

The Bruce Power Re-Build Contract: A Prudency Review

On Dec. 3, 2015, pursuant to a directive from the Government of Ontario, the Independent Electricity System Operator (IESO) signed a long-term electricity supply contract with Bruce Power to finance the re-building of six of its aging nuclear reactors.

This sole-source contract will provide Ontario with 35% of its electricity supply.¹ The contract has a 49-year term running from Jan. 1, 2016 to Dec. 31, 2064.²

According to the Government of Ontario's preliminary estimate, the capital cost of the re-build will be \$13 billion and the re-built reactors will produce electricity at an average cost of 7.7 cents per kWh.³

However, every nuclear project in Ontario's history has gone massively over budget. On average the actual costs of our nuclear projects have been 2.5 times their preliminary cost estimates.⁴ Therefore if history repeats itself, the Bruce Re-Build will have a capital cost of \$32.5 billion and will deliver electricity at an average cost of 14.4 cents per kWh.⁵

Final capital cost and cost to consumer still unknown

As noted above, the Government of Ontario is forecasting that the Bruce Re-Build will have a capital cost of \$13 billion and will cost Ontario's electricity consumers 7.7 cents per kWh over the contract's 49-year term.

However, according to the contract's actual wording, the final capital cost estimate for the Bruce Re-Build is still to be determined. Furthermore, the real cost of electricity for Ontario's electricity consumers will be a function of the contract's final capital cost estimate, not the Government's preliminary estimate.⁶

In other words, the Government has signed a 49-year contract for 35% of the province's electricity supply without knowing the true cost of this power and without competitive bidding to obtain the lowest possible price for consumers.

No evidence to show that it is our lowest cost option to keep our lights on

The Government of Ontario has provided absolutely no evidence to show that the Bruce Re-Build is our lowest cost option to keep our lights on.

In an attempt to justify its sole-source contract with Bruce Power, the Government has released a "Fairness Opinion" prepared by NERA Economic Consulting. But the 14-

The true cost of power under the Bruce Contract will almost certainly be higher than the Government's preliminary estimates.



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page NERA report provides no evidence that the Bruce Contract is in the best interests of Ontario's electricity consumers. In fact, the NERA report states:

“We have not been asked to and have not reviewed how the ultimate costs and benefits of power provided under the Agreement compare to the costs and benefits of power from alternate sources”.⁷

Lower cost options are available

There are numerous options that can meet our electricity needs at a cost of less than 7.7 to 14.4 cents per kWh.

Energy Efficiency: According to the IESO, it can obtain electricity savings from large-volume industrial consumers at a cost of 1.5 cents per kWh⁸ and from residential, commercial and small industrial consumers at an average cost of 3.5 cents per kWh.⁹

Water Power Imports from Quebec: Hydro Quebec has a large and growing surplus of water power available for export. As a result of transmission constraints, Hydro Quebec can only export 10 billion kWh per year to the U.S. during high price periods. As a consequence, approximately two-thirds of Hydro Quebec's electricity exports are sold at an average price of only 3 cents per kWh. According to the Quebec Energy Commission, Hydro Quebec's low-price electricity exports will grow by 50% between 2014 and 2022 from 20.1 billion to 31.1 billion kWh per year.¹⁰

Quebec's electricity consumption per person is the highest in the world.¹¹ As a consequence, by investing in energy efficiency, Quebec can lower its energy bills and free-up even more of its heritage hydro-electric capacity for export to Ontario and the U.S.

In 2010 Hydro Quebec signed a 26-year contract with Vermont at a starting price of 5.8 cents per kWh.¹²

Wind Power: In 2014 Hydro Quebec used a competitive procurement process to contract for 446.4 megawatts of wind power at an average generation cost of 6.3 cents per kWh.¹³

According to Lazard, one of the world's leading financial advisory and asset management firms, the cost of wind power has declined by 61% during the last six years.¹⁴ Moreover, according to Bloomberg New Energy Finance, the cost of wind power will fall by an additional 32% between now and 2040.^{13b}

The IESO has also established a competitive procurement process for procuring new renewable energy projects. In September 2015, it received 103 proposals for Made-in-Ontario green energy projects. The province has postponed a decision on winning bidders, which will now be announced in March 2016.¹⁵

Quebec's huge water power reservoirs can be used like a giant battery to convert Ontario's intermittent wind power into a firm, 24/7 source of base-load energy. When our wind power production is above average, we can export our surplus power to Quebec to keep the lights on in Montreal. As a result, Hydro Quebec can store more water in its reservoirs. This stored water, acting like a battery, can be used to generate renewable energy to be exported back to Ontario when our wind power production is below average.

