



People for Energy and
Environmental Literacy

Electric Vehicle History

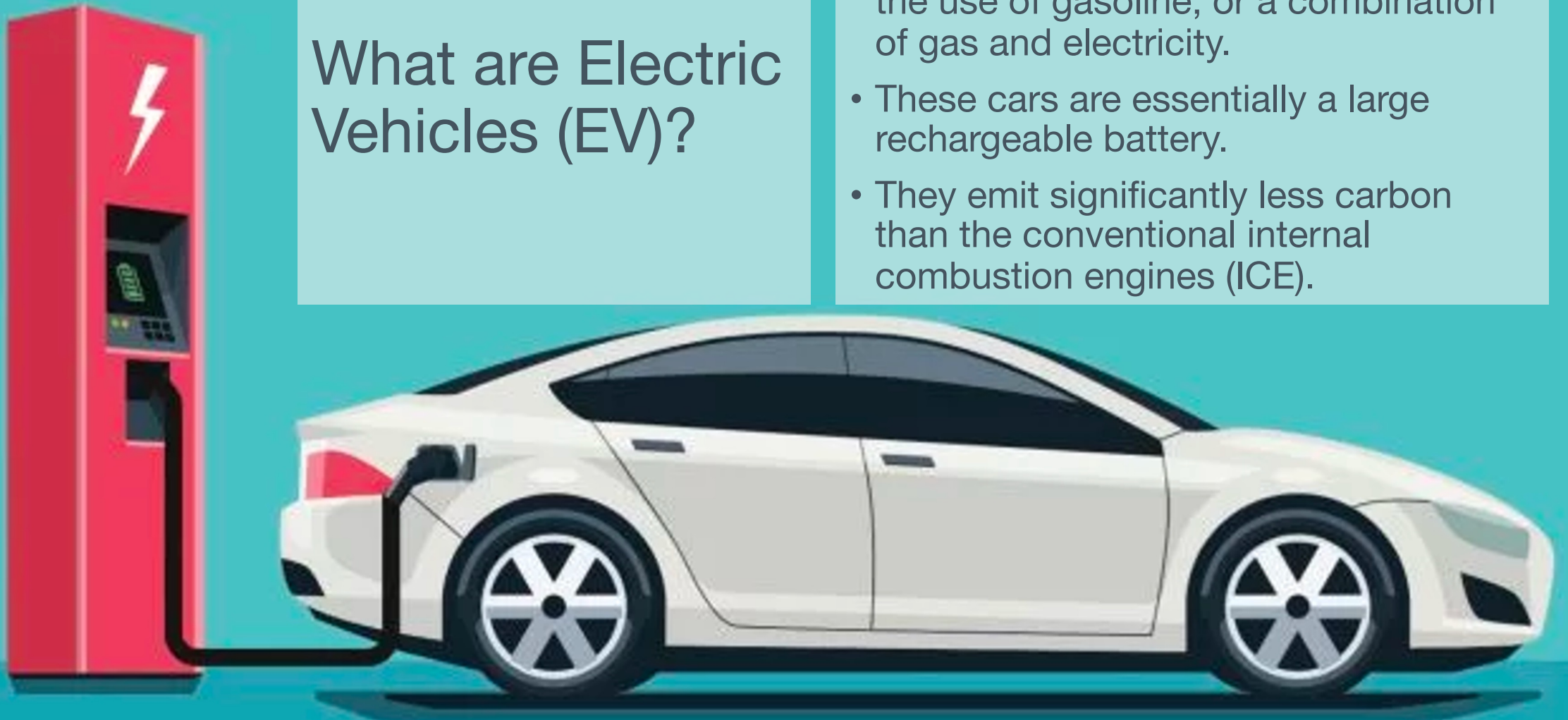
How it all started

Recommended for Grades 7 – 12

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What are Electric Vehicles (EV)?

