading generation assets that in many cases were 80 to 100 years old. On top of this, we have improved our customer service through new contact centers in Trail. Fortis has also made an effort to stay on top of monitoring all the statistics in the system, which improves its reliability and safety.

Over the last 10 years Fortis BC has spent nearly C\$1 billion purchasing and upgrading assets in the province. How can such a large amount of upfront capital expenditure provide strong return on investment for Fortis Inc?

We have invested heavily over the last number of years. Our investments are all in regulated assets; those dollars are in the rate-base that our customers pay. Obviously, when there is investment by a utility, the rates for customers go up. We were probably a bit ahead of the curve in the province, as now BC Hydro is on a similar trajectory with new expenditures and rate increases. Now we are trying to manage the rate impacts on our customers this investment has caused. This is the biggest challenge facing utilities across North America.

As BC hydro is now embarking on its own capital expenditure program, do you foresee there being greater rate parity between Fortis BC and BC Hydro?

We are expecting to see the rates gap close given the government's signals with regards to its plans for BC Hydro over the next five years.

What do you see as the principal challenges for British Columbia's power sector over the next three to five years?

The biggest challenge in British Columbia is managing power rates for customers. People can only absorb a certain cost threshold and there is a tipping point on how much people are willing to pay for the service. As we have had to invest money and as BC Hydro is investing money, managing

the public is going to be the biggest challenge for us. The second challenge is building infrastructure, even replacing infrastructure is a challenge because of the social license issues with First Nations issues and managing the public's expectations of projects. Given that British Columbia has enjoyed some of the lowest rates in North America for half a century, do you think public image is the biggest problem facing the industry and do you need to better educate the public?

The public does not care what the price of electricity is in Los Angeles or New York because it does not directly affect them. There is a need to educate not just on power price, but also on the importance and value of the energy sector to the province's economy. It goes beyond just heat and lights in our homes and businesses, but it drives the economy.

Given Fortis Inc's growth across North America, what do you see as the role British Columbia will play for the group going forward?

At present 40-45% of the asset-base of Fortis Inc is in British Columbia and we see some great organic growth opportunities in the province as well. Over the next five years we hope to capitalize on these growth opportunities as we contribute to the group overall. British Columbia is facing a great opportunity, we need to engage people in the province and show them how the energy sector, from LNG to upstream gas to power generation, is driving jobs and fueling a robust economy. This will help manage costs and create new opportunities ahead. •

Paul Kariya

Executive Director
CLEAN ENERGY BC



Could you please give us a brief overview of Clean Energy BC?

Clean Energy BC, previously known as the Independent Power Producers Association of British Columbia, represents approximately 220 members, including 80 developer/operators in British Columbia. Its members constitute companies across the value chain including gas generators, consultancies, engineering firms, and service providers.

How has the role of independent power producers (IPPs) evolved in British Columbia, especially since the passage of the Clean Energy Act in 2010?

IPPs picked up steam in 2001 under the Liberal government. In 2007 the government enacted the Clean Energy Plan, which laid out British Columbia's vision to be a leader in renewable energy. Prior to this development, IPPs made up 1% to 2% of the grid's production, today our members make up over 15% of grid production with non-member private producers in the mining and pulp and paper sectors also being active in selling excess power to the grid.

In December 2013 the government

announced its Ten Year Plan to modernize BC Hydro, but mention of IPPs was conspicuously limited. How does this plan impact your members?

The plan is not a full provincial electricity plan, but a plan specifically for BC Hydro. It is oriented to assist BC Hydro's Integrated Resource Plan (IRP) and ensure that their last legacy project, Site C, is completed. In the joint federal-provincial environmental review, BC Hydro has to demonstrate to regulators that Site C is necessary to meet British Columbia's needs. Therefore the Minister will remain relatively silent about IPPs until Site C has received an environmental certificate. However, the two-year review window of the IRP indicates that the government still sees value in IPPs. Typically, an IRP is given a five-year review window, but this shorter window will permit the government to review its policies once a decision on Site C is made and if LNG companies reach final investment decisions in 2014 or 2015. If Site C is not approved or extraordinary new load emerges, it provides a great opportunity for Clean Energy BC's members to fill a void. If the project goes through, it will be a longer wait until their markets picks back up.

In the last two years British Columbia has been a net exporter of electricity. How important are electricity exports to the province and what, if anything, can it do to increase them?

Arbitrage and power trading has always brought money to the province, and the government will not want to relinquish that revenue stream. BC Hydro could change how its stores generated energy from renewables through firming and shaping, but this method could restrict arbitrage. The government has not indicated that it does not want to part from its current power trading and the arbitrage of it. If California and the West Coast of the United States had come out of the recession like anticipated, the demand for clean energy would have been greater. However, the slow recovery and the advent of cheap gas have complicated the situation. There is export potential to Alberta, which needs to diversify away from dependency on coal production, but the east-west transmission network is not in place.

We also recognize that climate change may cause us to have years with electricity deficits and others with surpluses, as rain and snowmelt become more variable. No one wants to be in a deficit position in which they have to import whatever is available on the spot market. This was the rationale for the self-sufficiency policy.

When comparing BC to Alberta, the two provinces have charted different paths with regards to the generation mix and amount of regulation. Why did BC choose its path of a hydro dominated, fully regulated industry? What have been the consequences?

British Columbia developed hydroelectric power because of its geographic and topographic makeup. However, this has come at a cost. For example, while our two dominant river systems for power generation are the Peace and Columbia Rivers, the Fraser River, the largest single salmon-producing river in the world, has not escaped development. All of the major tributaries on the lower Fraser have been dammed. This has certainly been at a cost to salmon runs and the environment in general, which has affected the First Nations. Outside of Meso-America and Southern Ontario, British Columbia has the richest diversity of aboriginal peoples because of the abundance and diversity of salmon populations. How we develop hydro in the future has to be conscious of salmon, the environment, and the First Nations. The days of big hydro developments on the coast are over.

Do you have a final message for our readers?

The government issued its final power call in 2008, when 27 power purchase contracts were issued for 3,500 gigawatt hours; 14 projects from this and the 2006 power call are currently under construction. These projects are creating almost 2800 direct jobs, 700 to aboriginal people. The 14 projects representing \$4 billion of capital expenditure are on time and on budget. Not all of the original 27 contracts will be developed and that attrition, while troublesome, is part of the efficiency of the private sector. The clean energy sector is delivering what we promised to deliver: jobs and investment. •

British Columbia: excellent conditions for wind energy

Helmut Herold,
Senvion Canada

Compare the wind energy footprint in Canada and Germany, or even in the United States, and you will quickly draw one conclusion: there is still a lot of potential for wind energy in Canada. As a leader in renewable energies, Germany has about 34,000 megawatts (MW) of wind energy installations, while the United States – 26 times bigger than Germany – has an impressive capacity of about 61,000 MW. Meanwhile, Canada has about 8,500 MW of wind energy – 2.5 per cent of global installations. That said, although Senvion is active in all three countries, Canada is one of the most important markets. British Columbia is a big part of this equation, as we see a lot of opportunities for wind energy, enabling the province to remain a green energy frontrunner and to reduce its CO₂ emissions.

B.C.'s electricity generation is traditionally based on hydropower, but natural gas has been growing in importance. However, a big portion of this natural gas is destined for export, which will lead to increased energy demand due to investments in LNG plants in the future. This is one of the big opportunities we see for wind power generation in BC Wind is the perfect choice to supply this demand. It is low-cost and low-impact energy generation, and complementary with hydropower. Consider, too, that a decision on the big hydropower plant project, Site C, is currently pending. There are concerns that the project might result in higher energy costs for ratepayers and have major environmental impacts that cannot be mitigated.

New wind power installations might be a great, cost-effective and predictable alternative — especially as the investment costs and risks for wind energy projects are usually borne by private developers (IPPs). Also, due to technology improvements, the cost of wind energy has and will further decrease in the future. More-

over, B.C. has set very high targets in terms of demand side management (DMS) that might not be met – again resulting in higher energy demand than predicted.

We hope that all these reflections will be taken into account in revising B.C.'s Integrated Resource Plan (IRP), due at the end of 2015, and wind energy will become a bigger part of B.C.'s energy mix — especially as hydropower and wind energy are an ideal combination. Hydro can function as an energy storage system for surplus wind energy. Moreover, it fits very well into B.C.'s demand scheme, as there's a lot of demand in winter, when wind is strongest. In summer, when the wind is not as strong, energy demand can be supplied by hydropower.

Proven technology for reliable and competitive energy generation

As a German company, Senvion is an expert in wind energy generation technology and a leader in the offshore business. Since our founding in 2001, we have continuously developed our technology to increase energy yield and reduce asset costs. As well, our goal is to build technol-

ogy that lasts. This is why we have long-term clients who know that their IRR will be excellent and the risk they have to factor in is low. It's also why banks financing projects with Senvion wind turbines give us an excellent rating. Of course, all these factors contribute to reducing the cost of energy significantly.

One of the latest examples of how we improve our technology is the Senvion 3XM series of 3 MW turbines we recently launched in North America. This technology is based on our proven MM series combined with technological achievements from our offshore technology. This allowed us to develop a more powerful turbine with a bigger rotor, without sacrificing the low sound characteristics of our turbines. Today, we have a proven track record of 10 GW of this technology installed around the globe. This includes about 2,200 MM92 and about 350 3XM turbines. Our excellent track record is a direct result of upfront quality, R&D, intelligent product development, prototype validations, and years of experience with similar technologies. In Canada, we have a footprint of more than 600 MW. By 2016, this number will have doubled, with a total capacity of more than 1 GW supplied to Quebec wind farms alone. Given the great potential for wind energy developments, B.C. is one of the most promising markets in Canada, especially for the Senvion 3XM series.

In the future, we want to make sure British Columbians get clean, low-impact and low-cost energy to fill the predicted supply gap. We're confident that Senvion has the right technology and experience to do this, and have recently opened an office in Vancouver. Let's go, B.C.! •



Senvion, Saint-Robert-Bellarmin wind project, 2012. Photographer Joan Sullivan.

Helmut Herold

CEO North America
SENVION CANADA



Senvion Canada was founded in 2007. Can you highlight some of the company's key milestones?

Senvion Canada has achieved considerable growth since its inception in 2007 having installed in excess of 550 megawatts (MW) and more than 270 wind turbines. Our development is continuing with the construction of the 350 MW Riviere-du-Moulin wind farm in Quebec, the biggest contract in the history of Senvion, with completion due 2015. In 2014, Senvion completed its first community-based project in Quebec. Our development in Canada is on-going and we have been retained as the preferred supplier for Zero Emission Energy Developments Incorporated's (ZED) projects in British Columbia. Today, according to the 2013 BTM Consult report, we rank as the second largest turbine supplier in Canada. Due to our success in Canada, Senvion has nominated our office as the hub for United States and Canada.

Senvion has yet to appear prominently in British Columbia. How important is British Columbia to the company and its recent success in being named as the ZED preferred supplier?

ZED's projects are the first projects for Senvion in British Columbia, each having a capacity of 15 MW. They are also part of the few projects to be awarded within the new Standing Offer Program in the province. KPMG LLP conducted the procurement process. Project construction is set to commence in 2015 and will feature our 2-MW turbines, MM92; the off-taker of the energy will be BC Hydro.

What is the scope for the development of wind and wind technologies in British Columbia?

Wind is an excellent complementary source of energy to hydro. British Columbia and Quebec they can accumulate the fluctuating energy from wind and still rely on hydro. However, wind energy is not as intermittent as perceived; within a large province the wind farms are some distance apart, and blowing wind usually results in power generation in at least farm. Seasonally, in British Columbia and Quebec, wind is at its strongest when hydro power is at its lowest.

The Integrated Resource Plan (IRP) is always subject to change. What do you think will happen in this regulatory framework in the next two years?

Senvion would like to see wind power play a more prominent role in any future IRP. Wind could supply the increasing demand for energy from industry and particularly for liquefied natural gas (LNG) plants in the north.

Can you highlight some of the differences and challenges of operating in British Columbia as compared to Quebec and Ontario?

Projects in British Columbia are at a higher altitude, often over 1,500 meters above sea-level, which presents specific challenges, while Quebec and Ontario have flat terrain. Senvion will overcome the challenges of working at higher altitudes and logistically of moving between the cluster of projects in the south to the one in the north.

What makes Senvion unique from other wind technology specialists in British Columbia, for example, Siemens?

Our machines have been designed, used and approved in European environments, and we have over two decades of wind

power expertise. Our machines are designed to be reliable over the long-term and are environmentally friendly from a noise perspective, having the lowest noise level within the industry. Senvion's machines can also cope with the extreme temperatures in Canada.

Senvion has not had to develop special technologies to deal with the climate extremities of British Columbia. Are your technologies modelled on the machines that you have used in Europe and northern Quebec?

We will use all the good technologies developed in Europe and northern Quebec for our machines in British Columbia. In addition, we are introducing the new technology of our European-proven 3-MW and 3.2-MW into the British Columbia market, which will complement our current 2 MW - MM92 machine. The 3-MW and 3.2-MW being more powerful will reduce the cost of energy.

What have been the trends in the cost of Canadian wind energy over the last two years and how tough is competition with other wind turbine suppliers?

The wind sector is trying to bring down the cost of energy via new platforms. Our MM92 is an excellent machine, especially for wind areas with medium-to-strong winds. In British Columbia there are also areas with weaker wind that would complement machines with bigger rotors.

What are Senvion's key objectives for the next five years in British Columbia?

We want to complete our inaugural British Columbia project and enlarge our office in British Columbia to service local requirements, as our offices in Montreal and Toronto do. The wind business in British Columbia will grow and will benefit from investment in LNG. British Columbia has a high target for demand management. There is currently a review of BC Hydro's Site C project. If this project fails to go ahead, other energy sources could be explored and present an opportunity for wind energy.

We would like to see a positive development of wind and all stakeholders, including First Nations, to appreciate the great benefits that wind power can bring with positive effects on the environment via clean energy and competitive pricing. •

Peter Galbraith & Simon Davies

PG: Global Lead, Infrastructure
SD: Senior Project Manager,
Oil and Gas, Power

AUSENCO



PG

Can you give a brief overview of Ausenco in British Columbia and the importance of the B.C. power sector to the company?