There has been no evaluation of alternatives to rebuilding six aging reactors at the Bruce Nuclear Station, including no evaluation of the costs or environmental and safety benefits of other options.

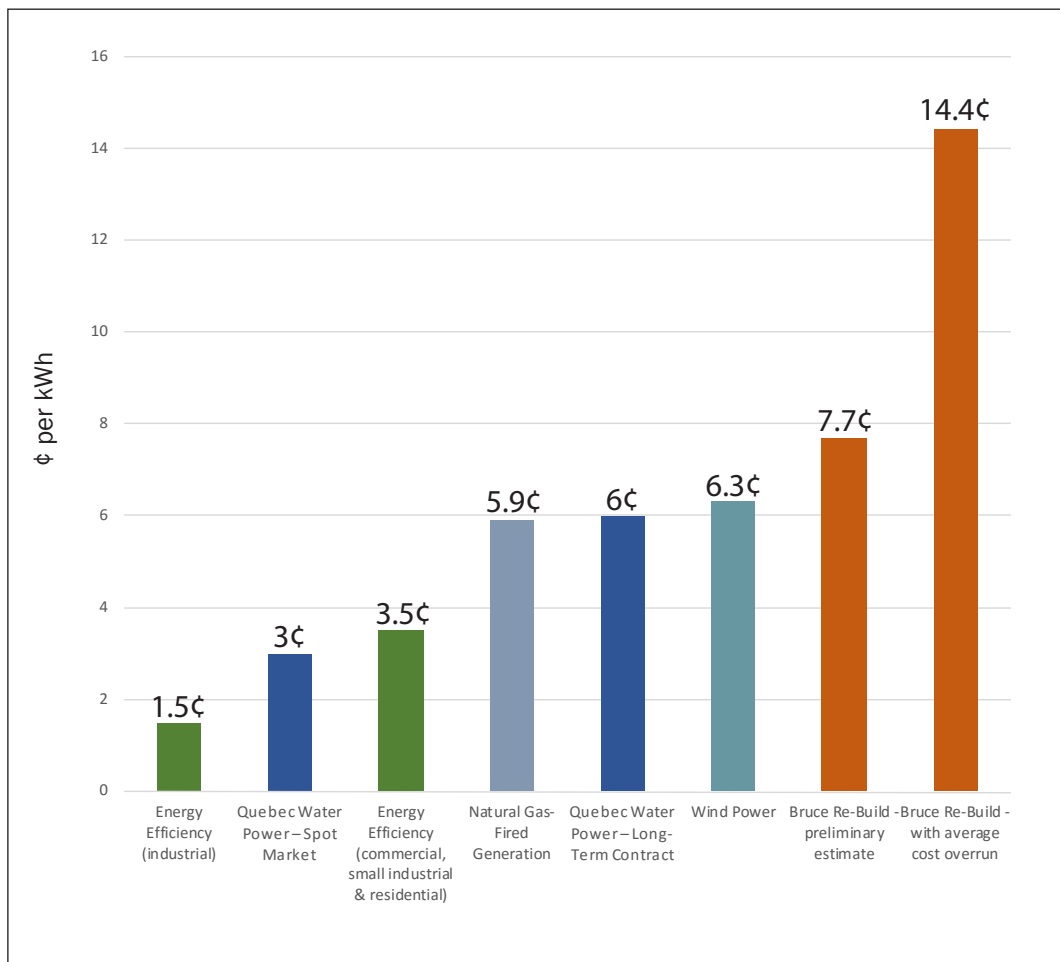
Natural Gas-Fired Generation: In 2024, when the first re-built Bruce reactor is forecast to return to service¹⁶, the IESO is forecasting that the cost of base-load natural gas-fired generation will be 5.9 cents per kWh.¹⁷ However, this cost does not include the cost of the gas plants’ greenhouse gas emissions.

