

Electric Vehicles

PRESENTATION TO THE ROTARY CLUB OF TORONTO - SUNRISE



1896 Photo of “The Fetherstonhaugh” (right)

F.B. Fetherstonhaugh (patent lawyer), William Still (engineer) and John Dixon (carriage builder) all of Toronto built this Canadian First electric car and first ran it around the track at the “Exhibition” in 1893.

What We Own – 2017 Bolt (GM)



Know your EV acronyms

BEV is a **Battery Electric Vehicle**: batteries store and deploy power to electric motors to drive the wheels and if you are lucky also heat your car a bit in cold weather. Nissan Leaf, the whole range of Teslas, the Polestar 2, the BMW i3, Hyundai Kona Electric, Kia Soul EV, VW's ID.3 and e-Golf, the Jaguar i-Pace and the GM BoltEV and BOLT EUV.

PHEV is a **Plug-in hybrid** and **HEV** is a **Hybrid Electric Vehicle**: PHEV's can plug in to charge a battery for small range (HEV's cannot). The remainder of the range is completed by the Internal Combustion Engine (ICE) and gasoline. Popular PHEVs include the Mitsubishi Outlander, Hyundai Ioniq, MINI Countryman PHEV and Volvo XC60 T8. The Toyota Prius is an HEV.

FCEV is a **Fuel Cell Electric Vehicle**: Many tout FCEV fuel cells as superior to BEV's but there is little infrastructure. Toyota Mirai is one of the few on the market.

How we came to purchase a BEV

1. We mostly rode our bicycles although we bought our first ICE vehicle shortly after our daughter was born.
2. For our second car my husband wanted a Hybrid but we could not put our bikes on a Prius. Waitlisted ourselves for a Highlander Hybrid and became an early adopter of a Hybrid SUV. Early adopters promote the technology and encourage others. It is expensive to be an early adopter and risks of purchasing in a first model year. But the vehicles tend to come with excellent warranties on the batteries and some government incentives which have fluctuated over the years.

Transitioning to a BEV

4. My husband spent a few years figuring out how he could build his own BEV in our driveway. But before we had to give up the driveway for his venture, TESLA came out with its first all electric Roadster in 2008 followed by the Model S. My husband asked monthly if we could buy one and monthly I said we will never spend 7 digits on a car. Incentives or not.
5. Eventually we looked to replace our aging Highlander and we needed a car that worked well in the winter but my husband had a secret agenda – it seems I was suddenly the recipient of my very own Subaru and very happy too. 😊
6. Secretly, on a waiting list for the BOLTEV my husband recounted various trips he made to the Dealer here in Toronto to see the evolution of the car. He did not want the “Tesla No”. Finally in July 2017 he owned his first and to date only BEV. I snubbed his car. It was “his thing”. Then one day I drove his car. I was hooked and loved driving it, at least in good weather.

Is an EV for me?

\$\$, Charging, Range

The main factors in any EV purchase are money and range. You have to assess for yourself if the up front costs are worth the purchase. There are still some government incentives with the Federal Government giving \$5000 incentives for full BEV's and \$2500 for PHEVs. You can now buy BEV's used and the cost has come down significantly.

You will have to pay for charging but never for gas.

Charging at home is a privilege. If you have that privilege then you should take advantage and have home charging.

Range for your daily commute is the next factor. “ I live in a climate with cold winters, my commute is 70 miles one way. Will I be able to make this commute without charging at work in the winter? Will I be able to turn on the heat?” These are real EV questions scenarios every day.

Which BEVs have the best Range?

Initially it was the Tesla and the BoltEV which had the longest ranges of the EV vehicle classes. Some new models are in the same ranges now with typically a range being stated as about 300 to 350 Miles (480 to 550 km) per full charge.

Those are the best ranges generally available at this time for BEVs and many factors will limit this range or might extend this range:

- A) how you drive and the speed at which you drive impact your range and the car calculates this as you go along giving you range feedback
- B) do you use the heat ☺ or the AC
- C) extra weight or reduction in smooth air flow by adding a roof rack or a trailer.

