



# Comparing Fuel and Maintenance Costs of Electric and Gas Powered Vehicles in Canada

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# Executive Summary

Despite being available to Canadians since 2011, battery electric vehicles (BEV) are still a rare sight on Canadian roads. In May 2018, electric vehicles made up just 2% of total vehicle sales.

One of the perceived barriers to a higher adoption rate is the initial purchase price of an electric vehicle. Is a BEV worth this higher price compared to an internal combustion engine vehicle (ICEV)?

This report does not address the other benefits of owning a BEV such as the improved ride experience, reduced greenhouse gas emissions and air pollution or the reduction in time wasted arranging vehicle service appointments and visits to the gas station. We only analyse out of pocket costs. To do this we use a model that compares the annual costs of fuel and maintenance of domestic ICEV and BEV vehicles for each province in Canada.

This report puts numbers on these savings by factoring in provincial averages for the price of gasoline (GasBuddy, August 2018), electricity rates (summarized by Hydro Quebec, 2017), vehicle maintenance costs (Vincentric, 2018) and the average distance travelled per household (Natural Resources Canada, 2008). We compare two similar cars that are available in both ICE and battery electric versions. Assuming a 250,000 km service life over 10 years, the results are displayed in the map below.



# Figure 1: Annual Savings in Fuel and Maintenance of BEVs Compared to ICEVs by Province

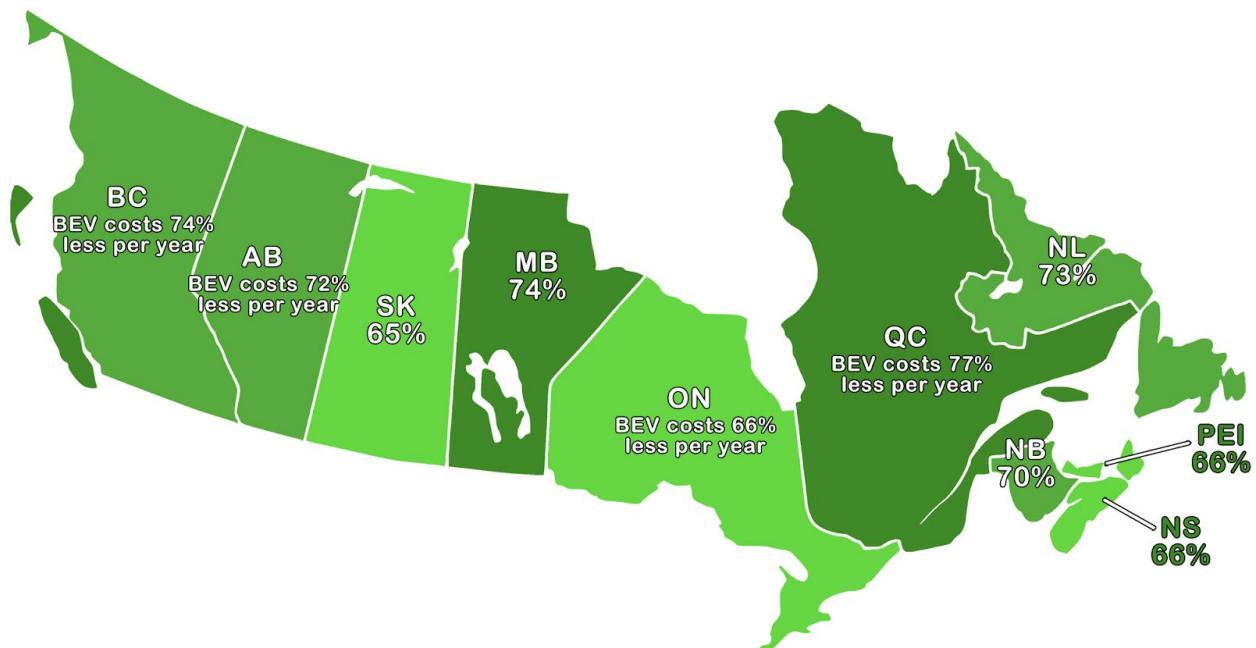


Figure 1: This map displays the annual percentage savings in fuel and maintenance of a battery electric vehicle (BEV) over the same type of vehicle with an internal combustion engine for each province in Canada.

# Figure 2: 10 year savings of driving BEVs per household

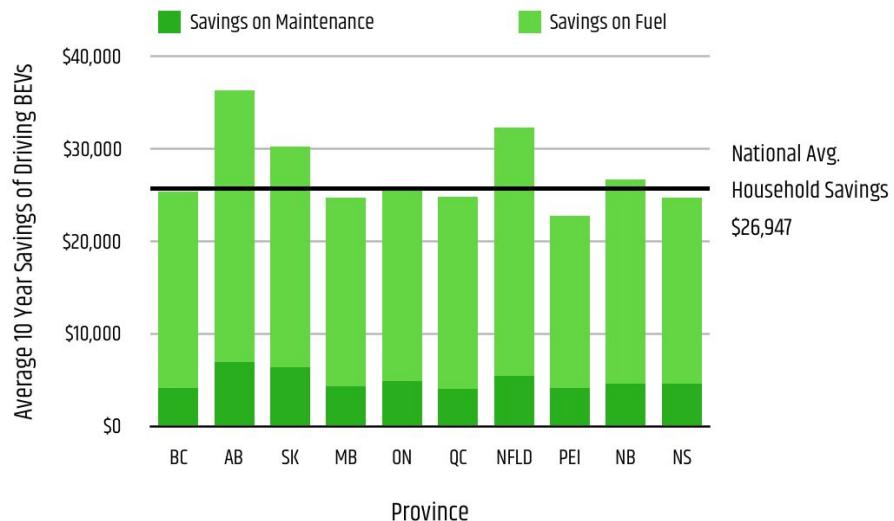


Figure 2: This chart shows the average savings per household in fuel and maintenance that will accrue from operating BEVs over comparable ICEVs for each province in Canada for 10 years. We assume an annual inflation rate of 2% for all costs. The average household in Canada has 1.5 vehicles.

# Introduction

An important step in transitioning away from non-renewable carbon fuels such as diesel and gasoline is to power the transportation sector with renewable electricity.

In 2008, electric cars re-entered the North American scene with a bang when TESLA introduced a model that was both fast and sexy. Sadly TESLA's price tag meant that, until recently, most of us could only watch the show. The introduction of the Nissan Leaf in 2011 provided the first of what is now a large and growing number of practical BEVs available at prices only slightly higher than their ICE counterparts. As a result, an increasing number of car buyers have begun to wonder if an electric car might be the best answer for their mobility needs.