If the cost of the Bruce Re-Build is 7.7 cents per kWh, natural gas-fired generation will continue to be a lower cost option as long as the cost of carbon is less than \$65 per tonne.¹⁸

If the cost of the Bruce Re-Build is 14.4 cents per kWh, natural gas-fired generation will continue to be a lower cost option as long as the cost of carbon is less than \$306 per tonne.¹⁹

Currently, the market price for carbon in California and Quebec is less than \$20 per tonne.

Figure 1: Comparison of electricity options



Competitive procurement processes are now in place for all other large power generators – including renewable energy sources. Only nuclear among large suppliers continues to be exempted from competition.

Sole-source contract vs. competitive procurement

The IESO uses competitive processes to procure electricity from natural gas-fired and larger renewable (greater than 500 kilowatts) projects. In addition, the IESO is developing a competitive procurement process with “broad eligibility” that will allow “all potential resources to compete on an even footing in the marketplace.”²⁰

A competitive procurement process that requires all resource options and all firms to

compete on a level playing field will ensure that our electricity needs are met at the lowest possible cost.

Nevertheless, the Government of Ontario directed the IESO to negotiate a sole-source, cost-plus-profit contract with Bruce Power for 35% of our electricity supply. In addition, the Government has provided no evidence to show that a sole-source contract with Bruce Power will provide lower electricity rates for Ontario consumers than a competitive bidding process. What it will do is enrich a privately owned corporation that leases a publicly owned asset for which taxpayers remain liable. Therefore it appears that the goal of the sole-source contract is to sacrifice the best interests of electricity consumers to prop up a nuclear industry that is not capable of competing in a free market.

“Our public policy-makers too often focus on the needs of energy producers in devising energy policy. But most Canadians, and Canadian businesses, are energy customers.”

Adam White, President of the Association of Major Power Consumers in Ontario²¹

The Bruce Power Contract’s key financial terms are secret

The Government of Ontario has failed to release virtually all of the financial terms of the Bruce Re-Build Contract. Specifically, it has failed to release the following Exhibits:

Exhibit 1.1(a): Form of Basis of Estimate Report;

Exhibit 1.1(b): Building Trades;

Exhibit 1.1(c): Financial Model;

Exhibit 1.1(d): CAS Instructions, namely, set of sequential instructions explaining how to effect the Financial Model Adjustments necessary to determine Contract Price Adjustments;

Exhibit 2.11(b): Initial Lifetime Asset Management Plan;

Exhibit 2.11(c): N and N + 1 Deliverables Report;

Exhibit 2.18(a): Specified Fuel Supply Arrangements;

Exhibit 4.7(a): Contract Price Adjustments For Changes To Operating Costs;

Exhibit 4.7(c): Contract Price Adjustment For Other Post-Employment Benefits and Burden Rate;

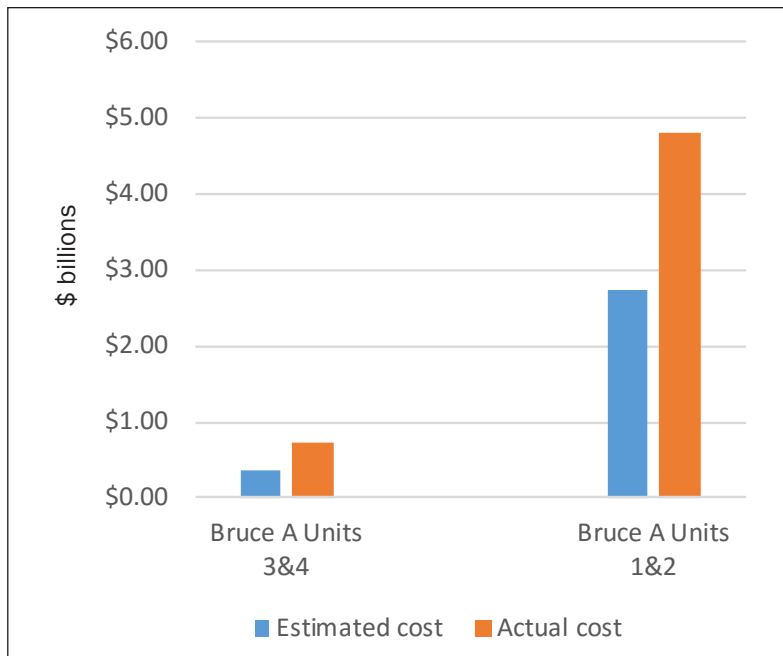
Exhibit 9.1: Unit Threshold Base Amount.

