Electricity Pricing in Ontario and its Effect on Competitiveness: An Automotive Manufacturing Case Study

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Executive Summary

Over the past decade, anxiety about the price of electricity in Ontario has grown. From 2006 to 2009, the province's top 10 print media covered the issue an average of 5.8 times per month. Since the start of 2014, those same media outlets have reported on it almost 20 times each month. The Ontario Chamber of Commerce has indicated that one in 20 businesses in Ontario expect to close over the next five years due to increasing electricity prices (Taber, 2015) and that 40 percent have delayed or cancelled investment decisions because of it (McKitrick and Adams, 2015).

This report considers the issue from the perspective of automotive assemblers. There are several reasons to analyze the cost of electricity's effect on automotive assembly, including its position as a critical source of investment and jobs and uncertainty about its ongoing capacity to thrive in the face of rising international competition. Moreover, studying automotive assembly can generate broader conclusions about the impact of the cost of electricity on the competitiveness of manufacturing in Ontario, some of which may challenge the narratives suggested by organizations and media.

Because the issue has been framed as one of competitiveness, this report provides electricity rates for some of Ontario's main sources of competition for investment: the top 10 automotive-producing jurisdictions in the US. From that, several new and important points for discussion emerge, key among them being confirmation that:

- At US$54 per vehicle, the cost of electricity is higher in Ontario than any of the top 10 automotive-producing jurisdictions in the US
- The cost of electricity per vehicle is between US$6 and $18 more in Ontario than the most expensive and least expensive US jurisdictions
- Expressed in USD, the cost per vehicle of electricity in Ontario has been relatively stable in recent years. However, the stability is the result of a) more efficient use of electricity (as evidenced by per vehicle electricity use dropping by 22 percent between 2006 and 2015) and b) the declining value of the Canadian dollar

Our research indicates that even though rates have been described as a major cause of the deteriorating competitiveness of Ontario's manufacturing industry, the size of the gap is not currently large enough to warrant such characterizations; certainly, not in the context of a $30,000 vehicle. However, the retail price of a completed vehicle may not represent a relevant starting point as most of a vehicle's costs come from other upstream and downstream stages within the value chain (e.g. research, design, parts and components, and marketing). In the end, automotive assembly plants generate only about 10 percent of a vehicle's final value (i.e. about $3,000) so it is on that basis that an individual plant's competitiveness should be judged.

Even in the context of approximately $3,000 of local content, however, the amount of electricity consumed in the assembly of a vehicle is not sufficient for it to be the cause of a meaningful deterioration in the overall competitiveness of assembling vehicles in Ontario. The question then is this: Why have electricity

costs occupied so much interest? We suggest the following reasons:

- Electricity rates, expressed in CAD, have increased in Ontario by 107 percent over the past decade (while US rates in USD have tended to stay at or below the rate of inflation)
- The introduction of a complex electricity pricing system for large electricity users in Ontario has caused users and their executive teams to:
  - Gather and analyze their use of electricity with increasing frequency
  - Make decisions (i.e. curtail production) that run counter to their core mandates: making vehicles

Overall, the gap in the cost of electricity per vehicle between Ontario and other automotive-producing jurisdictions is not currently large enough to seriously impair the province's competitiveness vis-à-vis those jurisdictions. Going forward, however, the combination of continuously rising electricity rates in Ontario and rates that are projected to stay at or near the rate of inflation in the US may create the conditions to elevate what is currently an intra-jurisdictional cost irritant to the level of true inter-jurisdictional issue affecting competitiveness.

1. Methodology & Data Sources

The genesis for this report is the volume of comments and complaints about electricity costs in Ontario and their effect on the province's ability to attract and retain automotive manufacturing investment. However, accurately judging the veracity of those comments has been challenging due to the fact that no definitive Canadian source details the cost of electricity in automotive assembly plants. To address this, we created a database that allows us to compare electricity costs in Ontario with those of the top ten automotive-producing jurisdictions in the US.

To create the database, we obtained US electricity rates for industrial consumers from the US Energy Information Administration (2016a). Comparative industrial electricity rates for Ontario came from the Independent Electricity System Operator (2016a). In Ontario, rates are comprised primarily of a Debt Retirement Charge, the Hourly Ontario Energy Price (HOEP), which is the market price for electricity in Ontario, and the Global Adjustment (GA), which covers the difference between the HOEP and the rates paid to regulated and contracted generators, as well as conservation and demand management programs[1].

There are limitations to which the electricity used in one OEM assembly plant can be compared to another. For example, not all vehicle assembly plants have a metal stamping line; some are more efficient than others; some are larger; and some employ alternative, off-grid sources of power. However, electricity is ultimately used in final assembly facilities to power similar activities: conveyors, production robots, welding and stamping lines, and lighting. The parallels allow us to use data provided by the US Census Bureau's Annual Survey of Manufacturers (ASM) as a proxy for Canada. The ASM includes multi-year data about total electricity used by manufacturers at the five digit North American Industrial Classification System (NAICS) code level, in this case for Automobile

1 Many competing U.S. markets are open, which allows industrial consumers to enter into contracts that provide for lower rates. Such rates can vary by location and facility.

and Light-Duty Motor Vehicle Manufacturing. Such information is not publicly available in Canada.

Beyond these data, context and clarity was added through a series of interviews with OEM representatives, energy consultants and electrical system executives.

