

Evaluating Electricity Price Growth in Ontario

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Executive summary

Electricity is an essential part of our modern lives. It powers our economy, generating the economic activity that underpins our high living standards. It also allows Canadians to enjoy the comforts of modern life, from warm homes and warm meals to internet access and entertainment. The full enjoyment of these benefits depends on electricity remaining affordable for people across the income spectrum.

But affordable electricity appears to be a growing challenge for Ontarians. In fact, electricity prices in Ontario have risen substantially over the last decade, placing a burden on many Ontarian households. Indeed, the province of Ontario has the fastest growing electricity prices in the country and its cities have some of the highest average residential monthly bills in Canada.

Electricity prices in Ontario have increased dramatically since 2008 based on a variety of comparative measures. Ontario's electricity prices have risen by 71 percent from 2008 to 2016, far outpacing electricity price growth in other provinces, income, and inflation. During this period, the average growth in electricity prices across Canada was 34 percent.

Ontario's electricity price change between 2015 and 2016 alone is also substantial: the province experienced a 15 percent increase in one year. This was two-and-a-half times greater than the national average of 6 percent during the same period.

From 2008 to 2015, electricity prices also increased two-and-a-half times faster than household disposable income in Ontario. In particular, the growth in electricity prices was almost four times greater than inflation and over four-and-a-half times the growth of Ontario's economy (real GDP).

The large electricity price increases in Ontario have also translated to significant increases in monthly residential electricity bills. Between 2010 and 2016, monthly electricity bills (including tax) in major Canadian cities increased by an average of \$37.68. During the same period, electricity bills in Toronto and Ottawa increased by \$77.09 and \$66.96, respectively. This means that residents in Toronto experienced electricity price increases of double the national average between 2010 and 2016.

In Toronto and Ottawa, the average monthly bills for residential consumers including taxes in 2016 were \$201 and \$183, respectively.

On average in 2016, residents of major Canadian cities paid \$141 including taxes for monthly electricity bills. This means that Toronto's monthly electricity bills (including tax) are \$60 more per month (\$720 more per year) than the Canadian average. Consumers in Ottawa pay \$41 more per month (\$492 more per year) on electricity bills than Canadians in other provinces. Montreal had the lowest monthly electricity bills for residential consumers at \$83.

The problem of skyrocketing electricity prices and high bills is a made-in-Ontario problem directly tied to the provincial government's policy choices. Ontario's policies around renewable energy (wind, solar, and biomass) have resulted in large additional costs for consumers. More specifically, Ontario's high electricity prices can be attributed to poorly structured long term contracts, the phase-out of coal energy, and a growing electricity supply and demand imbalance in the province that is resulting in Ontario exporting electricity at a loss.

High electricity prices for Ontarians, particularly when taxation is included, should be of central concern when the government is devising energy policy decisions. Given the critically important role that affordable electricity plays in peoples' standard of living, it is time for the Ontario government to have a hard look at how their policy choices are affecting peoples' lives. It is also time for the government to begin pursuing meaningful policy reforms aimed at lowering electricity bills for Ontario residents.

Introduction

Electricity is an essential part of our modern lives. It powers our economy, generating the economic activity that underpins our high living standards. It also allows Canadians to enjoy the comforts of modern life, from warm homes and warm meals to internet access and entertainment. The full enjoyment of these benefits depends on electricity remaining affordable for people across the income spectrum.

But affordable electricity appears to be a growing challenge for Ontarians. Some recent headlines suggest that a number of Ontarians may now have to make tradeoffs between heating and eating (CBC News, 2016). Green et al. (2016) found that, between 2010 and 2013, on average over eight percent of Ontario households were in energy poverty—a situation where a household has to dedicate 10 percent or more of its total expenditures to the energy used within its house (i.e., excluding gasoline costs). The average level of energy poverty in Ontario during this period was only behind Atlantic Canada and Saskatchewan.

Another recent report suggests that the situation could be even worse, as it found that more than 37,000 Ontarians were dedicating approximately 30 percent of their income just to their electricity bills (Minsky, 2016).

High electricity bills can place serious burdens on families. Kilian (2008) observes that “higher energy prices are expected to reduce discretionary income, as consumers have less money to spend after paying their energy bills” (p. 881) and that higher energy prices can lead to a reduction or postponement of the consumption of durable goods, like cars or household appliances.

Given recent findings regarding electricity affordability in Ontario and the possible negative consequences that can result from high electricity bills, this study seeks to evaluate both the extent to which prices have grown over the past decade and how the price level in Ontario compares to other provinces. The focus of this study will be on residential electricity prices, or those that households pay, and not industrial prices.

This study proceeds as follows. The first section will analyze Ontario’s electricity price growth and compare it with that of other Canadian provinces. The second section will examine and compare the current level of electricity prices. The final section will discuss some of the policy decisions that may be affecting electricity prices in Ontario.

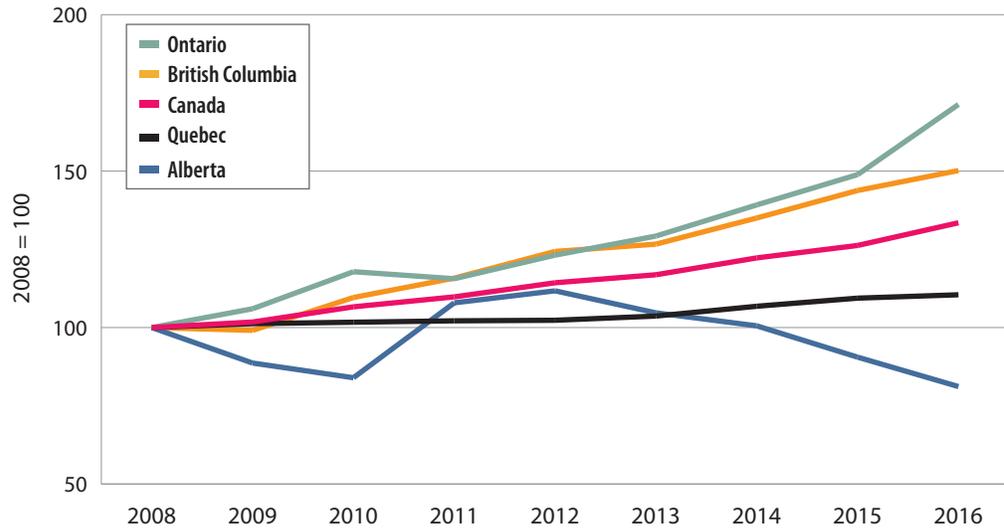
Trends in Ontario electricity prices

This section will examine the change in electricity prices in Ontario since 2008. We use 2008 as a base year since electricity price increases in the years prior to 2008 were modest by comparison to those that occurred after. Using 2008 as a base year is also useful in evaluating price changes associated with the introduction of some of the public policies that have shaped Ontario's current electricity system (Section 3).