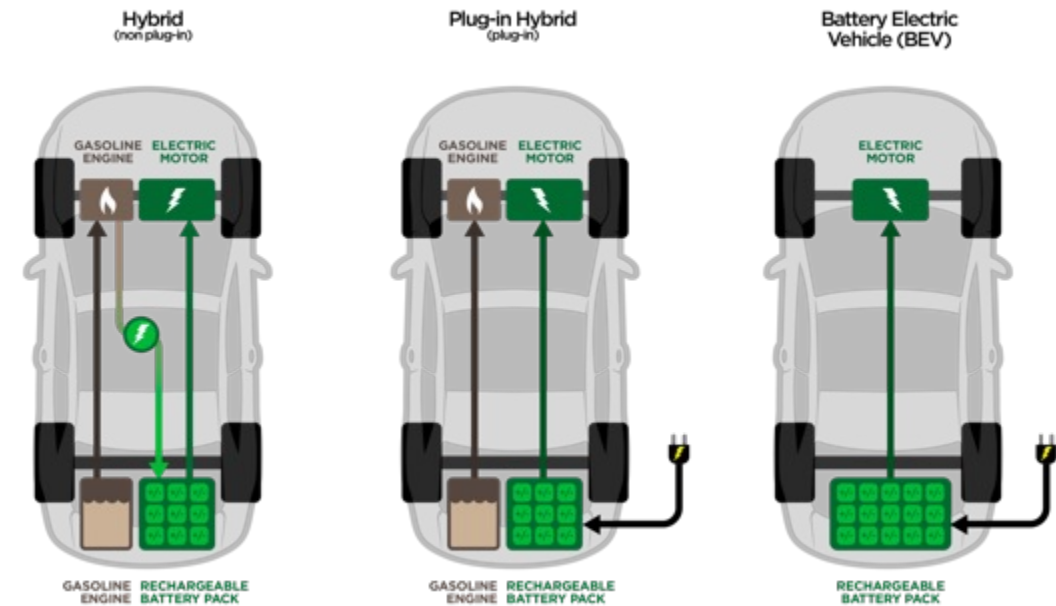
- An electric vehicle is a car that operates on an **electric motor** without the use of gasoline, or a combination of gas and electricity.
- These cars are essentially a large rechargeable battery.
- They emit significantly less carbon than the conventional internal combustion engines (ICE).



Source: www.greetechmedia.com

Types of electric vehicles

- **Hybrid:** Powered by gasoline and an electric motor. The battery is recharged while the vehicle is running on gas.
- **Plug-in hybrid Electric Vehicle (PHEV):** Similar to conventional hybrids, except they can be plugged in to recharge the battery.
- **Battery Electric Vehicle (BEV):** Powered 100% by an electric motor and battery. All-electric cars do not burn gasoline, have gears or a transmission, or require oil for the parts. On average, all-electric cars can travel 200 – 250 km on a single charge.



Source: www.nspower.ca

Who Created the Electric Car?



Robert Anderson's crude electric carriage powered by a non-rechargeable battery (1832)



Thomas Parker (1884) made the first practical electric car in the UK



William Morrison (1890) developed the second practical electric car (6-passenger) in America