The Government’s failure to release all the key financial terms of the Bruce Re-Build Contract is inconsistent with Premier Wynne’s pledge for open, transparent and accountable government:

“We want to be the most open and transparent government in the country. We want to be a government that works for the people of this province – and with them. It is of the utmost importance that we lead responsibly, act with integrity, manage spending wisely and are accountable for every action we take.”²²

These secret exhibits show how rates will rise once the true costs of re-building the Bruce units becomes known. The Bruce Nuclear Station’s history offers an important lesson in why this matters. The Bruce A Unit 2 reactor was prematurely shut down in 1995; and the three remaining Bruce A reactors were shut down in 1998 for safety reasons. The re-start of Units 1 and 2 were \$2 billion over budget, while the actual cost of the Units 3 and 4 re-starts were 1.9 times the original estimate.²³

Figure 2: History of Bruce A Cost Overruns



Off-Ramps

The Bruce Re-Build Contract has the following “off-ramps” that can be triggered by the Government of Ontario.

First, if Bruce Power’s Fully-Scoped Final Cost Estimate for a reactor re-build is greater than the Government’s “Cost Threshold,” the Government can elect to not proceed with the re-build. However, Bruce Power could still proceed with the re-build if it is willing to absorb costs in excess of the Government’s “Cost Threshold.”²⁴

The Government has refused to release its Cost Thresholds for any of the six reactor re-builds.^{24b}

Second, before the third reactor re-build commences, the Government can decide to cancel the re-building of the third, fourth, fifth and sixth reactors if, as a result of changes in the supply or demand for electricity, there is no longer a need for the re-builds or if there are more economic alternatives.²⁵ The third re-build is currently scheduled to start on January 1, 2025.²⁶

Third, before the fifth reactor re-build commences, the Government can also cancel the fifth and sixth reactor re-builds for the above-noted economic reasons.²⁷ The fifth re-build is currently scheduled to start on January 1, 2028.²⁸

However, if the government does exercise its right to use one of these “off ramps,” the price of power guaranteed to Bruce Power under the contract will be adjusted. Because the government has withheld the Financial Model section of the contract, we do not know what the potential price impact of an adjustment would be and whether ratepayers would pay a significant cost penalty for not proceeding with all six re-builds.

In this context, it should also be noted that electricity demand in Ontario has fallen by 11% between 2005 and 2014²⁹ despite the fact that our economy has grown by 10% (net of inflation) over the same period.³⁰ This decline is not unique to Ontario and is being driven by economic changes (shift from heavy industry to services) and new

Because most of the Bruce contract has been deemed secret, we have no way of knowing what the costs will be of taking “off ramps” if power demand continues to fall or renewable energy options become even cheaper

technologies (LED lighting, intelligent devices). As Bloomberg New Energy Finance projects “In industrialized economies the link between economic growth and electricity consumption appears to be weakening. Power use fell with the financial crisis but has not bounced back strongly in the OECD as a whole, even as economic growth returned. This trend reflects an ongoing shift to services, consumers responding to high energy prices and improvements in energy efficiency. In OECD countries, power demand will be lower in 2040 than in 2014.”³¹

Conclusion

Neither the Government nor Bruce Power know the actual cost of power from rebuilt reactors — a risky way to embark on a \$13-\$30 billion project.

Even taken at face value, the Bruce Re-Build Contract is financially imprudent. It has been signed despite a lack of due diligence in comparing its costs to other options. It has been signed despite steadily falling demand for electricity in Ontario and steadily falling prices for renewable alternatives. It has been signed despite the fact that our neighbours in Quebec have a growing surplus of low-cost water power available for export. And it has been signed despite the fact that no one knows the real costs of the project.

Of course, face value never tells the real story in nuclear deals in any case. Every nuclear project in Ontario’s history — including previous reactor re-start projects undertaken by Bruce Power — have gone massively over budget, on average by 2.5 times. The odds that Bruce Power can re-build six reactors originally built in the 1970s and ‘80s without encountering problems and delays are infinitesimal.

Unfortunately, the cost implications of what happens when problems occur are well hidden in the new Bruce contract. The Bruce Power contract’s lack of openness and transparency with respect to costs and price increases are unheard of in IESO electricity supply contracts outside of the nuclear sector.

The simple fact is neither the Government nor Bruce Power can say what electricity from Bruce’s re-built reactors will actually cost. This is a frightening starting point for a project which could cost \$30 billion or more and cause our electricity rates to skyrocket.

