

Breathe Free with EVs

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- Zoom features and settings are at the bottom of your screen.
- Upon entering, please check that you are **muted** with video off. You will be encouraged to change these settings later in the evening.
- Note: This meeting is being recorded. If you do not wish to be recorded, please keep your video off and change your participation name.
- **We will start at 5:00pm.**



National Drive Electric Week™

Presented by



Normal Now.

Sponsored by  electrify america



DEVA



Breathe Free with EVs

Electric Vehicle 101

Today's Presenter:

- **Peter Mackin** is Vice President of Power System Studies at GridBright, Inc., a consulting firm that helps the electric industry implement smarter solutions for managing the modern electricity grid.
- Mr. Mackin is registered electrical engineer with over 36 years experience in electric power system planning and the integration of large renewable generation projects into power systems.
- In his free time, he enjoys educating the public on the benefits of electric vehicles. Mr. Mackin's current daily driver is a 2013 Tesla Model S.



Summary

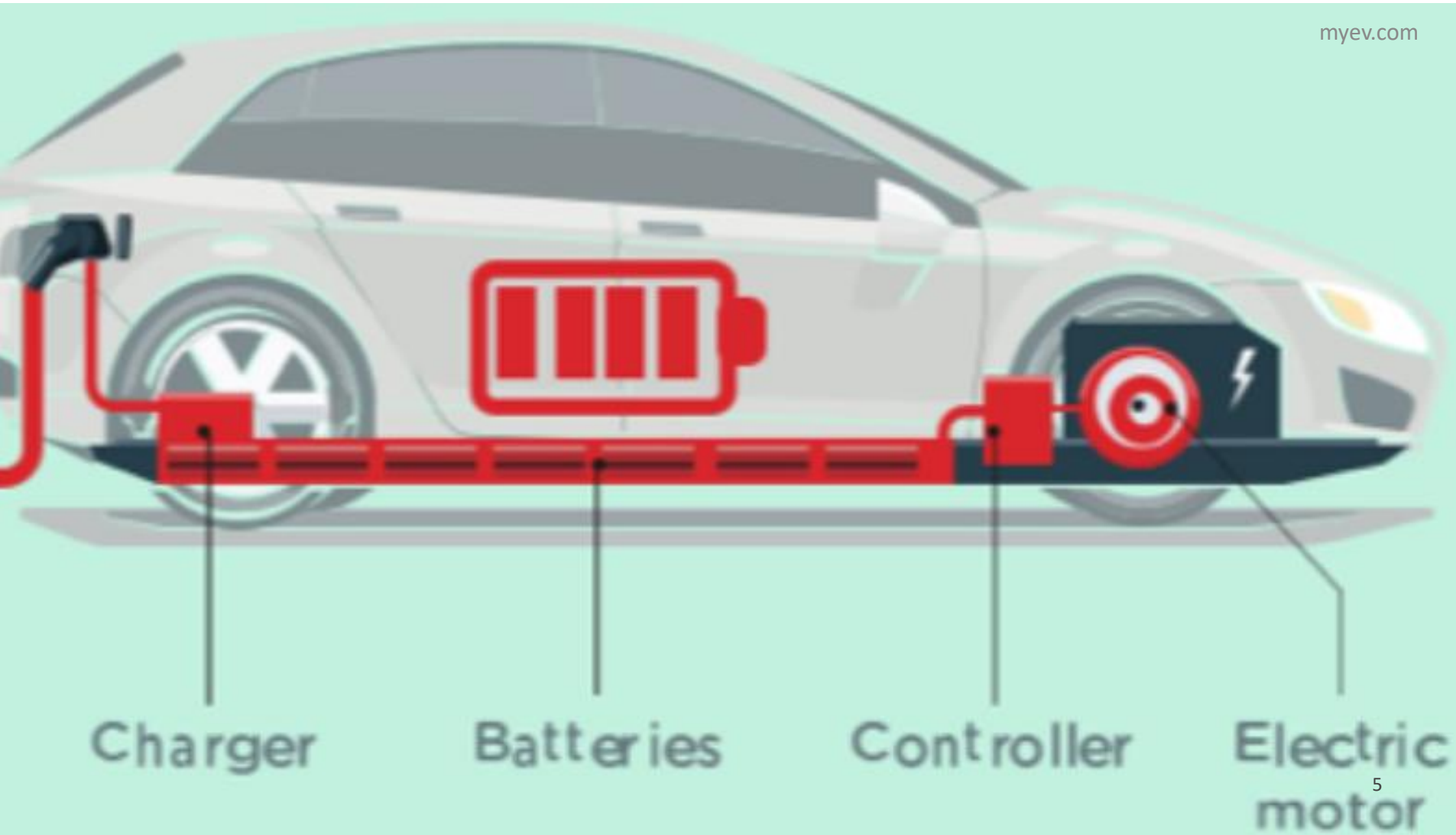
- Types of EVs
- Benefits of EVs
- Charging an EV
- Getting an EV
- Resources
- Q&A