Electricity price changes in Ontario and Canada will be measured through an examination of Consumer Price Index (CPI) data from Statistics Canada. The Consumer Price Index is obtained by comparing, over time, the cost of a fixed basket of goods (including electricity) and services purchased by consumers. Specifically, this section will examine CPI data for electricity and how Ontario's electricity price growth compares to other provinces.

Figure 1 displays an index of the growth in electricity prices based on CPI data for Canada and its four most populous provinces. The data shows increases in electricity prices across most of the country from 2008 to 2016, with the most drastic increase observed in Ontario. Modest increases were observed in Quebec and a decrease in prices occurred in Alberta. In terms of average annual growth rates, Ontario's price growth between 2008 and 2016 was 7.1 percent, representing the highest increase observed across all provinces. This is almost double the average annual electricity price growth rate for Canada as a whole over that period, which was 3.7 percent. Also, it was more than double the average annual increase in electricity prices in Ontario from 2002 to 2007, which was only 3.0 percent.

Figure 1 also shows that the electricity price shock in Ontario intensified in 2011, thus an analysis from 2011 to 2016 is useful to explain price growth. Between 2011 and 2016, electricity prices across Canada increased by 22 percent (4.1 percent annually). In a comparison of Canada's four largest provinces, the growth in electricity prices in Ontario and British Columbia exceeded the national average during this period. Between 2011 and 2016, electricity prices increased by 48 percent in Ontario and 30 percent in British Columbia. During the same period, electricity prices in Alberta decreased by nearly 25 percent. The results from Quebec show a modest increase of eight percent between 2011 and 2016, which is only one-sixth the rate of price growth in Ontario.

Figure 1**Comparative growth in electricity prices across provinces, 2008 to 2016**

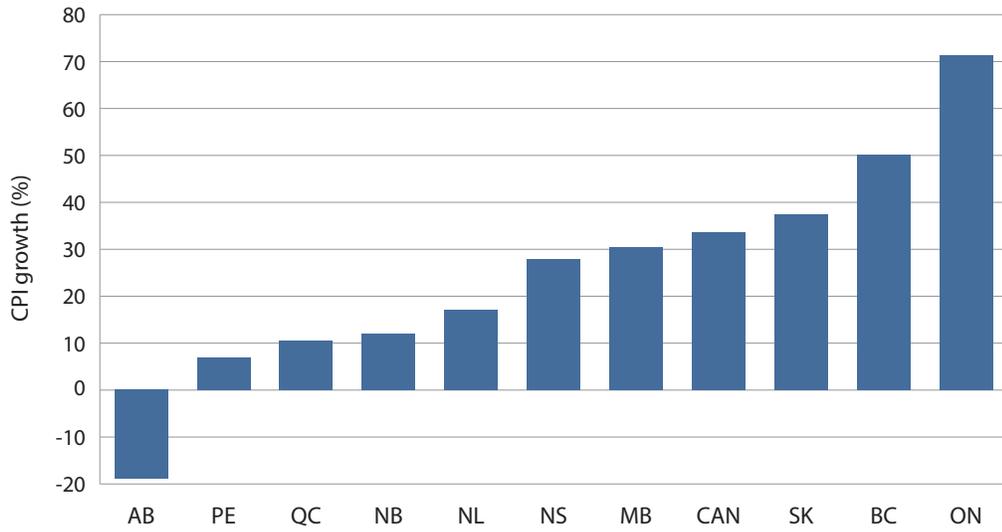
Sources: Statistics Canada, CANSIM Table 326-0021; calculations by authors.

Ontario's electricity price change between 2015 and 2016 alone is substantial: the province experienced a 15 percent increase in one year. This was 2.5 times the national average of six percent during the same period.

Figure 2 displays a comparison of residential electricity price growth across all Canadian provinces. From 2008 to 2016, electricity prices in Canada, measured by the basket of goods in the Consumer Price Index (CPI), grew by 34 percent overall. Electricity prices in Ontario increased by more than double that, 71 percent, over the same period. The comparable increase in the Atlantic region (Nova Scotia, Newfoundland & Labrador, New Brunswick, and Prince Edward Island) was 16 percent, less than a quarter the growth rate in Ontario. In Quebec it was only 11 percent, less than one sixth the rate in Ontario. The average growth in electricity prices across the prairies (Alberta, Saskatchewan, and Manitoba) was 16.4 percent, one quarter the rate in Ontario. In Alberta, prices actually decreased by 19 percent. The province with the second highest growth in electricity prices, British Columbia, saw an increase of 50 percent between 2008 and 2016, which is still substantially less than the 71 percent growth in Ontario. Thus, Ontario's electricity prices have increased substantially compared to other provinces and to the national average.

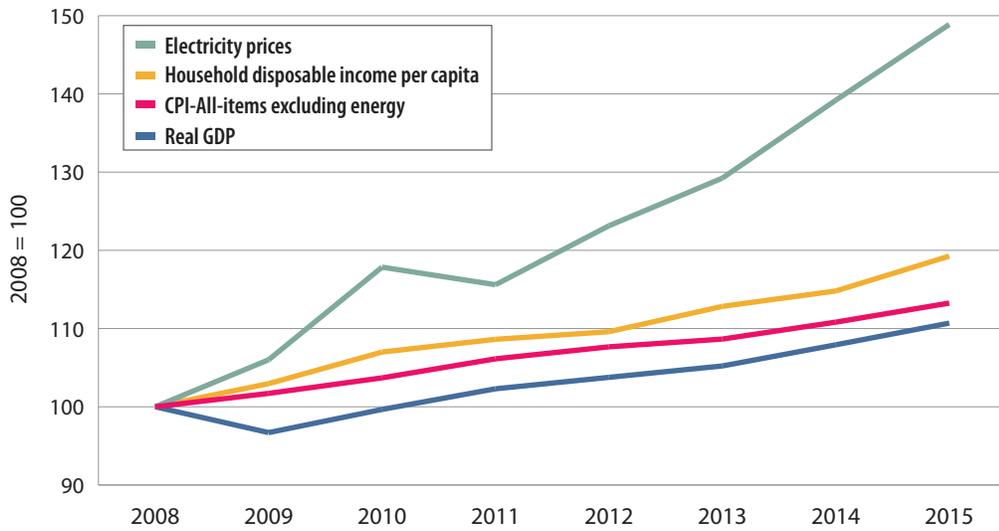
Another way to examine the rapid electricity price growth in Ontario is to compare it to other cost-of-living measures. **Figure 3** compares electricity price growth to other measures, including income, inflation (all-items CPI excluding energy), and real Gross Domestic Product (GDP) data.

Figure 2
Percentage growth of electricity prices as measured by the CPI, 2008 to 2016



Sources: Statistics Canada, CANSIM Table 326-0021; calculations by authors.

Figure 3
Comparative growth in electricity prices, inflation, the economy, and income, Ontario, 2008 to 2015 (2008=100)



Sources: Statistics Canada, CANSIM Tables 326-0021, 384-0040; calculations by authors.

