ELECTRIC MOBILITY CANADA
ACCELERATING ELECTRIC TRANSPORTATION

MOBILITÉ ÉLECTRIQUE CANADA
ACCÉLÉRER L'ÉLECTRIFICATION DES TRANSPORTS

The case for a Canadian EV industry & a ZEV standard

Document from Electric Mobility Canada

Presented by Daniel Breton

President and CEO

Dec 2, 2020

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About Electric Mobility Canada

Founded in 2006, Electric Mobility Canada is a national membership-based not-for-profit organization dedicated exclusively to the advancement of electric mobility as an exciting and promising opportunity to fight climate change, air pollution and stimulate and support the Canadian economy.

EMC is one of the very first organizations dedicated to electric mobility in the world.

EMC has more than 220 member organizations including utilities, vehicle manufacturers, infrastructure providers, tech companies, research centers, governmental departments, cities, universities, fleet managers, unions, environmental NGOs and EV owners groups.

The EMC team works on electric mobility from bikes to cars, from buses to boats, from trucks to trains and from BC to Nova Scotia.

Electric Mobility Canada supports the activities of its members by:

- Communicating legislative, policy, technical and operational matters of key interest pertaining to electric mobility to our membership. This includes identifying the actions required to meet the needs of the members and proactively communicating these needs to policy makers and other stakeholders.

- Establishing partnerships to accelerate the adoption of electric mobility through research, demonstration projects, policies, programs and strategies to increase market penetration.

- Acting as a resource center for relevant and contemporary information on electric mobility from across Canada and around the globe.

Electric Mobility Canada is ***the*** national organization dedicated to electric mobility in Canada with the most experience and expertise to help advance forward thinking projects and regulation.

Thank you,

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Executive summary

Canada should embrace EV adoption and a Canadian EV industry strategy for the following reasons:

Climate change and EV technology

While the government of Canada has already announced its intention to respect and even surpass its Paris accord target for 2030 (-30% in 2030 from 2005 emissions), GHG emissions in Canada were up 20,9% between 1990 and 2018 and are presently at the same level as 2005.

Between 1990 and 2018, GHG emissions from cars and light trucks went from 64,04 Mt CO2 eq to 89,26 Mt CO2 eq, a rise of **40%.** In fact, GHG emissions from transport may soon be **the #1** source of GHG emissions in Canada.

Canada is the **#1 country in the world** for GHG emissions per kilometer driven by its light duty vehicle fleet. So there is a lot of room for improvement.

While GHG emissions from transport are on the rise, GHG emissions from the electricity sector have decreased from 119,33 Mt CO2 eq. from 2005 to 64,25 Mt CO2 eq in 2018, a decline of 46%.

EVs are cleaner than gas vehicles everywhere in Canada. During their whole life they emit approximately 35% (PHEV) to 55% (EV) less GHG emissions than gas vehicles in Québec, B.C., Ontario, Manitoba, Yukon, Newfoundland, Northwest Territories, Prince Edward Island and New-Brunswick. They emit between 10% (EV) to 20% (PHEV) less in Alberta. As Alberta electric grid gets cleaner, the difference between GHG emissions from electric vehicles and gas vehicles will grow larger. In Saskatchewan and Nova Scotia, GHG emissions of EVs are between those of EVs in Québec and in Alberta.

A 40 kWh Nissan Leaf emits 50% less GHG emissions in the US than a 7,2 L/100 km compact car in his lifetime.

A Tesla Model 3 Long Range AWD emits 43% less GHG emissions in the US than a 7,2 L/100 km compact car in his lifetime.

Between 2013 and 2019, GHG emissions from battery manufacturing have gone from 175 kg/kWh to an average of 75 kg/kwh, a reduction of 60%.

In 2024-2025, new battery technology will make battery prices go down more than 50% while energy density (and range) will go up more than 50%.

Air pollution / health / health costs

According to the WHO, ambient air pollution accounted for an estimated 4.2 million deaths per year in 2018 due to stroke, heart disease, lung cancer and chronic respiratory diseases. Air pollution is the **#1 killer** on the planet… by far. Health Canada estimates the number of annual mortalities in Canada linked to air pollution from human sources to be **14,600 deaths** per year: **7.5 times** the death toll of motor vehicle accidents.

In 2017, transport represented **53.9%** of the total **carbon monoxide** emissions in Canada. Passengers cars, motorcycles, light trucks, large trucks and buses represented **30.5%** of total emissions. Transport represented **51.7%** of total nitrogen oxides emissions in Canada. Passengers cars, motorcycles, light trucks, large trucks and buses represented **21.9%** of total carbon nitrogen oxides emissions in Canada.

According to a 2019 report from Health Canada, the total annual economic value of health outcomes associated with air pollution is approximately **$114 billion a year.**

Jobs/Innovation :

By 2030, **559,400 clean jobs are expected to be created. Almost 50% of them will be in clean transport.**

Companies from BC to Nova Scotia are invested in electric mobility, from cars to buses, from utilities to infrastructure providers, from mining to R & D.

$190 billions in sales revenue between 2021 and 2030

Between 2021 and 2030, if Canada follows California, BC and Québec leadership, expected revenue from sales of EVs, electric buses, electric school buses, electric trucks, charging infrastructure and electricity could amount to more $190 billions in sales revenue.

The need for a ZEV standard

According to the new StatsCan ZEV sales data, ZEV sales were at 3,5% of all light duty sales for the first half of 2020 in Canada. Canada ZEV sales targets are: 10% by 2025, 30% by 2030 and 100% by 2040. Unless regulation is adopted, Canada won't be able to meet its EV adoption targets. Since Canada wants to be the world leader in clean technology companies, a ZEV mandate is unavoidable to send a clear message to companies around the world that it wants to support the shift towards EVs, from light to heavy duty. Despite a federal ZEV purchase incentive in place, it can still be very challenging to find an EV as only **33% of dealers in Canada** have at least one EV in stock. Outside of Quebec, BC and Ontario, fewer than **20% of dealerships** have at least one EV on their lot. So, to their claim, OEMs are **not** responding to consumer demand. ***In fact, dealers who want to sell EVs and don't have any in stock end up having to try to dissuade customers to buy an EV in order to meet their sales targets.***

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Chapter 1 : Climate change

Climate change is a very serious issue that represents unprecedented challenges for the world and therefore commends unprecedented actions so that future generations of Canadians can live prosperous and healthy lives. From increased forest fires to floods, from receding glaciers to droughts, the impacts of climate change is already being felt around the world with more and more serious impacts.

Recognizing that fact, the government of Canada has decided to act accordingly as we could read in the Sept 23, 2020 Speech from the Throne[1] :

"Climate action will be a cornerstone of our plan to support and create a million jobs across the country. This is where the world is going. Global consumers and investors are demanding and rewarding climate action.

Canadians have the determination and ingenuity to rise to this challenge and global market opportunity. We can create good jobs today and a globally competitive economy not just next year, but in 2030, 2040, and beyond.

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Canadians also know climate change threatens our health, way of life, and planet. They want climate action now, and that is what the Government will continue to deliver. The Government will immediately bring forward a plan to exceed Canada's 2030 climate goal. The Government will also legislate Canada's goal of net-zero emissions by 2050."

And the government is on its way towards a legislation when it announced in November that they would present Bill C-12[2] "An Act respecting transparency and accountability in Canada's efforts to achieve net-zero greenhouse gas emissions by the year 2050" in the House of Commons.

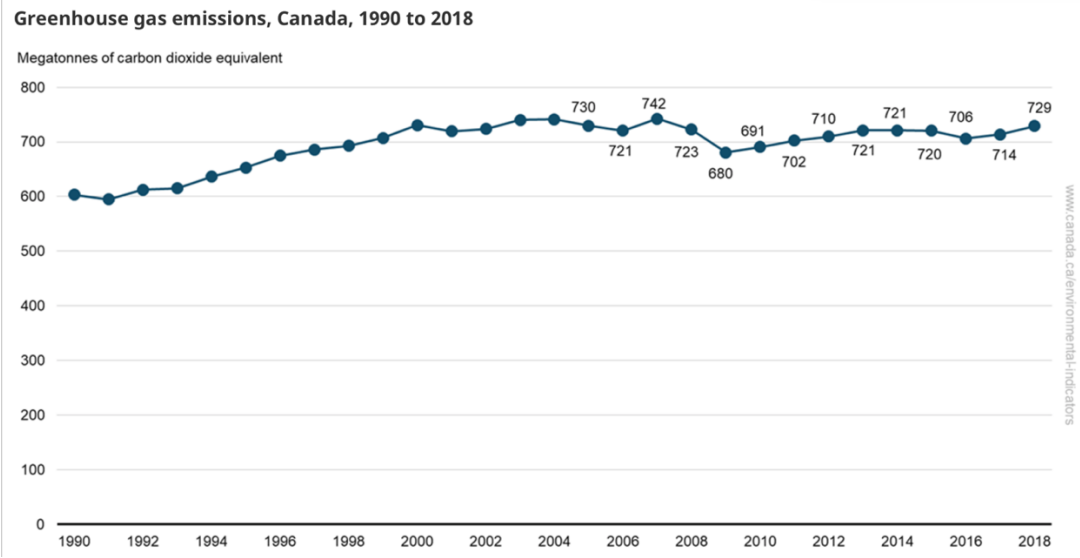
Canada's present objective is to lower GHG emissions in Canada by 30% in 2030 from 2005 GHG level. From the Speech from the Throne and Bill C-12, we understand that the new target will be more ambitious that -30%.

Although the transition towards electric vehicles from light to heavy duty won't be enough by itself to reach these new targets for 2030, 2035, 2040, 2045 and net zero by 2050, they certainly will contribute in a significant way.

a) GHG emissions in Canada: + 20,9% between 1990 and 2018

According to Environment and Climate Change Canada[3], « between 1990 and 2018, emissions increased by 20.9%, or 126 Mt CO_2 eq. Canada's emissions growth over this period was driven primarily by increased emissions from mining and upstream oil and gas production as well as transport. »

Between 2005 and 2018, GHG emissions have essentially stayed the same with 730 Mt eq. CO_2 in 2005 and 729 Mt eq. CO_2 in 2018.



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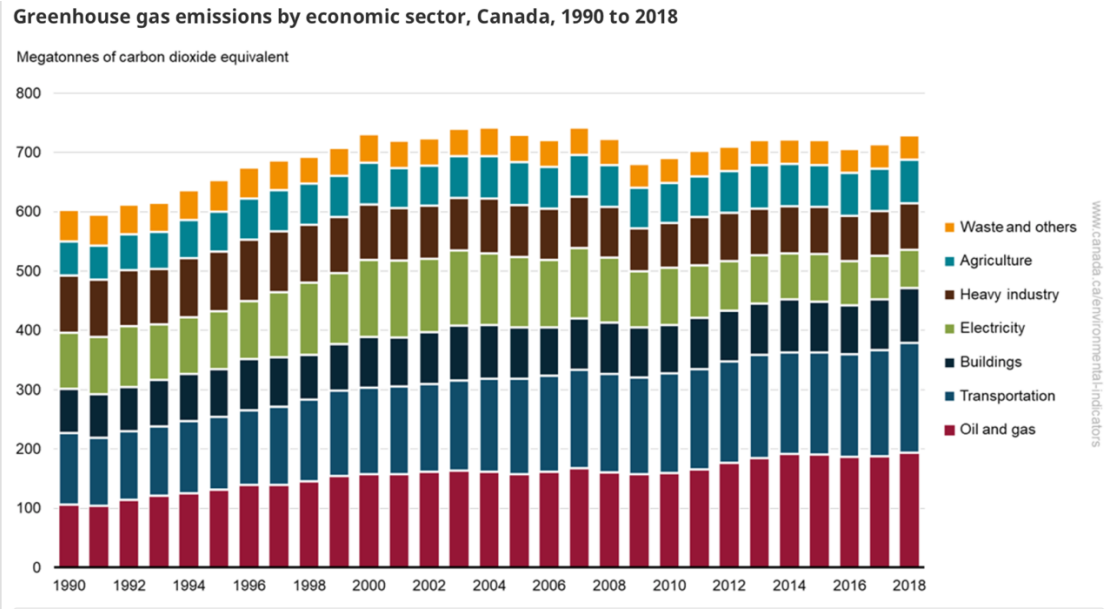
b) Transport and oil & gas : 52% of Canada's GHG emissions

According to ECCC, « in 2018, the oil and gas sector and transportation sector were the largest GHG emitters in Canada. Together, they accounted for 52% of total emissions »

In 2018, the oil and gas sector was the largest source of GHG emissions, accounting for 26% of total national emissions at 193 Mt CO_2 eq.