2. Results

a) Electricity Costs

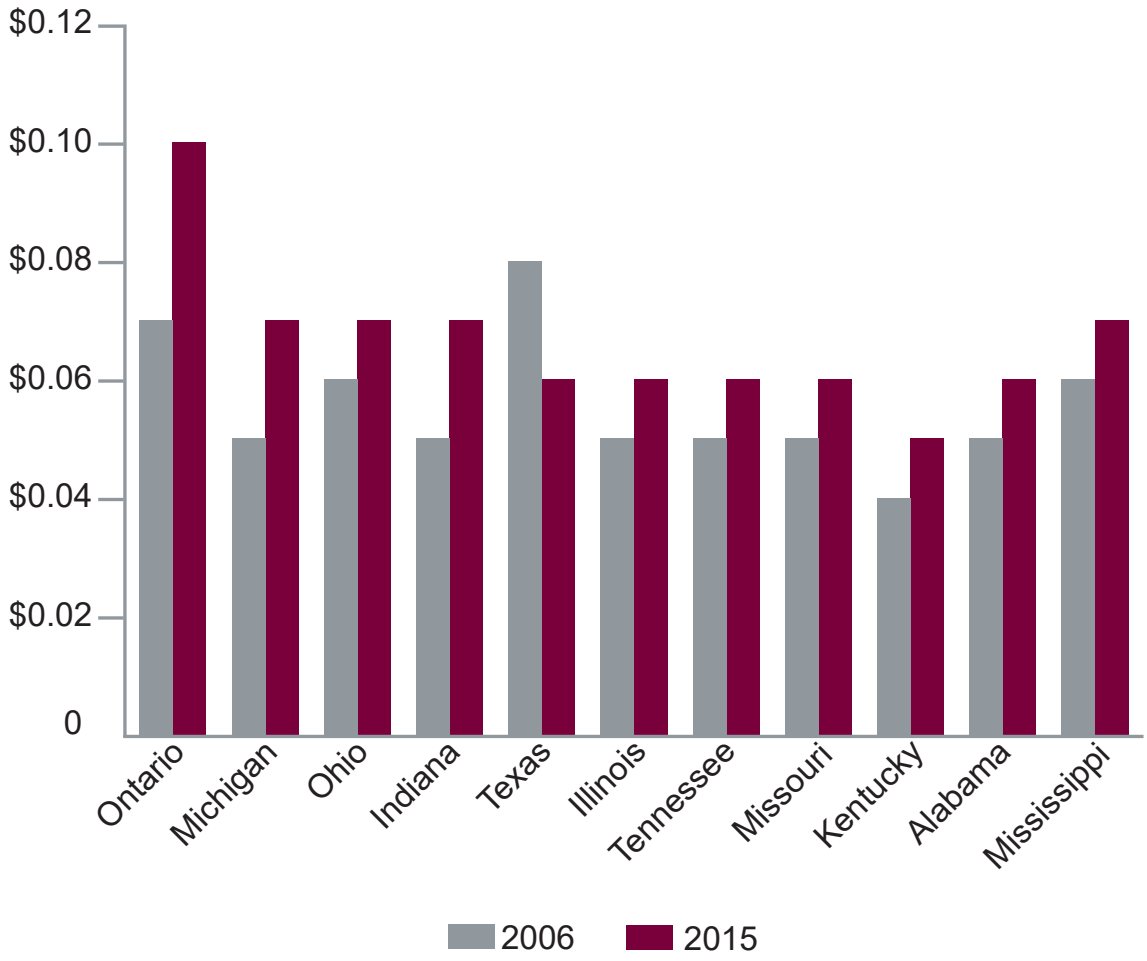
Figure 1 shows that the overall per vehicle trend for electricity use decreased between 2005 and 2015. For example, it indicates that average kilowatt hours (kWh) used per vehicle in the US in 2015 was 665, compared to 810 in 2006. According to one OEM representative, “We benchmark against the other plants ... Everyone is looking at everyone’s data, and everyone is looking at everything everyone is doing.” The upshot of this intra-company practice of competition and cooperation is increasing efficiency.

Figure 2 shows electricity costs for 11 jurisdictions: Ontario and the top 10

Figure 1 – Average kWhs of Electricity Used per Vehicle, 2005-2015

vehicle-producing states in the US between 2006 and 2015. As the issue of electricity costs has been presented as one of competitiveness, and because Ontario competes with US locations for OEM investment, we present the costs in US dollars. Figure 2 confirms that electricity prices in Ontario are more expensive than in competitor jurisdictions.

Figure 2 – Electricity Prices per kWh (US$), 2006 and 2015



From this two questions emerge:

1. Is the gap meaningful?
2. Does the gap justify the level of anxiety expressed?

We start to obtain answers to these questions by presenting the data in combined form: per vehicle electricity costs, obtained by multiplying average kWhs used per vehicle (Figure 1 data) by electricity rates in each of the 11 jurisdictions (Figure 2 data). Figure 3 shows that over the 10 year period between 2006 and 2015 Ontario experienced a per vehicle electricity cost increase of 51 percent when expressed in US dollars. This was the largest increase among any jurisdiction studied. By comparison, per vehicle electricity costs were at or below the rate of inflation in each US jurisdiction.