As figure 3 shows, Ontario's electricity prices increased by 49 percent between 2008 and 2015, while overall inflation in the province was only 13 percent. This means that between 2008 and 2015 the growth in electricity prices in the province of Ontario was nearly four times the overall rate of inflation.

It is also useful to compare growth in electricity prices relative to the growth in the provincial economy. Ontario's economic growth between 2008 and 2015 was modest at 11 percent. Ontario experienced a gradual economic decline following the 2008 Great Recession. However, during the same period, electricity prices increased by 49 percent. This means that electricity price increases outpaced economic growth by 4.6 times between 2008 and 2015.

Another helpful comparison is that between the growth in electricity prices and the growth in per-capita disposable income. From 2008 to 2015, nominal disposable income per person in Ontario grew by 19 percent. This means that electricity prices increased 2.5 times faster than household disposable income over that period. Furthermore, since 2011 alone electricity prices in Ontario increased by 29 percent, almost three times faster than income, which grew 10 percent.

In sum, electricity prices in Ontario have increased dramatically since 2008 based on a variety of comparative measures. The growth in electricity prices is more than double income growth and more than 4.6 times the growth of Ontario's economy (real GDP). This is a uniquely made-in-Ontario problem since the rate is far larger than in other provinces. It is therefore not surprising that Ontarians are struggling to afford electricity. The next question is how current prices compare between Ontario and other provinces.

Electricity prices in Ontario and Canada

Thus far we have analyzed the growth in household electricity prices in Ontario and compared it to growth rates in other provinces and to economic indicators. We now examine the actual prices that Ontarians pay and how they compare across Canada. To complete this analysis, this paper relies on a Hydro-Quebec survey of electricity costs, which examines both prices and monthly residential bills.¹ The survey provides rate information both with and without the sales and other taxes that are levied on electricity bills. A comparison of residential electricity costs per kilowatt-hour is examined in figures 4 and 5.

Figure 4 presents average residential electricity prices (including taxes) for major Canadian cities.² From 2010 to 2016, Toronto and Ottawa saw electricity prices rise from 12.41 cents/kWh and 11.56 cents/kWh to 20.12 cents/kWh and 18.25 cents/kWh, respectively. During the same period, Vancouver saw its prices for consumers change from 8.41 cents/kWh to 11.44 cents/kWh while prices in Calgary decreased from 11.18 cents/kWh to 10.92 cents/kWh. In Alberta's other major city, Edmonton, prices increased from 9.73 to 10.89 cents/kWh between 2010 and 2016. The rate of increase in Montreal was only 0.55 cents/kWh during those years.

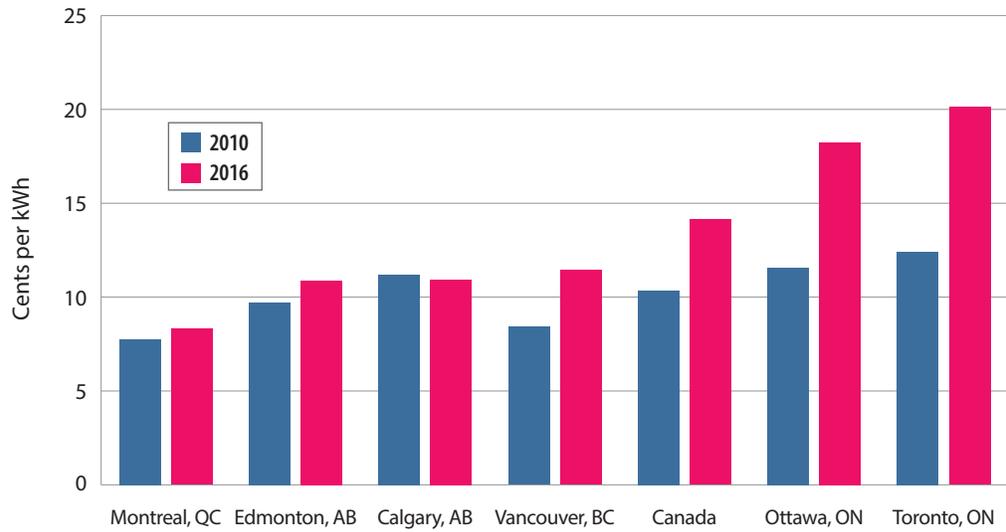
The actual cost of electricity to consumers is directly affected by local tax rates.³ Monthly electricity costs with and without taxes are summarized in **figure 5**.

1. The survey focused on the delivered cost of electricity on customer bills pertaining to specified levels of consumption, including applicable rate riders. The bills have been calculated according to base rates.

2. All prices in this section are in nominal dollars.

3. The taxes that were applied to typical consumer bills are based on the Hydro-Quebec survey report. For Canadian cities, these consisted of the federal goods and services tax and the applicable provincial sales tax (except in Alberta, which does not have a provincial sales tax). Where there is a 'harmonized' federal/provincial sales tax rate, as in the four Atlantic Provinces and Ontario, that rate was used.

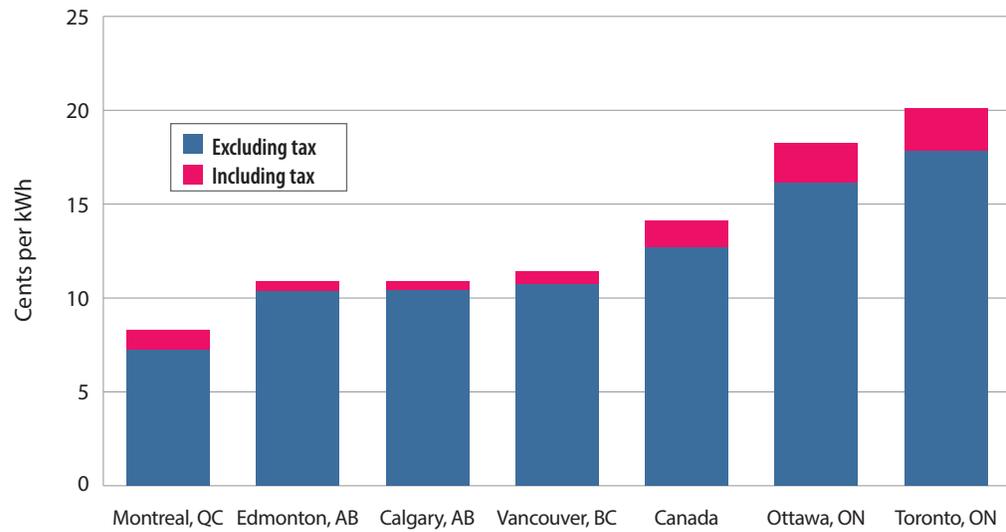
Figure 4
Average residential electricity prices (including taxes),
Canada and Canadian cities, 2010 and 2016



Sources: Hydro-Quebec, 2010-2016; calculations by authors.

Note: The data for Canada is based on a population weighted average using 2016 Census data.