In 2018, the transportation sector was the second largest source of GHG emissions, accounting for 25% at 185 Mt CO_2 eq.

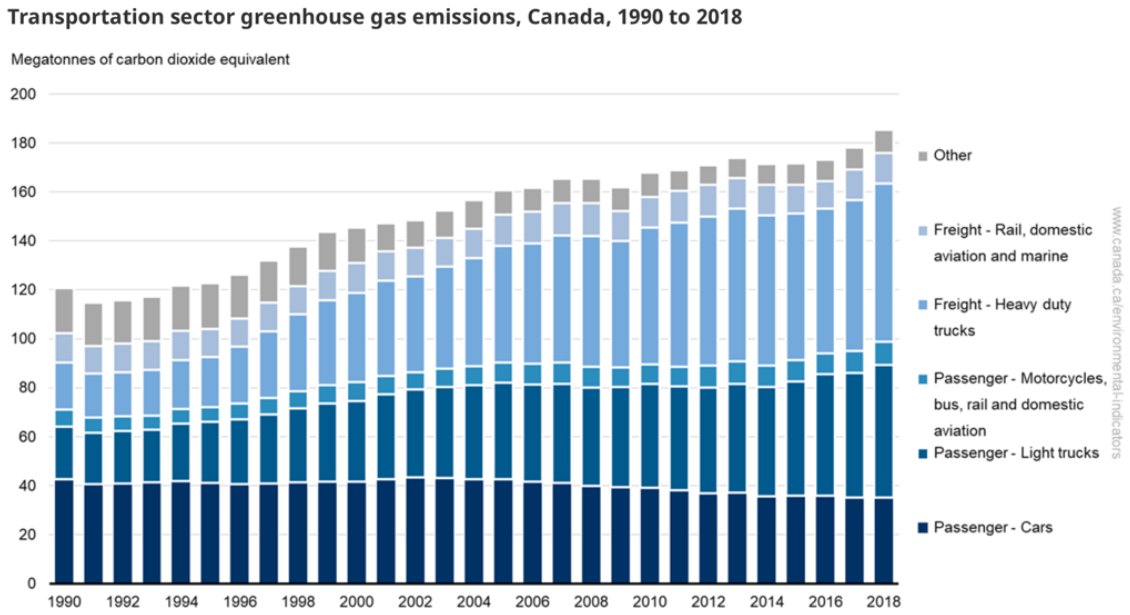


c) GHG emissions from the transport sector are increasing

- Between 1990 and 2018, GHG emissions from cars and light trucks went from 64,04 Mt CO2 eq to 89,26 Mt CO2 eq, a rise of 40%.

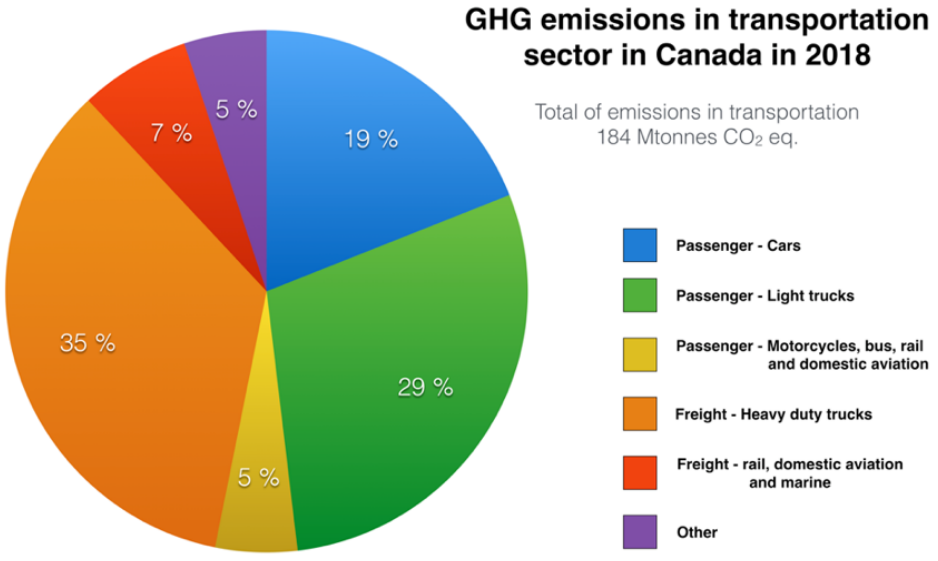
- While GHG emissions from cars have decreased by 17% during the same period, GHG emissions from light trucks have increased by 150,42% and since more and more people Canadians buy light trucks instead of cars, that number should keep rising over the coming years.

- GHG emissions from heavy duty trucks have also increased considerably: +233,47% between 1990 and 2018



d) 83% of GHG emissions from transport come from LDVs and HDT

83% of the GHG emissions from transport come from cars & light trucks (LDVs) + heavy duty trucks (HDTs). And the vast majority of these vehicles can be electrified.



Source of data: Environment and Natural Ressources Canada

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e) Transport may soon become #1 source of GHG emissions in Canada

Between 2017 and 2018, GHG emissions from the transport sector has risen **50%** more quickly the GHG emissions from the oil and gas sector :

- Transport : from 178,6 Mt (2017) to 185,9 Mt (2018) = + 7,3 Mt or + 4,1%

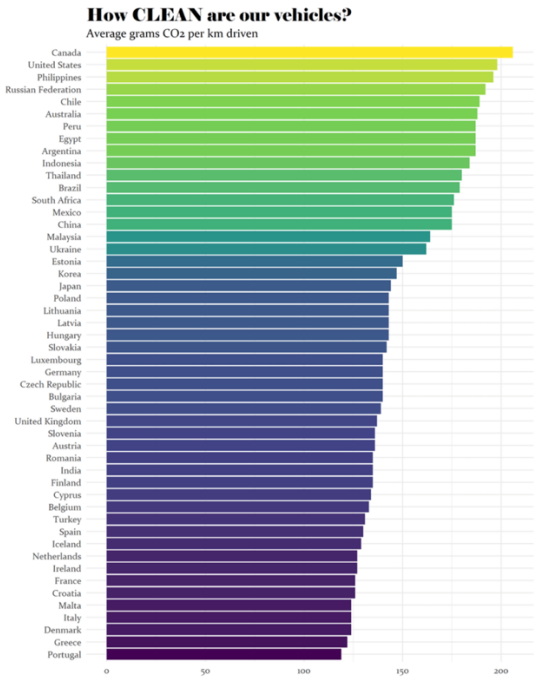
- Oil and gas : From 188 Mt (2017) to 193,2 Mt (2018) = + 5,2 Mt or + 2,8%

At this rate, we can reasonably expect to see GHG emissions from the transport sector to become the #1 source of emissions in Canada very soon. It's already the case in the USA, Ontario, Québec and other provinces.

f) Canada: #1 in the world for GHG emissions per kilometer for light duty vehicles

According to a 2019 study by the International Energy Agency[4], Canada is the #1 country in the world for GHG emissions per kilometer driven by its light duty vehicle fleet, in front of the United States. It's also the largest and the second heaviest in the world.

While some may say that the situation is catastrophic, there also is a positive argument for a rapid shift towards cleaner electric vehicles in Canada. Considering that ranking, we can also make the case that there is a lot of room for improvement.



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g) GHG emissions from electricity production in Canada are decreasing

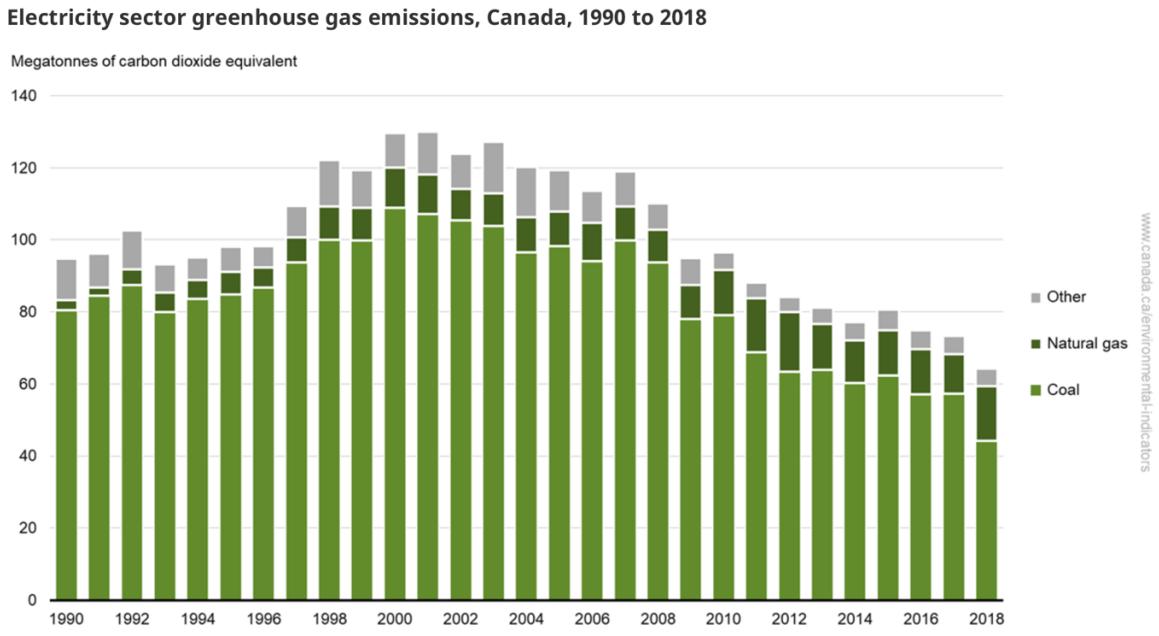
While GHG emissions from transport keep rising, GHG emissions from the electricity sector in Canada are declining.

According to Environment and Climate Change Canada:

- GHG emissions from the electricity sector has gone from 94,72 Mt CO2 eq in 1990 to 64,25 Mt CO2 eq in 2018, a decline of 32%

- GHG emissions from the electricity sector have gone from 119,33 Mt CO2 eq. from 2005 to 64,25 Mt CO2 eq in 2018, a decline of 46%.

- In 1990, the electricity sector accounted for approximately 15% of total Canadian GHG emissions. It now represents only 9% of Canada's GHG emissions. This means the contribution of Canadian GHG emissions from the electricity sector has decreased by 40% between 1990 and 2018. It will keep going down in the years to come, as more coal plants will close to be replaced by clean sources of energy like water power, wind power, solar power and less emitting sources like natural gas.



What this means is that electric vehicles will keep getting cleaner as the Canadian electric grid gets progressively decarbonized.