Electricity costs per vehicle in an assembly plant in Ontario are US$17.82 (or 49.5 percent) more than the lowest cost jurisdiction, Kentucky, and US$6.19 (or 13 percent) more than the second most expensive place, Michigan. Thus, as Table 1 demonstrates, based on total vehicle production of 2.4 million in Ontario in 2015, Ontario OEMs endured a premium of US$40 million in added costs over Kentucky and US$14 million over Michigan.

Figure 3: Per Vehicle Electricity Costs (US$), 2006, 2010, and 2015

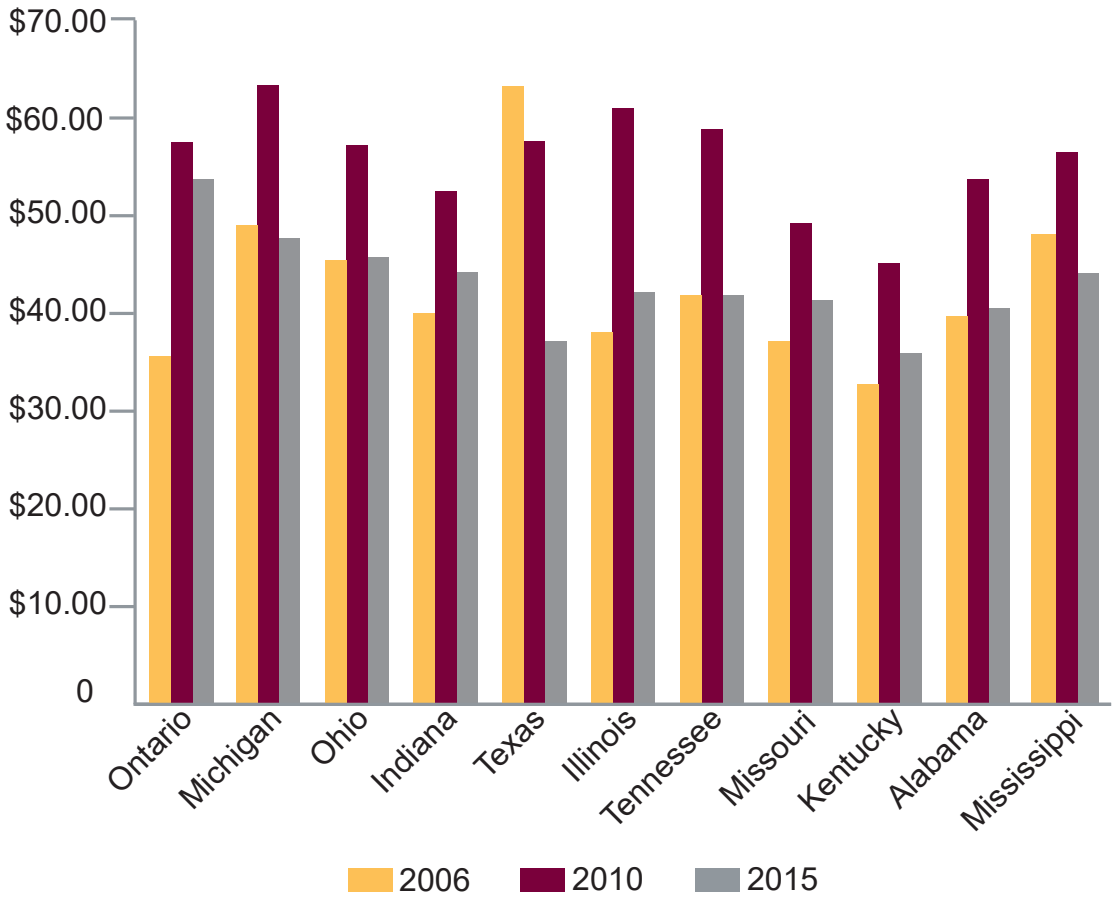


Table 1: Ontario Electricity Premium to US Competitor Jurisdictions

OEM	Vehicle Production	Ontario Electricity Premium			
		Michigan (highest price in US)		Kentucky (lowest price in US)	
		Per Vehicle Premium	Annual Costs per Company	Per Vehicle Premium	Annual Costs per Company
Toyota	579,411	$6.19	$3,586,554	$17.82	$10,325,104
General Motors	577,633		$3,575,548		$10,293,420
Fiat Chrysler	514,969		$3,187,658		$9,176,748
Honda	384,892		$2,382,481		$6,858,775
Ford	200,689		$1,242,265		$3,576,278
TOTAL	**2,257,594**		**$13,974,506**		**$40,230,325**

As Figure 1 illustrates, average kWhs consumed in the final assembly process decreased from 854 per vehicle in 2005 to 665 in 2015, an efficiency increase of 22 percent. Consequently, assembly plants in jurisdictions that experienced rate increases over that period of less than 22 percent could have recorded declines in electricity costs per vehicle. Indeed, on that basis, three states – Michigan,

Texas and Mississippi – exhibited per vehicle electricity costs that were lower in 2015 than a decade earlier. In Texas, for example, a combination of declining electricity rates and probable increasing efficiencies resulted in per vehicle reductions that may be more than US $26 per vehicle over that 10 year period.

But even though we know the size of the gap, we have not yet answered the essential questions: Is the gap meaningful? Does the gap justify the level of anxiety expressed? Placing those numbers in some context brings us closer to answers.

b) Electricity Costs in Context

Considering electricity rates, trends, and unit costs within and between jurisdictions provides a useful starting point for conversation about competitiveness. But are those rates, trends and costs truly relevant? After all, the focus here is on a cost element that, at approximately US$36 - $54 per vehicle is less than 0.2 percent of the value of a CAD$30,000 vehicle. To put it another way: even if electricity was free, would there be a substantive effect on the competitiveness of Ontario as a location for automobile manufacturing?

