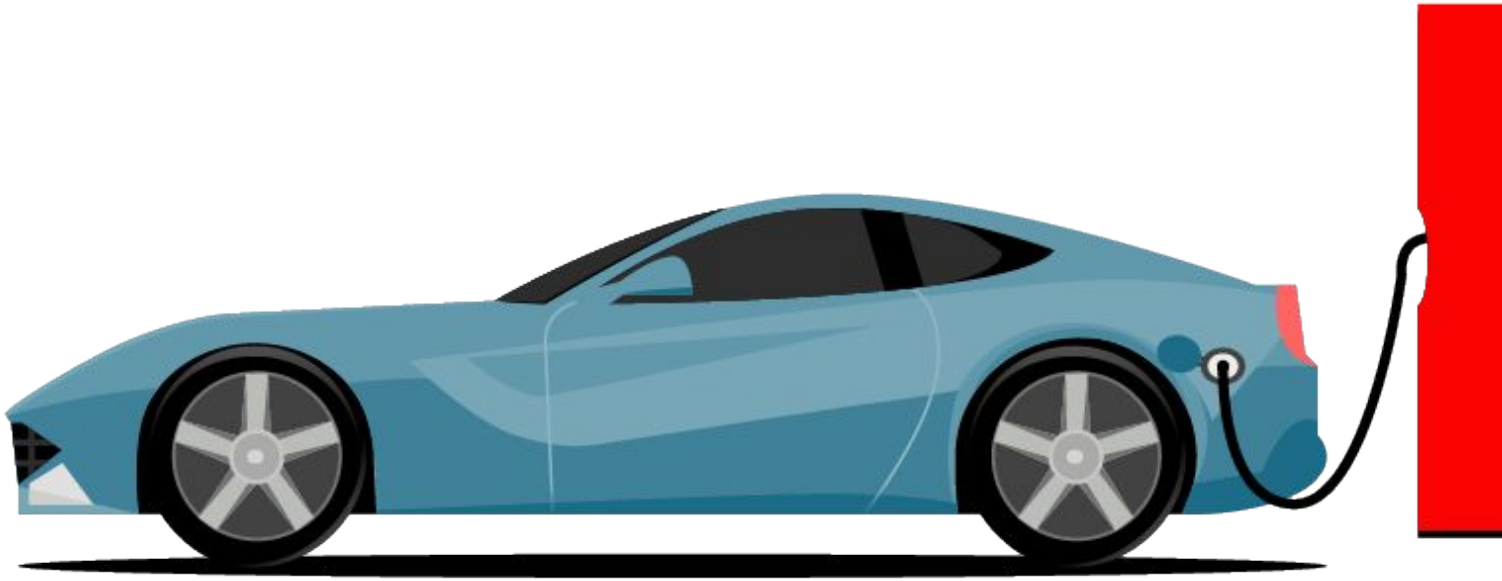
ELECTRIC VEHICLES 101

JANUARY 20, 2021

Heather Heinbaugh



Is an EV right for me?

Is charging an EV **cheaper** than buying gas?

Are electric vehicles **affordable**?

How and where would I **charge** an EV?

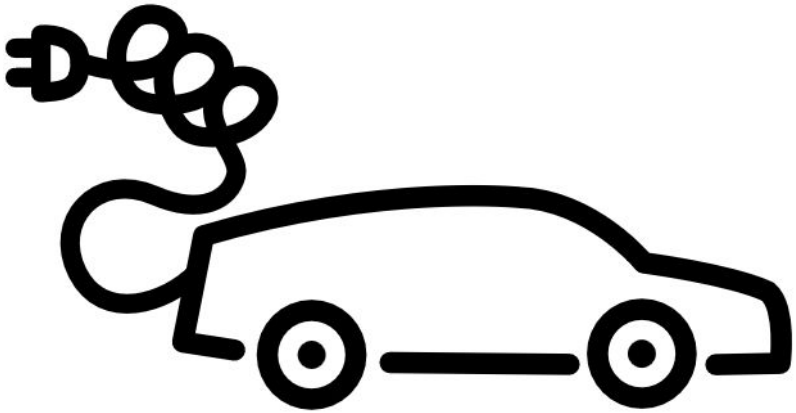
What type of EV is the **best** for me?

Should I buy **new** or **used**? Or is it better to **lease**?

Will an EV go enough **miles** between "fill-ups"?

Tonight's Agenda

- Reasons to Drive an Electric Vehicle
- Choosing Your Electric Vehicle
- Getting Charged
- Paying for Your Electric Vehicle and Charger
- Living with your EV



TOP REASONS TO DRIVE AN ELECTRIC VEHICLE

Lower Lifetime Cost

Cheaper to Charge than to fill the tank

Electricity Rates more stable than gasoline prices

Grants, Rebates and **Tax Credits** for new or used EVs & chargers

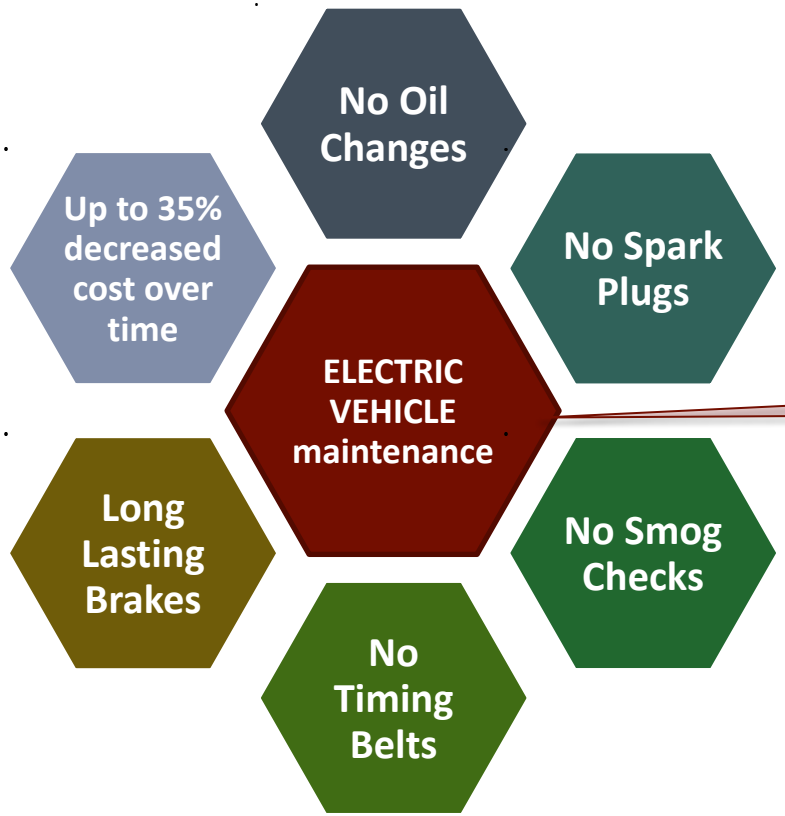
Higher upfront cost is typically **paid back by 50,000 miles**

