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Slow to Charge? How Canada's E-Vehicles Experience Measures Up Globally

By: Amelia Spacek

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- Thunder Bay on Robinson-Superior Treaty territory and the land is the traditional territory of the Anishnaabeg and Fort William First Nation.
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- Kirkland Lake is on the Robinson-Huron Treaty territory and the land is the traditional territory of Cree, Ojibway, and Algonquin Peoples, as well as Beaverhouse First Nation.
- Each community is home to many diverse First Nations, Inuit, and Métis Peoples.

We recognize and appreciate the historic connection that Indigenous peoples have to these territories. We support their efforts to sustain and grow their nations. We also recognize the contributions that they have made in shaping and strengthening local communities, the province, and Canada. munities, the province and the country as a whole.

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About the Author

Amelia Spacek



Amelia was born and raised just north of Sault Ste. Marie in Aweres Township. She is currently studying Computer Engineering at the University of Ottawa where she is also building a high-efficiency electric vehicle with the uOttawa Supermileage team. As a member of the Electrical Team, Amelia is working with her peers to implement a custom-built brushless electric motor controller and to design a data collection system to monitor the energy consumption of the vehicle remotely. She loves exploring Northern Ontario and particularly enjoys backcountry camping in Lake Superior and Killarney Provincial Parks.



Executive Summary

When it comes to e-vehicles sales, Ontario and Canada are slow to charge. In Ontario, ZEVs represented only 3.2 per cent of new vehicle registrations in 2021, placing the province below the national average. Northern Ontario saw even fewer ZEVs registered, accounting for only 2.2 per cent of all new ZEVs registered in Ontario in 2021. Globally, Canada's ZEV market share has not increased at the same speed as other countries such as the United Kingdom, France and Germany.

What is the secret to growth? Why are some countries quicker to adopt electric vehicles? The cause of faster electric vehicle uptake in certain countries appears to be a result of rebates and money-saving incentives. In Norway, for example, the country where ZEVs take the largest market share in the world, taxes on electric vehicles were reduced significantly, and ZEV drivers enjoyed free parking and bus lane access in 2021. Similar trends can be seen in Ontario. Electric vehicle sales dropped in 2018 when the provincial program to subsidize the cost of an electric vehicle, and at-home charging stations ended. However, when the federal government introduced its electric vehicle incentive, sales in Ontario increased once again.

Experiences of electric vehicle adoption in other countries can serve as good examples of what Canada might expect, at least in some aspects. Many countries have been able to keep electricity demands at similar levels through improving efficiencies elsewhere, such as charging vehicles at off-peak times and better insulating electrically heated buildings.

As car manufacturers try to catch up with EV demand amidst a global microchip shortage, lingering supply chain disruptions, and record-high gas prices, countries like Canada are racing to establish themselves in the EV industry. Northern Ontario is well placed in Canada for this industry. It has significant deposits of minerals essential to battery construction—an advantage it hopes to capitalize on in the coming years.

There are certainly many opportunities and much potential, as seen in countries around the world. However, there are still questions as to whether Canada can make EVs a viable option everywhere and achieve its goal of selling only ZEVs by 2035 without leaving people living in rural areas at a disadvantage.



E-vehicles: the Latest Hit

Electric vehicles (EVs) have been top of mind among policymakers and car buyers alike recently. For example, Google searches for “Electric vehicle” in Canada hit an all-time high in March 2022 (Google Trends, 2022). In addition, Ontario's new critical mineral strategy, which will increase the extraction of minerals necessary for EV battery construction, and the federal government's

mandatory 2035 target for zero-emission vehicles (ZEVs), have inspired considerable conversation about this transportation technology (Government of Canada 2022). Additionally, rising fuel prices have increased the cost of owning gas-powered cars, making EVs more desirable.