Figure 5
Average residential electricity prices, Canada and selected Canadian cities, 2016



Sources: Hydro-Quebec, 2010-2016; calculations by authors.

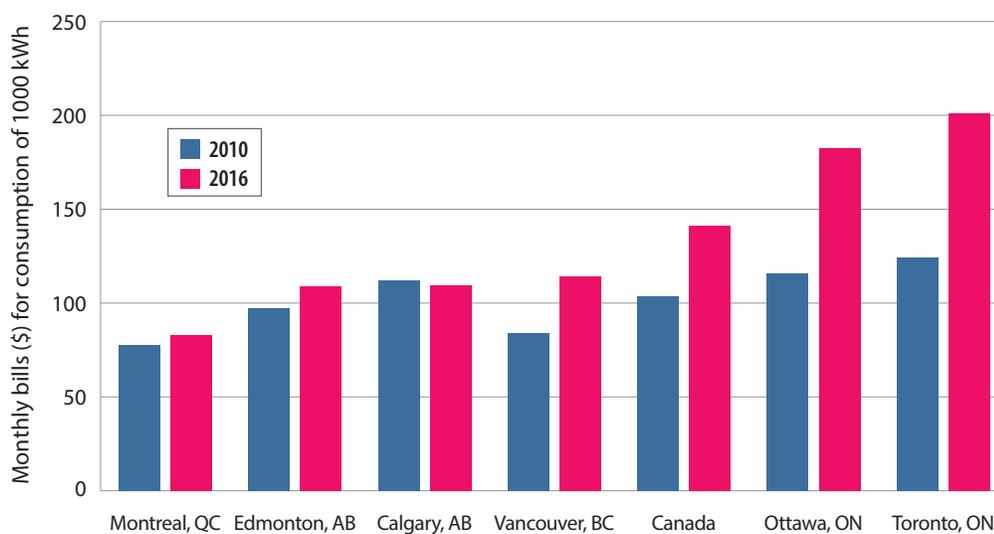
Note: The data for Canada is based on a population weighted average using 2016 Census data.

Focusing on 2016, figure 5 shows that when taxes are included, Toronto has the highest electricity prices of all Canadian cities in the Hydro-Quebec survey.⁴ On average, electricity costs in Toronto are double those in Calgary and Edmonton. Prices in Ottawa (18.25 cents/kWh) are also high compared to other major Canadian cities, and in particular are more than double those in Montreal (8.31 cents/kWh).

Figure 6 illustrates how residential electricity bills (including tax) in six Canadian cities compare from 2010 to 2016, according to the Hydro-Quebec survey. The survey provides the total cost on consumers' bills per year in terms of cents per kilowatt-hour (kWh), based on information received from or pertaining to electric distribution utilities in 12 Canadian cities (Hydro-Quebec, 2013). The Hydro-Quebec data is calculated based on a power demand consumption load factor of 1,000 kWh. Examining prices in cents per kilowatt-hour rates and average monthly bills is useful, as it allows consumers to relate electricity costs to their monthly household expenses.

In 2016, the lowest electricity bills were in Montreal, Edmonton, Calgary, and Vancouver. Those with the highest monthly bills in 2016 are Toronto and Ottawa.

Figure 6
Average residential monthly bills (including taxes),
Canada and Canadian cities, 2010 and 2016



Sources: Hydro-Quebec, 2010-2016; calculations by authors.

Note: The data for Canada is based on a population weighted average using 2016 Census data.

4. The Hydro-Quebec data for all twelve Canadian cities can be found in Appendix A. Average residential monthly bills (including taxes) can be found in table A2 of Appendix A.

From 2010 to 2016, the monthly costs for consumers in Ontario's two major cities increased from \$124.14 to \$201.23 per month in Toronto and from \$115.55 to \$182.51 in Ottawa. In Vancouver, monthly costs for consumers increased from \$84.14 to \$114.38, while they fell in Calgary, from \$111.79 to \$109.19. Average monthly bills in Edmonton increased slightly from \$97 in 2010 to \$109 in 2016.⁵ Between 2010 and 2016, residential electricity prices for consumers in Montreal increased by a negligible amount, from \$77.60 to \$83.08 per month.

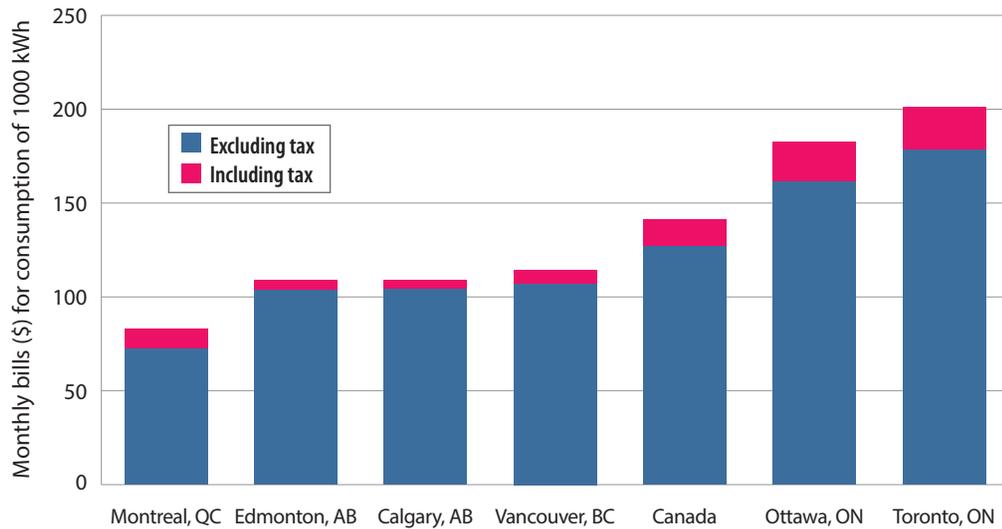
Comparing average monthly electricity bills in Toronto and Ottawa to the population-weighted Canadian average is useful to determine how much electricity prices for residential consumers increased in Ontario relative to the rest of Canada. Between 2010 and 2016, average monthly electricity bills in major Canadian cities increased by \$37.68. However, during the same period electricity bills in Toronto and Ottawa increased by \$77.09 and \$66.96, respectively. This means that residents in Toronto experienced electricity price increases of double the national average between 2010 and 2016. Monthly electricity bills with and without taxes are summarized in [figure 7](#).⁶

In Ontario, taxes add 13 percent to the average residential consumer's monthly bill. Taxes increased electricity prices in Toronto and Ottawa from \$178 and \$162 to \$201 and \$183, respectively, in 2016. In Vancouver, taxes add seven percent to residential monthly bills, increasing prices from \$107 to \$114. In Alberta's two major cities, Calgary and Edmonton, prices increased from \$104 to \$109, representing a five percent increase. The tax rates in Quebec increased the monthly bills of consumers in Montreal by 15 percent, increasing bills by \$11 per month. Montreal is the city with the lowest electricity prices for residential consumers and the highest tax rates. However, despite the 15 percent tax increase, Montreal still has lower prices than the five other cities referenced in [figure 7](#).