Free or Reduced Tolls

Many models listed **under $35,000** now on the market

Maintenance Costs are lower, especially with long battery warranties

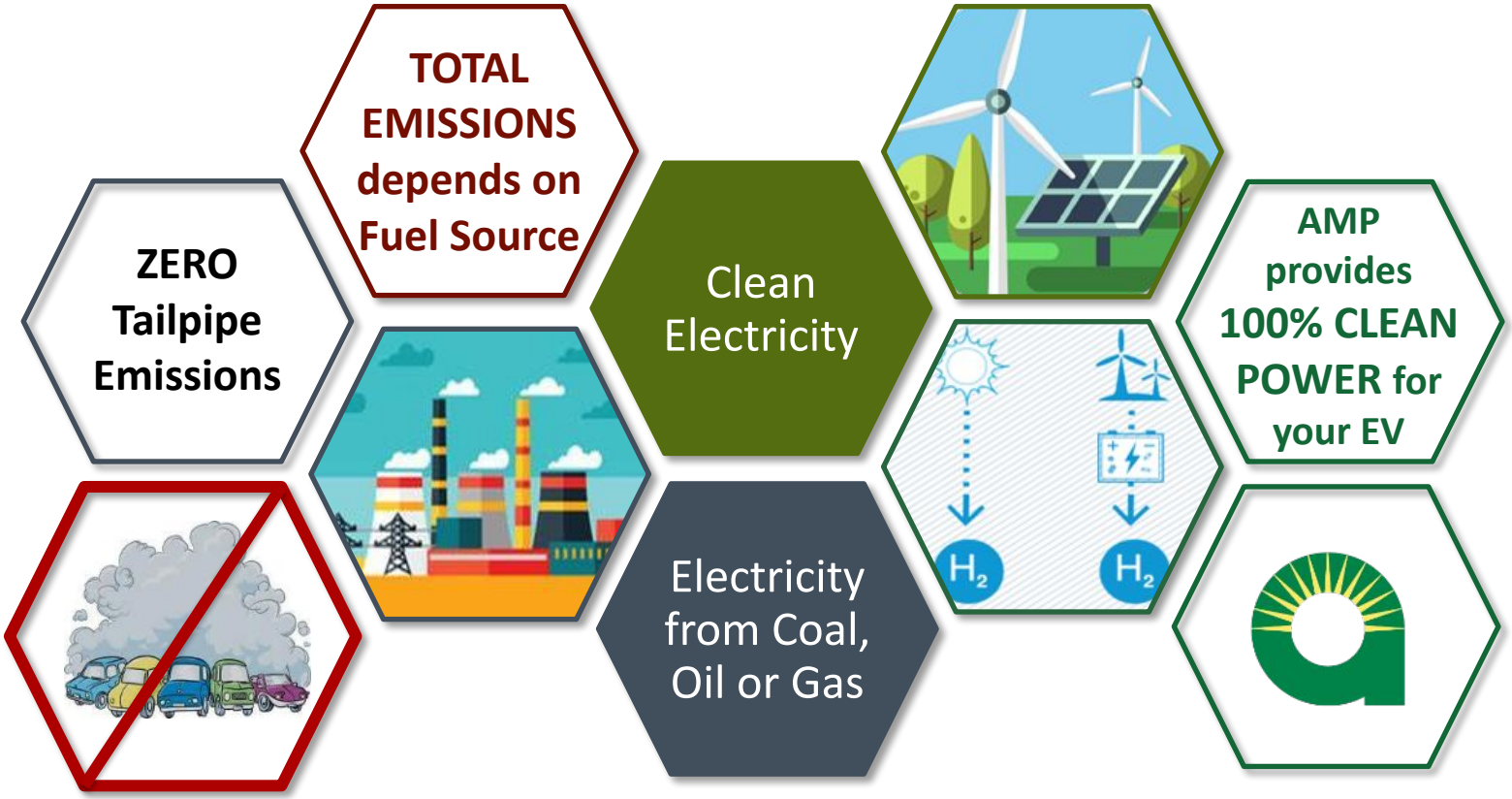
Lower Maintenance (Save $$$)



Top 10 Conventional Car Repairs
(Source: 2015 Forbes/Credit: credit.com)

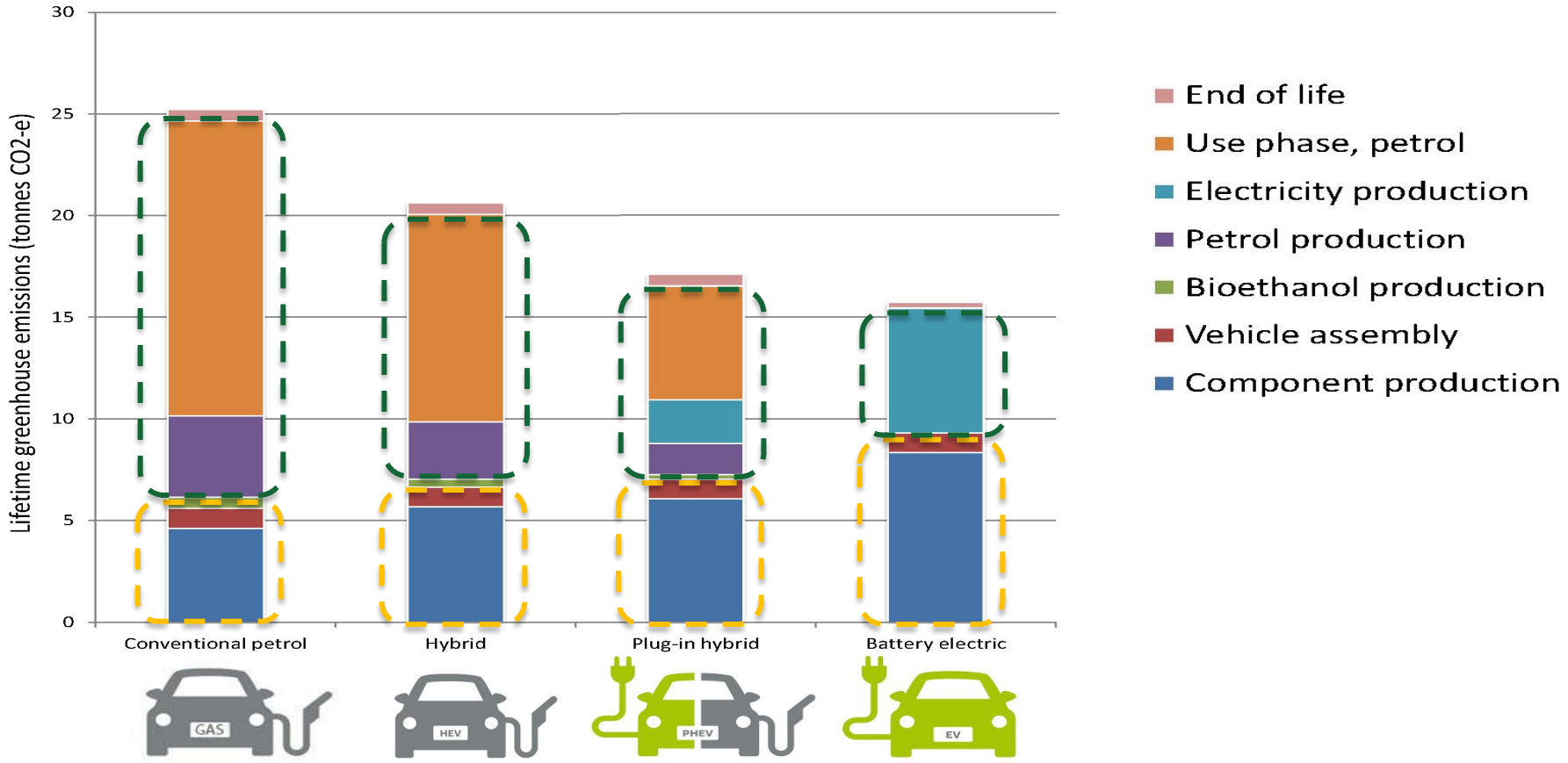
1. Replace Oxygen Sensor - $249
2. Replace Catalytic Converter - $1,153
3. Replace Ignition Coils & Spark Plugs - $390
4. Tightening or Replacing Fuel Cap - $15
5. Replace Thermostat - $210
6. Replace Ignition Coils - $236
7. Replace Mass Air Flow Sensor - $382
8. Replace Spark Plugs & Wires - $331
9. Replace EVAP Purge Control Valve - $168
10. Replace EVAP Purging Solenoid - $184