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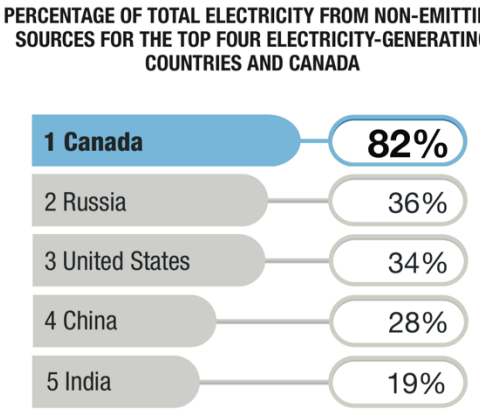
h) GHG emissions from the Canadian electricity sector: one of the cleanest in the world

- According to Natural Resources Canada's Energy Fact Book 2020-2021[5], Canada's electricity production is already one of the cleanest in the world, especially compared to the top 4 electricity generating countries with 82% of electricity in Canada coming from non-GHG emitting sources.

- Hydro made up 60%, nuclear was 15%, and other renewables were the remaining 7%.

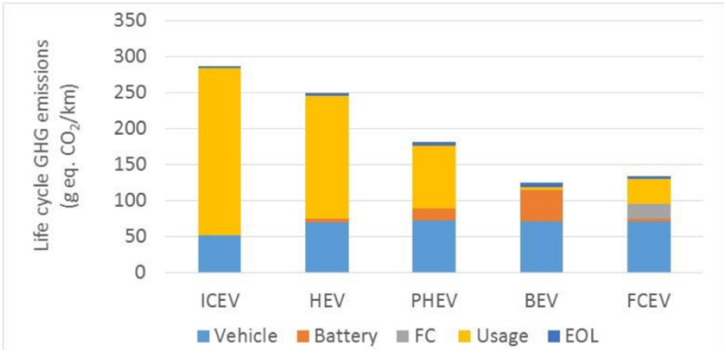
- Between 2010 and 2018, renewable electricity generation has increased 16% between 2010 and 2018, with solar and wind having the largest growth.



i) GHG emissions from EVs: cleaner than gas vehicles everywhere in Canada.

According to a document presented by the National Research Council of Canada during Electric Mobility Canada's annual conference in Nov 2020, GHG emissions of electric vehicles during their whole lifecycle (from cradle to grave) are ***always*** cleaner that those of gas vehicles in Canada. The NRC lifecycle analysis demonstrates that GHG emissions of electric vehicles are lower by:

- Québec: Between 35% (PHEVs) and 55% (EVs) less GHG emissions than ICE vehicles.



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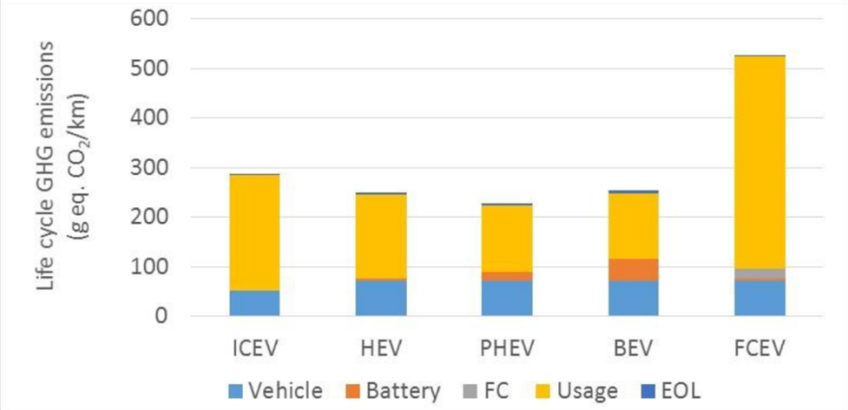
The GHG emission results for **British-Columbia, the Northwest Territories, Yukon, Manitoba, Ontario, Prince Edward Island, Newfoundland and New Brunswick** are close to that of Québec since the vast majority of their electricity production emits little GHG emissions. These provinces and territories represent **82%** of the population of Canada.

- Alberta: Between 10% (EV) and 20% (PHEV) less GHG emissions than ICE vehicles.

92% of Alberta's electricity production came from fossil fuel in 2018: 43% coal & coke + 49% natural gas.[6] ***As Alberta transitions towards cleaner electricity sources of production, the difference between GHG emissions from ICE vehicles and electric vehicles will grow larger.***



The GHG emission results for **Saskatchewan** (88% of its electricity production comes from fossil fuel) and **Nova-Scotia (**76% of its electricity production comes from fossil fuel) are between those of Québec and Alberta.

j) These popular EVs emit a lot less GHG emissions than their gas counterparts

According to a 2020 analysis by Carbon brief[7], lifecycle GHG emissions from popular electric vehicles like the Nissan Leaf with a 40 kWh battery and the Tesla Model 3 Long Range with a 75 kWh battery are much lower than the GHG emissions from an average conventional gas car in the USA.

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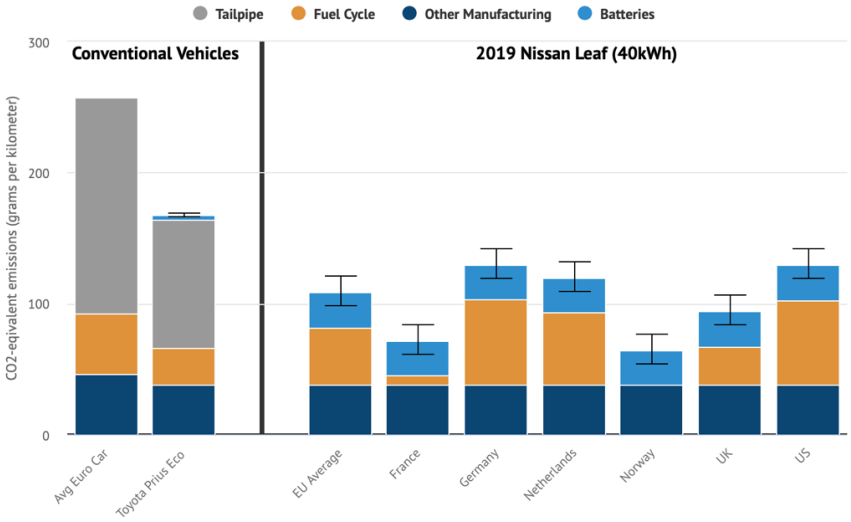
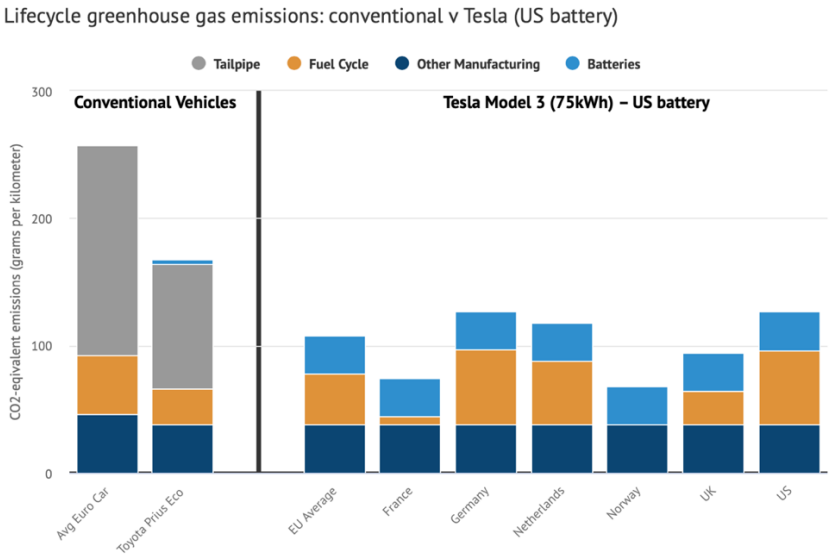


Lifecycle GHG emissions from the 40 kWh Leaf are 50% lower than a gas vehicle that averages 7,2 L / 100 km in USA



Lifecycle GHG emissions from a 75 kWh Tesla Model 3 are 43% lower than a gas vehicle that averages 7,2 L / 100 km in USA

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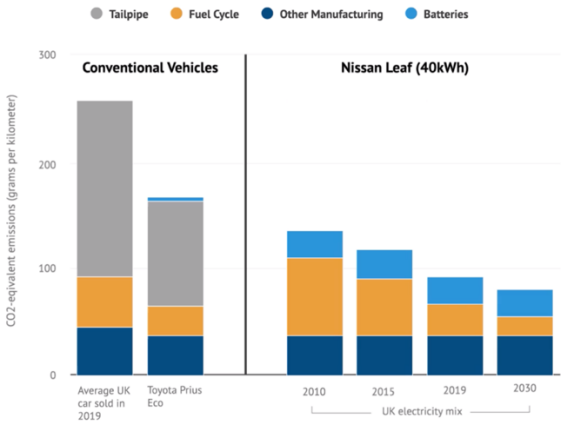
k) GHG emissions from electric vehicles (and their batteries) keep going down.

As the electricity production mix gets cleaner and battery technology evolves, GHG emissions from electric vehicles will keep getting lower compared to an average gas vehicle.



According to a September 2020 study published by the Eindhoven University of Technology titled *Comparing the lifetime greenhouse gas emissions of electric cars with the emissions of cars using gasoline or diesel*[8]: « Scaling up and smarter engineering (e.g. preserving heat in the manufacturing process) have dramatically lowered the energy that factories require to produce battery cells… Based on a list of recent publications we assume a range of 40 to 100 kg/kWh with a mean of 75 kg/kWh. »

In 2013, the general calculation for GHG emissions from battery cell production was around 175 kg/kWh. ***This means that improvement in battery manufacturing has made their GHG emissions 60% lower per kWh in recent years.*** What's more, as battery technology evolves quickly, we can expect EV batteries and battery manufacturing to be much more efficient.

2020 seals the warmest decade on record

2020 is shaping up to be one of the three warmest years on record, according to the World Meteorological Organization (WMO)'s interim annual report on the state of the world's climate, which concludes that the decade now ending will be the warmest on record, as will the six years since 2015. "The ecological balance of the planet is broken" and "humanity makes war on nature, it is suicidal", denounced the UN Secretary General, António Guterres. According to the WMO, there is at least one chance in five that the global average temperature will temporarily exceed 1.5°C by 2024, a critical threshold set in the Paris Agreement, signed in December 2015, where 195 countries committed to limit the temperature rise "well below 2°C" compared to the pre-industrial era and to "continue efforts to limit the temperature increase to 1.5°C", in order to avoid dramatic and irreversible consequences.

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Chapter 2 : EV technological evolutions and revolutions

As time passes, technological evolutions and revolutions in renewable energy and electric vehicles make them more and more competitive. As an example, hybrid vehicles have been on the market since 1997 while electric vehicles arrived in 2011. Subsidies for the purchase of hybrid vehicles existed for years to help offset their higher price… starting as early as 2006 under the Harper government.

Now that hybrid vehicles are price competitive, they no longer need subsidies. We expect purchase price parity between electric vehicles and gas vehicles by 2025 ***which means that electric vehicles will have become competitive in less time that hybrid vehicles.*** It therefore only makes sense that the EV industry *and* Canadian citizens would benefit from temporary government's support to help this sector grow and help create quality jobs all across the country.

It is worth noting that in 2012, former president Barack Obama[9] reminded its citizens that the US oil and gas sector was about to celebrate 100 years of subsidies and that the IMF calculated in 2019 that fossil fuel subsidies surpassed ***$5.2 trillions*** for the year 2017.[10]

Rapid evolution of EV autonomy

In 2012, the average range of an electric vehicle, excluding Tesla, was around 110 km. In 2016, around 150 km. In 2020, most EVs offer an average range of 400 km… for less than half the price of a 2012 Tesla with the same range. By 2025, an EV range should be between 600 to 1000 km, which will be greater than the range of many gasoline-powered vehicles.