Types

- What is an electric vehicle?
- How do hybrid, plug-in hybrid, and electric vehicles differ?
- What other types of electric vehicles are there?

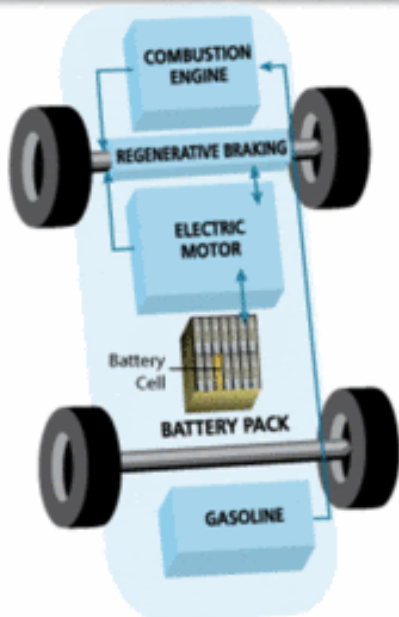
EVs, by definition, drive on electricity from a wall plug or charging station. They are propelled by electric motors and an on-board battery stores the electricity.

myev.com



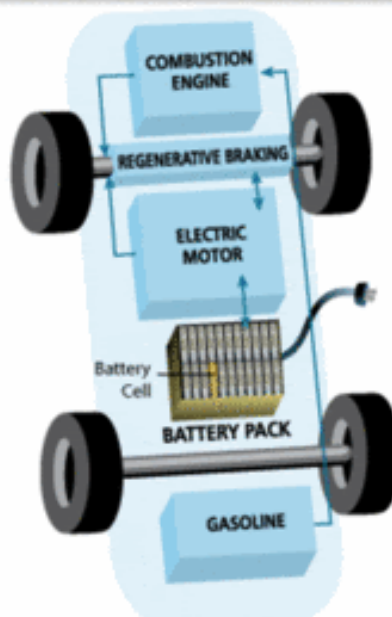
Hybrid vs. “Plug-in hybrid” vs. “All electric”

Hybrid Electric Vehicle (HEV)



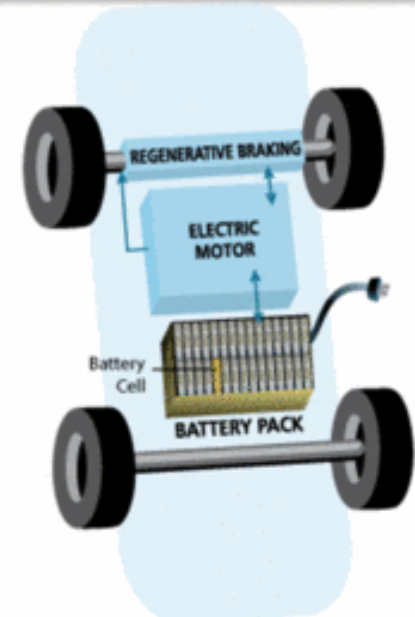
- Uses both an electric motor and an internal combustion engine (ICE)
- Electricity is generated on the car through regenerative braking or by the ICE