PG: Our largest office in North America is in Vancouver, where we have approximately 400 employees. We also have offices in Calgary, Halifax, Burlington, Toronto and Montreal, and in the United States - Denver, Reno, Concord and Houston. We have a total number of 900 employees in North America. In 2008, Ausenco acquired Sandwell, which had a history dating back to the 1960s of serving BC Hydro and its precursor, BC Electric Company. The peak of our power volume was in the late 1990s/early 2000s, when we led a joint venture called Pacific Power Consultants, which was involved in thermal power generation with BC Hydro at the Burrard Generating Station. This was a major capital reinvestment. Since then, our work in the power sector has reduced and now accounts for approximately 10% of our total revenue in B.C. Over the next five to 10 years, power will be a huge part of our plans. We anticipate that it will account for at least 25% of our overall goals.

BC Hydro plans to invest US\$1.7 billion per year over the next 10 years in its integrated resource plan (IRP). What is Ausenco's strategy to increase its share of the power business?

PG: Our goal is to do the following: build a deeper in-house core of capability; team with appropriate partners when it is more effective to do so rather than building organically in-house; continue to build on our existing work at BC Hydro and move outside our niche profile that has evolved over the years between BCH and Ausenco and previously with Sandwell, demonstrating to BC Hydro that Ausenco has a wider portfolio of expertise.

Our readers want to know more about gas feedstocks and supply of gas. How much do you see LNG being a part of your business and would you develop it through your Calgary office?

SD: LNG presents huge potential for B.C., and Ausenco anticipates carrying out a great deal of work in LNG. We have the expertise to add value in many areas, including ports and marine structures, as well as for larger volume engineering work. There are 15 to 20 projects currently under discussion. Preliminary work will be carried out on most but only a handful will be completed. Ausenco also has a world-leading computer simulation group that can take any facility concept (in any industry) and carry out a simulation, which can facilitate and expedite determining whether a project is viable and its optimal configuration.

Our expertise in Calgary will support our LNG business in B.C. In 2012, Ausenco acquired Reaction Consulting, a specialized gas and oil consulting business, and in 2013, PROJEX Technologies Limited to expand into the oil sands market.

What are the main challenges to upgrade BC Hydro's infrastructure from a technical perspective?

PG: One of the challenges of dealing with 50- to 70-year old infrastructure can be the varying degrees of quality of the work that was originally carried out and integrating it with modern requirements. This is frequently seen in structures since seismic performance standards have changed significantly resulting in the need to upgrade existing facil-

ities to the required level. Three years ago, Ausenco carried out an upgrade for seismic requirements at the water intake tower at BC Hydro's Strathcona Dam near the town of Campbell River. Challenges included drilling holes to extremely tight tolerances and accuracy vertically through the concrete structure to install reinforcing cables. The work was one-of-a-kind, carried out successfully, under schedule and on budget. The project won BC Hydro's Lach Russell Project of the Year award in 2011. This project is typical of many situations where innovative techniques will have to be utilized while upgrading older facilities. A further challenge is that the facilities frequently have to remain in service while work is undertaken.

What differentiates you from other players in the market?

PG: Ausenco has a physical presence in B.C. supported by a large pool of expertise. Many interested parties do not have this talent locally and will have to team with companies such as Ausenco. SD: Ausenco possess the following: local knowledge of the regulatory process; relationships with first nations; awareness of the unique geographical challenges; and familiarity with the local seismic characteristics.

PG: Arguably, you will hear most companies claiming similar attributes, but Ausenco has the nimbleness that bigger players lack. We will be selective as to what work we choose to target.

Over the last decade and a half, the IPP sector in B.C. has grown larger and more influential. Do you see this as an area of growth going forward?

PG: We have carried out a limited amount of work for IPPs. One of the challenges in generating alternative power sources to hydroelectric is that the consumer has become accustomed to cheap electricity. An alternative power source will have to be special to become viable. Going forward, Ausenco will work with IPPs, but this is not a priority. Our focus will be work related to the core BC Hydro facilities. •

David Daw & Shawn Smith

DD: BC Regional Manager,
Renewable Power

SS: Senior Electrical Engineer,
Renewable Power
HATCH



DD

How much of your business in Vancouver is considered hydroelectric, and in what way is the hydro expertise gained in British Columbia important to your global operations?

DD: Hatch has a few different sectors in which it works: power and energy; mining and mineral processing; and infrastructure. Power contributes one-third of its business in British Columbia, with the main focus on hydroelectric working for utilities, independent power producers (IPPs), other developers and financiers.

Vancouver is considered a mining hub. How much does mining contribute to your business?

DD: Historically, our business has been two-thirds mining, one-third power; today, the business-split is more or less equal due to the lull in mining. As energy is not related to commodity prices, much of our work is for utilities that have long-term energy plans with multi-year projects. The company's strategy has been to use the energy sector as a means of compensating for lulls in mining by acquiring power companies, i.e. the acquisition of Acres International back in 2004. This strategy has been adopted globally by Hatch.

BC Hydro is investing US\$1.7 billion per year over the next 10 years in upgrading its infrastructure. What business opportunities are there on the horizon for Hatch in British Columbia?

DD: There are many opportunities for Hatch as consulting engineers. BC Hydro is limited in engineering resources to execute its 10-year upgrade and has a strategy to engage engineering consultants. Hatch and its competitors are endeavoring to secure some of that work. BC Hydro has three general categories of work: sole source requests for specific projects; requests for proposals (RFPs) for single projects; and blanket/master services agreements for multiple projects.

What do you think should be BC Hydro's immediate priorities for updating its infrastructure? Do you feel that the 10-year upgrade will guarantee the future of BC Hydro's infrastructure?

SS: BC Hydro's priorities run throughout its infrastructure, ranging from spillways and generation equipment to sub-stations. A great deal of time, effort and money was invested by BC Hydro in the installation of its infrastructure, followed by a period of operation to the point where it has no choice but to conduct an upgrade. Arguably, most of the infrastructure and equipment is now past its best.

DD: BC Hydro's 10-year plan will facilitate recuperation of its infrastructure. It is essential that the plan is carried through, even at the expense of increased electricity rates.

What are some of the differences of working with BC Hydro and the IPP sector?

DD: From our perspective, over the next few years Hatch is looking for a greater amount of work with BC Hydro than IPPs, which will permeate from its Integrated Resource Plan (IRP). The projects for the past power call will be completed in two years. If there is no further power call within the next two years by BC Hydro, there will be a decline in IPP development. If IPPs cannot sell their power to BC Hydro, there is a limited alternative market.

SS: Discussions with IPPs reveal that the IPP market is relatively quiet on the new project front because BC Hydro has not issued a new call for power since the

last in 2008. The last of these projects awarded power purchase agreements in the 2008 call, which are now in construction, leaving only smaller projects eligible for BC Hydro's Standing offer program to be developed. For Hatch to focus on smaller projects would change its current strategy. BC Hydro's larger projects are Hatch's core.

The Vancouver Island project is BC Hydro's first major transmission line project in 20 years. What have been some of the project's challenges?

DD: It has been some time since BC Hydro has installed a major transmission line, and this change of direction has been a steep learning curve for BC Hydro; Hatch has assisted as project managers.

SS: BC Hydro initially struggled to include external service providers for the design and execution of projects, historically. Most of these projects were executed in-house. In part because of their limited resources, BC Hydro have moved more to executing projects with the help of engineering consultants and design-build contractors. It has been challenging for BC Hydro to make the transition from sourcing in-house to outsourcing. BC Hydro will evolve a formula that will complement its requirements.

What differentiates Hatch from its competitors in the marketplace in Vancouver and British Columbia?

DD: Hatch is a global company with worldwide engineering experience, making it a distinct choice for prospective clients. Hatch is a private company carrying out consulting engineering; it sells this as a differentiator and is beholden to itself.

SS: Compared to smaller consultants, Hatch has the expertise to execute entire projects in-house. It does not have to outsource the design of project components to sub-consultants.

What do you see as the objectives for Hatch in the renewable energy sector over the next three years?

DD: We are actively seeking to expand globally and increase our business in South and Central America. We acquired a company in Brazil two years ago, as part of this strategy. Hatch will also maintain and grow its business in Canada and the United States. •





Meeting Future Demand: Site C and Independent Power Producers?

“There is a direct correlation between aging infrastructure and catastrophe risk. As infrastructure ages, vigorous maintenance programs are critical particularly when introducing a large power generation project to the global insurance market; it will delineate the projects that receive special consideration, and will facilitate the most options and favorable terms as compared to parties that do not carry out the required level of maintenance.”

- Allison Miller,
Senior Vice President and Leader,
National Power and Utilities Practice,
Aon Global Power

For growth within the power industry, the key goal is to secure the appropriate senior technical expertise and develop staff under that umbrella. Typically we see this expertise coming from retired utility employees. The goal is to capture the years of experience and expertise available from the aging utility employee pool so that their years of relevant experience does not retire with them. DMD has already introduced into its workforce experienced ex-BC Hydro personnel to help develop its skill set and will continue to do so as development of this market continues.

- Trevor Stemo, DMD & Associates
Electrical Consultants

The Last in a Legacy's Line

The Push for Site C

Site C was originally proposed as the third of four major dams on the Peace River in the middle of the twentieth century. Two other dams, the 2,876-megawatts (MW) W.A.C. Bennett Dam and the 700-MW Peace Canyon Dam, were completed in 1968 and 1980, respectively. In 1982 and 1989, the British Columbia Utilities Commission (BCUC) indefinitely tabled proposals for developing Site C, but BC Hydro announced plans for its resurrection in April 2010. Following the approval of the Integrated Resource Plan (IRP) in November 2013,

BC Hydro began securing the next round of permitting and social licenses for Site C. "The approved IRP contemplates that BC Hydro would proceed with various processes and stages to advance Site C to a stage that would enable the government to make an informed final decision on whether Site C should proceed sometime in 2014 or 2015," commented Charles W. Bois, a partner at Miller Thomson LLP. If approved in the aforementioned timeframe, BC Hydro plans to bring the project online by 2024. "Site C is dispatchable and produces 1100 MW of firm capacity, which makes it higher quality than run of river or wind, which are both intermittent resources," said Doug Little, vice president of energy planning and economic development at BC Hydro. B.C.'s independent power producers (IPPs) are closely monitoring the situation. "Conditions have changed; I would not classify myself as an advocate of the [Site C] project. It is my job to assess whether Site C is the best way to generate 1100 MW of electricity at the point in time when it would be built and

operating. Over the last several months I have been busy trying to develop alternative packages of ideas, combinations of generation that I can take to the Cabinet and let them make the choice whether to pursue Site C or another option," commented Minister Bennett. Site C is the largest major supply-side question mark for B.C. On the demand-side, a number of soon to be determined factors caused BC Hydro to accelerate the IRP's revision timeline for 2015. "We acknowledge there is uncertainty in our load forecast, largely in the industrial sector due to the potential development of the liquefied natural gas (LNG) industry and the upstream natural gas sector. One of the action items we have in the IRP is to be ready with a Request for Proposals (RFP) from the IPP sector if needed. We are following the load growth very closely and if it looks like load is increasing faster than expected, we will be ready to launch a new procurement exercise. In addition, we will provide an update to the IRP in 2015," said Doug Little of BC Hydro. Paul Kariya, executive director, Clean Energy BC, sees the IRP and 10 Year Plan as designed to meet the interests of BC Hydro and its priority to build Site C, but also considers the two-year review window as a potentially positive development: "Typically an Integrated Resource Plan is given a five-year review window, but this two-year window indicates that the government is willing to review its policies once a final decision on Site C is made and if LNG companies reach final investment decisions in 2014/15."

Much of the province's economic and demand-side future hinges on how B.C. takes advantage of Western Canada's upstream gas reserves and whether it can position itself as an investment destination for oil companies that want to export to Asia. According to government figures, these companies have invested nearly C\$7 billion in corporate acquisitions and upstream production, but reviews are ongoing before final investment decisions are made. An estimate by Midgard Consulting puts the electricity demand needed for four of the 13 proposed projects: Kitimat LNG (Apache and Chevron), LNG Canada (Shell with KOGAS, Mitsubishi, and PetroChina),

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Pacific Northwest LNG (PETRONAS, Progress Energy and JAPEX) and Prince Rupert LNG (BG Group), at 2900 MW.

Even if Site C came online, there would not be enough generation capacity to accommodate LNG. "The larger question becomes if there is large build out of oil and gas or mining in the north, will industry be able to obtain power from the existing grid, or are they going to be forced to self-generate?" according to Graham McTavish, vice president of power, Canada, at Stantec.

Thus, there remains insurmountable connectivity issues associated with supplying LNG facilities with grid-based power according to McTavish: "Northwest B.C. [where the LNG sites are located] is dependent on a single radial 500-kilovolt transmission line from Prince George to Terrace that is subject to numerous small outages during the year. As the LNG sector moves forward, we will probably see the industry rely on their own gas generation for their power needs; so there is significant opportunity for gas generation and renewables combined with local transmission and distribution upgrades in and around Kitimat, Terrace and Prince Rupert. A limited transmission infrastructure in the north is also affecting the construction of new industrial and IPP projects in much of B.C. The large costs and timelines required to interconnect into the BC Hydro grid have significantly reduced the viability of some of these projects."

Aware of the consequences of LNG promotion, B.C. has revised some of its ambitious efforts to reduce the province's greenhouse gas emissions. In 2012, the Clean Energy Act of 2010, which outlined an objective "to generate at least 93% of the electricity in British Columbia from clean or renewable resources," was amended to allow for gas generation at LNG facilities to be considered a "clean source" of energy. "Certainly the decision to label LNG as a clean fuel source and the upcoming decision on whether or not to allow as-yet-to-be-built LNG export plants to power inside the fence will have an effect on IPPs," commented Jason Jones, business development director - power transmission and distribution sector - environment practice, at Tetra Tech EBA. •

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Powering Northern British Columbia

Graham McTavish,
Stantec

British Columbia is the fourth biggest economy of Canada, but most people are surprised to learn that roughly a third of B.C. is off the grid. No substantial electricity transmission structure exists from Prince George to the northern border of the province. This has not shooed residents and industry out of the area entirely, but it has put brakes on the speed of development and limited economic growth. Diesel generation provides power to these areas, but, over the lifetime of an industrial project, the cost of using diesel instead of hydroelectricity can drag an otherwise healthy development into the red. Yet the region's resource wealth has tantalized both industry and government for decades. Large deposits of copper, gold, and other exotic metals like niobium and molybdenum dot the map of northern B.C.