Let's not forget that 90% of Canadians travel less than 60 km each day to and from work. So for the vast majority of drivers, that 400 kilometer range is already more than enough for daily commutes… and longer trips.

Rapid decrease in charging time

In 2012, due to the lack of fast charging stations, recharging time was 4 to 6 hours for 100 kilometers. In 2016, on a 50 kW fast charger, it was about 1 hour per 250 km. In 2020, new ultra-fast charging stations are shortening the charging time to 20-30 minutes for 400 km, making traveling long distances with an EV no longer an issue. By 2025, the charging time is expected to be at approximately 10 minutes for 600 km.

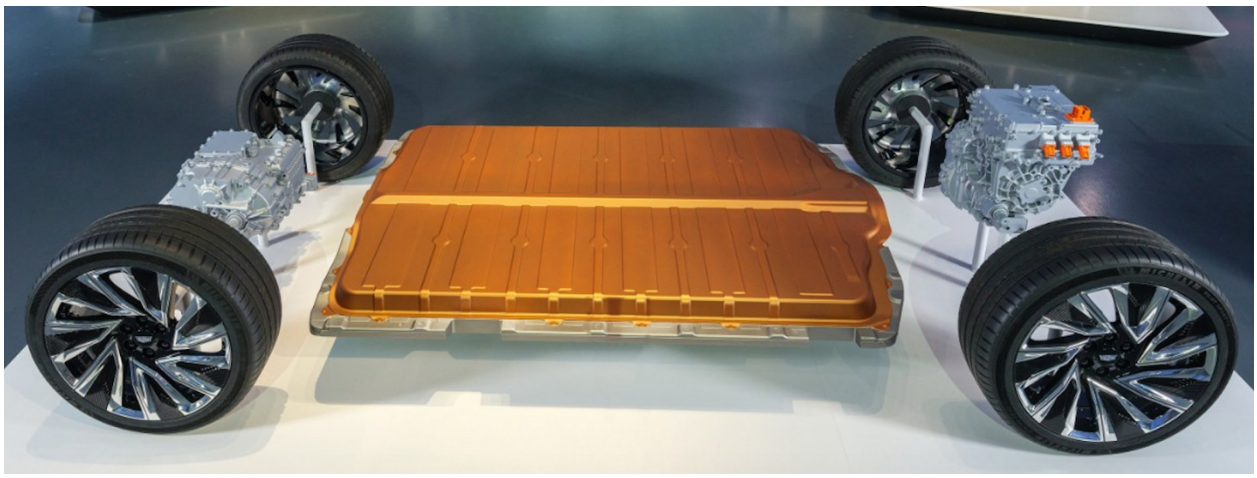
Since more than 80% of EV charging is done at home, this means that people generally waste less time in a month plugging their EVs than it takes gas vehicle owners to fill up at the gas station.

What comes next

Here are 2 examples of OEMs who recently announced major improvements in battery technology that will propel electric vehicles into a whole new generation by 2025.

General Motors (Nov 2020)

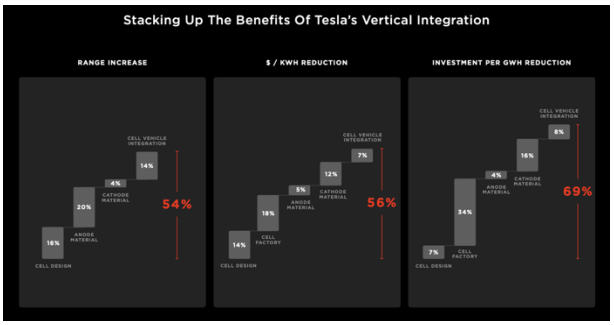
« By mid-decade, GM's Ultium battery packs projected to cost 60 percent less than today's packs with twice the energy density. GM ups full-charge maximum range of Ultium-based EVs to 450 miles. »[11]



(Credit: GM Ultium battery)

Tesla (Sept 2020):

During Battery Day, Elon Musk announced that new battery processing combined with advanced manufacturing and cleaner mineral mining would make Tesla vehicles not only cleaner, but will make the battery price go down 56% while range will increase by 54%, which will make a $25 000 US Tesla a reality just a few years from now.[12]



(Credit: Tesla presentation)

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Chapter 3 : air pollution & health

14,600 deaths per year from air pollution in Canada: 7.5 times more than car accidents

According to the World Health Organization, ambient air pollution accounted for an estimated 4.2 million deaths per year in 2018 due to stroke, heart disease, lung cancer and chronic respiratory diseases.[13] In fact, air pollution is the **#1 killer** on the planet… by far.

According to the latest report published by Health Canada in 2019 titled *Health Impacts of Air Pollution in Canada : Estimates of morbidity and premature mortality outcomes "* Health Canada estimates the number of annual mortalities in Canada that can be attributed to air pollution from human sources in North America to be **14,600 deaths** per year based on 2015 population counts."[14]

14 600 deaths from air pollution represents **7,5 times** the death toll of motor vehicle accidents, which was 1,922 in 2018.[15]

Polluted regions and COVID-19: A 11% higher death rate

During the COVID-19 pandemic, Harvard University researchers say people with COVID-19 who live in areas with high levels of air pollution are more likely to die from the illness than those who live in less polluted regions. "We found that an increase of 1 ug/m3 in the long-term average PM2.5 s is associated with a statistically significant 11 per cent increase in the county's COVID-19 mortality rate," said the authors of the report.[16]

Transport and air pollution: After years of progress, air pollution is stalling

A lot has been done by the US and Canadian governments to make sure that vehicle manufacturers build cars, light duty trucks and heavy duty buses and trucks that emit less and less air pollution like carbon monoxide, particulate matter, NOx, COV, etc.

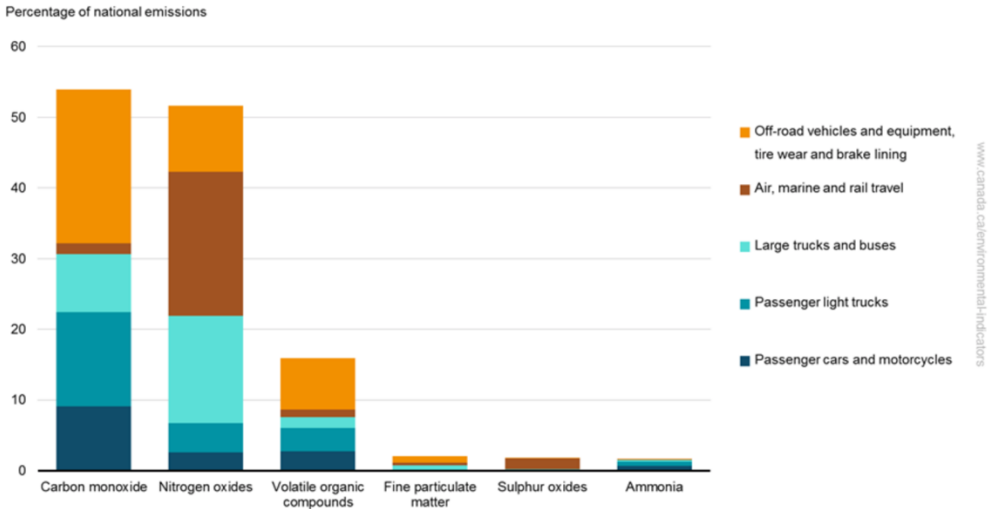
But after years of progress, it seems that the Canadian fleet of internal combustion engine vehicles is now having problems to emit less air pollutants from the tailpipe.

At the same time, 100% electric vehicles (light or heavy duty) emit no air pollutant from the tailpipe… since it has no tailpipe.

Latest numbers and statistics on air pollution in Canada[17]

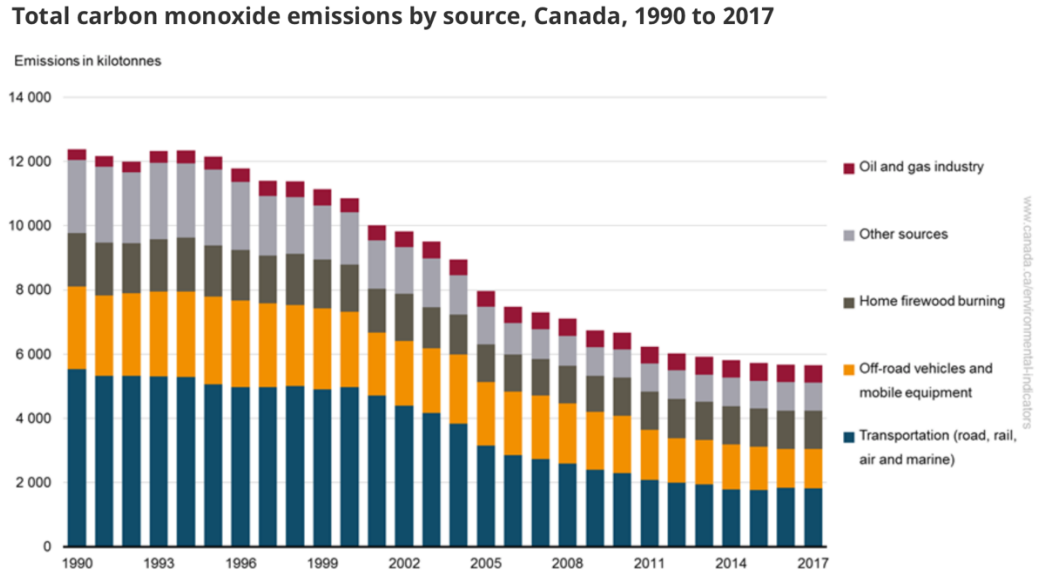
Transport: still a major contributor to air pollution

Contribution of transportation, off-road vehicles and mobile equipment to total air pollutant emissions by transportation mode, Canada, 2017



a) **Carbon monoxide** (CO): It is a colorless, odorless, tasteless gas produced by burning gasoline, wood, propane, charcoal or other fuel. Improperly ventilated appliances and engines, particularly in a tightly sealed or enclosed space, may allow **carbon monoxide** to accumulate to dangerous levels.

   In 2017, transportation (road, rail, air and marine) was the largest source of CO emissions in Canada. While carbon monoxide emissions have declined significantly between 1990 and 2014, ***we have recently witnessed a increase in emissions from transportation, going from 1790,2 Kt in 2014 to 1819,1 Kt in 2017.***



In 2017:

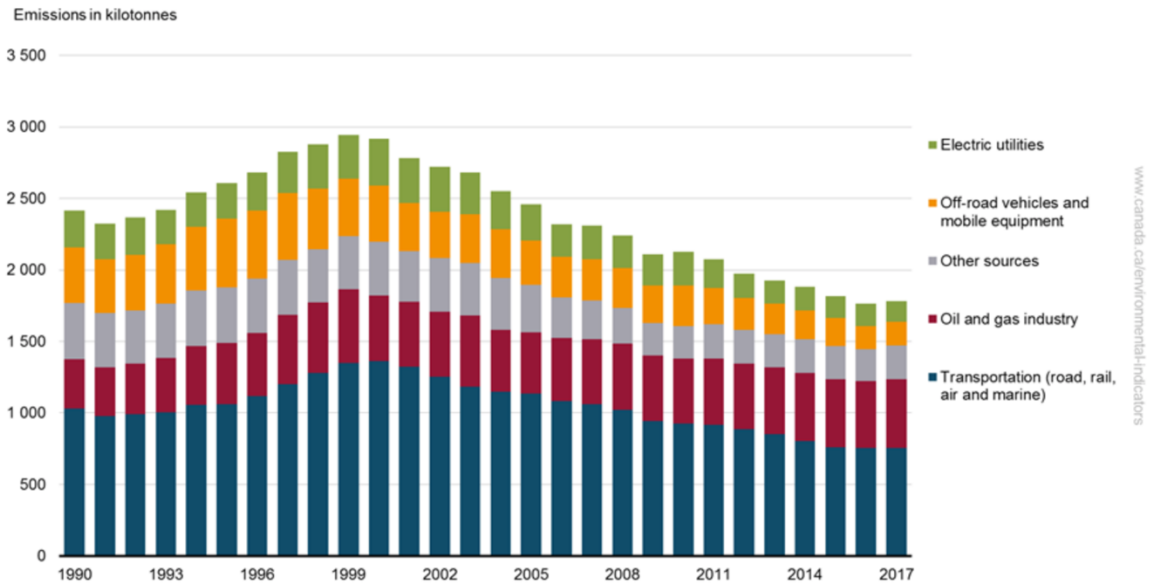
- 53,9% of the total **carbon monoxide** emissions in Canada came from the transport sector
- Passengers cars, motorcycles, light trucks, large trucks and buses represented **30,5%** of total carbon monoxide emissions in Canada

b) **Nitrogen oxides:** (NO_x stands for an indeterminate mixture of NO and NO_2) are formed mainly from N_2 and O_2 during high-temperature combustion of fuel in cars. Catalytic converters are used to reduce emissions. Nevertheless, NO causes a reddish-brown haze in city air that contributes to heart and lung problems and may be carcinogenic. Nitrogen oxides also contribute to acid rain because they combine with water to produce nitric acid (HNO_3) and other acids. Natural sources of nitrogen oxides include those produced during the metabolism of certain soil bacteria.

