EMOTIVE EV 101

- **Emotive Campaign**
- Key Discussions
  - Cost of Ownership
  - Charging Infrastructure
  - Variety & Availability
  - Range Anxiety
  - Environmental Benefits
  - Cold Weather

BRITISH COLUMBIA | cleanBC GO ELECTRIC | Plug In BC | Fraser Basin Council

EMOTIVE CAMPAIGN

Emotive is one of a suite of programs offered under the Province of BC's CleanBC Go Electric Program.

The Emotive program is funded through the Ministry of Energy, Mines and Low Carbon Innovation and is administered by the Fraser Basin Council Society.

Photo: Dave Heath, Accelerate Kootenays.

The Electric Vehicle Experience

Emotive promotes electric vehicles through *experience* by focusing on their tactile and emotional appeal.

Photo: Dave Heath, Accelerate Kootenays.

The Electric Vehicle Experience

- **Fun and powerful**
  - Instant torque, smooth acceleration, great handling and braking from battery positioning and regen braking.
- **Reduce emissions big time**
  - Reduced operating emissions make up for any extra manufacturing emissions. No GHGs once driving in B.C.
- **Lower total cost of ownership**
  - EVs are super efficient. Electricity to drive electric costs way less than gas. Less maintenance and fewer parts to replace.

Key research findings *(back in 2014)*

- **Awareness** of EVs was low.
- People bought cars **emotionally**.
- The most persuasive messengers were **current owners**.
- People were much more likely to consider an EV if they had **first-hand experience.**
- EV drivers loved the **power, performance and speed** of their cars the most!

Drive Electric Week, 2014.

Key research findings
(BC focused, 2020)

- The majority of British Columbians have seen an EV in person
- Half of British Columbians said that one of their family, friends or neighbours has an EV
- Personal experience related to having driven or being a passenger in an EV is still low.

Emotive #LiveElectric Story, 2021.

Key research findings
(BC focused, 2020)

- Familiarity with electric vehicles and associated technology ranked highly*
- The main reason listed for not yet purchasing an EV is that the price of the vehicle is too high.

*Fuel Cell EV familiarity in B.C. was the lowest ranked, while BEVs, PHEVs, and Hybrid familiarity was high, averaging around 70%.

Emotive #LiveElectric Story, 2021.

The conversation is changing

- Awareness is growing. 67% of respondents said they would consider buying an EV in the future.
- People are excited by EVs and aspire to get one; they are looking for much more specific details.
- EV owners are sharing their stories from all over B.C.
- Less time is spent proving EV viability, more time is spent on demonstrations and test drives.
- More variety of new models and used EVs.

Electrafest, Vancouver, 2019.

Raising awareness throughout BC

Emotive works with communities across the province and 200 EV Ambassadors:

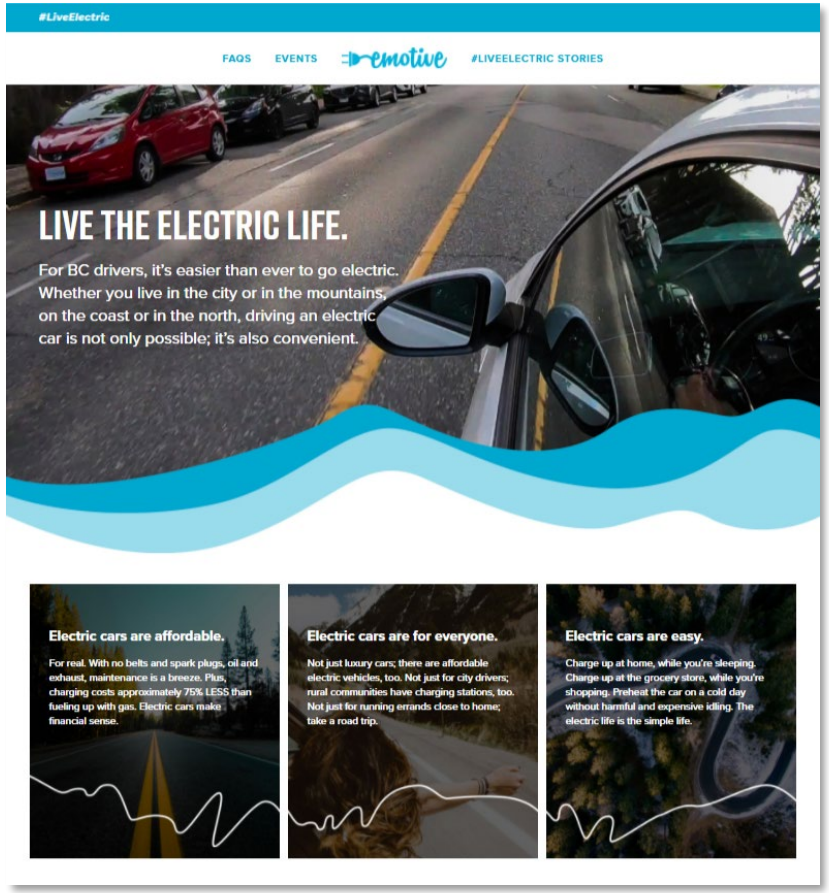
- Test drive events
- Vehicle demonstrations
- Static displays
- EV101 sessions
- Short videos
- Print/web media

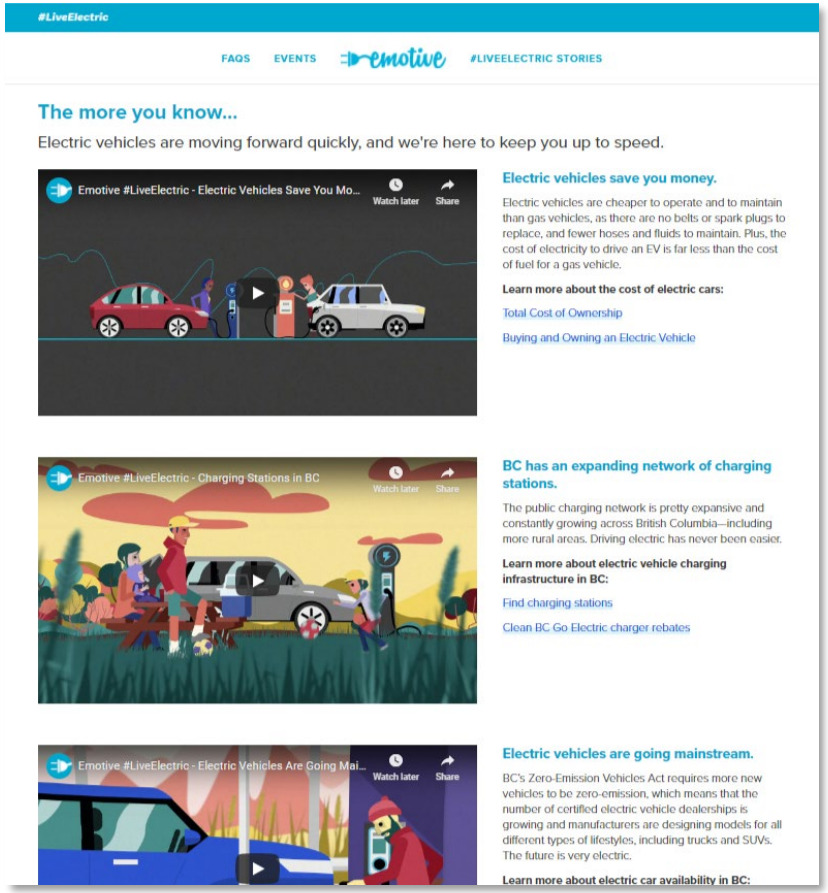
Emotive EV Ambassadors, Prince George, 2019.