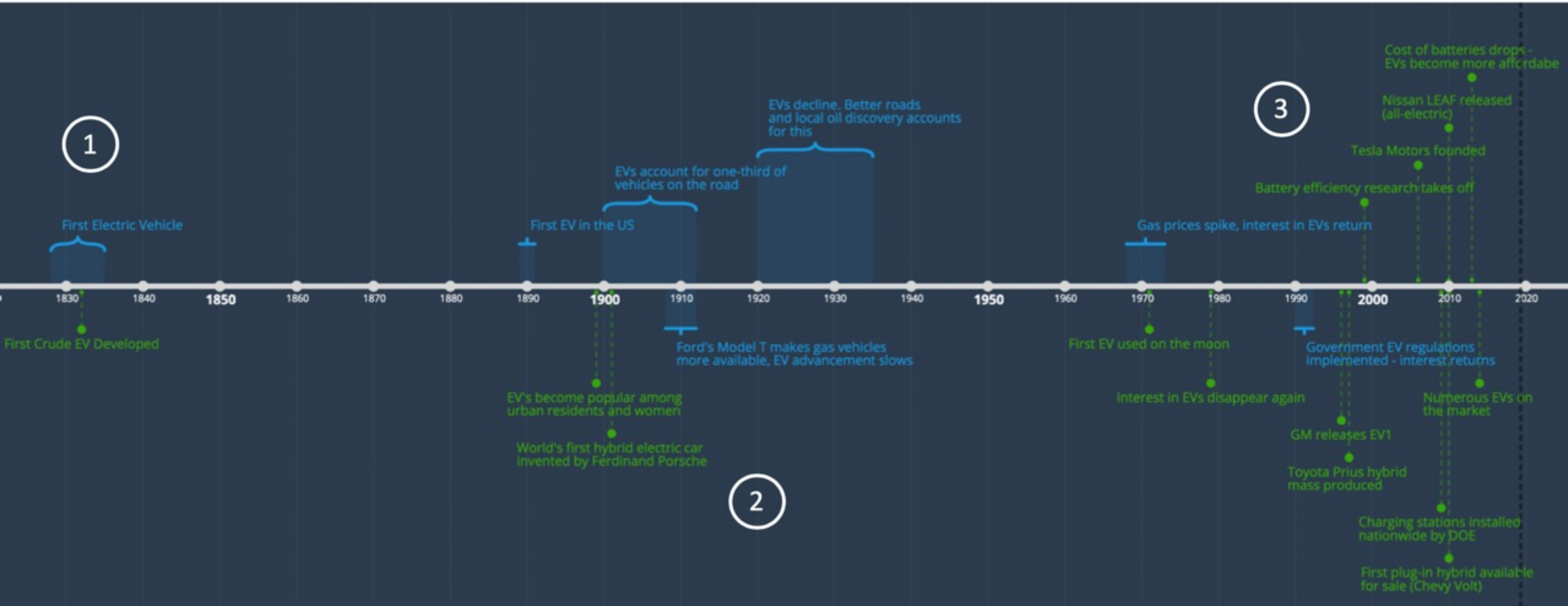
Ferdinand Porsche's P1 – first hybrid car (1898)



Did you know?

Electric vehicles were
around for 40 years
before gasoline
powered cars!

Electric Vehicle Timeline



The First Gasoline Car (Internal Combustion Engine)

- The first internal combustion car was invented by **Siegfried Marcus** in **1870**
- Innovation of gasoline cars continued to grow throughout the 19th century
- Gasoline cars were loud, hard to operate, and emitted a lot of fumes
- Electric cars became very appealing because they were easy to operate and were much quieter compared to ICE



What is an internal combustion engine?
The combustion of fuel to produce energy inside the engine



The First Transition to Electric Cars

- The unpleasant qualities of gasoline cars made electric cars more appealing
- Electric cars became very useful for driving around the city (roads outside of the city were poor)
- Interest in electric cars was at its peak in the **1890's and early 1900's**