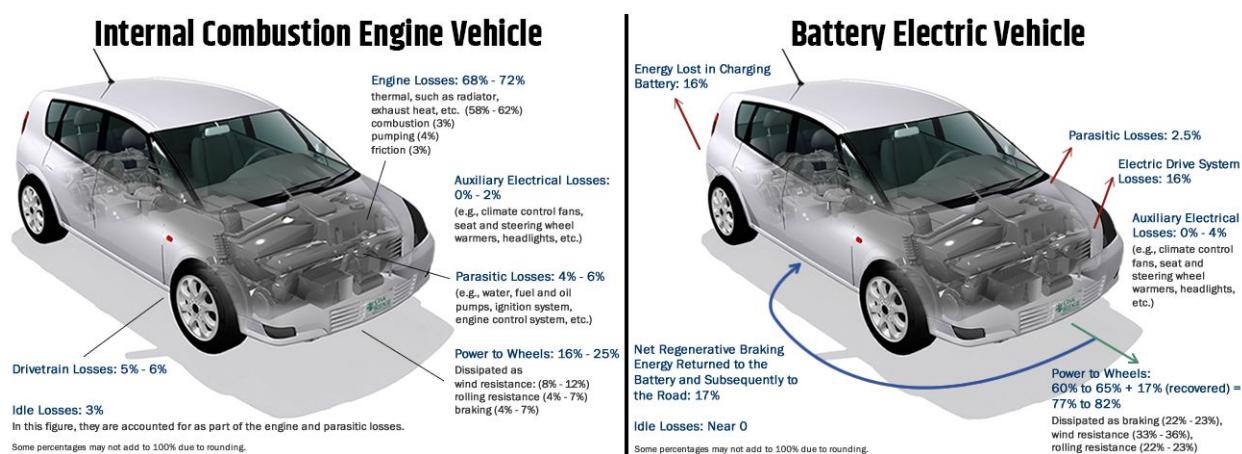
Like the LED light bulb, electrified transportation offers a drastic improvement in energy efficiency over older technologies (ICEVs). Depending on the ratio of city to highway driving, between 77% to 82% percent of the energy used to power an electric car is used to move it down the road. By contrast, ICEVs convert only 16% to 25% percent of the energy in the fuel into motive power ([Thomas, J.](#) 2014, [Baglione, M. et al](#), 2007, [Bandivadekar, A. et al](#), 2008, [Carlson, R. et al](#) 2016).

The first roadblock to widespread adoption was the limited range of early mid-priced BEVs but this has become less of a problem since the \$45,000 Chevy Bolt broke the 200 mile or 320km/charge barrier with a range of 383km/charge. As battery technology continues to improve and fast-charge rates continue to increase, range anxiety seems likely to recede into the background, especially as BEVs have the clear advantage that, unlike ICEVs, they can be "fueled" at home.

The second roadblock was cost: BEVs still cost a few thousand dollars more than ICE cars having roughly similar capabilities. On the other hand, BEV running costs such as electric "fuel" and routine maintenance are significantly lower. Typical BEV drivetrains have 90% fewer moving parts, require no maintenance such as oil changes or timing belts and their ability to use regenerative braking saves energy and makes their brake pads last longer ([US Department of Energy](#)). When looking at the top [10 most common car repair items](#), none of the repairs in the list apply to a BEV. Over time, such savings more than compensate for BEVs higher purchase price.

This report examines potential savings at a household level rather than at a vehicle level because in multi-vehicle households, a single BEV has the potential to perform the bulk of the driving needs and therefore maximize savings for the household ([Tamor et al. 2015](#)).

**Figure 3: Where the energy goes (combined city/highway values).**



Source: [US Department of Energy](#)

In a 2018 survey conducted by BC Hydro, 55% of respondents identified saving money on fuel and maintenance as their biggest motivation for buying an electric vehicle ([BC Hydro, 2018](#)).

This report will look at out-of-pocket operational costs for ICEVs and comparable BEVs in Canada. Although similar comparisons have been done in the past for the US by Palmer et. al. ([2018](#)), we believe that there is a need for a Canada-specific comparison. This study utilizes public data on the energy and service costs in each province of Canada to determine the relative operating costs of ICEVs vs. BEVs assuming that each vehicle is operated for 10 years.

## Methods

Comparison studies of this type face a number of practical problems. While fairly reliable estimates are available of the average annual distance driven by family cars in each province ([Natural Resources Canada, 2008](#)), it is less clear which exact ICEV and BEV models should be chosen for the comparison or how one should determine the servicing costs of a novel device like a BEV.

Although the average residential electricity rates are available for each province ([Hydro Quebec, 2017](#)), it is not always clear how these averages were calculated. We know that rates may vary substantially

with location and even time of day but we don't know when or where people will recharge their BEVs. Beyond this, several utilities provide a minimal residential service at a low rate and then charge more per kWh for usage above this threshold. Published average residential rates presumably represent a mixture of these two rates, but if we assume that car-charging will occur in addition to normal domestic use, unless these rules are changed, it seems likely that the owner of a BEV may have to pay somewhat more than the published "average" rate to charge his/her car.

Trying to determine the energy costs of running a BEV over a 10-year period raises additional questions related to the average number of kilometers driven and the rate at which electricity rates and gasoline prices will increase over the next decade. Will recent massive reductions in the cost of installing PV-solar arrays and large wind turbines cause rates to fall? Or will they rise because of the increased power usage related not only to the electrification of our road and rail transport but also to the need to replace the energy used to heat our homes and businesses when burning fossil-fuels is curtailed to control climate change?

Service costs are another source of uncertainty. Electric powertrains require virtually no routine maintenance, however, we do not yet have enough experience to know the average life of present battery packs. Early data from TESLA [vehicle owners](#) shows that after an initial 5% drop in capacity over the first 40,000 km, most batteries didn't drop below 90% of their original capacity until after 250,000 km. Although this is close to the distance travelled by the average Canadian car in 10 years, it is not clear that the 10-year service costs for a BEV should include the cost of replacing a battery today. First of all, improvements in battery design and operation seem likely to make newer batteries last longer. In addition, a modern car with a 90% battery capacity still has a significant range. Finally, it seems very likely that over the next decade, an industry will spring up to refurbish and replace such batteries for much less cost than the present cost of a new battery. Indeed, a [factory](#) for this exact purpose has already opened in Japan.

Despite these uncertainties, we believe that current data will still allow us to make an accurate estimate of the relative operating costs of ICEVs versus BEVs.

## Choosing Vehicles to Compare

To confront the plethora of model choices, we have confined our study to two models from two manufacturers: one from Asia and one from Europe. These cars are widely available in North America

but are unusual in that they can be purchased with either an ICE or a BEV powertrain. They are the Volkswagen Golf and Golf EV and the Kia Soul and Soul EV.

**Figure 4: Vehicle models used in this study.**



All four models represent fairly plausible family cars: not the fastest or the longest range, but with an average fuel economy and enough features to fulfil the transport needs of most urban families. The 2018 list prices of these cars, including the rebates currently available in each province, are shown in Table 1. For both the Kia Soul and Volkswagen Golf, vehicle model features were compared and priced to represent the closest match between the BEV and ICEV versions.