Plug-In Hybrid Electric Vehicle (PHEV)



- Uses both an electric motor and ICE
- Uses a combination of grid electricity, regenerative energy from braking, and power from an ICE

Battery Electric Vehicle (BEV)



- Uses batteries alone to power an electric motor
- Uses a combination of grid electricity and regenerative energy from braking

Plug-in Hybrid

- gas kicks in once battery depleted
- generally smaller battery and slow charging, but great total range (for EVs, rather than mpg we say “range” or “miles/charge”)
- lots of makes and models



All Electric

- can't be fueled with gasoline
- ranges vary from ~80-400 miles
- great for commuting and in-town errands
- Longer range models can replace ICE vehicles
- for commuting, choose one with a range of twice your daily usage



Other Types of EVs



- NEVs (neighborhood electric vehicles)
- e-motorcycles
- e-bikes
 - rideshare
 - personal

E-bikes



- range 20 to 40 miles
- 1 to 5 hrs to charge
- max speed about 28 mph (certain types)
- \$1,500 to \$7,000
- a few local stores sell them
- see Cool Davis' e-bike FAQs

Benefits

- What are the benefits of EVs?
- What financial incentives are available for purchasing or leasing an EV?



Lower Fuel Costs

- You can generally save **over 50%** in costs to power the vehicle
- “...over the vehicle’s lifetime an EV driver will save nearly \$13,000 on fuel not purchased.”
 - Anair and Mahmassani 2012