- Women were the main users of electric cars
- One third of cars on the road were electric
- They became so popular that many of the taxis in New York were electric in **1897**

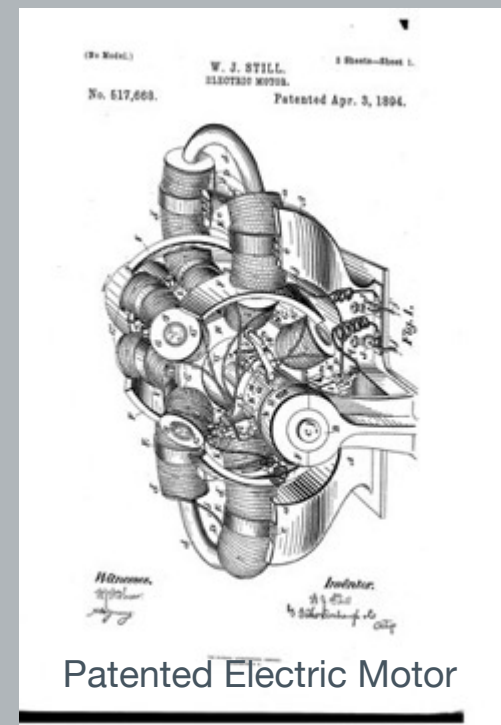


How EV's Came to be in Canada

- The first EV made its showcase in **December 1893**, at the Dixon Carriage works in Toronto.
- In 1893, William Still patented an electric motor to be used in a car. The motor was patented in the US the following year
- At the time, the batteries available could last for **1 to 5 hours!**
 - They were recharged by connecting the battery to the tramway power lines
- The Still Motor Company was created, but did not last long
- Canadian Cycle and Motor Company (CCM) was the next major car producer - Founded in 1899
 - CCM now makes hockey gear
- Electric cars were around until 1930



The first electric car in Canada



The first car (Jamais Content) to reach 100 km/h was ELECTRIC!