The area also contains what will become substantial pipeline corridors for B.C.'s liquefied natural gas export industry—if the industry ever matures. There are 15 proposed LNG plants in various stages of regulatory approval right now in the province, all hoping to ship cooled methane to the lucrative Asian market one day. Construction on the biggest terminals on the province's west coast is scheduled to begin next spring, but most of the terminals face significant regulatory hurdles, and, less commonly, financial issues and social opposition.

Developing both LNG and mining would supercharge the province's economy. It would also require substantial boosts in power generation and transmission. A single mine can consume as much electricity as a small city. Meanwhile, natural gas becomes a liquid at -162 Celsius and the compressors that bring it down to that frigid level consume huge amounts of energy, whether powered by hydroelectricity or natural gas. However, the

development of power transmission is, for industry, easily as knotty and complicated a problem as environmental approvals or First Nations consultation.

The crux of the issue is that industry and government are stuck in a chicken-and-egg situation. B.C. generates most of its power from hydroelectricity. Building industrial power transmission for that energy usually costs between \$500,000 and \$2 billion per kilometer of line. In a province this big—11 times the size of Austria—transmission projects can become prohibitively expensive. To make investment on that scale palatable, industry would like to build its projects as quickly as safety allows. But that is the exception more than the rule. For example, Imperial Metals began the permitting process for its Red Chris gold and copper mine in the late 1980s. The mine is, as of late summer 2014, just on the cusp of production. Industry is hesitant to tie up capital in such slow-moving and risky ventures. So why does government not kick start the process?

The provincial government regulates the power market through BC Hydro, a Crown corporation. The logical way to encourage these developments would be to have BC Hydro build one or two transmission lines to carry cheap, clean power to the remote corners of the province. But BC Hydro cannot do that with its current revenue. Legally prohibited from raising its rates, the corporation is currently trying to maintain its aging inventory of hydroelectric dams. Finding the \$1 or \$2 billion needed to construct these lines does not seem likely. Less likely is that the provincial government expends political capital necessary to raise the cost of power. So what is to be done?

There are two obvious steps from my point of view. First, permitting should be made more straightforward and efficient.

Requiring a firm to spend decades navigating the approvals process to know if the system will allow a project to proceed is the same as turning many firms away. This cannot be done at the expense of environmental protection, of course. An industrial project is only as strong as its social license to operate. The current regulatory regime is far from perfect, and the efficiency and efficacy of the system can be improved.

Second, BC Hydro and industry need to work together. There is enough project potential in oil and gas, mining and renewable energy in northern B.C. to help fund transmission line expansion throughout the province, providing that there is a long-term commitment from BC Hydro to repay those costs over time. If the public and private sector work together, they can meet the energy demands of the future. It makes good business sense for both sides to find the common ground.

Third, many rivers in the state of Alaska flow a comparative stone's throw from some of northern B.C.'s biggest potential industrial projects. Damming them and running transmission lines into Canada would be much cheaper than extending the grid within B.C. The most likely scenario would be for a series of dams north of Wrangell-St-Elias National Park to run power into mining projects in northwestern B.C., and then on down the coast into the American market. The ability to sell power to large industrial customers would make the cost of building a transmission line down the length of B.C. much more palatable, and the power demand in the American market is expected to increase by almost a third by 2040. There have been rumors of several credible firms mulling this over in recent years. It would be a great boost to industry, government, and ultimately the economic future of British Columbia. •

Graham McTavish

Vice President, Power, Canada
STANTEC



You recently joined Stantec. What attracted you to the company and what are some of its medium-term plans?

Stantec is in growth-mode. There are lots of opportunities in the industry right now, especially for transmission and distribution, because there are few qualified consultants with the capabilities to engineer large transmission and distribution projects. We plan to expand our work with utilities such as BC Hydro as well as with mining, oil and gas and IPP clients to help them with transmission, distribution and generation.

How important is the power sector to your business here in British Columbia?

The power sector is a growth opportunity for Stantec. Many of the electrical utilities in North America, including BC Hydro, are undergoing large capital spending to expand their grids. At the same time, they have to upgrade their existing transmission and distribution systems due to aging infrastructure. The utilities are struggling to keep rates down and lower overhead costs and are turning to outside consulting firms to help.

A huge opportunity for growth exists in northern B.C., where oil and gas, mining and remote communities want to connect to the grid rather than burn costly diesel fuel. There is also the possibility of distributed generation combined with wind power or run of the river hydro. Our team in British Columbia is focused on transmission and distribution, but our teams elsewhere in Canada and the United States are ready to help with a generation or renewable build project.

As BC Hydro sets to upgrade aging infrastructure under the Integrated Resource Plan (IRP), is there enough expertise to complete this task?

There are a limited number of veteran transmission and substation engineering, procurement and construction experts. BC Hydro and many of the other utilities still have them, but many of their senior engineers are starting to retire. Stantec has spent the last few years building a highly experienced transmission and distribution team and is well positioned to fill this manpower gap. We are also looking to grow in the next two to three years with the addition of industry experts as well as with younger staff.

Are current plans to upgrade aging infrastructure extensive enough to meet British Columbia's future needs?

These plans are extensive enough for upgrading aging infrastructure. However, if there is a large build out of oil and gas or mining in the north could these projects obtain power from the existing grid or would they be forced to self-generate? BC Hydro's IRP indicates that they will be able to support the power requirements for the province for the next 10 years, and they are not looking at constructing any additional large lines in northern B.C., other than the possible new line from Kitimat to Terrace. The LNG industry has had to eliminate the possibility of electric drive engines for their plants, as this source is not guaranteed. Northwest British Columbia, where the LNG facilities will be located, is dependent on a single, radial 500-kilovolt (kV) transmission line from Prince George to Terrace, which is subject to numerous small outages during the year. As the LNG sector moves forward, it will probably rely on its own gas generation. Thus, there is significant

opportunity for gas generation and renewables combined with local transmission and distribution upgrades in and around Kitimat, Terrace and Prince Rupert.

How much of a risk is it for the province to not install redundancy across parts of its transmission system?

Most transmission in North America has lightning protection. One lightning strike in the area of a transmission line could take that line down for up to a second, but that second or fraction of a second can mean huge costs to industrial clients. Northwest B.C. is also fed off of a single 500-kV radial line, and even though that line has some backup from the 700-megawatt (MW) hydro facility at Kitimat, an outage would have a huge impact on Northwestern B.C. industrial clients, which need 100 percent reliability not 99.99 percent.

Stantec was the engineer for BC Hydro to replace a fallen transmission line over the Fraser River. What were some of the challenges of this project?

The main challenge was coordinating the construction requirements with the engineering team and making sure a constructible design was in place quickly. Nonetheless, the approvals and design were executed quickly. There was an accelerated construction timeline, and BC Hydro will be doing more upgrades on the line before there is another incident. This goes back to the aging infrastructure issue; the original engineers probably never thought that the flows of the Fraser River would change like they did leading to the erosion around the foundations.

What are your top three objectives for Stantec in British Columbia over the next five years?

We have three objectives: (1) to build on our current transmission and distribution clients to become the number one transmission consulting company in Canada; (2) to build on our gas generation capabilities in Canada and be ready for the gas generation market that will materialize in British Columbia, Alberta and Saskatchewan over the next 5-10 years; an (3) to leverage our renewables expertise in Ontario, especially in wind, and expand into Western Canada when renewables are constructed again. •

New Power Generation: Independent Power Producers or BC Hydro

G. Henry Ellis,
Gowling Lafleur Henderson LLP

An interesting debate is going on in British Columbia with respect to sourcing of new electricity for the next 20 years. In November, 2002, the B.C. government's energy plan, "Energy for our Future: A Plan for B.C.," included a policy action that the private sector would develop new electricity generation with BC Hydro restricted to improving existing plants. The 2002 Energy Plan led to a proliferation of independent power producers (IPPs) responding to the BC Hydro 2003 Green Power Generation Call, the 2006 Open Call, the 2008 Bioenergy Call, the 2008 and 2010 Standing Offer Programs, the 2010 Clean Power Call and Integrated Power Offer as well as electricity purchase agreements (EPAs) directly negotiated with BC Hydro.

BC Hydro reported that as of April 1, 2014, there were 86 EPAs with IPPs in commercial operation with capacity of 3,764 megawatts (MW) and an additional 41 EPAs with IPP projects in development with a potential capacity of 1,703 MW. This potential capacity is being reduced as BC Hydro, relying on its demand forecasts and cost projections, is negotiating cancellation of EPAs where commencement of commercial operation dates have not been met. IPPs contribute approximately 20% of BC Hydro's total power capacity of approximately 15,800 MW.

Following the introduction of the British Columbia Clean Energy Act in 2010, the power dynamics changed. One significant change was that in its November 2013 Integrated Resource Plan (IRP), BC Hydro moved away from the 2002 policy of leaving new electricity generation to IPPs and included the building of Site C (1,100 MW of capacity by 2024), with contingency plans to add Revelstoke Generation Station 6 (500 MW by 2021) and upgrades to GM Shrum Units 1-5 (220 MW by 2021).

The BC Hydro IRP estimates power-capacity surpluses of 240 MW and 135 MW in 2017 and 2018, respectively. It also estimates continuous capacity deficits from 2019 to 2033. In the short-term, the capacity surpluses/deficits are miniscule percentages of current total capacity and given the likelihood that BC Hydro will not meet its demand side management (DSM) targets, there may be short-term deficits, which will exacerbate the long-term deficits. BC Hydro's forecasted capacity surplus of 240 MW in 2017 assumes 957 MW of incremental resources will be available in 2017. However, 82% (781 MW) of these incremental resources are attributable to savings from its DSM program. As BC Hydro places a 50% probability estimate on meeting its DSM targets, the DSM increment might be 390 MW, resulting in a 2017 deficit of at least 150 MW.

The question is whether IPPs can contribute to meet the increased capacity demand for power beyond 2018 or whether BC Hydro will meet the demand itself. If BC Hydro's plans to add 1,820 MW though Site C, Revelstoke 6 and GM Shrum, the projected shortfall potentially available to IPPs in 2033 would range from 56 MW to 417 MW. While these numbers suggest limited opportunity for IPPs, BC Hydro's assumptions will likely prove inaccurate and the capacity deficit will be significantly greater. For example, the IRP estimates an increase of 1,100,000 people (24%) in population for the next 20 years, while BC Statistics estimates an increase of 1,389,000 people (30%) by 2036.

In 2021, BC Hydro is targeting DSM-capacity savings of 1300 MW. To put these savings in context, this requires a reduction of 78% in new electricity demand, which seems improbable, given population and industrial growth. If only half of

the target is met, capacity demand would increase by 650 MW in 2021. By 2033, the DSM deficit could be 1300 MW, resulting in a shortfall potentially available to IPPs of 1356 to 1717 MW.

Other BC Hydro assumptions include wide ranges of expected loads from: (1) the LNG sector, a range of 8x (100 to 800 MW) with an expected load of 360 MW by 2022; (2) the mining sector in the North Coast region, the forecast of 130 MW could be 380 MW by 2019; and (3) the oil and gas sector, the potential load in the Fort Nelson region could grow between 13 MW and 80 MW by 2020 and the Horn River Basin could require additional capacity of 350 MW to 1,000 MW by 2033.

It is difficult to estimate the long-term capacity deficit that BC Hydro will incur over the next 20 years, given the many variables at play. However it appears that BC Hydro's estimates are conservative and that there is significant opportunity for IPPs to invest. While the IRP indicates BC Hydro is only looking to optimize existing IPP resources, there is an acknowledgement that BC Hydro will have to launch a major acquisition process if the large gap Contingency Resource Plan scenario materializes. This article is to encourage IPPs to carefully review the 2013 IRP, monitor growth and make an informed determination of the future capacity requirements. The immediate opportunities are for projects of less than 15-MW capacity under the Standing Offer Program, net-metering projects, co-generation projects and projects where there is a demonstrable demand for localized power capacity that BC Hydro cannot meet. However, analysis and planning for medium- to long-term projects should be undertaken now, given the multi-year time frame needed to design, permit and finance a new power project. •

G. Henry Ellis

Partner
**GOWLING LAFLEUR
HENDERSON LLP**



Why has British Columbia taken a more regulatory approach in the power sector than other provinces?

In Ontario, the power sector is comprised of many power-generating companies with a multiplicity of distributors. By way of contrast, in British Columbia, the government has monopolized power generation, transmission and distribution. Arguably, the reason for this is the nature of British Columbia's power source, i.e. mainly stored water requiring large dams for generation, extended transmission lines, distribution in many disparate population centers and extensive capital as the projects are located in the less populated eastern portions of the province while most the users are in the southwest sector of the province. This setup can be traced back to the 1960s, to W. A. C. Bennett, the then Premier of British Columbia, who successfully implemented his vision to build large dams on the Columbia and Peace Rivers to provide power for the province. BC Hydro's Site C project will be the third dam and generating station on the Peace River.

How have the projects in the independent power producers (IPP) sector evolved since you first got involved with them in

the 1990s?

Initially, there were no major players. Knight Piesold Consultants, an engineering firm, was one of the visionaries and secured the water license for the East Toba and Montrose Hydroelectric project, which was subsequently developed by Plutonic Power Corporation (now Alterra Power Corp.). Initial development was undertaken by small developers, funded through their own resources, venture capital and limited public offerings. Development has progressed to a mix of small developers and major players, i.e. Brookfield Renewable Energy Partners and Innergex. Capital from European energy funds is now being invested in IPP projects. Major financiers, such as GE Capital, have also invested in the IPP market by way of combinations of equity and debt.

From the last power call, only 14 of 27 awarded Electricity Purchase Agreement (EPA) came to fruition. What are the difficulties that IPPs face to complete projects?

The biggest difficulty in completing an EPA is the rising costs for project construction, as the capex budgeted at time of submission for an EPA often turns out to be well short of actual costs given the time between negotiation of an EPA and construction. The permitting procedure has been a hurdle with some IPPs, which fail to qualify for licenses of occupation or leave to commence construction either for environmental concerns or the impact on recreational resources. Accommodating the requirements of First Nations can also impact the timing and economic model.

Do you feel that IPPs are better equipped than BC Hydro to deal with First Nations issues?

The IPPs are business-focused, keen to secure business agreements with First Nations, and able to be more creative in their negotiations, as they are not as hampered by government regulation. BC Hydro enters negotiations with good intentions, but is constrained in what it can offer to First Nations.