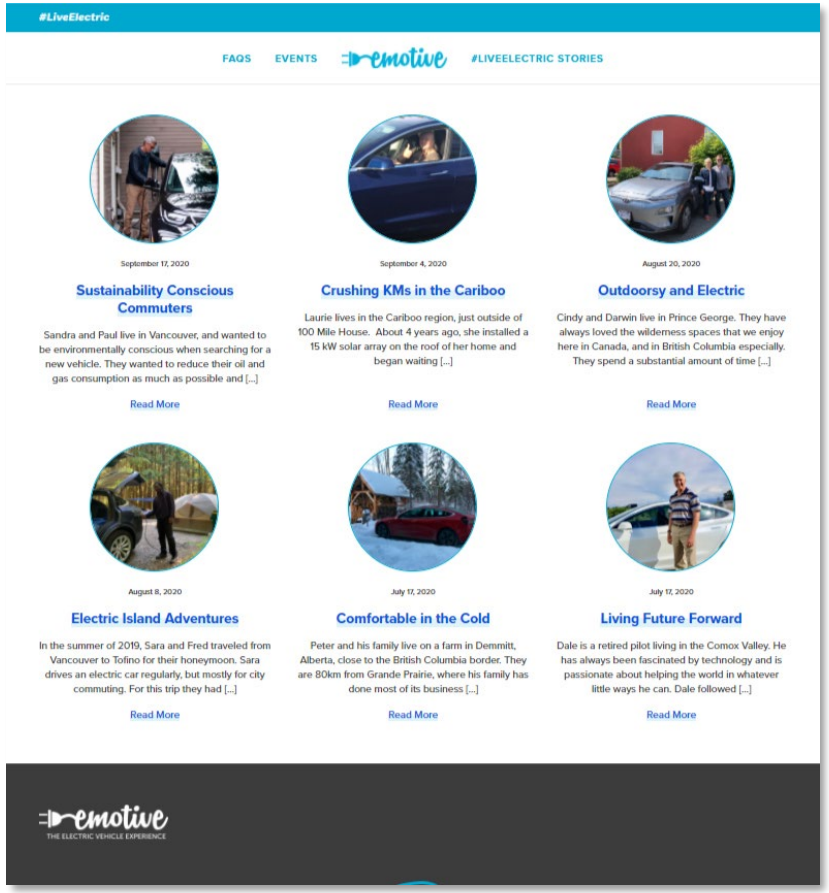
EMOTIVE CAMPAIGN: ONLINE ENGAGEMENT

Emotive Website

emotivebc.ca







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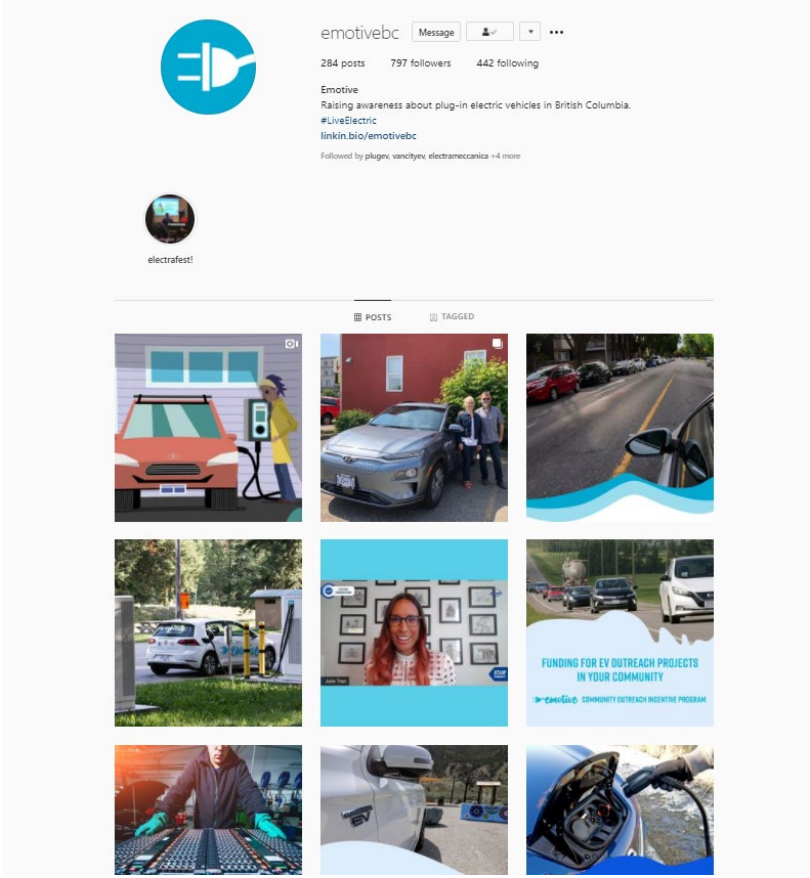
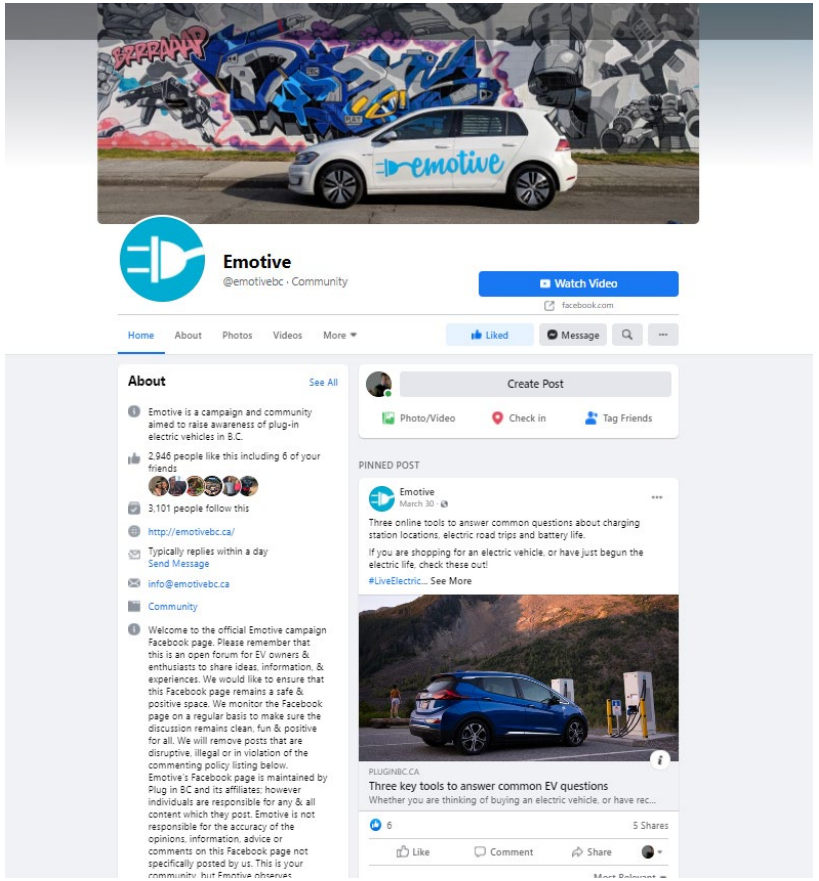
EMOTIVE CAMPAIGN: ONLINE ENGAGEMENT