1899



Replica of La
Jamais Content

The Rise of Oil (1935-1970)

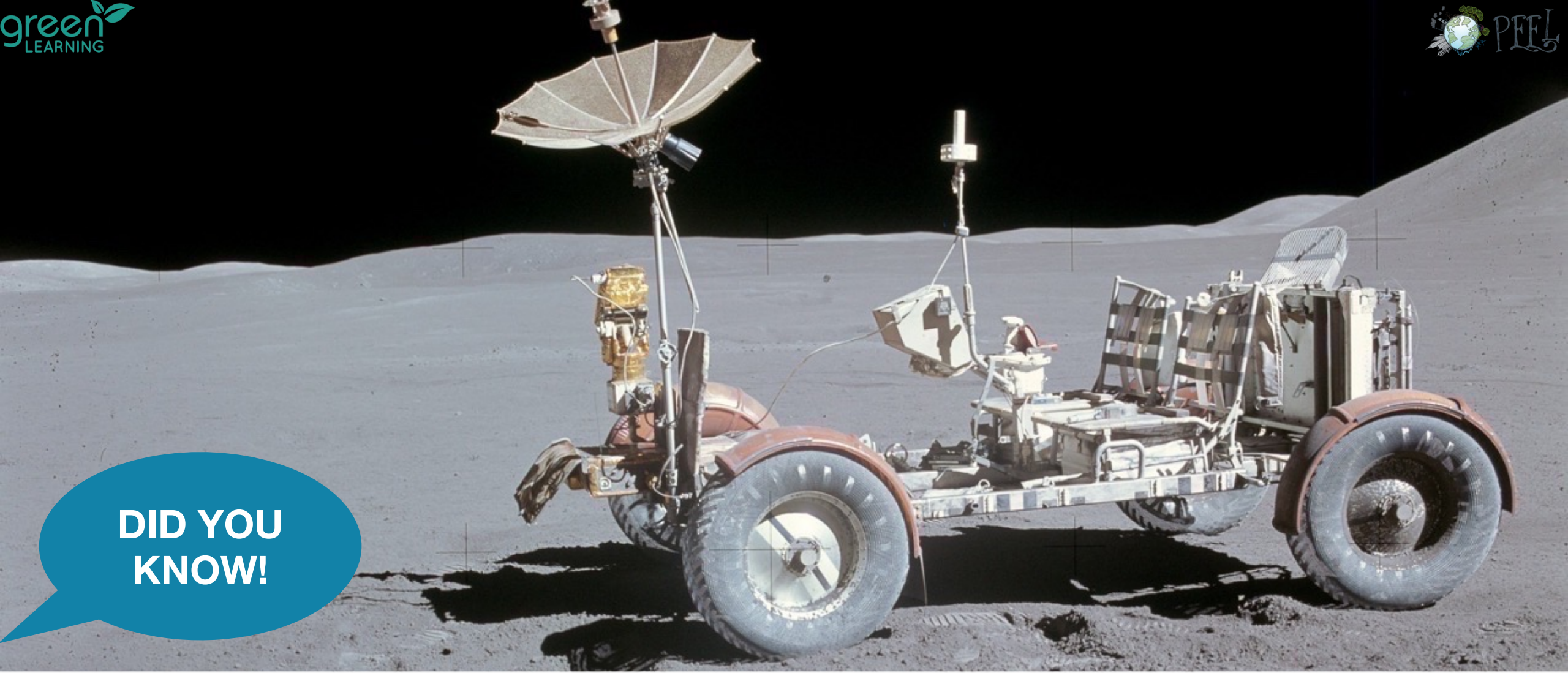
- In 1912, as interest in electric cars were growing, Ford Motors' Model T (gasoline engine) was mass produced
- The mass production halted all innovation of electric cars
- Charles Kettering's electrical starter made gasoline cars easier to operate (no hand crank)
- The discovery of oil lead to the disappearance of electric cars by 1935
- Gasoline prospered until the 1970's (Oil Crisis)



