Sustainable Gabriola electric vehicle initiative

This initiative stems from an online event on May 26th at which about 25 Gabriolans gathered to discuss ways in which we can reduce our carbon emissions, wth the goal of reducing emissions to one-half of what they were in 2020, by 2030. The session was supported by the library and Sustainable Gabriola and facilitated by Dawn Moorhead of the North Island Climate Hub. The participants focussed on a range of actions, including:

- increasing the level of active transportation (walking, cycling, bus, etc.),
- increasing the proportion of electric vehicles,
- retrofits to buildings,
- shifting away from fossil fuel heating (propane, fuel oil), and
- further reducing the amount of our organic waste that ends up in the landfill.

The discussion was informed using a planning tool at https://www.communityenergy.ca/climate-action-planner/, which anyone is free to use to discover the effects of making changes to how we do things on Gabriola. Using the tool—which doesn't include some important things like ferries and the climate cost of food choices—we found that the most effective path forward is to dramatically increase the proportion of electric vehicles on Gabriola, with a goal of 50% EVs on Gabriola by 2030. That will take a sustained communty effort. We will also have to augment our vehicle charging infrastructure.

The initiative was discussed at the June 27th meeting of Sustainable Gabriola. It was proposed that the first stage of the initiative should be about dissemintating information on electric vehicles (both electric cars and electric bicycles). (See below for some of the questions that might need to be answered.) This should take several forms, including:

1) written information on the SG website,
2) articles in the Sounder,
3) a face-to-face session at the Library or some other venue, and
4) an electric vehicle information event (outdoors) where current EV owners can share their experiences with those that are interested.

A second stage might include providing incentives for Gabriolans to purchase EVs, since they are still quite a bit more expensive to buy than fossil-fuel vehicles. This could involve loan funding from Island Futures and the Gabriola Community Investment Co-op, and we should also look for external funding.

Some "commonly asked" questions about EVs are provided in the following pages, along with some answers based on my research. If you have questions that are not asked here, or if you have better answers than what I've provided, please let me know (steven.earle@viu.ca).

Some common questions about EVs (and answers according to Steve)

1) What new EVs are available in Canada now? What do they cost and how far do they go?

The numbers in the table below are up to date as of mid-2021.

Make	Model	km range*	EV price**	FF price†
BMW	i3	246	$ 44,950	
Chevrolet	Bolt	417	$ 38,198	
Ford	Mustang-Mach E	418	$ 50,495	
Hyundai	Kona	415	$ 44,999	
Hyundai	IONIQ	274	$ 41,449	
Hyundai	IONIQ-plug-in hybrid	47#	$ 33,749	
Jaguar	I-pace	470	$ 99,800	
Kia	Niro	385	$ 44,995	$ 26,845
Kia	Soul	383	$ 42,995	$ 21,195
Mini	Cooper SE	183	$ 40,990	$ 23,490
Mitsubishi	I-MiEV	150	$ 27,998	
Nissan	Leaf	363	$ 44,298	
Tesla	Model-S	628	$ 113,600	
Tesla	Model-3	468	$ 44,999	
Toyota	Prius-plug-in hybrid	40#	$ 33,550	$ 29,150

*range indicated by manufacturer

**Canadian sticker price, doesn't include taxes etc., nor rebates (federal & provincial rebates range up to ~$8,000)

† The price for the equivalent model with a fossil-fuel engine (the average difference for the 3 pure EVs is $19,150)

for the two plug-in hybrids the ranges shown are "electric-only", electric + gas range is ~1000 km

2) What is the market like for used EVs, and where can they be found?

The table below shows the used EVs that are available on Vancouver Island from the Motorize dealer in Sidney. There are also numerous EVs at other dealers and for private sale. All of these vehicles are likely to have lower ranges than the ones in the table above because they are older models, and because their batteries have lost some capacity.