Do you see there being more merger and acquisition (M&A) activity amongst IPPs because of the uncertain future of Site C? Site C should have little impact on M&A activity in respect of current projects with

EPAs, as the current IPPs are locked into EPAs ranging from 25 years to 40 years, guaranteeing their cash flow. The bigger issue is that as Site C progresses, BC Hydro will reduce its emphasis of engagement with IPPs, as it is confident that Site C will supply most of the incremental power required for the next 20 years. The government's focus on LNG, coupled with the results of existing power calls and BC Hydro's interest in cancelling some EPAs, suggests that the government will place less emphasis in the future on contribution from IPPs and greater reliance on Site C for the extra capacity.

It has been said that with LNG the fiscal regime has to be correct. What will it take to achieve this and how important is it to be carried out quickly given the competition for LNG capital?

The government is aware of the time constraints, and is trying to achieve the balance between a fair return and encouragement for industry. I am confident that the government will discuss its fiscal regime with the majors and come up with a mutually satisfactory resolution in an appropriate time frame so as not to lose this opportunity.

Would you agree that LNG does not attract the same controversy as oil? What are the challenges to overcome if LNG is going to be developed?

LNG is not as dangerous and its ignition point is not as volatile compared to oil. However, LNG is capital-intensive and requires international capital to develop a plant and pipeline infrastructure. The tax regime will be the first issue to address, followed by permitting requirements and First Nations consultation and accommodation.

What will be Gowlings' objectives over the next five years and what will be the split of your business between IPP proponents and the LNG sector?

Over the next five years, Gowlings will be looking to continue its active involvement in the power sector. We have had interesting retainers, including involvement in many IPP projects and the current upgrading of the John Hart dam. Gowlings is experiencing growth in IPP business but currently LNG impacts have been limited to site explorations for potential plants. •

Waxing or Waning?

The Role of IPPs

In the early 2000s, the Liberal government under Premier Gordon Campbell supported Independent Power Producers (IPPs) to generate energy and meet the province's demands. IPPs had been present in the province since the 1980s, but this strategy enabled private sector players to gain significant market share for the first time, and IPPs now account for approximately 20% of B.C.'s power production. In 2008, 27 electricity purchase agreements (EPAs) were awarded to IPPs in a Power Call put out by BC Hydro. Of these 27, only 14 projects have come online or are expected to come online in the near future. The rest have had their contracts terminated or deferred by

mutual agreement between BC Hydro and the respective developer.

Glen Ichikawa, president of Kawa Engineering, a Vancouver-based engineering firm that specializes in work with IPPs, explains the reasons for the attrition rate from the 2008 Power Call. "The first is financing; some of these projects are millions (of dollars) over budget and no one is making much money on them. Some companies have gone belly up in the process. Lenders realize this and do not want the exposure, so it is harder to get money. The other side is the First Nation relationships; usually projects that fail have offended bands at an early stage and thus the project is always fighting uphill. Third, there are construction costs. Contractors have lost money in the past, so they have raised prices to de-risk themselves when someone cannot pay."

The project-developer model of B.C.'s IPPs has had mixed success. Some projects launched by smaller local companies have never made it off the ground, while other projects, such as GDF Suez's purchase of the Cape Scott wind farm from Sea Breeze Power, were attractive mergers and acquisitions (M&A) targets for global players. The province's IPP sector has therefore consolidated to fewer, larger players; namely Innergex Renewable Energy, Alterra Power, AltaGas, Brookfield Renewable Power and Capital Power.

Compared to earlier power calls, John Carson, CEO of Alterra Power, sees the attrition rate as a structural reality: "The contract structure of any power call will affect the number that succeed, whether it is being more generous on dollars per megawatt hours or the times of year when certain 'revenue buckets' can be filled. In the 2006 versus 2008 call for power, contracts were totally different. 2006 was more developer-friendly showing a lower attrition rate, 2008 was tougher and had a higher attrition rate."

While M&A activity in the IPP sector was robust from 2010 to 2013, most opportunities for a well-capitalized buyer to snatch a long term EPA at an attractive price have passed, even with Site C on the horizon. "Site C should have little impact on M&A activity in respect of current projects with EPAs, as the current IPPs are locked into EPAs ranging from 25 years to 40 years, guaranteeing their cash flow," said G. Henry Ellis, a partner at Gowling Lafleur Henderson LLP's Vancouver office.

As BC Hydro moves forward with Site C, it will likely dampen the prospects of IPPs in the province according to Ellis: "The bigger issue is that as Site C progresses, BC Hydro will reduce its emphasis of engagement with IPPs, as it is confident that Site C will supply most of the incremental power required for the next 20 years. The government's focus on LNG, coupled with the results of existing power calls and BC Hydro's current interest in cancelling some EPAs where the opportunity presents itself, suggests that the government will place less emphasis in the future on contribution from IPPs and greater reliance on Site C for the extra required capacity."

Vancouver-based Alterra Power, which plans on delivering its 62-MW Jimmie Creek run of river hydro project in 2016, is in many ways the quintessential example of an IPP navigating the cocktail of confusion in B.C. through geographic diversification and de-risking its assets. However, the company



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has a desire to continue its growth in B.C. if political decisions allow it. "If there is a call for more power input, Alterra is ready," commented Carson.

Regardless of the course of action for Site C, small opportunities for IPP developments remain under BC Hydro's Standing Offer Program (SOP). The SOP is designed to allow small projects a streamlined, ad-hoc EPA process with BC Hydro, rather than having to bid through a power call. Recently, the size of projects allowed under the SOP was increased from 10 MW to 15 MW, and the government is reviewing the program with the relevant stakeholders to create a more impactful program. "The IRP may have shut the front door to IPPs; the side door is still open via First Nations opportunities, as well as the SOP," observed Michael Walsh, principal and international managing partner at Midgard Consulting. While the SOP will be an option for IPPs, it will be a niche market and will take the right developer to execute the project ac-

ording to Mark Bohn, managing partner at Travelers Capital Corporation. "There are some mid-market developers that have the experience and financial capacity to make these transactions happen. A 15-MW hydro project needs to be done smartly, but it can be a good deal. A developer has to have a good handle on the construction costs; perhaps they opt for a multiple contractor model versus a fixed-price EPC." One of the most precarious issues in B.C. is land use due to the dozens of First Nations with land claims throughout the province. SOP projects require careful consideration of this land use and in many cases can deliver electricity to power-hungry remote First Nations communities. "While the SOP is a bit limited at the moment, First Nations and other communities are beginning to get more involved. Many of these communities run off of diesel and are looking for more energy efficient and environmentally friendly solutions," commented Bohn. •

Image: Kawa Engineering









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Mark Bohn

Managing Partner
**TRAVELERS POWER
CORPORATION**



Could we begin with a brief introduction to Travelers Capital Corporation?

Travelers Capital Corporation is a specialized financial services company that offers structured debt and project finance solutions along with financial advisory services to developers in the renewable energy sector with a focus on middle market transactions up to \$100 million or more in size. Having spent my career with various financial institutions in project finance I noticed a gap in the marketplace in terms of mid-market project finance expertise. Travelers Capital was set up in 2010 leveraging off the Travelers platform that was already in place with their equipment financing business. It was a nice fit and the timing was right.

This gap in mid-market project finance expertise, especially in the renewable sector, is a common observation in our reports worldwide. Why are the larger financial institutions unwilling to take on some of these projects?

The large project finance institutions have limited resources to focus on smaller deals; in many cases, they are driven to existing relationships with experienced developers and limit themselves to larger,

more attractive deals, where there is the potential for capital markets business and the deal execution risk is perceived to be lower. It is the same amount of work to execute a \$10-million non-recourse project financing as a \$100-million deal.

Does a lack of economies of scale hurt the viability of small and mid-market projects?

That is a valid question. The world has changed. The market dynamic is challenging because each deal has its own unique characteristics. We are trying to streamline the entire process, while still maintaining an appropriate level of due diligence. As time progresses, we will begin to see more of a cookie-cutter approach, particularly as it relates to legal documentation on smaller projects. This should speed up the process and allow developers, financial institutions and law firms to execute these deals faster.

How does your specialization in off-balance-sheet loan structures help provide clients finance? Is this typical in the industry?

Off-balance-sheet loan structures are a common product offering in project finance. We specialize in non-recourse project financing, particularly in the mid-market space. A lot of the Canadian banks, particularly the mid-market commercial banks, have a challenging time doing non-recourse financing for \$10 to \$20 million deals. Typically they would require some form of recourse backing the deal.

Of the 27 Electricity Purchase Agreements awarded in the 2008 Power Call only 14 of these projects will come to fruition. What have been some of the stumbling blocks for these developers?

The challenges for many of these less experienced developers, particularly those who used a public financing vehicle, is that they needed to show shareholders that they were making progress. Perhaps they were not cautious enough in evaluating factors such as construction costs and bid too low based on optimistic projections. The process to be awarded a contract is long, and developers were aggressively bidding in an inflationary environment, which escalated construction costs.

What were some of the keys to success

for IPP developers whose projects came to fruition?

The larger players were more disciplined and some were able to refinance partly through the construction phase, as they had the balance sheet strength. Lining up financing for construction of a project is an extremely difficult task. Players like Innergex, for example, have the breadth and depth of experience to do this, while smaller players have more trouble especially if they have limited access to capital.

Are there opportunities for smaller players to be viable moving forward?

Under the Standing Offer Program with BC Hydro, there is opportunity for projects under 15 megawatts (MW). It does not move the needle for the big players, but there are certainly opportunities for smaller players in the province. There are some mid-market developers that have the experience and financial capacity to make these transactions happen. A 15-MW hydro project needs to be done smartly, but it can be a good deal. A developer has to have a good handle on the construction costs; perhaps they opt for a multiple contractor model versus a fixed-price engineering, procurement and construction model to keep their costs lower. While the Standing Offer Program is a bit limited at the moment, First Nations and other communities are getting more involved. Many of these communities run off of diesel and are looking for more energy efficient and environmentally friendly solutions to meet their energy needs.

What is your outlook for your target markets over the coming months and what unique services does Travelers Capital offer?

Contrary to the mood amongst some in the industry, I feel optimistic with what is happening with community-based involvement and its impact on the sector. These will be smaller, localized, bilateral opportunities in British Columbia and across Canada that provide this opportunity for us. Larger banks do not want to get involved in them, which creates opportunities for us. Travelers Capital is unique because it is one of only a handful of firms in Canada focused on structuring and arranging private non-recourse debt for renewable projects. My philosophy in life is if you are going to do something, focus on it and do it well. •

Glen Ichikawa

President

KAWA ENGINEERING



Kawa Engineering is a relatively new company, founded in 2012. Could you provide a brief overview of the company's short history?

After working at Knight Piesold from 1996 to 2001, I founded Amnis Engineering and subsequently sold it to HDR in 2010. After one year I bought out my 5-year non-competition clause with HDR and started Kawa Engineering. After starting my first business I learned my lesson: minimize your partners and do not allow family members into the business. Currently we are the lead engineering firm on a number of small projects (under 15MW) associated with the Standing Offer Program as well as involved with larger projects such as Jimmie Creek in partnership with SNC-Lavalin. We make projects work; we are not a study company. We have a high build success rate because we provide solutions.

What can Kawa Engineering provide that larger, more-established companies in the engineering sector cannot?

Their overheads are too high, we have very little overhead costs and that makes a huge difference. Personally, I am not

interested in making a fortune in the short-term, so we can charge much lower engineering fees than these larger players can. They cannot compete with us on price. I rely on young engineers; I train them up and they gain unprecedented experience and qualifications. We offer young engineers a higher number of projects and a wealth of experience in the field that the big companies do not offer their employees. As a result their résumés look great because the skill set gained from this experience is missing in the industry.

Kawa has C\$200,000 invested in software, probably another C\$200,000 invested in hardware. This gives us more computing capacity than any other engineering company in British Columbia. We have some genius, Ph.D.-level programmers to help us diversify and allow us to do very detailed analysis of designs. We did forensic analysis of penstock failure on a project in Ontario and on these projects our computing power comes into play. If the company can use a 24-core machine versus a four-core machine for complex computing processes, then it is more productive. I make sure we have the most powerful computing system possible to not waste time.

To what extent has your work been with British Columbia's IPP sector versus BC Hydro?

I am hesitant to work with BC Hydro because of the bureaucracy involved. They would take up too much of my time; I can currently work on ten different projects at once with the IPP sector. To illustrate the point if the private sector had done Site C, it would cost a quarter of the price and be done already. The John Hart Project is another example; the millions that are being spent could be halved if the private sector controlled the project.

In your view, is there the expertise left in British Columbia to compete Site C?

Yes there is, but at the moment Site C is just a waste of money. The people working on Site C are not being productive. Environmental and social issues permitting, Site C would have been done had the private sector controlled the project. The relationship with BC Hydro amounts to a subsidy for the approved EPCM contractors on site C. It is like the situation

in Quebec, where the government used to subsidize the local engineering companies.

From the last Power Call by BC Hydro, only 14 of the 27 projects awarded EPAs are coming to fruition. From your perspective what can the IPP sector do to improve this attrition rate?

The first way to improve this attrition rate is financing. Some of these projects are millions (of dollars) over budget and no one is making much money on them. Some companies have gone belly up in the process. Lenders realize this and do not want the exposure, so it is harder to get money. When these things are happening it is harder for contractors to believe that they will get paid for project work. The second is the relationships with First Nations. Usually projects that fail have offended band societies at an early stage and thus the project is always fighting uphill. The third way to improve this attrition rate is through construction costs. Contractors have lost money in the past, so they have raised prices to de-risk themselves when someone cannot pay.

If there is the chance that a client will not be able to pay, is there any way that you can limit the risk?

It is a risk, a real risk. We have been waiting to be paid for six months by a major engineering, procurement, and construction management (EPCM) client. When a smaller client ensures that we are paid in a timely manner, I express how grateful I am because it is not easy to finance non-payment, as we are a small company ourselves. •

Jason Jones

Vice President - Power Transmission and Distribution Sector - Environment Practice
TETRA TECH EBA



Could we begin with a brief overview of Tetra Tech's power-related business in British Columbia?

Globally, Tetra Tech organizes its business operations around emerging and strategic initiatives. Strategic initiatives are those whose annual income is greater than \$100 million per year. Mining, oil and gas, and electric generation are all considered strategic initiatives for Tetra Tech. Our power interests within Tetra Tech usually fall within the electric generation initiative or the oil and gas initiative. There are seven Tetra Tech entities in Canada, all of which operate within the power space. Tetra Tech EBA, the entity I am involved with, interacts with the power sector in two primary ways: on the environmental front through routing, siting, permitting, wildlife surveys etc, and on the engineering side through geotechnical, electrical, civil, and structural engineering. Throughout our divisions Tetra Tech has taken a strategy to look at Western North America as a whole. Although the 49th parallel matters jurisdictionally, it is less important for the flow of electricity because there is so much north-south movement of energy.