5. The findings with respect to Canada are corroborated by the survey of Canadian cities' electricity costs undertaken by Manitoba Hydro (2013) with regard to costs applicable to this class of customer as of May 1, 2013. While some minor differences were indicated, the overall findings are very similar. It is worth noting that the Hydro-Quebec study may not accurately reflect the actual differential in the all-in delivered cost of electricity with regard to Alberta jurisdictions. Because customers have a choice over electricity, and their electricity providers generally pay negotiated contract prices for electrical energy that are lower than regulated rates, their actual all-in costs may be lower than indicated by Hydro-Quebec (Angevine and Green, 2014).

6. The taxes that were applied to typical consumer bills are based on the Hydro-Quebec survey report. For Canadian cities, these consisted of the federal goods and services tax and the applicable provincial sales tax (except in Alberta, which does not have a provincial sales tax). Where there is a "harmonized" federal/provincial sales tax rate, as in the four Atlantic Provinces and Ontario, that rate was used.

Figure 7
Average residential monthly electricity bills, Canada and Canadian cities, 2016



Sources: Hydro-Quebec, 2010-2016; calculations by authors.

Note: The data for Canada is based on a population weighted average using 2016 Census data.

Based on calculations from the 12 Canadian cities in the Hydro-Quebec dataset, population-weighted Canadian average monthly electricity bills were calculated. On average, Canadians pay \$127 excluding tax and \$141 including tax for monthly electricity bills. This means that Toronto's monthly electricity bills (including tax) are \$60 more than the Canadian average. Consumers in Ottawa pay \$41 more per month on electricity bills than Canadians in other provinces.

In addition, residential consumers in Ontario's major cities paid more than double the electricity rates in Montreal, including tax. Residential consumers in Toronto pay \$201 per month for electricity, whereas consumers in Montreal are paying \$83, a difference of \$118. Electricity costs for consumers in Ottawa are \$183 per month, while Calgarians pay \$109, including tax. Thus, consumers in Ottawa pay \$74 more per month for electricity compared to consumers in Calgary and Edmonton. Figure 5 shows Ontario's high electricity costs, with and without tax, relative to other major Canadian cities. Hydro-Quebec data for 12 Canadian cities, with and without tax, can be found in tables A1 and A2 in Appendix A.

Evidently, residential consumers in Ontario's two major cities are paying far more for electricity than their counterparts in other major Canadian cities. Residential consumers in Toronto pay the highest prices of any other major Canadian city. Electricity bills in Toronto reached unprecedented levels, climbing to \$201.23 per month in 2016, far exceeding prices in any other city.

The analysis above shows that Ontario households pay in excess of a hundred dollars more on their monthly bills relative to their neighbours in Montreal. The price differential between Toronto and Ottawa relative to other cities is substantial.

What's behind Ontario's rising electricity prices?

The data presented above shows that electricity prices have been increasing rapidly in Ontario, far outpacing growth in disposable income, inflation, and in the economy as a whole. These increases are also occurring at a much faster rate than those in other provinces. The rapid increase in prices has led to Toronto having the highest electricity bills of major cities in Canada. While the data on prices is clear, the question remains as to the causes behind such dramatic changes.

In order to answer this question, this section will examine some of the policy decisions that have contributed to the dramatic electricity price growth in Ontario since 2008. While many economy-wide factors contributed to the price changes, the fact that they are so large in Ontario relative to other Canadian provinces points to unique Ontario circumstances as key to the trends.

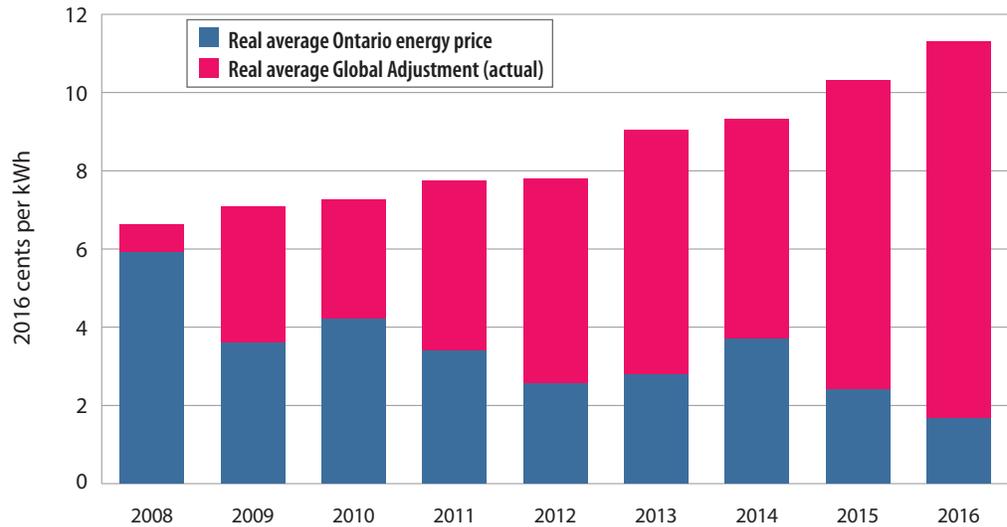
To understand the impact of policy choices on Ontario's electricity prices, it is useful to decompose them into the commodity portion and distribution and transmission costs. In 2014, the commodity cost (or generation cost) was estimated to amount to 62 percent of the total cost of electricity in the province (Auditor General of Ontario, 2015).

The commodity cost is comprised of two components: the Hourly Ontario Energy Price (HOEP) and the Global Adjustment (GA). The HOEP is the wholesale price of supplying electricity to the grid throughout the day. The GA, on the other hand, is a surcharge on consumers to make up revenue shortfalls between contracted costs (provincially-guaranteed rates for certain favoured classes of generators) and wholesale market revenue, as well as other non-market interventions such as conservation programs, and some costs related to nuclear power and gas capacity projects (IESO, n.d.).

Figure 8 presents the breakdown of the commodity cost portion of electricity bills in Ontario. In general, this portion of the bill has grown by over 70 percent, from 6.6 ¢/kWh in 2008 to 11.3 ¢/kWh in 2016.⁷ The most dramatic change in commodity cost, however, has been the growth of the GA.

7. All prices are in 2016 dollars.

Figure 8
Real average HOEP and average GA prices, 2008 to 2016 (2016 ¢/kWh)



Source: IESO, n.d.