Lower Emissions

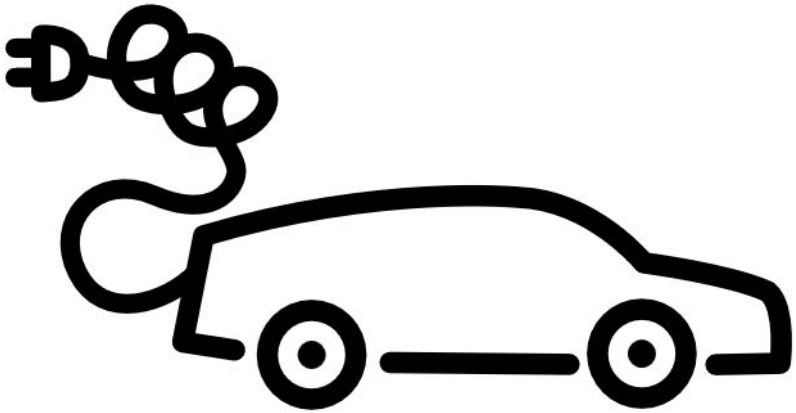


Lower Emissions

Average Lifetime Emissions*

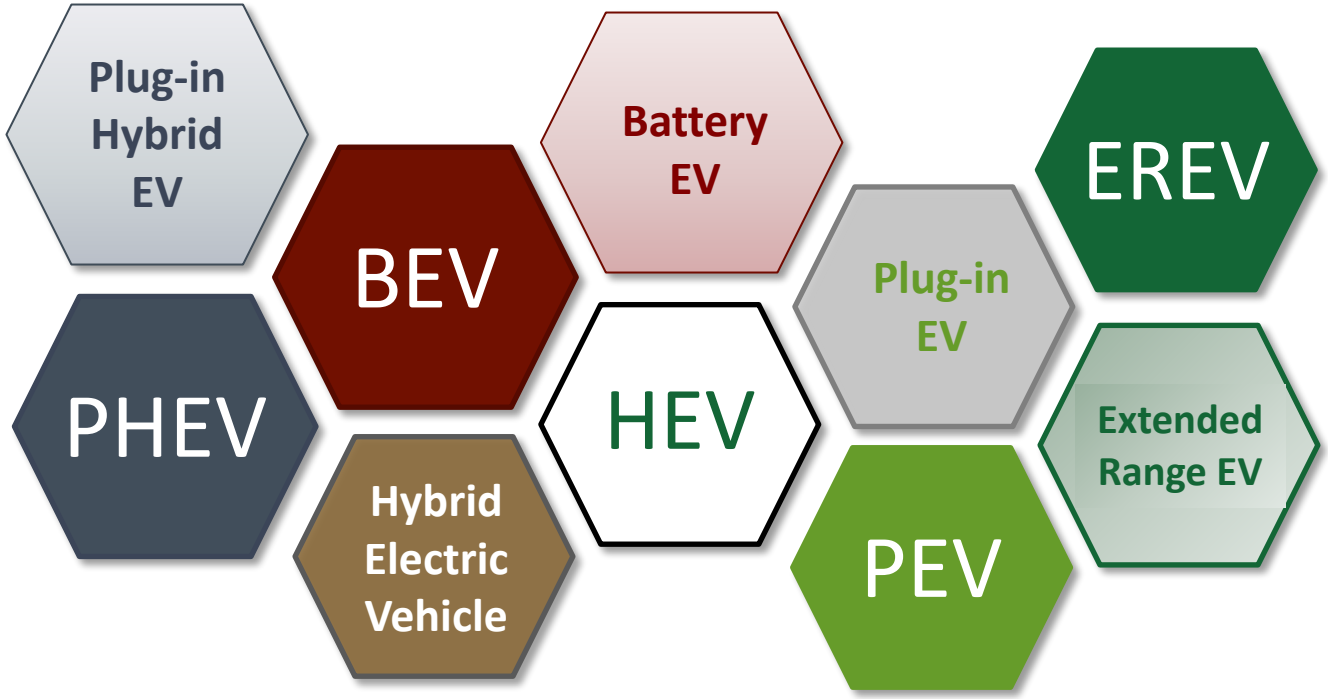


*Typical scenario from bravenewclimate.com



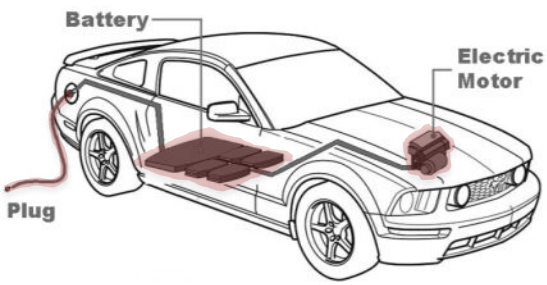
CHOOSING AN ELECTRIC VEHICLE

What kind of EV is right for me?



BEV: Battery Electric Vehicles

How does it work?



BEV

PEV

Hyundai Ioniq

Tesla Model S

Chevy Bolt

Battery charged using **Electricity**

Electricity accessed through **Plug**

Battery powers Electric Motor

BEV: Battery Electric Vehicles

ADVANTAGES

Simple, low maintenance **Electric Motor**

Many **Choices** of Vehicles

BEV

PEV

Hyundai Ioniq

Tesla Model S

Chevy Bolt

DISADVANTAGES

Charging Anxiety Where will I find a charge?

Fill-up Time Charging takes more time than filling a gas tank

Range Anxiety Can't drive as far between "fill-ups"

BEVs Today – Short and Mid Range

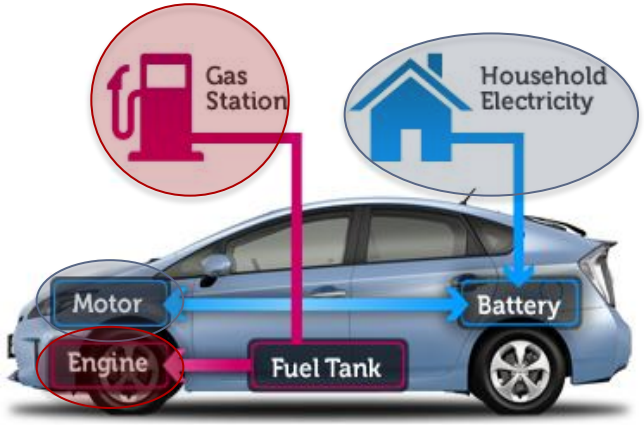
Cost	50 60 70 80 90 100 110 120 130 140 150 Miles
$$	Smart ED
$$$	Fiat 500e
$$$	Honda Clarity Electric
$$	Nissan Leaf 1st Gen
$$$	Kia Soul EV
$$$	BMW i3
$$	Ford Focus Electric
$$	Volkswagen e-Golf
$$	Hyundai Ioniq Electric
$$	Nissan Leaf 2nd Gen

BEVs Today – Long Range

Cost	200 220 240 260 280 300 Miles
$$$	Nissan Leaf Long Range
$$$$$$$	Jaguar I-PACE
$$$	Chevy Bolt EV
$$$	Kia Niro EV (SUV)
$$$$$$$	Audi eTron (SUV)
$$$	Hyundai Kona Electric (SUV)
$$$$$$$	Tesla Model S 75D
$$$$	Tesla Model 3 Mid Range
$$$$$	Tesla Model X (SUV)
$$$$$	Tesla Model 3 Long Range

PHEV: Plug-in Hybrid Electric

How does it work?