Recommendations

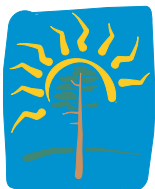
1. The Government should publicly reveal its “Cost Thresholds” for each of the six Bruce re-builds — the maximum capital cost per reactor that Bruce Power is allowed to recover from Ontario’s electricity consumers.
2. The Government should publicly reveal the full text of the Bruce Power Re-Build Contract, including how prices will be adjusted if “off ramps” are taken.
3. The Government should direct the Ontario Energy Board to hold a public hearing to analyse the costs and benefits of cancelling the Bruce Re-Build Contract before the first re-build commences in 2020.

Endnotes

- 1 According to NERA, at full capacity the Bruce Nuclear Station produces 50 TWh of electricity per year. According to the IESO website, in 2014, Ontario's total electricity demand was 139.8 TWh. Letter to Bruce Campbell, CEO, IESO from NERA Economic Consulting (December 2, 2015) re: NERA Economic Consulting's Opinion as to the Fairness of the Amended and Restated Bruce Power Refurbishment Implementation Agreement.
- 2 *Amended and Restated Bruce Power Refurbishment Implementation Agreement Between Bruce Power L.P. and Independent Electricity System Operator*, (December 3, 2015), Section 10.1.
- 3 Ontario Ministry of Energy, *News*, "Ontario Commits to Future in Nuclear Energy", (December 3, 2015).
- 4 Ontario Clean Air Alliance Research Inc., *The Darlington Re-Build Consumer Protection Plan*, (September, 2010), Appendix A.
- 5 According to Ontario Power Generation, if the actual capital cost of the Darlington Re-Build Project is 2.5 times greater than its "high-confidence" estimate, its cost of generating electricity will rise by 87% from 8.9 to 16.6 cents per kWh. We have used the same escalation rate to calculate the rise in the Bruce Re-Build Project's cost of electricity (7.7 cents per kWh x 1.87 = 14.4 cents per kWh). Ontario Clean Air Alliance Research Inc., *Ontario's Long-Term Energy Plan: A One Year Review*, (November 10, 2014), pages 1 and 3.
- 6 *Amended and Restated Bruce Power Refurbishment Implementation Agreement Between Bruce Power L.P. and Independent Electricity System Operator*, (December 3, 2015), Sections 2.4 and 2.5.
- 7 Letter to Bruce Campbell, CEO, IESO from NERA Economic Consulting (December 2, 2015) re: NERA Economic Consulting's Opinion as to the Fairness of the Amended and Restated Bruce Power Refurbishment Implementation Agreement.
- 8 The IESO has a \$500 million budget to reduce the electricity consumption of Ontario's large volume industrial customers by 1.7 TWh per year in 2020. The IESO assumes that these savings will persist for 20 years. Therefore the average cost per kWh saved is 1.5 cents. Email from Terry Young, Vice President, IESO to Jack Gibbons, Ontario Clean Air Alliance, (July 13, 2015).
- 9 Ontario Power Authority, *Conservation First Framework Update: Presentation to SAC*, (June 24, 2014), pages 7 & 8
- 10 Commission sur les enjeux energetiques du Quebec, *Maitriser Notre Avenir Energetique*, (2 fevrier 2014), pages 176 – 183.
- 11 Jean-Thomas Bernard & Jean-Yves Duclos, *Quebec's Green Future: The Lowest-Cost Route to Greenhouse Gas Reductions*, C.D. Howe Institute Backgrounder No. 118, (October 2009), page 2.
- 12 Hydro Quebec, *Press Release*, "Vermont and Quebec reach new energy agreement", (August 12, 2010); and State of Vermont, Public Service Board Docket No. 7670, *Order entered: 4/15/2011*, page 11.
- 13 Hydro Quebec, *Press Releases*, "Calls for tenders for the purchase of 450 MW of wind power: Hydro -Quebec Distribution accepts 3 bids totalling 446.4 MW", (December 16, 2014).
- 13b Bloomberg New Energy Finance, *New Energy Outlook 2015: Executive Summary*, (June 2015), page 4.
- 14 Lazard, *Lazard's Levelized Cost of Energy Analysis – Version 9.0*, (November 2015), page 10.
- 15 <http://www.ieso.ca/Pages/Participate/Generation-Procurement/Large-Renewable-Procurement/default.aspx>
- 16 *Amended and Restated Bruce Power Refurbishment Implementation Agreement Between Bruce Power L.P. and Independent Electricity System Operator*, (December 3, 2015), Section 2.2.
- 17 Assuming the gas-fired power plants have a 95% annual capacity utilization rate and the commodity cost of gas is \$5.50/MMBtu (2014\$) at the Dawn Hub. Ontario Power Authority, *Conservation & Demand Management Energy Efficiency Cost Effectiveness Guide*, (October 2014), pages 57 and 58; and email from Terry Young, Vice President, IESO to Jack Gibbons, (October 20, 2015).
- 18 According to the Ontario Power Authority, the greenhouse gas emission rates of a CANDU