While emissions from nitrogen oxides are in decline, the level of emissions in transportation remain important.

- In 2017, transportation represented **51,7%** of total nitrogen oxides emissions in Canada
- Passengers cars, motorcycles, light trucks, large trucks and buses represented **21,9%** of total carbon nitrogen oxides emissions in Canada.

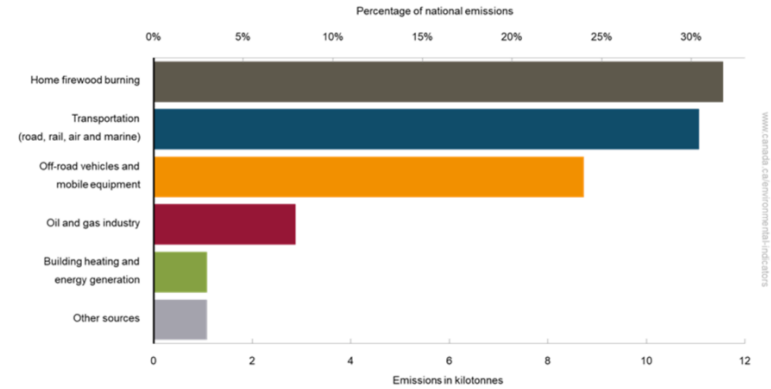
Total nitrogen oxide emissions by source, Canada, 1990 to 2017



c) **Black carbon**: Black carbon is a potent climate-warming component of particulate matter formed by the incomplete combustion of fossil fuels, wood and other fuels. Complete combustion would turn all carbon in the fuel into carbon dioxide (CO_2), but combustion is never complete and CO_2, carbon monoxide, volatile organic compounds, and organic carbon and black carbon particles are all formed in the process. The complex mixture of particulate matter resulting from incomplete combustion is often referred to as soot.. During this short period of time, black carbon can have significant direct and indirect impacts on the climate, glacial regions, agriculture and human health.

In 2017, black carbon emissions from transportation (road, rail and marine) + off-road vehicles represented 54,4% of total black carbon emissions in Canada.

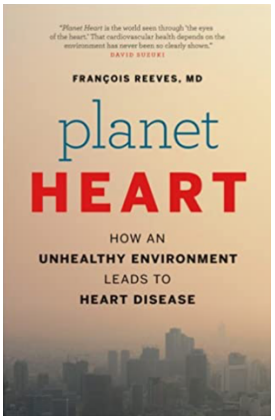
Total black carbon emissions by source, Canada, 2017



The impact of air pollution on humans[18]

How does pollution kill?

- By François Reeves, MD
  Cardiac Health and the Environment
  Associate Clinical Professor
  Faculty of Medicine - Department of Medicine
  University of Montreal
  Author of "Planet Heart"



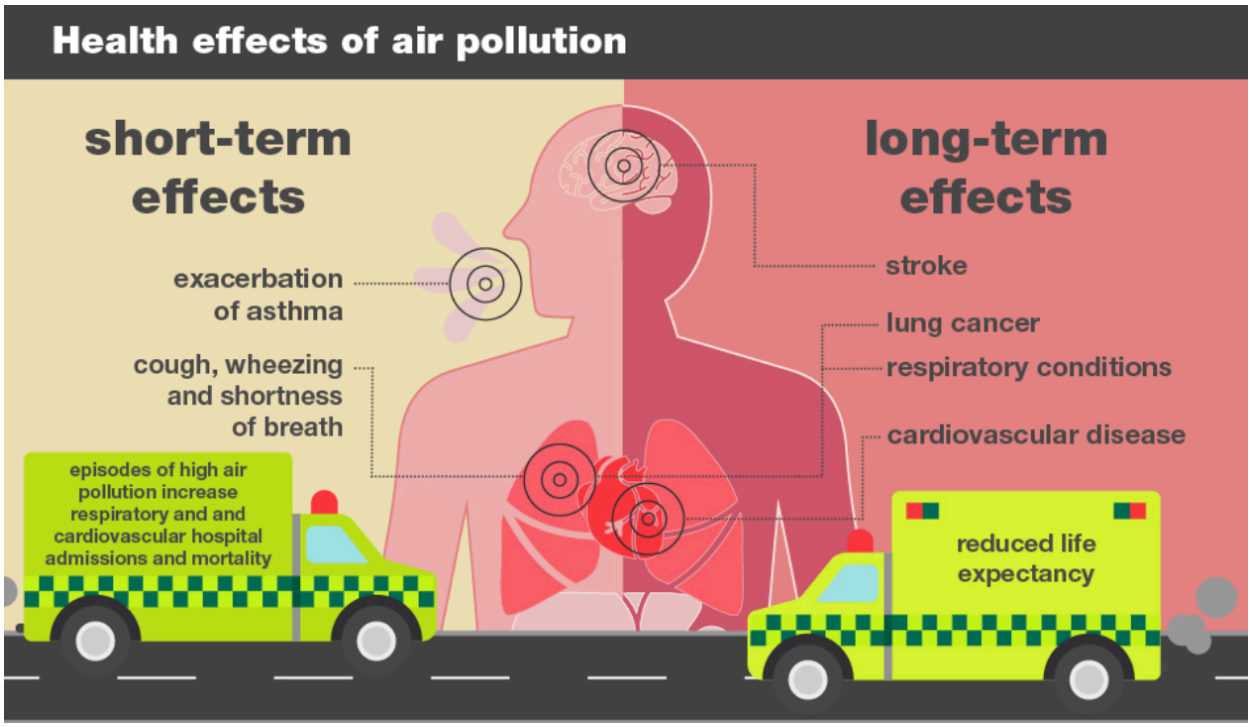
"To understand the toxicity of pollution, just think of tobacco smoke. Tobacco causes up to 300% more mortality among smokers and 25% more mortality among non-smokers. It is therefore understandable that the second-hand smoke from cities (coal, gasoline, diesel, fuel oil, wood stoves) that we breathe can be dangerous, especially since it is much more toxic than cigarettes.

To illustrate this toxicity, taking 5 or 6 puffs of cigarettes presents a very small risk; imagine taking 5 or 6 good puffs from a tailpipe.

To extend the analogy, the smoker is not "contaminated" between cigarettes. For the citizen in a polluted area, each of his or her breaths is contaminated 24/7, and this from the cradle, exposing him or her to a significant mass of pollutants. We breathe between 10 and 20,000 liters of air per day, or 10 to 20 kilos. Even with a rather low concentration of pollutants, this mass of air ends up causing significant exposure.

In the fumes from combustion engines, we find ozone (which triples in a heat wave), carbon monoxide (which kills in a few minutes), sulfur dioxide SO2 and nitrogen dioxide NO2 (which oxidize our arteries). When combined with water vapor, these two last two are transformed into sulfuric acid and nitric acid.

Fossil engines also emit fine and ultrafine particles, a soup of nanoparticles that are very varied (coal, heavy metals, synthetic molecules) and with one thing in common: they are so small (2.5 µ and 0.1 µ) that when we breathe them in, they pass from the blood to the arterial circulation. Like CO, NO2, SO2, and ozone, all gaseous, inflammatory and oxidizing.



(Credit: Public Health England)[19]

This explains why our arteries are attacked by pollution. Pollution causes atherosclerosis, the arterial rust that progressively clogs our vessels and that we unblock by millions around the world with our stents and bypass grafts. And we are right to protect our forests: they protect us. In the U.S., trees are estimated to purify the air of 17 million tons of smog per year, saving $6.8 billion in health care costs. It's not just the heart that is affected.

Fossil pollutants affect all aspects of health, from the fetus to the elderly. The University of Southern California is home to one of the world's leading environmental health departments. In 2017, it conducted a major review of their studies :

Air pollution, particularly near polluted roadways, causes:

- Babies of small weights
- More gestational diabetes
- More obesity in children whose pregnancy took place in a polluted environment
- More developmental delay at school
- More high blood pressure
- More diabetes
- More bad cholesterol
- More asthma
- More acute respiratory distress
- More emphysema and chronic bronchitis

- More calcium in the arteries (hardening)
- More arterial thrombosis with infarction and stroke
- More arrhythmias and cardiac arrests
- More cancers, especially lung cancer
- More Parkinson's
- More vascular dementia
- More Alzheimer's

All these diseases have several causes to explain why a particular individual suffers from them. These diseases are said to be multifactorial. First of all, there is heredity and lifestyle habits, which have been well proven to be factors in disease.

The environment is now an important part of the risk factors.

By eliminating from our vehicles many petroleum derivatives and synthetics, known to be carcinogenic, we avoid many diseases. A joint study by the Universities of Montreal and McGill has shown that women exposed to high levels of PAHs have more breast cancer, especially near polluted roadways. PAHs are polycyclic aromatic hydrocarbons emitted from tailpipes.

The good news is that it is much easier to change the environment than it is to change our genes.

And electrification of transportation is one of the solutions at hand to change a bleak tomorrow into a bright future."

Chapter 4 : Health costs of air pollution

As demonstrated in Chapter 3, air pollution from transport accounts for a significant part of total air pollution in Canada.

Now, if we add the economic health costs of air pollution by region and by air pollutant, the numbers speak for themselves.