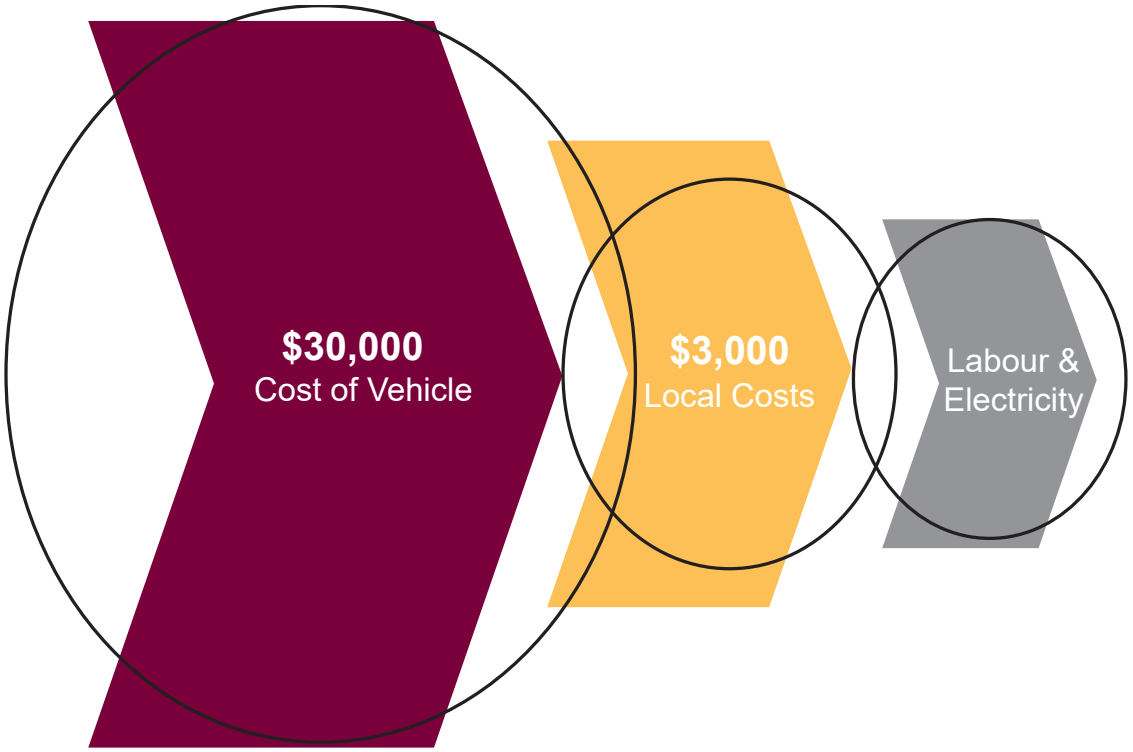
To answer the question, one must consider OEMs' cost structures. For OEMs making vehicles in Canada, many input costs are similar, whether they assemble the vehicle in Canada, the US, or Mexico. For example, parts and components from offsite suppliers comprise the largest portion of vehicle assembly costs and cannot be altered by changing the location of the assembly plant. Therefore, the cost of electricity must be assessed in the context of locally incurred costs only: costs experienced within the final assembly operation. When that happens, the cost of electricity – an expenditure that may disappear in the shadow of a CAD$30,000 vehicle – becomes magnified. The main costs attributed exclusively to final assembly are labour, depreciation, materials, and utilities (including natural gas, water, and electricity). According to one OEM, only about 10 percent of the cost of assembling a vehicle is incurred locally. This means that locally-incurred costs are approximately CAD$3,000 per vehicle. Therefore, in that context, the relevance of electricity costs increases by a factor of 10, from a 0.2 percent to about two percent of locally-incurred costs.

From there, a further narrowing occurs. Many locally-incurred costs do not vary substantially between jurisdictions. That means that decisions around the location of final assembly plants can hinge on costs that in Canada account for even less than the CAD$3,000 per vehicle described above. Accordingly, costs that have a bearing on competitiveness are those that are both a) locally-incurred and b) diverge between jurisdictions. By that standard, a limited number of relevant line items remain with labour and electricity being the largest. Electricity, however, is much less important than labour. For context: assuming a final assembly operation requires approximately 28.94 hours of labour[2] (Harbour and Associates, 2012), and base hourly wages (not including the costs of pensions and benefits) of CAD$35.42 (Unifor, 2016), final assembly labour constitutes more than CAD$1,025 of locally-incurred costs (not including benefits). For that reason, even though electricity costs can be isolated as one of two major locally-

2 The 2012 Harbour Report provides a sourcing adjusted Hours Per Unit (HPU) assessment of participating vehicle assembly plants. According to figures provided in the 2012 version, the last of its kind, the median HPU was 28.94 hours

incurred costs that differ substantially between competitor jurisdictions, those costs are only a fraction of the cost of labour (about 5%), and even less when pension and benefits cost are considered.

