



Electric Vehicles Frequently Asked Questions (FAQ)



“Why should I drive an Electric Vehicle (EV)?”

There are many reasons to drive an EV. Here are some of the most compelling:

Better Fuel Economy - Go 100 miles on \$4 of electricity. 4 cents per mile!

Never Visit a Gas Station Again - Use domestically produced, publicly regulated electricity instead of foreign oil which is always subject to volatile price swings. Don't waste time looking for the cheapest gas and pumping it. Studies show that gasoline nozzles are some of the dirtiest places we touch in public!¹

Clean Energy - Electricity can be made from many different clean, renewable fuel sources. If you have solar, your cost can be much cheaper.

Good for the Environment: In addition to using a much cleaner fuel source, depending on how the electricity is generated, there is a significant reduction in greenhouse gas (GHG) emissions, nitrogen oxide (NOx), and other pollutants over petroleum based vehicles.

Practicality – Driving range of EV's exceeds the distance most people drive each day, which is estimated to be less than 40 miles. EV's require no warm up period before driving.

Silent and Smooth - Electric motor is whisper quiet with no vibration. When you stop the car, there's no idling, no wasted energy. Imagine how quiet all EV roadways would be!

Reliable & Extremely Low Maintenance: There are very few moving parts and almost no maintenance.

Performance - Instant torque and quick acceleration make driving fun again. There's no “wind up” to power like in a gasoline/diesel engine. This is why most EV's can beat most gasoline/diesel powered vehicles off the line.

Carpool lane: All EV's can legally use the carpool lane at any time regardless of number of occupants with an Air Resources Board (ARB) white sticker.

“OK, but I'm still worried about the lack of range with EV's.”

This is known as “range anxiety”. The reality is, most people's daily driving is less than the full range of most readily available EV's (70-80+ miles). In fact, a study from MIT and the Santa Fe Institute concluded **87%** of the vehicles on the road today could be replaced by an EV, *even if there's no possibility of recharging during the day.*² Like your cell phone, you plug it in at home, charge overnight, and have a full “tank” in the morning. Battery technology is advancing rapidly with GM and Tesla planning to introduce EV's with 200+ mile range in 2016-2017. Current

¹“Gas Pump Handles Top Study of Filthy Surfaces,” Reuters, Oct 25, 2011:

<http://www.reuters.com/article/2011/10/25/us-usa-health-filth-idUSTRE79O0G820111025>

² Needell, Zachary et.al, “Potential for widespread electrification of personal vehicle travel in the United States,” Nature Energy, Aug 15, 2016. <http://www.nature.com/articles/nenergy2016112>

research efforts could lead to an EV with 500 mile range within the next ten years!³ In the meantime, for that occasional long trip, take the gasoline and maintenance money you're saving and rent something nice! Conversely, most families have two cars; why not make one of them electric?

“Is there really no maintenance?”

There are NO: oil changes, smog checks, tune-ups, transmissions, water pumps, fuel pumps, starters, alternators, belts, spark plugs, fuel injectors, mufflers, gas & oil filters, and only a few hoses. Brakes last much longer than those on gasoline powered vehicles due to regenerative braking (energy from slowing/stopping an EV actually recharges the batteries). The simple drivetrain has few moving parts to repair or replace. Maintenance typically consists of tire rotation, windshield washer fluid refill, and wiper blade replacements!

“What about the battery? I hear that's expensive to replace.”

It's true, the battery is the single most expensive component of an EV. Over many cycles battery capacity (and thus range) can diminish. Heat, aggressive driving, and deep charging (i.e., fully draining the battery frequently) have all been shown to reduce range. Many manufacturers include 8-10 year or more warranties on the battery. There are also things you can do to minimize degradation, including buying a vehicle that liquid cools its battery, avoiding driving aggressively, and avoiding complete discharge. An even better option may be to lease the EV as most people get a new car before 8-10 years, and battery technology is rapidly evolving. Very few first generation hybrid vehicles have needed battery replacements. Additionally, EV batteries are already cheaper than 2020 projections.⁴ With an EV you needn't worry about the cost of expensive gasoline motor and transmission repairs.

“OK, but aren't batteries bad for the environment? Aren't they dangerous?”