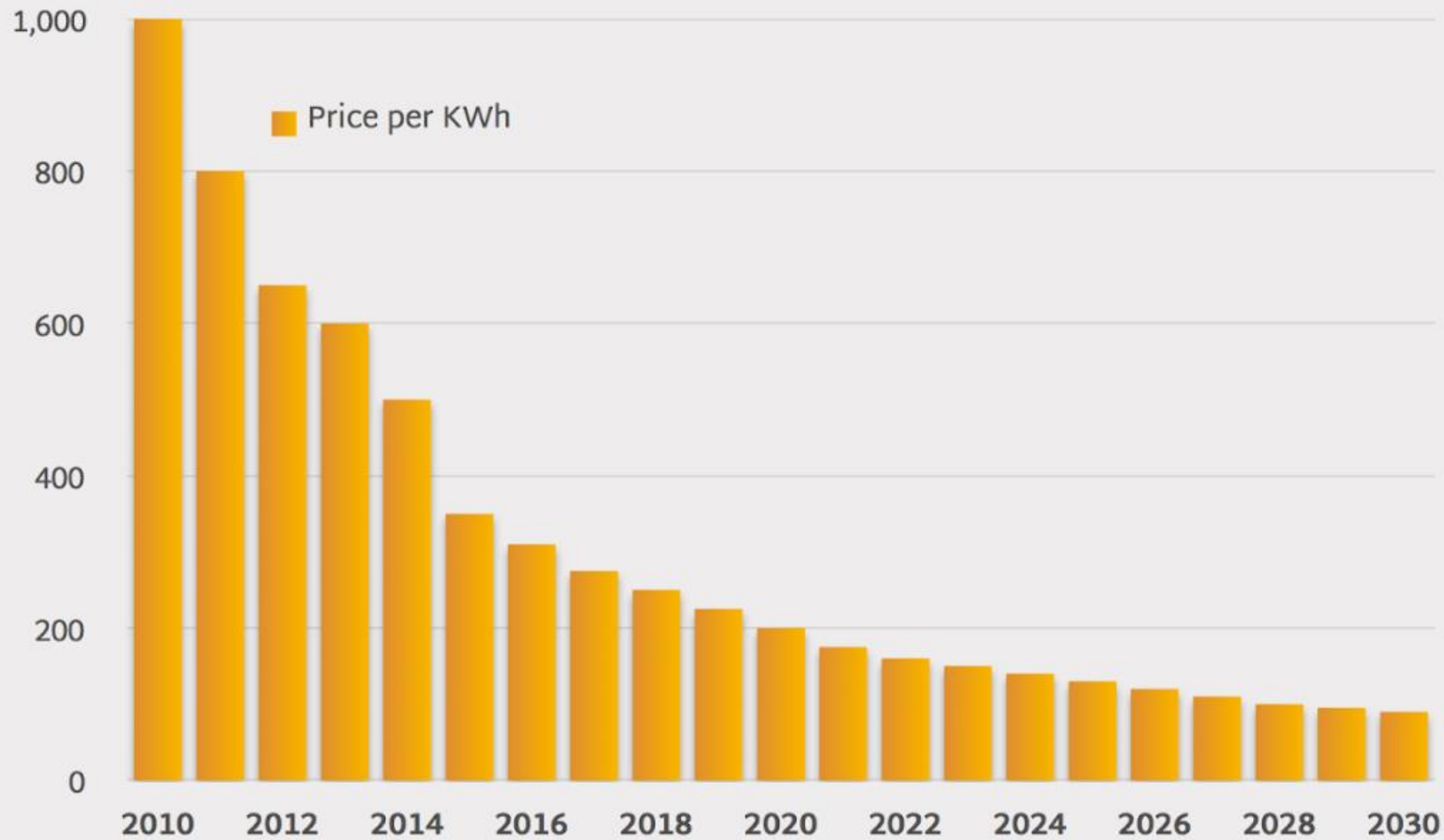


progressive.com

Lower Maintenance Costs

- 90% fewer moving parts
- Ultra long-life brakes
- Motor recharges battery
- No transmission fluid / oil changes
- No smog checks

Cost for lithium-ion battery packs (per KWh)





Good News

- After incentives, most prices are now comparable to gas-powered cars
- Incentives are continuing and expanding



- Federal:
 - \$2,500 - \$7,500
 - received with tax refund
- State:
 - \$2,500 - \$4,500
 - higher-income consumers are ineligible
 - lower-income can get an additional \$2,000
- PG&E
 - \$800
 - must be a PG&E customer



Other Incentives

- Vehicle-specific incentives
- Free parking in some places
- Carpool lane decals (from DMV)
- See more at cooldavis.org or the state's Drive Clean website



boingboing.net

Improves Air Quality

- When cars burn gasoline, they also emit air pollutants that affect our health
- Cutting emissions reduces illness, disease, and premature deaths



transform.iema.net

Support the Green Economy

- Fosters improvement in overall energy usage/generation
- Spur growth and jobs
- Supports solar/wind industries



Good Cars

- Provide maximum torque from a standstill, so when you hit the accelerator, you GO!
- Very quiet
- Batteries are more stable and much less flammable than gasoline



EVs Are Fun!

Charging

- What should I know about charging my vehicle?
- Where can I charge my vehicle?



- Charging takes longer than filling up (times vary)
- For most, over 90% of charging is while parked at home overnight (like a cell phone) or while at work
- EVs have a limited range between chargings
- Long-range EVs are great even for long distance travel if fast charging is available along your route.
- Or you can rent a PHEV/HEV/ICE or take the train

LEVEL 1 STANDARD OUTLET

- Plug into a standard 120V wall outlet
- Connector provided with every EV
- Great for overnight or workplace charging
- Ideal for typical commutes (up to 40 miles)

“TRICKLE
CHARGE”



40 miles
overnight

LEVEL 2 240 VOLT OUTLET

- Faster charging for longer drives
- Provides a full charge for most EVs in:



100% Electric

4-8 hours
empty to full
charge



Electric & Gas

1-2 hours
empty to full
charge

“QUICK
CHARGE”



25 miles
per hour of
charging

DC FAST CHARGE

- Much faster charging at public locations
- 3 different connectors depending on vehicle:



CCS Combo
65 miles
in 20 minutes



CHAdeMO
67 miles
in 30 minutes



Tesla Supercharger
130+ miles
in 20 minutes

“QUICK
CHARGE”