Since the government amended the Clean Energy Act of 2010 to facilitate LNG investment are we seeing decreased demand for renewable production centers because of the availability of cheap fossil fuels?

We are absolutely seeing this. The two provinces where this is most relevant are Alberta and British Columbia. There are a couple factors at play. First, there is the global commodities market driving fossil fuel prices. Second, there are government policies making certain energy mixes more or less attractive to development. The third factor is British Columbia's abundant pool of resources. British Columbia is in an enviable position with lots of water and abundant resources, therefore what drives choices here can sometimes be independent of global considerations. Certainly the decision to label LNG as a clean fuel source and the upcoming decision on whether or not to allow as-yet-to-be-built LNG export plants to power "inside the fence" will have an effect on independent power producers (IPPs).

I am very curious to see, with Premier Redford stepping down in Alberta, how energy relationships between British Columbia and Alberta will be affected. She and Premier Clarke were just beginning to talk the same language on energy flows between the two provinces.

What will be the challenges of upgrading trans-border infrastructure?

The US and Canadian system operators each need to take care of their respective shop. The hope is that these individual operators coordinate the timing and type of upgrades they do. There is no point doing an upgrade at one end of the line if the other side cannot accept the energy being sent and vice versa. Aging infrastructure is the essential problem for transmission and distribution in North America regardless of location. How each system operator in the US and Canada pays for upgrading infrastructure is one of the most thorny questions we will see at a political level over the next five to six years. It is certainly a thorny issue here in British Columbia and in Washington, Oregon and California.

How are these issues you are seeing on the West Coast impacting Tetra Tech's company strategy in British Columbia?

It has actually simplified our strategy in some ways. Tetra Tech's goal, particularly in the power market, is to offer a full suite of services. Having governments and crown corporations, like BC Hydro, starting to put their money where their mouth is in terms of committing to their refurbishment programs makes our business development strategy much easier. BC Hydro's commitment to spend at least CAD 1.5 billion on refurbishments over the next five years cannot be ignored. Fortunately, given our company's internal structure, Tetra Tech has the flexibility to be responsive and to increase our staff capacity in short order. We have a large work force with experience in multiple jurisdictions to take advantage of cyclical markets.

What do you see as Tetra Tech's top three strategic priorities in British Columbia over the next five years?

The first is to continue to develop Vancouver as a center of excellence for electrical engineering in order to support not only BC Hydro's infrastructure refurbishment, but also position ourselves for Site C and provide electrical design capabilities for our industrial clients. Second, equally important as the first, Tetra Tech considers meaningful aboriginal engagement as a core corporate value. Aboriginal peoples are partners that we have developed positive and productive business relationships with throughout Canada. Lastly, Tetra Tech wants to be the go to firm for complex projects; the projects nobody else wants to touch. Tetra Tech's corporate motto is 'complex world, clear solutions.' The company has the reputation of taking on the hard projects and finding cost-effective, socially responsible and environmentally responsible solutions. •

Amir Marciano

**Managing Partner
RAKIA RECRUITING**



What is Rakia Recruiting's niche market for the power sector in British Columbia?

In the power sector in British Columbia, there has been a lack of focus across the whole energy spectrum. In the electricity sector, government statistics predict that in five years there will be a void of 45,000 skilled personnel. There will be a seven to 10-year window while current students complete their studies and gain the necessary expertise in order to reduce the shortage of skilled personnel. In the interim, skilled workers can be imported from other provinces, but this will not compensate for the historic lack of ability to attract personnel into the power sector. Currently, Rakia Recruiting is focusing on employing skilled foreign workers as another option to fill the void.

Has employing foreign workers always been a specialized-field for Rakia, or is it an option it has adopted over the last four to five years because of the dearth of skilled workers in British Columbia?

We are associated with a global workforce company - Rakia Global, working together offering worldwide recruitment expertise. The Canadian market is important. In this market, skilled workers are regularly of-

fered attractive packages to move companies; Rakia oversees this transfer of skilled labor.

Do Canadian companies have a prejudice against employing foreign workers, or is it a lack of willing to change historical policies?

The language-barrier is cited as a reason for not employing foreign workers; our initial sources would be to recruit from Anglo-countries, furthermore most highly qualified professionals have learned to speak English. Another concern from clients is how the foreign worker will take to relocation. Rakia covers all aspects of relocating including immigration and housing.

Is the seven to 10-year gap of a skilled workforce in the power sector peculiar to British Columbia? How is it impacting BC Hydro's evolving business model of relying more on outside specialists?

This void of a skilled workforce is throughout Canada but more specific to western Canada, where there are an increasing number of energy projects requiring skilled labor. BC Hydro already has two large operating dams, and the third will likely require sub-contractor expertise. All situations can be managed providing there is the available capital to accommodate needs. There is an increase in demand for our services from the developer, the energy company, the sub-contractor, and other project advocates, to source expertise.

LNG is on the verge of final investment decisions and there is a lull in mining, your other main sector. Do you see the LNG sector as an opportunity for Rakia and for a demand for jobs in the province?

It is sensible to have LNG as an addition to hydro in British Columbia. This will bring many jobs including pipeline engineering and design draft engineers. LNG is a good resource for energy with a long lifespan and does not require a highly skilled trade workforce. Only a short training course is necessary to give local workers the necessary skills. The majority of the workers will be in these trade positions, whereas a minority will be highly skilled workers that we can recruit from overseas.

Looking at the LNG sector worldwide, there is competition for investment dollars

from Shell, Chevron Corporation and Apache Corp and a limited number of personnel who have LNG skills. How do you think British Columbia can attract LNG expertise?

Skilled foreign workers will follow work opportunities from country to country. Canada's immigration policies will not be a problem for companies, as the government understands that in these circumstances foreign workers will benefit the Canadian market. In Alberta, the government invests money to promote the facet of skilled foreign workers; in British Columbia, this policy is still to be adopted.

Are the educational institutions in British Columbia providing a talented workforce that can be trained-up through the ranks?

The educational institutions in British Columbia are providing a talented workforce. Five or six years ago, young people were not interested in entering the energy sector as a career. Today, education institutions are making careers in the energy sector more attractive by marketing and advertising. However, after finishing their education, students will still need to gain experience in the sector before they can start to fill the expertise void.

With British Columbia's educational institutions cultivating a talented workforce, do other provinces/countries try to poach the students?

There is a silent-war between provinces for good brains; provinces are improving benefits to attract expertise.

What do you see as the main strategic priorities for Rakia over the next three years?

Our main priority will be to educate clients on the benefits of the foreign worker solution in the energy sector. Some clients are reluctant to move away from their policy of only employing Canadians. Rakia's objective is to allay its clients' fears of employing foreign workers, currently the only solution for filling the expertise void. For example, we have a job opportunity for a distribution engineer that has been open for eight months. If the client would change its policy on employing foreign workers, Rakia could source it within a month to a non-Canadian with the necessary expertise. •

Electric Utilities Facing the Disorder Equation

Dan Boucher,
Schneider Electric Canada

Electric utilities and associated organizations are going through very challenging times. The “commodity” grid most people know from receiving their monthly bill is about to change. Although each utility operates inside its own context, all are facing new problems and dilemmas – call it the “Disorder Equation”. To make it more challenging, utilities must remain profitable while: sustaining energy rates or proving why their productivity cannot overcome inflation; massively investing in their infrastructure despite declining or flat revenues; coping with renewable generation, micro grids and power quality issues; remaining in full control despite half of their workforce retiring over the next decade; and being more resilient to extreme weather conditions. Is there hope for electric utilities to solve the new Disorder Equation? Of course. The energy revolution will never be simple math. In the meantime, we can think of the following dimensions and debate which ones should come first or last.

The first goal must be to educate customers. Educating consumers is not so much about the new “normal” weather, greenhouse gases, or energy efficiency. The message should be about aging infrastructure, reduction of outage frequency (SAIFI) and duration (SAIDI), and the importance of no longer taking electricity for granted. Currently consumers are not paying the true cost of their electricity. Education goes both ways: to make the customer experience better, utilities must also pay attention to the perceived value. It is no longer just about supplying electrons. Less biased lobbying against rising electricity pricing without sharing the total long-term true cost if the old grid is not modernized and/or improved would be helpful. We should also encourage simpler and regular education of consumers by governments including their

regulators to reconcile public interest with the true cost of electricity.

We also must modernize the old, under-performing grid. We know the grid is over 50 years old. The average life cycle of electrical equipment is 25 years. What happens after the life cycle is exceeded can be catastrophic! Switches and breakers may start behaving abnormally due to fault conditions and intense weather. Besides normal wear, there is always room to reduce outage frequency and duration, two fundamental metrics for all utilities. Replacing the “old” with the “better new” is inevitable to manage these performance levels, as well as power quality challenges and demand increase. We cannot afford to procrastinate when equipment fails to operate adequately and should adopt methodical root cause analysis and field urgency plans, when outages could interrupt or disturb sensitive loads.

Leveraging new technologies is also important, and, if there is a dialogue where everything is converging, it is the so-called “smart grid.” The smart grid definition can be as short as the “coming together” of kilowatts and kilobytes. Some new technologies have amazingly high returns on investment, but some can bring more harm than good. Utilities must decide if they want to enable new technologies to centralize their operations, or progressively resolve local issues. Once that strategy is agreed, utilities can outline the whole roadmap for the next 5 to 10 years to their regulators. For utilities with a big footprint and complex mesh topologies, this thinking process can take time. A strong leader, fully empowered, can alleviate the risk of never getting close to a regulator’s decision.

To significantly mitigate the risks of scope, time and cost variance, the project team and their sponsors should get good benchmarks from other utilities and/or capable solution providers. With a strategy in place, both incremental and

spectacular improvements can be explored, proven and sustained. We should do not look for easy decisions or expect to get the perfect plan for delivering the smart grid of the future. Instead, we should focus on incremental improvements, annual program reviews per shifting grid conditions, and appreciation of the key performance indicators.

The last component of the Disorder Equation, but not the least, is the crucial importance of collaboration. A wise man told me: “If both of us trade a dollar, we both have one; but if each of us share an idea, we both have two”. Over the next decade, electrical utilities will face perhaps their biggest challenge, as half their workforce will retire. Utilities can address this by getting valuable inputs from non-competing utilities. Those who are better communication agents will get more digested information from subject matter experts and be better at leading change management. Collaborative utilities will work faster and cheaper around attrition issues. How could we better address the climate change dilemma? Knowledge and insights can only speed up our capacity to lower its negative impacts.

The Energy revolution we are in will last for a long time. Utilities have realized that their business will no longer be about just selling electrons but providing valuable information and connecting to all home occupants. The Disorder Equation is triggered by financial opposites, difficult revenue assurance and rising costs. To solve this equation we must collaborate. If we worry more about getting things done and less about protecting intellectual property, we can improve faster with the talent we have. We can be optimistic, as most utilities are now seeking the best practices outside their ranks. From the generation turbine down to the outlet at home, there is a reinforcement of the community. Energy leaders are finally connecting in local and global forums. •

Susan Uthayakumar

Vice President, Partner Business for
SCHNEIDER ELECTRIC CANADA



What is the importance of the Energy market in British Columbia in the context of Schneider Electric's operations?

Schneider Electric has a dedicated presence in British Columbia, with over 50% of our employees based in Western Canada. Schneider Electric stands for energy efficiency and sustainability, which puts us very much in line with the provincial government in helping to reduce energy demand. We have two global competency centers in B.C. tied to conservation: our solar center in Vancouver and the metering center in Victoria.

How does this compare to your presence in the rest of Canada?

Schneider Electric is present across the country, but our natural resource play is primarily in the west and our two global competency centers make British Columbia a hub location for Schneider Electric. We have many products and services that enable customers, both residential and industrial, to manage their energy, from load centers to inverters, and various types of solutions with the end goal of making electricity green, productive and reliable.

What research are you undertaking in your

global competency centers?

We align our research with the province's interest in renewable energy, looking at ways to harvest clean energy and release it into the grid. In Victoria, we have our metering competency center, which keeps track of how and where energy is being spent and how to best preserve it, and we just opened the world's largest private MicroGrid Solar Laboratory in our Burnaby office.

Upgrading aging infrastructure is a global concern. Does Schneider Electric play a role on the smart grid side in modernizing this infrastructure to meet the province's goals?

Looking at the energy needs of B.C., BC Hydro's intention is to generate 66% of their energy through conservation initiatives in order to find the cheapest and easiest way for the province to reduce their energy needs. BC Hydro serves about 95% of the province's population, which means that virtually every home in British Columbia will have a smart meter, enabling them to monitor how much energy they are using and thus help everyone save. Additionally, B.C.'s economy is tied in part to the growth of liquefied natural gas facilities, with most of them being operational by 2020. The province does not have the infrastructure to support this ambitious industrialization initiative, so we are working with BC Hydro to put energy efficient and cost-effective structures in place.

What are other examples of opportunities for companies such as Schneider Electric to eliminate waste and inefficiency from the system?

This starts with a look at how energy is being spent, followed by managing the demand to lessen the load in the province. We have significant utility expertise, with our utility group currently working on upgrading BC Hydro's systems to help reduce the energy load. Secondly, in order for the government to reach their goal of energy self-sufficiency by 2016, they need to produce energy locally using inventive methods.

What is the economic benefit for the industry of incorporating energy efficient technologies?

It is in the best interest of energy intensive industries such as mining or data cen-

ters to use solutions that reduce costs, so they focus much of their attention to this expenditure. Schneider Electric has one of its four business units dedicated to using energy more efficiently in heavy industry businesses.

Looking at BC Hydro's integrated resource plan, are we likely to see more opportunity created for IPPs?

In the medium-term, BC Hydro cannot meet energy self sufficiency on their own, so bringing smaller run-of-river operations or wind farms in is one of Schneider Electric's more exciting tasks.

What are some of the key features of your monitoring systems?