Figure 4: The Cost Context for Automotive Assembly



By placing costs in context, we can assess whether the gap is meaningful. In the context of a $30,000 vehicle, one can classify a variance of US$6 - $18 as insignificant. Even when expressed in the context of $3,000 of local costs, discrepancies of that magnitude are immaterial.

Therefore, now that we have concluded that the gap is not meaningful, we move to a second question: How does one explain the level of anxiety expressed by industry stakeholders?

3. Explaining the Anxiety

So far, we have verified that electricity costs in Ontario are indeed higher than competing jurisdictions. Subsequently, we clarified that the number of locally-incurred costs that vary between jurisdictions is limited, a fact that justifies Canadian automotive executives enduring interest in the cost of electricity. The reality, though, is that the per vehicle electricity cost difference between the most expensive automotive manufacturing jurisdiction (Ontario) and the least expensive one (Kentucky) is just US$17.82 per vehicle: less than one percent of local costs. At $53.80, it is also less than 1/20th the value of the most important local cost in an assembly plant, labour. Michigan, which has the second most expensive electricity among automotive manufacturing jurisdictions, is just US$6.19 per vehicle less than Ontario. In Michigan, though, the cost of electricity

in automotive manufacturing barely registers as a concern. Consequently, in Ontario, other issues must be at play. We identify three:

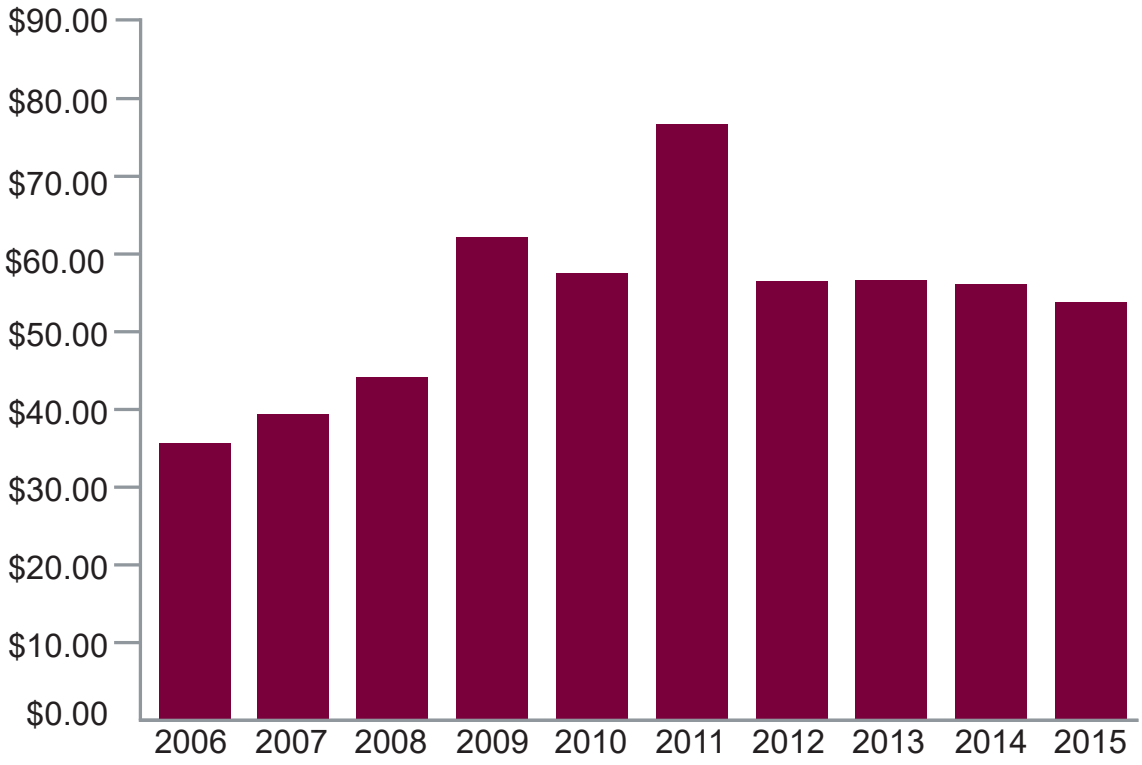
a. Trends in Canadian cost structures compared to other jurisdictions
a. OEMs' lack of confidence about future trajectories for electricity pricing, and
a. An Ontario electricity pricing scheme that has the effect of amplifying discord

a) Trends

On a US dollar basis, Canadian electricity costs per vehicle have been relatively stable. As Figure 5 shows, at US$53.80 per vehicle in 2015, Canadian costs exhibited a modest downward tendency over the past several years. However, we found three trends have had greater influence. First, even though Ontario's per vehicle electricity costs dropped by 6.5 percent on a USD basis between 2010 and 2015 (primarily the result of improving per vehicle electricity usage and a declining Canadian dollar), Ontario's result was considerably less impressive than any US competitor jurisdiction. For example, the worst performance in the US was recorded by Indiana, which experienced a five year reduction on a per vehicle basis of 15.7 percent. Texas was best with a decrease of 35.6 percent over the same period.

Second, trends regarding rates per kWh have proven to be more compelling than per vehicle costs. In Ontario, rates climbed by 25.8 percent in USD between

Figure 5: Electricity Costs per Vehicle in Ontario (US$), 2006-2015



2010 and 2015. Meanwhile, the next worse performer, Indiana, experienced an increase of just 13.5 percent. Rates in Texas, Illinois, and Tennessee decreased.