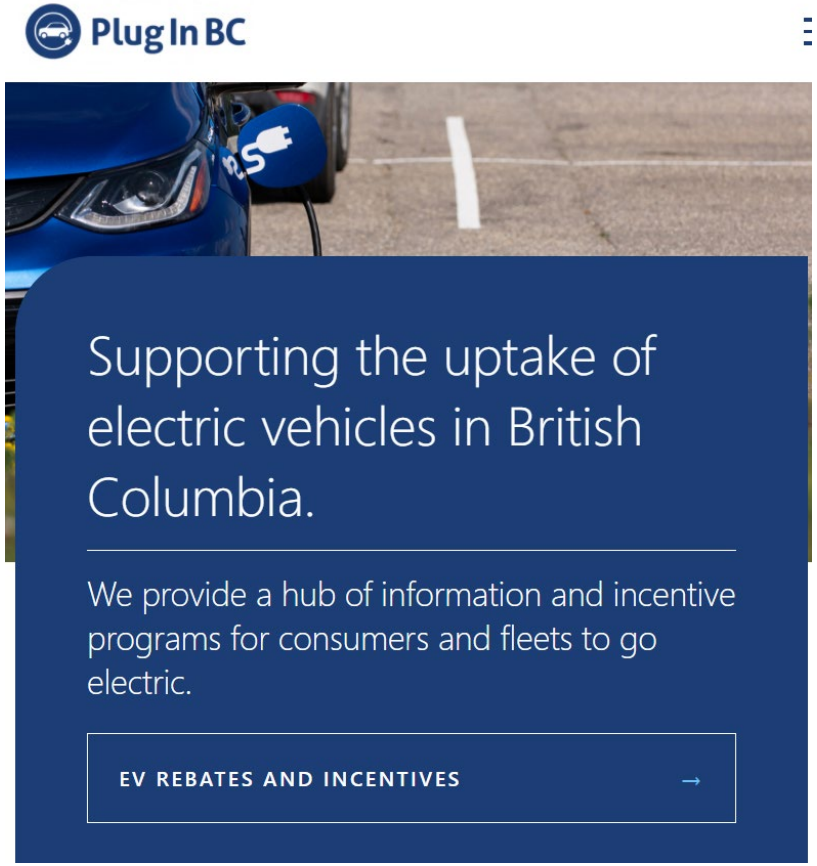
Instagram



Facebook



Plug In BC Website



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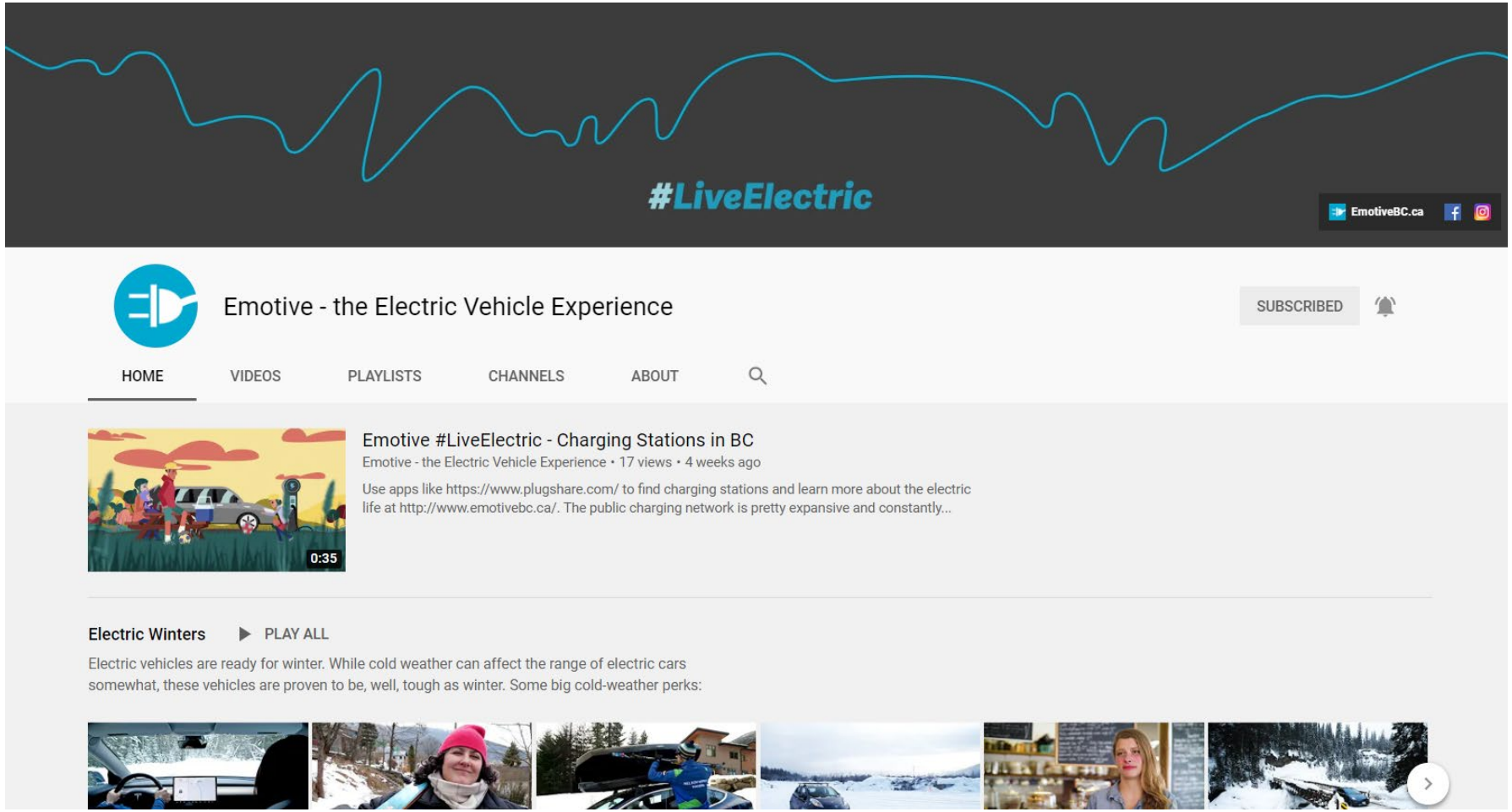
YouTube



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- Emotive Campaign
- **Key Discussions**
  - Cost of Ownership
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  - Range Anxiety
  - Environmental Benefits
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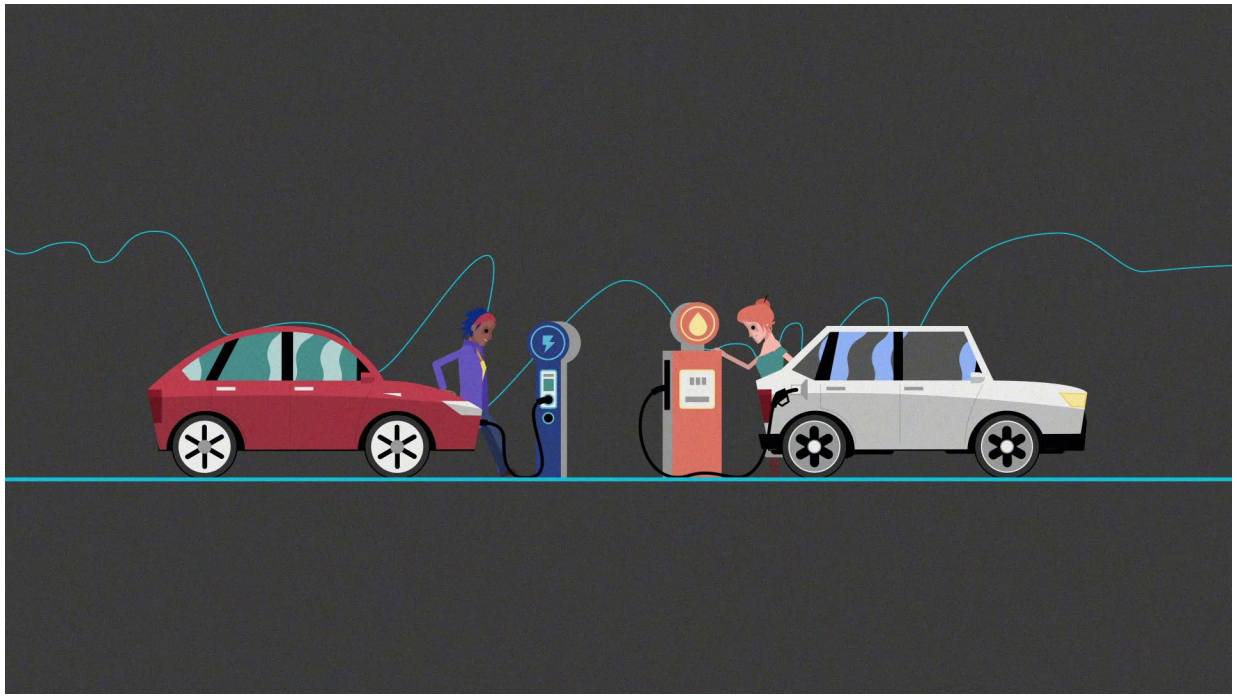
COST OF OWNERSHIP



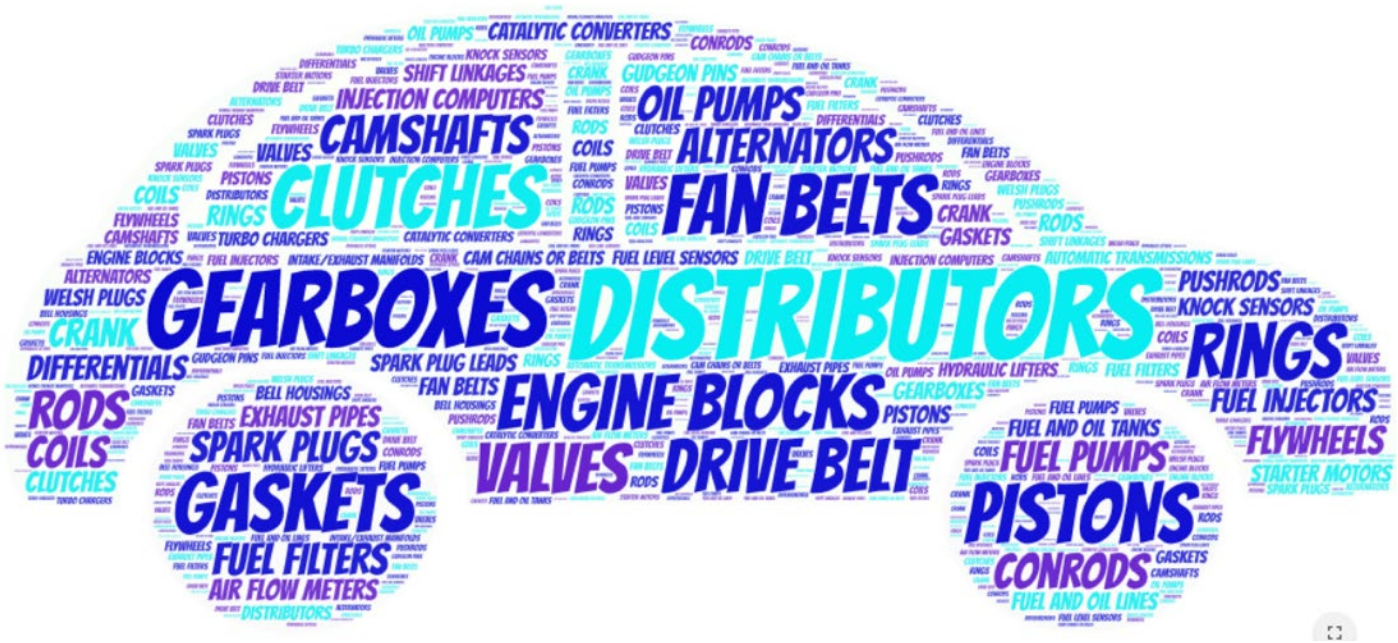
Electric vehicles save you money.