Photo: Hand crank before replaced by Charles Kettering's electric crank



Internal Combustion Engine Vehicle – circa 1935



**DID YOU
KNOW!**

First Manned Electric Vehicle on the Moon! (1971)

US Government Acts and Policies – R&D for vehicles

- The US Government passed an Act in 1976 to encourage innovation and development of electric and hybrid vehicles
 - Electric and Hybrid Vehicle Research, Development and Demonstration Act
- In 1990, environmental concern arose, which led to the passing of environmental protection acts
- These two acts together fueled the research and innovation of electric vehicles.

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Canadian Acts and Policies – R&D - vehicles

- In 2017, Quebec introduced the Zero-Emission Vehicle Standard
 - The first ZEV standard in Canada
- In 2019, the British Columbia government introduced the **Zero-Emission Vehicles Act** requiring all cars in the province to be zero-emissions by 2040.
 - 10% of light-duty cars to be zero-emission by 2025, and 30% by 2030
 - Act is accompanied by BC's rebate incentive – Up to \$5,000 rebate for the purchase of an EV or new battery
- In 2019, the Canadian Government is investing \$96.4M in alternative fuel infrastructure – includes natural gas, hydrogen and electric refueling stations

Canadian Incentives

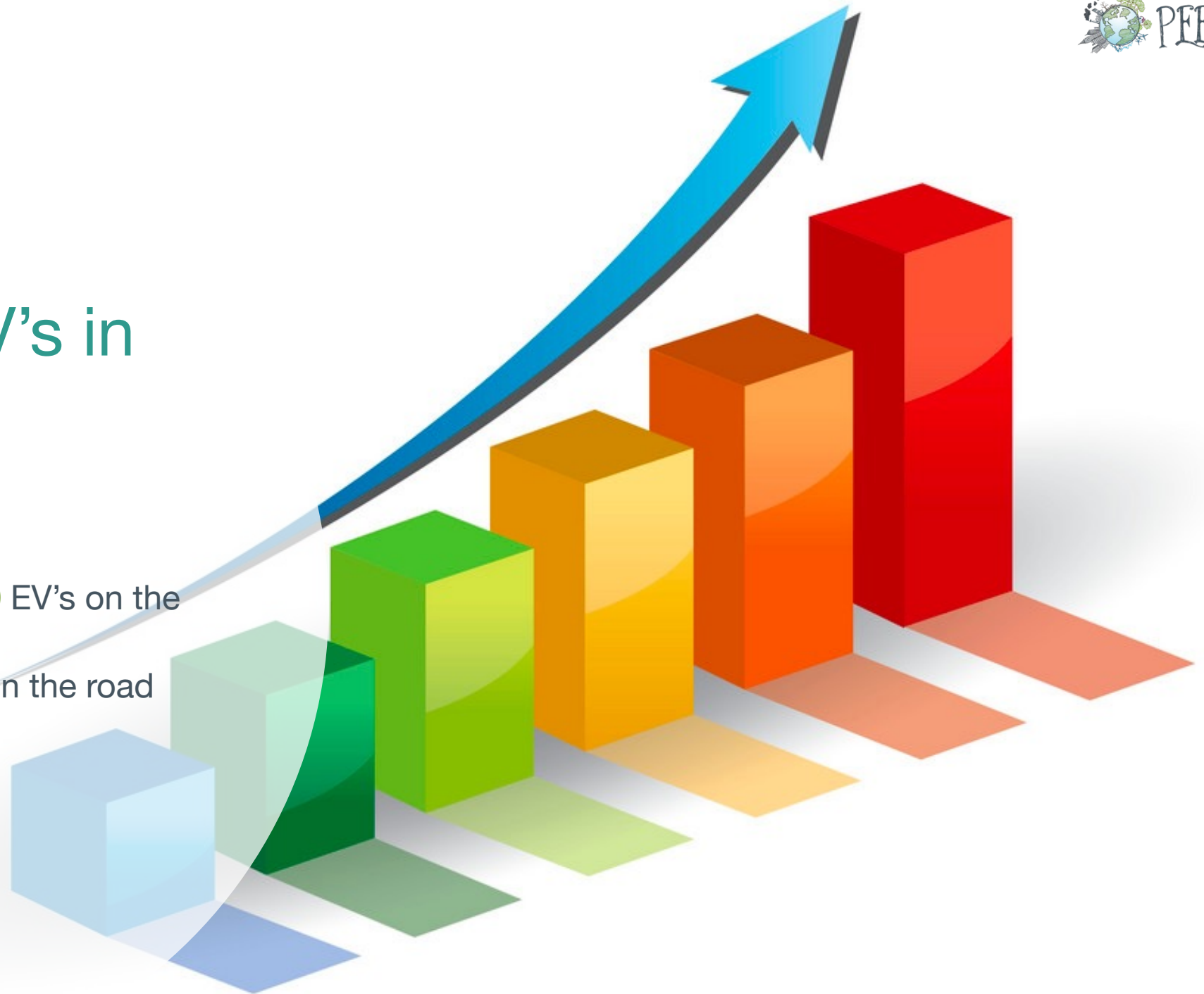
- The Liberal Federal government has an electric vehicle incentive – the **iZEV Program**
- Electric vehicles under **\$55,000**
 - \$5,000 back for battery-electric, hydrogen fuel cells, and longer-range plug-in hybrid
 - \$2,500 back for shorter range plug-in hybrids
- Eligibility:
 - Six or less seats < \$55,000
 - Seven or more seats < \$55,000