PHEV

EREV

PEV

Chevy Volt

Honda Clarity PHEV

Toyo

Battery Charged using **Electricity**

Electricity accessed through **Plug**

Gas-fueled **Internal Combustion Engine** when Battery Depleted

Battery powers **Electric Motor**

Enough Battery for **Short ALL-ELECT RIC Trips**

PHEV: Plug-in Hybrid Electric Vehicles

ADVANTAGES

Many **Choices** of Vehicles

Long Driving **Range**

Versatile Fuel Source

PHEV

EREV

PEV

Chevy Volt

Honda Clarity PHEV

Toyo

DISADVANTAGES

More Maintenance (2 engines, 2 fuels)

Relies on Gasoline to power Internal Combustion Engine

PHEVs Today - Sedans, Coupes & Compacts

Cost	0 10 20 30 40 50 EV Miles 20 30 40 50 MPG
$$$	MINI Countryman
Discontinued	Ford Cmax Energi (used)
$$$	Ford Fusion Energi
$$$	Toyota Prius Prime
$$$	Kia Niro
$$$	Hyundai Sonata
$$	Hyundai Ioniq
$$$	Kia Optima
$$$$	Chrysler Pacifica (Minivan)
$$$	Honda Clarity
Discontinued	Chevy Volt (used)

PHEVs Today – Luxury Cars

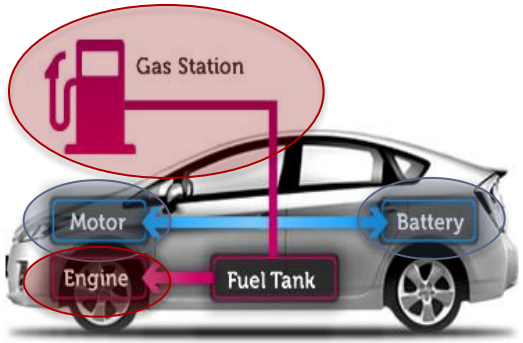
Cost	0 10 20 30 40 50 EV Miles	20 30 40 50 MPG
$$$$	Mercedes-Benz C-Class	
$$$$$$$$$	BMW 7 Series	
$$$$$$$$$$	BMW i8	
$$$$	BMW 3 Series	
$$$$$	BMW 5 Series	
$$$$	Audi A3 Sportback e-tron	
$$$$$$$$$$	Porsche Panamera	
$$$$$$	Volvo S90	
Discontinued	Cadillac CT6	
$$$$$$$$$$	Karma Revero	

PHEVs Today - SUVs

Cost		0 10 20 30 40 50 EV Miles	20 25 30 35 MPG
$$$$$$	BMW X5		
$$$$$$$$	Porsche Cayenne		
$$$$$$	Volvo XC60		
$$$$$$$$$$	Volvo XC90		
$$$	Mitsubishi Outlander		
$$$	Subaru Crosstrek Hybrid		

What about a “Regular” Hybrid?

How does it work?



Hybrid

Toyota Prius

Ford Fusion

Kia Niro

Relies on **Gasoline** to power Internal Combustion Engine

Drive using **Electric Motor** at low speeds and while cruising

Electric Motor increases **fuel efficiency** and decreases **emissions**

Battery **Automatically Recharges** while Driving

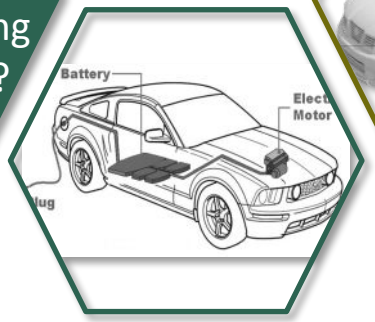
Comparison Shopping

Charging
What is my access to charging

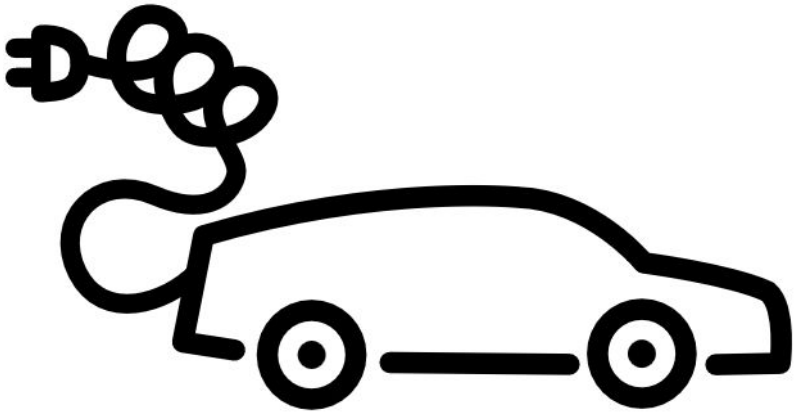
Range
What range do I need? How often?

Charge Acceptance Rate
Is quick charging critical to me?

Charger Level
Will the EV accept fast charging if I need it?



Battery Life & Warranty
Is there a long or extended warranty?