Batteries are some of the most highly recycled items estimated at nearly 99% recovery according to the US EPA.⁵ The metals in newer batteries are more valuable, further driving this recycling effort. Almost all EV's rely on lithium-ion batteries, which contain less toxic metals than other batteries like lead or cadmium, and are actually categorized as a non-hazardous waste. There are potential environmental impacts associated with obtaining lithium, but most lithium today comes from saltwater brine, not mining.⁶ There are also many other uses for EV batteries at their end of life, such as remanufacturing and energy storage to stabilize the electricity grid.^{7,8} Additionally, there are new battery technologies being considered using more abundant materials that could be

³ “8 Potential EV and Hybrid Battery Breakthroughs,” Popular Mechanics:

<http://www.popularmechanics.com/cars/g785/8-potential-ev-and-hybrid-battery-breakthroughs/>

⁴ Evans, Simon, “Electric Vehicle Batteries are Already Cheaper than 2020 projections,” CarbonBrief.org. Mar 23, 2015. <https://www.carbonbrief.org/electric-vehicle-batteries-already-cheaper-than-2020-projections>

⁵ “Advancing Sustainable Materials Management: Facts and Figures,” U.S. Environmental Protection Agency, 2013. <https://www.epa.gov/smm/advancing-sustainable-materials-management-facts-and-figures>

⁶ Abell, Lauren & Oppenheimer, Paul, “World Lithium Resource Impact on Electric Vehicles,” Plug-In America, Dec 2008: <http://action.pluginamerica.org/o/2711/images/World-Lithium-Resource-Impact-on-Electric-Vehicles-v1.pdf>

⁷ Ramoni, Monsuru & Zhang, Hong-Chao, “End of Life (EOL) issues and options for electric vehicle batteries,” Clean Technologies and Environmental Policy, Nov 2013: https://www.researchgate.net/publication/236649811_End-of-life_EOL_issues_and_options_for_electric_vehicle_batteries

⁸ Kelly-Detwiler, Peter, “The Afterlife for Electric Vehicle Batteries: A Future Source of Energy Storage?,” Forbes Magazine, Mar 18, 2014: <http://www.forbes.com/sites/peterdetwiler/2014/03/18/the-afterlife-for-electric-vehicle-batteries-a-future-source-of-energy-storage/#7babd18e53d1>

commercially viable in the coming decade.⁹ As for danger, studies have shown that electric cars are far safer than gasoline vehicles in the event of an accident.¹⁰

“Where do Electric Vehicles charge?”

The short answer is, anywhere there’s an electrical outlet! EV owners charge primarily at home overnight using off-peak hour electricity. You can also charge at one of the many public charging stations, often for free, which can be found using free mobile phone apps such as Plugshare. There are also DC Fast Chargers available that charge even faster, such as the one in Pollock Pines and South Lake Tahoe. AQMD has funded the installation of over 28 EV chargers in El Dorado County, most using competitive grant funding. Visit www.edcgov.us/EVs.aspx and click on the EV map.

“How long does it take to fully charge?”

This depends primarily on 4 factors. The:

- car’s ability to take a charge (charge rate),
- current charge level of the battery,
- battery capacity, and
- level of power being used to recharge.



In general, the following applies to most EV’s:

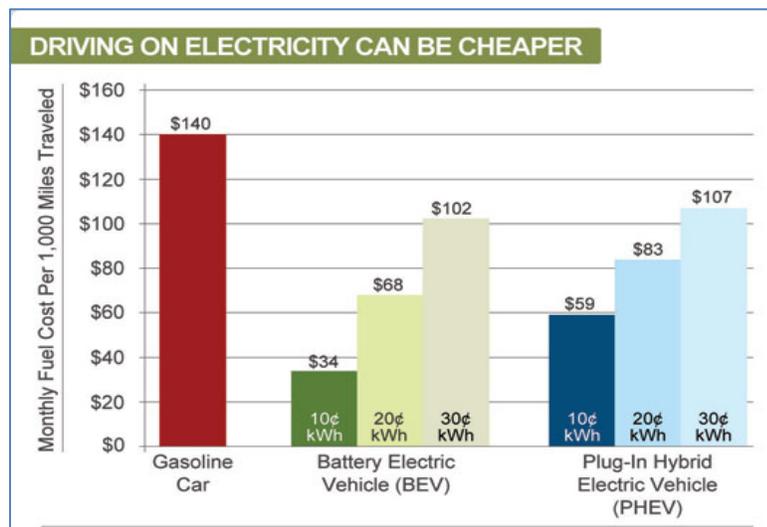
Level 1, (120V AC, typical wall outlet):
Level 2, (240V AC, typical electric dryer outlet):
DC Fast Charge, (480V DC, high-speed charger):

Full charge overnight.
Full charge in 3-5 hours.
80% charge in 30 minutes.