**Table 1: Purchase prices of vehicles used in this study.**

Province	Kia Soul ICEV	Kia Soul BEV	Kia Soul BEV (after rebate)	\$ difference after rebate	VW Golf ICEV	VW Golf BEV	VW Golf BEV (after rebate)	\$ difference after rebate
BC	\$24,930	\$37,780	\$32,780-\$26,780*	<b>\$7,850-\$1,850*</b>	\$28,495	\$36,355	\$31,355-\$25,355*	<b>\$2,860-(\$3,140)*</b>
AB	\$24,952	\$37,802	\$37,802	<b>\$12,850</b>	\$28,495	\$36,355	\$36,355	<b>\$7,860</b>
SK	\$24,930	\$37,780	\$37,780	<b>\$12,850</b>	\$28,495	\$36,355	\$36,355	<b>\$7,860</b>
MB	\$24,930	\$37,780	\$37,780	<b>\$12,850</b>	\$28,495	\$36,355	\$36,355	<b>\$7,860</b>
ON	\$24,969	\$37,819	\$37,819	<b>\$12,850</b>	\$28,495	\$36,355	\$36,355	<b>\$7,860</b>
QC	\$24,945	\$37,795	\$29,795	<b>\$4,850</b>	\$28,495	\$36,355	\$28,355	<b>\$(140)</b>
NFL	\$24,930	\$37,780	\$37,780	<b>\$12,850</b>	\$28,495	\$36,355	\$36,355	<b>\$7,860</b>
PEI	\$24,930	\$37,780	\$37,780	<b>\$12,850</b>	\$28,495	\$36,355	\$36,355	<b>\$7,860</b>
NB	\$24,930	\$37,780	\$37,780	<b>\$12,850</b>	\$28,495	\$36,355	\$36,355	<b>\$7,860</b>
NS	\$24,930	\$37,780	\$37,780	<b>\$12,850</b>	\$28,495	\$36,355	\$36,355	<b>\$7,860</b>

\*Lower value reflects participation in the BC Scrap-it program which offers \$6,000 trade in towards a new BEV.

## Average Driving Distances of Households in Canada

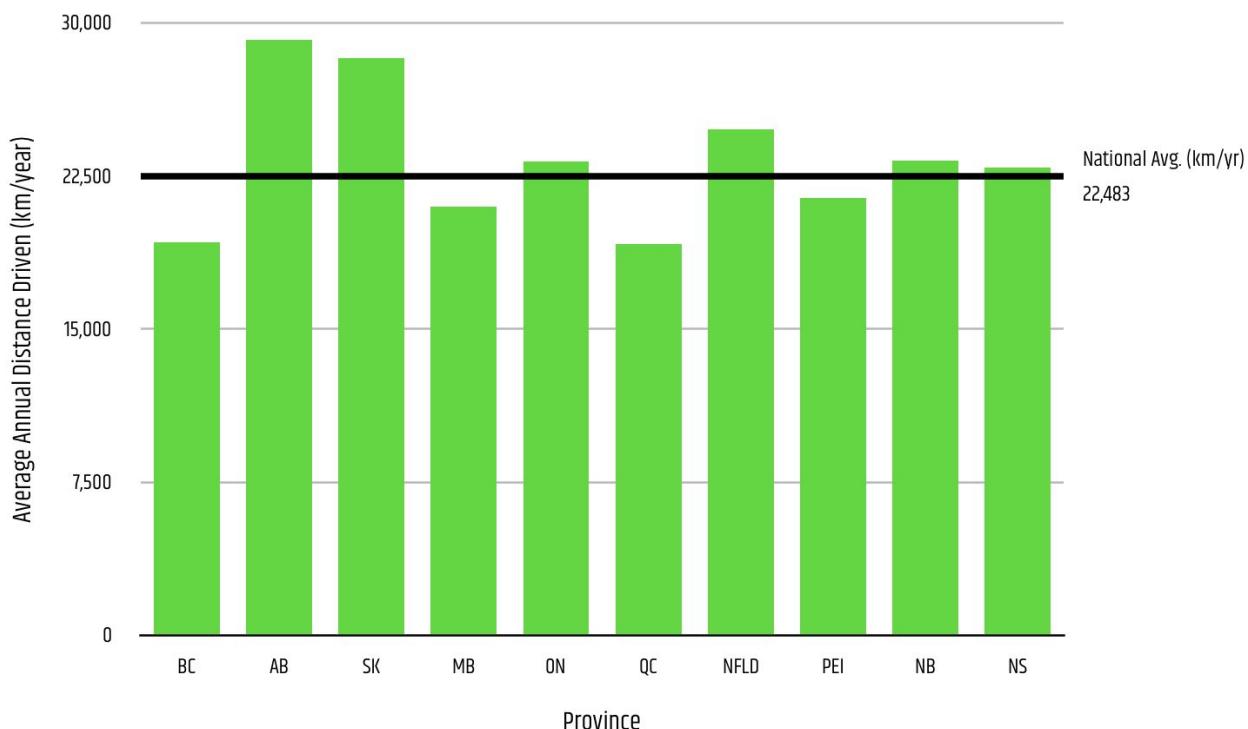
We determined annual average driving mileage per household using data from [Natural Resources Canada](#) on miles/vehicle and number of vehicles/household for all provinces. The national average numbers in the table below are population-weighted.

**Table 2: Calculating total distance driven per household in Canada.**

Province	Average distance driven per vehicle (km)	Average number of vehicles per household	Total distance driven per household (km)
British Columbia	13,100	1.47	19,257
Alberta	15,600	1.87	29,172
Saskatchewan	15,800	1.79	28,282
Manitoba	14,800	1.42	21,016
Ontario	16,000	1.45	23,200
Quebec	14,300	1.34	19,162
Newfoundland	18,100	1.37	24,797
PEI	15,300	1.4	21,420
New Brunswick	15,200	1.53	23,256
Nova Scotia	16,600	1.38	22,908
Population-weighted national average	15,151	1.48	22,483

Source: [Natural Resources Canada](#), 2008

**Figure 5: Average annual distance driven per household.**



Source: [Natural Resources Canada](#), 2008

# Fuel/Energy Costs

## Gasoline Prices

Gasoline prices were obtained from Gasbuddy. [Gasbuddy](#) uses crowd-sourced data submitted by thousands of volunteers to calculate near real-time gas prices from thousands of service stations across Canada. They are the data provider for many organizations including the Canadian Automobile Association. From these data, Gasbuddy compiles daily and monthly averages for regular gasoline prices (see: Table 5 in the Appendix).

Although the period chosen may indeed represent a spike in gas prices, news that fracked oil wells in the US continue to underperform over time, the continued confusion in the Middle East, while demand in Asia continues to rise, gives us some confidence in this choice. In addition, the Government of Canada has passed legislation mandating that some form of carbon tax will be [implemented nationally](#) by January 1st 2019. They have further specified that this tax will increase over the next decade. A \$30/ton-carbon tax translates into a \$3.5/barrel increase in the price of crude and represents a 5% increase in the cost of oil selling at \$60/barrel. Given all these factors, we have inflated the price of gasoline at what we believe is a conservative rate of 2% a year.