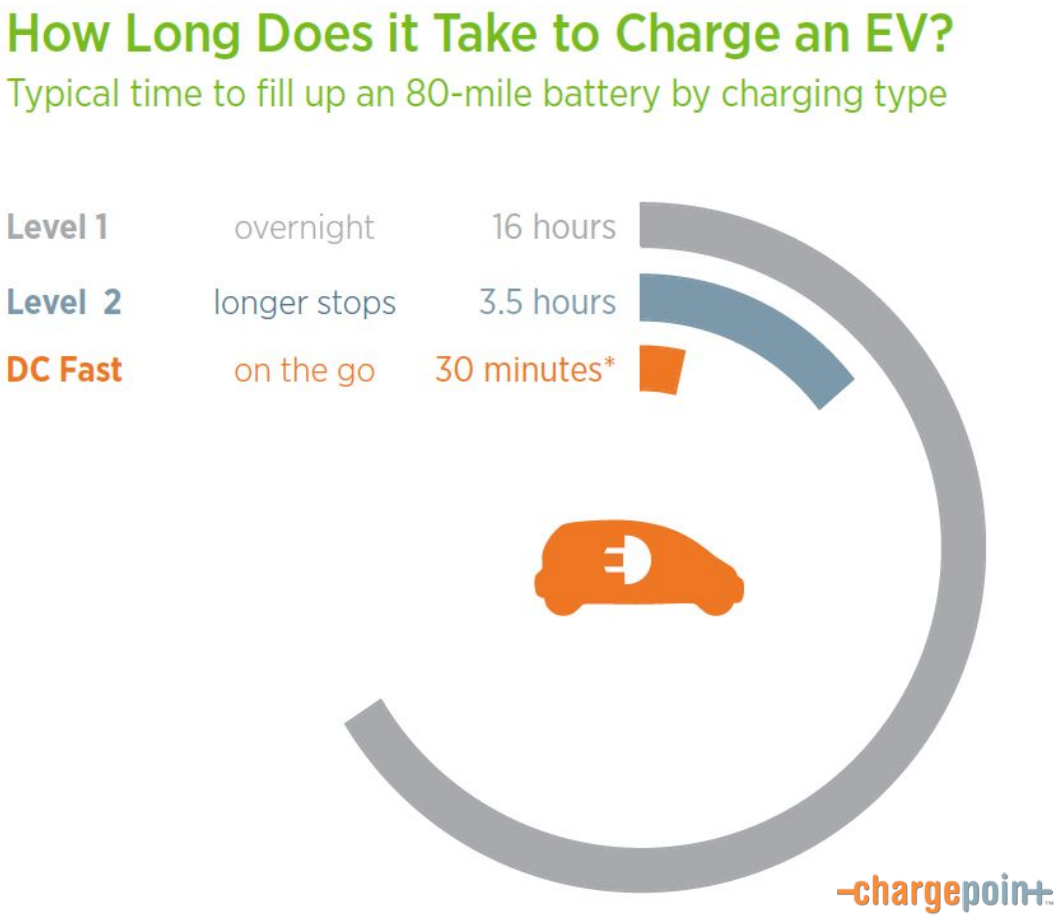


GETTING CHARGED!

Choosing a Charging Approach

Charging stations are known as **Electric Vehicle Supply Equipment (EVSE)**

Charge speed depends on two things:
(1) **Charger** and
(2) **Vehicle Acceptance Rate**



Home Charging – Level 1

What is needed:
Dedicated 120 V circuit, Standard Outlet

How it works:
Plug in the charging cord that **comes with the EV**
Get **4 - 5 miles of range per hour**, regardless of vehicle

Best for:
Shorter commutes (30-40 mi/day) and **longer charge times**

Home Charging – Level 2

What is needed:

-Dedicated **240 V** 15-50 Amp circuit (depends on EV) & a **Level 2 Charger**

How it works:

Depends on Charger **Delivery Rate** & Vehicle **Acceptance Rate**

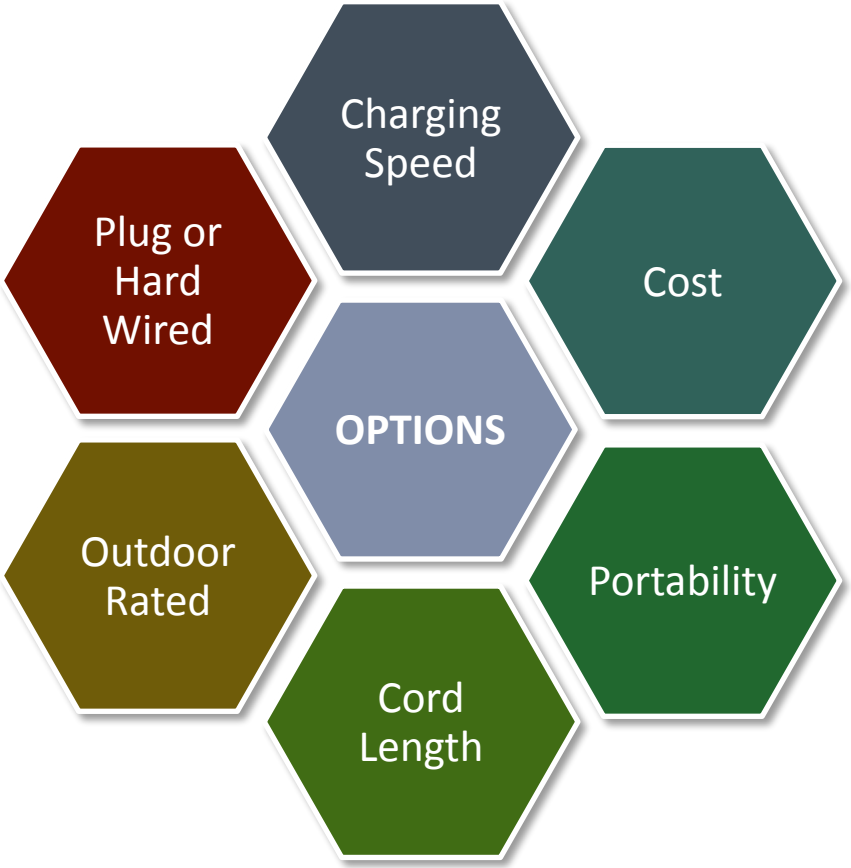
Get 11 - 32 miles of range per hour

Best for:

Longer Commutes

You may need an electrical **Panel Upgrade**

Home Charging – Level 2



Level 2 Public Charging

<u>Opportunity Charging:</u>
public chargers typically found in **parking garages & lots**

<u>Work Charging:</u>
available for **fleet** or **employee vehicles**

<u>Universal Plug</u>
"J-1772"
(Tesla provides adapter)

Level 3 / DC Fast Charging

How it Works:

- **High Power** (50-300W)
- **Public Only**
- Charges up to 80% in ~30 min, then slows to protect battery

Things to Watch for:

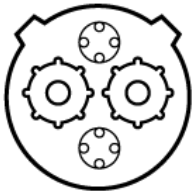
- PHEVs and some EVs **can't use** DC Fast Charging
- There are **3 types**; know which one you can use
- Routine Fast Charging can shorten **battery life**
- Only use if **battery is low** (<80%)

Best for:

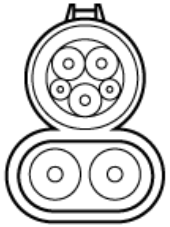
Quick charging **on the road**

DC Fast Charger Types

CHAdeMO



SAE Combo CCS



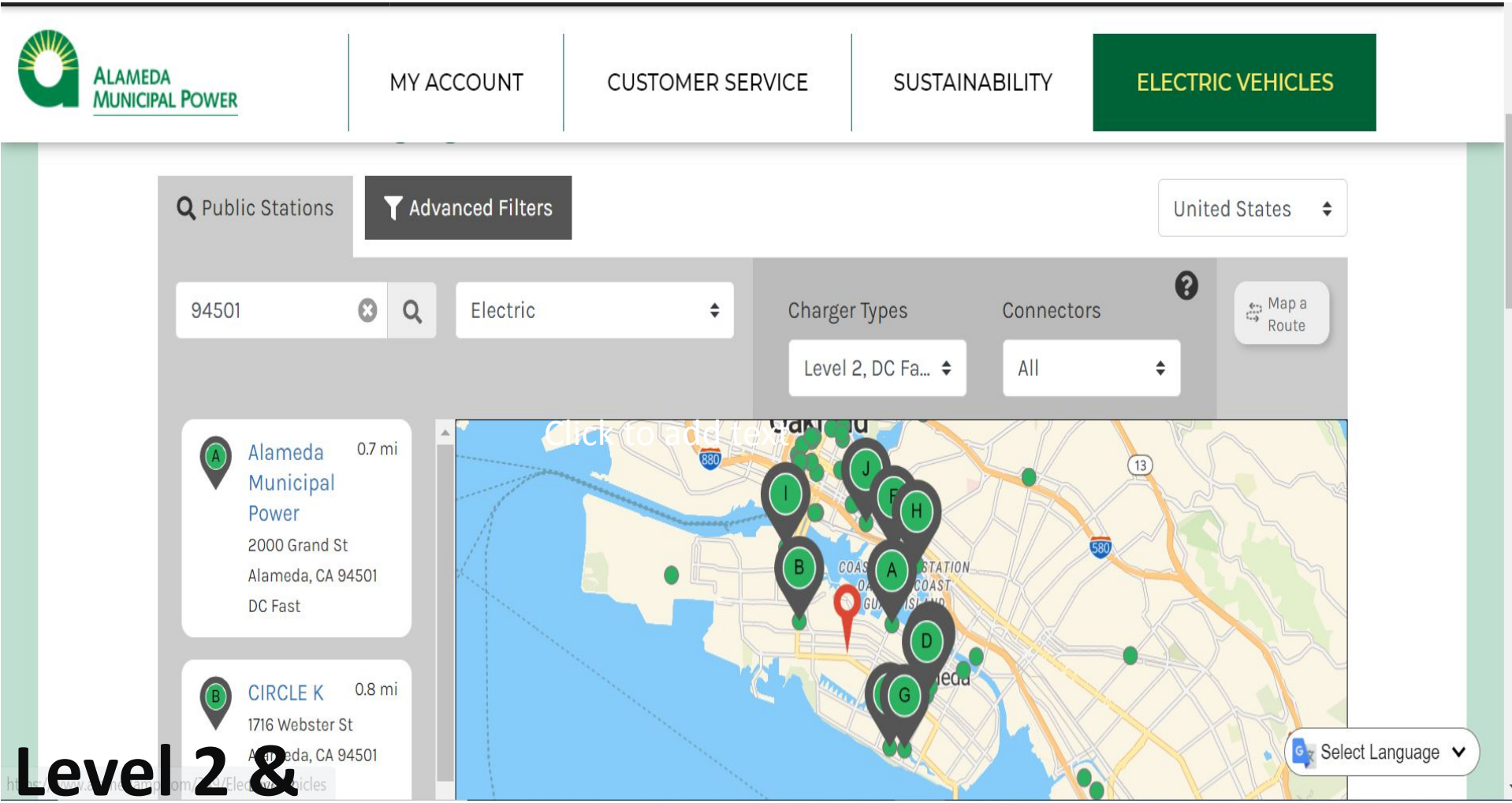
Tesla Supercharger

Tesla Only

(Tesla offers CHAdeMO adapter)

Finding Charging Stations on the Road

Finding Charging Stations in Alameda

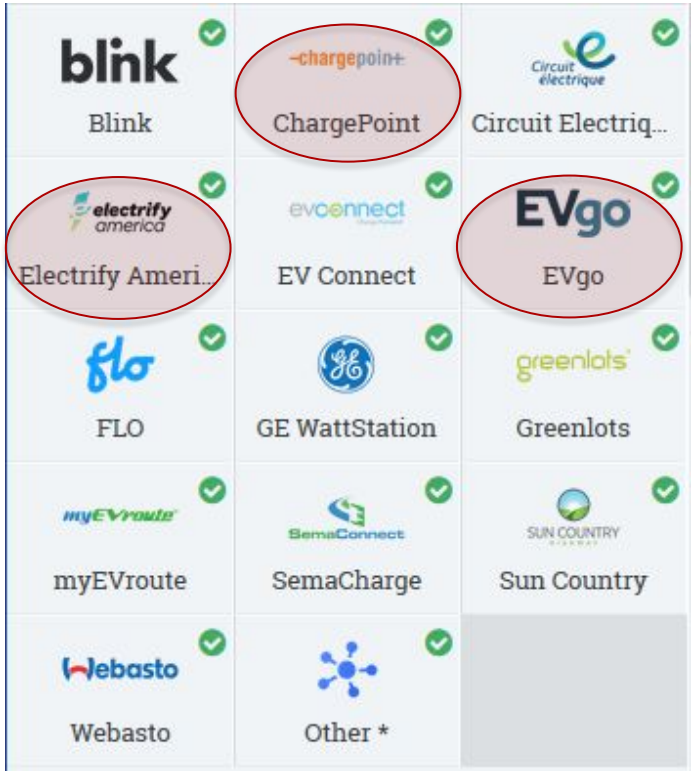


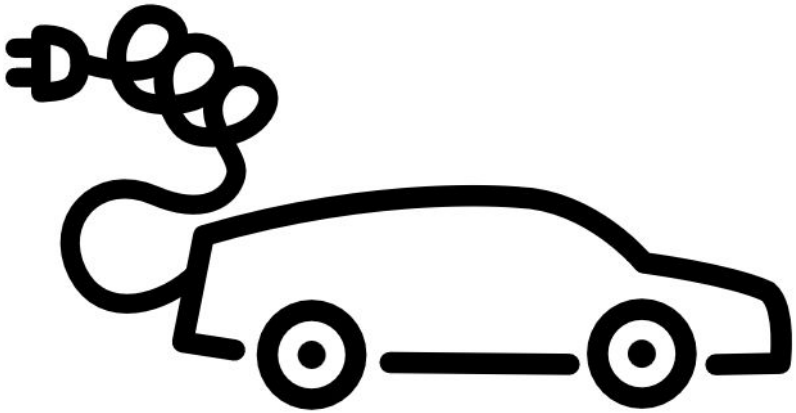
Level 2 & DCFC Chargers

Click Here to Check out the EV Website

Finding Charging Stations on the Road

- Sign up online for different networks





PAYING FOR AN EV & CHARGER

Evaluating the Upfront Cost

Manufacturer suggested retail price (MSRP)

Federal tax credits

Other rebates & grants

Level 2 charger purchase & installation

AMP Rebates
1. Used EVs
2. Chargers

Evaluating the Upfront Cost

Manufacturer Suggested Retail Price (MSRP)

Purchase a New EV

- MSRP ranges from $30,000 to over $100,000
- Typically can be negotiated with the Dealer

Purchase a Used EV

- Reputable dealer prices start at around $5,000

Evaluating the Upfront Cost

Level 2 Charger

Level 2 Charger	$200 - $1,000
City of Alameda Permit	$230
Electrician	$500 - $3,000
TOTAL	$930 - $4,230

*Coming Soon: AMP Electric Panel Upgrade Rebate

Evaluating the Upfront Cost

PURCHASE A NEW EV

Credit amount based on EV Battery Capacity

- $7,500 for BEV and Long Range PHEV
- $4,000 - $4,500 for Shorter Range PHEV

Federal Tax Credit factored into lease

Phased out as each manufacturer reaches sales target

Federal Tax Credits

Evaluating the Upfront Cost

PURCHASE A NEW EV (cost of vehicle up to $60,000)

Standard Rebate Amounts with Upper Income Limit

- $2,000 for BEV
- $1,000 for PHEV

Increased Rebate Amount for Income-qualified Customers

- $4,500 for BEV
- $3,500 for PHEV

*If purchased or leased >30 months within the previous 3 months

California Rebates
(limited funding, first come, first served)

Evaluating the Upfront Cost

California Clean Fuel Reward Program

- California Air Resources Board
- Point of sale rebate of $1,500
- Purchase and lease for a New EV
- Must be registered in CA
- Eligibility at participating dealerships

New Rebates (November 2020)

Evaluating the Upfront Cost

Used EV Rebate

- Purchase a used EV up to $22,000 and get $1,500 rebate

Standard AMP Rebates:

- Battery Electric vehicle (BEV) $1,000

Income Qualified AMP Rebates

- Battery Electric vehicle (BEV) $1,500

AMP Programs: Stackable with Other Grants

Evaluating the Upfront Cost

EV Bonus

Purchase a used EV and install a Level 2 Charger you can qualify up to a $2,300 rebate

- $1,000 (used BEV) + $800 (L2 Charger) + $500 Bonus= $2,300

- **Income Qualified Rebate Bonus (Up to $3,300)**

- $1,500 (used BEV rebate) + $500 bonus = $2,000
- $1,500 (used BEV rebate) + $800 (charger rebate) + $1,000 bonus = $3,300

Evaluating the Upfront Cost

PURCHASE A NEW OR USED EV

- For **income qualified customers** only

Plug-in Hybrid	Battery Electric and Fuel Cell	Mobility Options
$5,500 - $9,500	$5,500 - $9,500	Up to $7,500

Hybrid: up to $2,500

Plug-in Hybrid: up to $5,000

Battery Electric: up to $5,000

California Air Resources Board (CARB) Grants

Clean Cars for All (trade-in program)

Clean Vehicle Assistance Program (purchase)

Evaluating the Upfront Cost

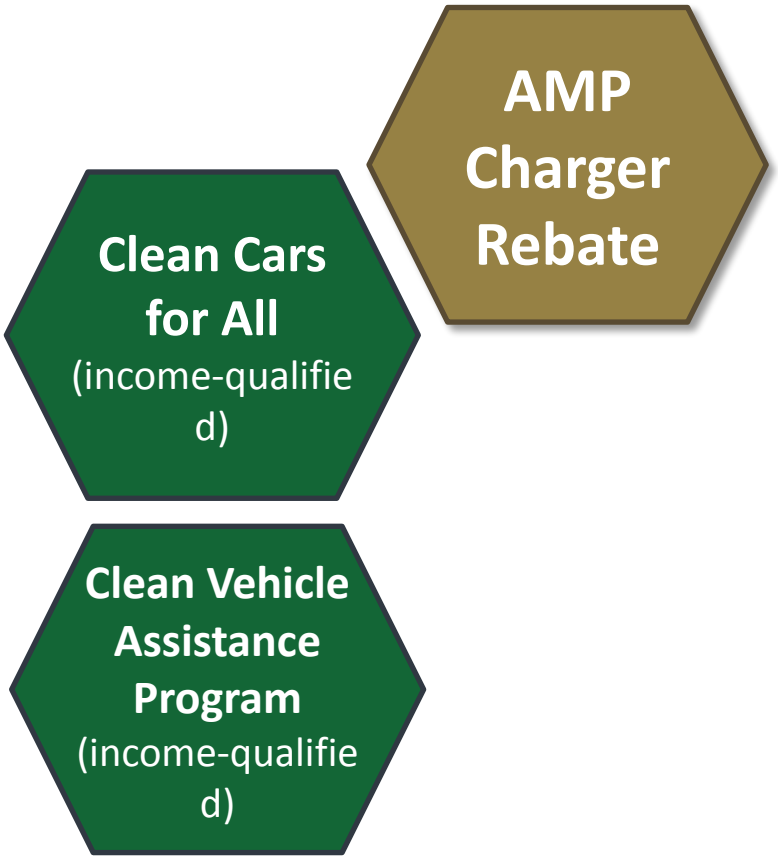
EV CHARGERS

AMP Level 2 Charger Rebate

- $800 toward purchase, permitting and/or installation costs

CCFA and CVAP

- $2,000 toward charger purchase and installation with the purchase of an EV through their program



Buying a Used EV

Check the Battery Warranty
It may only apply to original owner

Battery Warranties are typically 8 years, or 100,000 miles

Newer batteries may last for 20 years at 70-80% capacity

Previously Leased EVs
Vehicles are well-maintained

Battery Replacement
$5,000-$15,000
Reconditioning may be possible

Have electric motor, battery & regenerative brakes checked

Low Cost
Can be 50% of original MSRP after only 2 years

Find out whether this vehicle takes fast charging

Leasing an EV (rather than buying)

Manufacturer & dealer incentives

Great deals available

New technology hiccups

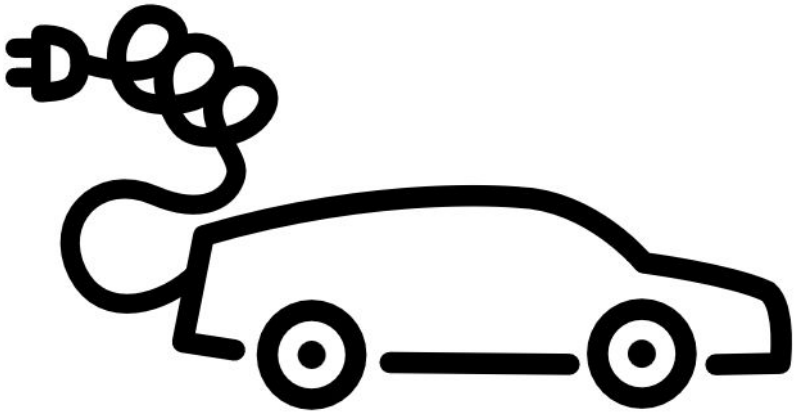
Taken care of by the dealership

Take advantage of upgrades

(range, batteries, charging)

Avoid Depreciation

All cars lose value the day you buy them



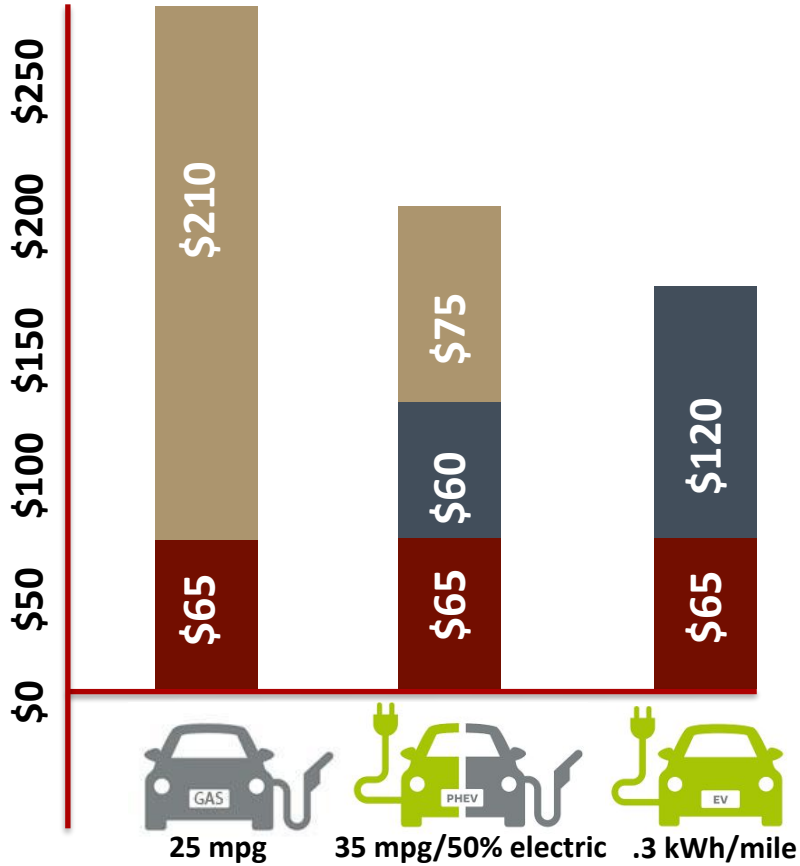
LIVING WITH YOUR ELECTRIC VEHICLE

How will my monthly expenses change?