Adoption and Market Share

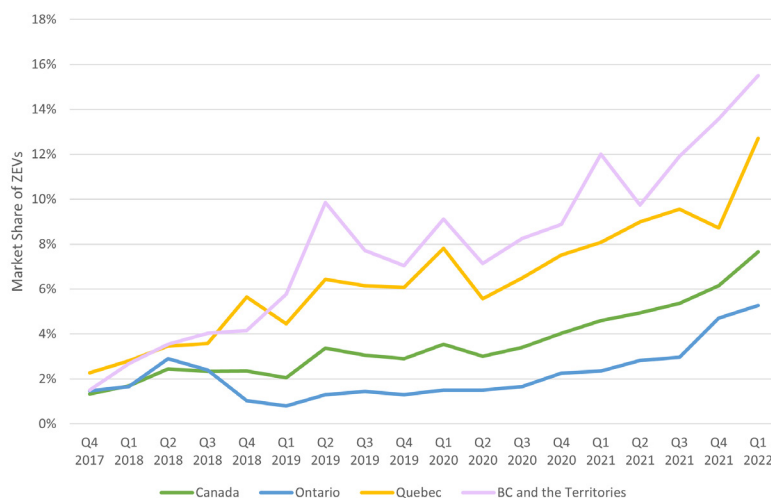
But where does Canada stand in comparison to countries around the world when it comes to the adoption of EVs? And where does Ontario stand in comparison to Canada's other provinces? Or Northern Ontario in comparison to the province as a whole? The answers to these questions can give us an idea of accomplishments so far and point to challenges we might face in the coming years.

Let's start with the Canadian government's definition of a ZEV, because this is not limited to battery EVs as might be expected. Plug-in hybrids are also considered ZEVs as they can be driven exclusively using battery power, even though they can also burn fuel when required (Transport Canada 2021). Moreover, vehicles using hydrogen fuel cells are also considered ZEVs. In 2021, 10 per cent of new vehicles registered in Canada were EVs but only

5.2 per cent were ZEVs (Statistics Canada, 2022) The rest were hybrids that cannot be charged using an external electricity source. These hybrids have a battery (separate from the traditional battery found in a gas-powered car) that can only be charged by the vehicle itself, either by the engine or by storing kinetic energy traditionally lost during braking through a technology called regenerative braking. These vehicles do not qualify as ZEVs.

Ontario's ZEV registrations were below the national average, accounting for only 3.2 per cent of total vehicle registrations. By comparison, Quebec and British Columbia were above the national average, with ZEVs representing 8.9 per cent and 12 per cent, respectively, of new vehicle registrations in 2021.

Figure 1: Percentage of vehicles registered that were ZEV's by quarter



Source: Author's calculations, Statistics Canada Table 20-10-0021-01.

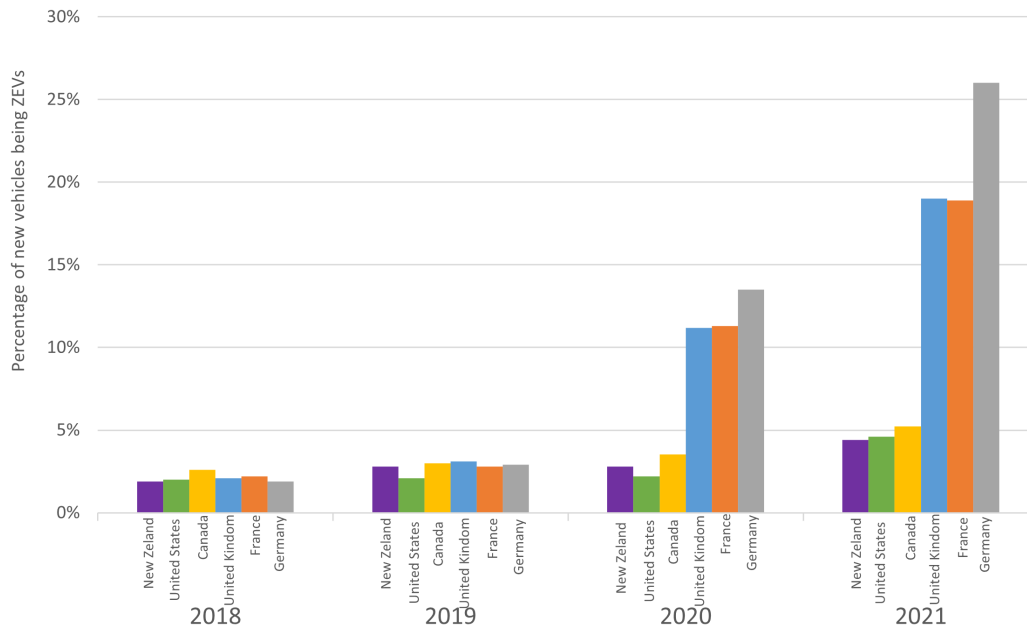
Furthermore, a mere 2.2 per cent of all new ZEVs registered in Ontario in 2021 were in Northern Ontario, meaning one ZEV was registered for every 1,793 Northern Ontarians. The provincial rate is one ZEV for