We actually use our monitoring system in our own facilities. Our monitoring system provides a real-time feed of how we are using energy in our facilities. The monitors are not only manufactured at our facilities but are integrated into our facilities. In order to be a good energy steward, the first need is measurement. Our monitoring system allows us to examine where the costs and greatest demand for power lie; to track electricity and natural gas usage annually and summarizes our monthly usage; and to measure energy use throughout our facility, allowing us to create an action plan that will reduce our energy consumption and increase our efficiency. A client could use this tool to reduce energy costs in multiple facilities, as it can be synchronized through different locations, even internationally. From one location, a client of ours can know in real-time exactly what energy is being spent where in multiple international facilities. Our system can also help reduce fluctuations in the grid that can damage equipment or result in fines.

What are some of your key strategic objectives in the medium-term in British Columbia?

Schneider Electric hopes to partner with the province to achieve its energy efficiency goals. We also want to help upgrade the aging infrastructure, focus on energy efficiency in new buildings and industrial facilities, and help B.C. balance its industrial growth with its dedication to sustainability. We invest 4% to 5% of our topline globally in research and development, and our partnerships in B.C. offer a wonderful opportunity for growth and innovation. •





The 20-Year Horizon: The Integrated Resource Plan

“The wind business in British Columbia will grow and benefit from investment in liquefied natural gas (LNG). British Columbia has a high target for demand management. There is currently a review of BC Hydro's Site C project. If this project fails to go ahead, other energy sources could be explored and present an opportunity for wind energy.”

- Helmut Herold, CEO North America,
Senvion Canada Inc.

B.C.'S TRANSMISSION SYSTEM

Source: BC Hydro

- High voltage transmission: Over 18,000 km of lines and underwater submarine cables; 100,000 wood poles; 22,000 steel towers; 292 sub-stations.
- Transmission grid operates at voltages from 69 kV to 500 kV and stretches over 75,000 hectares.
- Generation primarily from northern and southern interior of province
- 70% to 80% of consumption is in the Lower Mainland and on Vancouver Island.
- Two 138 kV lines and one 500 kV line connect B.C. to Alberta
- Two 500 kV lines and two 230 kV lines connect B.C. to the United States

Upgrade and Conserve

The Long-Term Trajectory of Power Generation in British Columbia

Under the Integrated Resource Plan (IRP) ushered in by the Clean Energy Act of 2010, BC Hydro is looking to implement significant demand-side savings and conserve energy. The authority expects to reduce the expected increase in demand for electricity in the year 2020 by at least 66%. Reducing energy usage will take much more than a clever, omnipresent ad campaign. "BC Hydro is first targeting the low hanging fruit, changing light bulbs,

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Renewable energy is a long game for investors but long-term constant returns are very rewarding.

- Chris Ball,
Executive Vice President,
Corpfinance International Limited (CFI)

”

etc in order to reduce usage. As they move forward, there will be a reliance on new technologies that in many cases have not even been developed yet to help them realize their future savings. There is obviously a bit of skepticism as to whether BC Hydro can really realize these savings," commented Sam Mottram, managing principal of power services at Knight Piésold.

Another key component of the IRP, which should serve as a major boon to the province's service providers, is the C\$1.7 billion BC Hydro plans to spend on upgrading its system. As aging infrastructure serves as a crucial issue across North America, British Columbia is making key investments to nip the problem in the bud. However, with aging infrastructure comes an aging workforce across the continent as well. "There are a limited number of veteran transmission and substation engineering, procurement and construction experts in the industry. BC Hydro and many of the other utilities still have many of them, but we have seen a trend where many of these senior engineers are starting to retire," said Graham McTavish, of Stantec. While an older generation retiring, Stantec and other firms are assembling ample teams to take the reins in British Columbia.

However, with aging infrastructure comes an aging workforce across the continent as well. Amir Marciano, managing partner of Rakia Recruiting, sees foreign workers as a solution to British Columbia's medium term labor shortages. "In the electricity sector, government statistics predict that in five years there will be a void of 45,000 skilled personnel. In the interim, skilled workers can be imported from other provinces, however, this will not compensate for

CFI
BEYOND BANKING:
BUILDING

Knowledge, Experience, Integrity

The way we see it, when you build others, you build yourself. For more than 30 years, we've provided financing to the power generation infrastructure sector and we've helped build hydroelectric dams, co-generation plants, solar and wind facilities. We have financed or provided advisory services to over 70 hydro projects across North America.

We can advise on all aspects of a project from early development, through construction to asset management for the term of the facility. Our senior team of originators, in offices located in Toronto and Vancouver, supported by dedicated in-house legal resources, and a highly experienced credit group, bring knowledge, experience, patience and integrity to every project.

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the historic lack of ability to attract personnel into the power sector. Currently, Rakia Recruiting is focusing on employing skilled foreign workers as another option to fill the void.”

While an older generation is retiring, firms are grooming younger teams to take the reigns. Adrian Gygax, principal of Vancouver-based Gygax Engineering Associates (GEA), sees B.C. as maintaining its position as a hub of innovation, as the next generation of engineers gain experience. “There are numerous young engineers and technologists in this province that have developed unique skills in the hydropower sector. There is a real potential to export these skills, but we need a strong project base in this province on which to build. It is essential that we do not lose the knowledge base that now resides in our young engineers.”

Although not an insurmountable challenge, extreme weather conditions in the central and northern parts of B.C., with snow lasting from November to March, adds another layer of complexity when it comes to infrastructure build. Guy Lemieux, president of Lex Engineering, which specializes in the design and build of substations and transmission lines, explains some of the special adjustments needed for their work in the province, “Lex transmission line and substations are designed to accommodate extreme temperatures of minus 50 °C and plus 40 °C. Transmission line conductors are sagged to not over tension at minus 50 °C and to provide the required vertical clearance at maximum sag during full load at maximum ambient temperature.”

Engineering firms also tend deal with the winter conditions by building as much of the substation and transmission line components at a manufacturing facility before transporting it to the remote locations where it is then assembled. Finally, generation firms are preparing machinery to handle the elements by fine-tuning design and manufacturing in Europe. Helmut Herold, CEO North America of Senvion Canada Inc., a wind power generation company, says, “Senvion's machines can cope with the extreme temperatures in Canada. Senvion will use all the good technologies developed in Europe and northern Quebec for its machines in British Columbia.”



International Consultants Power and Control Engineering

Lex Engineering Ltd. is a professional electrical engineering company serving the utility, forest, oil & gas, mining, manufacturing, and construction industries in North America. Our focus is based on cost effective solutions for our clients. We have combined our many years of experience with the latest technologies to provide the best engineered solution.

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Infrastructure precedes development, which makes getting it out a challenge. "Arguably, the biggest problem with removing old infrastructure, especially in the metropolitan areas, is that site access conditions have significantly changed since infrastructure installation. Historically, transformers were moved by rail or barge; rail sidings have since closed, and barge sites have been replaced with condominiums," commented David Stroud of Apex Industrial Movers.

As BC Hydro and the IPP sector are both active in developing projects, the province's logistics sector has seen an increased workload as massive generation and transmission components are imported from around the world and often sent inland via rail, river and/or road. "Our growth has come from both BC Hydro and IPPs. BC Hydro has been enacting system upgrades, new sub-stations as well as replacing old infrastructure. When working with IPPs, there are additional site issues tending to be more in rugged remote terrain and difficult to access areas; BC Hydro's locations are easier to access, being generally near major infrastructure, but BC Hydro's equipment is usually much larger," added John Brise of Apex Industrial Movers.

Given British Columbia's closer proximity to Asian manufacturing centers, it is surprising that many of Western Canada's oversized industrial components arrive in a port such as Houston and are moved overland due to difficulties and lack of equipment necessary of moving such objects through British Columbia. Canadian companies such as Apex, Triton Transport, T-Lane Transportation and Amix Heavy Lift are working to make British Columbia more accessible.

Amix Heavy Lift acquired a ringer-crane in 2005 and placed it on its Arctic Tuk barge in order to move heavy equipment, including transmission cable spools, and generation turbines of up to 380 metric tons. "There are substantial savings in time and money; companies can import straight into a British Columbian port, utilize our services of heavy-lifting equipment, and then truck the cargo to site," said Clarke Longmuir, president of Amix Heavy Lift. Like many in British Columbia's power value chain, the IRP is expected to contribute to Amix's bottom-line, "We expect business to permeate from the IRP. When there is a requirement for heavy lifting, Amix is ready with equipment to service BC Hydro's needs; whether it be for one large crane, the tug-and-barge service, or the use of our facilities at Chilliwack, Langley, New Westminster, Surrey and Prince Rupert," commented Longmuir. •

Christopher Ball

Executive Vice President

**CORPFINANCE
INTERNATIONAL LIMITED
(CFI)**



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Could we please begin the interview with an introduction to CFI and your key projects in British Columbia?

Corpfinance International Limited (CFI) has been active in providing advisory services and financing for infrastructure and energy projects for 30 years. Our clients are in Canada and the United States and are predominantly mid-sized enterprises, although some of our earliest customers have grown into well-known publicly traded names, such as Algonquin Power and Utilities Corporation, Innergex Renewable Energy Incorporated, and Boralex.

British Columbia is a strong market for CFI in the power sector. We are currently providing services to twelve hydroelectric and alternative power projects that have been completed (Rutherford Creek, Zeballos Lake, Furry Creek, McNair Creek, Ocean Falls, Tyson Creek, Upper Slave, Kwalsa, One Hundred Fifty Mile House, Boston Bar and, Savona). In addition to completed projects, we are raising debt capital for four additional power projects with strong cash flows and reasonable construction costs on a per megawatt basis. However, due to the customary confidentiality provisions of our mandates, we are unable to disclose additional details about projects under development.

British Columbia is also a strong infrastructure financing market for CFI. We have raised capital for eight infrastructure projects in the province, mostly in social infrastructure and particularly in the areas of retirement/nursing homes and hospitals. We expect a continued strong pipeline for social infrastructure projects, as the population grows and ages, demand for elder care will most certainly increase.

Can you tell us more about CFI's risk criteria when selecting energy projects?

CFI is able to help guide the client through the intricate nuances of non-recourse financing structures as well as advise our clients as to what the financing markets will expect, including appropriate contracting agreements for inputs and outputs, First Nations' consultations and agreements, and transmission interconnects. Our due diligence will also focus on geo-technical work, robust cash flows and sufficient capital and contingencies to complete a project.

What made your key projects in British Columbia bankable and sound investments?

The key to bankable and sound investments is identifying and mitigating risks, putting appropriate financial leverage on a project, and getting good long term power sales contracts with sound counterparties such as BC Hydro.

The Rutherford Creek project is an example. The original owner was Cloudworks, which CFI introduced to Innergex Energy. Innergex wanted to expand into British Columbia and, by joint venturing with Cloudworks to build the project, added a good sized project with a good design, robust cash flow, and a power sales contract of 40 years from BC Hydro. Cloudworks got a strong partner in Innergex, which helped complete the project at a higher capacity than originally envisioned.

Furry Creek is another. It was one of our first transactions and a smaller deal, but we were able to negotiate a First Nations' agreement in short order. Furry Creek also suffered from a dropped turbine during shipping, but we had the appropriate insurance in place to cover the additional costs and delays. To date, Tyson Creek has proven to have the strongest cash flow despite the last two years of low water levels.

What is the current lender appetite for renewable energy Independent Power Producer (IPP) projects?

Lenders have had a generally positive experience, and appetite for new projects is strong. As long as projects have a strong power purchase agreement for a lengthy period of time, such as the 40-year deals being offered by BC Hydro, renewable energy opportunities will be sought after.

How important has local First Nations' support been in previous projects and what measures do you put in place to ensure their continued support?

It is important to understand the historic situation of the First Nations, who want a relationship that is a two-way street. They also understand that both parties must benefit from a project and they are always mindful of how the land will be affected, as we all should be. The environmental and economic advantages to which the First Nations are entitled can be realized without making the economic and investment returns of a particular project sub-par. Replacing the ongoing use of extremely expensive diesel fuel for power generation in remote communities with cheaper and environmentally sensitive sources of renewable, alternative energy is another priority.

What is the potential for renewable energy in British Columbia and the rest of Canada?

Investment potential for renewable energy is largely driven by governmental policy. The industry can play a role in enhancing government awareness of the benefits independent power producers can bring to the table such as the entrepreneurial will to find and develop more (often smaller) sites, enhancing local employment, and the growing expertise of professionals in the field. British Columbia has key natural resources available, such as rivers with high headwaters with long flows, which usually equate to a lower cost of construction per megawatt compared to other regions that also host run-of-river projects. All that is required is reasonable transmission costs to interconnect the projects to where the demand exists. Renewable energy is a long game for investors but long-term constant returns are very rewarding. The power industry in Canada is exciting, and the country is a worldwide leader in the natural resource sector. •

Guy Lemieux

President
LEX ENGINEERING



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Could you give us a brief overview of how Lex Engineering Ltd. entered the power industry in British Columbia?

Lex Engineering was established in 1979 and has grown to a company of 23 personnel. Since our establishment we have completed 80 substations of 69 kilovolts (kV) and higher, which is comparable to, if not greater, than other consulting engineering companies in Western Canada. Our work includes 287-kV substations and transmission lines in the Kitimat area. Our work in the mining industry includes design of a 230-kV substation and 92-kilometers (km) transmission line design for the Mount Milligan Mine. Lex works mostly domestically, but has completed international assignments. Lex works in all sectors, including utility, transportation (YVR), mining; forestry, institutional, petrochemical, and petroleum and pipelines. In summary, power is our business.

British Columbia is known for its hydroelectricity. Do you specialize in any specific technologies and could you give details of current projects in British Columbia?

We are experienced in designing substations for major generation technologies, i.e. wind, hydro and thermal. Generation and load project examples in Western Canada include the 144-megawatt (MW) Dokie Wind Farm, near Chetwynd, B.C. and NR Green heat recovery generation at White Court, Alberta. Our load substation work includes a 69 kV, Gas (SF6) Insulated Substation (GIS) for Neptune Terminals in North Vancouver. Our work at Vancouver Airport Authority consists of the introduction of concepts making their power system more efficient, and less costly to operate. Other projects include a 230-kV substation for Spectra at Sukunka south of Chetwynd. In many cases, Lex completes the BC Hydro tap design. At the Dokie Wind farm, Lex brings power from the wind turbine generators on 35-kV collector power lines to the substation, stepping it up to 230 kV, and transmitting it to the BC Hydro tap point.

Where are the control buildings built, are they transported, and how difficult is it to work in extreme weather conditions?