Advantages of the BEV

1. No Gasoline
2. Simplicity – fewer things to maintain, fewer things to go wrong. “ According to Tesla, their drivetrain has no more than 20 moving parts compared to the 200 or so in a typical drivetrain for an internal combustion vehicle.
3. The Maintenance schedule for the first 7500 miles (12000 km) is checking the tire pressure and then at 12000 km rotate the tires. Make sure your dealer knows how to rotate the tires.
4. At 15,000 miles (24000) km replace the cabin air filter (sooner if you prefer) and you can do this yourself ordering the part online. Very easy (see online videos).
5. Some dealers will ask you to come in for an oil change. Remind them it's not necessary.

Other Maintenance

6. In addition, the brake fluid should be replaced every 24 months or 30,000 miles (50,000km), and the coolant changed after 15 years or 120,000 miles (200,000km).
7. Be sure to rinse off salt each year especially from undercarriage and usual brake checks are important especially since some BEV drivers opt to never touch their brakes (see one pedal driving) which is not recommended. So we have to remember to use our brakes.
8. All electric vehicle batteries will degrade over time and lose some of their ability to maintain a full charge, though this happens gradually, and eventually you will see range reduction and either have to replace the battery pack or the car.
9. BoltEV uses active thermal conditioning to prevent battery degradation. The Nissan Leaf on the other hand continues to be known for battery degradation. There are charts for each Vehicle.

BOLT EV Charge Port



Three Types of Charging

1. Trickle Charge – plug into a standard 110/120 volt outlet for a range of about 5 to 10 km/hour of charging. The vehicle must come with appropriate charging cable/plug for Trickle Charge.
2. Level 2 Charging (L2) – requires a special installation at home for 240 volt charging and charges about 40 – 50 km/hour. Charge to full over night from home is a typical use but public chargers are available. Tesla chargers require an adapter for non-Tesla cars.
3. Direct Current Fast Charge (DCFC) – sometimes called Level 3. Tesla has its own proprietary network of Fast chargers not accessible by other types of BEVs. DCFC requires appropriate port on a BOLT which used to be optional and is now on all BOLT EVs.

“Gears” Chevy BoltEV



Transmission Typically One Speed

Based on the Tesla Roadster first BEV Electric cars have an electric motor and not an engine and are designed with a single speed transmission, with the current exception of the Porsche Taycan which has two speed gearbox.

It is a balance between speed and efficiency as many BEVs have smaller battery packs. Larger packs are required for highway driving speeds.

All BEVs have a maximum speed you can attain for highway driving. Tesla is about 262 km/hour whereas the Bolt EV is 145 km/hour. A significant difference. Faster you drive the less range you will get.

Tesla goes from 0 to 60 MPH in about 3 seconds whereas the Bolt takes 6 seconds.

L “gear” on the Bolt is regenerative braking and some never use the D “gear” (which is like an ICE vehicle)

MCU and Infotainment Screens

In a **Tesla** electric car, the main computer control unit, also known as an "**MCU**," powers the touchscreen where drivers can view and control their entertainment, navigation, air conditioning and other vehicle features. Often known as an Infotainment Screen. Older Tesla models have an MCU1 and now offer an upgraded MCU2 (but you lose FM radio).

Tesla has been a leader in “over the air” upgrades/updates which are effectively software updates.

Most BEVs have remote control such as for pre-conditioning the battery to warm it before leaving home and warming it up before you get inside and turning on the heated steering wheel. Chevy Bolt does not use the over-the-air updates although they could do so. Tesla is a real leader in over the air updates.

Cameras

The BOLT and the Tesla both have great camera options and quality. Tesla has surround camera options, dashboard camera options. Our BOLT has birds-eye view, front and rear cameras. If car is packed full you can set up the Rear View Camera to see what is behind you on the road using the camera technology.