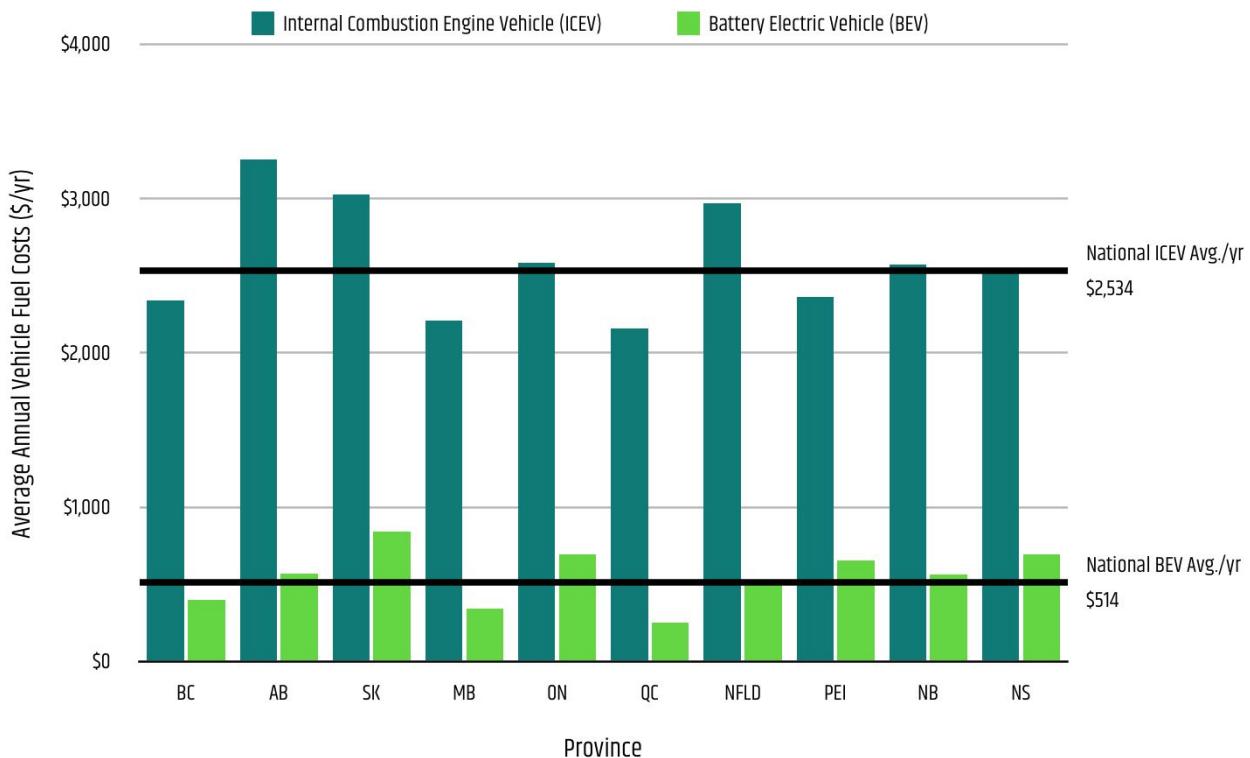
## Residential Electricity Prices

The residential electricity rates for each province have been obtained from a 2017 study by Hydro Quebec on average household electricity rates for major Canadian cities ([Comparison of Electricity Prices in Major North American Cities](#)). Since these rates are from 2017, we increased the values by 2% to estimate 2018 rates. For provinces in which data was provided for 2 or more cities, we population-weighted the averaged rate for the province (see: Table 6 in the Appendix). We assume that, in line with recent history, these rates will increase at 2%/year.

## ICEV and BEV Fuel Costs by Province

To determine annual gasoline fuel costs, we multiplied the average fuel economy of the Volkswagen Golf and Kia Soul by the distance driven per household in each province and by the average cost of this fuel. Fuel economy values were taken from [fueleconomy.gov](#) (See Table 7 in Appendix). The 2018 average annual fuel costs per household for each province are shown in Figure 6. On average, the population weighted savings on fuel costs from operating a BEV is 80% (See Table 9 in Appendix).

**Figure 6: Average annual fuel costs per household.**



## Vehicle Maintenance Costs

Service numbers for all 4 models were obtained from the data provider Vincentric. They include estimated costs of tires, brake replacement and the other disposables related to routine maintenance.

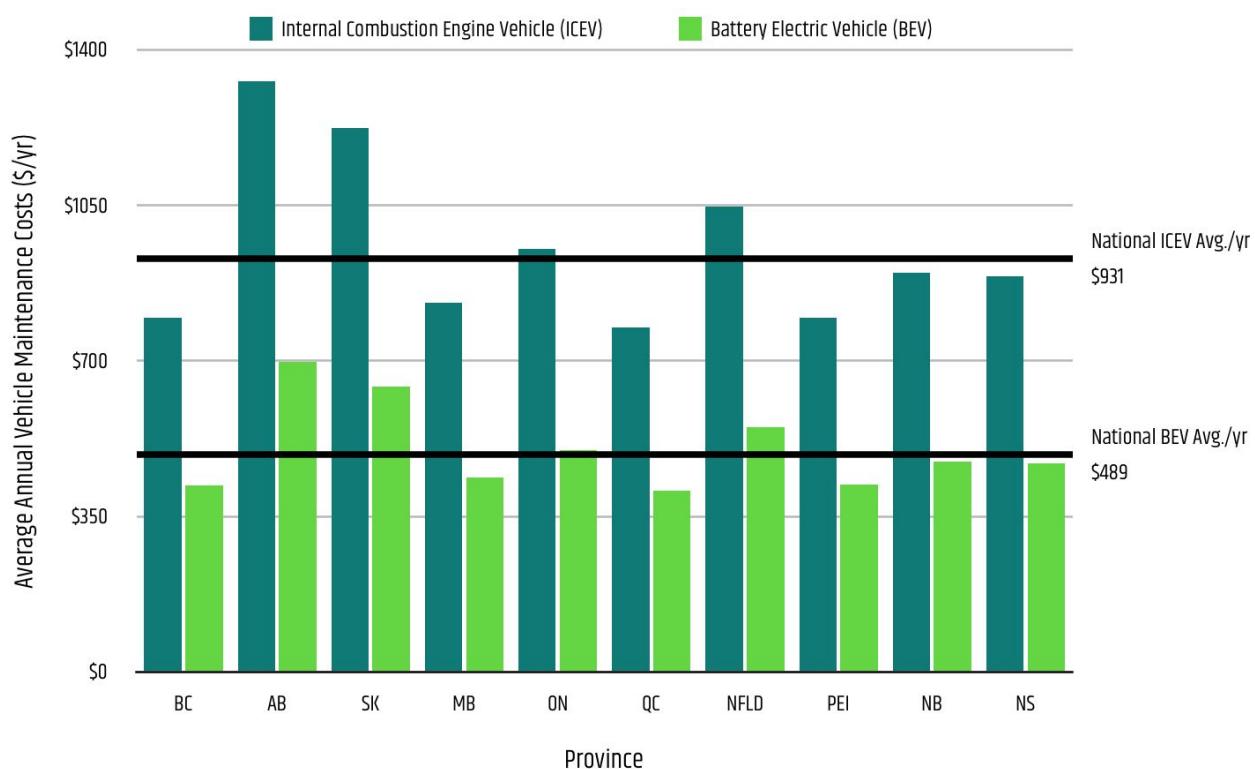
Vincentric's data reveals a 47% average cost savings in maintenance of operating a BEV over an ICEV in Canada. This is consistent with other scientific papers on this topic ([M. Alexander et al. 2013 61%](#), [Propfe et al. 2012 49%](#), [Institute for Automotive Research, 2012 35%](#)). Although we were unable to audit all of Vincentric's maintenance estimates, we believe the savings of operating a BEV could actually be much higher considering Vincentric originally didn't account for regenerative braking in hybrid and electric vehicles when estimating the lifespan of brake pads. Vincentric originally gave an equal 75,000km lifespan for brake pads for both ICEV and BEVs until we brought this inaccuracy to their attention and they later revised the BEV brake pad lifespan up to a more realistic 215,000km.