Lex minimizes low winter temperature site work by arranging to have the control buildings fitted with all equipment at the control building manufacturing facility. The off-site work includes installation of protective relay racks, communication equipment, switchgear, AC and DC station services, HMI systems, building HVAC and security systems. All interconnection wiring is completed at the factory with interface terminal strips provided for connection of field wiring, and where necessary, terminal strips are provided at shipping splits. Lex attends the factory to up-load protective relay programs and test relay function, including 61850 protocol communication, as well as final testing of the control building at site.

Lex transmission lines and substations are designed to accommodate extreme temperatures ranging from minus 50 degrees C to plus 40 degrees C. Transmission line conductors are sagged to prevent over tension at minus 50 degrees C and to provide the required vertical clearance at maximum sag during full-load at maximum summer temper-

atures. The transmission hot and cold curves are generated by our PLSCAD software.

What are the advantages of 230-kV transmission line design using brace post insulators on single pole structures?

In the case where a transmission line is placed adjacent to an existing major transmission line, such as at BC Hydro's 500-kV line, the conductor geometry of the braced post insulator line enhances reduction of asymmetrical induction by rolling the phase at two transpositions. The braced post geometry facilitates "rolling the phases" (rolling the conductors). Our computer modeling in a recent project shows an open circuit voltage unbalance of 17% is reduced to the 1% range by rolling the phases in two transpositions to provide three equal length segments exposed to the adjacent line. The single pole structure also reduces the transmission line right-of-way width.

How tough is the competition in engineering services and how do you carve a niche?

There is competition but Lex enjoys a good amount of repeat business and also "word of mouth" recommendations. Larger engineering firms have retained Lex on big projects. Lex's single discipline staff of 23 compares well to the electrical departments of larger multi-discipline firms. Our strategy is to continue steady growth and to lead in the industrial power and control field. Our office is located in Richmond, B.C., Canada.

Do you have a final message for our readers?

The abundant and economic supply of energy defines the standard of living of a society. British Columbia has enjoyed plentiful and low cost electrical power provided by WAC Bennett's Two Rivers Policy (the Columbia and the Peace) from the late 1960s to the present. It is now time to develop the next frontier of power, and Lex looks forward to continuing its sustainable growth in the power field. •

Clarke Longmuir

President
AMIX HEAVY LIFT

.....
Could we begin the interview with a brief overview of how Amix was formed and its niche market?

Amix dates back to the early 1970s, when its primary focus was scrap-metal. As this market for scrap-metal and demolition developed, there was a need for larger equipment to improve the company's capabilities. In the 1980s, Amix became more involved in marine transportation, partnering in tug and barge ownership, which evolved into barging scrap-metal and other commodities. As Amix advanced, it added further equipment, including cranes. In 2005, there was an opportunity to purchase a large ringer-crane. We had it designed for mounting on our barge, the Arctic Tuk, which was originally designed for transportation in the Canadian Arctic. This equipment enabled us to enter the heavy-lift market in Vancouver and North America's west coast, in addition to using it for our demolition work related to the scrap business. We marketed the Arctic Tuk along with other supporting equipment. Since then, this market sector has grown steadily to include power-related projects, including transporting generators from ship-to-rail or barge,

as well as heavy-lifting transmission cable spools, the heaviest being 380 metric tons (mt).

Prior to Amix entering the market, its type of service offering did not exist in British Columbia. How much are you able to save companies on logistic, as they no longer have to import into the United States then truck to Canada?

There are substantial savings in time and money. Companies can import straight into a British Columbia port, utilize our services of heavy-lifting equipment, and then truck the cargo to site.

Were there any particular challenges for Amix' involvement in the Cape Scott wind farm project?

Amix became involved with the Cape Scott wind farm project because there was a requirement to lift some of the components of the wind turbine towers. The managers of the project decided that all components would be staged at the Port of Nanaimo, Vancouver Island. There were limitations on what land-base cranes could reach from the dock, and it made economic-sense to commission Amix's water-borne Arctic Tuk ringer crane to lift the 85-mt nacelles and some of the large columns. Land-base hydraulic cranes handled the lighter equipment, including hubs and blades. The Arctic Tuk ringer crane proved successful, lifting from the lower holds of the ship across to the waiting trailers. Amix was hired by DP World, Vancouver, and worked with the cargo carrier, Grieg Star Shipping and Nanaimo Port Authority. The contract was carried out successfully without issue.

For the Cape Scott project you worked alongside the Nanaimo Port Authority and Grieg Star Shipping for an independent power producer (IPP). When carrying out a project, is there a difference between working for IPPs and BC Hydro?

We are a service-provider and can work directly with owner or manufacturers, but predominantly we are more involved with a shipping company/agent or a transportation company, which hire us for our ability to lift heavy cargo.

BC Hydro has its 10-year Integrated

Resource Plan (IRP) that will invest over 10 years an annual C\$1.7 billion to upgrade its aging infrastructure. Has the IRP directly affected your business?

We expect business to permeate from the IRP. When there is a requirement for heavy lifting, Amix is ready with equipment to service BC Hydro's needs, whether it is for one large crane, the tug-and-barge service, or the use of our facilities at Chilliwack, Langley, New Westminster, Surrey and Prince Rupert.

What percentage does the power sector contribute to your business?

Currently, the power sector does not contribute a large amount of our business; over the last few years, we carried out 25 days of craning work related to power projects equating to approximately 10% of our business.

There will be a considerable number of liquefied natural gas (LNG) facilities that will be built on British Columbia's coast. These facilities will require equipment. Do you see this as a business opportunity for Amix?

Amix see LNG sector as a future business opportunity. It will be a competitive market, but Amix has the equipment and expertise to service the needs of this developing sector. We have already been approached by companies within and outside British Columbia vying for business in the LNG sector for pricing input towards future concepts.

What are Amix's strategic objectives over the next three to five years?

1. We will improve industries' knowledge, including power and LNG, of Amix's service offering in the heavy lifting and marine transportation sectors and partner with other contractors in the area to share information and resources.
2. We will also seek a good business-fit for our facilities at Prince Rupert and Vancouver. Both are equipped with off-loading and re-load and have room for expansion. There is potential for new business in Prince Rupert and Vancouver; arguably, it would make economic sense to ship through these two ports, rather than the southern United States and overland into Alberta. Amix is trying to correct the misconception of British Columbia's service offering. •

David Stroud, John Brise & Doug Elliot

APEX INDUSTRIAL MOVERS



DS



JB

Apex Industrial Movers is a division of the Pacific Group of Companies. Can we begin with a brief overview of how Apex Industrial Movers fits into the broader Pacific Group of Companies and how it contributes to the revenue of the Pacific Group?

David Stroud (DS): Apex has been with the Pacific Group for 21 years; we interface primarily in the heavy industrial-side of the sector. As a rule, there is little crossover with the Pacific Group but we do have the advantage of sharing labor when necessary. Overall, Apex accounts for 10% to 15% of the Group's revenue.

Is the power sector important to your overall business, what percentage does it contribute, how has it grown over the last five years, and what growth do you anticipate over the next five years?

DS: For the last three to four years, 90% of our work has been associated with power generation or transmission. We anticipate that this trend will continue for the next four years.

Is your growth in the power sector due to BC Hydro's Integrated Resource Plan (IRP) and the upgrading of its existing infrastructure, or has your growth permeated from independent power producers (IPPs)?

John Brise (JB): Our growth has come from both BC Hydro and IPPs: BC Hydro has been enacting system upgrades, new sub-stations as well as replacing old infrastructure; our growth with IPPs has evolved over the last few years. When working with IPPs, there are additional site issues, which tend to be in more rugged and remote terrain and more difficult to access. BC Hydro's locations are easier to access, as they are generally near major infrastructure, but BC Hydro's equipment is usually much larger.

Doug Elliot (DE): Considerably more logistics are involved in moving BC Hydro's product than that for IPPs. With BC Hydro, the ministry's infrastructure is used to move product. For the remote locations of IPP sites, ministry infrastructure is not involved and therefore the logistics are not as difficult. Product is barged or railed near to the site and off-roads usually owned by IPPs are used to access the site.

You have some very specialized equipment, including a 200-metric ton (mt) transformer trailer. Is this a unique service offered from Apex, and are you focused totally on the British Columbia market?

JB: 200-mt transformer trailers are rare; there are very few transport companies in British Columbia that can handle such a load. We have the only dual-lane transporter that is permanently based in British Columbia, giving us a big advantage over our competitors.

DE: As well as British Columbia, Apex operates in Alberta and Saskatchewan. Our equipment is suitable for operation in the four jurisdictions in western Canada and the Pacific Northwest, encompassing predominantly power generation/transmission, but includes pulp mills, shipyards, mining, and oil and gas.

Looking at power transmission and the replacement of its aging infrastructure, there will be much demolition involved. Is the removing of the old equipment an area that presents particular technical challenges for Apex? Are there safety issues?

DS: Arguably, the biggest problem with removing old infrastructure, especially in the metropolitan areas, is that site access conditions have significantly changed since infrastructure installation. Historically, transformers were moved by rail or barge; rail sidings have since closed, and barge sites have been replaced with condominiums.

How does British Columbia's regulatory regime compare to other provinces?

DE: From a regulatory viewpoint, British Columbia is comparable to California for its stringent rules; however, British Columbia is looking at ways to become more accommodating on the movement of large loads. Over the last nine months, Apex has been working with the authorities to agree on the movement of a large load for the Northern Gateway pipeline project through the province to Alberta and Saskatchewan. Good headway is being made. There are principles that have to be applied for large-load haulage: can it be moved by barge or rail; if not, then the ministry will consider the road option. All Canadian provinces conduct this policy. Loads are now so large that rail-movement is becoming redundant.

What makes British Columbia's regulatory regime so stringent?

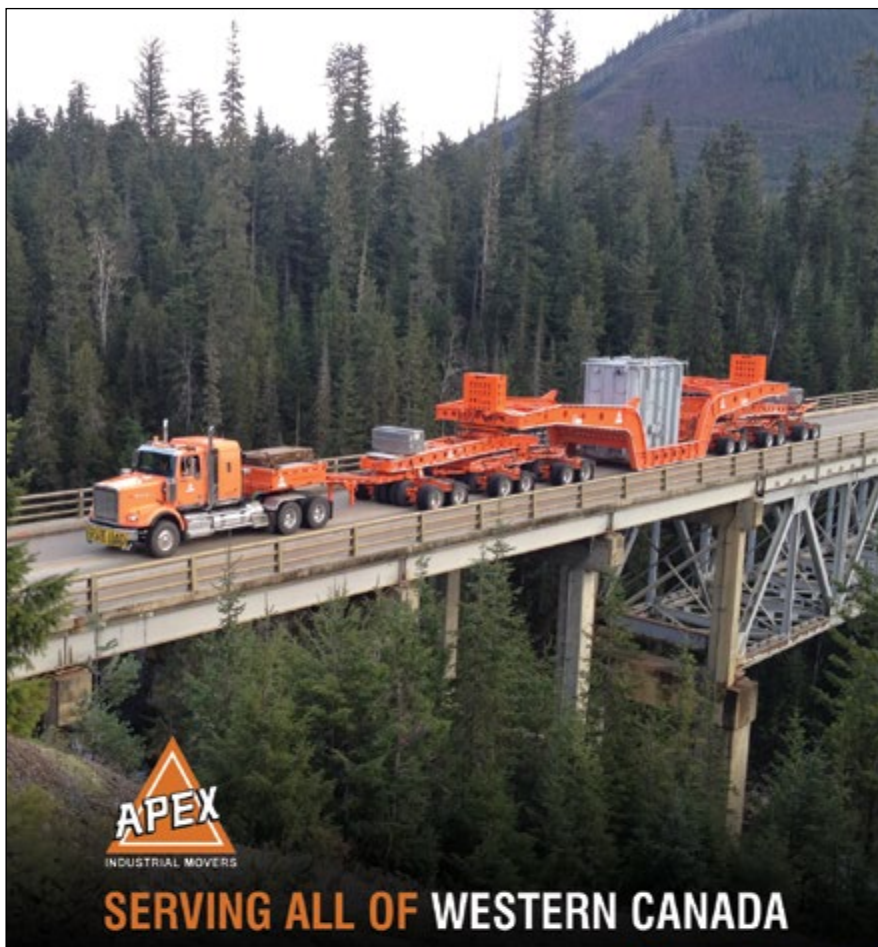
DE: It is the infrastructure that is in place. British Columbia does not have four-lane or six-lane roads; much of it is two-lane, mountainous and curvy, difficult for haulage. In Alberta, large and heavy loads are moved during the day; in British Columbia, they are moved at night, i.e. from midnight to 05:00, or for excessively large loads from 02:00 to 05:00. A load being taken from the Port of Vancouver to the British Columbia/Alberta border can take three days, where as a highway vehicle would take 12 hours. Apex is negotiating with the government to operate an eight-hour haulage day.

What were the challenges of delivering the transformers to the Seven Mile Dam project?

DE: There was a significant amount of logistics involved in the delivery of transformers to the Seven Mile Dam, taking us eight months to secure haulage approval from the ministry. Actual delivery took five days from delivery at the British Columbia border to the pad. Once a certain threshold of weight is achieved, the ministry does not cover the analysis work for bridges. Apex had to hire an independent engineering firm to carry out bridge analysis, and the process took three months to complete. This analysis was then submitted to the ministry, which conducted its own review. The whole process took six months. A project of this type, from its inception to the first transformer being on the road, can take 12 months. Most jurisdictions have a similar regulatory regime for this type of haulage project.

What do you see as the strategic objectives for Apex Industrial Movers over the next three to five years, and will that 90%-revenue contribution of power be maintained?

DE: Apex will be able to maintain the revenue contribution of power provided that BC Hydro continues its current strategic plan to upgrade its infrastructure. It is important to cultivate other markets, i.e. pulp mills and mines, as a safeguard should our BC Hydro work reduce. •



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Adrian Gygax

Principal
GYGAX ENGINEERING ASSOCIATES (GEA)



Could we begin the interview with a brief overview of GEA, why did you decide to form the company and what opportunities did you see in the market?

My background is in heavy engineering design, consulting and site services. For 15 years, I worked for a large European-based engineering firm covering all sectors from public transit to nuclear power. I moved back to Vancouver and felt that there was a niche for small players to provide engineering services to larger industrial public sector clients. These clients would typically go to the big players in the engineering sector for their large projects, but had smaller needs where it was not viable to instruct the big players.

GEA is involved in many sectors. How much of your business is concentrated on power, and how is this business apportioned between British Columbia and the other provinces?