“How much will charging add to my home's electric bill? How does that compare to my gasoline bill?”

This, of course, depends on many factors including the fuel efficiency of your current car, your particular cost of electricity, the current price of gasoline, etc. However, assuming your vehicle gets 26 mpg and gasoline costs \$3.63/gal, the following chart compares Battery Electric Vehicles (BEV) & Plug-In Hybrid Electric Vehicles (PHEV) at various electricity prices to a gasoline vehicle.¹¹:

Gas prices fluctuate wildly, and usually not in your favor, depending on world events.

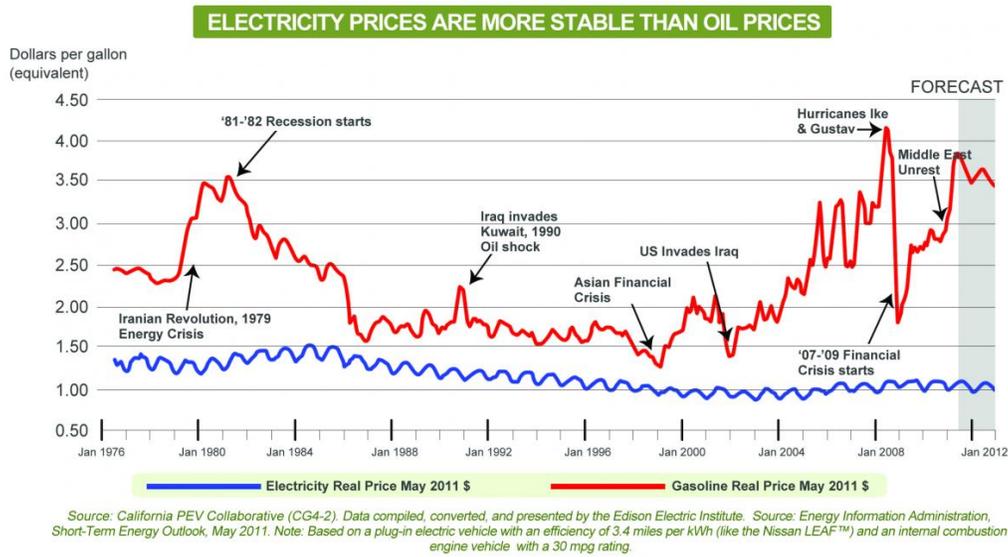


⁹ Karsten, Jack & West, Darrell, “Five emerging battery technologies for electric vehicles,”; Brookings Institute, Sept 15, 2015: <http://www.brookings.edu/blogs/techtank/posts/2015/09/15-five-emerging-battery-technologies>

¹⁰ Herron, David, “Electric cars are safer than gasoline cars,” The Long Tail Pipe, Aug 27, 2015 <http://longtailpipe.com/ebooks/green-transportation-guide-buying-owning-charging-plug-in-vehicles-of-all-kinds/electric-cars-are-safer-than-gasoline-cars/>