every 681 Ontarians. It is interesting to note that, in the same timeframe, 57 per cent of the province's new ZEVs registrations occurred in Toronto, meaning one registration for every 530 Torontonians (Statistics Canada, Table 0-10-0025-01).

ZEV market share is the percentage of new vehicles registered every year that fit ZEV criteria and it is a useful metric when comparing Canada's uptake of ZEVs to that of the rest of the world. In the United States, ZEV sales in Q4 2021 accounted for 5 per cent of total sales. (Dwyer 2022). Like some provinces in Canada, some states are seeing a higher uptake of ZEVs. For example, in California, the new vehicle market share for ZEVs is more than double the national average (Kane 2021). It is also worth noting that, in 2018, Canada led France, Germany,

the United Kingdom, the United States and New Zealand in ZEV market share. By 2019, ZEV registrations in all these countries averaged approximately 3 per cent of new vehicle registrations. However, ZEV registrations surpassed 15 per cent in both the UK and France in 2021 and surpassed 20 per cent in Germany, leaving Canada (5.2 per cent), the United States (4.6 per cent), and New Zealand (4.4 per cent) in the dust.

Figure 2: ZEV market share of new vehicles by country



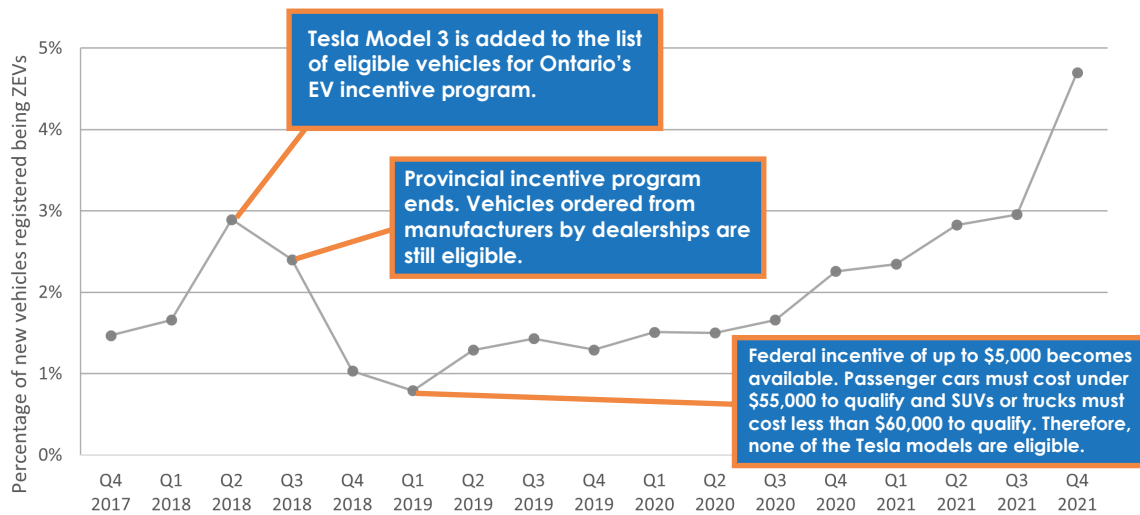
Source: Author's calculations, International Energy Agency 2022

Financial Incentives

What is the cause of this quick ZEV sales growth in some countries and slow growth in others? The answer seems to be government incentives, rebates, and dealership sales quotas. We see examples of this even within Canada. The Ontario provincial government offered rebates for both the purchase of an EV and the installation of at-home charging equipment until mid-2018 (CBC 2018). As seen in the following graph, EV sales dropped significantly in Ontario when the program ended. When the federal incentive program was introduced in the spring of 2019, sales slowly started to increase. Quebec and British Columbia both have rebates available in addition to what car buyers receive from the federal government, but Ontario has not reintroduced a similar program.