Electric vehicles are cheaper to operate and to maintain than gas vehicles, as there are no belts or spark plugs to replace, and fewer hoses and fluids to maintain. Plus, the cost of electricity to drive an EV is far less than the cost of fuel for a gas vehicle.

COST OF OWNERSHIP

COST BENEFIT

- Charging an EV typically costs $2-3 per 100km of range.
- An EV has far fewer parts to maintain. It gets rid of:
  - Thousands of engine components.
  - Spark plugs, engine oil, filters, pumps, belts and hoses.
  - The entire exhaust system.
  - Complicated AWD systems.



A gas drivetrain has 2,000+ parts. An electric system has about 20.

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COST OF OWNERSHIP

COST BENEFIT

- Out of the top 10 car repairs, none of the parts are found on an electric vehicle.
- Brake rotors and pads last longer because braking is mostly done by the electric motor (regen).

1. Replacing an oxygen sensor—$249
2. Replacing a catalytic converter—$1,153
3. Replacing ignition coil(s) and spark plug(s)—$390
4. Tightening or replacing a fuel cap—$15
5. Thermostat replacement—$210
6. Replacing ignition coil(s)—$236
7. Mass air flow sensor replacement—$382
8. Replacing spark plug wire(s) and spark plug(s)—$331
9. Replacing evaporative emissions (EVAP) purge control valve—$168
10. Replacing evaporative emissions (EVAP) purging solenoid—$184

Top 10 Car Repairs, 2015. source: Forbes.

COST OF OWNERSHIP

Volkswagen e-Golf

Potential fuel savings
$903/year

Charge cost
$2/100 km

Vehicle range
198 km

The carbon reduction is...
Like planting 139 trees every year

Tesla Model 3 Standard Range Plus

Potential fuel savings
$1,830/year

Charge cost
$2/100 km

Vehicle range
~~**401 km**~~ **420 km**

The carbon reduction is...
Like planting 237 trees every year

Based on driving 40 km per day, or 14,600 km per year. See more at https://evcalculator.bchydro.com/

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Upfront Cost Solutions

BRITISH COLUMBIA | cleanBC GO ELECTRIC

New passenger cars = $1500 - $3000

Specialty Use Vehicles = $2000 -$100,000

New passenger cars = $2500 - $5000

SCRAP-IT® BC SCRAP-IT® Program

Scrap an older car and choose:

NEW EV = $6,000
USED EV = $3,000

New or used passenger cars = $3000 - $6000

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COST OF OWNERSHIP

- The average vehicle purchase in Canada is now above $40,000.
- Popular electric vehicles are now priced near or below the average *before* rebates.

CleanBC Go Electric EV Charger Rebates

Rebates for

- Home and workplace charging stations,
- EV Ready plans for multi-unit residential buildings (MURBs),
- EV Ready infrastructure for MURBs.
- Administered by BC Hydro and Fortis BC in their respective service areas.

Single family homes:

- Up to $350, 50% of cost, to install level 2 charging station. Multi-Unit Residential Buildings + Workplaces
- Up to $2,000, 50% of cost per level 2 station.

COST OF OWNERSHIP

HOV ACCESS

- HOV access without needing to have multiple people in the vehicle.
- HOV access on provincial highways.
- Access to highways in select cities, as per the municipality.
- You must display a decal!
- Decals can be ordered on the Ministry of Transportation and Infrastructure website.

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CHARGING INFRASTRUCTURE

BC has an expanding network of charging stations.

The public charging network is pretty expansive and constantly growing across British Columbia, including more rural areas. Driving electric has never been easier.

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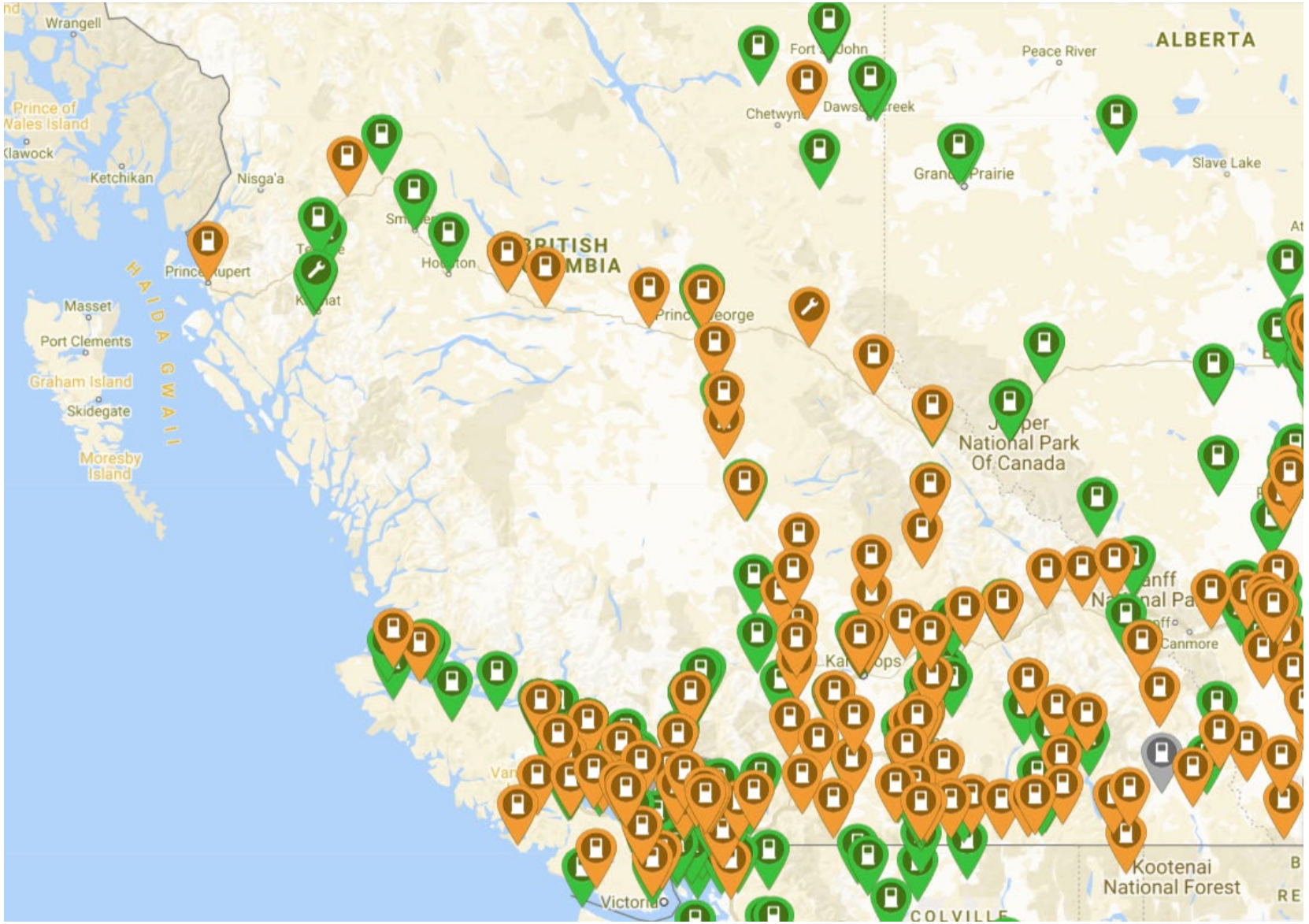
CHARGING INFRASTRUCTURE

You can use apps/websites like PlugShare.com, Chargehub or BC Hydro EV to find public charging stations.