Electric and plug-in hybrid electric vehicles available in Canada, 2019

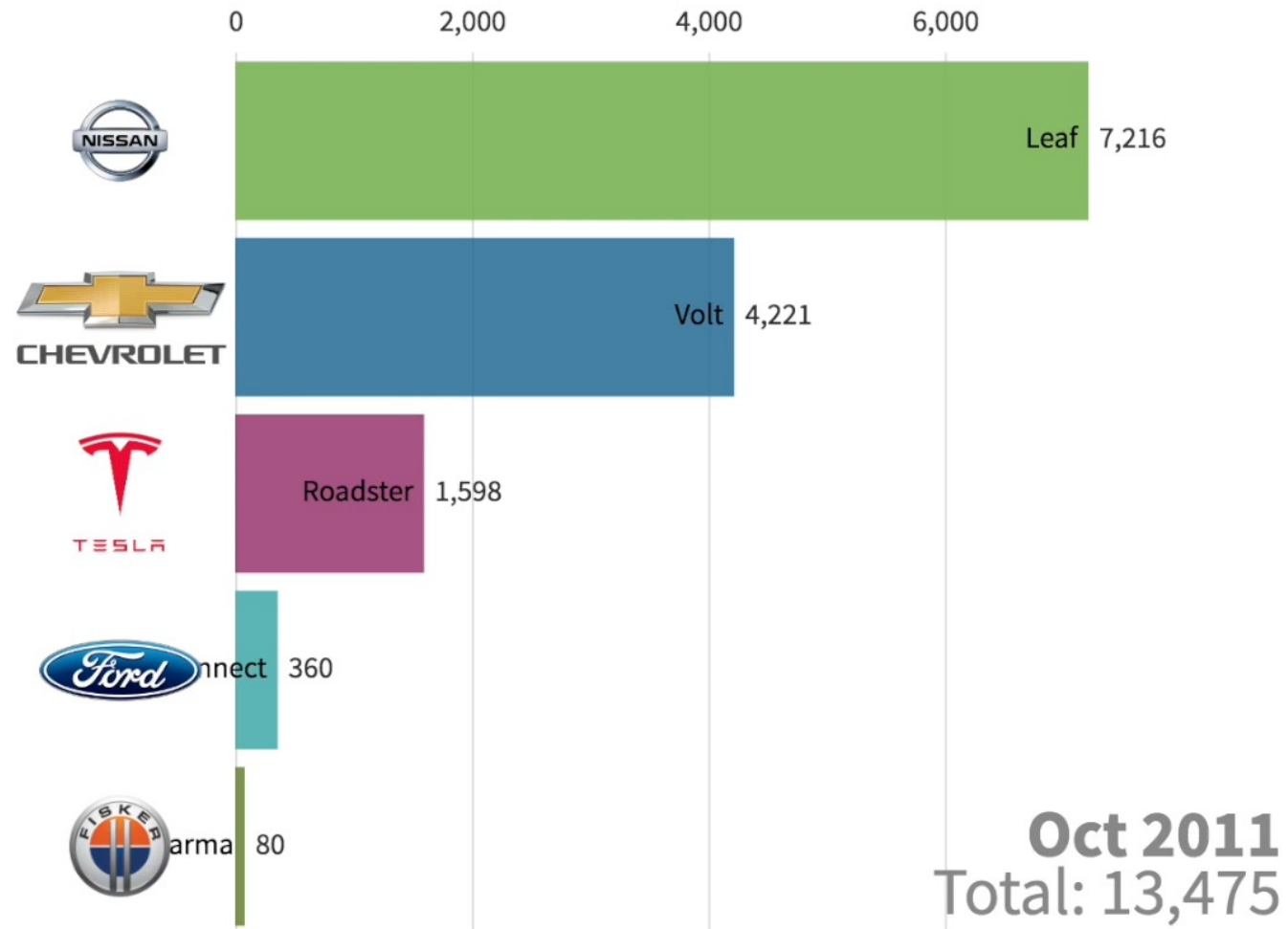
The Rise of EV's in Canada

- In 2012, there was over **2,020** EV's on the road in Canada
- In 2016, the number of EV's on the road jumped to **11,580!**



U.S. Plug In Vehicle Sales* Dec 2010 to Present

Replay



Source: [InsideEVs](#) • *Some values are estimates. Please visit InsideEvs for details. Dec 2010 - Dec 2011 include estimates interpolated from Wikipedia (Credit: Aldrich Bautista @gensao). Prior to Dec 2010 includes 1,379 Tesla Roadsters as a baseline starting point.

A Flourish bar chart race



Majority of auto manufacturers have electric vehicles or plug-in hybrid electric vehicles available today

“Volvo said it will phase out vehicles that run solely on gasoline or diesel fuel by 2025. In 2020, the company said, 20% of its vehicle sales will be that of plug-ins. By 2025, the company said, half of its vehicles sold will be fully electric, the other half plug-in hybrids and standard hybrids.”

- Los Angeles Times

“By 2025, we would like to be a world leader for e-mobility and launch more than 80 electrified models, including some 50 all-electric vehicles and 30 plug-in hybrids.”