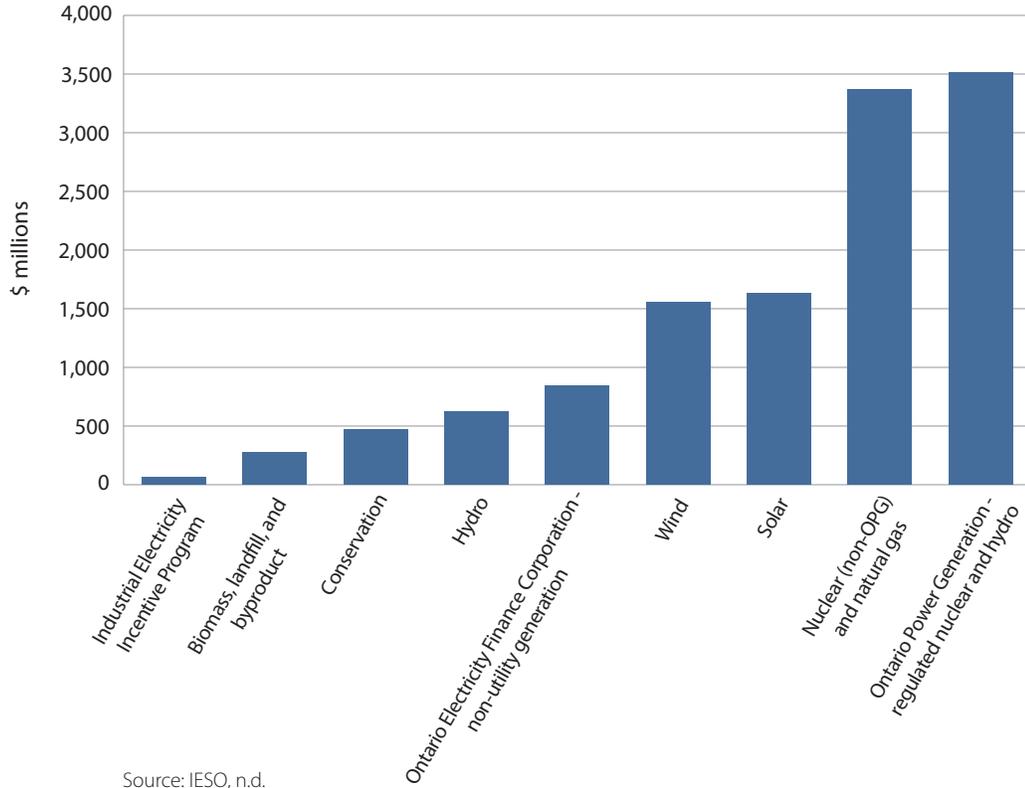
In 2008, the average GA price was 0.70 ¢/kWh, or 11 percent of the commodity cost. By 2016, the GA had increased to 9.66 ¢/kWh and now made up 85 percent of the commodity costs. Part of the inversion in prices between the GA and HOEP is to be expected, as one of the purposes of the GA is to make up for revenue shortfalls from guaranteed contracts caused by lower wholesale prices.

Breaking down the cost of the GA into its components allows for a better understanding of which policy choices by the Ontario government have led to such a dramatic increase in this one component of consumer's electricity bills. **Figure 9** presents the components of the GA in 2016 by their total cost for the year. While the two single largest components of the GA were the result of contracts for nuclear energy, natural gas, and hydro, when combined the three renewable energy components—wind, solar, and biomass—make up almost 30 percent of the cost of the GA.⁸ The share of the GA is expected to be much higher in 2017 and 2018, with a recent Ontario Energy Board (2017) report forecasting that between May 2017 and April 2018, the cost of the renewable component of the GA would be \$4.7 billion, while the total cost of the GA was expected to be \$11.1 billion. This means that 42 percent of the GA in this period will result from renewable energy.

The finding that renewable energy and its associated contracts make up such a large portion of the GA is particularly troubling given the amount of electricity produced by these forms of generation.

8. See table B1 in Appendix B for a description of each item in figure 9.

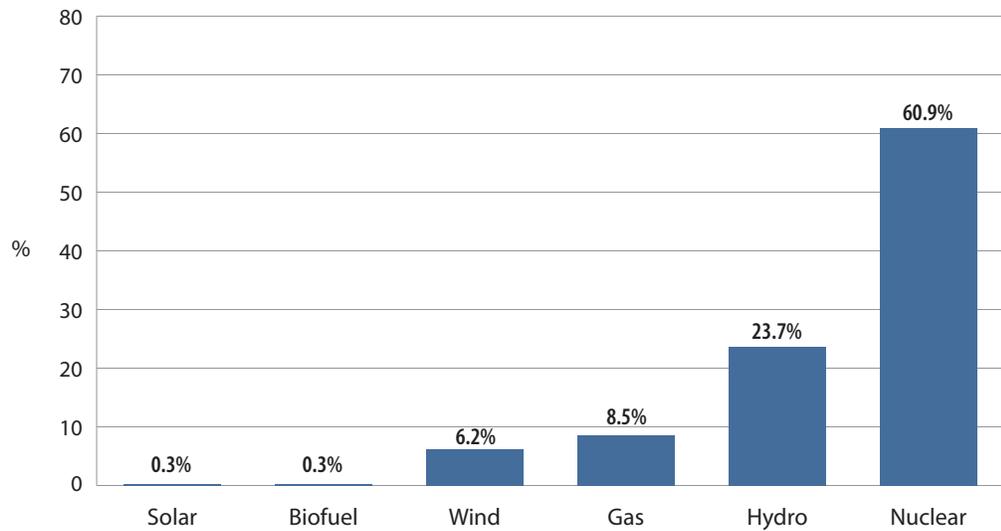
Figure 9
Breakdown of Global Adjustment components by 2016 cost



Source: IESO, n.d.

Note: An additional minor component of the GA not displayed in the figure are financing charges and funds which amounted to a gain of approximately \$6 million in 2016.

Figure 10
Ontario electricity generation by fuel type, percentage of total, 2016



Source: IESO, 2017.

Figure 10 displays 2016 electricity generation in Ontario by fuel type. Nuclear energy, which also had large amounts of the GA dedicated to it, generated the majority of Ontario's electricity, approximately 60 percent in total. The second largest source of electricity generation was hydro at almost 25 percent. When combined, wind, solar, and biomass generated just under seven percent of electricity in Ontario in 2016.

The high cost renewable energy component of the GA, which results in little electricity generation for Ontario, is primarily the product of the province's 2009 Green Energy Act (GEA). The intention of the act was to foster renewable energy usage in the province, while also encouraging energy conservation and efficiency (Green Energy and Green Economy Act, 2009). To achieve this goal, the centerpiece of the Act includes a schedule of subsidized electricity purchase contracts called Feed-in-Tariffs (FITs) that provide long-term guarantees of above-market rates for power generated by wind turbine farms, solar panel installations, bio-energy plants, and small hydroelectric generators. In other words, producers of renewable electricity receive a guaranteed price no matter what the market price of electricity is.