Economic impact of air pollution in Canada : $114 billions a year

Again, according to the latest report published by Health Canada in 2019 titled *Health Impacts of Air Pollution in Canada : Estimates of morbidity and premature mortality outcomes,* the « total annual economic value of health outcomes associated with air pollution is approximately **$114 billion.** This amount primarily reflects premature mortalities valued at $108 billion. Although the monetary value associated with morbidity endpoints is low ($5.5B) compared with that associated with mortalities, the morbidity impacts represent a health burden for the Canadian population. » [14]

Table 4. Annual premature deaths attributable to air pollution by province and territory

Region—population	Premature mortality counts[a]					Valuation ($1,000,000)[a,d]
	per pollutant				per 100,000 population	
	NO_2	$PM_{2.5}$	O_3[b]	All[c]	All[c]	All[c]
Canada—35,851,774	940	9,700	4,000	14,600	41	108,000
Alberta—4,196,457	90	740	400	1,200	29	9,100
British Columbia—4,683,139	140	980	440	1,600	33	11,500
Manitoba—1,293,378	30	260	110	400	31	3,000
New Brunswick—753,871	6	110	64	180	24	1,400
Newfoundland and Labrador—527,756	1	36	41	79	15	580
Northwest Territories—44,088	–	5	0	6	13	41
Nova Scotia—943,002	8	160	93	260	27	1,900
Nunavut—36,919	–	0	0	0	1	4
Ontario—13,792,052	400	4,500	1,800	6,700	49	49,700
Prince Edward Island—146,447	1	19	17	37	25	270
Québec—8,263,600	260	2,600	910	3,800	46	28,000
Saskatchewan—1,133,637	16	270	87	380	33	2,800
Yukon—37,428	–	0	1	1	2	5

[a] Values represent mean estimates of health outcome counts and economic valuation. Values are rounded to the nearest integer and given to a maximum of two significant figures for values below 10,000, and three significant figures for values of 10,000 or more.
[b] Acute and chronic exposure premature mortalities combined.
[c] NO_2, O_3, and $PM_{2.5}$; totals may not match because of rounding.
[d] Endpoint valuation estimates expressed in Canadian dollars and based on 2015 currency.

The high impact of air pollution from transport on human lives and health costs are 2 very important arguments in favor of the transition towards electric vehicles.

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Chapter 5 : Jobs & Innovation

As we will see more and more electric vehicles on the roads in Canada and everywhere in the world to help the fight against climate change and air pollution, there is one more very important question that Canadians need to ask themselves:

> *Will Canada take advantage of the fight against climate change and air pollution to create jobs in an innovative high tech sector such as the electrification of transport or will Canadians end up just importing electric vehicles, batteries and technologies developed elsewhere and miss the boat of high quality high paying long term jobs?*

That is THE question. And Canadians don't have a lot of time to think about this. Right now, there are countries and regions in the world who are resolutely engaged in building an EV industry. From China to Korea to Europe, countries are imposing more stringent regulations while helping the industry make the transition towards light and heavy duty electric vehicles. The election of Joe Biden means that a new more ambitious plan to fight climate change is on the way in the United States… with EVs in mind. Canada is blessed with a thriving innovation sector, world class universities, a highly skilled workforce and ample natural resources that can lead the shift towards electric and smart mobility.

So we can either see the shift towards electric mobility as a difficult challenge…or a great opportunity.

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Sept 23, 2020: A historic Speech from the Throne

On Sept 23, 2020, the government of Canada announced its clear intention in become a world leader in clean technology[1] in its Speech from the Throne:

"As part of its plan, the Government will:

- *Create thousands of jobs retrofitting homes and buildings, cutting energy costs for Canadian families and businesses;*
- *Invest in reducing the impact of climate-related disasters, like floods and wildfires, to make communities safer and more resilient;*
- *Help deliver more transit and active transit options;*
- *And make zero-emissions vehicles more affordable while investing in more charging stations across the country.*

A good example of adapting to a carbon-neutral future is building zero-emissions vehicles and batteries. Canada has the resources – from nickel to copper – needed for these clean technologies. This – combined with Canadian expertise – is Canada's competitive edge.

The Government will launch a new fund to attract investments in making zero-emissions products and cut the corporate tax rate in half for these companies to create jobs and make Canada a world leader in clean technology. ***The Government will ensure Canada is the most competitive jurisdiction in the world for clean technology companies.****"*

Making Canada the most competitive jurisdiction in the world for clean technology companies is a very ambitious goal.

Although ambitious, it is achievable.

Jobs across Canada

- With plenty of strategic minerals and metals in B.C. Alberta, Saskatchewan, Ontario and Québec;

- With universities and dedicated research centers from B.C. (Hydrogen), to Ontario (Prototypes, materials, recycling), to Québec (Batteries, Infrastructures, recycling) to Nova Scotia (Batteries)

- With vehicle manufacturers from B.C. to Manitoba to Ontario to Québec

- With utilities, infrastructure providers, electricians and construction workers working in electric mobility infrastructure in all the provinces.

Canada is certainly poised to be a leader.

EV on the road: Exponential growth ahead

According to the ***Electric Vehicle Outlook 2020*** from *Bloomberg New Energy Finance*[20], EV growth will be exponential in the years to come.

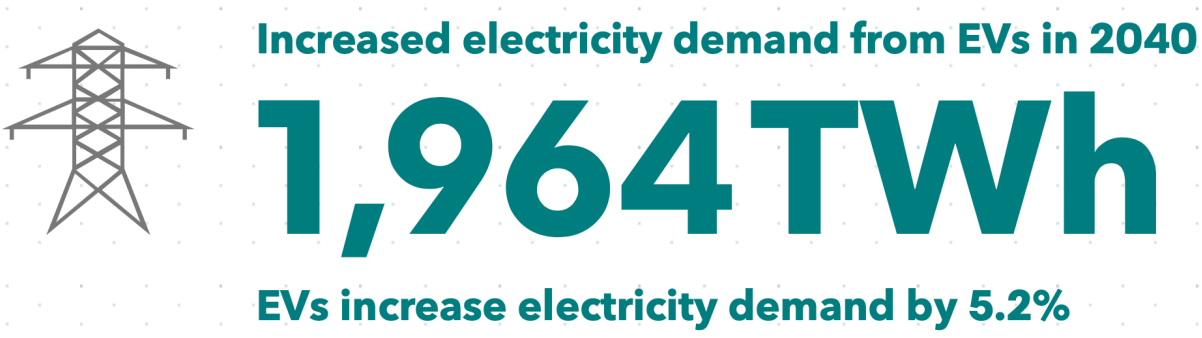
From passenger cars to light trucks to heavy duty trucks to electric buses, EV sales are on the rise across the globe.

- EV sales: « Passenger EV sales jumped from 450 000 in 2015 to 2,1 million in 2019 » They are expected to reach 8,5 millions in 2025, 26 millions by 2030 and 54 millions in 2040.

- EV share: of new sales should grow from 2,7% in 2020 to 10% in 2025, 28% in 2030 and 58% in 2040.

- Oil demand: EVs across all segments are already displacing 1 million barrels of oil demand every day.

- All those EVs add electricity demand but not as much as you think. By 2040 passenger EVs are expected to consume 1,290 TWh, commercial EVs 389 TWh, e-buses 1,290 TWh and electric two-wheelers 69 TWh.



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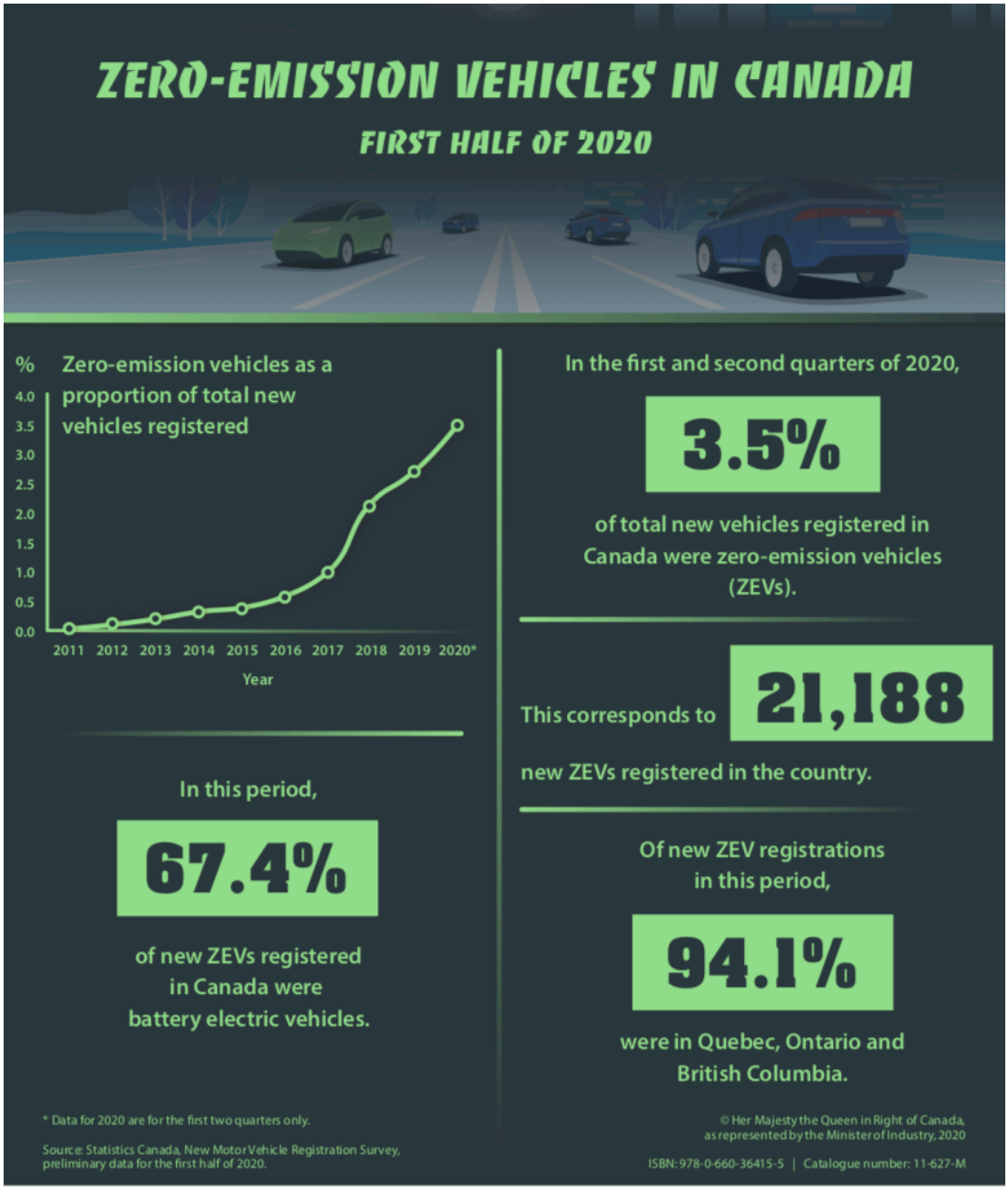
According to the new StatsCan EV sales data[21], ZEV sales were at 3,5% of all light duty sales for the first half of 2020 in Canada. Canada ZEV sales targets 10% by 2025, 30% by 2030 and 100% by 2040.