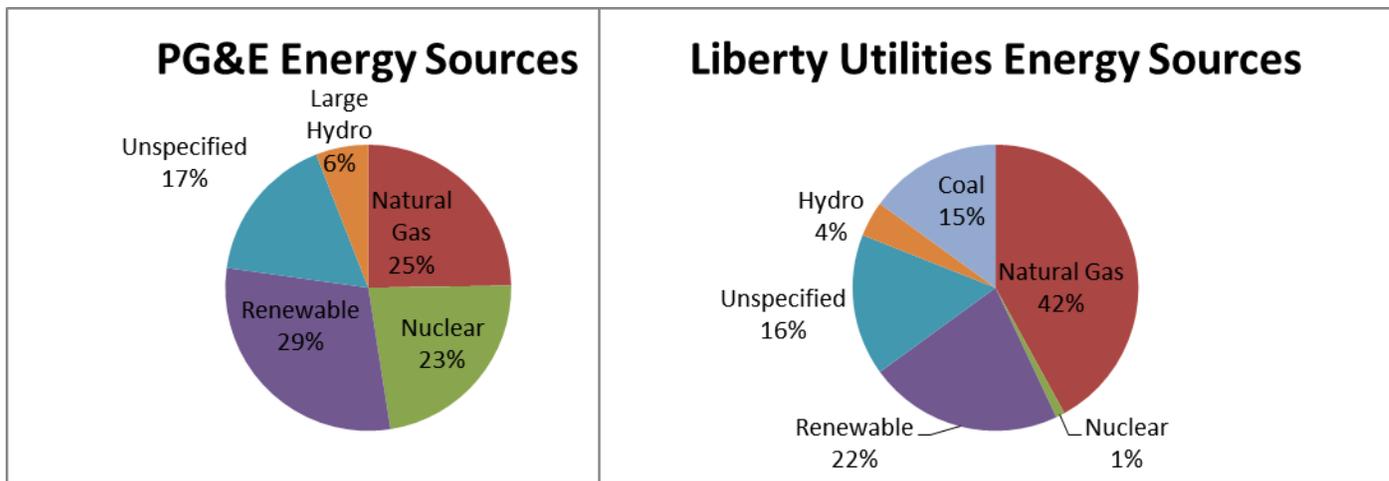
¹¹ “Fuel Costs: PEV vs Gasoline Cars?”, CA Plug-in Electric Vehicle Collaborative, Jan 2012: http://www.pevcollaborative.org/sites/all/themes/pev/files/Comm_guide4_122308.pdf

Conversely, the price of electricity has stayed relatively stable. If you have solar installed at your home your cost for electricity can be even cheaper. The monthly cost savings can offset the cost to purchase or lease an electric vehicle.



“Isn’t an EV just a ‘coal powered’ car?”

The following is a breakdown of the 2015 energy sources used by PG&E, the county’s largest utility providing power for the West Slope, and Liberty Utilities, providing power to the Tahoe area:



*Unspecified refers to electricity that is not traceable to specific generation sources by an auditable contract trail.

To meet California’s Renewable Portfolio Standard (RPS), PG&E and Liberty Utilities have committed to increasing the use of renewable sources to 33% by 2020.¹² Additionally, on April 24, 2015, Liberty Utilities announced they would remove all coal from their portfolio by January 2016 and replace it with a 50MW solar facility. Statewide, only 6.4% of California’s power comes from coal, which will continue to decrease as utility companies comply with the RPS.¹³

¹² PG&E Renewables, 2015: <http://www.pge.com/en/about/environment/pge/cleanenergy/index.page>

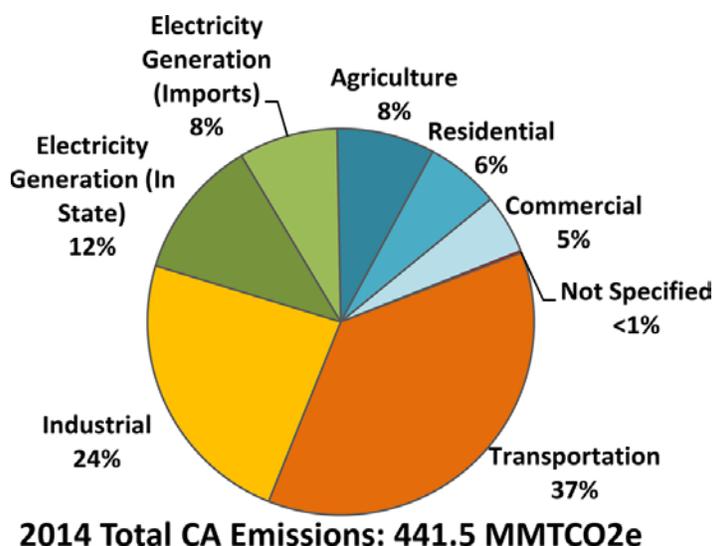
¹³ CA Energy Commission Energy Almanac, Total Electricity System Power, 2014 http://energyalmanac.ca.gov/electricity/total_system_power.html

EV's only get cleaner with age as electricity providers continually upgrade and convert to renewable resources. Conversely, petroleum fueled vehicle emissions and efficiency get worse with age as exhaust and emission control components, seals, and filters break down.

