



# EV/Plug-in Lunch and Learn

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# Basic Terms

Plug-in Electric Vehicle

**EV or BEV** = Battery Electric Vehicle (all-electric)

**PHEV** = Plug-in Hybrid EV (electric + gasoline)

I.C.E. = Internal Combustion Engine

Conventional gasoline or diesel vehicles

Could be a Hybrid vehicle too

Electrified = A vehicle that uses an electric motor to partially or wholly drive its wheels

# Electric Vehicle

Use no gas/ no engine

Driven by electric motors with electricity stored in a large battery pack (40-100 kWh)

Batteries are only charged via a plug and external power

Greatest electric driving range



# Plug-in Hybrid EV

Fuel from gasoline and electricity

Electricity stored in smaller battery pack (5-15 kWh)

Batteries charged mostly from a plug

Lesser electric driving range than EV



# Hybrid Vehicle (not Plug-in Hybrid)

Common area of confusion

Fuel from gasoline only; engine generates some electricity

Very limited electric driving range

Tiny battery and no plug to charge them (1-5 kWh)



# Range Extender

Fueled by electricity; can use gasoline if needed

Mid-sized battery pack (18-40 kWh)

Can operate as an EV in most situations



# Comparison of descriptions

	I.C.E. Vehicles	Electric Vehicles
Power:	Horsepower (hp)	Kilowatt (kW) (745 W=1 hp)
Capacity:	Gallons	Kilowatt hours (kWh)
Efficiency:	Miles/gallon (MPG)	Miles/kWh or Wh/Mile or MPGe
Refueling:	Less than 5 minutes	Miles of range per hour

Range Example: A car with 3 miles/kWh efficiency and a 40kWh battery size will provide roughly 120 miles of driving range



# Charging

Most every EV in the US uses a common standard to charge



Official name is **SAE J-1772** ;  
aka EV plug, J-plug

This type of charging is called **Level 1** and **Level 2**

Level 1 uses 120V AC power and Level 2 uses 240V AC power

They add about 3 to 20 miles of range per hour of charge



# Charging

Level 1 and Level 2 are not “fast charging”

This type of charging unit is commonly installed at homes and businesses



# DC Fast Charging and Supercharging

Two standards: Combo/CCS and CHAdeMO  
One proprietary: Tesla Supercharger

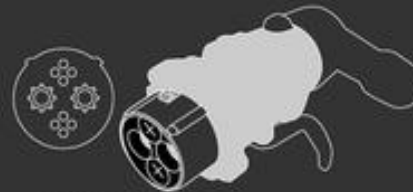
## Common Connector Types:



TYPE 1  
SAE J1772



CCS COMBO 1



CHADEMO



TYPE 2  
IEC 62196  
(TESLA NON-US)



CCS COMBO 2



TESLA US

Example: Can charge at about  
150 miles per hour

# Public Charging Stations

Many networks available that support Level 1, Level 2, and Fast Charging

Most charging stations require a membership and RFID cards

Memberships not interchangeable

Even free charging stations may require network memberships

Biggest Level 2  
Networks



Biggest Fast  
Charging  
Networks



# Financial Incentives and Perks

- \$7500 Federal Tax Credit (not a refund)
  - Reduced when manufacturer reaches 200,000 cars sold. Tesla has been reduced to \$3750 for cars sold thru June 30, 2019, \$1875 from July 1-Dec 31, 2019, and then eliminated. General Motors is close behind and the Volt/Bolt reduction will start April 1, 2019.
- Up to \$2500 California Clean Vehicle Rebate (income restricted)
- Long Beach Electric Vehicle Charger Giveaway
- \$1000 SCE Clean Fuel Reward Program Rebate
- Up to \$1500 SCE Charge Ready Home Installation Rebate
- \$250 AQMD Residential EV Charging Incentive Pilot Program
- California HOV Lane Exception Program
  - Red Stickers (2017/2018 purchases) expire 12/31/2021
  - Purple Stickers (2019 purchases) expire 12/31/2022
- FasTrak Toll Road discount rates



# Current Electric Vehicles



BMW i3



Tesla Model X



Fiat 500e



Chevy Volt



Volkswagen eGolf



Jaguar I-Pace

# Current Electric Vehicles



Kia Soul EV



Nissan Leaf



Hyundai Ioniq Electric



Honda Clarity Electric



Hyundai Kona  
Electric



Kia Niro EV



# Future Electric Vehicles



Audi e-tron



Porsche Taycan



Volkswagen I.D. Crozz



Volkswagen I.D. Buzz



Tesla Model Y



Mercedes-Benz EQC



# Future Electric Vehicles



Mini Electric



Rivian R1T



Rivian R1S



BMW iX<sub>3</sub> Electric



Byton EV SUV



Volvo Polestar 2

# Electrical Vehicle Resources

- Plugshare: [www.plugshare.com](http://www.plugshare.com)
- CA Clean Vehicle Rebate Project: [www.cleanvehiclerebate.org](http://www.cleanvehiclerebate.org)
- Plug In America: [www.pluginamerica.com](http://www.pluginamerica.com)
- CA Clean Air Vehicle Decals (HOV):  
<https://www.dmv.ca.gov/portal/dmv/detail/vr/decal>

# Electrical Vehicle Charging Networks

- Chargepoint: [www.chargepoint.com](http://www.chargepoint.com)
- EVgo: [www.evgo.com](http://www.evgo.com)
- Greenlots: [www.greenlots.com](http://www.greenlots.com)
- Electrify America: [www.electrifyamerica.com](http://www.electrifyamerica.com)
- Blink: [www.blinknetwork.com](http://www.blinknetwork.com)
- Sema Connect: [www.semaconnect.com](http://www.semaconnect.com)
- Volta: [www.voltacharging.com](http://www.voltacharging.com)