The third issue revolves around the rate when expressed in Canadian dollars. Even though Canadian plants compete with US plants for mandates and are assessed or benchmarked against those plants in US dollar terms, these are the realities: the plants are located in Canada; executives in Canada are influenced by Canadian dialogue; electricity bills incurred in Canada are paid in Canadian dollars. As Figure 6 shows, between 2006 and 2015 Ontario rates more than doubled in Canadian dollar terms. Thus, even though Canadian actors describe the effect of electricity prices in terms of the effect those prices have on their competitiveness vis-à-vis the US, the more likely source of their concerns relates to rising prices in Canadian dollar terms. This tells us that considerations and concerns with respect to electricity pricing in Canada are influenced less by concerns about competitiveness with the US and more by conversations about energy costs that occur in Canada.

Figure 6: Ontario Electricity Costs per kWhs (CAD$), 2006-2016

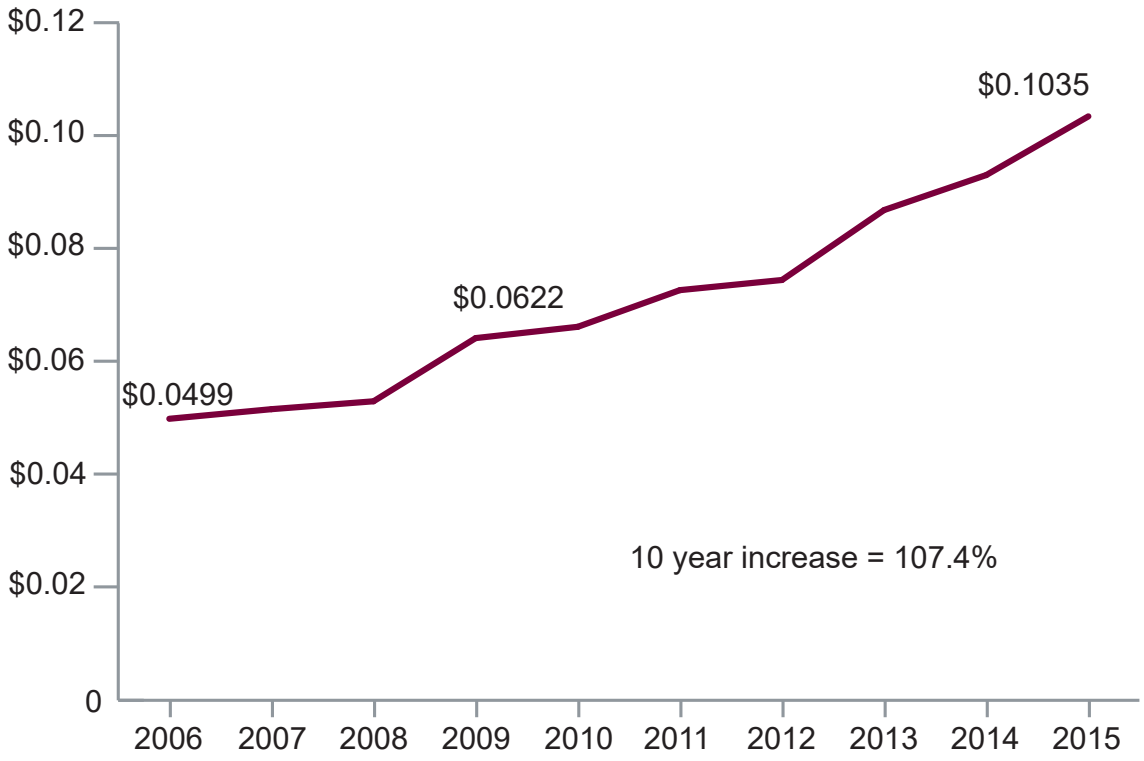
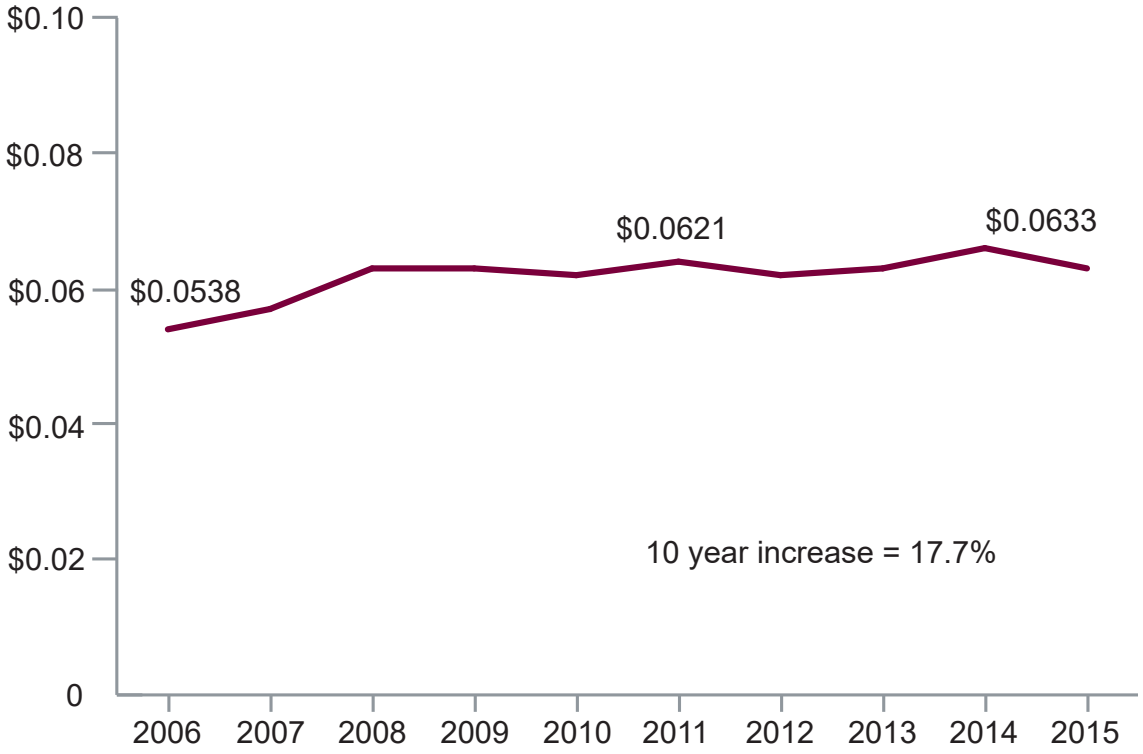