“How much pollution do on-road petroleum-fueled vehicles create?”

According to ARB's 2012 emissions inventory, mobile sources accounted for 83% of all Nitrogen Oxides (NOx) and 83% of all Carbon Monoxide (CO) emitted in California.¹⁴ That's 1,747 tons of NOx and 6,142 tons of CO, **per day!** Well over half of this pollution comes from on-road vehicles. NOx is one of the major components in the formation of ozone (smog), and CO is a deadly gas. El Dorado County is in non-attainment of the state and federal Ambient Air Quality Standards (AAQS) for ozone.

With respect to Greenhouse Gases (GHG), Transportation is the largest sector emitting 37% of all GHG in CA¹⁵. This is almost entirely emissions from on-road vehicles.



Even when factoring in an electricity power mix that's high in GHG emissions, (i.e., heavy use of coal, etc), EV's still have lower overall GHG emissions than the average new compact car, which gets 28 miles per gallon.¹⁶ A full life cycle assessment, from manufacturing to ultimate disposal (aka "cradle to grave") reveals a 50% GHG reduction over gasoline vehicles.¹⁷

“Doesn't the government heavily subsidize EV's?”

To help jumpstart public adoption of EV's, there are federal and state incentives available to those who purchase or lease qualifying vehicles. The federal incentive is a tax credit of up to \$7,500 but this will phase out and depends on how many vehicles of a specific type are sold.¹⁸ The CA state

¹⁴ 2012 Estimated Annual Average Emissions Statewide, Air Resources Board:

http://www.arb.ca.gov/app/emsinv/2013/emseic1_query.php?F_DIV=-4&F_YR=2012&F_SEASON=A&SP=2013&F_AREA=CA

¹⁵ 2014 California Greenhouse Gas Emission Inventory, Air Resources Board:

<http://www.arb.ca.gov/cc/inventory/data/data.htm>

¹⁶ Union of Concerned Scientists, *State of Charge* report, Sept. 2014 update:

http://blog.ucsusa.org/how-do-electric-cars-compare-with-gas-cars-656?_ga=1.264002316.109000200.1432745263

¹⁷ Union of Concerned Scientists, *Cleaner Cars from Cradle to Grave*, Nov 2015:

<http://www.ucsusa.org/clean-vehicles/electric-vehicles/life-cycle-ev-emissions#.VkpmsrQdW>

¹⁸ IRS page regarding federal EV tax credit: <http://www.irs.gov/Businesses/Plug-In-Electric-Vehicle-Credit-IRC-30-and-IRC-30D>

rebate is up to \$5,000 depending on the type of vehicle purchased.¹⁹ This rebate will also sunset at some point once funding is expended.

Locally, El Dorado County Air Quality Management District (AQMD) administers a Drive Clean! vehicle incentive program for eligible El Dorado County residents.²⁰ Visit http://www.edcgov.us/Government/AirQualityManagement/Grants_and_Incentive_Refunds.aspx for info. As an aside, the federal government has been subsidizing the oil and gas industry for decades.²¹

“What are some good websites for more information about EV’s?”

www.driveclean.ca.gov

www.pevcollaborative.org

www.PlugInAmerica.org

www.GreenCarReports.com

www.FuelEconomy.gov

www.EnergyCenter.org

www.saceva.org

www.PlugShare.com

www.EVWorld.com

¹⁹ CA clean car rebate: <https://energycenter.org/clean-vehicle-rebate-project>

²⁰ AQMD Drive Clean! EV incentive:

http://www.edcgov.us/Government/AirQualityManagement/Grants_and_Incentive_Refunds.aspx

²¹ “Long History of US Energy Subsidies,” Chemical & Engineering News, Dec 11, 2011:

<http://cen.acs.org/articles/89/i51/Long-History-US-Energy-Subsidies.html>