- As gasoline costs go down, electric bills go up

Alameda Commuter
Drives on average **50 miles/day**

Uses **350 kWh/month** of household electricity



Cost of Gasoline ($3.50/gal)

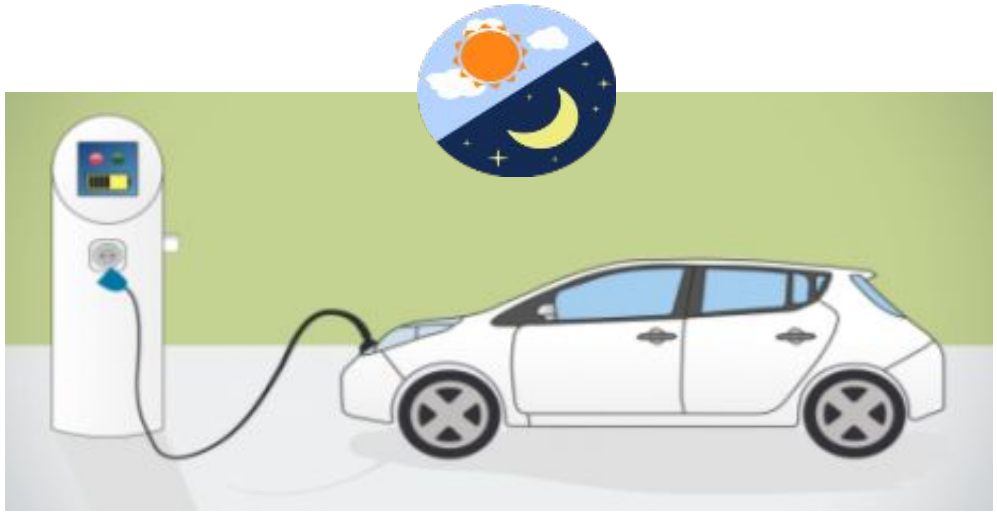
Electricity to charge EV ($.26/kWh)

Household Electricity ($.18/kWh)

How will my monthly expenses change?

Time of Use (TOU) Rates start July 2021*

**voluntary rate for EV owners only*



How does solar work with an EV?

The best time to charge is **while the Sun Shines**

If you don't yet have solar, consider that **AMP power is 100% Clean**

If you will only **charge at night**, consider installing a **Storage Battery**

Can I still use the Clean Vehicle Lanes?

Issued from 1/1/2019

VALID for 3 years

EXPIRED

EXPIRED

VALID until 1/1/2022

EXPIRED

Head to the DMV website for the application

A Public Service Agency

$22 FEE REQUIRED – MADE PAYABLE TO DMV

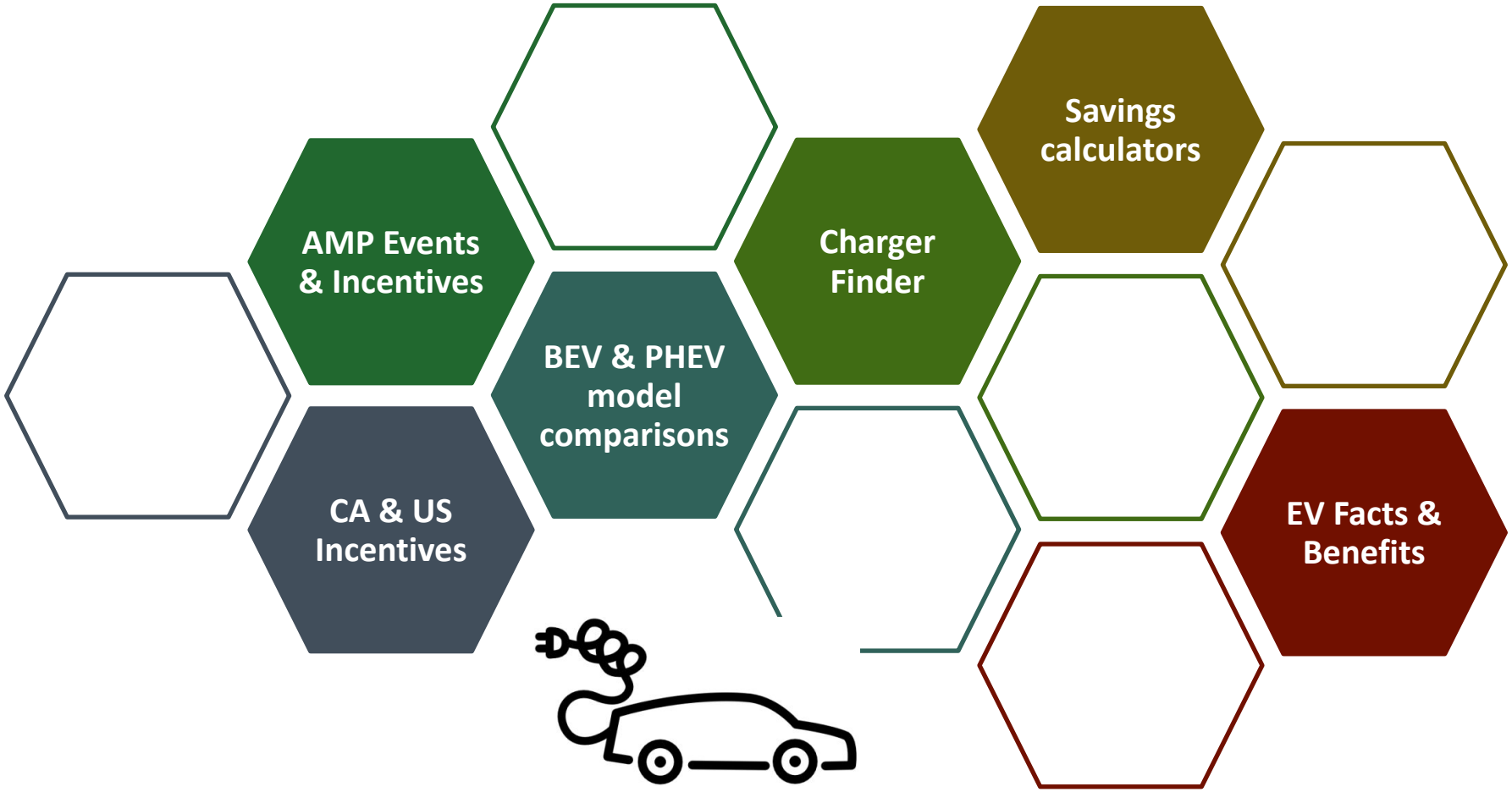
APPLICATION FOR CLEAN AIR VEHICLE DECALS

MAIL TO: DEPARTMENT OF MOTOR VEHICLES
SPECIAL PROCESSING UNIT – MS D238
P. O. BOX 932345, SACRAMENTO, CA 94232-3450

DMV USE ONLY
PREVIOUS DECAL
ISSUE DATE

Only the registered owner of record may apply. For vehicle eligibility, visit the California Air Resources Board (ARB) website at www.arb.ca.gov. Replacement decals are available to vehicles that have been involved in an accident in which body work affected decal placement. To avoid processing delays, check www.dmv.ca.gov/vr/decal.htm for information on how to complete this form.

AMP Website Resources



Questions

Email: **EV@alamedamp.com**

Website: **www.alamedamp.com**

Check out the Electric Vehicle Tab!