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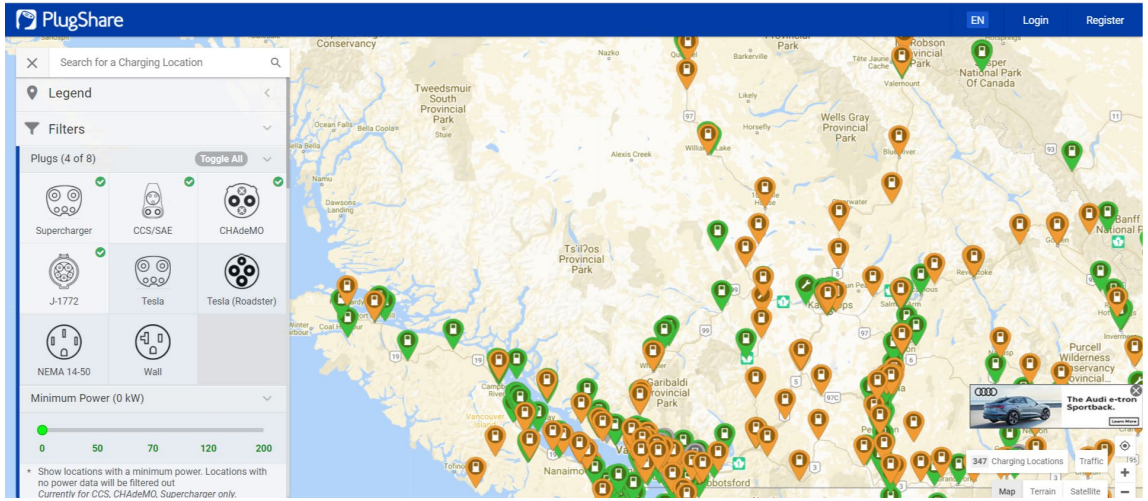
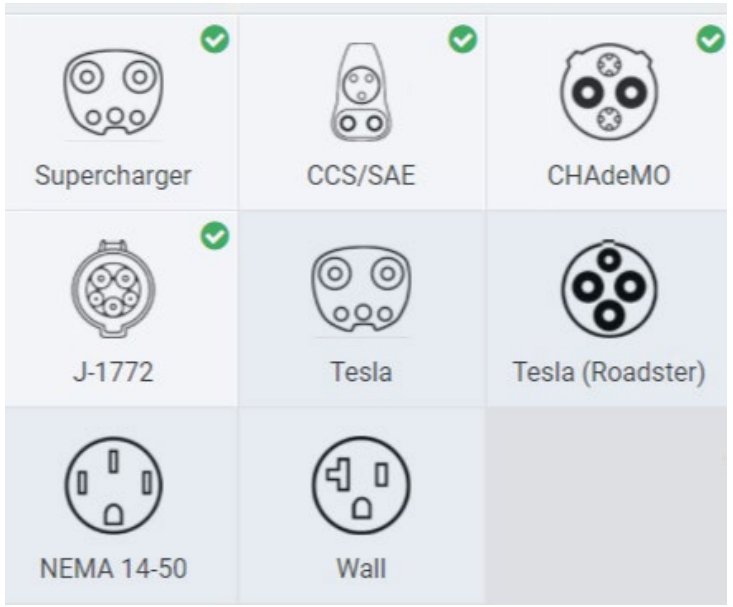
CHARGING INFRASTRUCTURE

PUBLIC CHARGING STATIONS

- Use apps/websites like PlugShare.com to find public charging stations.
- Thousands of public charging stations in BC; well over 100 fast-charging stations.
- When using an app to find charging stations, you can filter for the type of plug you need.

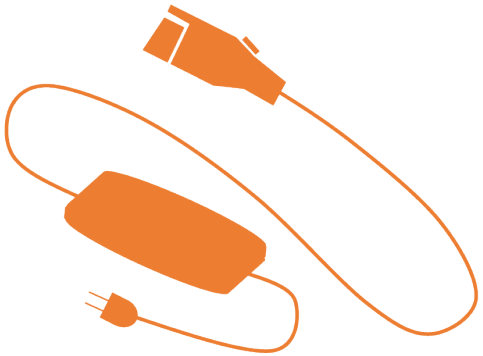




TYPES OF CHARGERS

All EVs come with a cable that plugs into a standard home wall outlet. These are known as **Level 1** chargers. They are portable and meant to be carried with the vehicle.

Vehicles can typically gain 8-10 km of driving range per hour of charging, making this the slowest charging method, *but still adequate for most daily commuters.*



CHARGING INFRASTRUCTURE

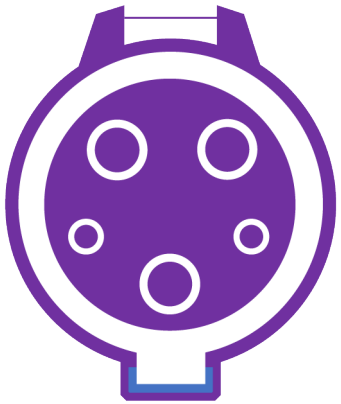
TYPES OF CHARGERS

Level 2 chargers use 240v power, just like ovens or dryers. They are commonly installed in home garages, workplaces, parkades, malls, parks and community centres.

They provide more power than a regular household outlet and most vehicles will gain 20-40km of range per hour of charging.

All **level 2** chargers use the J1772 plug (or “J-plug”) except for Tesla versions, which use the Tesla plug. Tesla vehicles can use J1772 chargers by way of a small adapter.

Rebates are available to purchase and install level 2 charging stations at home and at work.



J-1772

Tesla

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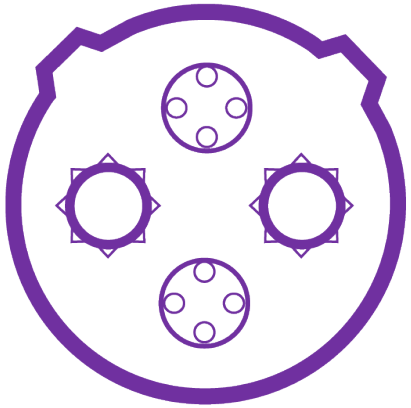
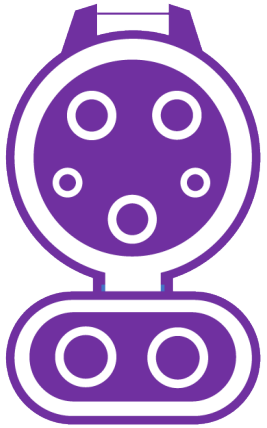
CHARGING INFRASTRUCTURE

TYPES OF CHARGERS

- **Level 3** or fast charging stations have CCS & CHAdeMO plugs. The stations are also called Direct Current Fast Chargers (DCFC).
- Most stations have one of each plug.
- Unless it is a Tesla, a vehicle capable of fast charging will use either CCS or CHAdeMO.
- Most plug-in hybrids and some older EVs do not have fast charging abilities, so they will not have CCS or CHAdeMO ports.
- Their output is measured in kilowatts (kW) ranging from 25 – 350 kW.



CHAdeMO



CCS

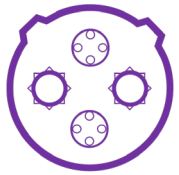
CHARGING INFRASTRUCTURE

TYPES OF CHARGERS

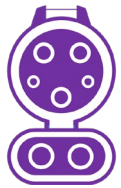
- **Tesla *Superchargers*** are high speed chargers, the counterpart to public fast charging stations.
- **Tesla *Destination Chargers*** are the equivalent of “Level 2” chargers at malls, parks, hotels, and places with longer dwelling times.
- All Tesla chargers use the same plug.
- Non-Tesla vehicles cannot use Tesla chargers.
- Teslas come with J1772 adapters, and Tesla drivers can purchase separate CHAdeMO adapters for use at public fast charging stations.