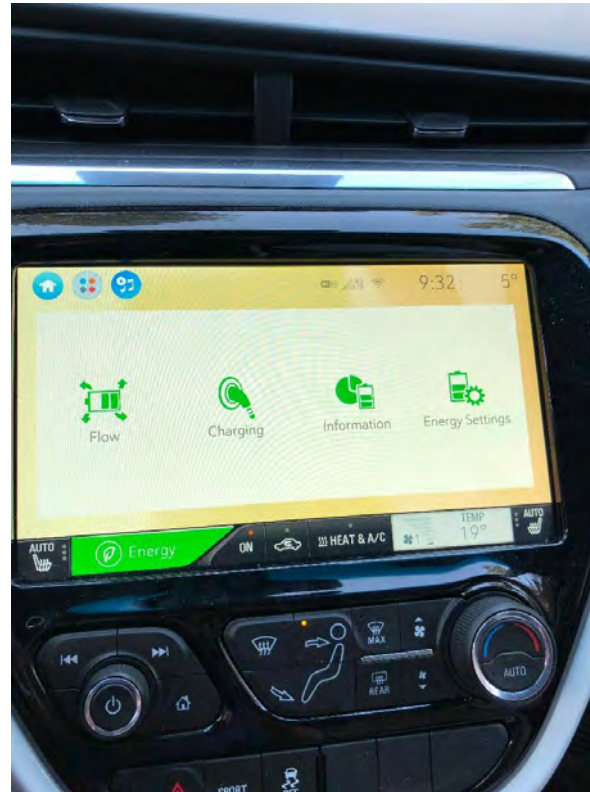
My favourite is being able to wash the rear camera from the driver's seat when it gets dirty.

AutoPilot

The upcoming redesigned 2022 Chevrolet **Bolt EV** and all-new **Bolt EUV** crossover **will** offer General Motors' Super Cruise "hands-free" semi-autonomous driving technology. ... Essentially, GM's Super Cruise **can** pilot the car on its own on select highways, and it doesn't require you to keep your hands on the wheel.

All new **Tesla** cars come standard with **Autopilot** as of April 2019, which includes Traffic-Aware Cruise Control and Autosteer. You can purchase **Autopilot** or Full Self-Driving Capability at any time through your **Tesla** Account – and the **Autopilot** software required will be added to your car.

Bolt Infotainment Screen Half size of a Tesla – Reboot (FF + Home)



“filling up the tank” and “range anxiety”

Range Anxiety is real as there is a learning curve to understanding the maximum range conditions and when range can be reduced. Cold Weather, Rain, headwinds, driving speeds and accelerations all factor in to your maximum range.

This is true as well of ICE vehicles but we don't monitor our ICE vehicles the way we monitor range in an EV. The EV has great tools and you can be as nerdy a geek as you like about your kilowatt hours and your own efficiency. If range is not an issue then no need to worry.

EV battery size is measured in kWh, or kilowatt hours. But *what is that?*

A kilowatt hour is a measure of energy used by an appliance if it were kept running for one hour.

The Range indicator on the dash aka the Guess-O-Meter (GOM)



Charging to “Full”

With an ICE car we often fill our tanks to full and we always have a comfort zone of a full tank of gas. We rely on the indicator of the tank “fullness” and there are plenty of gas stations to pull into if running low where we can “fill up” in 5 minutes or so and carry on.

With an EV we don’t have the luxury of a 5 minute fill up on the road. We have to plan ahead for when and where we will charge and while charging to 80% takes about 20 to 30 minutes, charging to Full can take much longer. That last 20% takes a very long time to pack in the electrons. So we simply don’t charge to full and plan our trips accordingly.

Home charging you can charge over night on L2 no worries but many have to rely on charging on the road for longer trips or at work if your employer has charging capability. With more EV cars on the roads you will often have to share a charger and/or wait.

Early Adopter Issues - Recalls

Recalls we have experienced since purchasing the first model year 2017 BOLT EV:

- Dead battery cell – dealer software fix (our first recall)
- Windshield Wipers could not handle heavy snow/ice – Transport Canada ordered this recall forcing GM to come up with a fix. They opted for a stronger motor to operate the wipers. ICE vehicles create heat that helps melt some snow whereas EVs do not and they had underestimated
- Other known issues covered by warranty but we have not had to use: Strut replacement, Steering wheel fix are two common ones
- LG Chem Batteries – this recall affects the Kona as well as the BOLT EV 2017 to 2019 model years. Risk of overheating and catching fire. Maximum charging was reduced by software and for Kona LG is doing full battery pack replacements. GM in some states will buy back your car. Ongoing issue.