Model	Price range	Number available in July 2021*
Leaf	$14,000 to $40,000	9
Tesla 3	$50,000 to $75,000	4
Soul	$20,000 to $50,000	2
Prius-PIH	$30,000	1
Niro	$43,000	1
i3	$20,000	1

*From Motorize in Sidney (which has a large selection of used EVs)

3) What is the typical annual maintenance cost of an EV?

According to Logtenberg et al., 2018*, the average annual maintenance cost for an EV in Canada is $489. This average is $931 for a similar fossil-fuel vehicle, so the difference is $442.

*Logtenberg, R, Pawley, J, and Saxifrage, B, 2018, Comparing fuel and maintenance costs of electric and gas-powered vehicles in Canada, Report for the 2° Institute, available at: https://www.2degreesinstitute.org/reports/comparing_fuel_and_maintenance_costs_of_electric_and_gas_powered_vehicles_in_canada.pdf

4) What does it cost (per km) to charge an EV at home, and how does that compare with the cost of fuel for a fossil fuel vehicle?

The average fossil-fuel vehicle consumes 9L/100km. At $1.50/L it costs $13.50 to drive 100 km. The average EV consumes 16 kWh of electricity per 100 km. The price of power at home from BC Hydro is ~$0.10/kWh, thus, if you charge at home, it costs $1.60 to drive 100 km. There are lots of places where you can charge for free, so that can bring the cost down. But if we assume that you charge at home, and that you drive 20,000 km/y (which is less than the average of 22,500 km for drivers in Canada), then the annual saving is $2380.

5) What is the 10-year difference in fuel and maintenance costs of an EV versus a fossil-fuel vehicle?

If you own a car for 10 years, then an EV will save you a total of about $28,220 in fuel and maintenance costs over that period. That more than offsets the difference in purchase costs, which averages out to $19,150 (not including any rebates) using the numbers for pure EVs provided in the answer to question 1. This comparison doesn't take inflation into account, which would make the savings even greater.

6) What does it cost to install an EV charger at home, and what's needed?

It costs around $2,000 to purchase and install a level 2 charger at home, although that can vary depending on the situation in your home. A 50% rebate is available from BC Hydro in July 2021.

7) How long does an EV battery last?

In most new EVs the batteries have an 8 to 10 year warranty. It is expected that battery performance will start to degrade after about 8 years. Battery life can be compromised if the car is used in a hot climate (not our climate most of the time!), and if it has been frequently charged with a Level III fast DC charger.

8) Can I replace the battery in an older EV? At what cost?

It is expensive to replace a battery in an older EV ($10,000 to $15,000, more for one with higher capacity) and there are some issues with availability.

9) What happens to used EV batteries? Can they be re-purposed or re-cycled?

Degraded EV batteries can be re-purposed into energy storage units for a variety of purposes, including in-home use. Batteries that cannot be re-purposed can be dismantled and the valuable materials recovered. This is being done on a limited scale now, and more plants are being built.

10) What are some of the ethical and environmental issues around EVs and their batteries?

Li-ion batteries include significant and variable amounts of copper, nickel, cobalt, aluminum and lithium. Some of those metals are in relatively short supply and some of them have associated ethical issues (e.g., dangerous mining conditions, use of water that should be available for people, pollution of water sources) and environmental issues.

11) What is the life-time environmental cost of an EV compared with a fossil-fuel vehicle?

A mid-size Li-ion car battery weighs in the order of 200 kg, and so includes several tens of kilograms each of metals such as copper, nickel, cobalt and aluminum and lithium. These are not significantly toxic materials, and if the battery is re-used or re-cycled they have almost no environmental impact. A fossil-fuel car driven for 22,500 km/y (which is the national annual average) emits about 27,000 kg of CO_2 over ten years, along with a number of other climate-changing gases (methane, ozone, nitrous oxide), as well as some toxic volatile organic compounds, and particulate matter. The engine from a mid-sized car weighs a little under 200 kg; most are recycled when the vehicle is scrapped.