CHARGING INFRASTRUCTURE

LEVEL 3 FAST CHARGING



CHAdeMO



CCS

Tesla CHAdeMO adapter

LEVEL 2

J1772

Tesla J1772 adapter

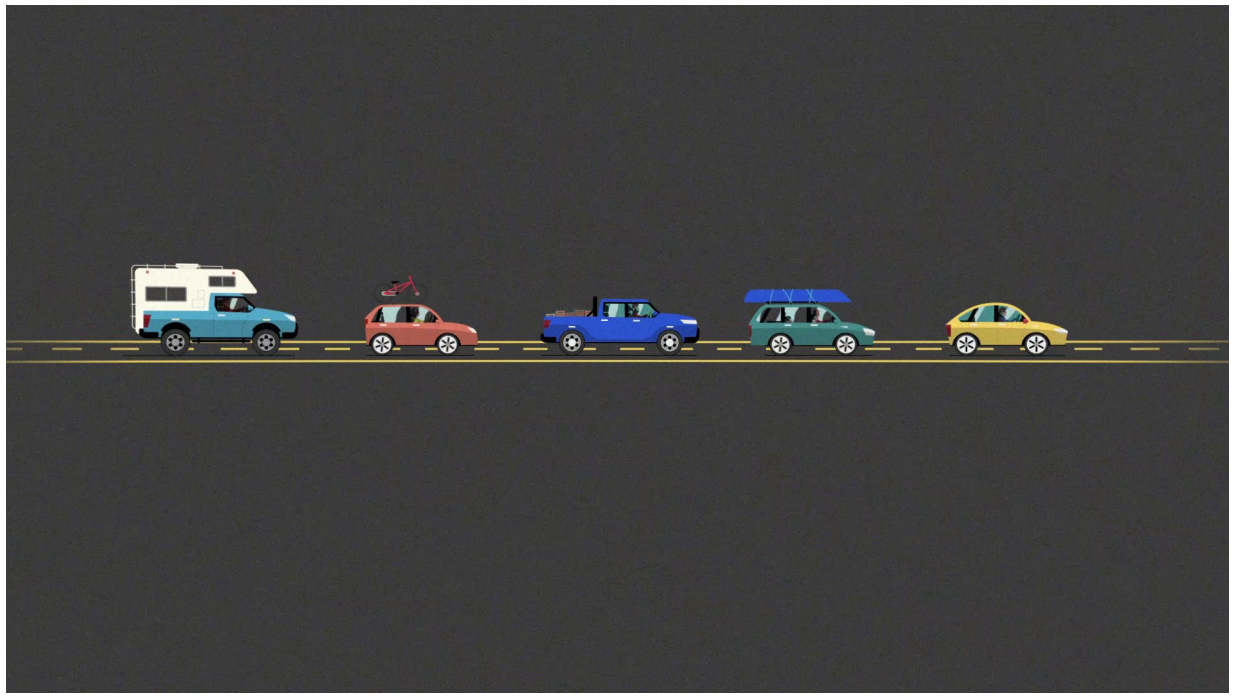
TESLA SUPERCHARGER

Tesla

TESLA DESTINATION CHARGER

Tesla

VARIETY AND AVAILABILITY



Electric vehicles are going mainstream

BC's Zero-Emission Vehicles Act requires more new vehicles to be zero-emission, which means that the number of certified electric vehicle dealerships is growing and manufacturers are designing models for all different types of lifestyles, including trucks and SUVs. The future is very electric.

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VARIETY AND AVAILABILITY - TYPES OF ELECTRIC VEHICLES

✗ **(Conventional) Hybrid NOT EV**

Toyota Prius

~900 km gasoline

✓ **Plug-in Hybrid (PHEV)**

Jeep Wrangler 4xe

~35 km

~600 km gasoline

BMW i3 REx

~203 km

~319 km gasoline

✓ **Battery Electric (BEV)**

Hyundai Kona EV

~415 km

Tesla Model S

~647km

✓ **Fuel Cell (FCEV)**

Toyota Mirai

~520km

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VARIETY AND AVAILABILITY - TYPES OF ELECTRIC VEHICLES

BATTERY ELECTRIC VEHICLE (BEV)

- Battery and electric motor. Simple.
- No shifting. Plenty of power.
- Fast deceleration with regen braking.
- Multi-motor options for advanced AWD.
- Battery ranges up to 650km, and charging speeds are increasing.

- Some older models couldn't use fast chargers, but all new models can.
- Have CCS or CHAdeMO ports, unless Tesla.
- Teslas owners can buy a separate CHAdeMO adapter for use on public fast chargers.

Tesla Model 3 SR+

MSRP $52,990

Range: 423 km

VARIETY AND AVAILABILITY - TYPES OF ELECTRIC VEHICLES

PLUG IN HYBRID EV (PHEV)

- Gas and electric drivetrain that work together.
- Like a traditional hybrid with a bigger battery, ability to plug in, and EV only mode.
- They can run on electricity from the grid. Because electricity is a cleaner energy source than gasoline or diesel, plug-in hybrids can produce significantly less global warming pollution than gas-only vehicles.
- Smaller batteries than fully electric vehicles.
- Typically around 40km electric range.
- Battery is recharged by plugging in, regen braking, and by the gas engine.
- Most do not have fast charging ability.

Toyota RAV4 Prime

MSRP $44,990

Range: 68 km / 979 km

VARIETY AND AVAILABILITY - TYPES OF ELECTRIC VEHICLES

PLUG IN HYBRID EV (PHEV) -- EXTENDED RANGE

- A variation of the PHEV idea.
- Battery and electric motor to drive the vehicle.
- Onboard gas generator provides “extended range.”
- Gas system never powers the vehicle directly.
- Larger batteries than most PHEVs so the vehicle rarely needs gas.
- Usually capable of fast charging.

BMW i3 REx

MSRP $53,600

Range: 203 km / 319 km

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VARIETY AND AVAILABILITY - TYPES OF ELECTRIC VEHICLES

FUEL CELL ELECTRIC VEHICLE (FCEV)

- Uses electric motors and batteries.
- Stores hydrogen on-board.
- Converts hydrogen and oxygen to electricity.
- Uses regenerative braking, like other electric vehicles.
- They don’t use chargers. Instead, they fuel up at hydrogen pumps, similar to gas stations.

Hyundai Nexo

MSRP $73,000

Range: 609 km

VARIETY AND AVAILABILITY – POLICY

BC ZERO-EMISSION VEHICLES ACT

- Zero-Emission Vehicle Sales Targets
  - 10% by 2025
  - 30% by 2030
  - 100% by 2040
- Applies to new zero-emission vehicle sales only.
- PHEVs are included.

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VARIETY AND AVAILABILITY – POLICY

ELECTRIC VEHICLES ARE GOING MAINSTREAM

- BC had ~10,000 EVs registered by late 2018.
- EV registrations grew to 54,000 by early 2021.
- In 2020, EVs represented 9% of new light-duty vehicle sales in B.C., the highest in Canada.
- Zoning bylaws for electrified parking are appearing beyond Metro Vancouver.
- Communities throughout BC are developing EV strategies.

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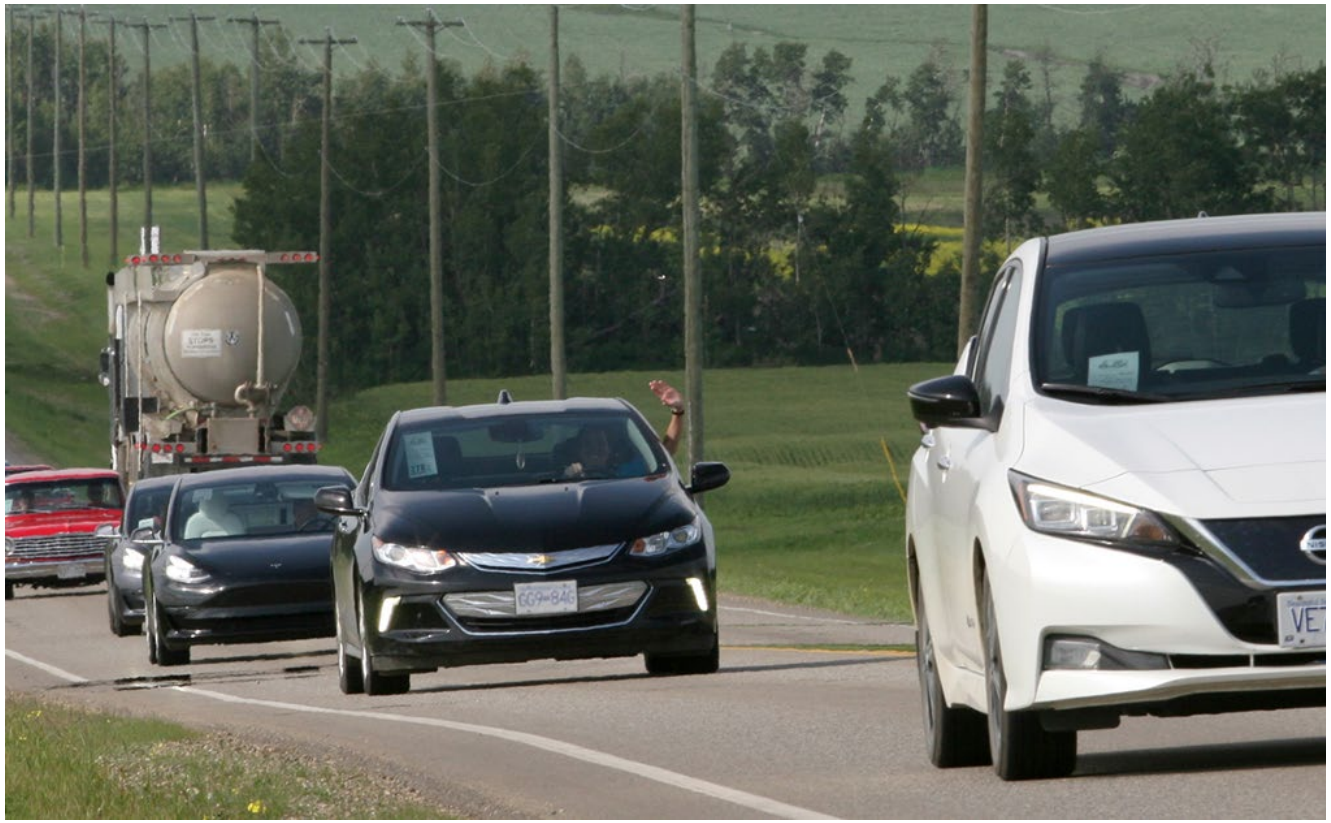
VARIETY AND AVAILABILITY – POLICY