0 to 80%
30-40 minutes

Charging at Home



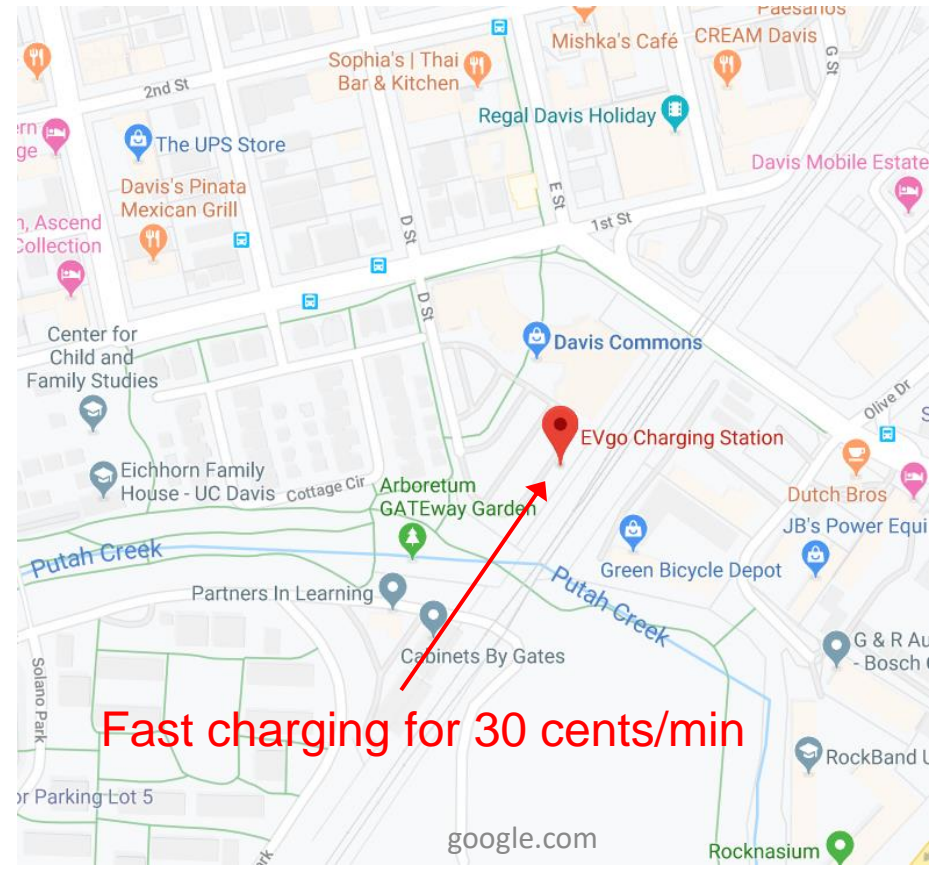
- Level 1 charging works for most
- If you drive a lot, get a Level 2, which can be installed by a licensed electrician
- Federal tax credit available for installation (2020 only)
- Your electricity bill will change, so use your utility company's calculator to estimate usage



Public Charging

- Charging is often free at public stations
- “For pay” stations are usually Quick Charge
- Does your workplace have charging?

- Locations are changing all the time
- Some housing communities and workplaces
- ~250 charging locations in Sacramento
- EVgo, ChargePoint, PlugShare, DrivetheARC





nytimes.com

Ports

- an EVSE with regular plug (e.g., NEMA 5-15) is included with all vehicles
- If you have the option for a Quick Charge port, get it

Getting an EV

- What are the options for getting an EV?
- What are the models currently available?
- What are the pros and cons to buying used?



Options

- **Lease** (\$60-\$250/mo; revisit market in a few years to see latest deals)
- **Buy used** (much cheaper and often includes good warranties)
- **Buy new**

Lease or Buy?