Trip and Charger Planning

<https://www.plugshare.com/en> is an app that you can find nearby charging stations which are operating and give feedback if you find a charger is not working. It also has trip planning features

<https://abetterrouteplanner.com/> is an app that helps you plan longer trips

Stay at hotels with chargers but remember with more EV drivers on the road you may have to arrange to share that charger and be sure to unplug when you are done

We were able to use a charger at a nearby Bed and Breakfast for a small fee even though we were not staying there when visited by our daughter driving the EV and she needed an overnight charge not available at our Air BNB.

Have accounts with the different companies which offer charging such as: FLO, Chargepoint, Greenlots are some. Have the App and be sure to also have the RFID card for options.

How to reduce up front Purchasing Costs

Buy Used

Consider COSTCO incentive for the purchase of a BOLTEV

Use all government grants available to you at the time of purchase (sadly Ontario no longer offers grants but other provinces do, as does the Federal Government).

Definitely shop around and choose a car that fits your personal needs.

Prices are coming down and will continue to come down with various manufacturers. Tesla first offered the Model 3 for which there was a 1 to 2 year wait list and a refundable deposit. During that time the BOLT EV came on the mark so we got our deposit refunded. Tesla is planning an even lower cost model within the next 5 years.

Environmental Issues

EVs do not burn fossil fuels and therefore consistently reduce the amount of CO₂ in the air.

EVs rely on rare earth minerals which are also non-renewable and have many “fair trade” issues such as child labour and safety of workers mining Lithium and Cobalt. This applies to our cell phones and much of modern technology and needs to be discussed openly in my opinion.

EVs do not require oil to be shipped but they do need electricity to power them. Some EV owners have set up solar charging and this is also available for example at the University of Waterloo where the Chargers are powered by Solar Energy. This is a great option.

Overall after several studies it appears that the environmental advantage goes to EV vehicles. In cities shifting from Diesel to Electric provides other benefits of reducing pollution.

Electric Vehicle Advantages and Disadvantages

EVs have most often been used for City and commuter driving. It's a great option with no gas and frequently you can benefit from the HOV lanes on the highways.

Long Distance use requires planning and drivers have to be able to provide enough time for the charging along the route. The Range is weather dependent and this is why we still have a Subaru because I don't have the time to charge on my trips to and from visiting and caring for my mom in London. Whereas round trips to Kitchener Waterloo are not an issue. KW is the Canadian capital for EV users and they have lots of charging options as do hotels. No need to charge for a KW round trip from Toronto in warmer weather (like today).

EVs are very road worthy in cold and wintery climates. Although I would like to have AWD which is not available on most EVs. Tesla has an AWD option. You need to have snow tires. Regular tires are low friction to maximize range.

What folks like about EVs

Total cost of ownership is less, initial purchase price may be higher, BUT 75% less fuel costs, very little maintenance

Enjoy the silence of driving with instant torque. It's just fun to drive.

Understand the energy requirements of your vehicle more fully. Or, you can just have fun driving it and feeling good as you go past that Gas Station.

You can leave in the morning with a full tank every day.

Way Less Maintenance. Way less mechanical parts to go astray. No oil changes.

Unbelievably inexpensive to operate. I'm just now at 225k kms looking into my first true maintenance of replacing my brake pads, says a friend.

Resources I rely on to Learn

I heavily rely on Facebook Groups to help me learn about aspects of our car, current recall issues, and ask questions about anything. One can really only manage about 3 of these groups and I belong to a World Wide BOLT owners group, a Canadian BOLT owners group and the Waterloo Region Electric Vehicle Association (and group). WREVA is really a great local resource as they are very active. I may also belong to TEVA (Toronto) but I am not active in that group.

Pre-Pandemic there were EV gatherings which were fun to attend and a great way to learn about EVs. We also went to several Car Shows to compare various EVs. It is lots of fun to see where the charging is located on the car, where the trunk is located, and learn about lots of fun aspects of the vehicle. Meeting fellow EV enthusiasts and other BOLT owners is lots of fun. I still wave at every BOLT I see in Toronto.

Links

<https://www.plugndrive.ca/> has a list of all Canadian EVs available for purchase, an FAQ. Plug'n Drive is a non-profit organization committed to accelerating electric vehicle adoption in order to maximize their environmental and economic benefits.

Plug'n Drive also has a current list of Canadian Incentives available

<https://www.fueleconomy.gov/feg/findacar.shtml> is a US site for car comparison