The battery is expected to last the life of the vehicle and is therefore not included as a maintenance cost. We have also left out any monetary recognition of the many hours spent by the owners of ICE

cars in driving to filling stations and arranging for, and implementing their more frequent service visits.

The graph below illustrates estimated annual maintenance costs for operating ICEVs and BEVs for each province in Canada (Figure 7). It is based on the average distance driven per household in each province for the year 2018.

**Figure 7: Average annual vehicle maintenance costs per household.**



## Comparing Total Fuel and Maintenance Costs

For comparing the total costs in fuel and maintenance of the ICEVs and BEVs used in this report, we added the two costs together for both vehicle types for each province (Table 3). The annual savings of switching to BEVs range from \$2,084/year on PEI to \$3,316/year in Alberta. As a percentage, the average savings for each province ranged from 65% in Saskatchewan to 77% in Quebec with the national average being 71%.

**Table 3: Annual savings on fuel and maintenance of driving BEVs per household.**

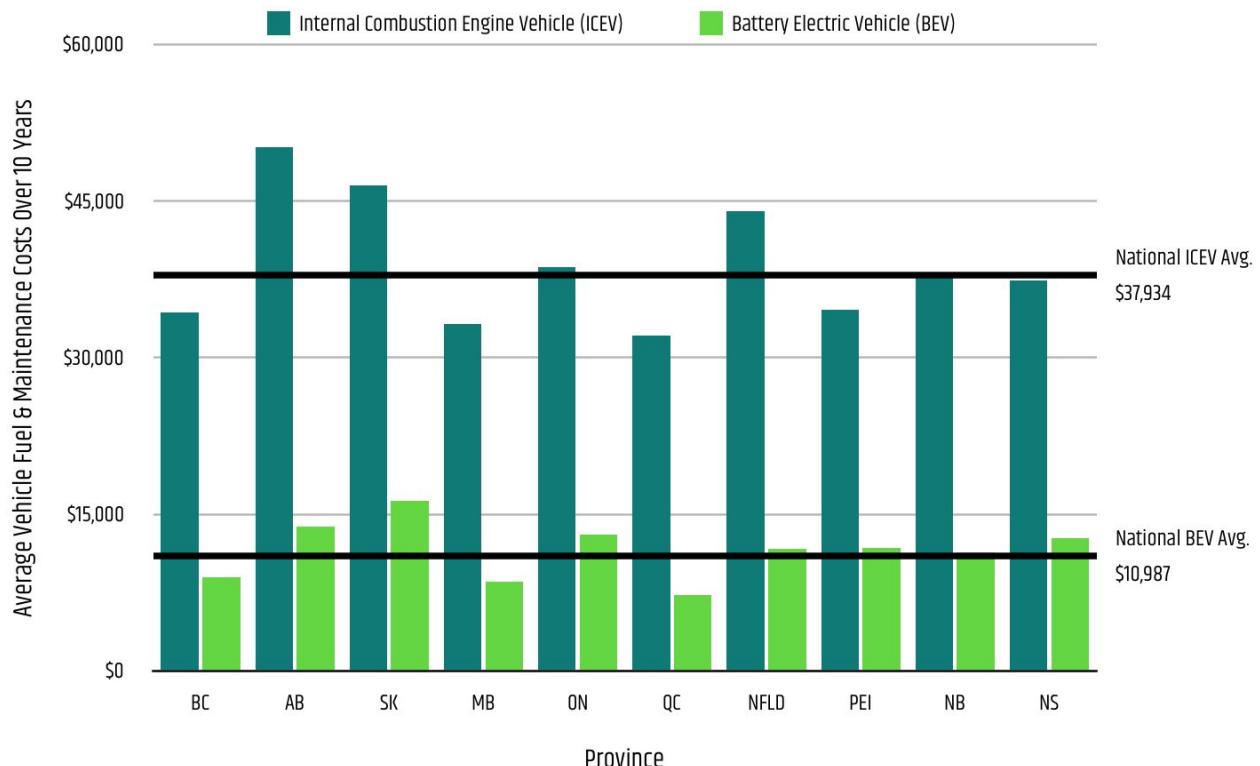
Province	Average ICEV Costs			Average BEV Costs			Savings	
	Maint.	Fuel	Total	Maint.	Fuel	Total	\$	%
British Columbia	\$797	\$2,339	\$3,136	\$419	\$400	\$819	<b>\$2,318</b>	<b>74%</b>
Alberta	\$1,330	\$3,251	\$4,581	\$698	\$567	\$1,265	<b>\$3,316</b>	<b>72%</b>
Saskatchewan	\$1,225	\$3,025	\$4,250	\$643	\$841	\$1,484	<b>\$2,766</b>	<b>65%</b>
Manitoba	\$831	\$2,207	\$3,038	\$438	\$342	\$779	<b>\$2,259</b>	<b>74%</b>
Ontario	\$952	\$2,583	\$3,535	\$500	\$694	\$1,194	<b>\$2,341</b>	<b>66%</b>
Quebec	\$776	\$2,157	\$2,933	\$408	\$254	\$663	<b>\$2,270</b>	<b>77%</b>
Newfoundland	\$1,048	\$2,970	\$4,018	\$551	\$519	\$1,070	<b>\$2,948</b>	<b>73%</b>
PEI	\$798	\$2,363	\$3,161	\$421	\$657	\$1,077	<b>\$2,084</b>	<b>66%</b>
New Brunswick	\$899	\$2,574	\$3,473	\$474	\$565	\$1,039	<b>\$2,434</b>	<b>70%</b>
Nova Scotia	\$891	\$2,527	\$3,418	\$469	\$694	\$1,163	<b>\$2,255</b>	<b>66%</b>
Population-weighted national average	\$931	\$2,534	\$3,464	\$489	\$514	\$1,003	<b>\$2,461</b>	<b>71%</b>

In our 10 year forecasts of future savings for each household, we used an annual inflation rate of 2% for the cost of fuel and maintenance for both vehicle types (Table 4).