Lease

- State rebate applies
- Federal credit applies for most dealers
- Stay current as tech improves
- No exposure to faster reduction in value
- No risk of battery issues*

Buy

- State rebate applies
- Full Federal credit received only if buyer tax liability is \$7,500+
- Own the vehicle
- No mileage limits
- More financially sound (traditionally)



Under \$22,000 After Incentives



Fiat, 87 mi



Ford Focus, 115 mi (used)



Hyundai Ioniq, 124 mi



Nissan Leaf, 151 mi

Plug-in Hybrids Under \$26,000 After Incentives



Prius Prime, 25 mi



Hyundai Sonata, 28 mi



Niro, 26 mi



Subaru Crosstrek, 33 mi



Honda Clarity, 48 mi



Chevy Volt, 53 mi

Minivans and SUVs



Range Rover, 19 mi



Mitsubishi Outlander, 22 mi



Chrysler Pacifica, 33 mi

Tesla



Model 3, 322 mi



Model Y, 316 mi



Model S, 402 mi



Model X, 351 mi



Used EV Pros

- Many now on the market
- Competitive prices
- Many previously leased (clean, well-maintained, low miles)
- Some incentives still available



Used EV Cons

- Federal/state incentives not available
- Likely shorter range than newer models
- Batteries will be somewhat degraded
- Carpool decals may no longer be valid

Popular Used EVs



Mitsubishi i-MiEV, 62 mi



BMW i3, 90 mi

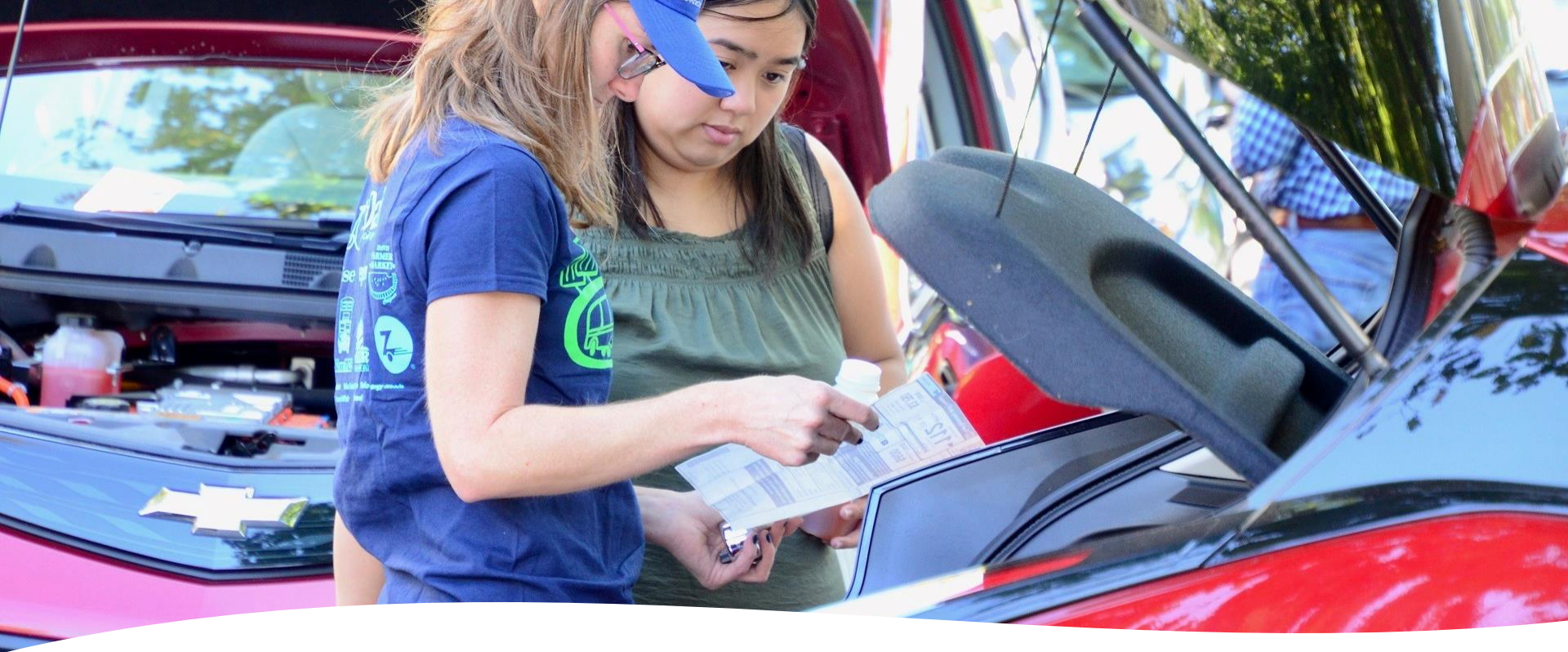


Nissan Leaf, 150 mi

and many
more!