nuclear reactor and a natural gas combined-cycle power plant are 12 and 290 grams per kWh respectively. Therefore continuing to operate the Bruce reactors instead of increasing the output of our gas-fired power plants will reduce our greenhouse gas emissions by 278 grams per kWh (290 – 12 grams per kWh) at a marginal cost of 1.8 cents per kWh (7.7 – 5.9 cents per kWh). Therefore the cost of the greenhouse gas reduction is 0.006475 cents per gram. This is equivalent to a cost of \$65 per tonne (0.006475 cents per gram x 1,000,000). Ontario Power Authority, *Supply Mix Analysis Report*, Volume 2, (December 2005), pages 213 and 222.

- 19 According to the Ontario Power Authority, the greenhouse gas emission rates of a CANDU nuclear reactor and a natural gas combined-cycle power plant are 12 and 290 grams per kWh respectively. Therefore continuing to operate the Bruce reactors instead of increasing the output of our gas-fired power plants will reduce our greenhouse gas emissions by 278 grams per kWh (290 – 12 grams per kWh) at a marginal cost of 8.5 cents per kWh (14.4 – 5.9 cents per kWh). Therefore the cost of the greenhouse gas reduction is 0.030576 cents per gram. This is equivalent to a cost of \$306 per tonne (0.030576 cents per gram x 1,000,000). Ontario Power Authority, *Supply Mix Analysis Report*, Volume 2, (December 2005), pages 213 and 222.
- 20 IESO, *CHPSOP 2.0 Procurement: Lessons Learned from the First Application Window and Recommendations for a Second Application Window*, Report to Minister of Energy, (September 1, 2015), page 9.
- 21 Adam White, “Ontario’s surging electricity prices endanger domestic manufacturing”, *Globe and Mail*, (December 14, 2015).
- 22 Mandate letter from Premier Kathleen Wynne to Energy Minister Bob Chiarelli (September 25, 2014).
- 23 Ontario Clean Air Alliance Research, *The Darlington Re-Build Consumer Protection Plan*, (September 2010), Appendix A; and email from Rachel Kulasa, Investor Relations, TransCanada to Jack Gibbons, Ontario Clean Air Alliance, (November 3, 2011).
- 24 *Amended and Restated Bruce Power Refurbishment Implementation Agreement Between Bruce Power L.P. and Independent Electricity System Operator*, (December 3, 2015), Section 9.1.
- 24b Email from Terry Young, Vice President, IESO to Jack Gibbons, Ontario Clean Air Alliance, (December 16, 2015).
- 25 *Amended and Restated Bruce Power Refurbishment Implementation Agreement Between Bruce Power L.P. and Independent Electricity System Operator*, (December 3, 2015), Section 9.2.
- 26 *Amended and Restated Bruce Power Refurbishment Implementation Agreement Between Bruce Power L.P. and Independent Electricity System Operator*, (December 3, 2015), Section 2.2.
- 27 *Amended and Restated Bruce Power Refurbishment Implementation Agreement Between Bruce Power L.P. and Independent Electricity System Operator*, (December 3, 2015), Section 9.2.
- 28 *Amended and Restated Bruce Power Refurbishment Implementation Agreement Between Bruce Power L.P. and Independent Electricity System Operator*, (December 3, 2015), Section 2.2.
- 29 <http://www.ieso.ca/Pages/Power-Data/demand.aspx>
- 30 Statistics Canada, CANSIM Tables 13-018-x and 384-0038.
- 31 Bloomberg New Energy Finance. *New Energy Outlook 2015: Executive Summary*, p. 4



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