ELECTRIC VEHICLES ARE GOING MAINSTREAM

- Electric vehicle adoption is aided by
  - Purchase rebates.
  - A growing network of charging infrastructure.
  - Home/workplace charging policies and incentives.
  - Supply policy (BC ZEV act).
  - Outreach / Education.
  - Increased variety of EVs.



Electric vehicles cruising near Dawson Creek.

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VARIETY AND AVAILABILITY – BEYOND PASSENGER VEHICLES

ELECTRIC VEHICLES ARE GOING MAINSTREAM

- Beyond passenger vehicles, other electrification is emerging:
  - E-bikes and micro-mobility and motorcycles/ATVs.
  - Buses and trucks.
  - Cargo vans.
  - Specialty use: refuse trucks, fire trucks, materials handling vehicles.
  - Forklifts, ice re-surfacers, landscaping & mowers.
  - Ferries and planes.

An electric tour bus in Richmond.

RANGE ANXIETY

Electric cars can go the distance.

Most electric cars have a range of 300-600km per charge (For reference: most of us drive less than 50km a day). They can also charge from any electrical outlet, so the likelihood of running out of power is slim. Especially with an ever-expanding charging network of highway fast chargers.

RANGE ANXIETY

CAN I REALLY GET WHERE I'M GOING?

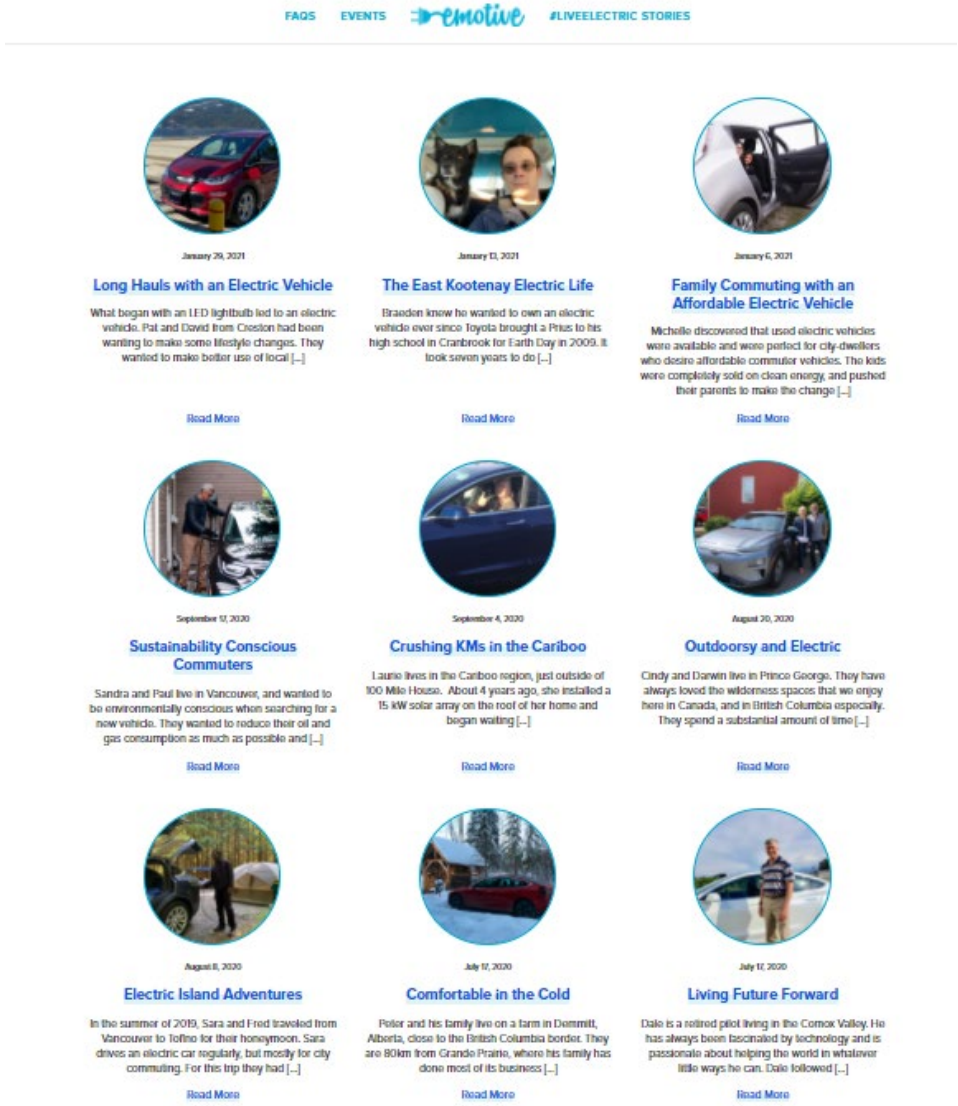
- Electric cars can go the distance.
  - Many fully electric EV ranges are between 300-600km per charge.
  - EV drivers are regularly taking trips all over BC.
  - Most of us drive less than 50km per day.
  - Most commuters can go for days at a time without charging.
  - Most charging happens at home, and a regular outlet can cover most people's daily commuting.

Charging at the Pacific Rim Visitor Centre, near Tofino and Ucluelet.

RANGE ANXIETY

CAN I REALLY GET WHERE I'M GOING?

- EV drivers enjoy sharing their experiences and Emotive collects stories from all over B.C.
- See #LiveElectric stories on EmotiveBC.ca for examples of EV drivers commuting and traveling throughout the province.