Researching

- How can I research more about EVs?
- What online resources are available?



Prep

- More research is needed to buy an EV than a gas-powered car
- Assess range needs
- Map out charging options
- Choose the right EV for you, not just the cheapest/most attractive

Plug In America[®]

plugstar.com



Shopping
Assistant



Browse Electric
Cars



Find a Local
Test Drive
Event



Find an Electric
Car Dealer or
Retailer

plugstar.com/cars

Sort by: Make | Price | Electric Range | Popularity

Clear filters - See all cars

46 vehicles displayed

Cash Loan Lease

Budget after incentives, in zip 95617

< \$1,400/mo.

Vehicle type

- Sedan
- Hatchback
- Coupe
- Crossover
- Minivan
- SUV
- Wagon
- Truck

Seats

- 2
- 4
- 5
- > 5

Fuel

- All-Electric
- Plug-in Hybrid

Minimum Range

Location

Hyundai
Ioniq Plug-In Hybrid



\$2,673

Due at Signing

est. \$223 /month
Lease Payment



MORE

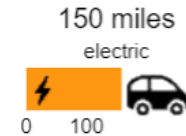
Nissan
LEAF



\$3,004

Due at Signing

est. \$230 /month
Lease Payment



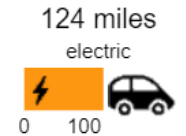
MORE

Hyundai
Ioniq Elect



\$3,031

Due at Signing



MORE

Volkswagen
e-Golf



Kia
Niro Plug-In Hybrid



Honda
Clarity Plug
Hybrid





ev.pge.com

Welcome to the EV Savings Calculator

Your electric car guide. Estimate and compare costs, savings, EV incentives, and more.



Browse Electric
Vehicles



Discover
Incentives



Compare
Rate Plans



Locate Charging
Stations

Why electric vehicles are a good idea.

Save money

Electric Vehicles can be cheaper to fuel and own than gas cars

Less hassle

Electric vehicles have no regular maintenance – no oil, filters, or belts to change

Drive anywhere

Ever-improving batteries and charging infrastructure provide freedom and peace of mind

Compare Electric Vehicles

Compare electric cars by EV range, price, or your personalized Match Score. Click on the EV for more details, including total cost compared to a similar gas vehicle.

Sort By Match Score

Refine Match Score

ROUNDTRIP COMMUTE

30 Miles

BUDGET AFTER INCENTIVES

\$30,000

Personalize Incentives

MINIMUM SEATS

2 seats

HOME CHARGING AVAILABILITY

Level 2

Help me choose

Filter

FUEL ?

All-Electric

Plug-in Hybrid

TYPE

Sedan

Hatchback

Coupe

Crossover

Minivan

SUV

Wagon

Truck

Chevrolet Bolt EV



Electric Range 238 miles
MSRP \$36,620

AFTER INCENTIVES **\$29,570**
MATCH SCORE **100**/100

Chevrolet Volt



Electric Range 53 miles
Total Range 420 miles
MSRP \$33,520

AFTER INCENTIVES **\$27,470**
MATCH SCORE **100**/100

Chrysler Pacifica Hybrid



Electric Range 32 miles
Total Range 520 miles
MSRP \$39,995

AFTER INCENTIVES **\$30,195**
MATCH SCORE **100**/100

Ford Fusion Energi



Electric Range 26 miles
Total Range 610 miles
MSRP \$34,595

AFTER INCENTIVES **\$27,710**
MATCH SCORE **100**/100

Honda Clarity Plug-In Hybrid



Electric Range 48 miles
Total Range 340 miles
MSRP \$33,400

AFTER INCENTIVES **\$23,600**
MATCH SCORE **100**/100

Hyundai Ioniq Plug-In Hybrid



Electric Range 29 miles
Total Range 630 miles
MSRP \$25,350

AFTER INCENTIVES **\$18,507**
MATCH SCORE **100**/100

Hyundai Kona Electric

Hyundai Sonata Plug-In Hybrid

Kia Niro EV

stats

- check the manufacturer's claimed range
- if needed, confirm it has a Quick Charge connector