Figure 7: Average Electricity Costs per kWhs ($USD), Top 10 Automotive-Producing States, 2006-2016



b) Uncertainty about Future Trajectories

While large electricity consumers are distressed about the past, they are equally pessimistic about future trajectories. As recently as 2013, the Province of Ontario's Long Term Energy Plan (LTEP) predicted that a combination of lower demand forecasts and various rate moderating measures would "mitigate rate increases and decrease the pressure on Ontario electricity consumers" (Long Term Energy Plan, 2013, p 17). The result was a prediction of increases from 7.9 cents per kWh in 2013 to 10.5 per kWh in 2018, at which point rate increases would smooth out at levels more closely matching the level of inflation. The LTEP also predicted an overall industrial rate hike of 16.5 percent between 2013 and 2015. While the LTEP prediction was well above the rate of inflation, actual results have proven to be worse, a 19.1 percent jump. By contrast, during the same period, the average rate of increase in the top 10 US auto producing states was 0.7 percent.

In 2015, former Toyota Senior Managing Director, Ray Tanguay, assumed the role of Automotive Advisor to the Governments of Canada and Ontario. His view was that the province's electricity infrastructure should be considered in the context of the global shift to a more carbon neutral economy, concluding that Ontario's electricity should be viewed as a benefit of investing there. "We have made the investments that are needed to assure availability for the next thirty years. Other jurisdictions haven't made the investments they'll need for the reduced carbon economy" (Tanguay, 2016). While Ontario had eliminated all coal-fired electricity by 2015, 33.1 percent of electricity in the US was still

generated from coal (US Energy Information Administration, 2016b), one of the lowest cost sources of electricity generation. However, on November 21, 2016 President elect Trump signaled his intention going forward:

> "Whether it's producing steel, building cars, or curing disease, I want the next generation of production and innovation to happen right here, in our great homeland: America - creating wealth and jobs for American workers … On energy, I will cancel job-killing restrictions on the production of American energy - including shale energy and clean coal - creating many millions of high-paying jobs. That's what we want, that's what we've been waiting for." (Seeking Alpha, 2016)

Should US jurisdictions eventually transition away from coal, Mr. Tanguay's assessment may prove prophetic. However, based on President Trump's declaration, for at least the next four years, the gap between Ontario and competitor jurisdictions will only widen.

c) Ontario's Electricity Pricing Scheme

We found that one of the main reasons Ontario's electricity pricing policy regime generates attention is related to the operational challenges it provokes. A pricing tool known as the Industrial Conservation Initiative (ICI) is the most prevalent example. The ICI was designed to provide relief for large scale users from a major part of their electricity bill, the Global Adjustment (GA). However, the contortions required to take advantage of the ICI program has heightened visibility of electricity pricing issues among the industry's decision makers. Furthermore, tension can be expected to rise. This is exactly the opposite effect the government intended. An explanation is provided below.

The GA was instituted in 2005. It is the biggest part of most electricity bills and is designed to account for the difference between the market price and the regulated contract price paid to generators and renewable power sources. In 2015, for example, the annual average weighted hourly price for electricity was 2.4 cents CAD per kWh with the GA adding another 7.9 cents CAD per kWh. However, large customers like OEMs are able to participate in the ICI, which provides an incentive for such consumers to shift their electricity consumption to off-peak hours and reduce their GA bills. By participating in ICI, those customers are assigned GA fees based on the percentage of electricity they consumed during Ontario's top five one hour usage peaks during the previous 12 month period. Thus, if a single customer accounted for 0.6 percent of the electricity used in Ontario during the five peak periods in Year 1, that company would pay 0.6 percent of the total costs assigned to the GA in Year 2. In 2015, for example, total costs assigned to the GA was CAD$9.47 Billion (Independent Electrical System Operator, 2016b) Therefore, if the large power consumer described above pulled 0.6 percent of the total load in 2014, that customer could expect an assessment of CAD$59.4 million as their portion of the 2015 GA (.06 x $9.47 billion). If, however, that large user was able to shave electricity use during the five peak one hour periods during 2014 by half by curtailing large portions of their operations, they could, under the ICI, reduce their GA assessment to 0.3 percent of the total system's GA in 2015, a significant reward for accurately predicting the five peak one hour periods in 2014 and taking measures to limit their draw.