#LiveElectric Stories on EmotiveBC.ca

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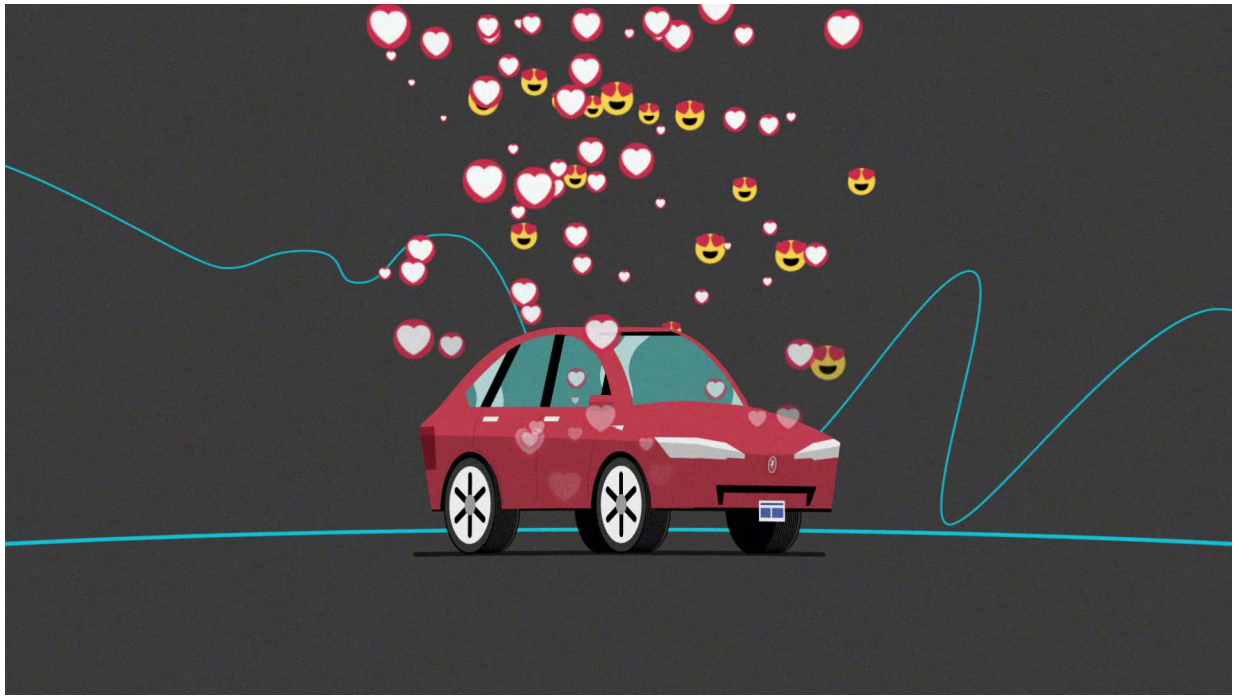
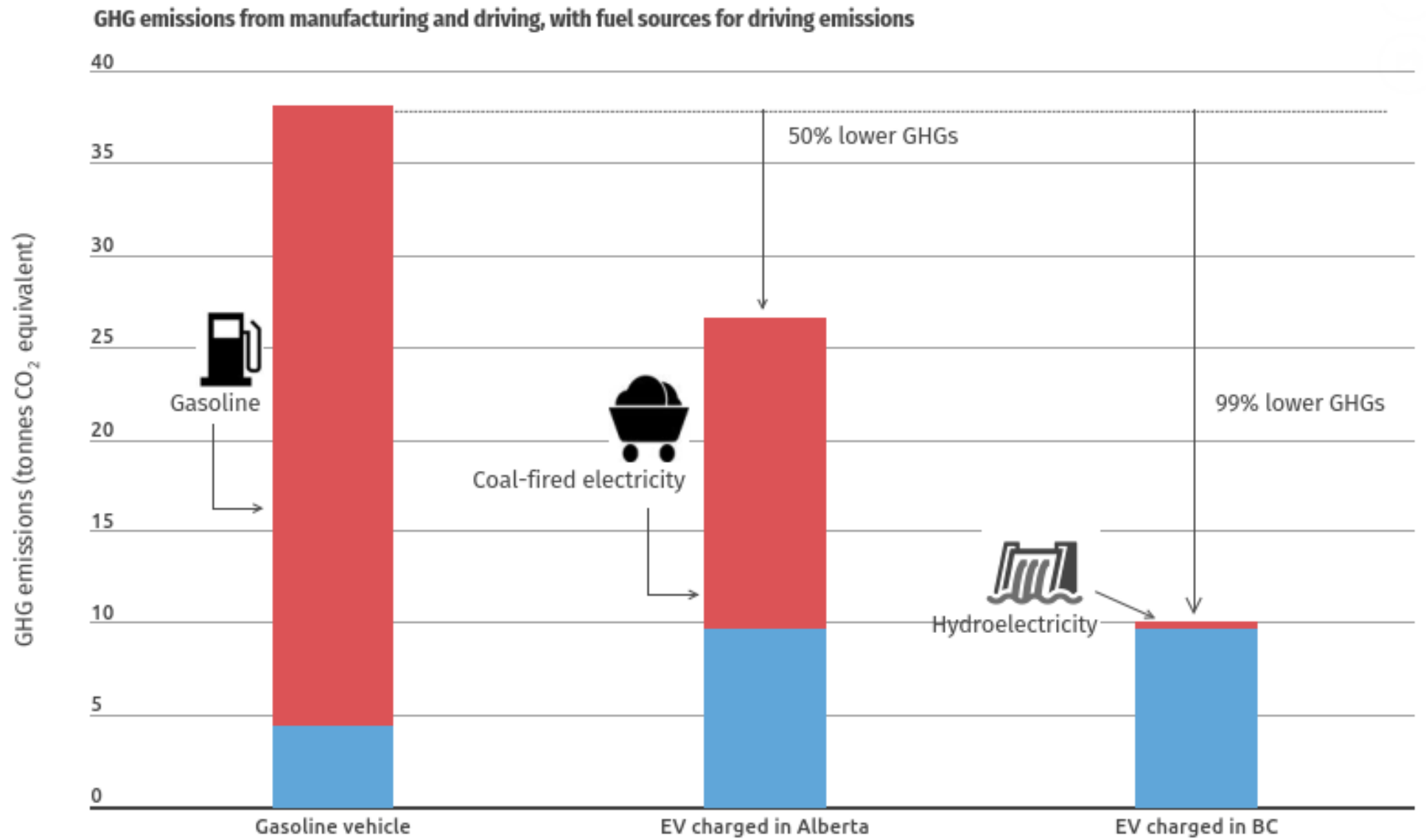
ENVIRONMENTAL BENEFITS



Electric vehicles reduce emissions.

In BC, most of the electricity is generated from renewable power. Electric cars are so efficient that they produce fewer emissions than gas cars regardless of how the electricity is generated. Total lifetime emissions are far lower in an electric vehicle, and battery recyclers are right here in BC.

ENVIRONMENTAL BENEFITS – GREENHOUSE GAS (GHG) REDUCTIONS



45% (Alberta) to 99% (BC) reduction in operating emissions over a 150,000km Lifespan.

Emissions reductions in Canada compared to average gas vehicle

ENVIRONMENTAL BENEFITS – GREENHOUSE GAS (GHG) REDUCTIONS

ENVIRONMENTAL BENEFIT

- Electric vehicles are *super* efficient. About 3 times more efficient than gas.
- Electric vehicles do not idle.
- Electric vehicles *make* electricity when the brakes are used, and when descending hills using regenerative braking.

- GHG reductions vary by power source.
- EVs are so efficient that they are always cleaner than gas.
- BC has a very clean grid, the majority of which is powered by hydro.
- EVs produce 99% less operating emission over their lifetime in BC (150,000 km).

A Hyundai Kona EV in Northern BC.

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ENVIRONMENTAL BENEFITS – GREENHOUSE GAS (GHG) REDUCTIONS

ENVIRONMENTAL BENEFIT

- Batteries require energy to produce, so there is an up-front GHG cost.
- But those emissions are small compared to what a gas vehicle emits over its lifetime.
- The emissions from battery production have been falling as more power grids where the batteries are manufactured move to renewable energy.

- Battery capacity is measured in kilowatt hours (kWh).
- In 2017, it was estimated that each kWh of battery manufacturing produced 200kg of CO_2
- In 2019, that figure fell to 61 – 106kg of CO_2.

Image: Kyle Fields, Clean Technica

ENVIRONMENTAL BENEFITS – BATTERIES

AREN'T BATTERIES HARD ON THE WALLET, AND THE ENVIRONMENT?

- Batteries are typically covered by warranty for 8 years or 160,000km, to 80% capacity.
- The likelihood of needing a replacement battery in a new EV is quite low.
- They keep getting better – and cheaper.

- Used batteries can be repurposed as energy storage.
- Auto makers are designing batteries to be **serviced**, repurposed and eventually recycled.
- They are too valuable to be thrown away.

Charging at a B&B in Port Renfrew.

emotive
THE ELECTRIC VEHICLE EXPERIENCE

ENVIRONMENTAL BENEFITS

- Fewer fluid leaks
- Less brake dust
- Lower noise pollution
- Any associated emissions from power production are shifted away from schools, homes, hospitals, workplaces.

Charging in Cache Creek.

COLD WEATHER

Electric vehicles are ready for winter.

While cold weather can affect the range of electric cars, these vehicles are proven to be, well, tough as winter. Some big cold-weather perks: Electric engines don’t struggle to turnover in the winter. They start in all conditions. And, you can preheat while plugged in without expensive idling.

ARE ELECTRIC CARS GOOD IN WINTER?

- An electric motor does not struggle to “turn over” in severe cold. It will always turn on.
- Multi-motor options for advanced AWD.
- Great handling due to battery positioning and lowered centre of gravity.
- You can heat/pre-heat without idling.
- Control cabin temperature remotely to pre-heat.

A Tesla Model 3 on a snowy highway near Prince George.

ARE ELECTRIC CARS ANY GOOD IN WINTER?

- Most range reduction in winter comes from using an electric heater to warm the cabin.
- Newer models use heat pumps instead and thermal battery management to address cold weather use.
- Use heated seats and heated steering wheel instead of cabin heater.
- Batteries are so big that range reductions have little real impact on daily driving.

A Nissan Leaf on a winter road trip in the Kootenays.

EMOTIVE EV 101

Questions?

- **Ask an EV Ambassador**
- **Use the message form at Emotivebc.ca**
- **Email emotive@pluginbc.ca**

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