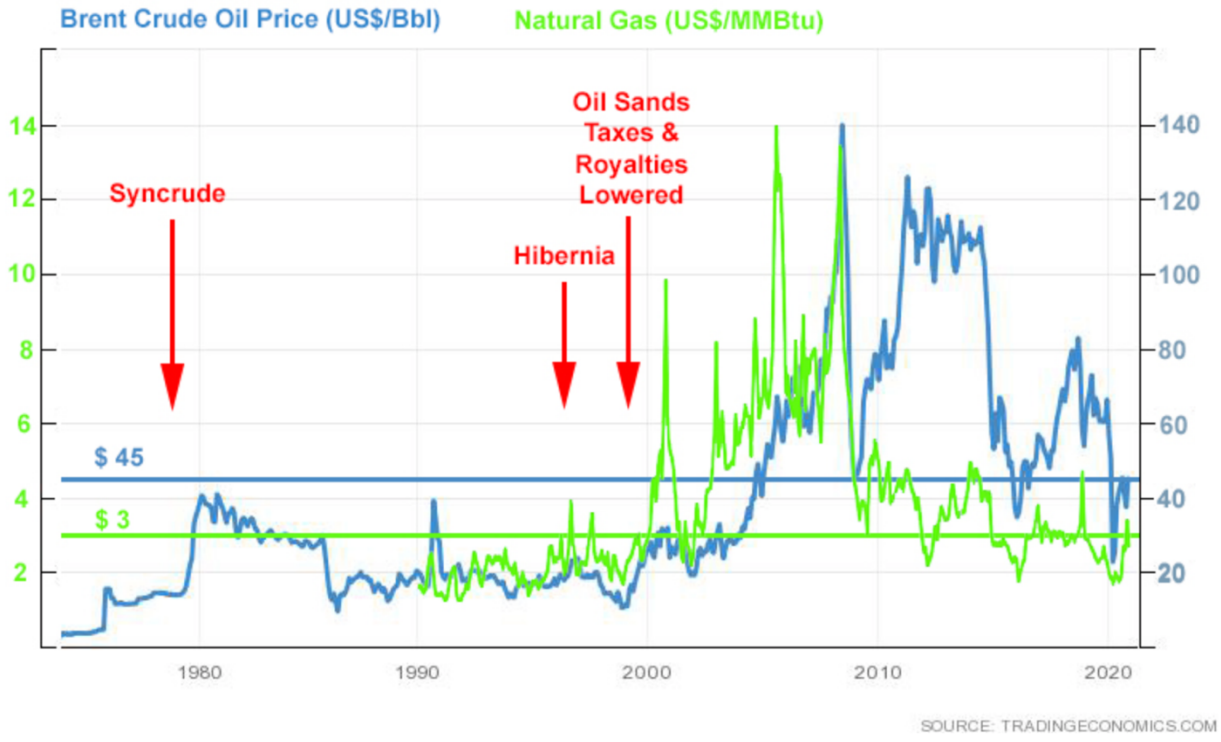


Jobs: Growth in electricity, reduction in oil and gas

According to the Energy Fact Book 2019-2020[22], there are presently 60% more direct jobs in the electricity sector (0,5% of Canada's total employment) VS direct jobs in oil and gas extraction (0,3% of Canada's total employment).

In recent years, the oil and gas sector has been suffering from low prices and low demand for oil which has had a devastating impact on Canadian workers in the oil and gas sector… and investors don't expect that the situation will get better any time soon. "According to Statistics Canada, the country recorded its largest ever drop in natural resources employment in the second quarter of 2020 with close to **43,000 workers** losing their jobs. Employment in the natural resources sector fell 7.3 per cent.

The losses have been driven by a substantial drop in demand for crude oil and refined petroleum products due to global travel restrictions and the growing prevalence of working and schooling at home, Statistics Canada said in a release."[23]



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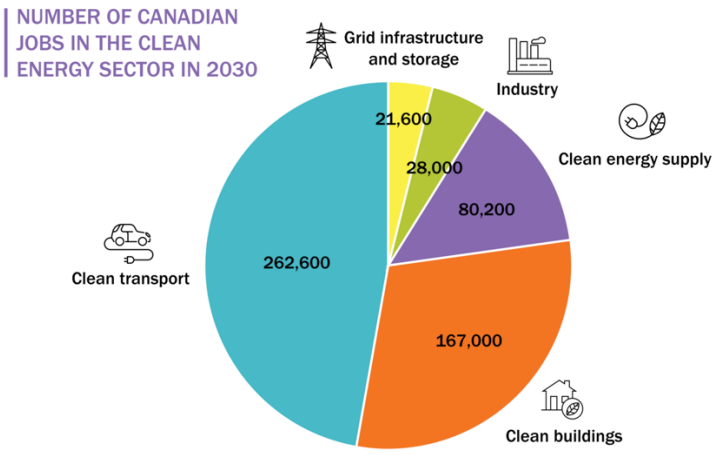
According to ***The Fast Lane, tracking the energy revolution 2019***[24] from Clean Energy Canada, demand for clean energy and clean transportation jobs will keep growing at a very fast rate.

559,400 clean jobs by 2030 : **Almost 50% in clean transport.**

"That's jobs like manufacturing electric cars, buses, and trucks that are forecast to hit our roads in record numbers. In fact, several transit authorities have committed to buying only electric buses over the next decade"



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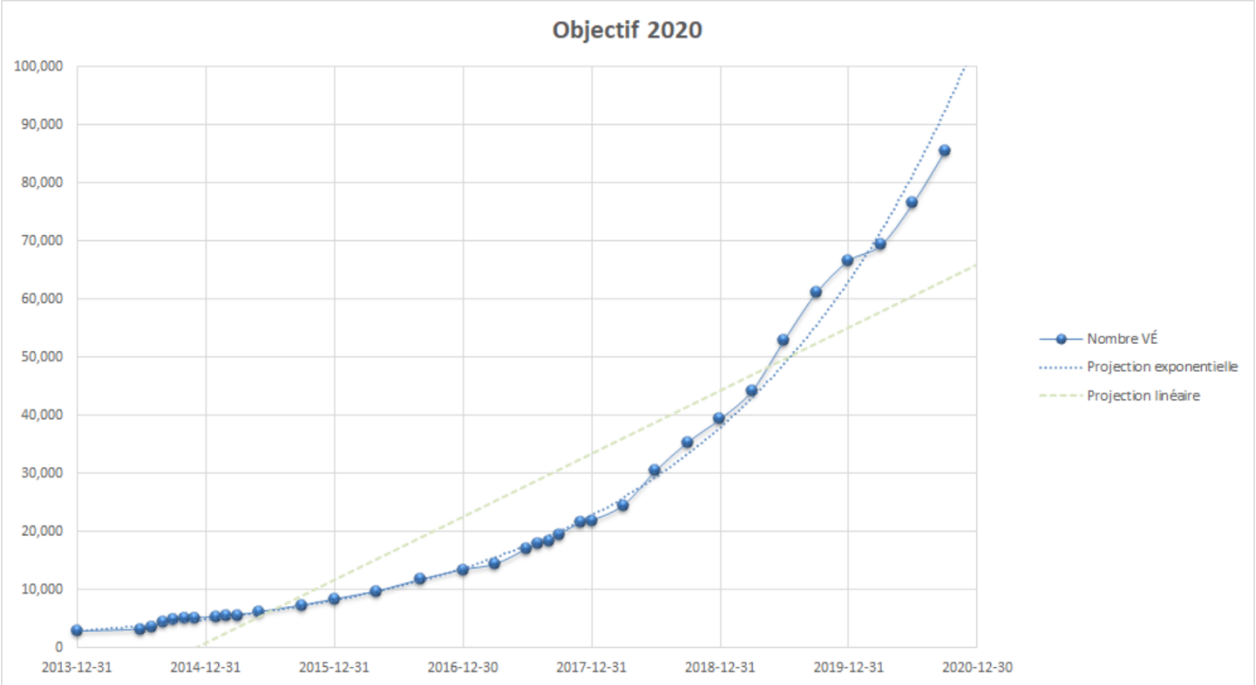
Chapter 6 : Over $190 billions in sales revenue between 2021 and 2030

According to data from the SAAQ and AVÉQ, the province of Québec is on its way to reach its 100,000 ZEVs by Jan 2021. That is just one month behind schedule because of COVID-19 drop in light duty vehicle sales).[25] The government target was 100,000 ZEVs in Québec by the end of 2020.



$9 billions in potential revenue for utilities

Considering the fact that these Zero Emission Vehicles need to be recharged, we have calculated the actual revenue for Hydro-Québec.

Let's make the following calculation :

- 100,000 ZEVs at 20 000 km a year on average
- Each EV has a 20 kWh / 100 km electricity consumption average (for light duty vehicles only)
- Hydro-Québec's rate is at around 10.8 cents / kWh[26] for home charging.

100 000 ZEVs X 4000 kWh per ZEV/year X 10.8 cents / kWh = $ 43 200 000

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If we multiply this number by 15 (1.5 million ZEVs by 2030 which is the new target for Québec in 2030), Hydro-Québec is expected make at least $650 millions in 2030… just for light duty electric vehicles. If we add the revenue for heavy duty charging of electric buses, school buses and trucks, the anticipated revenue for Hydro-Québec will surpass $1 billion a year in 2030 or approximately $3,6 billions between now and 2030… at today's electricity rates.

If we multiply HQ revenue by 2.5 for the whole of Canada, it represents potential Canadian utility revenue of more than **$9 billions** between 2021 and 2030. Why 2.5? Because in 2019, Québec light duty vehicle sales represented approximately 23% of the Canadian market[27]. So normally we should multiply the number of ZEVs by 4.3 (23% X 4.3 = 99% of Canadian sales) to consider total light duty vehicle sales in Canada but we multiply that number by only 2.5 instead of 4.3 to ponder the fact that Québec may still represent the most important EV market in Canada.

$157.5 billions in light duty ZEV sales revenue

Let's be conservative and say that a ZEV will cost an average of $45,000 by 2030. That shouldn't be too surprising since the average selling price for a light duty vehicle in Canada was over $40,000 in 2019[28]. So 1,400,000 ZEV X $40,000 = **$63 billion over 10 years.**

Once again, if we multiply that number by 2.5 instead of 4 to ponder the fact that Québec may still represent the most important EV market in Canada, it could represent a **$157.5 billions** market between 2021 and 2030.

$3.75 billions in residential charger revenue

Add to this an exponential increase in sales of residential chargers and installation contracts for electrical contractors. If 2/3 of ZEV owners in Québec purchase a residential charger at an average price of $1000 each, that means at least **$1 billion** in sales over 10 years + at least **$500** million in installation revenues.

$1.5 billion X 2.5 = a potential market of **$3.75 billions** for residential charging sale and installation between 2021 and 2030 in Canada.

$537 millions in BRCC revenue

If we add to that 2150 BRCC between 2021 and 2030 in Québec at a $100,000 per charger (including installation), this amounts to approximately $215 million between 2021 and 2030 X 2.5 = **$537 millions** in Canada between 2021 and 2030

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$6.6 billions in electric bus sales revenue

If we add the total number of electric urban buses that Québec wants to see on the road by 2030 (55% of the fleet by 2030): 55% of approx. 4000 transit buses[29] = 2200 electric buses by 2030

2200 X $1.2 million each (2019 price) = $2.6 billions X2.5 = **$6.6 billions between 2024 and 2030**

$3.94 billions in electric school bus revenue

There were 10 784 school buses in Québec in 2019[30]. Since the government of Québec 65% of these school buses to be electric by 2030, it adds up to approximately 7000 electric school buses.

7000 X $225 000 each by 2030 = $1.575 billion X 2.5 = **$3.94 billions** between 2021 and 2030

$10.5 billions in electric truck sales

In 2019, there were 700 000 trucks registered in Canada[32], if only **5%** of these trucks are electric by 2030, it represents 35 000 trucks at an average price of $300 000 = **$10.5 billions by 2030**

$9 B + 157.5 B + 3.75 B + 0.537 B + 6.6 B + 3.94 B + $10.5 B = **$192 billions in potential sales revenue**

(Mustang MACH-E)

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Chapter 7 : 13 myths about electric vehicles

By Daniel Breton
President and CEO

Over the many years I've been writing about hybrid and electric vehicles, I've been confronted with many myths conveyed through media, social media, dealerships and a whole army of unfamiliar people. And some of these myths are particularly tenacious.

Here are my top 13 myths regarding partial and full electric vehicles:

Myth #1: Electric car are very (too) expensive

While hybrid and electric vehicles generally cost more to purchase or lease than their gasoline equivalents, the total cost of ownership (purchase cost + maintenance costs + energy costs + insurance costs + resale value) often means that partial or full electric vehicles end up costing about the same or sometimes slightly less than their gasoline counterparts.

For example, a Honda Civic, Toyota Corolla or Hyundai Ioniq electric will cost you about the same over a 5-year period, especially with government rebates. And after that, EVs often end up costing less.

According to Bloomberg New Energy Finance, the purchase price of EVs and their gas counterparts are expected to be at par by 2024-2025 without government rebates.

Myth #2: Batteries don't last long and are expensive to replace.

