

What Electric Vehicle Should You Buy?

Re-Energy
Learner Worksheet
Grade Level 7-12



Name(s): _____

Junior Activities

There is a lot of information in the backgrounder and the catalogue. So, let's break it down and look at the number of things you have to consider in buying an electric car:

- How big is your family? Look at the fourth column (number of seats). Eliminate any cars that are too small for your family.
- What is the most expensive electric car?
- What is the least expensive electric car?
- Which of these electric cars, if any, might fit your family budget? (Ask one of your parents)
 - Eliminate all the cars that are too expensive (retail price) for your family.
- How far an electric car can go before it needs to be recharged (battery range (km)) is a big factor. What is the longest car trip your family takes? Can any of the cars make the trip without recharging?

Senior Activities

Step 1: Analyze your scenario

- Select an EV that you are interested in and take note of the vehicle's battery capacity and vehicle range.
- You can select a scenario previously listed or research how many kilometres your family drives per year on average.

Tip: Try to maintain a total budget of \$50,000 for the vehicle and \$5000 max for yearly operation costs.

Step 2: Impact Analysis

A. Operating Cost of an EV

For the purpose of this exercise, we will only assume that the “operating cost” refers to the price of fuel (gasoline or diesel) compared to the price of charging your EV (electricity). For now, we will ignore things like oil changes, etc.

The cost to operate a car is an important consideration. You will calculate the cost of the electricity to drive just one kilometre.

1. The catalogue shows how many **kilowatt hours** (kWh) the battery of your car can store (Battery size kWh).
 - Find **kilowatt hours** for your car: _____
2. The chart also shows how far the car can go on one full battery charge (Battery Range (km)).
 - Find the **range** of your car: _____
3. Divide the kilowatt hours by the range to find out how many kilowatts your car uses to go 1 km.
 - **kWh to drive 1 km** = kilowatt hours/range _____
4. Now calculate how much that electricity costs. Different provinces and territories in Canada have different prices for electricity. Look up the cost of electricity (in cents) where you live.

To get the **cost to drive one kilometre**. Multiply the **kWh to drive 1 km X cost of electricity** _____

This should turn out to be just a few cents. For example, the Audi e-Tron costs 2.96875 cents per km. But who only drives 1 kilometre?

First, you must determine how many kilometres your family or assigned scenario typically drives in a year.

Tip: If you are calculating for your own family, ask a parent or sibling. If they are not sure you can assume an average of 15,000 kilometres. This will be useful as we calculate the annual electricity used below.

1. Calculate the **annual electricity cost** of your car.
 - Multiply the average annual kilometers per year by your car’s cost per kilometer:

Tip: For comparison an average gas-powered car costs about \$900 per year in gas.

B. Greenhouse Gas Produced

One of the biggest reasons people are now choosing electric vehicles is to reduce their production of greenhouse gases (GHG) which are causing climate change. Burning gasoline produces greenhouse gases and generating the electricity to go into electric cars produces greenhouse gases. Let's do a comparison:

Like the cost of electricity, the GHG created while generating electricity varies widely province by province due to the different ways, we produce electricity. For example, if you look at a province that burns coal or natural gas you will have much higher greenhouse gas emissions compared to a province which relies mostly on hydroelectric. The amount of GHG is measured in grams of carbon dioxide per kilowatt hour (g CO₂ per kWh).

Province	GHG (CO ₂ per kWh)
AB	790.0
BC	12.9
MB	3.4
NB	280.0
NL	32.0
NS	600.0
ON	40.0
PE	20.0
QC	1.2
SK	660.0

Find the amount of GHG produced by your electric car in one year:

1. Find the **kWh to drive 1 km** (already done in **Step 2: Operating Cost, Question 3**):

2. Assuming your drive 15,000 km per year, calculate the **annual kWh**:

3. Finally multiply the **annual kWh X GHG (g CO₂ per kWh)** for your province from the chart) = _____ g CO₂ per year.
4. Divide by 1000 to convert grams to kilograms _____ kg CO₂ per year.

The Audi e-Tron produces 142.5 kg CO₂ per year.

For comparison, just 1 litre of gasoline produces 2300 g CO₂ and an average gas-powered car produces 2500 kg CO₂ per year.

C. Your family's current vehicle

We know a lot more about the EV we picked out, but what does this mean compared to your family's new vehicle now? Using the Natural Resources Canada Database,

<https://fcr-ccc.nrcan-rncan.gc.ca/en>

find your family's vehicle and its fuel consumption (L/100km) for your internal combustion engine. Sometimes you will find multiple fuel economies for one vehicle, city driving, highway driving and an average. If given these options go with the average.

1. Use the same number you used for **Annual kilometres** before and multiply it by the **fuel economy (L/100 kms)** you found on the Natural Resources Canada website in order to find your **Annual Fuel Consumption:** _____
2. Now that you know your **annual fuel consumption**, you can calculate approximately how much fuel your family buys per year.
Multiply the average cost of gasoline in your local area by your **annual kilometres** in order to get your **operating cost** _____
3. Using the same [Natural Resources Canada database](#) again, find your family's vehicle and its emissions intensity, which is listed in grams of carbon dioxide per kilometre (gCO₂/km), to determine your family's personal vehicle's emissions.
Multiply the **emission intensity** by your family's expected **annual kilometres** in order to determine how much gCO₂ your family's vehicle annual GHG emissions _____.

Step 3: Determining Your Choice!

Wow! We now have lots of information figured out. Let's compare our options and see which vehicle makes more sense for our vehicle. There may be some government incentives in your home province, feel free to research what is available to save yourself some money. Use the chart to help make your decision:

	Electric Vehicle	Internal Combustion Engine
Purchase Price (+)		
Annual Operating Cost (+)		
Government Incentive (-)		
Total Cost (=)		
GHG Emissions		

Step 4: Presenting Your Choice

With all the information you have collected, which vehicle fits your family's needs best and why? Is it because you want to reduce your environmental footprint? Is it because you have range anxiety? Or maybe you just picked a vehicle because it looks cool!

Present your decision to your educator, family, peers, or other members of the learning community. Possible presentation ideas include PowerPoint, poster, Prezi, etc.

Extension Idea

- What would your emissions be if you moved to another province? It could be a province where you used to live or where you have family. You can choose a province that creates their electricity from mostly different natural resources than your home province, such as coal, natural gas, nuclear or hydro. Does this effect your decision to keep your internal combustion engine or switch to an EV?