**Table 4: 10 year savings on fuel and maintenance of driving BEVs per household.**

Province	Average ICEV costs			Average BEV costs			10 yr Savings
	Maint.	Fuel	Total	Maint.	Fuel	Total	
British Columbia	\$8,724	\$25,616	34,340	\$4,587	\$4,376	\$8,963	<b>\$25,377</b>
Alberta	\$14,562	\$35,597	50,159	\$7,640	\$6,211	\$13,851	<b>\$36,308</b>
Saskatchewan	\$13,413	\$33,128	46,541	\$7,045	\$9,206	\$16,251	<b>\$30,290</b>
Manitoba	\$9,102	\$24,163	33,264	\$4,791	\$3,743	\$8,534	<b>\$24,730</b>
Ontario	\$10,419	\$28,288	38,707	\$5,480	\$7,600	\$13,079	<b>\$25,628</b>
Quebec	\$8,495	\$23,616	32,112	\$4,469	\$2,785	\$7,254	<b>\$24,857</b>
Newfoundland	\$11,476	\$32,519	43,996	\$6,031	\$5,686	\$11,717	<b>\$32,279</b>
PEI	\$8,736	\$25,876	34,611	\$4,605	\$7,192	\$11,797	<b>\$22,814</b>
New Brunswick	\$9,847	\$28,181	38,028	\$5,186	\$6,190	\$11,375	<b>\$26,652</b>
Nova Scotia	\$9,757	\$27,673	37,430	\$5,138	\$7,598	\$12,736	<b>\$24,695</b>
Population-weighted national average	\$10,189	\$27,745	\$37,934	\$5,357	\$5,629	\$10,987	<b>\$26,947</b>

**Figure 8: Average 10 year fuel & maintenance costs of ICEVs and BEVs per household.**



When comparing fuel and maintenance costs for the estimated vehicle life (250,000km), we divided 250,000km by the average distance driven per year for each province. we used an annual inflation rate of 2% for the cost of fuel and maintenance for both vehicle types (See Table 10 & 11 in Appendix).

**Figure 9: Lifetime Savings in Fuel and Maintenance of the Volkswagen Golf EV & Kia Soul EV**



## Discussion

The results in Tables 3 and 4 make clear that the considerable reductions in operating expenses accompanying the choice of a BEV can more than offset its higher initial cost.

Although depreciation and insurance are also significant costs of automobile ownership, we have not included them in this study because we lack long term data. Although some early BEV models did suffer high rates of initial depreciation, this was chiefly because rapid improvements in battery technology have greatly improved the performance of more recent cars. As the field matures and battery performance plateaus, we can expect that the mechanical depreciation rates of BEVs may come to match those of ICE cars. Indeed, because EV drivetrains are much simpler in design with significantly less moving parts as ICE drive trains, it seems likely that most BEVs will depreciate even more slowly than ICE cars. Of even more relevance, as the effects of global warming become ever more severe and carbon taxes are raised ever higher, reselling ICE cars may become virtually impossible while this is unlikely to be true of BEVs.

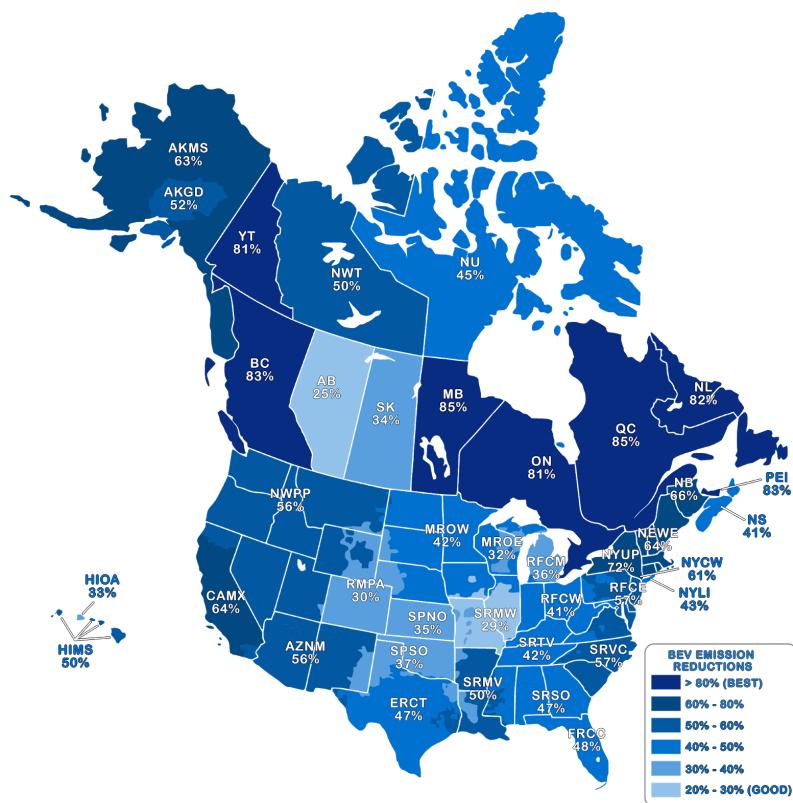
Insurance costs of ICE and BEV cars are now roughly the same. However, as BEVs come to incorporate ever more sophisticated self-driving features, it is predicted that these will significantly reduce the BEV accident rate, perhaps leading to a reduction in accident insurance rates.

## Conclusion

From a financial perspective, BEVs save Canadian households on average about 71% in fuel and maintenance costs. Using the four vehicles in our comparison model, this translates into 10 years household savings ranging from \$23,000 to \$36,000, or vehicle lifetime savings of \$27,000 to \$38,000 depending on which province they are used in. These savings should be factored in when comparing the purchase price of BEVs and ICEVs. Some used BEVs can be found for [under \\$18,000](#), which essentially means the car could pay for itself in fuel and maintenance savings.

Aside from financial savings, BEVs have an important role to play in transitioning away from fossil carbon as a fuel source. At a time when anthropogenic greenhouse gas emissions are skyrocketing and climate change is accelerating, the need to stop our use of fossil-fuels is becoming increasingly urgent.

Everywhere in Canada, replacing a gas vehicle with an electric one will result in a [reduction in total greenhouse gas emissions](#). This map (right) shows the life cycle reduction (for both car and fuel) in GHG emissions from replacing a gasoline vehicle with a comparable electric car.



Air quality will improve as more gas vehicles on the road are replaced with electric. According to the report "[Costs of Air Pollution in Canada](#)" by the International Institute for Sustainable Development, air pollution results in 7,700 premature deaths in Canada each year and in 2015, treating them cost

Canadians \$36 billion. The transportation sector is one of the largest air pollution sources in Canada ([G.O.C.](#), 2017.)

Although we hope that some will find that this economic analysis helps them to appreciate the cost advantages of purchasing a BEV, we feel that it is important to point out that, for most of those who have already purchased BEVs, saving money was not the major goal. Some may have "gone EV" to reduce their personal GHG contribution as well as eliminating more common air-pollutants such as ozone, unburned hydrocarbons and nitrogen and sulphur oxides. But probably many more "went electric" because of the improved driving experience: not just the silence but the instant acceleration. There was also the increased reliability of the simplified drive train and, in addition, many liked the fact that they could "fuel-up" at home or drive in HOV lanes without needing a second or third occupant. Whatever the reason, they were all soon aware that they were part of the wave of the future. We hope you are able to join them soon.