Effective management of the GA and ICI is a major undertaking with the largest players drawing upon a combination of in house expertise and external advice. However, even with such support, to accurately predict the five peak hour periods and increase the likelihood of matching their pullback with the year's five peak draws, ICI participants must curtail their operations as many as 15 times per year.

Certainly, the ICI has provided some companies with a vehicle to mitigate cost increases. However, if the intention of the province was to use the program to ease anxiety about costs, we find that it has not – and will not – succeed for three reasons:

1. ICI program participation is a major administrative and operational task, causing senior executives from across a company to gather at least 15 times per year for the sole purpose of discussing and scrutinizing electricity. The act of gathering executives with such frequency to consider operational decisions that defy production mandates – and doing so on the basis of one commodity – can only have the effect of intensifying anxiety around that commodity
2. In 2014, the program was expanded when the threshold for eligibility was lowered from five megawatts to three, expanding the number of participating organizations from 80 to 280 (thus, an expansion of scrutiny). Then, in the September 2016 Speech from the Throne, the Government of Ontario signaled its intention to lower the threshold to one MW, effectively expanding eligibility for enrolment to 1000 (Ontario Ministry of Finance, 2016; Greater Niagara Chamber of Commerce, 2016). This means more companies and more decision makers will be engaged in the 15 times per year operational discussions and debates described above
3. Increasing participation in the program will have the effect of making it even more difficult for participating companies to accurately pinpoint the five peak periods. As more establishments sign up for ICI, and as more companies develop and implement energy reduction plans, the likelihood of making accurate predictions can be expected to drop further. ICI participants will need to curtail production even more frequently to increase their probability of identifying the five peak load hours.

4. Conclusions

The policies and mechanisms that have accumulated over generations and that now form the foundation for price setting within Ontario's electricity supply system have generated considerable attention among the province's manufacturing base, including its automotive assemblers. This report grounds those conversations with tangible, comparable data, comparing the effect of electricity pricing on vehicle assembly across the top automotive-producing jurisdictions in North America. Several observations are offered, many of which contradict general perceptions.

One aspect that does not contradict perceptions is Ontario's ranking with respect to cost. This report shows that the average electricity price per vehicle in an Ontario assembly plant in 2015 was about US$54, confirming Ontario's status as the highest cost location for electricity among the top auto producing jurisdictions

in North America. By contrast, Michigan was the second most expensive at about US$47.50 per vehicle. Meanwhile, Kentucky and Texas were the lowest cost locations at approximately US$36 and US$37 respectively.

Even though Ontario is the most expensive location, we reject the notion that marginal costs that range from US$6.19 per vehicle (Michigan) to US$17.82 (Kentucky) have the capacity to undermine the province's competitive calculus. Agitation around the issue, therefore, must be explained by other factors. We uncover those factors via several measures. First, we place electricity costs in context. However, rather than considering a US$6.19 marginal cost in the context of a CAD$30,000 vehicle, we measure its effect against other locally controlled cost elements. This step removes external inputs like parts and components; costs that are beyond the control or responsibility of local management. This measure has the effect of narrowing the frame of comparison from CAD$30,000 to approximately CAD$3,000. From there, we exclude those cost items under local control that exhibit similar results with other jurisdictions (e.g. depreciation and local supplies). When that happens, only two major items remain: labour and electricity. Labour is much more important than electricity; at least 20 times more costly. Regardless, we demonstrate that electricity is important to OEM management in Canada because it is one of a limited number of local costs of consequence.

The second factor that influences the conversation – which makes it significant – relates to trends experienced in Ontario. Electricity rates in Ontario, when expressed in Canadian dollars, increased 107 percent between 2006 and 2015, more than six times the rate of inflation. Certainly, electricity rates are higher in Ontario than they are in Michigan – at least 13 percent higher when expressed in USD – but this report has shown that both the absolute and relative size of that gap remains quite small. So, rather than electricity cost concerns being a legitimate, present day issue of inter-jurisdictional competitiveness, it is an issue that has emerged because of intra-jurisdictional trends. Eventually, those trends may manifest to levels that affect cross-border, inter-jurisdictional competitiveness, but to date, they have not reached that state, perceptions and rhetoric notwithstanding.

Third, this report reveals that manufacturing executives, including those in the automotive industry, have acquired much more day-to-day engagement managing electricity use than they have ever had previously. This newfound engagement is driven largely by the electricity pricing system in Ontario. Specifically, the ICI has created a growing population of executives (and opinion leaders) who must make important operational decisions as many as 15 times per year (and growing) about whether and how they will use electricity. Each time this happens, it causes them to analyze and assess electricity costs, and each time that process unfolds, a perception is reinforced that Ontario provides an uncompetitive environment in so far as its electricity pricing system is concerned. Moreover, this engagement has swelled: as more companies qualify for the ICI program; as the challenge of accurately predicting peak production hours grows.

Looking ahead, the effect of the mutually reinforcing phenomenon described above will expand. Ontario costs are forecast to continue to rise. Meanwhile, unless US jurisdictions transition away from coal, electricity cost inflation there

will be moderate. As those patterns unfold, the Ontario - US cost gap will grow. Eventually, a situation could manifest when the absolute cost of electricity is meaningful and the gap between Ontario and its US competitors is large. When that happens a true inter-jurisdictional competitive issue may emerge.

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