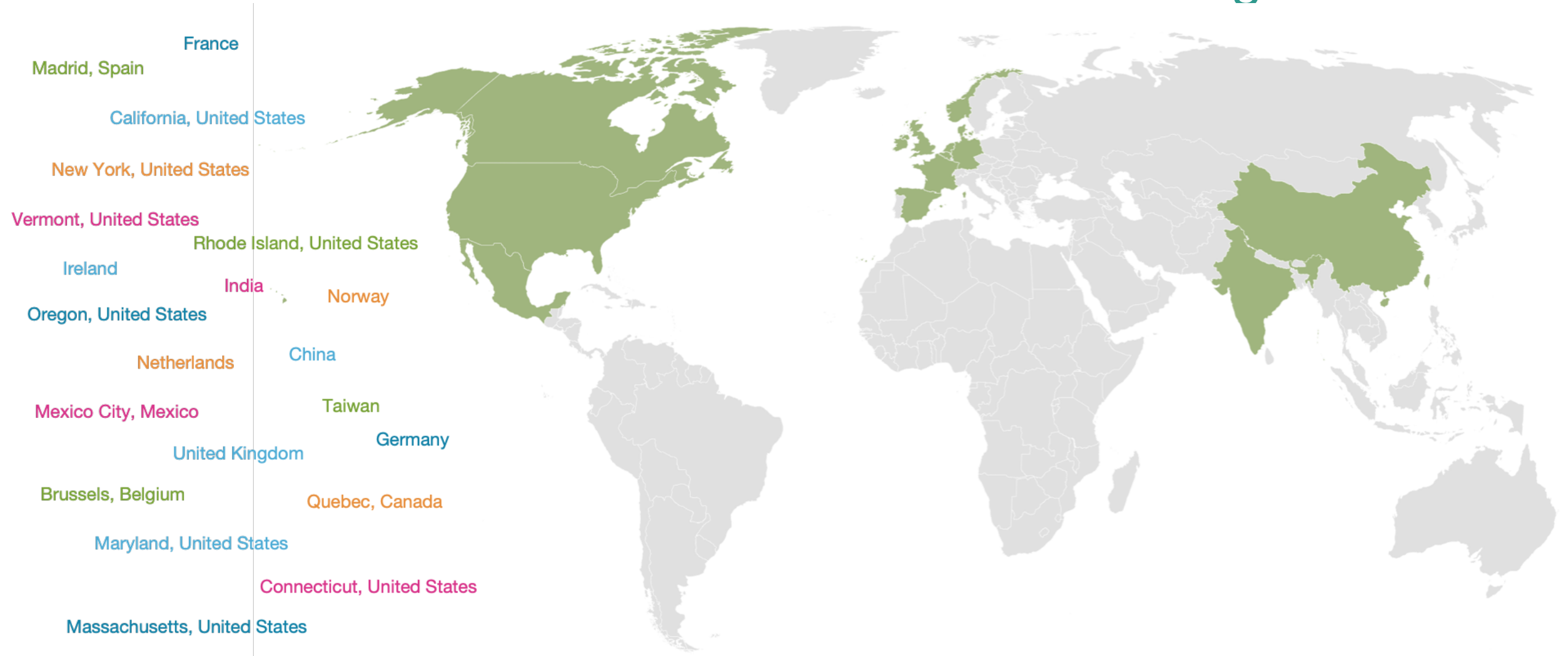
- Volkswagen 2018 Sustainability Report

“GM's goal is to abandon the internal combustion engine entirely.”

- NBC News

Other manufacturers are committing to a majority of their fleet being plug in hybrid electric or battery electric vehicles.

Countries that will ban internal combustion engines



Top Three US EV/PHEV Vehicles in 2019

- 1) Tesla Model 3 (EV) - \$44,990
- 2) Chevrolet Bolt (PHEV) - \$40,198
- 3) Tesla Model Y (EV) - \$53,990



Least Expensive BEVs on the Market



BEV = Battery Electric Vehicle

Most Expensive BEVs on the Market

Tesla Roadster

\$257,000



BMW i8 Roadster

\$169,900



BMW i8 Coupe

\$149,900



Tesla Model X

\$113,590



Tesla Model S

\$106,890

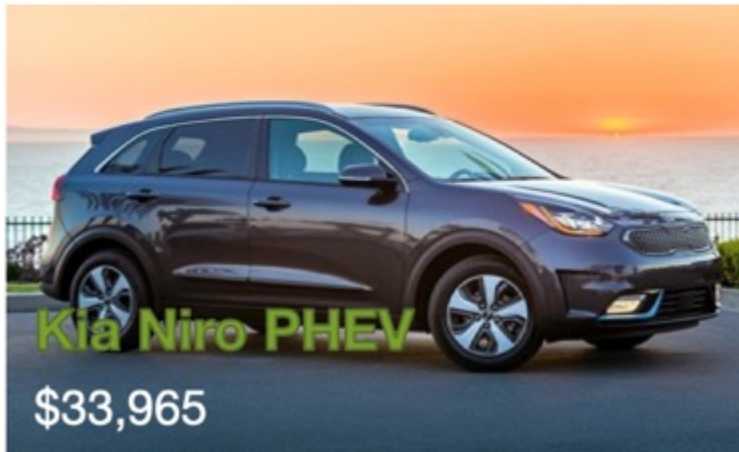


Audi e-Tron

\$90,000



Least Expensive Plug-in Hybrids



Most Expensive Plug-in Hybrids



In Summary

- There is a wide range of options for all electric and plugin hybrids
- There is a mix of sedans and SUVs that can fit any need





Thank you!

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