## Recommendations

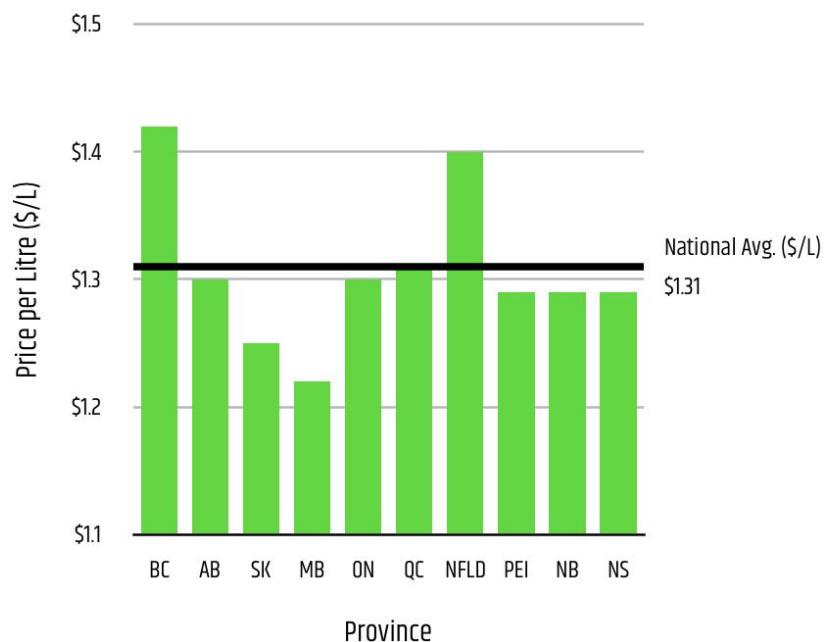
Electric Vehicles not only cost less to operate than their gas powered equivalents, but they are an essential tool in reducing greenhouse gas emissions and transitioning away from fossil-fuels. We need to reduce our carbon footprints as quickly as possible if we are to avert catastrophic climate change. The 2 Degrees Institute recommends not delaying your transition to the new electrified transportation era, especially if you live in an area that has an electrical grid powered primarily by renewable energy.

If you live in an area that still uses a high percentage of fossil-fuels to power the electrical grid (ie: Alberta and Saskatchewan), installing solar panels on your roof or buying your electricity from green sources will substantially reduce the carbon footprint of operating your electric vehicle.

# Appendix

**Table 5/Figure 10: Average regular unleaded gasoline prices by province (August, 2018).**

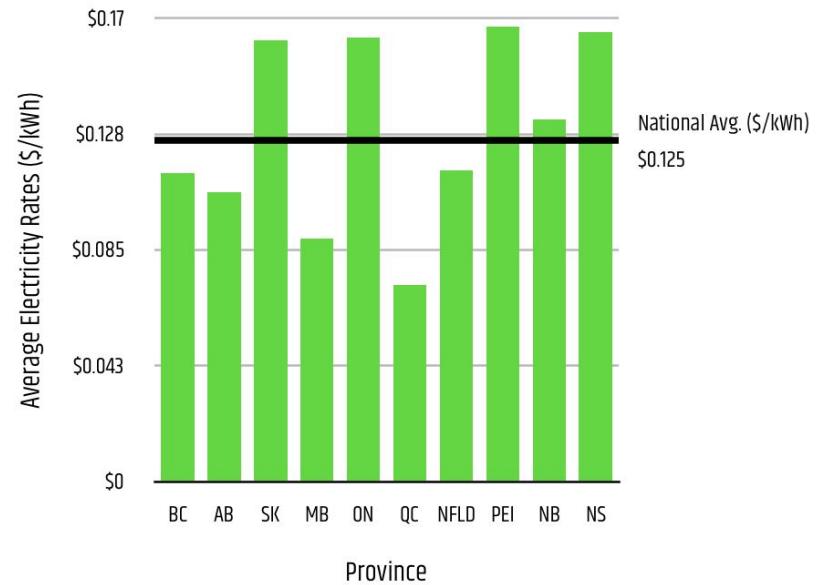
Province	Price (\$/L)
British Columbia	\$1.42
Alberta	\$1.30
Saskatchewan	\$1.25
Manitoba	\$1.22
Ontario	\$1.30
Quebec	\$1.31
Newfoundland	\$1.40
PEI	\$1.29
New Brunswick	\$1.29
Nova Scotia	\$1.29
Population-weighted national average	\$1.31



Source: [Gasbuddy.com](https://gasbuddy.com), August, 2018

**Table 6/Figure 11: Average provincial electricity rates.**

Province	Price (\$/kWh)*
British Columbia	\$0.113
Alberta	\$0.106
Saskatchewan	\$0.162
Manitoba	\$0.089
Ontario	\$0.163
Quebec	\$0.072
Newfoundland	\$0.114
PEI	\$0.167
New Brunswick	\$0.133
Nova Scotia	\$0.165
Population-weighted national average	\$0.125



Source: [Hydro Quebec](https://hydroquebec.com), 2017 \*rates increased by 2% to estimate 2018 prices

**Table 7: Average fuel economy of vehicles.**

ICEVs				BEVs			
Type	Class	Curb weight (kg)	l/100km	Type	Class	Curb weight (kg)	kWh/100km
2018 Volkswagen Golf 5D hatchback	compact	1,362	8.47	2018 Volkswagen E-Golf 5D hatchback	compact	1,553	17.40
2018 Kia Soul EX 5D	Small wagon	1,434	8.70	2018 KIA Soul EV 5D hatchback	Small wagon	1,491	19.26
Average		1,398	8.59	Average		1,522	18.33

Source: [US Department of Energy \(fueleconomy.gov\)](http://US Department of Energy (fueleconomy.gov))

**Table 8: Averaged vehicle and maintenance costs per km by province.**

Province	ICEV Costs (\$/km)			BEV Costs (\$/km)			Savings per km
	Fuel	Maint.	Total	Fuel	Maint.	Total	
British Columbia	\$0.121	\$0.041	\$0.163	\$0.021	\$0.022	\$0.043	<b>\$0.120</b>
Alberta	\$0.111	\$0.046	\$0.157	\$0.019	\$0.024	\$0.043	<b>\$0.114</b>
Saskatchewan	\$0.107	\$0.043	\$0.150	\$0.030	\$0.023	\$0.052	<b>\$0.098</b>
Manitoba	\$0.105	\$0.040	\$0.145	\$0.016	\$0.021	\$0.037	<b>\$0.107</b>
Ontario	\$0.111	\$0.041	\$0.152	\$0.030	\$0.022	\$0.051	<b>\$0.101</b>
Quebec	\$0.113	\$0.040	\$0.153	\$0.013	\$0.021	\$0.035	<b>\$0.118</b>
Newfoundland	\$0.120	\$0.042	\$0.162	\$0.021	\$0.022	\$0.043	<b>\$0.119</b>
PEI	\$0.110	\$0.037	\$0.148	\$0.031	\$0.020	\$0.050	<b>\$0.097</b>
New Brunswick	\$0.111	\$0.039	\$0.149	\$0.024	\$0.020	\$0.045	<b>\$0.105</b>
Nova Scotia	\$0.110	\$0.039	\$0.149	\$0.030	\$0.020	\$0.051	<b>\$0.098</b>
Population-weighted national average	\$0.113	\$0.041	\$0.154	\$0.023	\$0.022	\$0.045	<b>\$0.109</b>

Source: [Vincentric 2018, GasBuddy 2018, Hydro Quebec 2017 \(average of the Kia Soul & VW Golf BEV & ICEV versions.\)](http://Vincentric 2018, GasBuddy 2018, Hydro Quebec 2017 (average of the Kia Soul & VW Golf BEV & ICEV versions.))