Nissan LEAF 2019

[Manufacturer website](#)



Compare Favorites

Find Dealer

[Overview](#) | [Photos](#) | [Popularity](#) | [Reviews](#) | [Build](#) | [Incentives](#) | [Charging](#) | [Cost](#)

EPA-Rated All-Electric Range: **150 miles**

Home Charging

Charging On The Go

COST

\$0.39

Cost of Charging

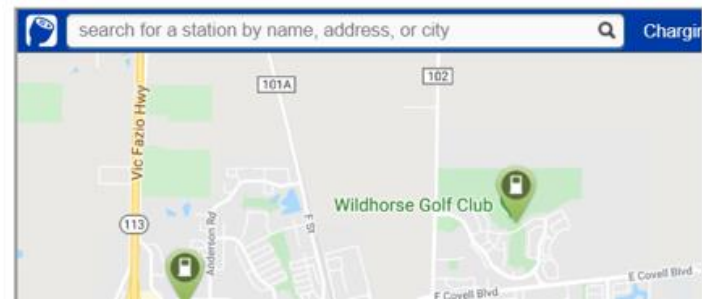
10

Miles



PG&E - EV rate (off-peak) - \$0.13/kWh

LOCAL CHARGING STATIONS



Sponsor Resources

- **PlugStar.com**
Compare vehicles, find incentives, get equipped
- **Plug In America's EV Support Program**
1 (877) EV-HELP-1
support@pluginamerica.org
- **DriveElectricWeek.org**
EV events September 26–October 4, 2020
- **DriveElectricEarthDay.org**
EV events throughout April
- **PlugInAmerica.org**
Learn more about our organization
- **SierraClub.org/transportation**
Learn more about our organization
- **Electricauto.org**
Learn more about our organization

Questions

- FAQs
- Questions from the audience

Are EVs Better For the Environment?



- EVs use electricity, which can come from burning of fossil fuels, but more and more is from renewable sources
- Mining to produce battery components can be damaging, but it's far better than burning gasoline
- Batteries can be reused or recycled

FAQs

- How often do you have to replace the batteries?
 - Most owners may never have to replace their battery pack.
 - GM and Nissan offer warranties covering 8 years or 100,000 miles of driving on the lithium-ion batteries in the Volt or the Leaf.
 - Plug In America is conducting surveys of battery life among EV drivers. You can learn about survey results or participate [here](#).
- Will plug-in cars lead to more coal and nuclear power plants?
 - No. According to the U.S. Department of Energy, the existing electric grid's off-peak capacity for power generation is sufficient to power 73 percent of commutes to and from work by cars, light trucks, SUVs and vans without building a single new power plant.
 - [See a recent article on this topic.](#)
- What's the recommended maintenance for EVs?
 - Battery EVs generally require less maintenance than gasoline engines. The same applies to plug-in hybrids if you don't have a long commute and drive mostly using electricity.
 - [See this sample owner's manual](#) for an idea of the suggested maintenance.

Battery Lifetime Q&A

- How long are the lifetimes of EV batteries?
 - For a typical lithium-ion battery, capacity declines steadily depending on the number of charge/discharge cycles (more about the cycles than the time)
- How does range of the vehicle correlate with lifetime of the battery? Will vehicle's range be expected to degrade as the battery ages?
 - At 2500 cycles, typical battery capacity is at about 80%, which translates to 80% of range after 7 years for daily use
 - Some drivers might be ok with a 60% range and so would not need to invest in a new battery for a long time
- How much are they to replace? (all costs: disposal, labor)
 - Between \$100-200 per KWh

Other Questions?

Email deva@cooldavis.org with questions
about electric vehicles in Davis.