I've been hearing people repeat this myth for over 15 years. First of all, it is important to know that batteries in hybrid, plug-in hybrid and electric vehicles are generally protected by a minimum 8 to 10 year warranty or 160,000 km or more. Therefore, they are the components of light duty vehicles on the market that have the longest warranty. What's more, over the past 20 years, we've discovered that batteries generally last as long or longer than the vehicles themselves.

If they need to be replaced, for example in the event of an accident, the price of batteries vary according to their chemistry and capacity. In other words, a NiMH battery (hybrid vehicle) now costs little to replace (generally less than $2,500) and a Li-Ion battery (found in more and more hybrid vehicles and the vast majority of plug-in hybrids and 100% electric vehicles) will see its price vary according to its capacity (from $5,000 to $25,000).

If you think that $25,000 is a high price, you should know that this is a very large battery found in a luxury car and is therefore more expensive. Keep in mind that in the event of an accident, the gasoline engine of a luxury gasoline-powered car will cost just as much to replace.
You probably suspect that the engine of a Toyota Yaris is much less expensive than the engine of a Porsche 911.

What's more, with the price of batteries constantly decreasing, the battery that used to cost $10,000 to replace in my venerable 2001 Honda Insight now costs less than $2,000. The price of batteries in today's new cars will therefore also decrease, ***which will not be the case for the price of internal combustion engines.***

Myth #3: An electric car is only good for the city

This myth was once associated with the fact that electric cars had a rather limited range, which is hardly the case anymore. In fact, you can now travel 200, 300 and even 400 kilometers in winter weather conditions in an increasing number of vehicles. What's more, the growing choice of plug-in hybrids means you're no longer limited to short distances or city driving.

Recently, I even read that representatives from the auto sector said that EVs were mainly good for the cities and that the prime example of that fact was that 80% of EVs in the province of Québec were concentrated in Montreal and Québec City.

Here are the facts : According to the data from the SAAQ and AVÉQ, 24% of EVs in Québec are registered in Montreal and Québec City.

This means that **76%** of EVs in Québec are registered outside of Montreal and Québec City in suburbs, smaller cities, municipalities and rural areas.

Myth #4: Canada is a big country so people have to drive longer distances

According to data collected by the CNTA and EMC from StatsCan, ***80% of Canadians drive less than 40 km a day to go to work and back and 90% of Canadian drive less than 60 km to go to work and back.***[29] In fact, who knows anyone that drives from Nova Scotia to Vancouver on a daily basis? It's not because Canada is a large country that people drive across Canada to go to work. Considering that many households have more than one car or light truck, getting one electric vehicle out of the 2 vehicles is absolutely feasible… or even getting a PHEV vehicle.

Myth #5: You can't take long trips with an electric car… especially in the winter.

In addition to the greater autonomy of new electric vehicles, one factor that has changed the game for long trips is the growing number of fast charging stations found just about everywhere on the roads of Quebec and North America, which greatly helps you travel long distances in a

100% electric vehicle. For example, last year I went on vacation to the Magdalen Islands (1200 km to get to the ferry) without any problem.

To know where to stop to "fill up" your EV, all you need to do is to know the network of quick charging stations by downloading the main applications for smart phones (Le Circuit Électrique, FLO, ChargeHub, PlugShare, ChargePoint, etc) which will inform you where you can plug in, the level of the stations (L2, Fast + Tesla) and if they are available.

Here are 2 examples of 2020 trips :

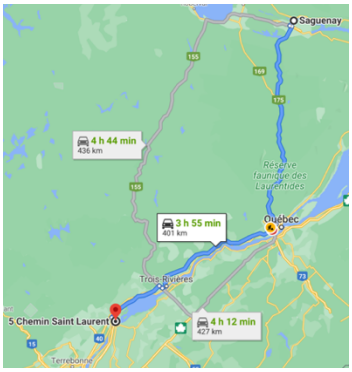
One trip in the winter

A friend and I drove a 2020 Chevrolet Bolt EV last January in -20 degree Celsius weather from Berthier to Saguenay, a 400 kilometer trip. We first drove to Québec City (200 km) where we stopped to eat for 40 minutes and charge the vehicle up to 80% on a 50 kW fast charger.

We then left for Saguenay (another 200 km) where we drove across the Laurentian Park on the snowy roads across the mountains to arrive with more than 125 kilometers of range left.

We drove at speeds varying from 95 km/h to 110 km/h depending on traffic and how slippery the road was in the snow. We sometimes had to close the heater since we were a bit too hot in the car.

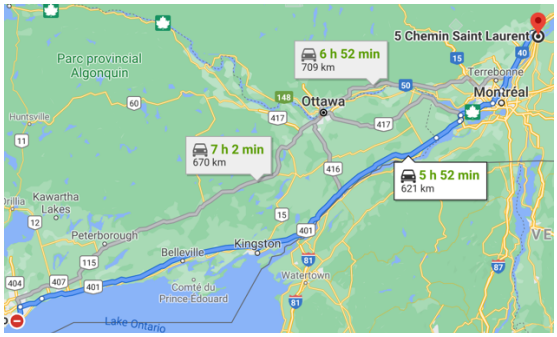
These are real life winter driving conditions.



One trip in the summer :

Last summer, I traveled with my family from home to Toronto: a 630 kilometers trip.

We drove to Kingston (365 km) where we stopped for a bite to eat while the car was charging. After 40 minutes, we left to go directly to Toronto (265 km)



As simple as that.

That's not to mention that more and more hotels, restaurants, bed and breakfasts and other venues ***offer free charging across North America. How many times have you been able to fill up your gas car for free? Well, it often happens to EV drivers.***

Myth #6 : People don't want to buy electric cars

In the past, I have heard the argument a few times by some OEM representatives. They said that there was no real demand for electric cars and if and when there would be such demand, they would meet the demand with sufficient supply. I heard it before I was in government, when I was in government, during a parliamentary commission for a ZEV standard in Québec in 2016… and I still hear it now.

The reality is very different.

In 2012, 2014, 2016 and even now, it is not always easy to find electric vehicles on the dealer's lots in Québec. Outside Québec where there are no ZEV standard, it's often times impossible.

When I was in government, my team documented this with many visits to different dealers across Québec. There was little inventory then.

In 2019 and 2020, things haven't changed that much.

According to a 2020 study from Dunsky Energy Consulting entitled *Plug-In electric vehicle availability*[29] "despite a national ZEV purchase incentive in place, it can still be very challenging to find a PEV as only **33% of dealers in Canada** have at least one PEV in stock. Outside of Quebec, BC and Ontario, fewer than **20% of dealerships** have at least one PEV.

Given the federal ZEV sales targets for 2025 and 2030, it will be important for the federal government to continue to monitor the availability of PEVs across Canada and explore

opportunities to address supply issues to ensure that a lack of PEV availability does not create an additional barrier to adoption of PEVs."

So, to their claim, OEMs are in fact **not** responding to consumer demand.

Dealers who want to sell EVs and don't have any in stock end up having to try to dissuade customers in order to meet their sales targets.

Myth #7: Electric cars don't perform well.

The car manufacturer Tesla has been debunking this myth for a few years now by offering cars that make a big splash on everything that runs on petrol, be it Porsche, Ferrari or Lamborghini. With the Roadster 2.0, Tesla will push the limits with a car that will do the 0-100 km/h in less than 2 seconds... while a 1000 km range.

Even in the category of vehicles closer to the means of regular people we can see that the acceleration and general performance of 100% electric cars are often times superior to their gasoline rivals because of the instantaneous torque and lower center of gravity of EVs.

Myth #8: Electric vehicles are not for big families.

If this statement was valid in the past for large families, it is no longer valid. Indeed, with the arrival of more spacious vehicles such as the Chrysler Pacifica hybrid, Toyota Highlander hybrid, Volvo XC90 PHEV, Tesla X, Tesla Model Y, Toyota RAV4 Prime, Mitsubishi Outlander PHEV, etc, which are vehicles that can accommodate 5, 6, 7 people, families find themselves with an ever-increasing choice of hybrid, plug-in hybrid and electric vehicles that can meet their needs.

And, with the growing arrival of hybrid, plug-in hybrid and 100% electric SUVs and pickup trucks, the choice will get even better in the coming months.

Myth #9: Electric vehicles are less reliable

In fact, not only is this myth false, it is quite the opposite. Numerous studies over the years have determined that hybrid and electric vehicles are generally more reliable than their gasoline-powered counterparts.

In fact, it is quite peculiar to note that after just over 10 years on the mass market, electric cars are generally more reliable than gasoline-powered cars whose technology has been mass-produced for a century.

Electric Mobility Canada /Mobilité électrique Canada – www.emc-mec.ca – info@emc-mec.ca
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Myth #10: A ZEV standard won't increase electric vehicle sales in Canada.

Jurisdictions with ZEV standards see significantly higher levels of EV supply, EV sales, and EV market share. An examination of global zero-emission vehicle standards found that regions with ZEV standards typically have more EV models available and see higher sales. A look at California and Québec show that jurisdictions with ZEV standards in place have significantly higher EV market shares than the national average and account for outsized portions of total national EV sales.

Myth #11: ZEV sales seem to be doing just fine. We don't need regulation.

In fact, while ZEV sales and market share are on the rise but Canada is not on track to meet its 2025, 2030 or 2040 ZEV sales targets under existing policies.

Canada has set light-duty zero-emission vehicle sales targets of 10% by 2025, 30% by 2030, and 100% by 2040.

Under current policies, Transport Canada indicates that zero-emission vehicles could make up only 4% to 6% of all new light-duty vehicles purchased by 2025 and 5% to 10% by 2030. With low gas prices and weaker vehicle emission standards now on the books, ***these gaps could be even greater.*** Third party modeling by Navius Research shows even less optimistic projections: Under current policies, ZEVs are projected to account for only 3.7% of new light-duty vehicle sales by 2025, 7.3% by 2030, and 14% by 2040.

Myth #12: Technology is the problem. EV technology costs are too high and battery ranges aren't where they need to be.

In fact, like we said earlier in this document, technology is quickly improving and costs are falling. So much so that Tesla and Ford say that they make a profit from their EVs.

To that point, here is a recent quote from Ford's CEO : *« Ford Chief Executive Officer Jim Hackett told Bloomberg News. The Mach-E will make a profit "on vehicle one," he said in a Bloomberg TV interview. "That's surprising a lot of people because electrics have not had a history of making money. This will."*[31]

Myth #13 : Auto assembly is a major contributor to Canada's economy.

Canada's auto industry was in decline long before COVID-19 and risks falling further behind if it doesn't transition to electric vehicles. According to an Innovation Economy Council report, the number of vehicles assembled in Canada has been in decline for 20 years. Canada produced about 1.9 million vehicles in 2019, down from 3 million in 2000.

Since the auto industry is now investing in electric vehicles, the more they sell them, the faster they will see return on their investment.

Hence the need for a federal ZEV standard.

In Sept 2020, Ford and FCA signed agreements with Unifor to build EVs in Canada. That's great news for Canadian auto workers. To make the deal a success, the governments of Canada and Ontario have decided to chip hundreds of millions of dollars as an investment on high quality high paying jobs.

BUT… We have seen such a deal in the past.

Canadian built EVs does not mean available in Canada

In 2011, the governments of Canada and Ontario invested 70,8 millions[31] each to assemble the Toyota RAV4 EV in Woodstock, Ontario. The only trouble was that since there was no ZEV standard in Canada but there was one in California, all the RAV 4 EV were sent south of the border so Canadian customers who wanted to buy that vehicle couldn't.

That is another very important reason for a ZEV mandate in Canada : to make sure that Canadian built EVs supported by Canadian funds are available to Canadian customers.

(Chevrolet Bolt EV in front of wind turbines)

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