Our power business varies from year to year. For the last two years, Gygax has been focused on hydropower; primarily handling a total of over 100 megawatts (MW) installed capacity from three projects, the smallest being 18 MW and the largest 70 MW. In previous years, we have been more active in industrial port facilities, but try to remain active in different industrial sectors not wishing to be pigeonholed. Currently, 45% to 55% of our revenue comes from hydropower. The bulk of our remaining revenue is in the thermal power sector having a standing-agreement with Qulliq Energy Corporation in Nunavut, where we are designing remote power stations. Similarly, Northwest Territories Power Corporation has been a long-standing client; we have carried out projects on new and existing thermal plants and upgrading their hydropower facilities. We also act as sub-consultants for projects in the municipal sector; clients range from Metro Vancouver through the various municipalities of lower mainland and throughout British Columbia. Our projects in the industrial sector extend worldwide. For example: in 2013, we completed an expansion to a clinker terminal and cement production plant in the Port of Abidjan, Ivory Coast; in the late 1990s/

early 2000s we carried out a similar project in the Dominican Republic. Other projects have been in Southeast Asia, northern and western Africa, the Caribbean, and North America.

You have worked on smaller-scale run-of-river projects. Can you outline the technology gains and expertise that have been achieved in this sector in British Columbia?

My early career involved working on similar sized projects in Europe. In North America, technology gains have been made, but initially it was a steep learning curve for engineering firms as small hydro plants had been rare. GEA has been successful in this sector as it has in-house experience of run-of-river hydro. There are issues where British Columbia is at the forefront: many are environmentally related, i.e. fisheries and habitat mitigation and protection through operational constraints on the plants; the intake design; types of weirs and Coanda screen technology. It is the application of this technology that has been championed by British Columbia. GEA is currently involved in a project near Squamish where the Coanda screen intake is not operating in its traditional use as a spillway; the screen would normally be oriented as a weir perpendicular to the flow of water, but we are using a flap-gate to regulate a head-pond sending the water over the Coanda screen located at the side of the head-pond. This method was a requirement to address fisheries issues.

Looking at the future, what is the demand for small-scale hydro in the province?

The B.C. run-of-river power industry has advanced considerably the way such projects are developed. On a hydro-technical level, we have also advanced considerably during the past two decades. For instance, our firm designed the highest head run or river plant in North America at 865 meters. We designed the first two projects in B.C. to use fiber-reinforced-polymer pipe for the penstock (conveyance pipe) with a considerable advantage in construction time and complexity. And we and other firms in the province have

developed design methods that eliminate the need for expensive concrete foundations at the bends of welded steel pipe, relying instead on the soil backfill to limit movement. There are numerous young engineers and technologists in this province that have developed unique skills in the hydropower sector. There is a real potential to export these skills, but we need a strong project base in this province on which to build. In any case, regardless of the current miscommunication between certain environmentalists and our industry, I firmly believe we will need small hydro in our medium and long-term future. It is essential that we do not lose the knowledge base that now resides in our young engineers.

The British Columbia Clean Energy Act states that 93% of electricity must come from renewable sources, and

you mentioned that hydro is seen as controversial when it is built. Why do you think this is when the province has such a green reputation?

There has been a lot of misinformation; arguably, there was lag between the regulatory agencies' requirements and the initial development of the renewable sector in the early 2000s. There was uncertainty by the regulators as to how deal with renewable projects, and most of the requirements and review criteria seemed to be developed while projects were in motion. Arguably, the government must take some responsibility; the Gordon Campbell government had this vision of green power to make British Columbia one of the greenest places on earth. It failed to lay out sufficient regulatory rules and preparation that would have made it easier for the developers to understand the government's regulatory requirements. Albeit,

the regulatory framework has since evolved to become clearer. Also adding to the confusion was the restructuring of the ministry responsible for the run-of-river hydropower. Then, there is a public perception that small hydro activity regularly kills fish, permeating from media misinformation.

If we return in three years, how do you expect GEA to have developed in the market?

GEA is currently in a transition phase; some of its younger employees are coming into ownership and management, and it is unclear what their focus and direction will be. Everyone in this office enjoys hydropower projects; my younger colleagues have gained invaluable engineering knowledge in this sector. Hopefully, this expertise will be utilized and not be lost out of the province. •



GEA Gygax Engineering Associates Ltd.

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Gygax Engineering Associates Ltd. (GEA) has a proven global track record with hydroelectric projects. With our interdisciplinary approach, we have played a major design role on more than ten recent hydropower projects in British Columbia and the Northwest Territories, ranging from 1 to 70 MW in installed capacity.

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Sam Mottram

Managing Principal, Power Services
KNIGHT PIÉSOLD



Under the Integrated Resource Plan (IRP), BC Hydro is planning to spend \$1.7 billion per annum over the next 10 years. What are the principal opportunities for Knight Piésold in British Columbia given this plan?

We have bid on a number of upcoming refurbishment projects, including the 130-megawatt (MW) John Hart Hydroelectric Redevelopment Project, and teamed up with a number of contractors and developers to help realize these projects. BC Hydro has aging facilities that need a lot of work. Under the IRP, BC Hydro now has a program to upgrade all of these, many of which are 60 to 70 years old on both the hydro generation facilities side and the transmission and distribution side.

It has been nearly three decades since BC Hydro has undertaken a large-scale project. Does it have the in-house expertise to undertake Site C?

BC Hydro no longer has large, in-house expertise, which is why they have hired external consultants to help them. A number of consultants have been involved in the 1,100-MW Site C Clean Energy Project (Site C) in various ca-

pacities. Knight Piésold is involved in assessing the downstream impacts of Site C, including the fluvial geomorphology of the river system. BC Hydro has assembled a team that has the experience to realize the project. There is still a debate whether or not Site C is best for the province, but large hydro has served the province quite well in the past and will continue to do so in the future.

BC Hydro has a “conserve first” mentality to reduce electricity usage in the province by up to 75%. How can this goal be accomplished?

BC Hydro is first targeting the low-hanging fruit to reduce usage, such as changing out light bulbs. Going forward, there will be a reliance on new technologies that in many cases have not yet even been developed to help realize future savings. There is some skepticism as to whether BC Hydro can realize all these demand-side management savings. If the economy picks up, a few new mines connect to the grid, or liquefied natural gas (LNG) moves ahead, the energy forecast will change significantly. BC Hydro is revising its demand forecast for next year because there are so many uncertainties about how much more energy it is going to need.

Knight Piésold envisioned the Green Power Corridor of 30 low-impact hydro projects in the Toba and Bute Inlets of British Columbia. How has this corridor developed with the Independent Power Producer (IPP) sector since we last interviewed you in 2011?

Two of the 30 potential projects we identified are now operating, namely the 147-MW East Toba River and the 88-MW Montrose Creek facilities. Alterra Power is currently developing the third project, Jimmie Creek, with construction scheduled to start in 2014. Additional development of the Green Power Corridor will be dependent on BC Hydro's large Clean Power Calls, which are not expected in the short-term. The Green Power Corridor would effectively compete with Site C in terms of energy production volume. It is probably not going to be advanced in the short-term, but the potential in the long-term is certainly there.

Knight Piésold has grown much larger in the last decade. Do you still see opportunity in smaller projects associated with the IPP sector?

Although we are involved with megaprojects like the 1,333-MW Ingula Pumped Storage Project in South Africa, our niche is still in the small-to-medium hydro sector with projects in the 2-MW to 200-MW range. There is unlikely to be a new, large Clean Power Call in B.C. in the next couple of years, but there are still opportunities for small hydro with BC Hydro's Standing Offer Program (SOP) for projects up to 15 MW in size. The other opportunity for IPPs is going to be with First Nations-based and/or small communities-based projects. Some of these off-grid communities are currently running on diesel power that is costing them upwards of C\$300 per megawatt hour to generate power, so identifying viable small hydro or wind projects for them is very important. They want to get off the high cost, dirty diesel and onto cost-effective, renewable energy.

What do you see as the main challenges in the market over the next five years? What can be done to keep rates low, as BC Hydro and the government have promised?

There has been finger pointing at the IPPs for the cost increases in residential electricity rates, but IPPs only account for a fraction of the increases. The cost of building new power for BC Hydro, whether it is new generation or refurbishing existing projects, is having, as much, if not more, pressure on costs than the development of IPPs. Having a blend of both public and private sector development helps maintain competitiveness and keeps rates as low as possible for customers. As long as the government maintains the SOP, there will be opportunities for IPPs in the Clean Power sector in B.C. in the short-term. Hopefully, there will be a large Clean Power Call in the future, as the economy recovers and new mines and LNG facilities are developed. •



Into the Future: Final Thoughts, and Company Index

“In Ontario, the power sector is comprised of many power-generating companies with a multiplicity of distributors. By way of contrast, in British Columbia, the government has monopolized power generation, transmission and distribution. Arguably, the reason for this is the nature of British Columbia’s power source, i.e. mainly stored water requiring large dams for generation, extended transmission lines, distribution in many disparate population centers and extensive capital as the projects are located in the less populated eastern portions of the province while most the users are in the southwest sector of the province.”

- G. Henry Ellis, Partner,
Gowling Lafleur Henderson LLP

“The province has to decide where and how much its industrial growth will be. There are clear and accepted proposals for residential and smaller industry growth; what people are less comfortable with are the projections of the required industrial growth mainly around LNG, mining, and to a lesser extent any other industry that becomes predominant in B.C.”

- John Carson, CEO,
Alterra Power Corp.



The needs will be enormous in Canada and US; in relation to power in addition to BC Hydro's Site C, LNG will play a leading role because of that industry's need for large amounts of electricity (which will in turn drive material increases in greenhouse gases).

The required power for LNG is likely to be produced inside the fence. For example four of the proposed LNG projects will require a total of 3,000 MW of natural gas-fired generation adding to the greenhouse gas emissions regardless of the cleanliness of LNG.

The British Columbia government is pursuing the path of LNG; arguably, it will be successful. From our viewpoint, LNG is big business, and will continue to grow; we are already involved with a number of projects both on the gas and procurement-side with Asia showing great interest to buy into LNG.

- P. John Landry, Partner,
Davis LLP

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Generally speaking, there are limits as to what loads can be hauled in B.C.; loads often have to be broken-down and made lighter to meet the axle weight restrictions on B.C. roads and bridges. Another challenge British Columbia faces is availability of big, heavy lifting cranes; these often have to be brought in from outside the province or even from outside of country. This means there are considerable costs when moving 30 to 80 loads of equipment hundreds of miles for a specific project. Saying that, permitting in British Columbia is efficient and relatively easy with costs that are somewhat in line with other provinces and jurisdictions.

- Devlin Fenton, President
DLB Cranes, part of the Surespan Group

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There is a dramatic geographic diversity between the wind regimes of Vancouver Island and the Columbia Gorge region. We found that the coastal wind regime has a winter-peaking system that drops off in the summer and then returns; the Columbia Valley region has exactly the opposite. If these resources are combined, they result in average with a generally similar profile to base-load power throughout the year; however, there will be the odd occasion when weather phenomena occurs, i.e. no wind in either region; back-up from dams or gas plants will be required, but using far less of those resources than if the geographic diversity were not being exploited at all. The only way that this valuable geographic diversity can be captured is by construction of more cross-border transmission capacity connecting the regions, increasing the capacity and ability to shift the power from one area to another as it is available.

- Paul B. Manson, President and CEO,
Sea Breeze Power Corp.

Site C is a legacy project that could provide clean energy to the province for decades. History has demonstrated that construction of the large hydroelectric dams 40 to 50 years ago, has allowed British Columbia to become a competitive resource-based economy. However, the government could also achieve a similar or perhaps a greater legacy benefit by looking at and developing alternative projects to Site C, including constructing a number of clean and renewable energy projects, such as wind, solar, run-of-river, geothermal as well as natural gas fired generation projects, in different areas of the province to ensure a diverse supply of distributed generation sources which would stimulate longer term economic development in the different communities. British Columbia was a leader in developing renewable energy projects, but it is questionable as to whether it will remain a leader.

- Charles W. Bois, Partner,
Miller Thomson LLP

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It is challenging for Canadians to participate in U.S. markets: they are highly uncertain, the regulatory regime is extremely risky and the liabilities are extreme. It is hard to have confidence Canadian firms are going to be treated fairly in the United States. That said, the United States is an enormous market, so Canadian companies have a financial interest to compete there. In my view, only the largest companies can survive; the United States has largely put itself outside the reach of smaller players because it is too difficult of a market from a regulatory and liability perspective.

- Chris W. Sanderson, Partner,
Lawson Lundell LLP

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- Paulo Brinholi, Practice Leader, Natural Resources,
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Associations and Government

BC HYDRO	3, 6-19, 21-33, 35, 37-45, 48, 50
BC MINISTRY OF ENERGY & MINES	3, 10, 44-45, 47
CLEAN ENERGY BC	15, 22

Production and Service

ALTERRA POWER CORP	27-29, 49
AQUATIC INFORMATICS	12
DMD & ASSOCIATES ELECTRICAL CONSULTANTS	21
FORTIS BC	12, 14
INNERGEX RENEWABLE ENERGY INC.	7, 27-28, 30
SEA BREEZE POWER CORP	29, 50
SENVION CANADA	2, 16-17, 36-37, 39

Consulting and Engineering

AUSENCO	18
GYGAX ENGINEERING ASSOCIATES (GEA)	39, 46-47
HATCH	19
KAWA ENGINEERING	28-29, 31
KNIGHT PIÉSOLD	27, 31, 38, 48
LEX ENGINEERING	39, 42
MIDGARD CONSULTING	23, 28
SCHNEIDER ELECTRIC CANADA	34, 35
STANTEC	7, 20-21, 23-25, 38
TETRA TECH EBA	32

Financial, Legal, Logistical, Recruiting and Risk Management

AMIX HEAVY LIFT	40, 43, 49
AON GLOBAL POWER	21
APEX INDUSTRIAL MOVERS	38, 41
CORPFINANCE INTERNATIONAL LIMITED (CFI)	40, 44-45
DAVIS LLP	50
DESIGN GROUP STAFFING	50
GOWLING, LAFLEUR, HENDERSON LLP	22, 26-27
LAWSON LUNDELL LLP	50
MILLER THOMSON LLP	21-22, 50
RAKIA RECRUITING	33, 38-39
SURESPAN GROUP	50
TRAVELERS POWER CORPORATION	28-30

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