**Table 9: Percent savings on fuel costs by operating a BEV over an ICEV.**

Province	Fuel Savings	Province	Fuel Savings
British Columbia	83%	Quebec	88%
Alberta	83%	Newfoundland	83%
Saskatchewan	72%	PEI	72%
Manitoba	85%	New Brunswick	78%
Ontario	73%	Nova Scotia	73%
Population-weighted National average	80%		

**Table 10: Lifetime costs of fuel & maintenance (average costs of Kia Soul & VW Golf).**

Province	ICEV costs*			BEV costs*			Lifetime Savings*
	Fuel	Maint.	Total	Fuel	Maint.	Total	
British Columbia	\$36,544	\$12,446	\$48,990	\$6,243	\$6,544	\$12,787	<b>\$36,203</b>
Alberta	\$32,465	\$13,281	\$45,746	\$5,665	\$6,968	\$12,632	<b>\$33,113</b>
Saskatchewan	\$31,101	\$12,592	\$43,693	\$8,643	\$6,614	\$15,257	<b>\$28,436</b>
Manitoba	\$30,868	\$11,628	\$42,496	\$4,782	\$6,120	\$10,903	<b>\$31,594</b>
Ontario	\$32,310	\$11,901	\$44,210	\$8,680	\$6,259	\$14,939	<b>\$29,272</b>
Quebec	\$33,298	\$11,978	\$45,276	\$3,927	\$6,301	\$10,228	<b>\$35,048</b>
Newfoundland	\$34,101	\$12,035	\$46,136	\$5,962	\$6,325	\$12,287	<b>\$33,849</b>
PEI	\$32,250	\$10,888	\$43,137	\$8,963	\$5,740	\$14,703	<b>\$28,434</b>
New Brunswick	\$32,387	\$11,316	\$43,703	\$7,113	\$5,960	\$13,073	<b>\$30,630</b>
Nova Scotia	\$31,819	\$11,219	\$43,038	\$8,736	\$5,908	\$14,644	<b>\$28,394</b>
Population-weighted national average	\$33,001	\$12,120	\$45,120	\$6,696	\$6,372	\$13,068	<b>\$32,052</b>

\*Estimated 250,000km vehicle lifespans

**Table 11: Lifetime costs of fuel & maintenance of the Kia Soul ICEV & EV.**

Province	Kia Soul ICEV costs*			Kia Soul BEV costs*			Lifetime Savings*
	Fuel	Maint.	Total	Fuel	Maint.	Total	
British Columbia	\$37,044	\$14,219	\$51,263	\$6,560	\$6,946	\$13,507	<b>\$37,756</b>
Alberta	\$32,909	\$15,424	\$48,333	\$5,953	\$7,412	\$13,365	<b>\$34,968</b>
Saskatchewan	\$31,527	\$14,501	\$46,028	\$9,082	\$7,028	\$16,110	<b>\$29,918</b>
Manitoba	\$31,291	\$13,175	\$44,465	\$5,025	\$6,490	\$11,515	<b>\$32,950</b>
Ontario	\$32,752	\$13,575	\$46,327	\$9,121	\$6,642	\$15,763	<b>\$30,563</b>
Quebec	\$33,754	\$13,631	\$47,384	\$4,127	\$6,685	\$10,812	<b>\$36,572</b>
Newfoundland	\$34,568	\$13,801	\$48,369	\$6,266	\$6,717	\$12,982	<b>\$35,387</b>
PEI	\$32,691	\$12,192	\$44,883	\$9,419	\$6,077	\$15,496	<b>\$29,387</b>
New Brunswick	\$32,830	\$12,766	\$45,597	\$7,475	\$6,316	\$13,791	<b>\$31,805</b>
Nova Scotia	\$32,255	\$12,671	\$44,926	\$9,180	\$6,262	\$15,442	<b>\$29,484</b>
Population-weighted national average	\$33,452	\$13,847	\$47,299	\$7,036	\$6,764	\$13,800	<b>\$33,499</b>

\*Estimated 250,000km vehicle lifespans

**Table 12: Lifetime costs of fuel & maintenance of the Volkswagen Golf ICEV & EV.**

Province	Volkswagen Golf ICEV costs*			Volkswagen Golf BEV costs*			Lifetime Savings*
	Fuel	Maint.	Total	Fuel	Maint.	Total	
British Columbia	\$36,044	\$10,673	\$46,717	\$5,926	\$6,142	\$12,067	<b>\$34,650</b>
Alberta	\$32,021	\$11,138	\$43,159	\$5,377	\$6,523	\$11,900	<b>\$31,258</b>
Saskatchewan	\$30,676	\$10,683	\$41,359	\$8,204	\$6,200	\$14,403	<b>\$26,955</b>
Manitoba	\$30,446	\$10,081	\$40,527	\$4,539	\$5,751	\$10,290	<b>\$30,237</b>
Ontario	\$31,868	\$10,227	\$42,094	\$8,239	\$5,875	\$14,114	<b>\$27,980</b>
Quebec	\$32,842	\$10,325	\$43,167	\$3,727	\$5,917	\$9,645	<b>\$33,523</b>
Newfoundland	\$33,635	\$10,268	\$43,903	\$5,659	\$5,932	\$11,592	<b>\$32,311</b>
PEI	\$31,808	\$9,583	\$41,392	\$8,508	\$5,402	\$13,910	<b>\$27,482</b>
New Brunswick	\$31,944	\$9,866	\$41,810	\$6,752	\$5,604	\$12,355	<b>\$29,454</b>
Nova Scotia	\$31,384	\$9,767	\$41,151	\$8,292	\$5,554	\$13,845	<b>\$27,305</b>
Population-weighted national average	\$32,549	\$10,392	\$42,941	\$6,355	\$5,980	\$12,336	<b>\$30,605</b>

\*Estimated 250,000km vehicle lifespans

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## About the 2 Degrees Institute

The 2 Degrees Institute's mission is to develop and support strategies that empower people to make the behavioural and lifestyle changes needed to keep our planet from warming by 2 degrees Celsius above pre-industrial levels. Find out more about the 2 Degrees Institute by visiting [www.2degreesinstitute.org](http://www.2degreesinstitute.org).

The Electric Pledge is a campaign of the 2 Degrees Institute to accelerate the adoption of zero emission transportation by encouraging people to take the pledge that their next vehicle purchase will be an electric one. Find out more at [www.electricpledge.org](http://www.electricpledge.org).

This report can be downloaded online at:

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