Figure 3: Market Share of ZEV's in Ontario New Vehicle Registrations Quarterly



Source: Author's calculations, Statistics Canada Table 20-10-0024-01.

Similar trends in relation to cash incentives were seen across Europe, where EVs and ZEVs have grown immensely in popularity in the last few years. Norway has the highest market share of ZEVs worldwide, with that category accounting for 86 per cent of new vehicle sales (Bu 2022). The country went from where Canada is now (roughly 5 per cent ZEV market share of new vehicles) to its current market share (86 per cent) in less than 10 years (2013 to 2021) (International Energy Agency 2022). This growth was achieved by cutting taxes from new EV sales while maintaining significant taxes for gas-powered vehicles, thus making ZEVs much more affordable and attractive. Norwegians purchasing an electric car pay

less than 50 per cent of the taxes they would pay for a gas-powered vehicle (Manthey 2022). This means that, in 2021, a Volkswagen e-Golf could be purchased for €790 (~\$1,170 Canadian) less than a regular Volkswagen Golf (Meaker 2021). For perspective, an e-Golf costs at least \$5,000 more than a regular Golf in Canada according to the manufacturer's website and various third-party vehicle sellers nationwide. EV owners in Norway also get access to toll roads, parking, and bus lanes for free. That said, even though most new vehicles sold in Norway are ZEVs, 85 per cent of vehicles on the road are gas-powered cars (Meaker 2021).

Implications

Canada needs to increase EV sales if we are to meet the zero-emissions targets set out by the federal government, and there are many countries to look to as examples. However, Canada is huge in comparison to those countries. For example, it has an area approximately 26 times bigger than that of Norway. Furthermore, people want to know that there will be enough charging stations to get where they want to go comfortably before forgoing their gas-powered cars. Canadians' concerns, especially those relating to range limitations and charge-point availability along long stretches of highway, cannot be erased by success stories in other, smaller countries.

Nevertheless, developments abroad may indicate trends that could occur in Canada. For example, the impact of increased electricity demand is one issue that comes to mind when considering the viability of EVs in Canada. Many countries have been able to keep electricity demands at similar levels by improving efficiency in other areas, such as better insulation for buildings that use electric heat. In Norway, where the ZEV market share of new vehicles jumped from less than 2 per cent to

nearly 50 per cent between 2008 and 2018, there was no significant increase in electricity demand per capita (International Energy Agency 2020). Strategies such as setting timers to charge EVs at off-peak hours can also help keep electricity demands in line with available supply and decrease the cost of charging the vehicle at home.

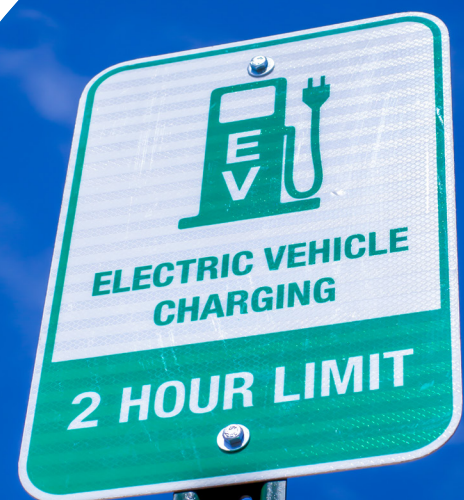
Another consideration is that the average EV owner will not deplete the battery's charge during their daily commute to work and is therefore rarely recharging their vehicle from empty. This is a change in behaviour from the way many of us drive gas-powered cars. Usually, a person will drive a car until the gas light turns on, or is close to turning on, and then fill it up. But with EVs, it is easy to top up every night at home. From the perspective of electricity demand, this means that the concerning figures you get when multiplying the number of EVs you expect to see on the roads in a few years' time by the amount of electricity they consume when charging from empty are not accurate representations of how ZEV owners use their vehicles and, therefore, of predicted electricity needs.