Other research has also found that wind and solar energy in particular were significantly adding to the costs of the GA while producing little electricity. McKittrick and Adams (2014) estimated that wind and solar were accounting for about 20 percent of the average commodity cost, while providing only four percent of Ontario's power.⁹

Ontario's Auditor General has also raised serious concerns about the costly effects of the province's policies on renewable energy. In her 2015 annual report, Auditor General Bonnie Lysyk estimated that consumers would pay \$9.2 billion more for renewable energy under the contracts enacted as part of the GEA than under the province's previous program. She also found that Ontario's guaranteed price for renewable energy was double the market price for wind and three and a half times the market price for solar in 2014. Also, regarding renewable energy production, the Auditor General found that the conversion of a coal plant to a biomass plant was needlessly costly. The new biomass plant was producing electricity at a cost of \$1,600/mWh, which is nearly 25 times the average cost of electricity from other biomass facilities in the province (Auditor General of Ontario, 2015). The Auditor General's report highlights a number of different ways that renewable energy is causing higher costs for Ontario consumers.

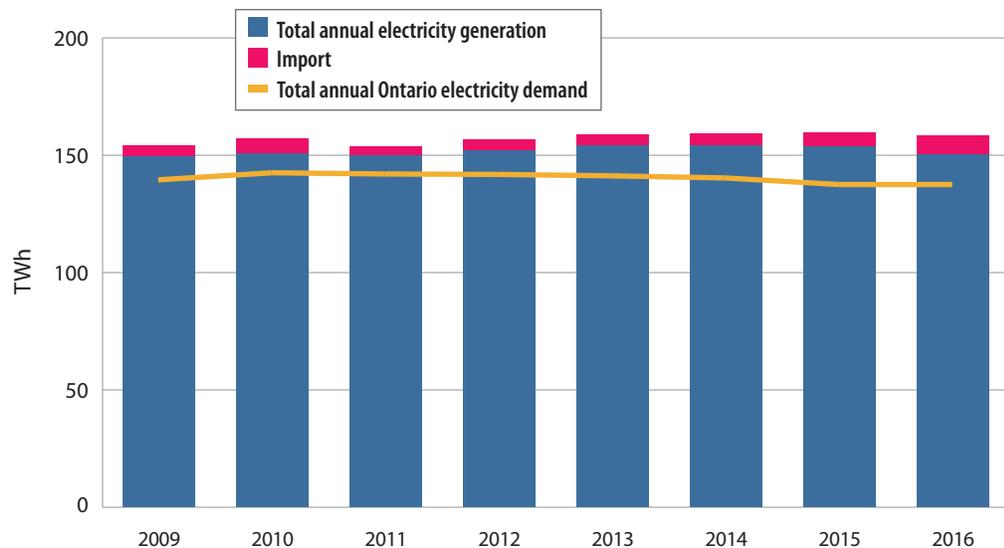
9. One of the reasons that the renewables inflate the cost of the GA is that they bid to supply power at a low level which drives down the cost of the HOEP but increases the cost of the GA because of the guaranteed contracts to other generators (McKittrick and Adams, 2014).

Another effect of the province's long-term shift towards renewable energy was the decision to phase-out coal fired electricity generation. This plan was initiated before the GEA was implemented but was only completed in 2014. Coal is one of the cheapest forms of electricity generation. Consistent with this fact, McKitrick and Adams (2014) found that the reductions of coal-fired generation in the province were associated with increases in the GA. In addition, other research has suggested that key justifications for the phase-out of coal-fired electricity—namely health and environmental benefits—have not resulted. Thus, Ontario's coal phase-out is another case of well-intentioned government intervention in the electricity sector resulting in higher prices but little, if any, other benefits (McKitrick, 2013; McKitrick and Aliakbari, 2017).

Imbalances between supply and demand are also becoming increasingly costly for Ontario consumers. As seen in [figure 11](#), in every year from 2009 to 2016, Ontario has generated on average 17.4 terawatt-hours (TWh) of excess supply (including imports) which is exported at a large loss. Curiously, given this imbalance, Ontario in recent years has continued to increase the generation capacity of its electricity system (Morrow and Cardoso, 2017).

Figure 11

Total annual Ontario electricity demand vs. total annual electricity generation, 2009 to 2016



Sources: IESO, n.d. (a), n.d. (b)

Note: The generation data refers to transmission-connected generation which includes facilities that are connected to the high-voltage grid. Transmission-connected generation makes up almost the entirety of the electricity supplied in Ontario.

This oversupply of electricity is dealt with either through increased exports or curtailed generation. The issue with this practice is, however, that the excess electricity is often exported at prices below what the generators are paid for production, or the generators are paid when their production is curtailed. In her 2015 annual report, the Ontario Auditor General explained some of the costs of these practices:

From 2009 to 2014, Ontario had to pay generators \$339 million for curtailing 11.9 million MWh of surplus electricity; during the same period, Ontario exported 95.1 million MWh of power to other jurisdictions, but the amount it was paid was \$3.1 billion less than what it cost to produce that power. In 2014 alone, 47% of Ontario's total power exports were related to surplus generation, with low-cost and low-carbon-emission energy, such as hydropower and nuclear-generated electricity, being exported. As well, from 2009 to 2014, there were also almost 2,000 hours in which the Hourly Ontario Electricity Price was negative, and Ontario paid exporters a net total of \$32.6 million to take our power." (Auditor General of Ontario, 2015: 216)

Thus, poor governance in the electricity sector has resulted in overspending on supply, both by paying above market rates and by purchasing more supply than required to meet system needs (Vegh, 2016: 4). In the end, it is consumers who pay for these imbalances through higher prices, since the losses are made up via the Global Adjustment surcharge.

While the above discussion is not exhaustive, it covers the main ways in which policy choices by the Ontario government have been the leading drivers of increased prices. Ontario's experience and policy choices should serve as a cautionary lesson to governments who are considering adopting similar policies.

Conclusion

Ontario has the fastest growing electricity prices in the country and its cities have some of the highest average residential monthly bills in Canada. Ontario's electricity prices have been growing faster than incomes and inflation. This situation is directly tied to policy choices by the Ontario government. The province's policies surrounding renewable energy (wind, solar, and biomass) have resulted in large additional costs for consumers, whether from poorly structured long-term contracts, the phase-out of coal energy, or the contributions of green energy sources to the growing supply and demand imbalance in the province. High costs of renewable energy are particularly troubling given the relatively small amount of electricity that these sources generate.

In addition, the Ontario government is using debt-financing to try to address the policy failures that resulted in high electricity prices for household consumers. The government recently announced the Fair Hydro Act, which is a plan to take on more debt to reduce electricity bills for the next 10 years. However, this policy decision to lower rates for current consumers will result in a new charge to future bills called the "Clean Energy Adjustment" in the mid-to-late 2020s, costing ratepayers tens of billions of dollars in debt plus interest (Ontario, 2017; FAO, 2017). The Ontario government's plan to reduce electricity costs in the short term is essentially borrowing from future ratepayers to subsidize current bills. Thus, the overall effect of the government's policy decisions will be to further increase electricity rates in the long term, not reduce them.