Canada Energy Regulator is predicting electricity demand in Canada to increase by 47 per cent between 2021 and 2050 if policies to reduce carbon dioxide emissions continue to evolve (Canada Energy Regulator 2022). Predictions suggest this demand will be met largely by the construction of new renewable electricity generation projects, such as wind and solar, since the technology and electricity storage are becoming more affordable. According to the International Renewable Energy Agency, the cost of installing a large-scale solar farm decreased by 85 per cent from 2010 to 2020 while the cost of onshore wind projects decreased by 56 per cent. Additionally, the cost of large-scale battery storage for electricity fell by 71 per cent between 2015 and 2018 in the United States (International Renewable Energy Agency 2020). Most of the electricity generated in Ontario is produced using non-carbon-creating technologies—over 90 per cent of it comes from nuclear, hydro, and wind (Canada Energy Regulator 2022). This puts Ontario in a good position to reduce emissions by transitioning to EVs. Even though some of the electricity generated to charge EVs does generate emissions, a 2020 report published by the universities of Exeter and Cambridge in the UK and Nijmegen in the Netherlands concluded that, in the vast majority of countries (Canada included), these emissions are less than those that would be created by a gas-powered vehicle over its lifespan even when emissions related to manufacturing the batteries are taken into account (Knobloch et al. 2020).

Worldwide, EV sales doubled in 2021 and represented almost 10 per cent of new vehicles purchased, which was four times the 2019 rate (International Energy Agency 2022). In 2022, approximately 80 per cent of Canadians are open to owning an EV, up from 71 per cent in 2019 (Clean Energy Canada 2022). However, getting an EV is not as easy as deciding to purchase one. According to the Tesla website, as of May 30, 2022, the wait time for a Model 3 is between three and six months and between eight and 11 months for a model X (SUV). Canadians looking to buy a vehicle from a dealership face similar delays, with wait times ranging from a few months to over a year in some cases. A survey conducted of approximately 80 per cent of Canadian car dealerships by Montreal's Dunsky Energy + Climate Advisors on behalf of Transport Canada concluded that almost half did not have any EVs in stock. When these dealerships were asked about predicted wait time, the majority did not answer the question. Most who did answer predicted a three-month wait (Dunsky Energy + Climate Advisors 2021). Additionally, manufacturers ship the majority of their EVs to dealerships in Quebec and British Columbia to meet minimum sales quotas imposed by provincial governments, making it even more challenging to find one elsewhere in the country. As car manufacturers try to catch up with EV demand amidst a global microchip shortage, lingering supply chain disruptions, and record-high gas prices, countries like Canada are racing to establish themselves in the EV industry. Minerals essential to battery construction are more valuable than ever and Northern Ontario has significant deposits of them—an advantage it hopes to capitalize on in the coming years.

Conclusion

There are certainly many opportunities and much potential as seen in countries around the world, but there are still questions as to whether Canada can make EVs a viable option everywhere, not just in its major cities. What would a road trip across Ontario look like in an EV? Would drivers be limited to certain routes? What are the impacts of cold weather on the EV range? Future reports from Northern Policy Institute will look at some of these challenges as well as economic opportunities for mining and manufacturing to support the production of EVs. They will also explore the EV charging infrastructure across Northern Ontario in-depth to identify any gaps in the network assuming real Northern Ontario driving conditions. Through these undertakings, we will better understand if today's electric vehicles can reliably accomplish what we need them to do on a large scale.



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We believe in partnership, collaboration, communication, and cooperation. Our team seeks to do inclusive research that involves broad engagement and delivers recommendations for specific, measurable action. Our success depends on our partnerships with other entities based in or passionate about Northern Ontario.

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