Given the critically important role that affordable electricity plays in peoples' standard of living, the results of this study suggest that it is time for the Ontario government to have a hard look at how their policy choices are affecting peoples' lives. It is also time for the government to begin pursuing meaningful policy reforms aimed at lowering the electricity bills for Ontario residents.

Appendix A

Table A1

Residential monthly bills, excluding taxes (CA\$)

	2010	2011	2012	2013	2014	2015	2016
Montreal, QC	68.75	68.21	67.58	68.66	70.58	71.91	72.26
Calgary, AB	106.47	174.69	138.85	148.11	134.06	116.55	104.00
Charlottetown, PE	161.47	145.07	145.07	148.67	152.37	156.17	160.17
Edmonton, AB	92.70	164.04	129.04	139.00	118.79	115.47	103.69
Halifax, NS	128.88	136.23	150.06	154.46	160.30	160.30	158.83
Moncton, NB	116.63	118.23	118.23	118.23	120.58	122.98	124.98
Ottawa, ON	110.05	124.37	131.43	123.91	134.49	141.97	161.52
Regina, SK	131.51	137.92	125.38	131.52	139.53	143.72	146.45
St. John's, NL	107.33	109.86	117.98	125.48	113.39	115.53	119.64
Toronto, ON	118.23	129.01	135.72	124.75	137.84	143.07	178.08
Vancouver, BC	77.93	76.81	87.77	89.07	97.07	102.90	107.03
Winnipeg, MB	70.84	73.05	74.55	76.25	78.92	81.09	84.29

Source: Hydro-Quebec, 2010-2016.

Table A2

Residential monthly bills, including taxes (CA\$)

	2010	2011	2012	2013	2014	2015	2016
Montreal, QC	77.60	77.71	77.70	78.94	81.15	82.68	83.08
Calgary, AB	111.79	183.43	145.79	155.52	140.77	122.38	109.19
Charlottetown, PE	169.54	152.32	152.32	169.48	173.70	178.03	182.59
Edmonton, AB	97.34	172.24	135.49	145.95	124.73	121.24	108.87
Halifax, NS	135.32	143.04	157.56	162.18	168.32	168.32	166.77
Moncton, NB	131.79	133.60	133.60	133.60	136.26	138.97	141.23
Ottawa, ON	115.55	126.49	133.67	140.02	151.97	160.42	182.51
Regina, SK	137.48	144.19	144.19	151.25	160.46	165.28	168.42
St. John's, NL	121.28	124.14	133.32	131.75	129.41	131.86	135.20
Toronto, ON	124.14	131.21	138.06	143.04	158.04	164.04	201.23
Vancouver, BC	84.14	82.65	94.16	95.51	103.92	110.04	114.38
Winnipeg, MB	81.11	83.64	85.36	87.31	91.15	93.77	97.46

Source: Hydro-Quebec, 2010-2016.

Table A3
Residential residential prices, excluding taxes (cents/kWh)

	2010	2011	2012	2013	2014	2015	2016
Montreal, QC	6.88	6.82	6.76	6.87	7.06	7.19	7.23
Calgary, AB	10.65	17.47	13.89	14.81	13.41	11.66	10.40
Charlottetown, PE	16.15	14.51	14.51	14.87	15.24	15.62	16.02
Edmonton, AB	9.27	16.40	12.90	13.90	11.88	11.55	10.37
Halifax, NS	12.89	13.62	15.01	15.45	16.03	16.03	15.88
Moncton, NB	11.66	11.82	11.82	11.82	12.06	12.30	12.50
Ottawa, ON	11.00	12.44	13.14	12.39	13.45	14.20	16.15
Regina, SK	13.15	13.79	12.54	13.15	13.95	14.37	14.65
St. John's, NL	10.73	10.99	11.80	12.55	11.34	11.55	11.96
Toronto, ON	11.82	12.90	13.57	12.48	13.78	14.31	17.81
Vancouver, BC	7.79	7.68	8.78	8.91	9.71	10.29	10.70
Winnipeg, MB	7.08	7.31	7.46	7.63	7.89	8.11	8.43

Source: Hydro-Quebec, 2010-2016.

Table A4
Residential residential prices, including taxes (cents/kWh)

	2010	2011	2012	2013	2014	2015	2016
Montreal, QC	7.76	7.77	7.77	7.89	8.12	8.27	8.31
Calgary, AB	11.18	18.34	14.58	15.55	14.08	12.24	10.92
Charlottetown, PE	16.95	15.23	15.23	16.95	17.37	17.80	18.26
Edmonton, AB	9.73	17.22	13.55	14.60	12.47	12.12	10.89
Halifax, NS	13.53	14.30	15.76	16.22	16.83	16.83	16.68
Moncton, NB	13.18	13.36	13.36	13.36	13.63	13.90	14.12
Ottawa, ON	11.56	12.65	13.37	14.00	15.20	16.04	18.25
Regina, SK	13.75	14.42	14.42	15.12	16.05	16.53	16.84
St. John's, NL	12.13	12.41	13.33	13.17	12.94	13.19	13.52
Toronto, ON	12.41	13.12	13.81	14.30	15.80	16.40	20.12
Vancouver, BC	8.41	8.27	9.42	9.55	10.39	11.00	11.44
Winnipeg, MB	8.11	8.36	8.54	8.73	9.12	9.38	9.75

Source: Hydro-Quebec, 2010-2016.

Appendix B

Table B1
Description of Global Adjustment components

Wind	Includes projects under Renewable Energy Supply, Renewable Energy Standard Offer Program, and the Feed-in-Tariff program
Biomass, landfill, and byproduct	Includes projects under Renewable Energy Supply, Renewable Energy Standard Offer Program, Feed-in-Tariff, recently converted OPG Atikokan and Thunder Bay facilities, and NUG contracts with the IESO
Hydro	Facilities with agreements through Renewable Energy Supply Program, Renewable Energy Standard Offer Program, Hydroelectric Contract Initiative, and Feed-in-Tariff programs, as well as OPG's facilities that fall under the Hydroelectric Energy Supply Agreement
Nuclear (non-OPG) and natural gas	Bruce Power nuclear and natural gas facilities including OPG's Lennox (dual fuel)
Solar	Includes projects under Renewable Energy Supply, Renewable Energy Standard Offer Program, and Feed-in-Tariff program
Industrial Electricity Incentive Program	An incentive for eligible consumers in Ontario to increase industrial production. Eligible activities include building a new facility or expanding an existing one, that falls within a specific NAICS Canada 2012 sector
Funds and financing	Includes programs supporting community groups in the design and delivery of renewable energy initiatives and also includes contract penalties received from generators
Conservation	Conservation programs including Save on Energy and Conservation Fund
Ontario Power Generation: Regulated Nuclear and Hydro	Regulated rates for OPG's nuclear and remaining hydro generation as set by Ontario Energy Board
Ontario Electricity Financial Corporation: Non-Utility Generation	Contracts administered by Ontario Electricity Financial Corporation with existing generation facilities

Source: IESO, n.d.

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